

# Product catalog

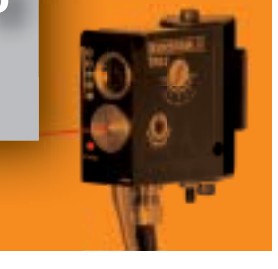
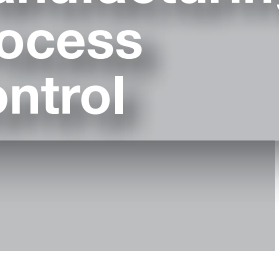
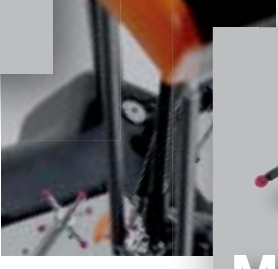
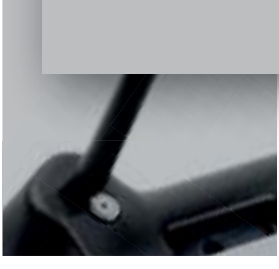
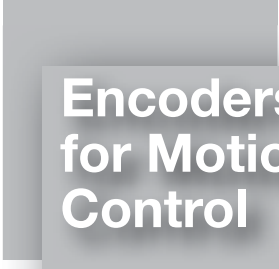
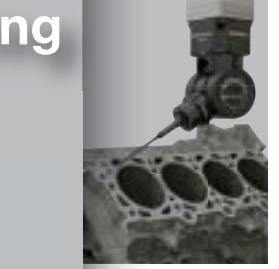
## Issue 18

Industrial  
Metrology

Additive  
Manufacturing

Encoders  
for Motion  
Control

Manufacturing  
Process  
Control



# Introduction

## Foreword

All prices are quoted in U.S. dollars and are subject to change without notice. Prices include packaging, but exclude freight, tax and insurance (where applicable).

All freight is shipped F.O.B. Hoffman Estates, Illinois. Renishaw automatically ships and insures items via United Parcel Service unless the customer specifies otherwise.

Renishaw's terms of business are thirty (30) days net.

**Renishaw's return policy for unused items returned by customers is as follows:**

A notice requesting goods to be returned must occur within 30 days of shipment. A Return Goods Authorization number (RGA) will be issued by Renishaw's Customer Service department and is required prior to goods being returned. Goods must then be returned within 30 days of issue date. The RGA number must be noted on all paperwork and labels for return. Shipment to Renishaw without an RGA number may be refused.

Returned product will be inspected and credit will be issued, except where an item is damaged, incomplete, or not in the original packaging. Specials, or non-standard assembled products, are non-returnable.

If you require further information regarding Renishaw products, please contact us at:

## The Renishaw mission

Renishaw will design, manufacture and supply metrology systems of the highest quality and reliability to enable customers worldwide to carry out dimensional measurements to traceable standards.

Our product offerings will enhance quality and productivity, and we will strive for total customer satisfaction through superior customer service.

Our aim is to provide leading edge technology by encouraging innovation to address our customers' needs.

We are committed to sustained growth through continued investment in product development and manufacturing methods.

Renishaw wishes to be recognized collectively and individually as leaders and contributors in our field and our community.

We wish to achieve our aims in a way that is caring, open and honest.

Renishaw is an environmentally conscious and responsible company. We will strive to ensure that all aspects of the business have the least harmful effect on the environment.

# 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



### 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



### 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

**Part number:** A-1045-1893



## 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)  
**Part number:**A-1046-5098 (coiled 18-50 in, 5 pin DIN)  
**Part number:**A-1046-5099 (coiled 30-95 in, 5 pin DIN)  
**Part number:**A-1046-5094 (plain 177 in, 5 pin DIN)  
**Part number:**A-1046-5096 (coiled 23-72 in, 7 pin amph)

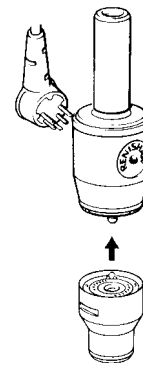


## PH6A

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



## 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



## 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 $\sigma$  positional repeatability: 1.5  $\mu$ 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



## 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 $\sigma$  positional repeatability: 1  $\mu$ 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° in 7.5° steps = 48 positions  
Probe mounting: Autojoint  
Mounting options: Shank to suit your CMM

**Part number:** A-1070-0003



## 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 $\sigma$  positional repeatability: 1  $\mu$ 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° in 7.5° steps = 48 positions  
Probe mounting: Autojoint  
Mounting options: Shank to suit your CMM

**Part number:** A-1373-0001



## 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

### MH20 head with standard force module

**Part number:** A-4043-0100

### MH20 head with medium force module

**Part number:** A-4043-0200

### MH20 head with extended force module

**Part number:** A-4043-0300





## 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

### MH20i head with standard force module

**Part number:** A-4099-0100

### MH20i head with medium force module

**Part number:** A-4099-0200

### MH20i head with extended force module

**Part number:** A-4099-0300

## 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 x TP20 modules (standard, medium, extended or low)  
 2 x M2 stylus spanners  
 2 x M4 stylus spanners  
 Cleaning kit

**Part number:**A-5400-#### (see overleaf)

(Additional charge for 6-way module per module)

### RTP20 non-rack kit

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

**Part number:**A-5400-8### (see overleaf)



## 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**

## Motorized probe heads

### PH10T

The new PH10T 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 $\sigma$ positional repeatability:	0.5 $\mu$ 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 (purchased separately)
Dimensions:	Length 102 mm excluding AM1, width 62 mm
Weight:	645 g

**Part number:** A-1025-1520

### PH10M

The PH10M 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, allowing probe extension bars up to 300 mm long to be used.

The PH10M has an autojoint mounting.

2 $\sigma$ positional repeatability:	0.5 $\mu$ 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 (purchased separately)
Dimensions:	Length 102 mm excluding AM1, width 62 mm
Weight:	645 g

**Part number:** A-1025-0050

### PH10MQ

The PH10MQ 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 is identical to that of the PH10M, with the following exceptions:

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

**Part number:** A-1036-0001

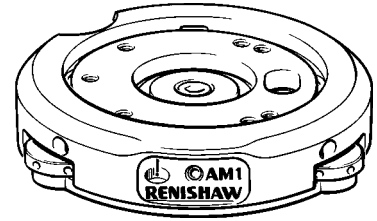
\* On all the PH10 series of probe heads, it is possible to extend beyond 300 mm using our range of CF extensions.



## 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.

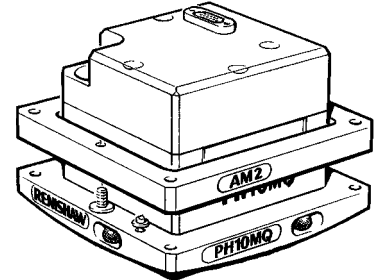


	AM1	AM2
Size:	60 mm x 15.5 mm	80 mm x 10 mm
Adjustment:	±2° in pitch and roll* ±4.5° in yaw	±1° in pitch and roll ±1° in yaw
Overtravel:	±3.5° in pitch and roll	0
Mounting:	Mounts to quill using shank	Mounts direct to quill

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

**Part number:** A-1026-0320 (AM1)

**Part number:** A-1036-0080 (AM2)



### PHC10-3

The PHC10-3 head control receives instructions and processes signals to rotate the angles of the PH10 series probe heads. The PHC10-3 is compatible with all PH10 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-5684-0100

### 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



**MCUlite-2 joystick**

**Part number:** A-5331-0015



**MCU5 joystick kit**

**Part number:** A-5121-0003

**MCU5 wireless joystick**

**Part number:** A-5121-0077

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



**PL163**

5 meter cable for MCU1.

**Part number:** A-1016-8098

**PL164**

10 meter cable for MCU1.

**Part number:** A-1016-8099

**PL171**

20 meter cable for MCU1.

**Part number:** A-1016-8100

**12U retrofit cabinet**

**Part number:** A-5567-1000



## 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.
- *MCUlite-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.



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		MCR20NI and MCR20	
Joystick		Multifunction MCU <i>lite</i> -2	
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 kit part numbering scheme

**A-5669-####**

The first number represents the controller kit:

- 1 = No controller kit
- 2 = PH20 UCC kit 1 (PH20, PCI, UCC, SPA, MCU*lite*-2)
- 3 = PH20 UCC kit 2 (PH20, PCI, UCC, SPA, MCU*lite*-2)

The second number represents MODUS™ and labor:

- 1 = No MODUS™ or labor
- 2 = MODUS™ and labor
- 3 = MODUS™ only

The third and fourth numbers represent the shank or quill (specified at the time of order).

### PH20 with UCC kit 1

Includes: PH20  
Interface  
Licence  
Cable  
UCC  
SPA  
MCU*lite*-2

**Part number:** A-5669-21##

### PH20 with UCC kit 2

Includes: PH20  
Interface  
Licence  
Cable  
UCC  
SPA  
MCU*lite*-2

**Part number:** A-5669-31##

### PH20 with UCC kit 1, MODUS™ and labor

Includes: PH20  
Interface  
Licence  
Cable  
UCC  
SPA  
MCU*lite*-2  
Labor  
MODUS™

**Part number:** A-5669-22##

### PH20 with UCC kit 2, MODUS™ and labor

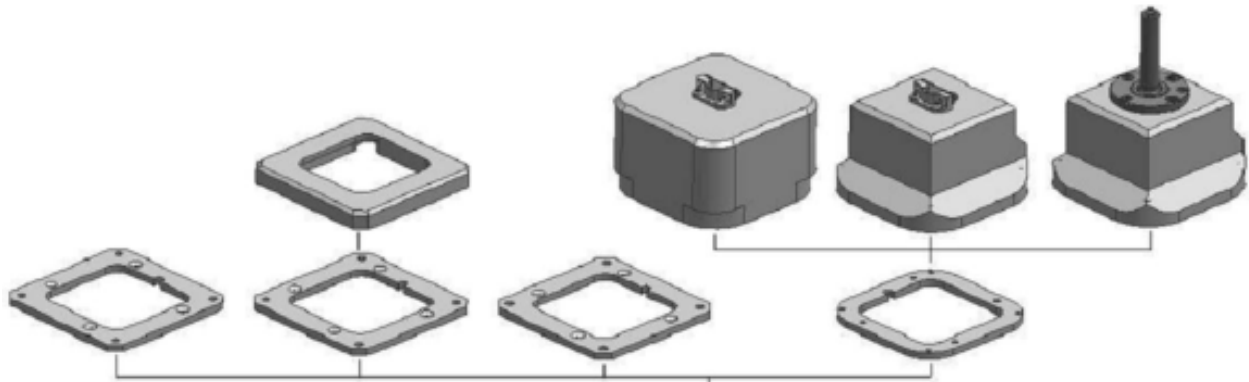
Includes: PH20  
Interface  
Licence  
Cable  
UCC  
SPA  
MCU*lite*-2  
Labor  
MODUS™

**Part number:** A-5669-32##

**NOTE:** This equipment requires installation by a Renishaw-certified technician. Prices quoted do not include a controller cabinet, scales, adaptor cables or any repair work to machine mechanics.



## PH20 shanks



### PH20 shank adaptor

Part number: A-3007-1715

### PH20 small quill adaptor

60 mm × 60 mm.

Part number: A-3007-1716

### PH20 large quill adaptor

80 mm × 80 mm.

Part number: A-3007-1717

### PH20 PH10MQ quill adaptor

Part number: A-3007-1720

## Rack for PH20

### MCR20NI

Part number: A-5669-0020



**NOTE:** See CMM probe shanks starting on page 1-39.

## 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 **Reniscan5™** 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 **Reniscan5™** 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/m <sup>3</sup>	
		Dewpoint	Class 4	3 °C	
		Oil	Class 4	5 mg/m <sup>3</sup>	
	After filtration air specification (ref: ISO8537.1)	Particle size	Class 2	1 µm	Pressure 5 bar
		Dirt concentration	Class 2	1 mg/m <sup>3</sup>	
		Dewpoint	Class 3	-20 °C	
		Oil	Class 2	0.1 mg/m <sup>3</sup>	
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

### 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

### 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

### 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

**REVO® head kit**

**Part number:** A-3060-0040

**RSP2 REVO® probe kit**

**Part number:** A-3060-0020

**RSP3-1 REVO® probe kit**

RSP3-1 and SH25-1.

**Part number:** A-3060-0031

**RSP3-3 REVO® probe kit**

RSP3-3 and SH25-3A.

**Part number:** A-3060-0030

**RSP3-4 REVO® probe kit**

RSP3-4 and SH25-4A.

**Part number:** A-3060-0034

**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

**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

**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

**REVO® rack kit #4**

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

**Part number:** A-3060-0014

**RSH250 kit**

**Part number:** A-3060-0021

**RSH350 kit**

**Part number:** A-3060-0022

**RSH450 kit**

**Part number:** A-3060-0026

**RSH500 kit**

**Part number:** A-3060-0023

**45 mm diameter datum ball kit**

**Part number:** A-3060-0310

**RCP TC kit 1**

REVO® rack changing port – thermally controlled

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

**Part number:** A-3061-0300

**REVO® TDA tip correction block**

**Part number:** A-3060-0085

**REVO® RCP2 rack changing port**

**Part number:** A-3060-0090

## 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  
SFA calibration artifact

**Part number:** A-5453-3000

## 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:	$\pm X, \pm Y, +Z$
$2\sigma$ 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)

**Part number:** A-1041-7541 (TP1SM)



## 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.

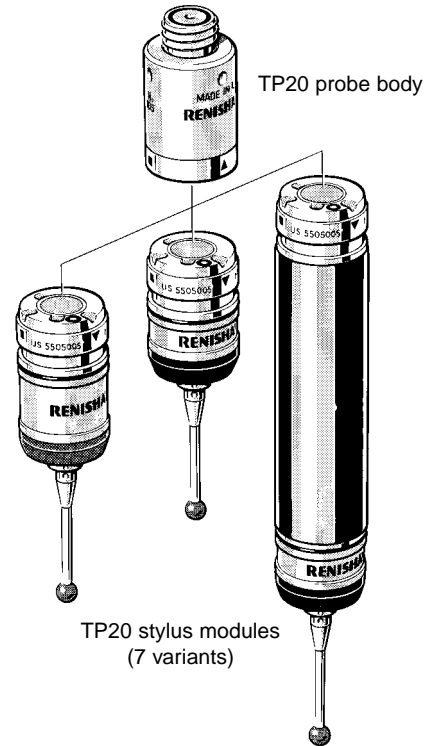
A direct replacement for the industry standard Renishaw TP2 probe, the TP20 probe system brings a range of new benefits to manual and DCC CMM applications, and can easily be retrofitted to existing TP2 installations.

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.



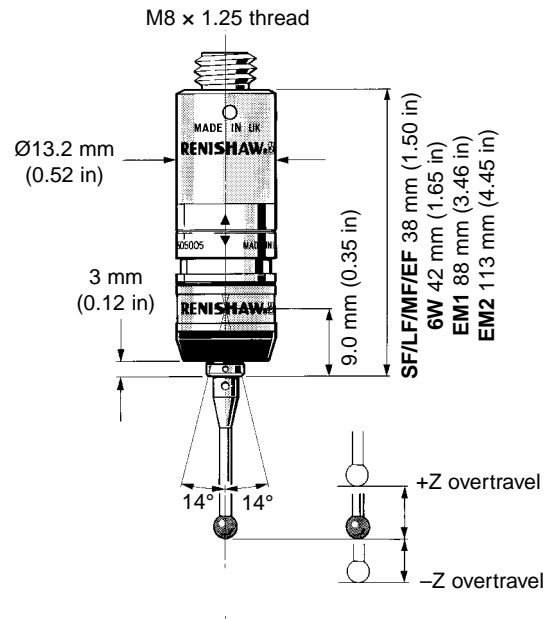
### TP20 probe body

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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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	±X, ±Y, +Z ±X, ±Y, ±Z	±X, ±Y, +Z ±X, ±Y, ±Z
Pre-travel variation	LF SF/EM1/EM2 MF EF 6W	±0.6 µm (±0.000023 in) ±0.8 µm (±0.000032 in) ±1.0 µm (±0.000039 in) ±2.0 µm (±0.000079 in) ±1.5 µm (±0.000058 in)	±0.6 µm (±0.000023 in) ±0.8 µm (±0.000032 in) ±1.0 µm (±0.000039 in) ±2.0 µm (±0.000079 in) ±1.5 µm (±0.000058 in)
Repeatability of stylus change (max)	With SCR200 Manual	±0.5 µm (±0.000020 in) ±1.0 µm (±0.000040 in)	±0.5 µm (±0.000020 in) ±1.0 µm (±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

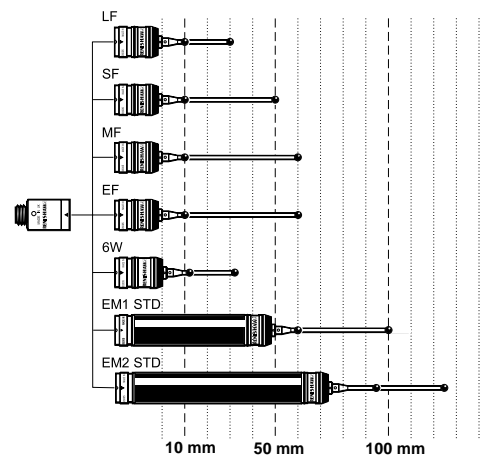


Module type and test stylus length	Trigger force		Overtravel force			Overtravel displacement			Unidirectional repeatability 2σ at stylus tip	2D (XY) form error
	XY	Z	XY	+Z	-Z	XY	+Z	-Z		
<b>SF</b> (black cap) 10 mm	0.08 N	0.75 N	0.2-0.3 N	3.5 N	-	±14°	4.0 mm (0.16 in)	-	0.35 µm (0.000014 in)	±0.8 µm (±0.000032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

### TP20 probe kit 2

Includes one standard force and one medium force module.

**Part number:** A-1371-0291

### TP20 probe kit 3

Includes one standard force and one extended force module.

**Part number:** A-1371-0292

### TP20 probe kit 4

Includes two medium force modules.

**Part number:** A-1371-0293

### TP20 probe kit 5

Includes one medium force and one extended force module.

**Part number:** A-1371-0294

### TP20 probe kit 6

Includes two extended force modules.

**Part number:** A-1371-0295

### TP20 probe kit 7

Includes one standard force and one 6-way module.

**Part number:** A-1371-0418

## TP20 non-inhibit (NI) probe kits

### TP20 non-inhibit probe kit 1

Includes two standard force modules.

**Part number:** A-1371-0640

### TP20 non-inhibit probe kit 2

Includes one standard force and one medium force module.

**Part number:** A-1371-0641

### TP20 non-inhibit probe kit 3

Includes one standard force and one extended force module.

**Part number:** A-1371-0642

### TP20 non-inhibit probe kit 4

Includes two medium force modules.

**Part number:** A-1371-0643

### TP20 non-inhibit probe kit 5

Includes one medium force and one extended force module.

**Part number:** A-1371-0644

### TP20 non-inhibit probe kit 6

Includes two extended force modules.

**Part number:** A-1371-0645

## TP20 accessories

### TP20 probe modules

#### Standard force probe module

**Part number:** A-1371-0270

#### Medium force probe module

**Part number:** A-1371-0271

#### Extended force probe module

**Part number:** A-1371-0272

#### 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

#### 6-way probe module

**Part number:** A-1371-0419

#### 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

#### 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

#### 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

#### Cleaning kit

**Part number:** A-1085-0016

## 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

### MCR20 probe module change rack kit 2

Includes one standard force and one medium force module.

**Part number:** A-1371-0262

### MCR20 probe module change rack kit 3

Includes one standard force and one extended force module.

**Part number:** A-1371-0263

### MCR20 probe module change rack kit 4

Includes two medium force modules.

**Part number:** A-1371-0264

### MCR20 probe module change rack kit 5

Includes one medium force and one extended force module.

**Part number:** A-1371-0265

### MCR20 probe module change rack kit 6

Includes two extended force modules.

**Part number:** A-1371-0266

### MCR20 location plate

**Part number:** M-1085-0301

## 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 ( $\pm X$ , $\pm Y$ , $+Z$ )
$2\sigma$ unidirectional repeatability:	0.35 $\mu\text{m}$
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



## 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:	$\pm X$ , $\pm Y$ , $+Z$
$2\sigma$ unidirectional repeatability:	0.35 $\mu\text{m}$
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)

**Part number:** A-1039-0028 (TP6A)



## 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:	±X, ±Y, ±Z	
2σ unidirectional repeatability:	High sensitivity	0.25 μm
	Mid sensitivity	0.25 μm
Pre-travel variation:	High sensitivity	±0.25 μm
	Mid sensitivity	±0.50 μm
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

## TP7M EP

The TP7M EP (enhanced performance) is capable of achieving a 3D accuracy of <0.6 μm tested to ISO 10360 Pt 2.

### TP7M EP probe kit

**Part number:** A-1073-0261

## 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: $\pm X, \pm Y, \pm Z$	6 way: $\pm X, \pm Y, \pm Z$
Unidirectional repeatability ( $2\sigma$ $\mu\text{m}$ )	Trigger level 1		0.4 $\mu\text{m}$ (0.000016 in)	0.4 $\mu\text{m}$ (0.000016 in)
	Trigger level 2		0.5 $\mu\text{m}$ (0.000020 in)	0.5 $\mu\text{m}$ (0.000020 in)
XY (2D) form measurement deviation	Trigger level 1		$\pm 0.8$ $\mu\text{m}$ (0.000032 in)	$\pm 1.0$ $\mu\text{m}$ (0.000040 in)
	Trigger level 2		$\pm 0.9$ $\mu\text{m}$ (0.000036 in)	$\pm 1.2$ $\mu\text{m}$ (0.000047 in)
XYZ (3D) form measurement deviation	Trigger level 1		$\pm 1.0$ $\mu\text{m}$ (0.000040 in)	$\pm 2.5$ $\mu\text{m}$ (0.000100 in)
	Trigger level 2		$\pm 1.4$ $\mu\text{m}$ (0.000056 in)	$\pm 4.0$ $\mu\text{m}$ (0.000160 in)
Repeatability of stylus change	With SCR200		$\pm 0.5$ $\mu\text{m}$ (0.000020 in) max	$\pm 0.5$ $\mu\text{m}$ (0.000020 in) max
	Manual		$\pm 1.0$ $\mu\text{m}$ (0.000040 in) max	$\pm 1.0$ $\mu\text{m}$ (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		50 mm (1.97 in) steel - 100 mm (3.94 in GF)	50 mm (1.97 in) steel - 100 mm (3.94 in GF)
	LF module		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

### **TP200 probe with low force module**

**Part number:** A-1207-0002

### **TP200B probe with standard force module**

**Part number:** A-1207-0055

## **TP200 accessories**

### **Standard force stylus module**

**Part number:** A-1207-0010

### **Low force stylus module**

**Part number:** A-1207-0011

### **TP200 probe cleaning kit**

**Part number:** A-1085-0016

### **GF stylus kit \***

**Part number:** A-5003-2310

\*See Stylus section for kit contents.

## 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 ( $2\sigma$ ) at 50 mm:	Automatic: 1 $\mu\text{m}$ Manual: 2 $\mu\text{m}$
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)

**Part number:**A-1207-0070 (low force modules)

### SCR200 stylus changing rack only

**Part number:** A-1085-0370

### SCR200 datum stylus (PS35R)

**Part number:** A-5000-7812

### SCR200 cables

**Part number:** A-1016-7630 (PL63S – 5 m)

**Part number:** A-1016-7631 (PL64S – 10 m)

**Part number:** A-1016-7632 (PL65S – 20 m)

### SCR200 mounting kit

**Part number:** A-1085-0005

### SCR200 location plate

**Part number:** M-1085-0301



## 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"> <li>• compatible with PH10M, PH10MQ, and PH6M</li> <li>• may be mounted to autojoint extension bars</li> </ul>
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)

**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

**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

**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

**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

**SM25-1 scanning module kit**

Includes: 1 × SM25-1  
2 × SH25-1

**Part number:** A-2237-1101

**SM25-2 scanning module kit**

Includes: 1 × SM25-2  
2 × SH25-2

**Part number:** A-2237-1102

**SM25-3 scanning module kit**

Includes: 1 × SM25-3  
2 × SH25-3

**Part number:** A-2237-1103



### **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

### **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

### **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

### **TM25-20 TTP module adaptor only**

**Part number:** A-2237-1200

### **TM25-20 TTP module adaptor kit #1**

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

**Part number:** A-2237-1201

### **SM25-1 scanning module only**

**Part number:** A-2237-1111

### **SM25-2 scanning module only**

**Part number:** A-2237-1112

### **SM25-3 scanning module only**

**Part number:** A-2237-1113

### **SM25-4 scanning module only**

**Part number:** A-2237-1114

### **SH25-1 stylus holder only**

**Part number:** A-2237-1301

### **SH25-2 stylus holder only**

**Part number:** A-2237-1302

### **SH25-3 stylus holder only**

**Part number:** A-2237-1303

### **SH25-4 stylus holder only**

**Part number:** A-2237-1304

### **AC3 interface card**

**Part number:** A-2237-1601

## 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



### 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



### 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



### FCR25 port adaptor insert kit

Includes: 3 × PA25-SH  
 3 × PA25-20

**Part number:** A-2237-1415

## 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.

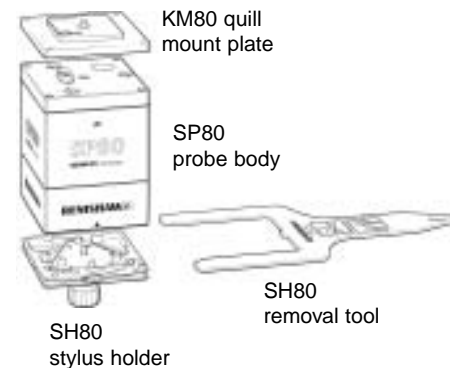
It is able to reach deep into parts by carrying styli up to 500 mm long and 500 g mass, including star configurations which do not require counterbalancing. Renishaw's M5 styli products are designed to complement SP80 and ensure maximum performance.

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

### SP80 probe kit 2

- Includes: SP80 probe kit 1  
 SCP80 stylus change port (3 off)  
 MRS kit 2 (600 mm rail length – see page 1-50)

**Part number:** A-2238-0732

### SP80 probe kit 3

- Includes: SP80 probe kit 1  
 SCP80 stylus change port (4 off)  
 MRS kit 2 (600 mm rail length – see page 1-50)

**Part number:** A-2238-0733

### SP80 probe kit 4

- Includes: SP80 probe kit 1  
 SCP80 stylus change port (5 off)  
 MRS kit 3 (1000 mm rail length – see page 1-50)

**Part number:** A-2238-0734

### SP80 probe kit 5

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

**Part number:** A-2238-0735

### SP80 probe kit 6

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

**Part number:** A-2238-0736

### SP80 probe kit 7

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

**Part number:** A-2238-0737

## 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

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 1-50.

**Part number:** A-2238-0706

### 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

### 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

### 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

### 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

### KM80 quill mount plate

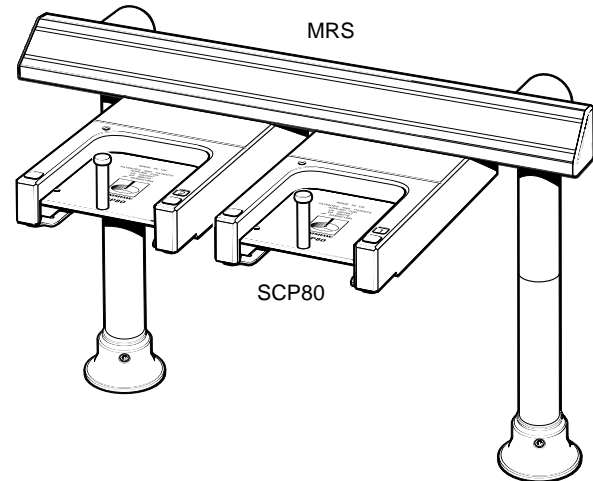
The standard mounting plate between the CMM quill (80 mm square) and the SP80 probe body. Provides easy and repeatable removal/replacement of the probe. Alternative CMM quill mountings are available (see KM6080 and SM80 below).

**Part number:** A-2238-0703

### KM6080 quill mount plate

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

**Part number:** A-2238-0020



### SM80 shank mount plate

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

**Part number:** A-2238-0704

### 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

### CC6 counter card

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

**Part number:** A-4068-0400

### Cables

#### PL156

IU80 to OEM controller (supplied unterminated).

**Part number:** A-1016-7129

#### PL157

SP80 probe cable (included with all SP80 kits).

**Part number:** A-1016-7132

#### PL158

IU80 to CC6.

**Part number:** A-1016-7133

## 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

### AC1 analog converter PC card

**Part number:** A-2098-1000

### AC2 analog converter PC card

**Part number:** A-2172-0001

### Stylus module - SH600 standard

**Part number:** A-2098-0284

### Stylus module - SH600 extended

**Part number:** A-2098-1036

## 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

## 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





## 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

## 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.

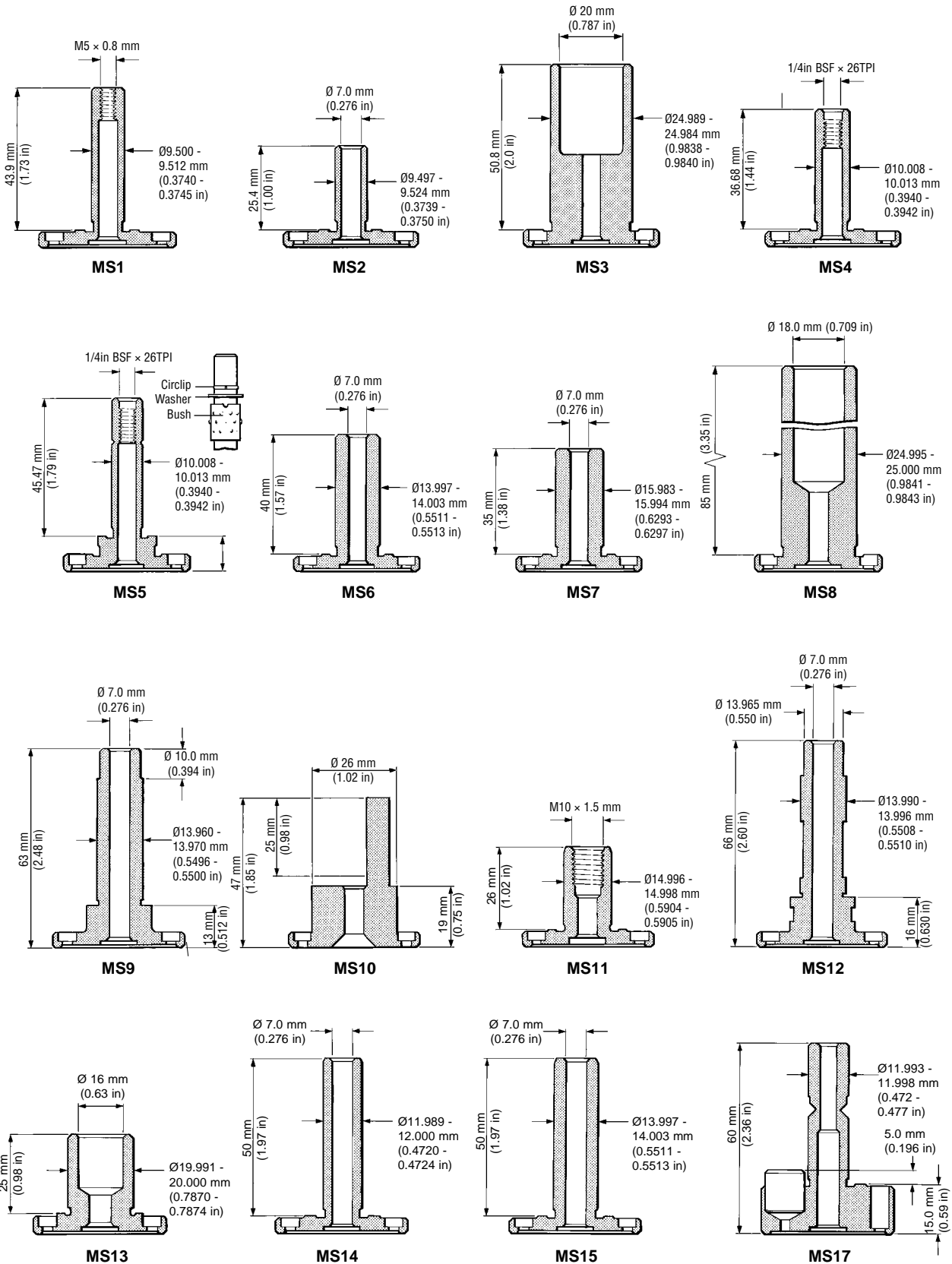
**Note:** The PH6 requires a different shank and has a separate listing (see overleaf).

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

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

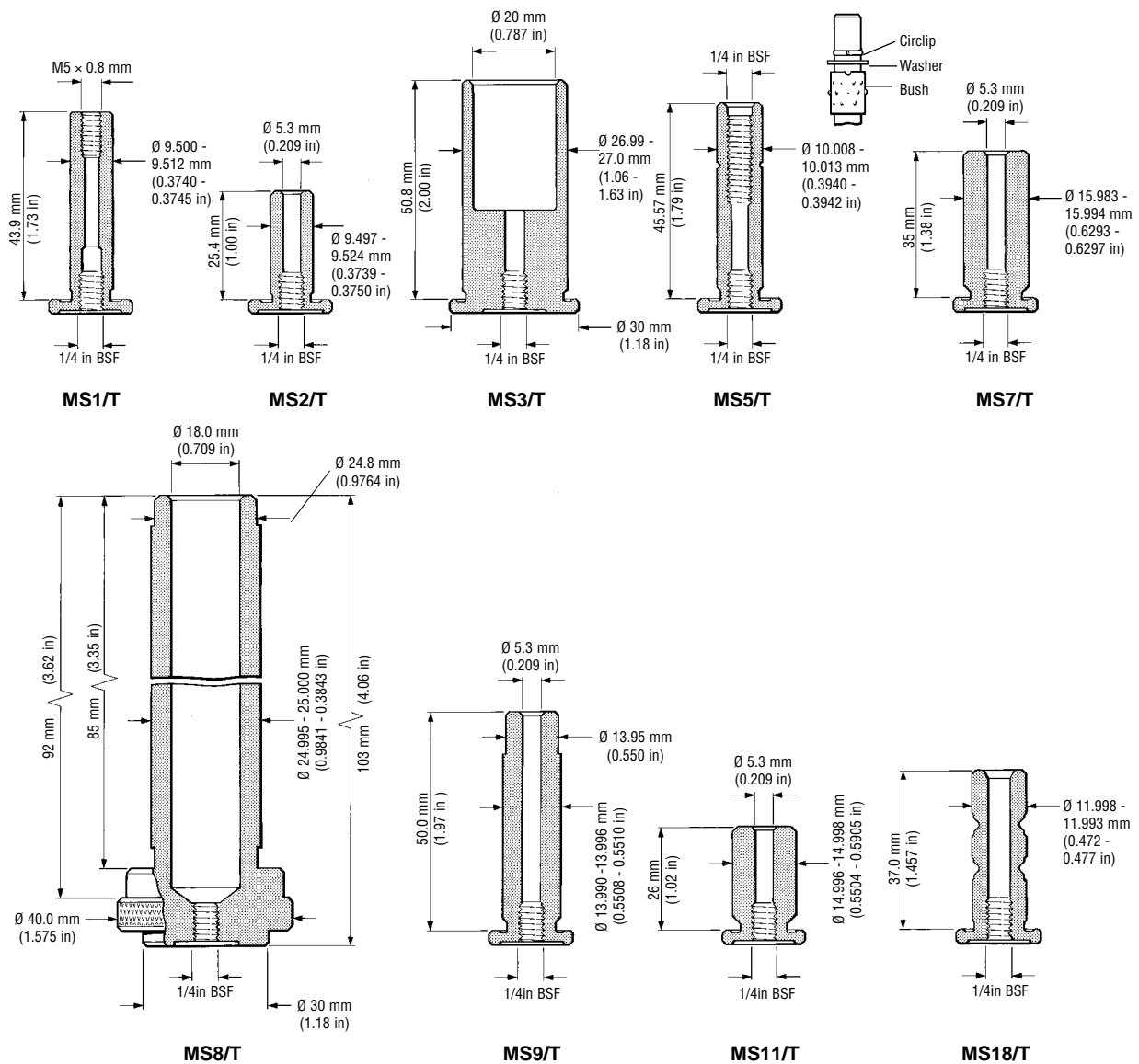


## PH6 shanks

### Shank Used on the following machines

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

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
PL1(T)	Coiled	315 mm – 730 mm (12.4 in – 28.7 in)	5 pin DIN	A-1016-0004
PL2(T)	Coiled	465 mm – 1290 mm (18.3 in – 50.8 in)	5 pin DIN	A-1016-0006
PL3(T)	Coiled	765 mm – 2415 mm (30.1 in – 95.1 in)	5 pin DIN	A-1016-0012
PL4(T)	Plain	4510 mm (177.6 in)	5 pin DIN	A-1016-0001
PL14	Coiled	595 mm – 1830 mm (23.4 in – 72 in)	7 pin AMPHENOL	A-1016-0003
PL17(T)	Coiled	200 mm – 400 mm (7.9 in – 15.8 in)	14 pin LEMO	A-1023-7024
PL18(T)	Coiled	500 mm – 1300 mm (19.7 in – 51.2 in)	14 pin LEMO	A-1023-7025
PL27(T)	Coiled	203 mm (8 in)	5 pin MOLD – 5 pin MOLD	A-1016-6370
PL27(T)	Plain	152 mm (6 in)	5 pin MOLD – 5 pin MOLD	A-1016-6440

### Motorized probe head cables

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

### Machine cables

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

### Output cables

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

### Multiwired cables

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

## Adaptor/extension cables

Cable	Type	Overall length	Description	Part number
PL9	Plain	0.6 m (23 in)	Machine cable to probe interface cable	A-1029-0182
PL10	Plain	0.1 m (4 in)	Machine cable to probe/head cable (5 pin)	A-1029-0111
PL22	Plain	0.3 m (12 in)	Probe head cable adaptor (PL1S, 2S, 3S, 4S to PI4-2, PI200-3 input)	A-1057-0131
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
PL97(S)	Plain	0.1 m (4 in)	SCR200 Y adaptor cable	A-1016-7660

## PICS interconnection cables

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

## 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
PEL1	M8 thread to M8 thread	Aluminum	50 mm (1.97 in)	13 mm	A-1047-3484
PEL2	M8 thread to M8 thread	Aluminum	100 mm (3.94 in)	18 mm – 13 mm	A-1047-3485
PEL3	M8 thread to M8 thread	Aluminum	200 mm (7.87 in)	18 mm – 13 mm	A-1047-3486
PEL4	M8 thread to M8 thread	Aluminum	300 mm (11.81 in)	13 mm	A-1047-3487
PECF1*	M8 thread to M8 thread	Carbon fiber	50 mm (1.97 in)	13 mm	A-1047-7065
PECF2*	M8 thread to M8 thread	Carbon fiber	100 mm (3.94 in)	13 mm	A-1047-7064
PECF3*	M8 thread to M8 thread	Carbon fiber	200 mm (7.87 in)	13 mm	A-1047-7066

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

### Knuckle joint

Number	Description	Part number
PK1	Knuckle joint	A-1014-1720

### Autojoint extension bars

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

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

## Interfaces

### PI4-2

The PI4-2 interface is the basic interface for standard touch-trigger probes that allows for a PICS or SSR output. The supply voltage is automatically detected. The unit is usually free-standing but can be rack-mounted.

Application:	TP1, MIP, TP2, TP20, TP6, TP6A, 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-1506-0010



### 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

### 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





## 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

## 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

## Interface accessories

### HC2

Probe arm/disarm switch used with PI12 and PI4-2.

**Part number:** A-1506-0100

### RPM01

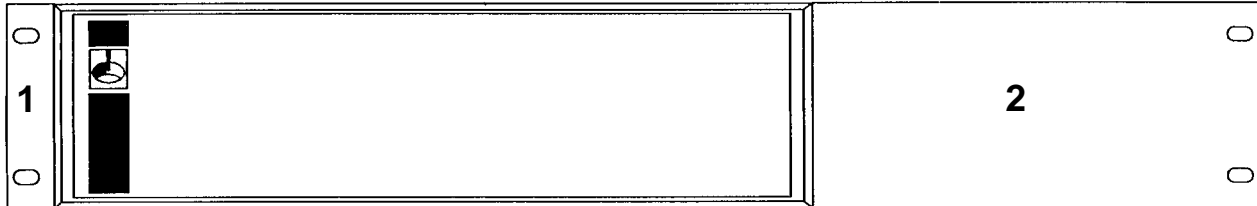
Touch-trigger probe interface module.

**Part number:** A-1009-0209

## Mounting brackets

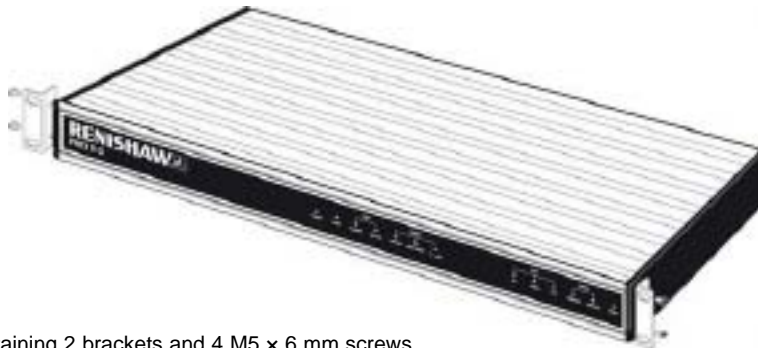
Renishaw controllers and interfaces are supplied in various different types of enclosures. Consult the drawings below to determine your bracket requirements based upon the combination of products you are installing.

### PHC9 / PHC50 / PHC10-2 / ACC2-2



1. Rack mount bracket kit                      **Part number:** A-1018-0124
2. 1/3 blanking panel kit                      **Part number:** A-1018-0123

### PHC10-3 cabinet mounting



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

**Part number:**A-1018-0189

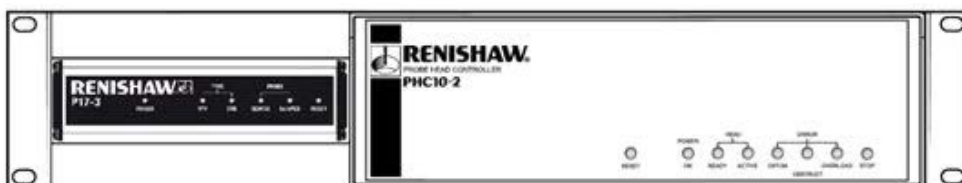
### PI7-3 alone / PI200-3



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

### PI7-3 next to PHC10-2



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

**Part number:**A-1018-0173

## 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

**Note:** Adjustable base, legs and cable sold separately (see page 1-49).

#### Horizontal mounting kit

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

**Part number:** A-1051-0441

#### Vertical mounting kit

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

**Part number:** A-1051-1308

### 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



## **ACR1 autochange system accessories**

### **Adjustable rack base**

**Part number** A-1051-0440

### **Leg (100 mm)**

**Part number** M-1051-0147

### **Leg (200 mm)**

**Part number:** M-1051-0148

## **Port replacement kits**

All kits contain four ports.

### **Short port replacement kit**

**Part number:** A-5036-0049

### **Long port replacement kit**

**Part number:** A-1051-7077

### **Mixed port replacement kit**

Contains two short and two long ports.

**Part number:** A-1051-7076

## **ACR1 autochange system cables**

### **PL19 5 m cable**

**Part number:** A-1051-0199

### **PL20 10 m cable**

**Part number:** A-1051-0045

### **PL21 15 m cable**

**Part number:** A-1051-0102

### **PL40 30 m cable**

**Part number:** A-1054-0002

## 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

**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

#### MRS kit 2

600 mm long rail.

**Part number:** A-4192-0002

#### MRS kit 3

1000 mm long rail.

**Part number:** A-4192-0003

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

### MRS rails

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

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

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



## ACR3 components

### SCP600

Stylus change port for SP600.

**Part number:** A-2098-0933



### MRS legs

**Part number:** A-4192-0061 (62.5 mm)

**Part number:** A-4192-0053 (125 mm)

### MRS heavy duty leg kit

Ø60 mm × 350 mm long. One leg per kit.

**Part number:** A-4192-0020

### MRS adjustable foot plate

**Part number:** A-4192-0702

### MRS leg and foot adaptor

**Part number:** A-4192-0055

### MRS fixed foot

**Part number:** A-4192-0056

### MRS step back adaptor

**Part number:** A-4192-0058

### M8 T nut \*

**Part number:** P-NU18-0005

\* no discounts

## 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



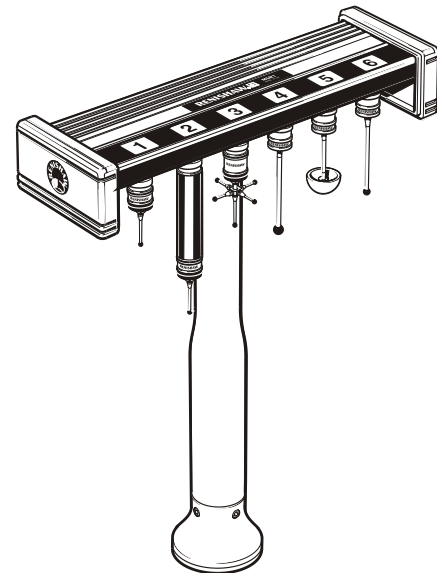
## MSR1 rack

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



## 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
Ø12 mm ball	A-1034-0028
Ø19 mm ball	A-1034-0027
Ø25 mm ball	A-1034-0026
Ø¾ in ball	A-1034-0031
Ø1 in ball	A-1034-0035

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

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

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

\* Special order





# Mahogany boxes

## Probe head boxes

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

## Extension bar boxes

Description	Part number
PEL extension bars (PC19)	A-1015-7694
PEM extension bars	A-1015-7761

## Probe extension kits

**Kit EKL**                      **Part number:** A-1047-7005

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

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

## Stylustools

**S1 C spanner(for use withTP20 probebody)Part**

number:A-1042-1486

**S3 hex key 1.5 mm A/F**

Part number:P-TL01-0150

**S4 hex key 3.0 mm straightarm**

Part number:P-TL01-0300

**S5 wrench2 mm A/F**

Part number:P-TL01-0200

**S6 hex key 2.5 mm A/F**

Part number:P-TL01-0250

**S7 stylustool(for use with M2 and M3 styli)Part**

number:M-5000-3540

**double-endedspanner**

Part number:A-1047-3932

**S10 jointkey (for use withautojoint)**

Part number:A-1051-0040

**S12 hex key 0.9 mm A/F**

Part number:P-TL01-0089

**S20 torquetool(for use withcarbonfiber stylus)**

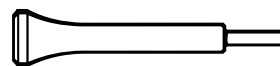
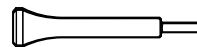
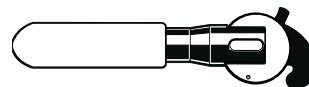
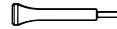
Part number:A-5003-2300

**M4 stylustool(for use with M4 and M5 styli)Part**

number:M-5000-3707

**tool(for use withadaptorM-5000-9301) Part**

number:M-5000-9304



## 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

### 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

### 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

### 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

### 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

### TK7 tool kit

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

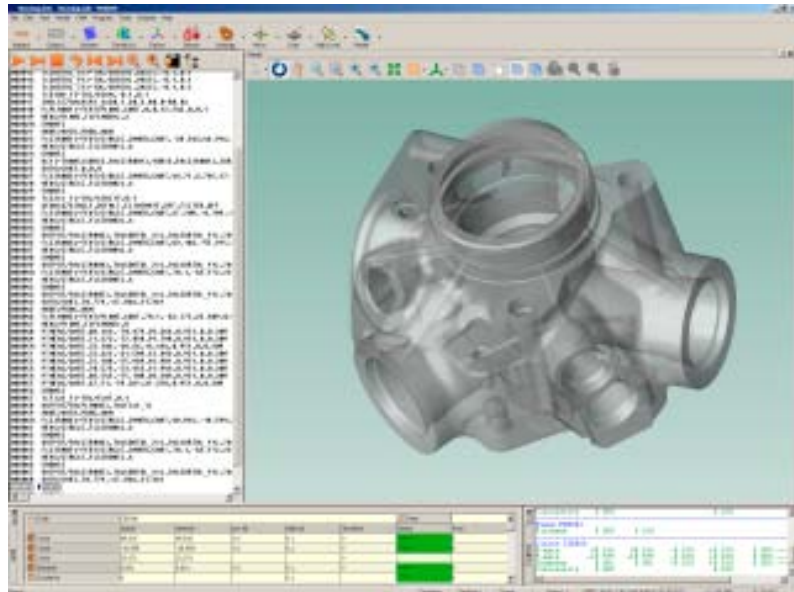
**Part number:** A-1039-0041

## CMM metrology software

### MODUSTM

Renishaw's new MODUSTM 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



### MODUSTM

#### MODUSTM – 3-axis and 5-axis touch-trigger

Part number: A-5639-0001

#### MODUSTM – 3-axis scanning

Part number: A-5639-0003

#### MODUSTM – 5-axis scanning

Part number: A-5639-0005

### MODUSTM Offline\*

#### MODUSTM – Offline 3-axis and 5-axis touch-trigger

Part number: A-5639-0101

#### MODUSTM – Offline 3-axis scanning

Part number: A-5639-0103

#### MODUSTM – Offline 5-axis scanning

Part number: A-5639-0105

#### Offline – Graphical reporting

Part number: A-5639-0007

### 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 MODUSTM can also be run offline without the need to purchase MODUSTM Offline. Only purchase MODUSTM Offline if you require a dedicated offline seat of MODUSTM.

## 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

### 3 days

**Part number:** A-5639-1700

### 2 days

**Part number:** A-5639-1702

### 1 day

**Part number:** A-5639-1703

## Onsite MODUS™ training

Up to four people, all inclusive of expenses.

### 4 days

**Part number:** RI-A-5639-1701

### 3 days

**Part number:** RI-A-5639-1700

### 2 days

**Part number:** RI-A-5639-1702

### 1 day

**Part number:** RI-A-5639-1703

## MODUS™ training block

**Part number:** A-5639-2500

## 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.

<b>Part number</b>	<b>Description</b>
RI-6002-0001	CMM hourly labor
RI-6002-0002	CMM hourly travel
RI-6002-0003	CMM expenses
RI-6002-0004	CMM in-house training

# Machine tool probes



## Inspection probes for machining centers

### MP11

The MP11 is a hard-wired probe ideal for small machine tools with manual tool changing. The probe is mounted in the machine spindle with the signal transmission cable connected to the machine control. With the MP11, the illuminated LED switches off every time the probe stylus contacts the workpiece.

Sense directions	±X, ±Y, +Z
Stylus overtravel	X and Y: ±17.5°
	Z: 8 mm (0.31 in)
Stylus trigger force	X and Y: 50 gf – 150 gf
	Z: 180 gf – 700 gf
Unidirectional repeatability	1.0 µm (0.00004 in)

### MP11 retrofit kit

Includes: MP11 probe with cable and connectors  
 Remote socket kit  
 50 mm and 100 mm ceramic styli  
 Renishaw Inspection Plus software  
 Installation and applications support

A shank is not included in this kit. See the section entitled Shanks and Toolholders for price and part number information.

**Part number:** MP11-NS-S (Available at fixed price)  
 Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### MP11 hardware only kit

Includes: MP11 probe with cable and connectors  
 Remote socket kit  
 50 mm and 100 mm ceramic styli

A shank is not included in this kit. See the section entitled Shanks and Toolholders for price and part number information.

**Part number:** MP11-NS-KIT



### MP11 probe

Includes: MP11 probe with cable and connectors

**Part number:** A-2045-0001

### MP11 replacement parts

#### Spare MP11 cable

**Part number:** A-2045-0051

#### 4 pin connector for MP11 cable

**Part number:** MP11 PLUG KIT

#### 4 pin socket for MP11

**Part number:** P-CN21-0304

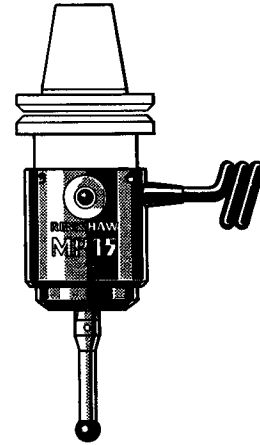
#### Outer diaphragm kit

**Part number:** A-2051-7105

## MP15

The MP15 probe is used on small CNC machines with limited Z travel and manual tool changing.

The probe is mounted in the machine spindle with the signal transmission cable connected to the machine control. With the MP15, the illuminated LED switches off every time the probe stylus contacts the work piece.



### MP15 hard-wired probe kit

**Part number:** A-2116-1802

### MP15/MP11 adaptor

**Part number:** M-2116-1356

### MI8 interface

**Part number:** A-2037-0010



## MP700

The MP700 is an optical transmission part probing system for use on machining centers. The MP700 is specifically designed to deliver high-accuracy CMM type probe performance. The MP700 uses strain gage sensors and an internal microprocessor to provide a solid state sensor mechanism with unprecedented life and reliability. Low trigger force and consistent pre-travel results in high accuracy with long styli.

The MP700 is available with either 35° or 70° output. An M code must be supplied to turn the probe on. An internal timer or M code is used to turn the probe off.

Sense directions	±X, ±Y, +Z
Stylus overtravel	X and Y: ±16.5°
	Z: 11 mm (0.45 in)
Stylus trigger force	X and Y: 19 gf
	Z: 325 gf
Unidirectional repeatability	0.25 µm (0.00001 in)



### MP700 retrofit kit

Includes: MP700 probe with 70° OMP  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm carbon fiber styli  
 Sealtite conduit  
 9 V alkaline battery  
 TK1 tool kit  
 Renishaw Inspection Plus software  
 Installation and applications support

A shank is not included in this kit. See the section entitled Shanks and Toolholders for price and part number information.

**Part number:** MP700-NS-S (Available at fixed price)  
 Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### MP700 hardware only kit

Includes: MP700 probe with 70° OMP  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm carbon fiber styli  
 Sealtite conduit  
 9 V alkaline battery  
 TK1 tool kit

A shank is not included in this kit. See the section entitled Shanks and Toolholders for price and part number information.

**Part number:** MP700-NS-KIT

### MP700 probe

Includes: MP700 probe  
 Adjusting plate  
 9 V alkaline battery  
 Tool kit

**Part number:**A-2107-0035 (35°)  
**Part number:**A-2107-0070 (70°)

### MP700 probe module

**Part number:** A-2108-0001

### MP700 OMP only

**Part number:** A-2107-0036 (35°)  
**Part number:** A-2107-0071 (70°)

### OMM optical receiver

**Part number:** A-2033-0576

### Receiver mounting bracket

**Part number:** A-2033-0830

### MI12 interface

**Part number:** A-2075-0142

### Sealtite conduit

¼ in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

## OMP40

The OMP40 is an ultra-compact optical transmission part probing system. Measuring just 40 mm diameter and 50 mm in length, the OMP40 is suitable for all machining and mill-turn centers. Utilizing a revised state-of-the-art modulated optical transmission method, the system offers the highest level of resistance to light interference when used with the OMI-2/OMI-2T. The OMP40 probe is also backwards compatible with existing OMM/MI12 and OMI receivers, enabling current MP7, MP8, MP9 and MP10 system users to benefit from its innovative features.

Sense directions	±X, ±Y, +Z
Stylus overtravel	X and Y: ±12.5°
	Z: 6 mm (0.23 in)
Stylus trigger force	X and Y: 50 gf – 90 gf
	Z: 585 gf
Unidirectional repeatability	1.0 µm (0.00004 in)

### OMP40 retrofit kit

Includes: OMP40 probe  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm ceramic styli  
 Sealrite kit  
 Renishaw Inspection Plus software  
 Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** OMP40-NS-S (Available at fixed price)  
 Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### OMP40 hardware only kit

Includes: OMP40 probe  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm ceramic styli  
 Sealrite kit

**Part number:** OMP40-NS-KIT



### OMP40 probe kit

Includes: OMP40  
 ½ AA battery (2)  
 Tool kit

#### Legacy

**Part number:** A-4071-0001

#### Modulated

**Part number:** A-4071-2001

### OMP40 upgrade kit

Current users of MP7, MP8, MP9 or MP10 optical transmission probes may upgrade to OMP40. A complete working system (probe module plus transmission system) must be exchanged.

Includes: OMP40 probe system

**Part number:** RI-4071-0001

### OMP40 accessories and replacement parts

#### ½AA battery (2 pack)

**Part number:** P-BT03-0007

#### OMP60/RMP60 style shank adaptor

**Part number:** A-4071-0031

## **OMP40 continued**

### **OMM optical receiver**

**Part number:** A-2033-0576

### **OMM-2 optical receiver**

**Part number:** A-5492-0051

### **OMI-2 optical receiver/interface**

**Part number:** A-5191-0049

### **OMI-2T optical receiver/interface**

**Part number:** A-5439-0049

### **Receiver mounting bracket**

**Part number:** A-2033-0830

### **MI12 interface**

**Part number:** A-2075-0142

### **OSI interface**

**Part number:** A-5492-2000

### **Sealtite conduit for OMM or OMI**

¼ in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

### **Sealtite conduit for OMM-2, OMI-2 or OMI-2T**

5/16 in conduit, 1 meter long. Includes one fitting.

**Part number:** A-4113-0306

## OMP400

OMP400 is an optical probe using strain gage technology. Measuring just 40 mm diameter x 50 mm in length, OMP400 is suitable for all machining and mill-turn centers requiring uncompromised 3D metrology performance. Utilizing a revised state-of-the-art modulated optical transmission method, the system offers the highest level of resistance to light interference when used with OMI-2. The OMP400 probe is also backwards compatible with existing OMM/MI12 and OMI receivers, enabling current MP7, MP8, MP9 and MP10 system users to benefit from its innovative features.

Sense directions	±X, ±Y, +Z
Stylus overtravel	X and Y: ±18°
	Z: 11 mm (0.43 in)
Stylus trigger force	X and Y: 6 gf
	Z: 260 gf
Unidirectional repeatability	0.25 µm (0.00001 in)

### OMP400 retrofit kit

Includes: OMP400 probe  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm carbon fiber styli  
 Sealrite kit  
 Renishaw Inspection Plus software  
 Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** OMP400-NS-S (Available at fixed price)  
 Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### OMP400 hardware only kit

Includes: OMP400 probe  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm carbon fiber styli  
 Sealrite kit

**Part number:** OMP400-NS-KIT

### OMM optical receiver

**Part number:** A-2033-0576

### OMM-2 optical receiver

**Part number:** A-5492-0051



### OMP400 probe kit

Includes: OMP400 probe  
 ½ AA battery (2)  
 Tool kit

### Legacy

**Part number:** A-5069-0001

### Modulated

**Part number:** A-5069-2001

### OMP400 upgrade kit

Current users of MP700 optical transmission probes may upgrade to OMP400. A complete working system (probe module plus transmission system) must be exchanged.

Includes: OMP400 probe

**Part number:** RI-5069-0001

**Note:** A new shank is required. See section entitled Shanks and Toolholders for price and part number information.

## OMP400 continued

### OMI-2 optical receiver/interface

**Part number:** A-5191-0049

### OMI-2T optical receiver/interface

**Part number:** A-5439-0049

### Receiver mounting bracket

**Part number:** A-2033-0830

### MI12 interface

**Part number:** A-2075-0142

### OSI interface

**Part number:** A-5492-2000

### Sealtite conduit for OMM or OMI

¼ in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

### Sealtite conduit for OMM-2, OMI-2 or OMI-2T

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

To obtain optimal metrology performance, the following carbon fiber styli are recommended. Refer to the Styli section for more details.

<b>Stylus</b>	<b>Part number</b>
6 × 50 mm CF	A-5003-7306
6 × 100 mm CF	A-5003-6510
6 × 150 mm CF	A-5003-6511
6 × 200 mm CF	A-5003-6512

## OMP60

OMP60 is an optical transmission probing system suitable for medium to large machining and mill-turn centers. Utilizing a revised state-of-the-art modulated optical transmission method, the system offers the highest level of resistance to light interference. The OMP60 probe is also backwards compatible with existing OMM/MI12 and OMI receivers. OMP60 also supports all methods of probe activation – shank switch, spin and M code – enabling current MP7, MP8, MP9 and MP10 users to benefit from some of its innovative features.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 18^\circ$
	Z: 11 mm (0.43 in)
Stylus trigger force	X and Y: 75 gf – 140 gf
	Z: 530 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)

### OMP60 retrofit kit

Includes: OMP60 probe  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm ceramic styli  
 Sealtite kit  
 Renishaw Inspection Plus software  
 Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** OMP60-NS-S (Available at a fixed price)  
 Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### OMP60 hardware only kit

Includes: OMP60 probe  
 OMM  
 Receiver mounting bracket  
 MI12 interface  
 50 mm and 100 mm ceramic styli  
 Sealtite kit

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** OMP60-NS-KIT



### OMP60 probe kit

Includes: OMP60 probe  
 AA battery (2)  
 Tool kit

### Legacy

**Part number:** A-4038-0001

### Modulated

**Part number:** A-4038-2001

### OMP60 upgrade kit

Current users of MP7, MP8, MP9 or MP10 optical transmission probes may upgrade to OMP60. A complete working system (probe module plus transmission system) must be exchanged.

Includes: OMP60 probe system

**Part number:** RI-4038-0001

## **OMP60 continued**

### **OMM optical receiver**

**Part number:** A-2033-0576

### **OMM-2 optical receiver**

**Part number:** A-5492-0051

### **OMI-2 optical receiver/interface**

**Part number:** A-5191-0049

### **OMI-2T optical receiver/interface**

**Part number:** A-5439-0049

### **Receiver mounting bracket**

**Part number:** A-2033-0830

### **MI12 interface**

**Part number:** A-2075-0142

### **OSI interface**

**Part number:** A-5492-2000

### **Sealtite conduit for OMM or OMI**

¼ in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

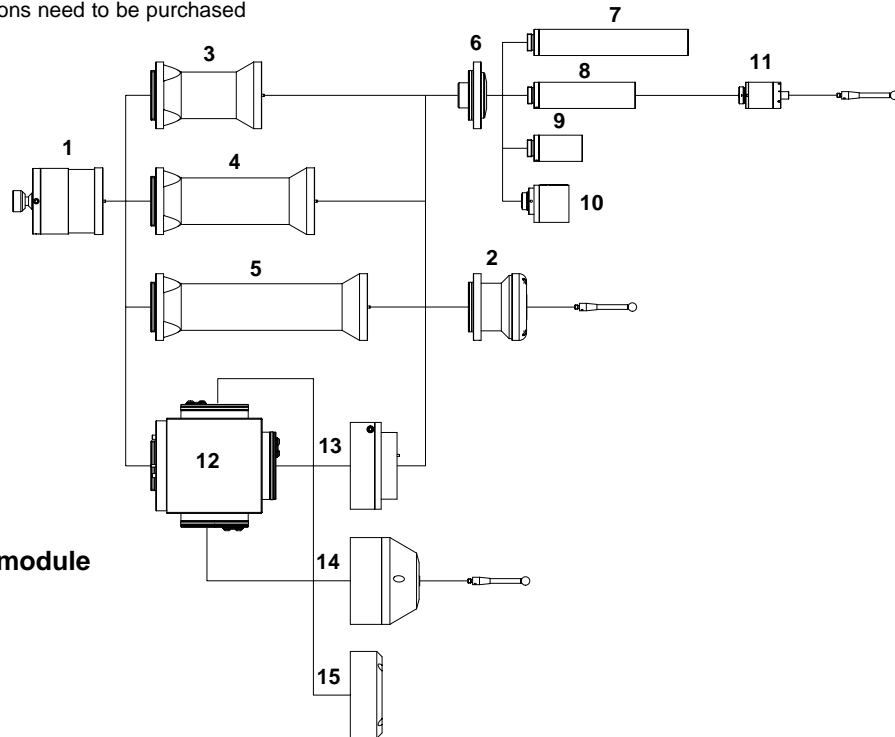
### **Sealtite conduit for OMM-2, OMI-2 or OMI-2T**

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

## OMP60M

OMP60M is a modular version of the OMP60. The OMP60M, probe module, adaptors and extensions need to be purchased separately.



**1 – OMP60M transmission module**

Part number: A-4038-1003

**2 – OMP60M probe module**

Part number: A-4038-1002

**3 – OMP60M 100 mm extension**

Part number: A-4038-1010

**4 – OMP60M 150 mm extension**

Part number: A-4038-1027

**5 – OMP60M 200 mm extension**

Part number: A-4038-1028

**6 – OMP60M LP2 adaptor**

Part number: A-4038-0212

**7 – LPE3 150 mm extension**

Part number: A-2063-7003

**8 – LPE2 100 mm extension**

Part number: A-2063-7002

**9 – LPE1 50 mm extension**

Part number: A-2063-7001

**10 – MA4 90° adaptor**

Part number: A-2063-7600

**11 – LP2 probe assembly**

Part number: A-2063-6098

**12 – OMP60M 3-way adaptor**

Part number: A-4113-0784

**13 – OMP60M probe module adaptor**

Part number: A-4113-0771

**14 – MP3 probe**

Part number: A-2053-5358

**15 – Shorting cover**

Part number: A-2053-6468

### OMP60M upgrade kit

Current users of MP7, MP8, MP9 or MP10 optical transmission probes may upgrade to OMP60M. A complete working probe must be exchanged.

Includes: OMP60M module  
OMP60M probe module

Part number: RI-4038-1003



## RMP40

RMP40 is the latest generation of radio transmission part probes, ideal for use on small to medium machining centers. RMP40 features an integrated probe module delivering exceptional robustness and generous overtravel. RMP40 complies with FCC regulations and operates in the 2.4 GHz range. RMP40 delivers interference-free transmission through the use of FHSS (frequency hopping spread spectrum).

RMP40 supports two methods of probe activation:

**Radio-on** The probe is turned on via an RF signal produced by the RMI and initiated by an M code. The probe is turned off via an RF signal or the internal timer.

**Spin-on** The probe is turned on via an internal centrifugal switch. The probe is turned off via the centrifugal switch or the internal timer.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 12.5^\circ$
	Z: 6 mm (0.24 in)
Stylus trigger force	X and Y: 50 gf – 90 gf
	Z: 585 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)



### RMP40 retrofit kit

Includes: RMP40 probe and transmission system  
RMI radio machine interface  
Receiver mounting bracket  
50 mm and 100 mm ceramic styli  
Sealtite kit  
Renishaw Inspection Plus software  
Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** RMP40-NS-S (Available at a fixed price)  
Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### RMP40 hardware only kit

Includes: RMP40 probe and transmission system  
RMI radio machine interface  
Receiver mounting bracket  
50 mm and 100 mm ceramic styli  
Sealtite kit

**Part number:** RMP40-NS-KIT

### RMP40 probe kit

Includes: RMP40 probe  
 $\frac{1}{2}$ AA battery (2)  
Tool kit

**Part number:** A-5480-0001

### RMI radio machine interface

**Part number:** A-4113-0050

### Receiver mounting bracket

**Part number:** A-2033-0830

### Sealtite conduit

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

## RMP60

RMP60 is a radio transmission part probing system ideal for use on all machine tools. RMP60 features an integrated probe module delivering exceptional robustness and generous overtravel. RMP60 complies with FCC regulations and operates in the 2.4 GHz range. RMP60 delivers interference-free transmission through the use of FHSS (frequency hopping spread spectrum).

RMP60 supports three methods of probe activation:

- Radio-on** The probe is turned on via an RF signal produced by the RMI and initiated by an M code. The probe is turned off via an RF signal or the internal timer.
- Spin-on** The probe is turned on via an internal centrifugal switch. The probe is turned off via the centrifugal switch or the internal timer.
- Switch-on** The probe is turned on and off via a switch incorporated into the shank, activated when the probe is loaded into the spindle.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 18^\circ$
	Z: 11 mm (0.43 in)
Stylus trigger force	X and Y: 75 gf – 140 gf
	Z: 530 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)

### RMP60 retrofit kit

- Includes: RMP60 probe and transmission system  
RMI radio machine interface  
Receiver mounting bracket  
50 mm and 100 mm ceramic styli  
Sealtite kit  
Renishaw Inspection Plus software  
Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** RMP60-NS-S (Available at a fixed price)  
Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### RMP60 hardware only kit

- Includes: RMP60 probe and transmission system  
RMI radio machine interface  
Receiver mounting bracket  
50 mm and 100 mm ceramic styli  
Sealtite kit

**Part number:** RMP60-NS-KIT



### RMP60 probe kit

- Includes: RMP60 probe  
AA battery (2)  
Tool kit

**Part number:** A-4113-0001

### RMI radio machine interface

**Part number:** A-4113-0050

### Receiver mounting bracket

**Part number:** A-2033-0830

### Sealtite conduit

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

### RMP60 upgrade kit

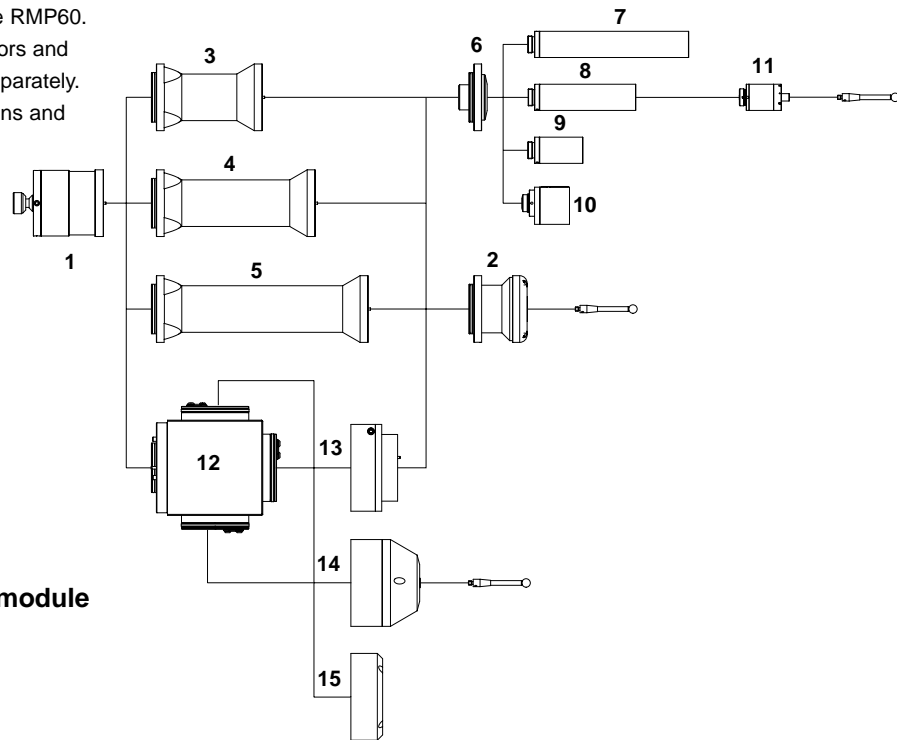
Current users of MP14, MP16 or MP18 radio probes may upgrade to RMP60. A complete working system (MP3 probe, transmission system, MI14 or MI16 interface and RMM antennas) must be exchanged.

- Includes: RMP60 probe  
RMI radio machine interface  
Receiver mounting bracket  
Sealtite kit

**Part number:** RI-4113-0001

## RMP60M

RMP60M is a modular version of the RMP60. The RMP60M, probe module, adaptors and extensions need to be purchased separately. RMP60 complies with FCC regulations and operates in the 2.4 GHz range.



**1 – RMP60M transmission module**

Part number: A-4113-1003

**2 – RMP60M probe module**

Part number: A-4038-1002

**3 – RMP60M 100 mm extension**

Part number: A-4038-1010

**4 – RMP60M 150 mm extension**

Part number: A-4038-1027

**5 – RMP60M 200 mm extension**

Part number: A-4038-1028

**6 – RMP60M LP2 adaptor**

Part number: A-4038-0212

**7 – LPE3 150 mm extension**

Part number: A-2063-7003

**8 – LPE2 100 mm extension**

Part number: A-2063-7002

**9 – LPE1 50 mm extension**

Part number: A-2063-7001

**10 – MA4 90° adaptor**

Part number: A-2063-7600

**11 – LP2 probe assembly**

Part number: A-2063-6098

**12 – RMP60M 3-way adaptor**

Part number: A-4113-0784

**13 – RMP60M probe module adaptor**

Part number: A-4113-0771

**14 – MP3 probe**

Part number: A-2053-5358

**15 – Shorting cover**

Part number: A-2053-6468

### RMP60M upgrade kit

Current users of MP14, MP16 or MP18 radio probes may upgrade to RMP60M. A complete working system (probe, MI14 or MI16 interface and RMM antennas) must be exchanged.

Includes: RMP60M module  
RMP60M probe module  
RMI radio machine interface  
Receiver mounting bracket  
Sealtite kit

Part number: RI-4113-1003

## RMP600

RMP600 is the latest generation compact radio transmission probe using strain gage technology. Measuring only 63 mm in diameter and 76 mm in length, with an omni-directional transmission distance of 15 m, it is ideal for use on all machine tools. RMP600 features an integrated probe module delivering exceptional robustness and generous overtravel. It delivers interference-free transmission through the use of FHSS (frequency hopping spread spectrum). RMP600 complies with FCC regulations and operates in the 2.4 GHz range.

RMP600 supports three methods of probe activation:

- Radio-on** The probe is turned on via an RF signal produced by the RMI and initiated by an M code. The probe is turned off via an RF signal or the internal timer.
- Spin-on** The probe is turned on via an internal centrifugal switch. The probe is turned off via the centrifugal switch or the internal timer.
- Switch-on** The probe is turned on and off via a switch incorporated into the shank, activated when the probe is loaded into the spindle.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 15^\circ$
	Z: 11 mm (0.43 in)
Stylus trigger force	X and Y: 10 gf
	Z: 193 gf
Unidirectional repeatability	0.25 $\mu\text{m}$ (0.00001 in)

### RMP600 retrofit kit

- Includes: RMP600 probe  
RMI radio machine interface  
Receiver mounting bracket  
50 mm and 100 mm carbon fiber styli  
Sealtite kit  
Renishaw Inspection Plus software  
Installation and application support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** RMP600-NS-S (Available at a fixed price)  
Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### RMP600 hardware only kit

- Includes: RMP600 probe  
RMI radio machine interface  
Receiver mounting bracket  
50 mm and 100 mm carbon fiber styli  
Sealtite kit

**Part number:** RMP600-NS-KIT



### RMP600 probe kit

- Includes: RMP600 probe  
AA battery (2)  
Tool kit

**Part number:** A-5312-0001

### RMI radio machine interface

**Part number:** A-4113-0050

### Receiver mounting bracket

**Part number:** A-2033-0830

### Sealtite conduit

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

### RMP600 upgrade kit

Current users of MP14, MP16 or MP18 radio probes may upgrade to RMP600. A complete working system (MP3 probe, transmission system, MI14 or MI16 interface and RMM antennas) must be exchanged.

- Includes: RMP600 probe  
RMI radio machine interface  
Receiver mounting bracket  
Sealtite kit

**Part number:** RI-5312-0001

## Shanks and Toolholders

### Shanks for OMP60, MP11, MP700, RMP60 and RMP600 (spin-on, optical-on, radio-on) systems

Part number	Description
M-2045-0068	CAT30
M-2045-0069	CAT40
M-2045-0138	CAT45
M-2045-0071	CAT50
M-2045-0292	CAT60
M-2045-0077	BT30
M-2045-0027	BT40
M-2045-0038	BT45
M-2045-0073	BT50
M-2045-0186	HSK A40
M-2045-0187	HSK A50
M-2045-0188	HSK A63
M-2045-0189	HSK A80
M-2045-0190	HSK A100
A-2045-0243	½ in straight shank
A-2030-0252	1 in straight shank
A-2030-0211	25 mm straight shank
M-2045-0313	CAPTO C4
M-2045-0346	CAPTO C5
M-2045-0310	CAPTO C6
M-2045-0311	CAPTO C8
M-2045-0335	KM63
M-2045-1831591	KM63Y (Mazak)

## Calibration masters

### Calibration tools

Part number	Description
M-2253-0954	CAT40
M-2253-0955	CAT50
M-2253-1562	BT30
M-2253-1263	BT40
M-2253-1262	BT50

## Shanks for OMP40, OMP400 and RMP40

Part number	Description
M-4071-0050	CAT30
M-4071-0058	CAT40
M-4071-0072	CAT50
M-4071-0049	BT30
M-4071-0057	BT40
M-4071-0071	BT50
M-4071-0048	ISO30 DIN69871
M-4071-0069	ISO40 DIN69871
M-4071-0044	HSK E25
M-4071-0055	HSK E32
M-4071-0054	HSK E40
M-4071-0045	HSK A32
M-4071-0046	HSK A40
M-4071-0047	HSK A50
M-4071-0129	HSK A63
M-4071-0141	CAPTO C4
M-4071-0066	CAPTO C5
M-4071-0067	CAPTO C6
M-4071-0065	KM63

## OMP40, OMP400 and RMP40 shank kits

### CAT40 shank kit

Includes: CAT40 shank  
OMP60/RMP60 shank adaptor

**Part number:** M-4071-0058-RI

### BT40 shank kit

Includes: BT40 shank  
OMP60/RMP60 shank adaptor

**Part number:** M-4071-0057-RI

## Shanks for OLP40 and RLP40

Part number	Description
A-5625-1003	25 mm straight shank
A-5625-1004	½ in straight shank
A-5625-1007	1 in straight shank

## Tool setting probes for machining centers

### NC3 tool setter

NC3 is a non-contact tool setter, available in a fixed configuration and offered in a single size. NC3 is compact and designed to accommodate tools up to 80 mm diameter making it ideal for small to medium machining centers and special applications.

Repeatability		±0.15 µm (0.000006 in)
Tool diameter	Measurement	Min: 0.20 mm (0.008 in)
		Max: 80 mm (3.15 in)
	Breakage	Min: 0.10 mm (0.0039 in)



### NC3 fixed system kit

Includes: NC3 fixed unit with 10 m integral cable  
 NCi-5 interface  
 Air regulator kit  
 Ø17 mm OD x 4 m conduit  
 Mounting plate

**Part number:** A-4179-1100

### NC3 fixed unit only

Includes: NC3 fixed unit with 10 m integral cable

**Part number:** A-4179-1500

### NC3 fixed system retrofit kit

NC3 retrofit kit includes all items above plus the following:

Tool setting software  
 Installation and application support

**Part number:** NC3-F135-S

### NCi-5 interface

**Part number:** A-5259-2000

### NC3 air regulator kit

**Part number:** A-4179-1600

### NC3 air filter service kit

**Part number:** P-FI01-S002

### Steel sheath conduit

Ø17 mm OD x 1 m length, for cable protection.

**Part number:** P-HO01-0008

### 45° mounting bracket

**Part number:** A-4179-1501

### NC3 air nozzle kit

**Part number:** A-4179-0450

## NC4 tool setter

NC4 is a non-contact tool setter and our most compact design. NC4 is available in fixed or separate configurations. NC4F (fixed) is available in four different sizes. NC4S (separate) systems are user-configurable operating between 500 mm and 5 m.

Repeatability	±1.0 µm (0.00004 in)	
Minimum tool diameter	Measurement	0.03 mm (0.0012 in)
	Breakage	0.03 mm (0.0012 in)

## NC4 fixed system retrofit kits

Include: NC4 fixed unit with 12.5 m cable  
NCi-5 interface  
Air regulator kit  
Ø22 mm OD steel braided conduit  
Mounting plate  
Tool setting software  
Installation and application support

**Part numbers:** NC4-F300-Modular-S \*  
NC4-F300-S \*  
NC4-F230-S \*  
NC4-F145-S \*  
NC4-F115-S \*  
NC4-F95-S \*

## NC4 separate system retrofit kits

Include: NC4 separate unit with 12.5 m cable  
NCi-5 interface  
Air regulator kit  
Ø17 mm OD steel braided conduit  
Tool setting software  
Installation and application support

**Part numbers:** NC4-S800-S \*  
NC4-S1500-S \*  
NC4-S2000-S \*  
NC4-S3000-S \*  
NC4-S5000-S \*

**Note:** When ordering a separate system retrofit kit, the customer must select an NC4 based on its operating range. In addition, the customer must select tool setting software based on the control type. Brackets and an adjusting method (see following page) are also needed for NC4 separate systems. These are not included with NC4 separate systems and must be ordered additionally. Mounting brackets for various machines are continually developed. Contact Renishaw for the latest list of compatibility. Bracket installation is **not** included with the standard separate system retrofit price, this service can be quoted upon request.

\* Available at a fixed price. Call for details.

## NC4 fixed kits

### NC4 F300/225 with NCi-5 kit

Separation 225 mm

**Part number:** NC4-F300-Modular-kit



### NC4 F300/240 with NCi-5 kit

Separation 240 mm

**Part number:** NC4-F300-kit



### NC4 F230/170 with NCi-5 kit

Separation 170 mm

**Part number:** NC4-F230-kit

### NC4 F145/85 with NCi-5 kit

Separation 85 mm

**Part number:** NC4-F145-kit

### NC4 F115/55 with NCi-5 kit

Separation 55 mm

**Part number:** NC4-F115-kit

### NC4 F95/23 with NCi-5 kit

Separation 23 mm

**Part number:** NC4-F95-kit

## NC4 separate kits

### NC4 S800 with NCi-5 kit

Separation 500 mm – 800 mm

**Part number:** A-4114-5060



### NC4 S1500 with NCi-5 kit

Separation 800 mm – 1500 mm

**Part number:** A-4114-5065

### NC4 S2000 with NCi-5 kit

Separation 1500 mm – 2000 mm

**Part number:** A-4114-5070

### NC4 S3000 with NCi-5 kit

Separation 2000 mm – 3000 mm

**Part number:** A-4114-5075

### NC4 S5000 with NCi-5 kit

Separation 3000 mm – 5000 mm

**Part number:** A-4114-5080

**NC4 tool kit**

Part number: A-4114-4110

**NC4 air regulator kit**

Part number: A-2253-5120

**NC4 air filter service kit**

Part number: P-FI01-S002

**NCi-5 interface**

Part number: A-5259-2000

**NC4 access panel 0.2**

Part number: A-4114-0082

**NC4 access panel 0.4**

Part number: A-4114-0084

**NC4 access panel 0.6**

Part number: A-4114-0086

**NC4 set-up tool**

Part number: A-4114-8000

**NC4S mounting hardware options**

**1. NC4 spacer plate – separate**

Part number: A-4114-4400

**2. NC4 adjuster pack – separate**

Part number: A-4114-3100

**Steel sheath conduit 22 mm OD x 1 m**

For NC4 fixed cable protection.

Part number: P-HO01-0011

**Steel sheath conduit 17 mm OD x 1 m**

For NC4 separate cable protection.

Part number: P-HO01-0008

**NC4F 90-degree cable exit kit**

Part number: P-CA61-0068

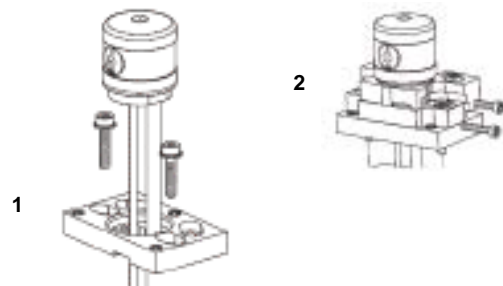
Part number: P-CA61-0069

**NC4F air blast nozzle and bracket**

Part number: A-5450-0480

**Solenoid kit**

Part number: A-5450-0490





## OTS

The OTS is a new optical transmission tool setter for vertical and horizontal machining centers. Modeled on the TS27R, OTS can set tool length and diameter of rotating tools and perform broken tool detection. OTS is available in two configurations – OTS ½AA and OTS AA. OTS can be used with the OMI-2, OMI-2T or OMM-2/OSI interface. OMI-2T or OMM-2/OSI must be used if OTS is to be paired with another optical transmission probe.

Sense directions	±X, ±Y, +Z
Stylus overtravel	X and Y: ±10°
	Z: 5.5 mm (0.21 in)
Stylus trigger force	130 gf – 240 gf
Unidirectional repeatability	1.0 µm (0.00004 in)

### OTS retrofit kit

Includes: OTS ½AA or OTS AA probe  
OMI-2T  
Receiver mounting bracket  
Sealtite kit  
Renishaw tool setting software  
Installation and application support

**Part number:** OTS-S (½AA configuration)

**Part number:** OTSAA-S (AA configuration)

Available at fixed price – call for details.

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### OTS hardware only kit

Includes: OTS ½AA probe or OTS AA probe  
OMI-2T  
Receiver mounting bracket  
Sealtite kit

**Part number:** OTS-KIT

**Part number:** OTSAA-KIT

### OTS ½AA probe kit

Includes: OTS probe  
½ AA battery (2)  
Tool kit

**Part number:** A-5401-2001

### OTS AA probe kit

Includes: OTS probe  
AA battery (2)  
Tool kit

**Part number:** A-5514-2001

OTS ½AA



OTS AA



### OMM-2 optical receiver

**Part number:** A-5492-0051

### OMI-2 optical receiver

**Part number:** A-5191-0049

### OMI-2T optical receiver

**Part number:** A-5439-0049

### Receiver mounting bracket

**Part number:** A-2033-0830

### OSI interface

**Part number:** A-5492-2000

### Sealtite conduit for OMM-2, OMI-2 or OMI-2T

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

## RTS (available winter 2013)

The RTS is a radio transmission tool setter for vertical and horizontal machining centers. Modeled after the OTS, RTS can set tool length and diameter of rotating tools and perform broken tool detection. RTS uses AA batteries (identical to RMP60). RTS can be used with either the RMI or the RMI-Q. The RMI-Q must be used if RTS is to be paired with another radio transmission probe.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 10^\circ$
	Z: 5.5 mm (0.21 in)
Stylus trigger force	130 gf – 240 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)



### RTS retrofit kit

Includes: RTS AA probe  
 RMI-Q  
 Receiver mounting bracket  
 Sealtite kit  
 Renishaw tool setting software  
 Installation and application support

**Part number:** RTS-S

Available at fixed price – call for details.

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### RTS hardware only kit

Includes: RTS AA probe  
 RMI-Q  
 Receiver mounting bracket  
 Sealtite kit

**Part number:** RTS-KIT

### RTS AA probe kit

Includes: RTS probe  
 AA battery (2)  
 Tool kit

**Part number:** A-5646-0001

### RMI radio machine interface

**Part number:** A-4113-0050

### RMI-Q radio machine interface

**Part number:** A-5687-0050

### Receiver mounting bracket

**Part number:** A-2033-0830

### Sealtite conduit

5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306

## TS27R

The TS27R is a tool setter for vertical machining centers that enables the user to set both tool length and diameter of rotating tools, and to carry out broken tool detection.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 10^\circ$
	Z: 5.5 mm (0.21 in)
Stylus trigger force	130 gf – 240 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)



### TS27R retrofit kit

Includes: TS27R probe  
 HSI interface  
 Sealtite kit  
 Renishaw toolsetting software  
 Installation and application support

**Part number:** TS27R-S (Available at fixed price)  
 Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### TS27R hardware only kit

Includes: TS27R probe  
 HSI interface  
 Sealtite kit

**Part number:** TS27R-KIT

### TS27R probe, stylus, and holder kit

**Part number:** A-2008-0368

### HSI interface

**Part number:** A-5500-1000

## OTS, RTS or TS27R replacement parts and accessories

### Tungsten carbide stylus (0.5 in disk)

**Part number:** A-2008-0382

### Ceramic stylus (19 mm square)

**Part number:** A-2008-0384

### Retrofit stylus kit

Includes: Break protection  
 Tether  
 Screws

**Part number:** A-5003-5171

### Break protect link

**Part number:** A-5003-0661

### Stylus holder with 4 set screws

**Part number:** A-2008-0389

### Stylus holder set screws

**Part number:** P-SC13-0403

### Crank for horizontal machining centers

**Part number:** A-2008-0448

### 100 mm riser

**Part number:** M-2008-0866-RI-KIT

### TS27 stylus (0.5 in disk)

For TS27 probes shipped prior to July 1995.

**Part number:** M-5003-1033 (steel)

**Part number:** M-2008-0197 (ceramic)

## TRS2

TRS2 is a cost-effective laser-based solution for high-speed broken tool detection. Working with the reflective properties of a rotating tool, TRS2 can detect broken tools at a distance of between 300 mm and 2 m, but optimized for use between 300 mm and 1 m. Toolwise™ Electronics makes TRS2 especially effective with tiny, easily broken tools down to 0.019 in (0.5 mm) diameter. TRS2 is suitable for solid profile tools including drills, taps, reamers and end mills.



### TRS2 hardware kit

Includes: TRS2 laser system with integral interface  
Tool kit  
Air regulator kit  
Sealtite kit  
Mounting bracket  
Renishaw TRS2 BTD software

**Part number:** TRS2-KIT

### TRS2 probe only

Includes: TRS2 laser system with integral interface

**Part number:** A-5450-0400

### TRS2 retrofit kit

Includes: TRS2 laser system with integral interface  
Tool kit  
Air regulator kit  
Sealtite kit  
Mounting bracket  
Renishaw TRS2 BTD software  
Installation and application support

**Part number:** TRS2-S (Available at fixed price)  
Call for details

Special pricing available for multiple systems.

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### TRS2 air regulator kit

**Part number:** A-2253-5120

### TRS2 air filter service kit

**Part number:** P-FI01-S002

### Sealtite conduit for TRS2

¼ in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

### TRS2 replacement air cap

**Part number:** A-4178-0440

## TS34

TS34 is a hard-wired tool setter for vertical and horizontal machining centers that enables users to set both length and diameter of rotating tools and perform broken tool detection.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 9^\circ$
	Z: 4 mm (0.157 in)
Stylus trigger force	X and Y: 65 gf – 142 gf
	Z: 550 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)



### TS34 probe, stylus and holder kit

#### Rear exit

**Part number:** A-2197-2100

#### Side exit

**Part number:** A-2197-3000

#### HSI interface

**Part number:** A-5500-1000

## Inspection probes for turning centers

### OLP40

OLP40 is the latest generation of optical transmission part probes, ideal for use on turning centers. OLP40's compact design features an integrated probe module delivering exceptional robustness and generous overtravel. Utilizing a revised state-of-the-art modulated optical transmission method, the system offers the highest level of resistance to light interference. The OLP40 probe is also backwards compatible with existing OMM/MI12 and OMI receivers. OLP40 supports two methods of probe activation – M code and spin-on.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 12.5^\circ$
	Z: 6 mm (0.24 in)
Stylus trigger force	X and Y: 50 gf – 90 gf
	Z: 585 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)

### OLP40 retrofit kit

Includes: OLP40 probe and transmission system  
OMI-2 optical machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit  
Renishaw lathe inspection software  
Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** OLP40-NS-S (Available at fixed price)  
Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to us before a retrofit order can be processed.

### OLP40 hardware only kit

Includes: OLP40 probe and transmission system  
OMI-2 optical machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit

**Part number:** OLP40-NS-KIT

### OLP40 probe kit

Includes: OLP40 probe  
 $\frac{1}{2}$  AA battery (2)  
Tool kit

### Legacy

**Part number:** A-5625-0001

### Modulated

**Part number:** A-5625-2001



### OMM optical receiver

**Part number:** A-2033-0576

### OMM-2 optical receiver

**Part number:** A-5492-0051

### OMI-2 optical receiver/interface

**Part number:** A-5191-0049

### OMI-2T optical receiver/interface

**Part number:** A-5439-0049

### Receiver mounting bracket

**Part number:** A-2033-0830

### MI12 interface

**Part number:** A-2075-0142

### OSI interface

**Part number:** A-5492-2000

### Sealtite conduit for OMM or OMI

$\frac{1}{4}$  in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

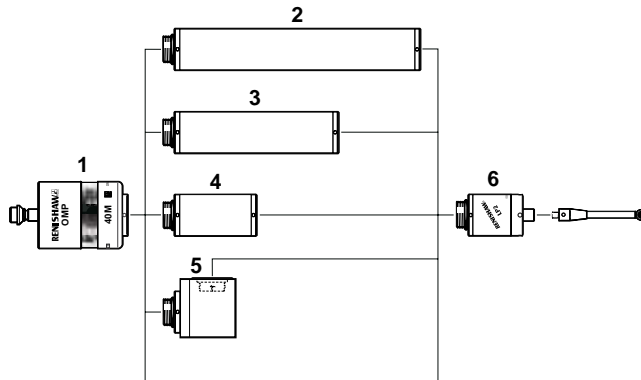
### Sealtite conduit for OMM-2, OMI-2 or OMI-2T

$\frac{5}{16}$  in conduit, 1 meter long. Includes one fitting.

**Part number:** A-4113-0306

## OMP40M

OMP40M is a modular version of the OLP40. The LP2 probe module, adaptors and extensions need to be purchased separately.



**1 – OMP40M transmission module**

**Legacy**

**Part number:** A-5626-0001

**Modulated**

**Part number:** A-5626-2001

**2 – LPE3 extension 150 mm**

**Part number:** A-2063-7003

**3 – LPE2 extension 100 mm**

**Part number:** A-2063-7002

**4 – LPE1 extension 50 mm**

**Part number:** A-2063-7001

**5 – MA4 90° adaptor**

**Part number:** A-2063-7600

**6 – LP2 probe assembly**

**Part number:** A-2063-6098

### OMP40M retrofit kit

Includes: OMP40M transmission system  
LP2 probe  
OMI-2 optical machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit  
Renishaw lathe inspection software  
Installation and applications support

**Part number:** OMP40M-NS-S (Available at fixed price)  
Call for details

### OMP40M hardware only kit

Includes: OMP40 transmission system  
LP2 probe  
OMI-2 optical machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit

**Part number:** OMP40M-NS-KIT

A shank is not included in the above kits. See section entitled Shanks and Toolholders for price and part number information.

### OMM optical receiver

**Part number:** A-2033-0576

### OMM-2 optical receiver

**Part number:** A-5492-0051

### OMI-2 optical receiver/interface

**Part number:** A-5191-0049

### OMI-2T optical receiver/interface

**Part number:** A-5439-0049

### Receiver mounting bracket

**Part number:** A-2033-0830

### MI12 interface

**Part number:** A-2075-0142

### OSI interface

**Part number:** A-5492-2000

### Sealtite conduit for OMM or OMI

¼ in conduit, 5 ft long. Includes one fitting.

**Part number:** SEALTITE, 7455

### Sealtite conduit for OMM-2, OMI-2 or OMI-2T

5/16 in conduit, 1 meter long. Includes one fitting.

**Part number:** A-4113-0306

## RLP40

RLP40 is the latest generation of radio transmission part probes, ideal for use on turning centers. RLP40's compact design features an integrated probe module delivering exceptional robustness and generous overtravel. RLP40 complies with FCC regulations and operates in the 2.4 Ghz range. RLP40 delivers interference-free transmission through the use of FHSS (frequency hopping spread spectrum).

RLP40 supports two methods of probe activation:

**Radio-on** The probe is turned on via an RF signal produced by the RMI and initiated by an M code. The probe is turned off via an RF signal or the internal timer.

**Spin-on** The probe is turned on via an internal centrifugal switch. The probe is turned off via the centrifugal switch or the internal timer.

Sense directions	±X, ±Y, +Z
Stylus overtravel	X and Y: ±12.5°
	Z: 6 mm (0.24 in)
Stylus trigger force	X and Y: 50 gf – 90 gf
	Z: 585 gf
Unidirectional repeatability	1.0 µm (0.00004 in)

### RLP40 retrofit kit

Includes: RLP40 probe and transmission system  
RMI radio machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit  
Renishaw lathe inspection software  
Installation and applications support

A shank is not included in this kit. See section entitled Shanks and Toolholders for price and part number information.

**Part number:** RLP40-NS-S (Available at fixed price)  
Call for details

**Note:** The retrofit questionnaire at the end of this section must be filled out and returned to Renishaw before a retrofit order can be processed.

### RLP40 hardware only kit

Includes: RLP40 probe and transmission system  
RMI radio machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit

**Part number:** RLP40-NS-KIT



### RLP40 probe kit

Includes: RLP40 probe  
½ AA battery (2)  
Tool kit

**Part number:** A-5627-0001

### RMI radio machine interface

**Part number:** A-4113-0050

### Receiver mounting bracket

**Part number:** A-2033-0830

### Sealtite conduit

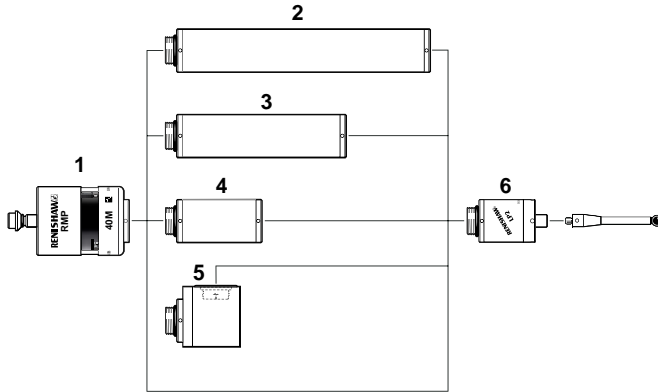
5/16 in conduit, 1 m long. Includes one fitting.

**Part number:** A-4113-0306



## RMP40M

RMP40M is a modular version of the RLP40. The LP2 probe module, adaptors and extensions need to be purchased separately.



### 1 – RMP40M transmission module

Part number: A-5628-0001

### 2 – LPE3 extension 150 mm

Part number: A-2063-7003

### 3 – LPE2 extension 100 mm

Part number: A-2063-7002

### 4 – LPE1 extension 50 mm

Part number: A-2063-7001

### 5 – MA4 90° adaptor

Part number: A-2063-7600

### 6 – LP2 probe assembly

Part number: A-2063-6098

## RMP40M retrofit kit

Includes: RMP40M transmission system  
LP2 probe  
Receiver radio machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit  
Renishaw lathe inspection software  
Installation and applications support

**Part number:** RMP40M-NS-S (Available at fixed price)  
Call for details

## RMP40M hardware only kit

Includes: RMP40 transmission system  
LP2 probe  
RMI radio machine interface  
Receiver mounting bracket  
30 mm stainless steel stylus (x2)  
Sealtite kit

**Part number:** RMP40M-NS-KIT

A shank is not included in the above kits. See section entitled Shanks and Toolholders for price and part number information.

## RMI radio machine interface

Part number: A-4113-0050

## Receiver mounting bracket

Part number: A-2033-0830

## Sealtite conduit

5/16 in conduit, 1 m long. Includes one fitting.

Part number: A-4113-0306

## LP2

The LP2 probe is used on CNC lathes for workpiece inspection and tool setting. It is also used in special applications where its small body makes it suitable for gaging workpiece features with restricted access.

The LP2 is universal and can be fitted to optical, inductive, hard-wired and radio transmission systems. An array of sockets and adaptors is available to support these applications. Please contact Renishaw for further details.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 12.5^\circ$
	Z: 6.5 mm (0.25 in)
Stylus trigger force	X and Y: 50 gf – 90 gf
	Z: 585 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)

Includes: LP2 probe  
 2 C spanners  
 TK1 tool kit

**Part number:** A-2063-6098



## LP2H

The LP2H probe is used on CNC lathes for workpiece inspection and tool setting. It is designed for heavier duty applications where machine vibration or heavy stylus arrangements may cause unexpected triggers.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 12.5^\circ$
	Z: 5 mm (0.20 in)
Stylus trigger force	X and Y: 200 gf – 400 gf
	Z: 3000 gf
Unidirectional repeatability	2.0 $\mu\text{m}$ (0.00008 in)

Includes: LP2H probe  
 2 C spanners  
 TK1 tool kit

**Part number:** A-2064-0002



## LP2DD

The LP2DD probe is based on the LP2 design, but incorporates a revised diaphragm assembly. This probe is recommended for grinding machines and other installations where dust-filled coolant is abundant.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 15^\circ$
	Z: 6.5 mm (0.25 in)
Stylus trigger force	X and Y: 50 gf – 90 gf
	Z: 585 gf
Unidirectional repeatability	1.0 $\mu\text{m}$ (0.00004 in)

Includes: LP2DD probe  
 2 C spanners  
 TK1 tool kit

**Part number:** A-2063-8020



## LP2/LP2DD replacement parts

### Conversion kit

This kit allows the conversion of your existing LP2 probe to LP2DD.

Includes: 2 C spanners  
Front ring  
Outer diaphragm  
O ring

**Part number:** A-2063-8023

### LP2DD diaphragm replacement kit

An outer diaphragm replacement kit for the LP2DD.

Includes: Diaphragm  
O ring

**Part number:** A-2063-8030

### Chip deflector

This deflector is recommended if the LP2DD is subjected to continual exposure to hot chips.

**Part number:** M-2063-8003

### C spanner

A C spanner is required for fitting an LP2 to your machine.

**Part number:** A-2063-7587

### LP2 service kit (DK2)

Includes: Front cap  
Metal eyelid  
Spring  
O ring

**Part number:** A-2063-7542

### TK1 tool kit

Includes: Stylus tool  
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

**Part number:** A-2053-7531

## LP2 accessories

### FS1 adjustable female socket

Provides  $\pm 4^\circ$  of angular rotation about the centerline of the LP2. Supplied with 500 mm long cable, protective cover and adjusting screws.

**Part number:** A-2063-6697

### FS2 fixed female socket

Designed for rigid mounting of an LP2. Supplied with 500 mm long cable and protective cover.

**Part number:** A-2063-5431

### FS3 single axis adjustable holder

The socket pivots on two balls, this provides  $\pm 4^\circ$  of pitch adjustment about the centerline of the LP2. Supplied with 500 mm long cable, protective cover and adjusting screws.

**Part number:** A-2063-5308

### MA4 90° adaptor

**Part number:** A-2063-7600

### COS to LP2 adaptor

This adaptor allows the use of the LP2 on the MP7/MP8/MP9/MP10 OMP.

**Part number:** A-2063-7774

### IMP inductive module

**Part number:** A-2028-7574

### MI5 interface

**Part number:** A-2019-0006

### MI8 interface

**Part number:** A-2037-0010

### LPE1 extension

A 50 mm long extension which can be fitted between the LP2 and holder.

**Part number:** A-2063-7001

### LPE2 extension

100 mm long.

**Part number:** A-2063-7002

### LPE3 extension

150 mm long

**Part number:** A-2063-7003

## LP2 straight shanks

LP2 straight shanks are fitted with FS2 socket assemblies to accommodate the LP2 probe. An M18 interface is also required.

### LP2 0.75 in straight shank with FS2 and cable assembly

**Part number:** A-2063-8326

### LP2 1 in straight shank with FS2 and cable assembly

**Part number:** A-2063-8328

### LP2 22 mm straight shank with FS2 and cable assembly

**Part number:** A-2063-8366

## MP250

MP250 is the next generation compact probe. Measuring just 25 mm in diameter and 40 mm in length, MP250 is identical in size to the popular LP2. MP250 uses Rengage™ strain gage sensing technology and delivers superior metrology performance. MP250 is aimed at the tool cutter grinder and special CNC lathe markets. MP250 is supported via hard-wired only and must be used with the HSI interface and FS sockets designed specifically for the MP250. MP250 is not suitable for use with inductive, optical or radio transmission.

Sense directions	$\pm X, \pm Y, +Z$
Stylus overtravel	X and Y: $\pm 15^\circ$
	Z: 6.5 mm (0.25 in)
Stylus trigger force	X and Y: 11 gf
	Z: 220 gf
Unidirectional repeatability	0.25 $\mu\text{m}$ (0.00001 in)

### MP250 probe kit

Includes: MP250 probe  
 Tool kit

**Part number:** A-5500-1600

### MP250 accessories

#### FS1 adjustable female socket for MP250

**Part number:** A-5500-1710

#### FS2 fixed female socket for MP250

**Part number:** A-5500-1810

#### HSI interface for MP250

**Part number:** A-5500-1000



## Tool setting for turning centers

### High precision removable arm (HPRA)

The HPRA is a 'plug-in', cost effective, precision tool setting system for use on CNC lathes. When needed, the arm is manually introduced to the machine envelope and held in place through the use of the machine resident HPRA base. The arm is locked in position through the duration of the tool setting cycle. After use, the arm is removed and stored on the HPRA storage stand.

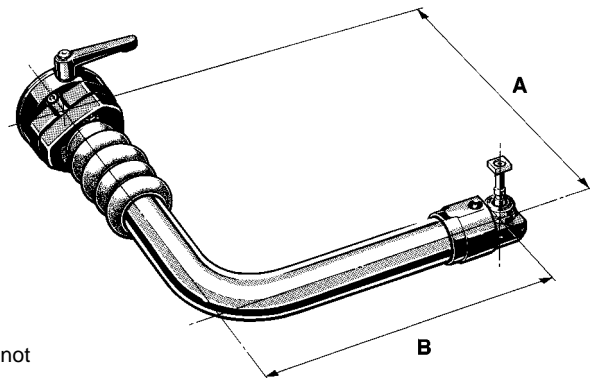
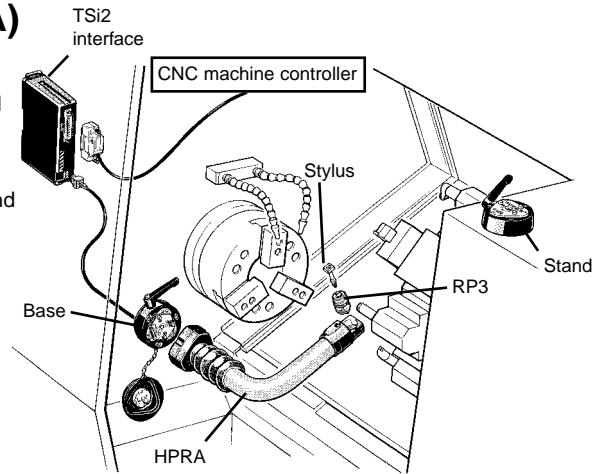
#### Unidirectional repeatability

Max 2 sigma value: 5.0  $\mu\text{m}$  (0.0002 in) for arms supporting 6 in to 15 in chucks  
8.0  $\mu\text{m}$  (0.0003 in) for arms supporting 18 in to 24 in chucks

Max arm dimensions: A=580 mm B=450 mm  
Min arm dimensions: A=250 mm B=211 mm

HPRA is available to fit most common chuck sizes from 6 in to 24 in. Each HPRA standard kit (see below) is supplied complete with:

- RP3 probe (A-2197-0049)
- 90° probe holder
- TSi2 interface (A-2176-0010)
- HPRA storage stand (A-2176-0019)



### Standard kits

**Part number:** See below

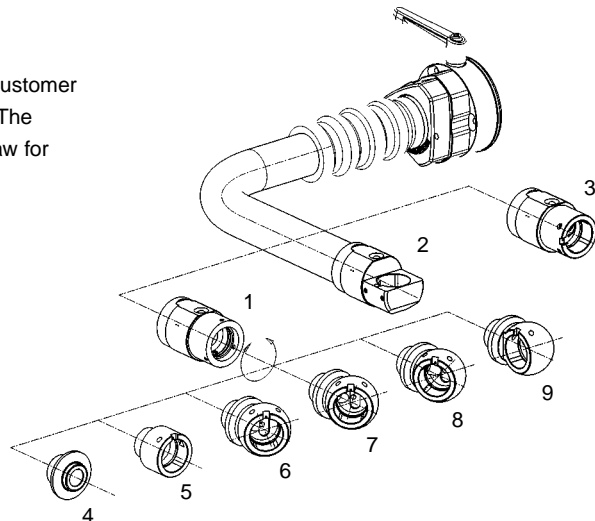
\* A stylus assembly and base (R/E or S/E) rear exit or side exit are not included and must be ordered separately.

Part description	Part number	A-dimension	B-dimension
HPRA 6 in chuck with RP3 kit	A-2176-0883	250	211
HPRA 8 in chuck with RP3 kit	A-2176-0884	280	241
HPRA 10 in chuck with RP3 kit	A-2176-0885	325	290
HPRA 12 in chuck with RP3 kit	A-2176-0886	355	290
HPRA 15 in chuck with RP3 kit	A-2176-0887	455	335
HPRA 18 in chuck with RP3 kit	A-2176-0888	510	375
HPRA 24 in chuck with RP3 kit	A-2176-0889	580	450

### Custom kits

The HPRA can also be designed for specific applications. The customer must specify arm length, probe holder, stylus configuration etc. The items below depict some of the options. Please contact Renishaw for pricing.

- |   |             |                    |
|---|-------------|--------------------|
| 1 | A-2176-0268 | PCB/LED housing    |
| 2 | A-2176-0018 | 90° holder fixed   |
| 3 | A-2176-0257 | I/L holder fixed   |
| 4 | A-2048-0523 | LP2 adaptor        |
| 5 | A-2176-1291 | I/L adj RP3 holder |
| 6 | A-2176-1290 | 30° adj RP3 holder |
| 7 | A-2176-0269 | 45° adj RP3 holder |
| 8 | A-2176-1289 | 60° adj RP3 holder |
| 9 | A-2176-1288 | 90° adj RP3 holder |



## HPRA bases

The HPRA base is designed to provide a repeatable location for fixing the HPRA arm during tool setting cycles. The base is designed to stay resident within the machine and is supplied with a cover to protect the unit from coolant and debris when the arm is not in use. HPRA bases are available in rear and side exit configurations and are supplied with 3 meters of cable.

### HPRA rear exit base

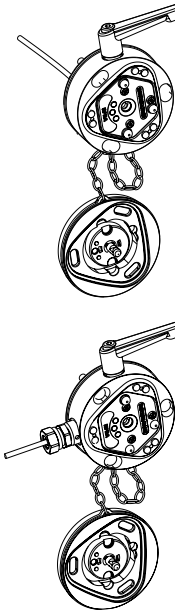
**Part number:** A-2176-0025

### HPRA side exit base

**Part number:** A-2176-0187

### HPRA storage stand

**Part number:** A-2176-0019



## HPRA/HPPA/HPMA stylus kits

There are six primary configurations of styli to support HPRA. Each is designed to be compatible with standard sizes of block tooling ranging from 5/8 in to 2 in. Each stylus kit is supplied complete with:

- 15x15x4 stylus assembly
- Break stem
- Stylus extension/adaptor
- Screws and tool kit

**Part number:** A-2197-0157 (16 mm tooling)

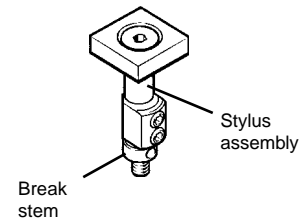
**Part number:** A-2197-0158 (20 mm tooling)

**Part number:** A-2197-0159 (25 mm tooling)

**Part number:** A-2197-0160 (32 mm tooling)

**Part number:** A-2197-0161 (40 mm tooling)

**Part number:** A-2197-0162 (50 mm tooling)



## HPRA/HPPA/HPMA break stems

**Part number:** M-2197-0156 (16 and 20 mm tooling)

**Part number:** M-2197-0150 (25 to 50 mm tooling)



## High precision pull-down arm (HPPA)

## High precision motorized arm (HPMA)

The HPPA is a manual 'pull-down' 'push-up' tool setting system for use on CNC lathes. The HPMA is an 'automatic' servo driven system. Both products are designed to permanently reside in the machine envelope.

When needed, the HPPA is manually 'pulled-down' into position. After use, the arm is 'pushed-up' away from the cutting volume. HPMA requires the use of CNC M codes to drive the arm to its active and stowed positions.

All HPPA and HPMA systems are supplied with an enclosure to protect the probe and stylus assembly when not in use. HPPA and HPMA hubs are available in both R/E (rear exit) and S/E (side exit) configurations. S/E hubs are supplied with a fixed 5 m cable. **R/E hubs are supplied with a bulkhead connector and require the purchase of a separate cable.**

### Specifications

Unidirectional repeatability

max  $2\sigma$  value in machine XZ axis: 5.0  $\mu\text{m}$  (0.0002 in) for arms supporting 6 in to 15 in chucks  
8.0  $\mu\text{m}$  (0.0003 in) for arms supporting 18 in to 24 in chucks

HPPA max arm dimensions: A=555 mm B=458 mm

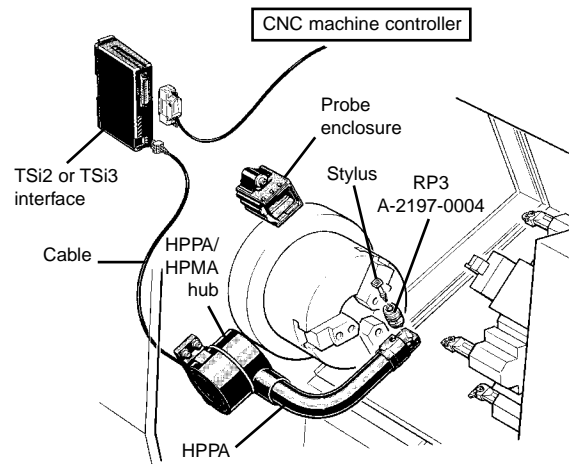
HPPA min arm dimensions: A=250 mm B=219 mm

HPMA max arm dimensions: A=555 mm B=458 mm

HPMA min arm dimensions: A=250 mm B=219 mm

HPPA and HPMA are available to fit most common chuck sizes from 6 in to 24 in. Each 'standard' kit (see below) is supplied complete with:

- Arm
- HPPA or HPMA hub
- RP3 probe (A-2197-0049)
- 90° probe holder
- TSi2 interface for HPPA (A-2176-0010)
- TSi3 interface for HPMA (A-2181-0465)
- Probe enclosure (A-2275-0098)
- Cable (supplied with S/E systems only, **purchase separately for R/E systems**)



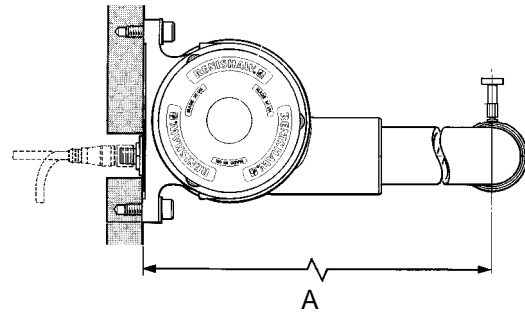


## HPPA standard kits

**Part number:** See below

\* A stylus assembly is not included and must be ordered separately. In addition HPPA and HPMA R/E systems require the separate purchase of a cable.

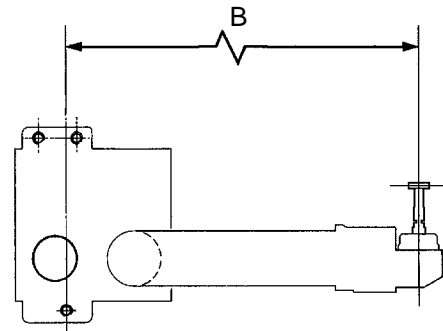
Part description	Part number	A-dimension	B-dimension
HPPA 6 in R/E with RP3 kit	A-2275-0181	250	219
HPPA 8 in R/E with RP3 kit	A-2275-0182	286	249
HPPA 10 in R/E with RP3 kit	A-2275-0183	335	298
HPPA 12 in R/E with RP3 kit	A-2275-0184	368	298
HPPA 15 in R/E with RP3 kit	A-2275-0185	400	343
HPPA 18 in R/E with RP3 kit	A-2275-0186	469	383
HPPA 24 in R/E with RP3 kit	A-2275-0187	555	458
HPPA 6 in S/E with RP3 kit	A-2275-0188	250	219
HPPA 8 in S/E with RP3 kit	A-2275-0189	286	249
HPPA 10 in S/E with RP3 kit	A-2275-0190	335	298
HPPA 12 in S/E with RP3 kit	A-2275-0191	368	298
HPPA 15 in S/E with RP3 kit	A-2275-0192	400	343
HPPA 18 in S/E with RP3 kit	A-2275-0193	469	383
HPPA 24 in S/E with RP3 kit	A-2275-0194	555	458



## HPMA standard kits

**Part number:** See below

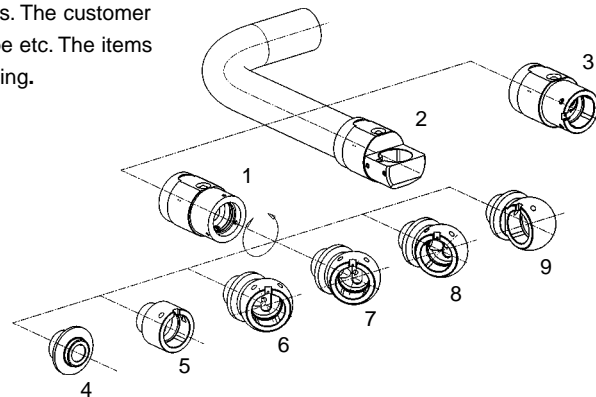
Part description	Part number	A-dimension	B-dimension
HPMA 6 in R/E with RP3 kit	A-2181-0645	250	219
HPMA 8 in R/E with RP3 kit	A-2181-0646	286	249
HPMA 10 in R/E with RP3 kit	A-2181-0647	355	298
HPMA 12 in R/E with RP3 kit	A-2181-0648	368	298
HPMA 15 in R/E with RP3 kit	A-2181-0649	400	343
HPMA 18 in R/E with RP3 kit	A-2181-0650	469	383
HPMA 24 in R/E with RP3 kit	A-2181-0651	555	458
HPMA 6 in S/E with RP3 kit	A-2181-0652	250	219
HPMA 8 in S/E with RP3 kit	A-2181-0653	286	249
HPMA 10 in S/E with RP3 kit	A-2181-0654	355	298
HPMA 12 in S/E with RP3 kit	A-2181-0655	368	298
HPMA 15 in S/E with RP3 kit	A-2181-0656	400	343
HPMA 18 in S/E with RP3 kit	A-2181-0657	469	383
HPMA 24 in S/E with RP3 kit	A-2181-0658	555	458



## Custom kits

The HPPA and HPMA can also be designed for specific applications. The customer must specify arm length, probe holder, stylus configuration, hub type etc. The items below depict some of the options. Please contact Renishaw for pricing.

1	A-2176-0268	PCB/LED housing
2	A-2176-0018	90° holder fixed
3	A-2176-0257	I/L holder fixed
4	A-2048-0523	LP2 adaptor
5	A-2176-1291	I/L adj RP3 holder
6	A-2176-1290	30° adj RP3 holder
7	A-2176-0269	45° adj RP3 holder
8	A-2176-1289	60° adj RP3 holder
9	A-2176-1288	90° adj RP3 holder



## HPPA/HPMA cables

The HPPA and HPMA R/E systems require the use of one of the cables below:

**Part number:** P-CA82-1010 (2 meters)

**Part number:** P-CA82-1009 (5 meters)

**Part number:** P-CA82-1011 (10 meters)

## HPRA/HPPA/HPMA stylus kits

There are six primary configurations of styli to support HPPA and HPMA. Each is designed to be compatible with standard sizes of block tooling ranging from 5/8 in to 2 in. Each stylus kit is supplied complete with:

- 15×15×4 stylus assembly
- Break stem
- Stylus extension/adaptor
- Screws and tool kit

**Part number:** A-2197-0157 (16 mm tooling)

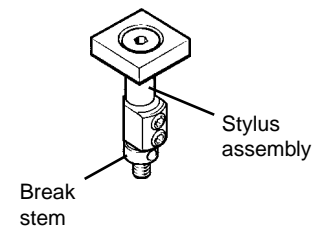
**Part number:** A-2197-0158 (20 mm tooling)

**Part number:** A-2197-0159 (25 mm tooling)

**Part number:** A-2197-0160 (32 mm tooling)

**Part number:** A-2197-0161 (40 mm tooling)

**Part number:** A-2197-0162 (50 mm tooling)



## HPRA/HPPA/HPMA M4 break stems

**Part number:** M-2197-0156 (16 mm and 20 mm tooling)

**Part number:** M-2197-0150 (25 mm to 50 mm tooling)

**Part number:** M-2048-2093 (Mori Seiki)



## Legacy HPA stylus kits

### TS20 replacement stylus kit

Includes stylus 10×10×4, break protect link, adaptor and screw.

**Part number:** A-2008-0601 (25 mm tooling)

**Part number:** A-2008-0602 (32 mm tooling)

**Part number:** A-2008-0603 (40 mm tooling)

### TS20 break protect link

**Part number:** M-2008-0333 (25 mm tooling)

**Part number:** M-2008-0604 (32 mm tooling)

**Part number:** M-2008-0605 (40 mm tooling)

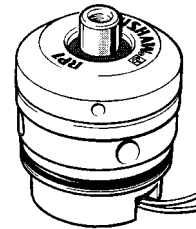
## RP1, RP2 and RP3 tool setting probes

The RP1, RP2 and RP3 probes are suitable for OEM installation into purpose-built holders, or for use with Renishaw's automatic or manual tool setting arms.

### RP1 – Tool setting/inspection probe and toolkit

For use on OEM installation into purpose-built holders.

**Part number:**A-2154-0007



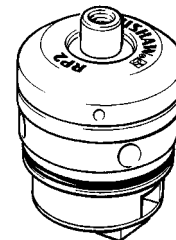
### RP1 DD – RP1 double diaphragm version and toolkit

For use on OEM installation into purpose-built holders.

**Part number:**A-2154-0008

### RP2 – Probe for tool setting arm (TSA) only

**Part number:** A-2116-0149

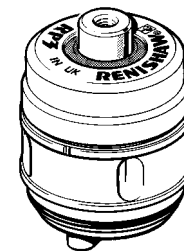


### RP2DD – RP2 double diaphragm version for TSA only

**Part number:**A-2116-0150

### RP3 – Probe for HPRA, HPPA and HPMA arms

**Part number:** A-2197-0049



## Interfaces

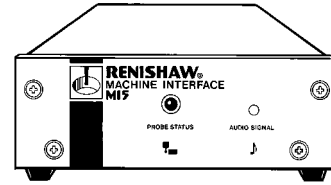
### MI5 interface

The MI5 interface is required for use with Renishaw's inductive transmission probe systems. The MI5 converts probe signals into an acceptable form for the CNC machine control. This interface has solid state relay outputs.

**Part number:** A-2019-0006

#### MI5 board only (SSR)

**Part number:** A-2084-0500



### MI12 interface

The MI12 interface is required for use with Renishaw optical probes using Legacy transmission. The MI12 converts signals received from the OMM receiver into an acceptable form for the CNC machine control. This interface has solid state relay outputs.

**Part number:** A-2075-0142

#### MI12 board only (SSR)

**Part number:** A-2075-0141



### OSI interface

The OSI interface is required for use with Renishaw optical probes using Modulated transmission. The OSI works exclusively with the OMM-2 receiver.

**Part number:** A-5492-2000



### HSI interface

The HSI interface is required for use with Renishaw's MP250 and TS34 probes. The HSI converts signals received from the probe into an acceptable form for the CNC machine control. The HSI has solid state relay output.

**Part number:** A-5500-1000



### NCi-5 interface

An NCI-5 interface is required for use with Renishaw non-contact tool setting systems. The interface converts probe signals into an acceptable form for the CNC machine control. This interface has solid state relay outputs.

**Part number:** A-5259-2000



## Receivers and interfaces

OMI, OMI-2 and OMI-2T are optical receivers that transmit signals between the probe and CNC control. These interfaces differ from the OMM as they include machine interface circuitry that eliminates the MI12 interface. All three systems offer visual indicators of probe status, start signal status, battery condition and error condition.

### OMI

OMI is compatible with all Renishaw optical transmission systems including the new OMP60, OMP40 and OMP400 when configured for Legacy transmission (does not work with the OTS).

**Part number:** A-2115-0001



### OMI-2

OMI-2 offers increased resistance to light interference and is exclusively compatible with Renishaw optical transmission systems operating in Modulated transmission mode (OMP60, OMP40, OMP400 or OLP40).

**Part number:**A-5191-0049 (8 m cable)

**Part number:**A-5191-0050 (15 m cable)



### OMI-2T

OMI-2T is identical to the OMI-2 and is the exclusive interface supporting the twin probe system. OMI-2T is capable of communicating with multiple optical probes. CNC must have supporting M codes. This interface should be used when combining an OTS with an OMP60, OMP40 or OMP400.

**Part number:**A-5439-0049 (8 m cable)

**Part number:**A-5439-0050 (15 m cable)



### OMM optical machine module

The OMM receiver is required for use with Renishaw optical probes using Legacy transmission. The OMM works exclusively with the MI12 interface.

**Part number:** A-2033-0576 (25 m cable)



### OMM-2 optical machine module

The OMM-2 receiver is required for use with Renishaw optical probes using Modulated transmission. The OMM-2 works exclusively with the OSI. OMM-2 is capable of communicating with multiple optical probes.

**Part number:** A-5492-0051 (25 m cable)



## RMI radio machine interface

The RMI interface is required for use with Renishaw's radio transmission probes. The RMI converts RF signals into an acceptable form for the CNC machine control. The RMI has solid state relay output.

**Part number:**A-4113-0050 (15 m cable)



## RMI-Q radio machine interface (available winter 2013)

RMI-Q is identical to RMI and is the exclusive interface supporting multiple (up to four) probe systems. RMI-Q is capable of communicating with multiple radio probes. CNC must have supporting M codes. This interface should be used when combining an RTS with an RMP40, RMP60 or RMP600.

**Part number:**A-5687-0049 (8 m cable)

**Part number:**A-5687-0050 (15 m cable)



## RMI accessories

### RMI 30 m replacement cable

**Part number:** A-4113-0303

### RMI 50 m replacement cable

**Part number:** A-4113-0304

### RMI antenna cover

**Part number:** A-4113-0305

## Lathe tool setting arm interfaces

There are two primary configurations of interfaces supporting lathe arms. The TSi2 and TSi3 deliver OCT (active high) output for probe status and arm positions, while the TSi2-C and TSi3-C interfaces deliver SSR solid state relay outputs for probe status and arm positions. The TSi2 and TSi2-C support the HPRA and HPPA lathe arms. The TSi3 and TSi-3C support the HPMA lathe arm.

### TSi2

**Part number:** A-2176-0010

### TSi2-C

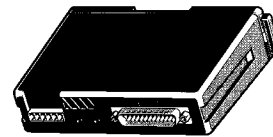
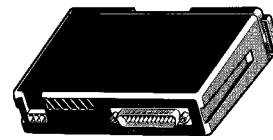
**Part number:** A-2176-1152

### TSi3

**Part number:** A-2181-0465

### TSi3-C

**Part number:** A-2181-2239



## Machine tool software

### Macro based programming

Renishaw probing and tool setting software is a set of macros that control probing motion and data manipulation for a number of routines with input of a few parameters. Some capabilities may vary by specific software package and individual controller. All software is supplied on CD-ROM with electronic user's guide.

### Inspection Plus software for machining centers

Available measurement cycles include:

- X or Y or Z single surface measure
- Any angle web/pocket
- 3 or 4 point bore/boss
- Internal/external corner
- 4th or 5th axis measure
- Feature to feature measure
- Print data via RS232

Description	Memory	Part number
Brother 32A (June 2002 and above)	35K/87M	A-4012-0908
Brother 32B	35K/87M	A-4012-1028
Fanuc 0-31	47K/117M	A-4012-0516
Haas	47K/117M	A-4012-0880
Mazak Fusion	47K/117M	A-4013-0023
Mazak Matrix	65K/163M	A-4013-0112
Meldas	47K/117M	A-4012-0516
Mori Seiki (Fanuc control)	47K/117M	A-4012-0936
Okuma OSP	53K/133M	A-4016-1035
Siemens 810D/840D (Ver 4 or less)	77K/190M	A-4014-0075
Siemens 810D/840D (Ver 5 and above)	77K/190M	A-4014-0356
Toshiba Tosnuc 888	47K/117M	A-4012-0610
Yasnac I80, MX3, J50, J300	47K/117M	A-4014-0070

### Inspection Plus software for machining centers using strain gage probes

Available measurement cycles include:

- X or Y or Z single surface measure
- XYZ vector measure
- Any angle web/pocket
- 3 or 4 point bore/boss
- Internation/external corner
- 4th or 5th axis measure
- Feature to feature measure
- Print data via RS232

Description	Memory	Part number
Fanuc 0-31	47K/117M	A-4012-0685
Haas	47K/117M	A-4012-0890
Mazak Fusion	47K/117M	A-4013-0040
Meldas	47K/117M	A-4012-0685
Mori Seiki (Fanuc control)	47K/117M	A-4012-0942
Okuma OSP	53K/133M	A-4016-1035
Siemens 810D/840D (Ver 4 or less)	77K/190M	A-4014-0152
Siemens 810D/840D (Ver 5 and above)	77K/190M	A-4014-0362
Yasnac I80, MX3, J50, J300	47K/117M	A-4014-0104



## Tool setting software for machining centers

Renishaw tool setting software allows you to set tool length and diameter offsets for single point and multiple point tools, perform in-cycle broken tool detection and manual or automatic (programmed) positioning.

### Contact tool setting

Description	Memory	Part number
Brother 32A (June 2002 and above)	13K/32M	A-4012-1007
Brother 32B	13K/32M	A-4012-1103
Fadal	13K/32M	A-4016-0043
Fanuc 0-31	9K/23M	A-4012-0584
Haas	9K/23M	A-4012-0886
Mazak 640M, M32, M+	9K/23M	A-4013-0036
Meldas	9K/23M	A-4013-0007
Okuma OSP	9K/23M	A-4016-1039
Siemens 810/840D (Ver 4 or less)	9K/23M	A-4014-0090
Siemens 810/840D (Ver 5 and above)	9K/23M	A-4014-0396
Yasnac J50, J300, I80/MX3	9K/23M	A-4014-0018

### Non-contact tool setting

Description	Memory	Part number
Brother 32A (June 2002 and above)	27K/67M	A-4012-0904
Brother 32B	27K/67M	A-4012-1035
Fadal	27K/67M	A-4016-0061
Fanuc 0-31	24K/67M	A-4012-0820
Haas	24K/67M	A-4012-0895
Makino	27K/67M	A-4012-0900
Mazak Fusion	24K/67M	A-4013-0062
Mazak Matrix	57K/143M	A-4013-0119
Meldas	24K/67M	A-4013-0050
Okuma OSP	27K/67M	A-4016-1021
Siemens 810/840D (Ver 4 or less)	34K/84M	A-4014-0157
Siemens 810/840D (Ver 5 and above)	27K/67M	A-4014-0401
Yasnac MX3, I80, J50, J300	27K/67M	A-4014-0020

### Special non-contact tool setting

Description	Memory	Part number
Fanuc angle beam 0-31	27K/67M	A-4012-0821
Makino angle beam	27K/67M	A-4013-0900
Mazak angle beam Fusion	27K/67M	A-4013-0088
Mazak Matrix angle beam	57K/143M	A-4013-0119
Mazak E-Series Matrix	52K/130M	A-4013-0123
Mazak E-series Fusion	27K/67M	A-4013-0092
Mazak Mark III Fusion	27K/67M	A-4013-0567
Yasnac angle beam	27K/67M	A-4014-0025

## Inspection software for turning centers

Renishaw's Inspection software for turning centers offers macros for:

- single-point (radial) measurement
- two-point (diameter) measurement
- rib/groove measurement
- single Z-surface measurement

It can update tool offsets and work offsets. It has an upper tolerance band which can be set for no offset correction. On completion of each measurement cycle it is possible to print out the results.

Description	Memory	Part number
Fanuc 0-31	11K/27M	A-4012-0541
Haas	11K/27M	A-4012-0874
Mazak Fusion	11K/28M	A-4013-0071
Siemens 810D/840D	19K/47M	A-4014-0137
Yasnac LX3	10K/26M	A-4014-0011

## Inspection software for multi-axis turning centers

- horizontal and vertical head orientations
- X, Y and Z single surface measure
- bore/boss
- web/pocket
- C axis find

Description	Memory	Part number
Mazak Mark III Fusion	45K/113M	A-4013-0030
Mazak E-series Fusion	75K/188M	A-4013-0083
Mori Seiki MTNT	43K/106M	A-4012-0834
Hitachi Hi-Cell	75K/188M	A-4012-0843
Nakamura NTX	46K/113M	A-4012-1074
Mazak Mark IV and E-series Matrix	110K/275M	A-4013-0106
Doosan MT	43K/106M	A-4012-1016

## Tool setting software for turning centers

The Renishaw tool setting software for turning centers sets tool length and/or diameter for static and powered tools. It has manual or automatic (programmed) positioning capability.

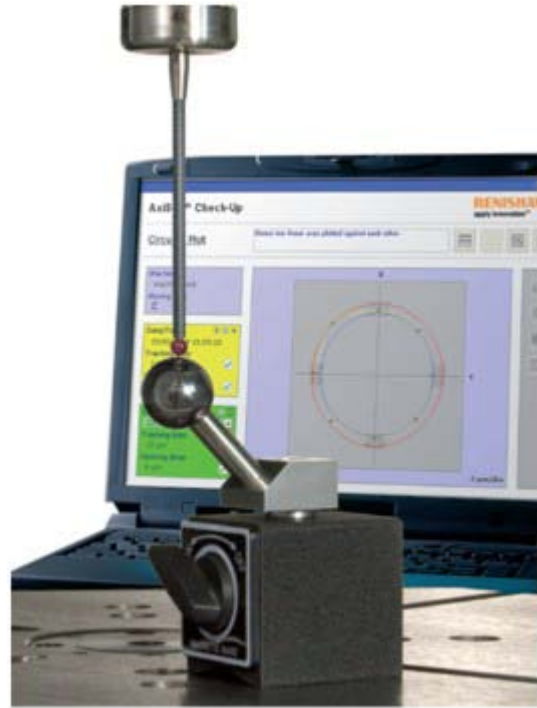
Description	Memory	Part number
Fanuc 0-31	4K/8M	A-4012-0528
Haas	4K/8M	A-4012-0877

## AxiSet™ Check-Up

Compatible with common formats of 5-axis machines, AxiSet™ Check-Up provides machine users a fast and accurate method for determining rotary axis pivot points. The system is comprised of macro software, dedicated calibration artifact and PC-based data analysis software. Performance analysis is reported graphically via Microsoft® Excel®, compared against user-defined tolerances and stored for historical comparison.

The solutions defined below are compatible with 5-axis table-table machines. New solutions are being developed. Contact Renishaw for the latest list of compatibility. Each solution includes:

- CNC specific macro
- Artifact with magnetic base
- PC-based data analysis software



### **AxiSet™ Check-Up Mazak Variaxis**

Part number:A-5642-1000

### **AxiSet™ Check-Up Fanuc (Table-Table)**

Part number:A-5642-1100

### **AxiSet™ Check-Up Mori Seiki NMV NMH**

Part number:A-5642-1400

### **AxiSet™ Check-Up Siemens (Table-Table)**

Part number:A-5642-1500

### **AxiSet™ Check-Up Mazak Mark IV**

Part number:A-5642-1005

### **AxiSet™ Check-Up Mazak eV/eH**

Part number:A-5642-1009

### **AxiSet™ Check-Up Hurco Winmax (Table-Table)**

Part number:A-5642-1105

### **AxiSet™ Check-Up Haas**

Part number:A-5642-1600

### **AxiSet™ Check-Up Mori Seiki NT**

Part number:A-5642-1405

### **AxiSet™ Check-Up Siemens (Head-Head)**

Part number:A-5642-1515

## Off-line programming

Productivity+™ is a new software module designed to simplify the process of integrating probing cycles into the CNC machining program. Productivity+™ Active Editor Pro runs standalone, while the Productivity+™ GibbsCAM® plug-in runs in the GibbsCAM® environment and requires GibbsCAM® version 7 or above.

Productivity+™:

- Imports the native CAD model
- Creates and edits probing programs
- Allows simulation of inspection routines in a virtual environment
- Requires no detailed knowledge of macro codes
- Is compatible with many popular controls

Productivity+™ comes with three CAD importers as standard: IGES, STEP and Parasolid®. Other CAD importers are available (select from the list below).

Productivity+™ is supplied with one post processor (select from the list below).

The Productivity+™ GibbsCAM® plug-in requires the GibbsCAM® machine post processor to be upgraded to allow compatibility. The first post processor upgrade is included.

### Productivity+™ GibbsCAM® plug-in

**Part number:** A-4007-1000

### Productivity+™ Active Editor Pro

**Part number:** A-4007-1400

### Productivity+™ post processors

Control	Part number
Brother	A-4007-5900
Fanuc Macro B	A-4007-5100
Haas	A-4007-5200
Heidenhain	A-4007-6000
Hitachi Seicos	A-4007-5300
Hurco	A-4007-6800
Makino	A-4007-5400
Mazatrol ISO	A-4007-5500
Mitsubishi Meldas	A-4007-5600
Mori Seiki	A-4007-6600
Okuma	A-4007-6300
Siemens	A-4007-6700
Yasnac	A-4007-5700



### Productivity+™ CAD importers

CAD system	Part number
Pro-E	A-5226-0007
CATIA	A-5226-0008
UG/NX	A-5226-0009
ACIS	A-5226-0010
SolidWorks®	A-5226-0011
Inventor™	A-5226-0012
All of the above	A-5226-0020

### GibbsCAM® post processor upgrade service

**Part number:** A-4007-1000-RI

### One-year maintenance contract

**Part number:** A-4007-4000

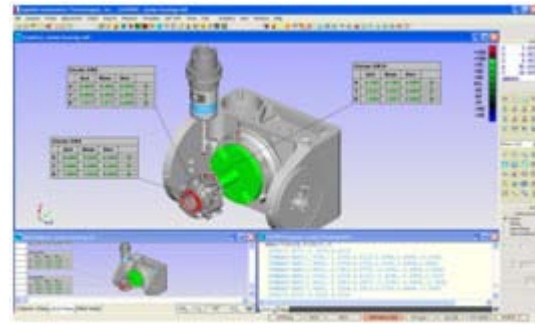
### Productivity+™ Active Editor Pro 90-day trial

**Part number:** A-4007-8999

## Renishaw CappsNC

Renishaw CappsNC is a comprehensive part verification software package for machine tools, designed to give confidence to the user that the part produced conforms to the CAD model.

- Generate measurement programs from the CAD model, offline, in a virtual PC environment.
- Using the comprehensive probe builder, various shanks, Renishaw probes and styli can be modeled.
- Generate probe paths for 3-axis machines measuring 2D and 3D prismatic features and 3D free-form surfaces.
- Collision avoidance automatically detects obstructions and generates avoidance paths.
- Supports a variety of CNCs and machine communication protocols (RS232, Ethernet, FOCAS, Mnet, TNCDirect, Siemens OPC, MTConnect).
- Uses industry-standard DMIS code to generate machine motion, construction, dimensioning and tolerance instructions.
- Generate comprehensive measurement reports with full GD&T.
- Using the optional 4th/5th axis module, CappsNC supports a variety of multi-axis machine configurations.
- Using the optional tool and work offset module, tool compensation commands and work offset shifts can be incorporated into the post processed output.
- First year maintenance and support included.



## CappsNC options

### Additional machine interface option

**Part number:** A-5722-3000

### Additional execution module

Includes one machine interface option.

**Part number:** A-5722-1100

### 4th-axis option

**Part number:** A-5722-6000

### 5th-axis option

**Part number:** A-5722-6001

### Work offset and tool compensation

**Part number:** A-5722-6002

### Work offset only

**Part number:** A-5722-6005

### Tool compensation only

**Part number:** A-5722-6006

### AAT SPC

**Part number:** A-5722-6003

### AAT Modify Bestfit for NC part program correction

**Part number:** A-5722-6004

\* specify control type (Fanuc, Mazak, Haas, Siemens or Heidenhain) and interface type (RS232, FOCAS, TNCDirect, Mnet or MT Connect)

## CappsNC Advanced

CappsNC Advanced is a single software license designed for the user who intends to program inspection cycles and capture measurement results on a single PC.

Includes: Complete CappsNC license  
Machine interface option\*  
CAD importers (IGES and STEP)  
One-year CappsNC maintenance and support

**Part number:** A-5722-1000

## CappsNC Advanced Programming Server

CappsNC Advanced Programming Server is a modular configuration designed for users who have the requirement to program remotely while capturing measurement results locally, at the machine tool.

Includes: Complete CappsNC license  
CappsNC execution module\*  
CAD importers (IGES and STEP)  
One-year CappsNC maintenance and support

**Part number:** A-5722-1001

## **CappsNC CAD importers**

### **Catia4 Direct Import**

**Part number:** A-5722-5000

### **Catia5 Direct Import**

**Part number:** A-5722-5001

### **Pro-E Direct Import**

**Part number:** A-5722-5002

### **Unigraphics Import**

**Part number:** A-5722-5003

### **Parasolid Import**

**Part number:** A-5722-5004

### **Solid Works Import**

**Part number:** A-5722-5005

### **VDA Import**

**Part number:** A-5722-5006

## **CappsNC maintenance**

The first year's maintenance is included. Subsequent years' maintenance is offered at 15% of the list price for all components.

**Part number:** A-5722-4000

## **CappsNC networking options**

### **CappsNC License Manager – Programming Server**

Includes two connections.

**Part number:** A-5722-3100

### **CappsNC License Manager – Execution Module**

Includes two connections.

**Part number:** A-5722-3101

### **CappsNC License Manager – additional connections**

**Part number:** A-5722-3102

## Additional retrofit customer information

### Machine tool software requirements

<b>Machining center:</b>	Inspection Plus	46.5 Kb	117 m
	Tool setting	9 Kb	23 m
	NC4 tool setting	15 Kb	38 m
<b>Lathe software:</b>	Inspection	11 Kb	28 m
	Tool setting	6 Kb	15 m

### Program number requirements

Renishaw program numbers range from 9002 through 9100, and 9700 through 9900.

Macro variables required #100–#149 (only used while macro is running)  
 #500–#565 (some variables in this range required and must be dedicated)

### Training

Training will be provided after installation on the use and application of Renishaw probing cycles. Training will **not** include the incorporation of probe cycles into the customer's current manufacturing programs. Any special applications or additional software training which requires additional time or visits to the original scheduled installation/training will be charged at Renishaw Inc standard service rates.

**Note:** Please indicate any additional training requirements on your purchase order.

### Part probe system details

<b>OMP40/OMP60/RMP60</b>	Turn on (via optical or RF) / Turn off (via optical or RF) or time out	Installation time	Up to 8 hours
		Training time	Up to 6 hours
	Turn on methods	Auto start (OMP40/OMP60) sends a start signal every second until a probe command is received. This method can only be used if the probe is stored outside the machine enclosure when not in use.	
		Machine start (OMP40/OMP60/RMP60) requires that an M code be available for use to issue the start command.	
		Spin start (OMP60/RMP60) uses an internal switch. The probe will turn on after being spun at 650 RPM for 1 second.	
	Turn off methods	Time out (OMP40/OMP60/RMP60). A timer automatically switches the power off 12, 33 or 134 seconds (selectable) after turn on. Each time the probe is triggered, the timer is reset to the selected value.	
		Optical off (OMP40/OMP60) / RF off (RMP60) requires that an M code be available to initiate the turn off sequence.	
<b>OMP400</b>	Optical (flash) on/optical off or time out (optical transmission)	Installation time	Up to 8 hours
		Training time	Up to 6 hours
	Turn on method	Machine start (optical on) requires that an M code be available for use to issue the start command. Auto start cannot be used with the strain gage probes.	
	Turn off methods	Time out. A timer automatically switches the power off 33 or 134 seconds (selectable) after turn on. Each time the probe is triggered, the timer is reset to 33 or 134 seconds.	
		Optical off. Requires the use of an M code as stated for machine start above.	
<b>RMP40M OLP40M</b>	Turn on (via optical or RF) / Turn off (via optical or RF) or time out	Installation time	Up to 8 hours
		Training time	Up to 6 hours
	Turn on method	Machine start requires that an M code be available for use to issue the start command. Auto start cannot be used with these probes (for lathe applications).	
	Turn off method	Optical off. Requires the use of an M code as stated for machine start above.	

## Tool setting probe details

<b>TS27R</b>	Hard-wired	Installation time	Up to 6 hours
		Training time	Up to 6 hours
<b>OTS</b>	Machine start requires that an M code be available for use to issue the start command. Auto start cannot be used with these probes.		
	These probes are fixed either to a T slot in the machine bed, or can be mounted on a riser if required to allow tools to reach the stylus. A riser is not provided by Renishaw unless specified on the quotation. The TS27R is wired to the probe interface via a tough cable conduit. The TS27R cannot be mounted on pallets or rotary tables.		
<b>NC4 or TRS2</b>	Hard-wired	Fixed installation time	Up to 8 hours
		Training time	Up to 6 hours
	Fixed system	The probe is fixed either to a T slot in the machine bed, or can be mounted on a riser if required to allow tools to reach the laser beam. A riser is not provided by Renishaw unless specified on the quotation. The NC4 is wired to the probe interface via a tough cable conduit. <b>The NC4 cannot be mounted on pallets or rotary tables.</b>	
		Separate installation time	Up to 12 hours *
		Training time	Up to 6 hours
	Separate system	The probe transmitter and receiver are mounted to brackets which attach to the machine. Brackets and their installation are not provided by Renishaw unless specifically stated in the quotation. Brackets not provided by Renishaw must be mounted prior to the arrival of a Renishaw engineer. The brackets should allow for complete machine motion (pallet shuttles, rotary tables, axis travels etc), laser beam alignment and expected system performance.	
		* Depending on bracket mounting requirements, additional time may be required.	
	Fixed or separate	The NC4 must be mounted in such a way that the tool can access the laser beam and move in all three axes (X, Y, Z) with respect to the beam. For basic functionality (length, diameter, basic broken tool), no M code is required. For additional features (missing/ broken insert, profile checking, rapid broken tool check) a level M code pair is required.	
<b>HPRA</b>	Hard-wired	The HPRA must be mounted to a bracket which attaches to the machine. The brackets and their installation are not provided by Renishaw unless specifically stated in the quotation. Brackets not provided by Renishaw must be mounted prior to the arrival of a Renishaw engineer. The brackets should allow for complete machine and expected system performance.	

## Dual probe installations (part and tool probe on same machine)

Requires either two independent probe inputs (multi-channel skip) or an M code driven relay. The M code driven relay must be installed and available prior to the probe installation.

Example      M51 – part probe (selected)      M61 – tool setter (selected)

M51 energize relay (coil latches and stays energized) program continues  
 M61 de-energize relay (coil resets) program continues

M code for flash (optical) on and off

M71 pulse (momentarily energize relay) program continues

Example:      Pulse M code      M71 (flash on and flash off)



# Gaging systems



# EQUATOR™

## the versatile gauge™

The Renishaw EQUATOR™ is a versatile alternative to custom gaging, offering inspection of an unprecedented variety of manufactured parts.

### Fast, repeatable and versatile

The EQUATOR™ system consists of a highly repeatable, “parallel kinematic” structure, machine coupled with a high-power, multi-axis universal controller and digital servo power amplifier. The resultant system is capable of high-speed, comparative gaging for inspection of high-volume manufactured parts, directly on the shop floor. Additionally, the optimized ratio of working envelope (300 mm × 300 mm × 150 mm) to machine footprint (~ 570 mm × 500 mm), means EQUATOR™ can be set to work in even the most crowded of factory spaces. The lightweight machine, weighing just 55 lbs, requires just single phase power and needs no costly air supply.

Re-configuration of the gaging system to cater for part design changes, or to measure new parts, is possible in a fraction of the time it would take with conventional custom gaging. An operator can switch between parts in seconds, perfect for flexible manufacturing processes or for accepting parts from multiple machines.

### Easy to use

The included, intuitive MODUST™ Organizer operator front-end software requires little or no training, while on the programmable system the comprehensive MODUST™ EQUATOR™ programming software allows engineers to rapidly create gaging routines for any part – simple or complex, prismatic or free-form – using industry-standard DMIS programming.

### Thermally “stable” – for shop floor use

Re-mastering is as swift as measuring a production part and immediately compensates both the machine and the part being measured, for temperature variations typical of a shop floor environment.



### Integrated stylus changing

Further versatility is offered by the included, EQUATOR™-specific stylus changing rack, allowing automated in-cycle changing of SM25 stylus modules. The SM25 modules couple to the industry-standard SP25 CMM probe, allowing EQUATOR™ users to swap the stylus configurations without re-qualifying each time. Up to six stylus combinations can be loaded into the rack at any time. These can be used on a single complex part or with multiple parts of varying geometries.

### Traceability to calibrated CMMs

Master parts do not need to be expensive custom parts like a traditional gage; take a production part and measure it on a CMM to establish feature variation from CAD or drawing nominals. The results from any CMM can be configured to be used directly within the EQUATOR™ software.

Effectively, the calibrated absolute accuracy of the CMM can be “extended” onto the shop floor to provide calibrated traceability to EQUATOR™ measurements. With the calibration file loaded into the EQUATOR™ software, measurements made in the EQUATOR™ system can be referred back to the CAD or drawing nominals. This allows true process control with SPC packages.

## Machine kit

Includes: EQUATOR™ 300 machine  
 EQUATOR™ 6-port rack  
 SP25M scanning probe kit  
 Calibration accessory kit  
 Joystick (or 'E-stop' button)  
 Cables



## Controller kit

Includes: EQUATOR™ controller  
 Intuitive "front-end" software package

## EQUATOR™ tiles

Renishaw fixture plates (various options available).

## EQUATOR™ combination kits

### Operator's version (shop floor version)

Description	Part number
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer software and M6 threaded fixture plate	A-EQ33-1J10
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer software and ¼ in threaded fixture plate	A-EQ33-1J20
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer software and M8 threaded fixture plate	A-EQ33-1J30
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer software and ¼ in R&R threaded fixture plate	A-EQ33-1J40
EQUATOR™ machine with 6-port rack and stop button, controller with Organizer software and M6 threaded fixture plate	A-EQ33-1S10
EQUATOR™ machine with 6-port rack and stop button, controller with Organizer software and ¼ in threaded fixture plate	A-EQ33-1S20
EQUATOR™ machine with 6-port rack and stop button, controller with Organizer software and 8 mm threaded fixture plate	A-EQ33-1S30
EQUATOR™ machine with 6-port rack and stop button, controller with Organizer software and ¼ in R&R threaded fixture plate	A-EQ33-1S40

### Programmer's version

Description	Part number
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer and MODUS™ programming software and M6 threaded fixture plate	A-EQ33-2J10
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer and MODUS™ programming software and ¼ in threaded fixture plate	A-EQ33-2J20
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer and MODUS™ software and M8 threaded fixture plate	A-EQ33-2J30
EQUATOR™ machine with 6-port rack and joystick, controller with Organizer and MODUS™ software and ¼ in R&R threaded fixture plate	A-EQ33-2J40

## Replacement equipment

### Stop button

Part number: A-5504-0255



### Joystick kit

Part number: A-5504-0258



### Joystick cable only

Part number: A-5358-5016

### Autochange rack (6 ports)

Part number: A-5504-0250



### Rack set-up tool

Part number: A-2237-0682

### MODUS™ EQUATOR™ dongle

Part number: A-5639-3000



### Power cables

Part number: P-EQ33-MAINS

### Fixturing plate (¼-20 in)

Part number: PCR-501212-50-20



### Fixturing plate (M4)

Part number: PCR-13300300-10-4

### Fixturing plate (M8)

Part number: PCR-13300300-15-8

### Fixturing plate spacer 300

Part number: A-5504-0203



## Optional equipment

### Digital I/O box

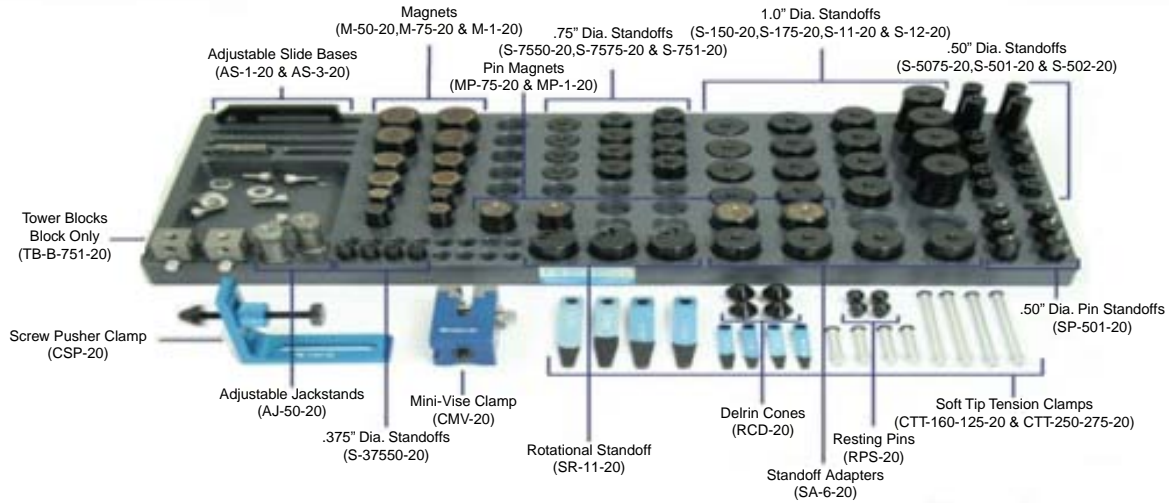
Part number: A-5504-0259



## Fixturing components

### R&R component kit FSC-MCR-20 (1/4-20 in)

Part number: FSC-MCR-20



### R&R component kit FSC-MCA-20 (1/4-20 in)

Part number: FSC-MCA-20

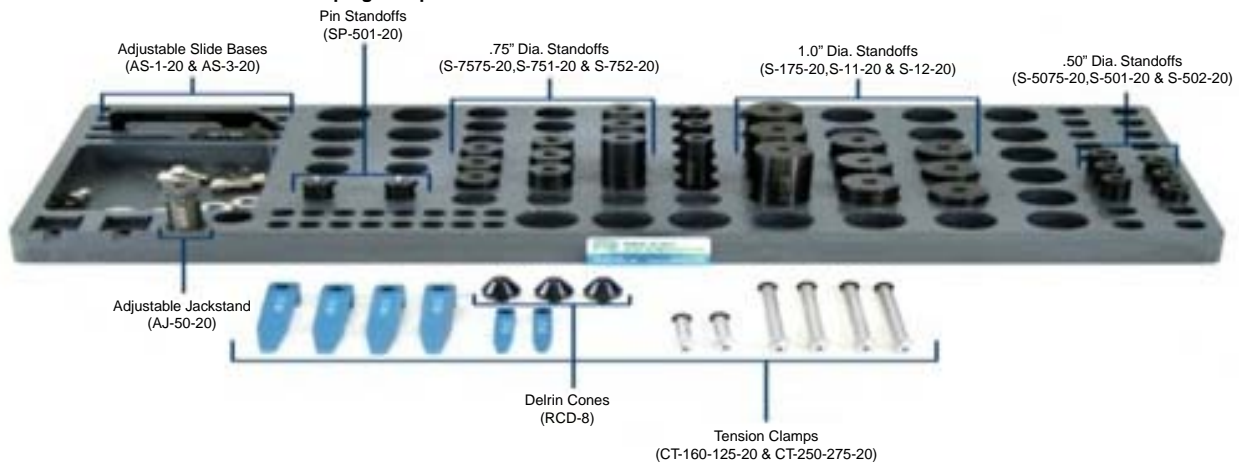
Shown Below: 1/4-20 Threaded Magnetic & Clamping Component Set "A"



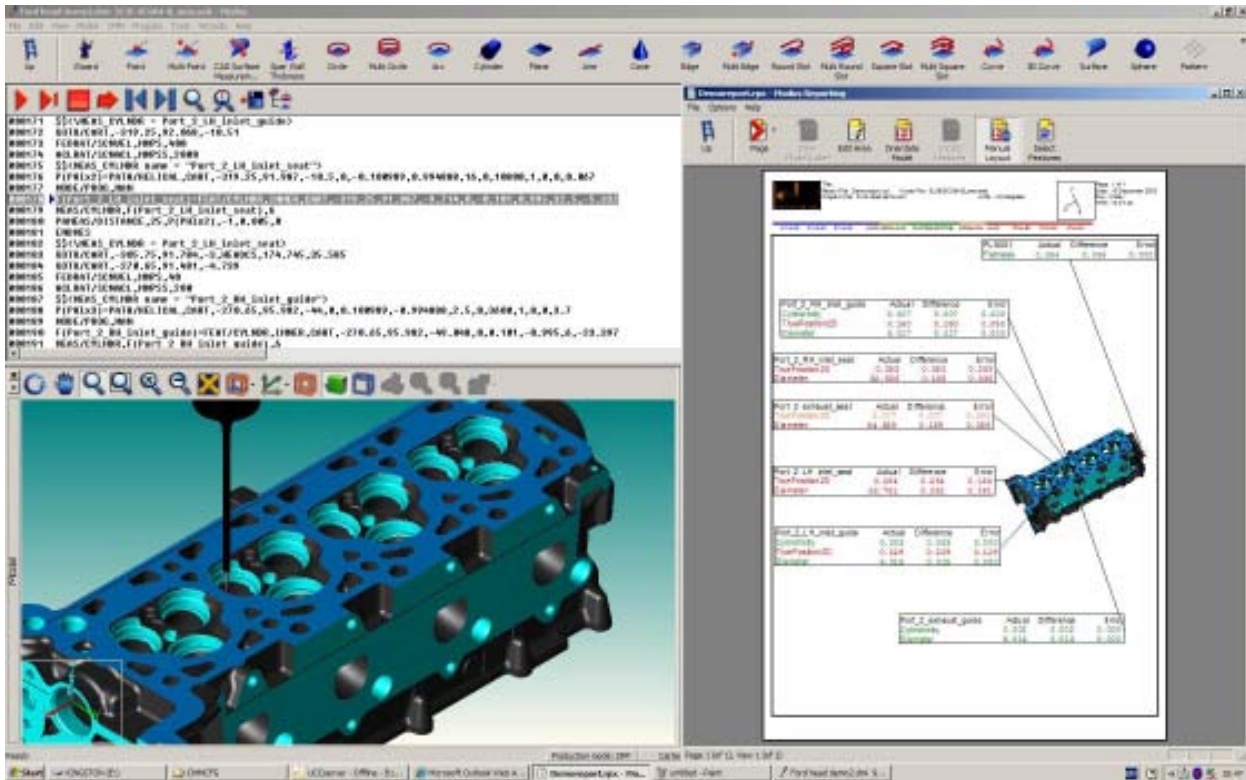
### R&R component kit FSC-CA-20 (1/4-20 in)

Part number: FSC-CA-20

Shown Below: 1/4-20 Threaded Clamping Component Set "A"



## EQUATOR™ MODUS™ software training



### On site training (maximum 4 students)

Description	Part number
EQUATOR™ MODUS™ scanning training (US travel) – 4 days	A-5639-1701-EQT
EQUATOR™ MODUS™ advanced training (US travel) – 2 days	A-5639-1702-EQT

### Training at Renishaw Inc\*

Description	Part number
EQUATOR™ MODUS™ scanning training (US) – 4 days	A-5639-1701-EQ
EQUATOR™ MODUS™ advanced training (US) – 2 days	A-5639-1702-EQ

\* per student

# Portable laser measurement and calibration



## XL laser calibration system

Used for comprehensive accuracy and performance measurement of any machine or system.

Linear measurement range	80 meters
Linear measurement accuracy	±0.5 ppm
Laser frequency accuracy	±0.05 ppm
Resolution	1 nm
Maximum travel velocity	4 m/s
Dynamic capture rate	10 Hz – 50 kHz

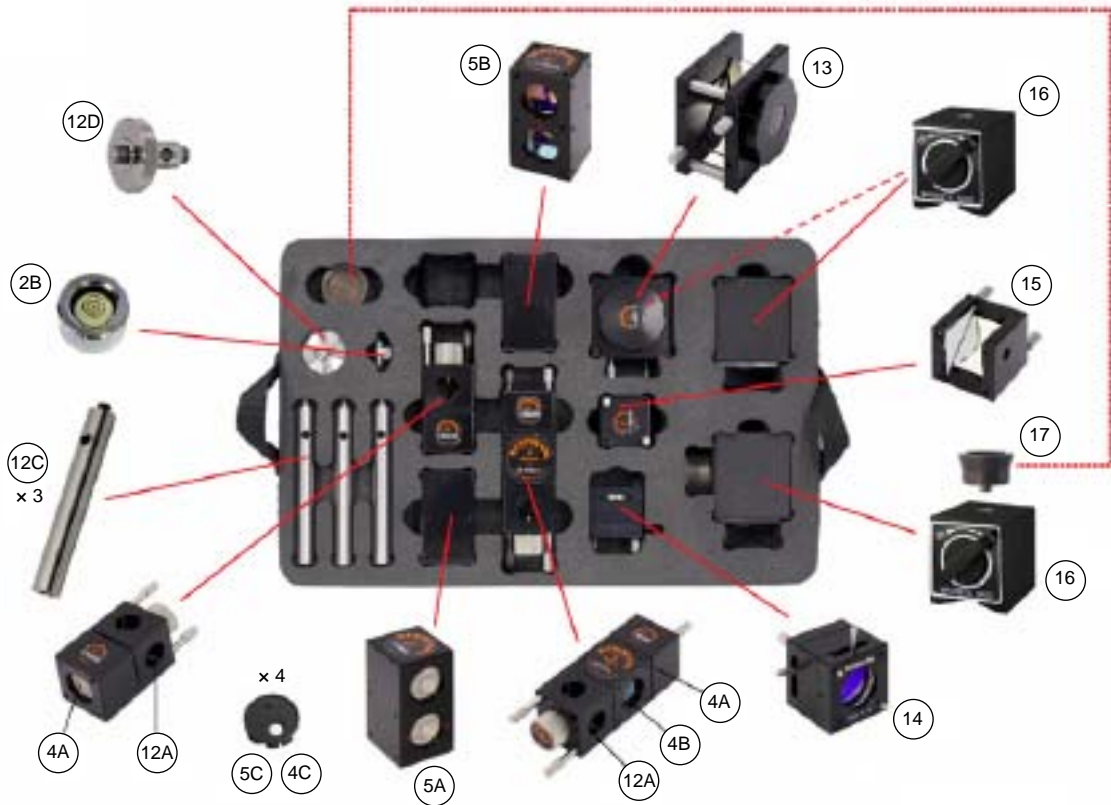


**Contents of base XL system case**



## XL laser system components

Kit part number	Includes	Part number	Index
<b>A-9908-0405</b>	XL-80 laser Universal power supply USB cable XL system support disk AUX I/O connector	N/A A-9908-0299 A-9908-0286 A-9908-0303 A-9908-0329	1A 1B 1C Not shown Not shown
<b>A-9908-0700</b>	XL translation stage Spirit level circular Tripod adaptor	A-9908-0700 A-9908-0323 A-9908-0770	2A 2B Not shown
<b>A-9908-0510</b>	XC-80 compensator Material temperature sensor and cable Air temperature sensor and cable XC mounting plate USB cable	A-9908-0564 A-9908-0879 A-9908-0878 A-9908-0892 A-9908-0286	3A 3B 3C 3D 3E
	LaserXL™ software	A-9908-0301	Not shown
<b>A-8003-0440</b>	Linear reflector (qty 2) Linear interferometer Alignment target (qty 2)	A-8003-0219 A-8003-0557 A-8003-0478	4A 4B 4C
<b>A-8003-0441</b>	Angular interferometer Angular reflector Alignment target (qty 2)	A-8003-0186 A-8003-0181 A-8003-0478	5A 5B 5C
<b>A-8003-0443</b>	Short range straightness reflector Woollaston short range	A-8003-0615 A-8003-0393	6A 6B
<b>A-8003-0444</b>	Long range straightness reflector Woollaston long range	A-8003-0620 A-8003-0430	7A 7B
<b>A-8003-4209</b>	Straightness shutter	A-8003-4209	8A
<b>A-8003-STAK</b>	Laser beam steerer LS350 Fixed turning mirror Large straightness retroreflector Straightness base	A-8003-3072 A-8003-1325 A-8003-0604 A-8003-0576	14 8B 8C 8D
<b>A-8003-0665</b>	Optical square Bracket squareness optic	N/A M-8003-1680	9A 9B
<b>A-8003-0442</b>	Flatness mirror (qty 2) Base (150 mm) Base (100 mm) Base (50 mm)	A-8003-0630 A-8003-0256 A-8003-0257 A-8003-0258	10A 10B 10C 10D
<b>A-8003-4270</b>	Long range retroreflector Periscope Long range target Clamp screw (qty 2)	A-8003-2061 A-8003-2039 M-8003-2081 M-8003-0221	11A 11B 11C 11D
<b>A-8003-0447</b>	Clamp block (qty 2) Base plate (qty 2) Mounting pillar (qty 3) M8 adaptor	A-8003-0262 A-8003-0522 M-8003-0470 A-8003-0979	12A 12B 12C 12D
	Base case	M-9908-0313	
	Full system case	M-9908-0314	
	Tripod	A-9908-0295	Not shown
	Tripod case	M-9908-0527	Not shown
	Swivel mirror	A-8003-1304	13
	Fixed turning mirror	A-8003-1325	15
	Magnetic base	A-9908-0780	16
	Magnetic base adaptor	A-9908-0760	17



**Contents of full XL system case (tray)**



**Contents of full XL system case (tray removed)**

## XL laser calibration systems

### Base system kit

Includes: XL-80 laser head  
XC-80 environmental compensator kit  
LaserXL™ software  
Software support disk  
XL tripod stage kit

**Part number:** XL80-BASE



XL-80 laser head

### Linear system kit

Includes: Components of base system kit	XL80-BASE
Linear measurement optics	A-8003-0440
Beam steerer LS350	A-8003-3072
Optics mounting kit	A-8003-0447
2 magnetic bases	A-9908-0780
Magnetic base adaptor	A-9908-0760
Tripod	A-9908-0295
Tripod case	M-9908-0527
Base system case	M-9908-0313



XC-80 environmental compensation unit

### Linear/angular system kit

Includes: Components of base system kit	XL80-BASE
Linear measurement optics	A-8003-0440
Angular measurement optics	A-8003-0441
Beam steerer LS350	A-8003-3072
Optics mounting kit	A-8003-0447
2 magnetic bases	A-9908-0780
Magnetic base adaptor	A-9908-0760
Tripod	A-9908-0295
Tripod case	M-9908-0527
Base system case	M-9908-0313

### Advanced system kit

Includes: Components of base system kit	XL80-BASE
Linear measurement optics	A-8003-0440
Angular measurement optics	A-8003-0441
Swivel mirror	A-8003-1304
Long range straightness optics	A-8003-0444
Short range straightness optics	A-8003-0443
Straightness accessory kit	A-8003-STAK
Straightness shutter	A-8003-4209
Squareness measurement kit	A-8003-0665
Optics mounting kit	A-8003-0447
2 magnetic bases	A-9908-0780
Magnetic base adaptor	A-9908-0760
Tripod	A-9908-0295
Tripod case	M-9908-0527
Full system case	M-9908-0314



XL system case and tripod case

## Optics

All Renishaw optics housings are lightweight aluminum with a hard anodized finish for durability and good thermal stability.

### Linear kit (standard 40 m)

Includes: 1 linear beam splitter  
2 linear reflectors  
2 alignment targets

**Part number:** A-8003-0440



### Small linear accessory kit

Please call for details.

**Part number:** A-8003-3244



### Long range linear optics kit (80 m max)

For use with the ML10X for linear measurements in excess of 40 m.

Includes: Periscope  
Large retroreflector

**Part number:** A-8003-4270



### Angular kit

Includes: 1 angular beam splitter  
1 angular reflector  
2 alignment targets

**Part number:** A-8003-0441



### Linear/angular combination kit

This combination kit is a cost-saving solution, allowing linear and angular measurement to be made with a single set-up.

Includes: 1 angular beam splitter  
1 angular reflector  
1 linear reflector  
2 alignment targets

**Part number:** A-8003-2774



## Straightness measurement kits

### Short range

Suitable for measurements up to 4 m (160 in)

**Part number:** A-8003-0443

### Long range

Suitable for measurements from 1 m to 30 m (40 in to 1200 in)

**Part number:** A-8003-0444



## Straightness accessory kit

Facilitates measurements on vertical axes and in other difficult configurations.

Includes: 1 fixed turning mirror  
1 large retroreflector  
1 stainless steel base  
1 LS350 beam steerer



**Note:** XL-80 and ML10 users require straightness shutter, part number A-8003-4209, shown on page 4-8.

**Part number:** A-8003-STAK

## Squareness measurement

This precision pentaprism is used in conjunction with straightness optics to measure squareness of machine axes. It includes a mounting bracket for a fixed turning mirror and LS350 beam steerer.

**Part number:** A-8003-0665



## Flatness measurement kit

The turning mirrors rotate and tilt for easy alignment and are fitted with non-slip pads. The lightweight aluminum bases have precision stainless feet and guides.

Includes: 2 turning mirrors  
1 50 mm flatness base  
1 100 mm flatness base  
1 150 mm flatness base

**Part number:** A-8003-0442



## Standard optics mounting kit

This universal mounting kit is designed for use with the complete range of Renishaw measuring optics.

Includes: 2 mounting blocks  
3 stainless pillars  
1 stainless M8 adaptor  
2 stainless bases

**Part number:** A-8003-0447



## Magnetic base

Suitable for mounting optics and XL80 laser head when fitted with A-9908-0760 magnetic base adaptor (sold in pairs).

**Part number:** A-9908-0780



### CMM optics mounting kit

Designed specifically to aid the mounting of laser optics and other accessories on coordinate measuring machines. Recommended for UCC error mapping requirements.

**Part number:** A-1333-0174



### Beam steerer LS350

This is the best time-saving device a laser system user could buy. It works with all the measuring optic kits, including HP optics using the HP optic adaptor plate. Included in straightness accessory kit.

**Part number:** A-8003-3072



### Swivel mirror

This is used for directing the laser beam through any angle from 0° to 106°, for example for diagonal measurement and slant bed lathes. It works with all the optics kits, including HP optics using the HP optic adaptor plate.

**Part number:** A-8003-1304



### Fixed turning mirror

This can be used with angular optics for 90° accessories. Included in straightness accessory kit.

**Part number:** A-8003-1325



### Quarter wave plate

Used with linear optics for plane mirror interferometry applications.

**Part number:** A-8003-1998



### Straightness shutter

Required for vertical straightness measurements.

**Part number:** A-8003-4209



## Tripod and cases

### Universal tripod

Tripod only, without the stage.

**Part number:** A-9908-0295



### XL translation stage

**Part number:** A-9908-0700



### Tripod adaptor

This allows the XL translation stage to be used with the Renishaw universal tripod or any other tripod with a standard camera mounting thread.

**Part number:** A-9908-0770



### Tripod converter ML-XL

**Part number:** A-9908-0765



### Magnetic base adaptor

This allows the XL translation stage to be mounted on any base or fixture with an M8 x 1.25 mounting hole.

**Part number:** A-9908-0760



### Universal tripod case

Lightweight fabric.

**Part number:** M-9908-0527



## System cases

### Base system case

Suitable for basic laser system including linear and angle optics with accessories.

**Part number:** M-9908-0313



### Full system case

Suitable for an advanced laser system including linear, angle, short range and long range straightness, squareness and flatness optics with accessories.

**Part number:** M-9908-0314



## Software

### LaserXL™ calibration software



This is the standard software package for use with the Renishaw XL80 laser system. It provides for linear, angle, straightness, squareness and parallelism measurement. Data can be analyzed to many national and international machine tool and CMM standards. LaserXL™ is not compatible with ML10 lasers. Windows® XP or Vista only.

**Part number:** A-9908-0301

### Linear correction software

This is used with both Laser10 and LaserXL™. It provides automatic linear correction to a range of CNC machine tool controllers.

Controller model	Part number
Fanuc 10 through 21	A-8003-4182
Fanuc 0	A-8003-4188
Mazak M2, M32, M+	A-8003-4185
NUM 750, 760, 1040, 1050, 1060	A-8003-4184
Siemens 810, 810D, 820, 840, 840D, 880	A-8003-4183
Acrumatic 2100	A-8003-4186
Cincinnati 850, 950	A-8003-4187
All options	A-8003-4190

### RS232 cable kit for linear correction software

Kit includes data cable, adaptors and gender changers to suit all above controls.



**Part number:** A-8003-4178

### QuickView XL software



QuickView is the simple, intuitive software package that allows you to understand the dynamic performance of many different machines and devices such as stages, machine tools and CMMs. It brings the functionality of an oscilloscope to the mechanical engineer, right on your desktop.

- Capture, review, and save dynamic data
- Measure distance, velocity and acceleration against time
- Display continuous “streaming” data or set trigger levels to capture single or multi-shot “events”
- Linear, angular or straightness modes
- Optional hardware – compact low mass optics kit

#### Applications

- Measure consistency of position, velocity and acceleration
- Determine movement in a locked rotary axis (torsional vibration)
- Detect dynamic yaw and lateral play (slop)
- Measure vibration
- Perform ASME B5.54 CNC tests such as Feedrate and acceleration, Minimum Block Execution Time (MBET) and Least Increment

Benefits include:

- Live data display allowing analysis of motion and positional characteristics
- Save data for analysis in other applications such as Excel® and MathCad
- Flexible measurement – avoids the need for defined measurement targets and sequences

**Part number:** A-9908-0302



## Spare parts

The following items are normally supplied as parts of system kits but can be purchased as individual components for replacement purposes.

### Clamp block

**Part number:** A-8003-0262



### Locking screw assembly

For use with clamp block.

**Part number:** A-8003-4501



### Locking screw pressure pad

Brass pad and rubber retaining ring.

**Part number:** A-8003-4500



### Clamp screws

Long (for use with clamp block)

**Part number:** M-8003-0264

Short (for use with linear and angular optics)

**Part number:** M-8003-0221

LS350 (for use with LS350 beam steerer)

**Part number:** M-8003-3083

For use with fixed turning mirror.

**Part number:** M-8003-1070

For use with swivel mirror.

**Part number:** M-8003-1063



### Mounting pillar

110 mm long with M8 × 1.25 male thread at one end, female at the other.

**Part number:** M-8003-0470



**Straightness accessory base**

**Part number:** A-8003-0576



**Large retroreflector**

For use with vertical straightness measurements.

**Part number:** A-8003-0604



**M8 adaptor**

**Part number:** A-8003-0979



**Alignment target**

**Part number:** A-8003-0478



**Linear beam splitter**

**Part number:** A-8003-0557



**Linear reflector**

**Part number:** A-8003-0219



**Angular reflector**

**Part number:** A-8003-0181



**Angular beam splitter**

**Part number:** A-8003-0186



## Cables

### USB single port extension cable (5 m)

**Part number:** CBL-USBX-1



### USB dual port extension cable (5 m)

**Part number:** CBL-USBX-2



### XC80 temperature sensor cable (5 m)

**Part number:** A-9908-0932



### USB to serial adaptor

Allows QC10 ballbar and other serial devices to be used with notebook PCs that do not have an RS232 serial port.

**Part number:** A-8014-0670



### DX10 interface kit (USB)

Connects ML10 and EC10 to any Windows® XP based computer via USB. Compatible with Laser10.06 and subsequent versions. (Driver update may be required for older versions of Laser10.) Operational indicators provide status condition. Supplied with 3 m USB cable.

**Part number:** A-8003-3116



## XR20-W rotary axis calibrator and components



## XR20-W rotary axis calibrator

The XR20-W rotary axis calibrator allows the measurement of rotary axis positional accuracy to within 1 arc second. Totally wireless operation and modular mounting systems ensure suitability for a wide range of machines.

Includes: XR20-W  
Mounting ring  
Adaptor plate  
Centration aid  
Chuck adaptor  
Battery charger  
Batteries Li-polymer × 3  
Electrical adaptor for use in any territory  
USB cable and mains adaptor  
Rotary XL software including system manual  
Peli™ system case



**Part number:** A-9920-0400

## XR20-W rotary axis calibrator upgrade

**Part number:** XR20W-UPG

When trading in an RX10 less than 7 years old:

When trading in an RX10 more than 7 years old:

**NOTE:** The standard trade-in allowance quoted is on the basis that a complete and fully functional RX10 kit is returned. Non-functional, damaged or incomplete kits may be considered for trade-in at Renishaw's discretion. If accepted, the trade-in allowance will be reduced.

## XR20-W kit components

### Mounting ring

The mounting ring bolts or clamps directly to the test surface for ease of centring the system on the test axis.

**Part number:** A-9920-0440



### Mounting ring adaptor 150 mm

The adaptor plate enables fitting to rotary tables with unsuitable centre recesses. It can also be used to secure the XR20-W to the chuck adaptor and custom mounts.

**Part number:** A-9920-0270



### Chuck (lathe) adaptor

The adaptor has a 40 mm diameter to fit most popular chuck sizes. It can also be used to secure the XR20-W to users' own custom mounts.

**Part number:** A-9920-0280



## Centration aid

The centration aid fits temporarily inside the mounting ring to assist visual centration before XR20-W insertion.

**Part number:** A-9920-0340



## Fixings kit

A complete set of screws and allen keys for XR20-W.

**Part number:** A-9920-0430



## Battery Li-Polymer 3.7 V

High-power rechargeable lithium battery (three batteries supplied with each XR20-W).

**Part number:** A-9920-0330



## Battery charger and cables

Battery charger and a set of power cables for any territory (UK, Europe and USA).

**Part number:** A-9920-0320



## Battery cover

Replacement battery cover for XR20-W.

**Part number:** A-9920-0460



## USB cover plug

Replacement protective plug for USB socket on XR20-W.

**Part number:** A-9920-0380



## USB power supply

USB power supply adaptors for any territory (UK, Europe and USA).

**Part number:** A-9920-0450



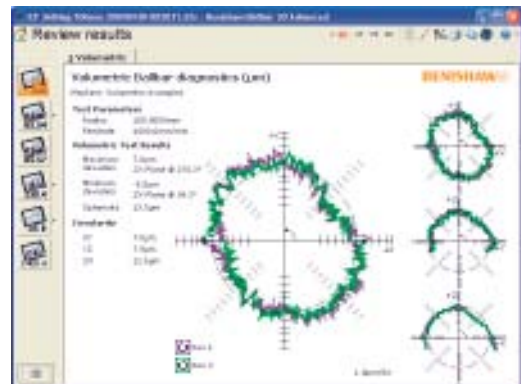
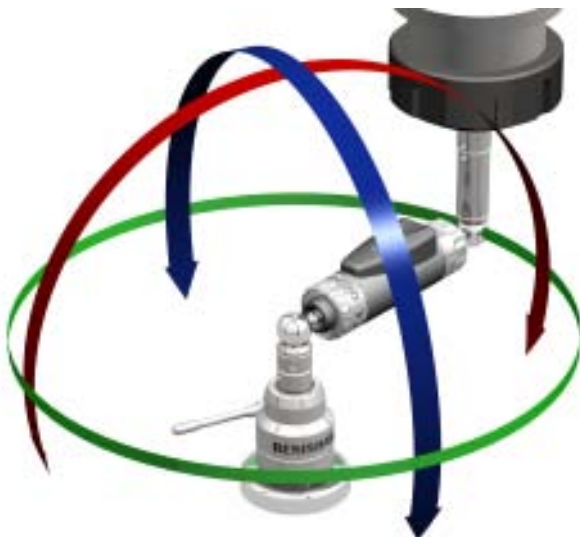
## XR20 case

Heavy duty transport and storage case for XR20-W.

**Part number:** A-9920-0360



## QC20-W wireless ballbar



## QC20-W ballbar kit with Zerodur® calibrator

The Renishaw QC20-W ballbar contains a precision linear transducer of Renishaw's own design. Signal processing is carried out within the ballbar and data transmitted to a suitable PC using a Bluetooth® Class 2 module.

- Includes:
- QC20-W wireless ballbar (and one CR2 battery)
  - Center pivot
  - Tool cup
  - Extension bars – 50 mm, 150 mm and 300 mm
  - Zerodur® calibrator
  - System software (including manuals)
  - Setting ball
  - Machine validation cards
  - Calibration certificate
  - Bluetooth® adaptor (A-8014-BTA1)
  - System carry case (the case includes cut-outs for the optional small circle and VTL adaptors)



**Part number:** A-8014-1510

**NOTE:** Special “trade-in” offer. Customers can trade-in a complete working QC10 kit and claim a net price of . Contact Renishaw or reseller for further details.

## QC20-W ballbar upgrade kit

The lowest cost entry to QC20-W use is with the QC20-W upgrade kit. The kit includes a new ballbar, battery and BB20 software. The packaging fits directly into the later style aluminum framed case. Users with earlier plastic or wooden cases should purchase a new QC20-W case separately (see below).

- Includes:
- QC20-W wireless ballbar upgrade kit (A-8014-1530)
    - QC20-W wireless ballbar
    - Tool cup
    - System software (including manuals)
    - Setting ball
    - Machine validation cards
    - Calibration certificate
    - Foam tray (fits aluminium QC10 case only)
  - Partial arc test kit (A-8014-1575)
  - Bluetooth® adaptor (A-8014-BTA1)
  - 2nd spare battery (A-8014-CR2)



**Part number:** A-8014-BBUG

## QC20-W system carrying case

The new QC20-W case has dedicated locations to carry the small circle accessory kit and VTL, and is lockable.

**Part number:** M-8014-1600





## Small circle accessory kit (SCAK)

The small circle accessory kit is used with the QC20-W ballbar to allow tests with a radius of 50 mm. The existing QC10 small circle accessory kit (SCAK) cannot be used with the QC20-W. The SCAK includes a 50 mm Zerodur® calibrator, calibration certificate and the small circle adaptor, which is supplied with an additional center ball already fitted.

If you already use the QC10 SCAK, just purchase the new adaptor, which is a simple screw mount to the QC20-W body. You can retain your existing 50 mm Zerodur® calibrator (see QC20-W spare parts overleaf).

**Part number:** A-8014-1540



## VTL adaptor kit

The VTL adaptor is available for 2-axis CNC applications. This replaces the “tool cup” in the standard set-up and gives restricted movement of the center cup in a single axis, enabling typical 2-axis machines such as vertical turning lathes and laser cutting machines etc to benefit from QC20-W ballbar diagnosis.

**Part number:** A-8014-0417



## Lathe adaptor kit

The lathe adaptor kit allows you to perform 360°, 100 mm radius ballbar tests on a lathe. The kit consists of an arm assembly for attachment to the lathe turret and a spindle bar for attachment in the lathe spindle. Both arm and spindle include magnetic cups in which to locate the ballbar.

Includes:

- Lathe adaptor arm assembly
- Spindle bar assembly
- Spherical adaptor
- Center cup
- Cup screw (with magnetic cup)
- 5 mm long-arm hex key
- 3 mm hex key
- Set of user instructions
- Plastic carrying case

**Part number:** A-8014-0551



## Lathe adaptor kit upgrade

Required for users upgrading from QC10 to QC20-W. Includes spherical adaptor and center cup.

**Part number:** A-8014-LKUG



## QC20-W ballbar system spare parts



Item	Description	Part number
1	QC20-W ballbar assembly (including balls)	Only available as RBE
2	QC20-W system carrying case (not fully shown)	M-8014-1600
3	Transducer ball	A-8014-0182
4	Center cup	A-8014-0522
5	Center ball	A-8014-0141
6	Cover ring	A-8014-1592
7	Center pivot assembly	A-8014-1281
8	50 mm extension bar	A-8014-0231
9	150 mm extension bar	A-8014-0144
10	300 mm extension bar	A-8014-0145
11	Tool cup assembly	A-8014-0521
12	Setting ball	A-8014-1570
13	Tool cup extension	A-8014-1610
14	Zerodur® calibrator	A-8014-0280
15	Spanner set	A-8014-1141
16	Lithium battery	A-8014-CR2
17	Battery end cap assembly	A-8014-1593
Not shown	Getting started DVD	A-8014-1285
Not shown	Validation card (minimum order quantity 10)	A-8014-VCAR
Not shown	Validation card holder (minimum order quantity 10)	A-8014-VCHD
Not shown	Ballbar20 software upgrade	A-8014-0717
Not shown	Cup cleaning kit	A-8014-0423

### Small circle accessory kit

Item	Description	Part number
18	50 mm Zerodur® calibrator	A-8014-0491
19	Small circle adaptor	A-8014-1560

### VTL adaptor kit

Item	Description	Part number
20	VTL adaptor kit	A-8014-0417

### Lathe kit (cannot be stored in system case)

Item	Description	Part number
Not shown	Cup screw assembly	A-8014-0552
Not shown	Spindle bar assembly	A-8014-0553

## Zerodur® calibrator

A Zerodur® calibrator is supplied with all QC20-W kits and is used to calibrate the length of a ballbar. This type of calibrator is manufactured from a material which has a temperature expansion coefficient of almost zero.

**Part number:** A-8014-0280



## Cover ring

The cover ring needs to be removed from the QC20-W body before attaching the small circle adaptor.

**Part number:** A-8014-1592



## Tool cup assembly

The condition of the phosphor bronze bearings in the tool cups affects the errors measured by the transducer. Tool cups cannot be repaired (if they are damaged they must be replaced).

**Part number:** A-8014-0521



## Tool cup extension

The tool cup extension will provide the required clearances for conducting a vertical 220° partial arc test on a machine, for collet sizes up to ER40 (63 mm diameter collet nut). It has two different outer diameters, the smaller diameter is 12 mm and the larger diameter is ½ inch, to suit different collets.

**Part number:** A-8014-1610



## Transducer ball

If a ball joint is dropped onto a hard surface, the ball sphericity may be affected, which will add to the errors measured by the ballbar system. If this happens, discard the ball joint and replace it with a new one, using the special spanner provided.

**Part number:** A-8014-0182



## Battery end cap assembly

The battery end cap assembly is supplied with a center ball already fitted.

**Part number:** A-8014-1593



## QC20-W spare parts continued

### Center ball

If a ball joint is dropped onto a hard surface, the ball sphericity may be affected, which will add to the errors measured by the ballbar system. If this happens, discard the ball joint and replace it with a new one.

**Part number:** A-8014-0141



### Center pivot assembly

The magnetic center pivot assembly has a clamping mechanism that can be locked/unlocked by pulling the lever to the horizontal/vertical position. The center pivot assembly is supplied with a center cup fitted.

**Part number:** A-8014-1281



### Center cup

The condition of the phosphor bronze bearings in the center cups affects the errors measured by the transducer. Center cups cannot be repaired (if they are damaged they must be replaced).

**Part number:** A-8014-0522



### Setting ball

The setting ball is placed into the center mount cup when setting the zero coordinates for a test.

**Part number:** A-8014-1570



### Extension bars

By assembling the ballbar with different combinations of extension bars, it is possible to carry out ballbar tests with 100, 150, 250, 300, 400, 450, 550 or 600 mm radii.

**Length 50 mm**

**Part number:** A-8014-0231

**Length 150 mm**

**Part number:** A-8014-0144

**Length 300 mm**

**Part number:** A-8014-0145



### Spanner set

The C spanners can be used to ensure the screw joints on the ballbar (including any extension bars) are not loose and the screw joints on the tool cup extension (if used) are tight. The battery end cap spanner is designed to securely hold the battery end cap when unscrewing the center ball.

**Part number:** A-8014-1141



## Validation card

Double-sided card for recording ballbar test results and displaying on the tested machine (insert into card holder below).

**Note:** Pack of 10.

**Part number:** A-8014-VCAR



## Validation card holder

Plastic wallet with self-adhesive back to attach to the machine.

**Note:** Pack of 10.

**Part number:** A-8014-VCHD



## Cup cleaning kit

The tool cups are magnetic and may attract steel swarf and chips into the cup during use. Clear any swarf from the cups before storing them away with the cleaning kit.

**Part number:** A-8014-0423



## 50 mm Zerodur® calibrator (small circle accessory kit)

The 50 mm Zerodur® calibrator includes a calibration certificate.

**Part number:** A-8014-0491



## Small circle adaptor (small circle accessory kit)

The small circle adaptor is supplied with an additional center ball already fitted. The adaptor is a simple screw fitting to the main ballbar body.

**Part number:** A-8014-1560



## Spindle bar assembly (lathe adaptor kit)

The spindle bar assembly is fitted with a clamp holder and clamp.

**Part number:** A-8014-0553



## Cup screw assembly (lathe adaptor kit)

The cup screw assembly is supplied with a center cup already fitted.

**Part number:** A-8014-0552



## QC20-W spare parts continued

### Bluetooth® USB wireless adaptor

Provides Windows PC with Bluetooth® communications capability.  
Tested and compatible with QC20-W.

**Part number:** A-8014-BTA1



### Lithium battery for QC20-W

CR2 lithium battery.

**Part number:** A-8014-CR2



## Machine checking gage

The Renishaw MCG is designed for rapid, volumetric accuracy evaluation for CMMs. The gage takes account of variations due to probe, machine and software errors.

Measuring range: Vertically: ±45°  
 Horizontally: 360°  
 Total gage error: ±0.5 µm

Two kits are available, each supplied in a hardwood box.

### MCG1 – small kit

Suitable for machines up to 40 in (1000 mm) cubed.

**Part number:** A-1007-0006

### MCG2 – large kit

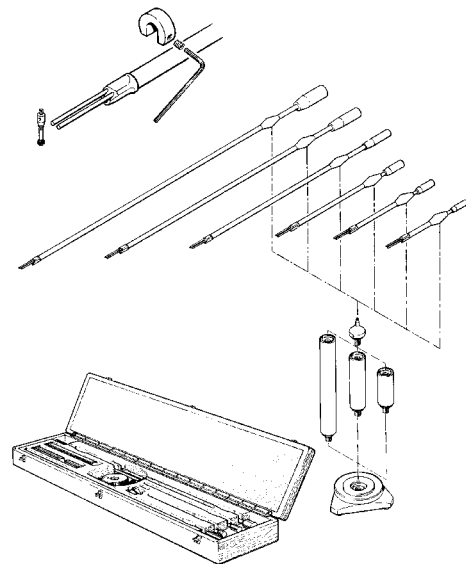
Suitable for machines larger than 40 in (1000 mm) cubed.

**Part number:** A-1007-0056



## MCG spares and accessories

Description	Part number	MCG1	MCG2
SA3-M3/M2 stylus adaptor	M-5000-4163	*	*
SE2-20 mm stylus extension	M-5000-3592	*	*
SE7-5 mm stylus extension	M-5000-7634	*	*
Pivot	A-1007-0017	*	*
Special stylus	A-5000-7650	*	*
101 mm arm	A-1007-0007	*	*
151 mm arm	A-1007-0008	*	*
226 mm arm	A-1007-0009	*	*
380 mm arm	A-1007-0010	*	*
532 mm arm	A-1007-0011		*
685 mm arm	A-1007-0012		*
76 mm pillar	M-1007-0023	*	*
127 mm pillar	M-1007-0024	*	*
235 mm pillar	M-1007-0025		*
Baseplate	A-1007-0061	*	*
Additional weights	A-1007-0018	*	*



## Training

Renishaw offers world class training at their modern facilities in Hoffman Estates, Illinois, only 45 minutes from Chicago's O'Hare airport. Regular classes are held once per month for both laser and ballbar product groups. In-house courses start on Tuesday morning and conclude around midday on the Friday. The training includes a mix of classroom work and hands-on experience in the Renishaw technology center where we have a selection of modern machines for students to work with. If you have a large group, or prefer not to travel, on-site training is also available.



Our standard, in-house training courses cover the following subjects:

- The 21 degrees of freedom
- Accuracy and the environment
- Relative thermal behaviour
- Machine geometry and design
- Determining relative errors
- Interpreting analysis data
- Troubleshooting set-up and machine errors
- Machine tool part programs
- Hardware set-up procedure
- Software set-up and data capture
- Correcting errors on the machine

Two basic training courses are offered:

### Learning practical laser interferometry

In addition to the standard metrology subjects, the laser class will cover the following aspects:

- Laser interferometry theory
- Laser kit parts identification
- Current laser technology
- Linear, angular and straightness measurements
- Cosine, deadpath and Abbé errors
- Error compensation
- Using the laser as a diagnostic tool
- Implementing maintenance programs
- Accessories for the laser

**Part number:** A-8003-LATC

### Using and understanding the QC20-W ballbar and machine metrology

The comprehensive course provides students with a detailed understanding of the most powerful machine tool diagnostic device you can buy.

Specialist features of the course include:

- Why buy a ballbar?
- When to use a ballbar
- Ballbar theory
- Ballbar kit parts identification
- Ballbar accessories

Training materials, lunch and refreshments are provided each day.

**Part number:** A-8003-BBTC

### Advanced training at Renishaw Inc

Charged per student, per day

**Part number:** A-8003-0008

### Training on-site at customer's premises (1-2 days)

**Part number:** T-2000-1080-S

### Training on-site at customer's premises (4 days)

**Part number:** T-2000-1081-S

### Additional day's training on-site at customer's premises

**Part number:** A-8003-0006



# Non-contact position encoders



## Product range

Welcome to non-contact position encoders

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### Absolute position optical encoders

#### RESOLUTE™ absolute optical encoder range

- RESOLUTE absolute linear encoder system
- RESOLUTE absolute rotary encoder system

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### Incremental position optical encoders

#### RG2 20 µm pitch linear encoder range

- RGH22 series readhead
- RGH24 series readhead
- RGH25F series readhead
- RGH26 series serial comms readhead
- RGS20 gold scale

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#### RG2 20 µm pitch rotary encoder range

- RGH20 series readhead
- RESR angle encoder scale

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#### Ultra-high vacuum (UHV) encoder range

- RESOLUTE UHV, TONiC™ UHV, RGH25F UHV and RGH20F UHV readheads

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#### RG4 40 µm pitch linear encoder range

- RGH34 series readhead
- RGH40 series readhead
- RGH41 series readhead
- RGS40 gold scale
- RGS40-G glass scale

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#### SiGNUM™ encoder range

- SiGNUM series readhead
- SiGNUM with FANUC serial interface

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**TONiC encoder range**

- TONiC encoder system
- TONiC DOP (dual output) encoder system
- RGSZ20 gold scale

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**TONiC and SiGNUM linear and rotary scale range**

- RELM linear ZeroMet™ scale
- RSLM linear stainless steel scale
- *FASTRACK*™ and *RTLCS*-S high-accuracy incremental linear encoder scale system
- RESM angle encoder scale
- RESD distance-coded scale
- REXM/REXT ultra-high accuracy angle encoder

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**Accessories**

- Interpolators, interfaces and DROs
- Scale applicators
- Special mounting options and custom solutions

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**Magnetic encoders**

- Rotary magnetic encoders
- Linear magnetic encoders
- Magnetic ring encoders

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**RLE laser interferometer systems**

- RLD detector units
- RLE system benefits
- RCU10 compensation system
- RPI parallel interface

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## Welcome

Renishaw offers a wide range of compact magnetic and optical encoders to meet the diverse requirements of industrial automation. This section details an extensive selection of robust magnetic linear, ring and rotary encoders, optical incremental linear and rotary encoders, laser interferometers and our new range of optical true-absolute linear and rotary encoders.

Renishaw's optical encoder systems are based on an innovative non-contact arrangement which provides zero mechanical hysteresis and excellent metrology, yet can withstand a variety of contaminants such as dust, light oils and scratches without compromising signal integrity. This ensures customers' machines run reliably with little or no maintenance.

TONiC (see page 5-28) is our smallest high-performance packaged encoder for applications requiring very high fidelity feedback and truly outstanding scale accuracy, and high reliability. LM13 and LM15 are magnetic encoders made for Renishaw by our associate company RLS d.o.o., taking the product line into rugged application areas where optical encoders cannot survive (see pages 5-42 and 5-53).

The highlight in Renishaw's range is the ground-breaking RESOLUTE absolute encoder (see page 5-6). Featuring single-track technology, a completely unique mode of operation and performance that defies convention, RESOLUTE is a world-leading product that defines Renishaw's commitment to unrivaled innovation in encoder development.

In addition to these benefits, Renishaw encoders have an established reputation for being easy to install and set up. Scale is available in many lengths with special formula self-adhesive backing, removing the need for drilling and tapping, and saving time and money.

All optical readhead and interface combinations feature a unique set-up LED which speeds installation and removes the need for complex set-up equipment or oscilloscopes.

In addition to market-leading product performance, Renishaw provides unequalled engineering back-up with a global team of experienced engineers always on hand to offer application advice and expert installation support.

To ensure that we never hold up your production, stock is held at over 30 Renishaw operations worldwide and, thanks to flexible manufacturing techniques, even out-of-stock items can be manufactured and shipped promptly.

Renishaw's encoder systems are used in all sectors of industrial automation such as semiconductor, electronics, medical, flat panel display manufacturing, printing, scientific research, robotics, solar PV, specialist machine tools, precision metrology and advanced motion systems.

## Innovation

Each year, Renishaw re-invests approximately 20% of turnover into engineering, research and development. The results are ground-breaking products such as RESOLUTE and TONiC that demonstrate our commitment to developing unique technologies that push encoder performance to new levels. You will not find 'me too' replicas of competitors in this catalog, only superior encoder designs that offer higher fidelity positional feedback.



## Quality

We are so confident of our products that we warrant them with a comprehensive two-year guarantee. If you need to exchange a product, we will offer an immediate replacement, anywhere in the world, to ensure that you do not suffer additional downtime. All returned products are thoroughly investigated and you will receive a report explaining exactly what caused the fault. In cases where problems are caused by customer damage, we can apply our applications engineering experience to help eliminate the cause.

## Delivery

ISO9001 certified quality management system meets rapid delivery! Our efficient processes are tuned to enable us to react quicker than the competition to increases in demand. Allied to this, we hold large quantities of stock locally at subsidiaries around the world for 'next-day' deliveries. OEM customers can also benefit from consignment stock and kanban arrangements.

## Price

Renishaw not only supplies encoders at a fair price, but also gives customers better price performance ratios and minimizes cost of ownership. How? As well as embedding quality and reliability into the fundamental encoder design, we develop novel production techniques that reduce manufacturing costs, allowing us to pass on the savings.



## Operating principles of optical encoders

### RESOLUTE

RESOLUTE is a family of true absolute, fine pitch optical encoder products. Linear scale options include high-accuracy RSLA stainless steel spar scale, RELA ZeroMet scale and RTLA-S stainless steel tape scale, also available with the *FASTRACK* RTLA track-mounted linear encoder scale system. Rotary options include RESA stainless steel rings and REXA ultra-high accuracy rings.

#### How it works...

RESOLUTE communicates bi-directionally in purely serial format, using a variety of industry-standard protocols, of both proprietary and open standard.

#### The process begins...

The controller initiates operation by sending a demand message to the readhead, instructing it to capture the absolute position on the scale – linear or rotary – at that instant. The head responds by flashing a high-power LED source to illuminate the scale. The flash duration is as brief as 50 ns to minimize image blur on moving axes. Crucially its timing is controlled within a few nanoseconds to preserve the relationship between demanded and reported position – one of the essential features that makes RESOLUTE ideally suited to very high specification motion systems.

#### Single track scale

The scale is essentially a single track of full-width contrasting lines, based on a nominal pitch of 30 µm. The absence of multiple parallel tracks gives important immunity from yaw errors and much more lateral tolerance in head position.

#### Image acquisition

The scale is imaged, via an aspheric lens which minimizes distortion, onto a custom detector array designed specifically for RESOLUTE. The optical arrangement, with a folded illumination path but direct imaging, is highly compact yet stable, thus assuring the fidelity essential for excellent metrology.

#### Data decoding and analysis

Once captured by the detector, the image is transferred by analog-to-digital converter (ADC) at about 500 Mb/s to a powerful Digital Signal Processor (DSP). Specially developed algorithms then obtain a true absolute, but relatively ‘coarse’ position from the code embedded in the scale. This process is checked, and corrections are made by further algorithms in the DSP which exploit redundancy and intentional restrictions in the scale code. Meanwhile other routines calculate a very high resolution ‘fine’ position, which is then combined with the coarse position to provide a truly absolute and very high resolution location.

#### Final checks and data output

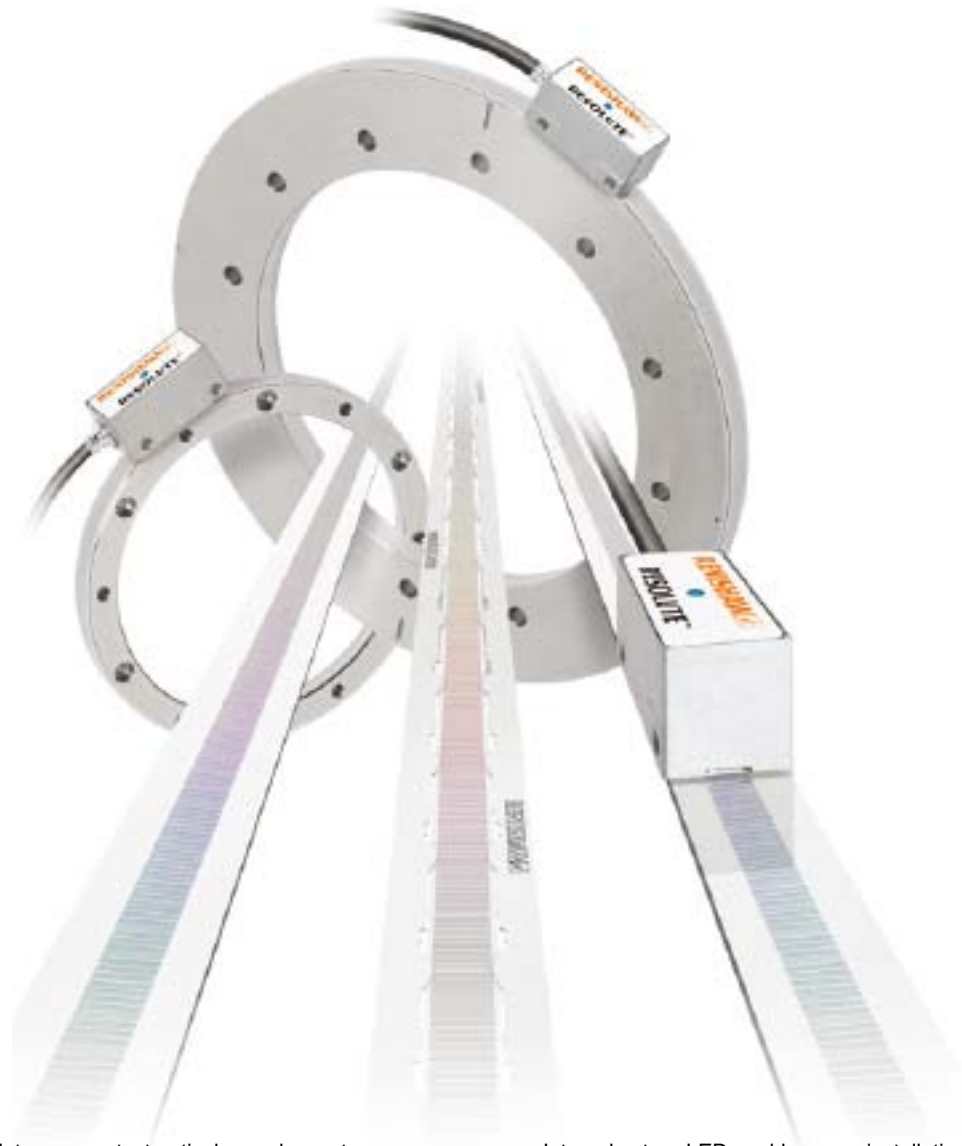
After final error-checking procedures this information is uploaded again in the appropriate protocol to the controller, as a pure serial word representing position to within 1 nm. Protection against electrical noise disturbance is provided by addition of a Cyclic Redundancy Check (CRC). The entire process, from demand to response, can take as little as 12 µs and be repeated up to 25 000 times per second. By a variety of techniques, including adjusting the light flash duration to the axis speed, this performance is achieved at up to 100 m/s while, crucially, preserving exceptionally low positional jitter at lower operating speeds.

#### And the result is...

The outcome is an encoder with generous installation tolerances: RESOLUTE allows ±0.5° in yaw, pitch and roll and an impressive ±150 µm in ride height. Meanwhile the generous optical footprint and advanced error correcting procedures confer excellent immunity to optical contamination, both particulate and greasy smears. All this while maintaining 1 nm resolution at 100 m/s: RESOLUTE is the answer to the toughest absolute challenge.



## RESOLUTE absolute optical encoder summary



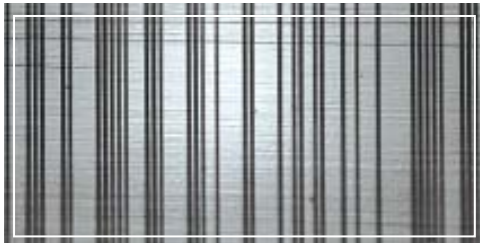
- True absolute non-contact optical encoder system: no batteries required
  - Wide set-up tolerances for quick and easy installation
  - High dirt immunity to scratches and light oils
  - Resolutions to 1 nm or 32-bit rotary
  - 100 m/s maximum speed for all resolutions (to 36,000 rev/min)
  - 30  $\mu\text{m}$  nominal scale pitch ensures exceptional motion control performance
  - $\pm 40$  nm sub-divisional error for smooth velocity control
  - Less than 10 nm RMS jitter for improved positional stability
  - Built-in separate position-checking algorithm provides inherent safety
  - IP64 sealed readhead for high reliability in harsh environments
  - Integral set-up LED enables easy installation and provides diagnostics at a glance
  - Readhead and linear/rotary scales are bolt-hole compatible with SiGNUM encoders
  - Operates up to 80 °C
  - Integral over-temperature alarm
  - Variety of serial protocols available. Contact your local representative for the latest list
- Compatible with:
- RELA ZeroMet spar scales
  - RSLA stainless steel spars
  - *FASTRACK* with RTLA
  - RTLA-S self-adhesive tape scale
  - RESA angle encoders
  - Ultra-high accuracy REXA angle encoders



## System features

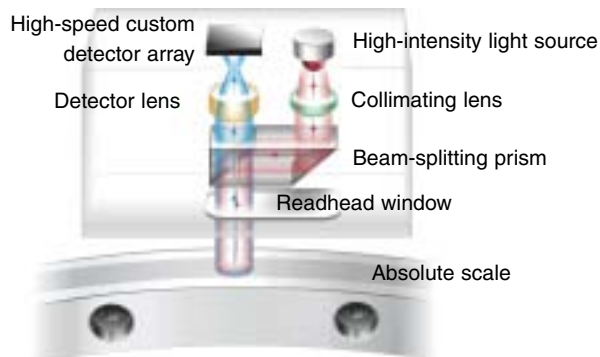
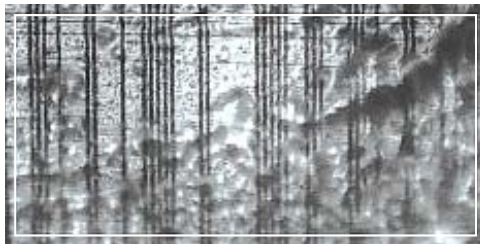
### Unique single track absolute optical scale

- Absolute position is determined immediately upon switch-on
- No battery back-up
- Much higher tolerance to yaw de-phasing than dual-track systems
- Fine pitch (30 µm nominal period) optical scale for superior motion control compared to inductive, magnetic or other non-contact optical absolute encoders
- High-accuracy graduations marked directly onto tough engineering materials for outstanding metrology and reliability



### High dirt immunity

- Advanced optics and embedded surplus code means RESOLUTE even reads dirty scale.
- Absolute position can be determined in all three cases shown here; clean scale (left), grease contamination (below left), particle contamination (below).



### Unique detection method

- Readhead acts like an ultra-fast miniature digital camera, taking images of a coded scale.
- Photos are analyzed by a high-speed DSP to determine absolute position.
- Built-in position-check algorithm constantly monitors calculations for ultimate safety and reliability.
- Advanced optics and determination algorithms are designed to provide low noise (jitter <10 nm RMS) and low sub-divisional error (SDE ±40 nm).

### Range of rotary (angle) and linear scales

- Tough RELA high-precision ZeroMet spars with ±1 µm accuracy available up to 1130 mm length
- Shatter-proof RSLA high-precision stainless steel scale, offering higher accuracy than glass scales and long lengths up to 5 m, with ±4 µm accuracy over a complete 5 m length (for longer lengths contact your local representative)
- RTLA with *FASTRACK*, and RTLA-S tape scales with ±5 µm/m accuracy and easiest installation
- RESA ring with unique taper mount has large through hole for easy installation
- REXA ultra-high accuracy ring with ±1 arc second total installed accuracy with dual readheads

### Range of protocols and resolutions

Protocol	Resolutions	
	Linear	Rotary
<i>BiSS</i>	50 nm 5 nm 1 nm	18-bit 26-bit 32-bit
Drive-Cliq (available Fall 2012)	50 nm 1 nm	26-bit 29-bit 32-bit
FANUC	50 nm 1 nm	23-bit (high type A) 27-bit (high type B)
Mitsubishi	50 nm 1 nm	23-bit 27-bit
Panasonic	100 nm 50 nm 1 nm	–

## RGH22 series readhead



Renishaw's RG2 linear encoder system is a non-contact optical encoder designed for position feedback solutions.

The system uses a common reflective tape scale scanned by a readhead chosen from a range of options offering industry standard digital square wave or analog sinusoidal output signal formats.

Renishaw's patented optical scheme is used in all readhead series and gives proven performance benefits together with high tolerance to scale contamination.

The RGH22 range is suitable for use in a broad range of applications, offering high resolution and high speed with stability and reliability.

A dual limit sensor option is also available offering two dedicated signal outputs, left and right end-of-axis travel indication.

RGH22 is an ideal feedback solution wherever precision controlled movement is required. The RGH22 readheads offer the full set of RG2 features and integral interpolation in a robust package, with an integral set-up LED for quick and easy installation.

Common applications include coordinate measuring and layout machines, semiconductor/electronics manufacturing and inspection, height gages, electronics assembly and test, linear motors, digital image setters and a variety of custom linear motion solutions.

### Single limit range

RGH22D – 5 µm resolution  
 RGH22X – 1 µm resolution  
 RGH22Z – 0.5 µm resolution  
 RGH22Y – 0.1 µm resolution  
 RGH22B – 1 Vpp differential  
 RGH22C – 12 µA differential (no limit)

### Dual limit range

RGH22P – 5 µm resolution  
 RGH22Q – 1 µm resolution  
 RGH22R – 0.5 µm resolution  
 RGH22S – 0.1 µm resolution  
 RGH22H – 50 nm resolution  
 RGH22A – 1 Vpp differential

- Non-contact open optical system
- Integral interpolation
- Industry standard digital and analog output options
- Resolutions from 5 µm to 50 nm
- Integral reference and limit sensors
- Dual limit sensor option
- Integral set-up LED
- Uses RGS20-S self-adhesive scale

## RGH24 series readhead



Renishaw's RG2 linear encoder system is a non-contact optical encoder designed for position feedback solutions.

The system uses a common reflective tape scale scanned by a readhead chosen from a range of options offering industry standard digital square wave or analog sinusoidal output signal formats.

Renishaw's unique patented optical scheme is used in all readhead series to provide high tolerance to scale contamination.

RGH24 is an ideal feedback solution wherever precision controlled movement is required.

The RGH24 readheads offer a wide selection of output configurations and their compact size and low mass makes the system ideal for small XY stages and actuators.

An integral set-up LED enables quick and easy installation.

Common applications include semiconductor/electronics manufacturing and inspection, coordinate measuring and layout machines, height gages, linear motors, pre-press printing and a variety of custom linear motion solutions.

### Digital range

RGH24D – 5  $\mu\text{m}$  resolution  
 RGH24X – 1  $\mu\text{m}$  resolution  
 RGH24Z – 0.5  $\mu\text{m}$  resolution  
 RGH24W – 0.2  $\mu\text{m}$  resolution  
 RGH24Y – 0.1  $\mu\text{m}$  resolution  
 RGH24H – 50 nm resolution  
 RGH24I – 20 nm resolution  
 RGH24O – 10 nm resolution

### Analog range

RGH24B – 1 V<sub>pp</sub> differential  
 RGH24C – 12  $\mu\text{A}$  differential

- Non-contact open optical system
- Compact size
- Low mass
- Integral interpolation
- Digital and analog output options
- Resolutions from 5  $\mu\text{m}$  to 10 nm
- Integral set-up LED
- Uses RGS20-S self-adhesive scale
- Reference mark or limit switch capability

## RGH25F series readhead



Renishaw's RGH25F offers all the benefits of the market leading RG2 non-contact linear encoder systems; patented filtering optical scheme, high contamination tolerance and high speed.

The RGH25F has been designed for use with Renishaw's RGS20-S gold-plated scale in precision applications requiring fine resolutions, high accuracy, compact size and low mass.

The readhead is enclosed in an RFI screened housing and uses proven solid state components to give outstanding reliability.

The REF interfaces can be mounted remotely to interpolate the signals produced by the readhead.

The interfaces incorporate automatic gain control and unique self-tuning adaptive electronics which, combined with the filtering optics, ensure excellent signal integrity, and give a low cyclic error.

Common applications include optical fiber alignment, semiconductor manufacturing, inspection, precision stages and other systems requiring high resolution where space is at a premium.

### Readhead

RGH25F – common readhead

### Interfaces:

#### Digital

REF0004 – 5  $\mu\text{m}$  resolution  
 REF0020 – 1  $\mu\text{m}$  resolution  
 REF0040 – 0.5  $\mu\text{m}$  resolution  
 REF0100 – 0.2  $\mu\text{m}$  resolution  
 REF0200 – 0.1  $\mu\text{m}$  resolution  
 REF0400 – 50 nm resolution  
 REF1000 – 20 nm resolution  
 REF2000 – 10 nm resolution  
 REF4000 – 5 nm resolution

#### Analog

REF0000 – 1 Vpp differential

- Customer selectable AGC operational at all speeds
- Digital and analog output options
- Resolutions from 5  $\mu\text{m}$  to 5 nm
- Binary interpolation factors from x4 to x4096
- Low cyclic error (<50 nm)
- Self-tuning adaptive electronics give reliability and high accuracy
- Uses low profile RGS20-S self-adhesive scale
- Low mass
- Tri-colored set-up LED indicating signal strength

## RGH26 series serial comms readhead



The RGH26, based on Renishaw's RG2 range of linear encoders, has been specifically designed for use with Mitsubishi's MELSERVO®-J2 Super series of servo amplifiers. The RGH26 offers speeds of up to 6 m/s with resolutions to 0.5 µm.

The RG2 system uses a reflective tape scale scanned by a readhead chosen from a range of options. It offers industry standard digital square wave, analog sinusoidal, and now Mitsubishi-compatible serial communication signal formats.

Renishaw's patented filtering optical scheme is used in all RG2 linear encoders and gives outstanding performance combined with a high tolerance to dust, scratches and light oil contamination.

Unlike other serial communication linear encoders, the RGH26 does not require a separate bulky interface. Renishaw's innovative electronics, interpolation and serial conversion are all contained within the same compact body of the popular RGH22. The incremental count takes place within the readhead, resulting in exceptional system noise immunity.

Dual limit sensors have been incorporated as standard, offering two dedicated signal outputs for left and right end-of-axis travel indication. A repeatable reference mark output is also included, along dedicated real-time channels as well as part of the serial word.

The class-leading compact size, exceptional high speed, high accuracy, and zero-friction configuration make the RGH26 the encoder of choice for linear feedback applications wherever a MELSERVO® J2 Super is used.

### Serial communication (dual limit) range

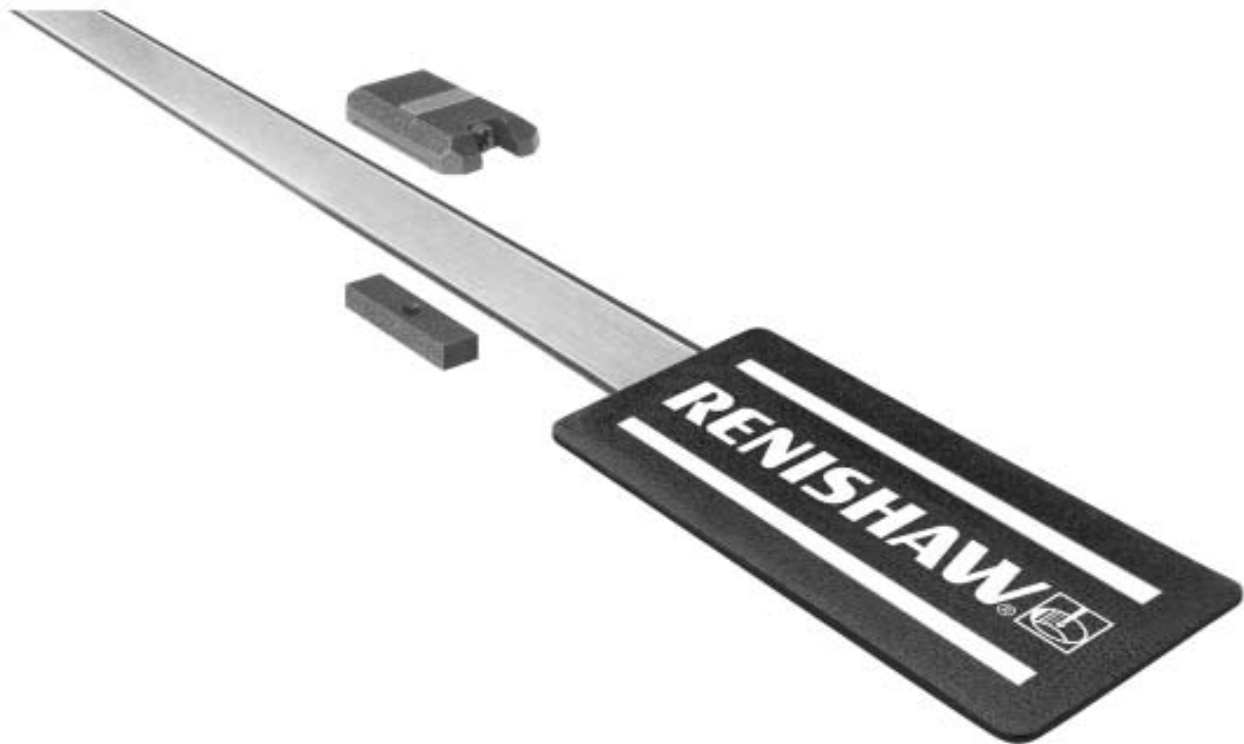
RGH26P – 5 µm resolution  
 RGH26Q – 1 µm resolution  
 RGH26R – 0.5 µm resolution

### Compatible Mitsubishi products

MELSERVO®-J2 Super series

- Non-contact open optical system
- Integral interpolation
- Mitsubishi compatible serial communications
- Speeds up to 6 m/s
- Resolutions from 5 µm to 0.5 µm
- Integral reference and dual limit sensors
- No interface required
- Integral set-up LED
- Uses RGS20-S self-adhesive scale

## RGS20 and RGS40 gold scale



Renishaw's patented RGS20-S scale comprises 20  $\mu\text{m}$  graduations on a steel strip 6 mm wide and 0.2 mm thick and features a thin gold surface layer to enhance reflectivity.

A lacquer coating provides protection against handling and contamination. The 20  $\mu\text{m}$  pitch scale is suitable for use with all Renishaw RG2 series readheads (RGH22, RGH24, RGH25 and RGH26), whilst the 40  $\mu\text{m}$  RGS40-S is suitable for use with the RGH34 and RGH41 readheads.

The scale is supplied with a specially formulated adhesive backing tape. Installation is quick, easy and suits both high-volume production and one-off field service installations.

To simplify customer inventory and maximize production flexibility, the scale can be supplied on a reel for 'cut-to-suit' convenience at the point of installation.

RGS20-S and RGS40-S are suitable for mounting to most common engineering materials including metals, granites, ceramics and composites, whilst RGS20-PC and RGS40-PC polyester coated versions have an increased resilience to solvent and lubricant attack.

The scale ends are rigidly fixed to the axis substrate by means of epoxy fastened end clamps, eliminating the need to drill holes. Because the scale has a very small cross section, it is 'mastered' to the substrate and matches its thermal expansion. Differential movement between the scale and the substrate is close to zero, even throughout significant temperature swings.

- RGS20 20  $\mu\text{m}$  tape scales for RGH22, RGH24, RGH25 and RGH26 readheads
- RGS40 40  $\mu\text{m}$  tape scales for RGH34 and RGH41 readheads
- 'Cut-to-length' flexibility
- Lengths from 100 mm to over 50 m
- Protective lacquer or tough polyester coating option for applications using harsh solvents
- Efficient, accurate installation
- Affixes to most common engineering materials
- Self-adhesive
- Automated application

## Technical specifications

### Scale

<b>Type</b>	Reflective gold plated steel tape with protective lacquer coating or tough polyester coating option for applications using harsh solvents and self-adhesive backing	
<b>Scale pitch</b>	RGS20-S, RGS20-PC = 20 µm	RGS40-S, RGS40-PC = 40 µm
<b>Linearity</b>	RGS20-S = ±3 µm/m, ±0.75 µm/60 mm RGS20-PC = ±5 µm/m, ±1.5 µm/60 mm	RGS40-S = ±3 µm/m, ±1 µm/60 mm RGS40-PC = ±5 µm/m, ±1.5 µm/60 mm
<b>Scale length</b>	100 mm – 50 m (>50 m by special order)	
<b>Substrate materials</b>	Metals, ceramics and composites with expansion coefficients between 0 and 22 µm/m/°C (steel, aluminum, ZeroMet, granite, ceramic etc.)	
<b>Expansion coefficient</b>	Matches that of substrate material with scale ends fixed by epoxy mounted end clamps	
<b>End fixing</b>	Epoxy mounted end clamps (A-9523-4015) using two-part epoxy adhesive (A-9531-0342) Scale end movement <1 µm over temperature range -20 °C to 50 °C	
<b>Operating specification</b>	Temperature: -10 °C to 120 °C (scale only, also refer to data sheet) Minimum installation temperature 10 °C Humidity: 80% maximum RH (non-condensing)	

### Reference mark

<b>Type</b>	Magnetic actuator	
<b>Mounting options</b>	Adhesive mounted	A-9531-0250
	Screw mounted	A-9531-0287
	Adhesive or screw mounted 90° actuator for use with RGH24, RGH25 or RGH34	A-9541-0037
<b>Position</b>	One or more at user selected locations	
<b>Repeatability</b>	Output synchronized with incremental channels Repeatability of position (uni-directional) maintained within these conditions: Temperature range: RGS20-S, RGS20-PC ±10 °C from installation temperature RGS40-S, RGS40-PC ±20 °C from installation temperature Speed: Refer to individual readhead specifications Magnetic field: steady ±0.02 T or changing ±7.5 T/s	

### Limit switch

<b>Type</b>	Magnetic actuator	
<b>Mounting options</b>	Adhesive mounted 10 mm actuator	A-9531-0251
	Adhesive mounted 24.35 mm actuator	A-9531-2052
	Adhesive mounted 50 mm actuator	A-9531-2054
	Flush mounted actuator	A-9531-0285
	Adhesive or screw mounted 90° actuator for use with RGH24, RGH25 and RGH34	A-9541-0040
<b>Position</b>	One or more at user selected locations	
<b>Repeatability</b>	0.1 mm	

## RGH20 series readhead



The RGH20 is a compact readhead for use with Renishaw's range of 20 µm RESR rotary encoders and RSLR high-accuracy linear scale.

Like all Renishaw encoders, the RGH20 offers reliable, high-speed, open, non-contact performance with excellent immunity to dust, scratches and light oils on the scale.

The RGH20 also benefits from Renishaw's patented readhead set-up LED which simplifies installation and monitors signal condition during operation.

The ultra-compact RGH20F connects to the REF interface to give high-accuracy digital and analog outputs. The REF interface incorporates advanced signal processing and offers high speed and resolution.

### Digital and analog RGH20

RGH20D – 5 µm resolution  
 RGH20X – 1 µm resolution  
 RGH20Z – 0.5 µm resolution  
 RGH20W – 0.2 µm resolution  
 RGH20Y – 0.1 µm resolution  
 RGH20H – 50 nm resolution  
 RGH20I – 20 nm resolution  
 RGH20O – 10 nm resolution  
 RGH20B – 1 Vpp differential

### RGH20F/REF system options

REF0004 – 5 µm resolution  
 REF0020 – 1 µm resolution  
 REF0040 – 0.5 µm resolution  
 REF0100 – 0.2 µm resolution  
 REF0200 – 0.1 µm resolution  
 REF0400 – 50 nm resolution  
 REF1000 – 20 nm resolution  
 REF2000 – 10 nm resolution  
 REF4000 – 5 nm resolution  
 REF0000 – 1 Vpp differential

- Compatible with 20 µm RESR angle encoder and RSLR high-accuracy linear scales
- Filtering optics provide excellent dirt immunity
- Compact and robust housing
- Industry standard digital and analog outputs
- Integral interpolation and set-up LED on RGH20 option
- Ultra-compact RGH20F/REF system gives high accuracy and high resolution
- Resolutions from 5 µm to 5 nm
- Reference mark or single limit switch sensor
- Hi-flex double screen 8 core cable



## RESR angle encoder scale



The RESR is a one-piece stainless steel ring with graduations marked directly onto the periphery.

The RESR offers impressive accuracy with resolution to 0.008 arc second, suiting the most demanding precision applications.

Read by Renishaw's filtering optics readheads, including the RGH20, RGH34, RGH35 and RGH40, the system has a high tolerance to dirt, scratches and greasy fingerprints that can cause other encoder systems to miscount.

The low profile RESR, with a large internal diameter, is easy to design into most installations. More importantly, its low mass, low inertia design will not compromise system performance. A repeatable reference mark is available to provide a home (datum) position, while Renishaw's RGH40 readhead with filtering optics offers dual limit sensors.

### System features

- High-speed, non-contact, optical performance
- Graduation accuracy to  $\pm 0.5$  arc second
- Angular resolution to 0.008 arc second
- System repeatability to 0.008 arc second
- Wide range of sizes and line counts provide compatibility with industry-standard controllers ( $\text{\O}52$  mm to  $\text{\O}550$  mm with line counts from 4,096 to 86,400)
- Patented taper mount simplifies integration and minimizes installation errors
- Filtering optics provide excellent dirt immunity
- UHV compatible
- Low magnetic permeability as standard
- Compact size for easy integration
- Low mass and low inertia
- Compatible with RGH20, RGH34, RGH35 or RGH40 readheads to offer industry-standard analog or digital incremental outputs with reference mark option
- Integral set-up LED on all Renishaw encoders for quick set-up and instant "health check" at any time
- Ultra-low inertia versions also available in 75 mm, 100 mm, 150 mm and 200 mm sizes

## Ultra-high vacuum (UHV) encoders

### RESOLUTE UHV, TONiC UHV, RGH25F UHV and RGH20F UHV readheads

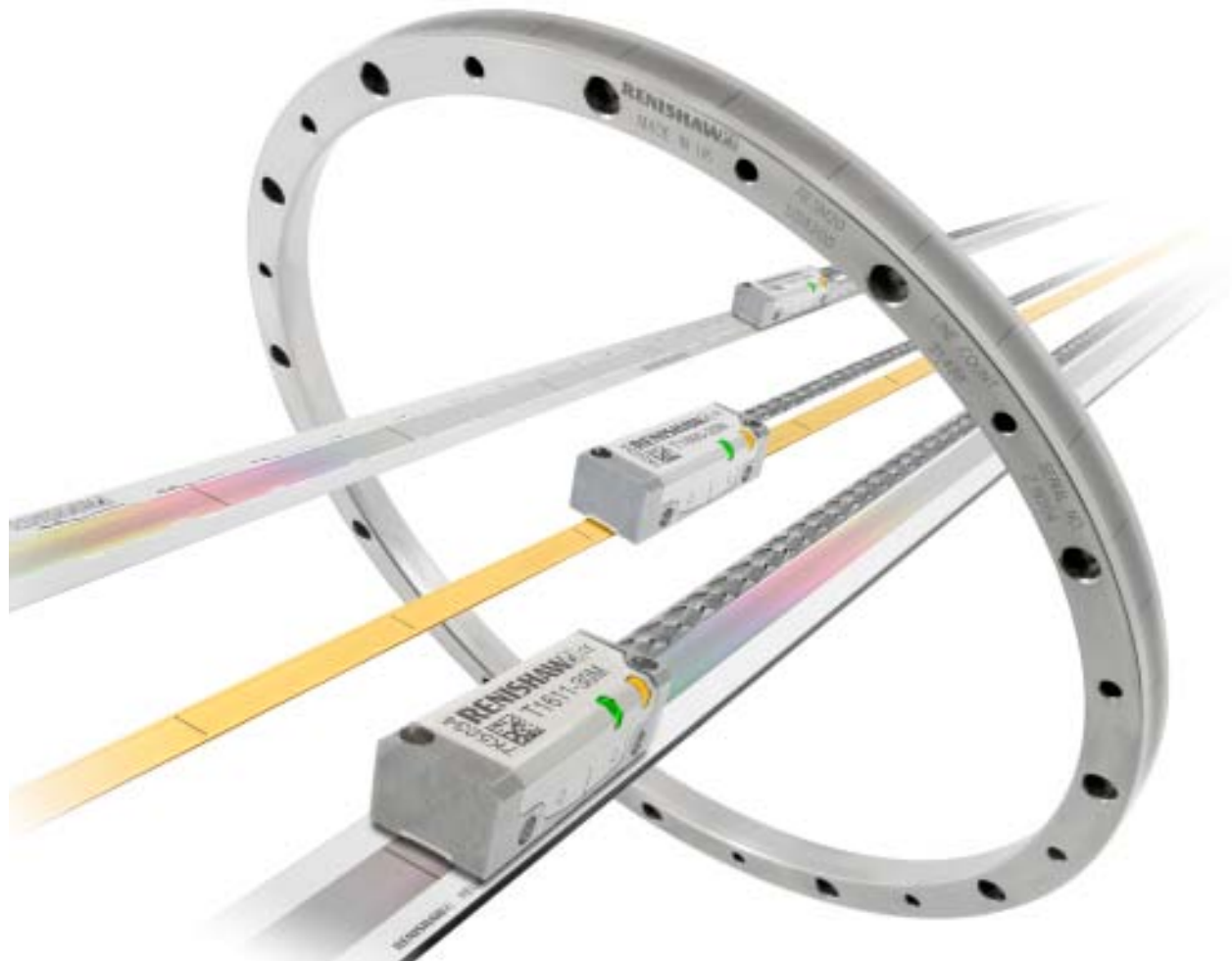
All products in Renishaw's range of ultra-high vacuum (UHV) compatible encoders are designed for use in a variety of scientific, semiconductor and other advanced industrial applications with vacuum pressures to  $10^{-11}$  Torr. The fundamental principles of operation are the same as those for our equivalent standard-atmosphere products, but the UHV variants are designed to eliminate unvented voids and are specially constructed from clean, vacuum-compatible materials and adhesives. The suitability of the products for use in UHV environments is qualified by an independent specialist test house, including a Residual Gas Analysis (RGA) spectrum test.

The range includes versions of RESOLUTE, TONiC, RGH25F and RGH20F readheads, along with a variety of linear and rotary scales, offering superior performance and high reliability.

RESOLUTE UHV uses the same true-absolute encoder operating principles as the rest of the RESOLUTE range. This provides an encoder with fine-pitch performance, combined with wide set-up tolerances and built-in safety. RESOLUTE determines absolute position immediately upon switch-on, eliminating uncontrolled movements and facilitating complete command of axes without the need for reference returns or 'wake-and-shake' routines. With 1 nm resolution,  $\pm 40$  nm SDE and  $< 10$  nm RMS noise, RESOLUTE also offers users a significant performance upgrade.

All incremental readheads in the range include dynamic signal conditioning comprising Auto Gain Control (AGC) for solid and dependable signals over extended machine lifetimes, and Auto Offset Control (AOC) for improved signal fidelity. AOC and the encoder's low positional noise also add the benefit of reducing velocity ripple on direct-drive systems, thereby helping minimize heat build-up in motors inside the vacuum.

High accuracy is assured, with linear measuring standards including options of self-adhesive tape scale, stainless steel and ZeroMet spars. Angle encoder options include the low-profile RESR/RESM and the ultra-high accuracy REXM ring with guaranteed installed accuracy better than  $\pm 1$  arc second.

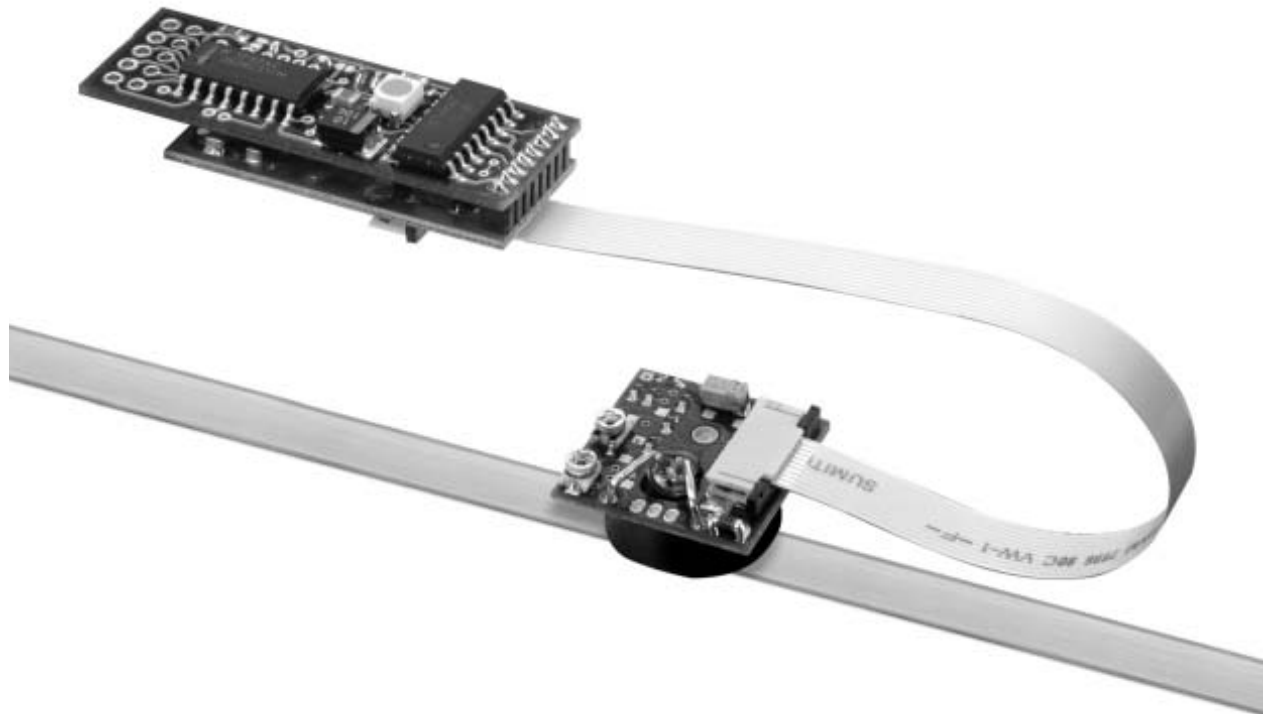


## UHV product features

- RESOLUTE UHV is the first true-absolute optical encoder for UHV environments
- Constructed from vacuum-compatible materials and adhesives to give low outgassing rates
- Proven clean RGA
- Bake-out temperature of 120 °C
- Non-contact open optical system for high-speed, reliable operation with zero friction and zero wear
- Industry-standard digital and analog outputs with resolutions to 1 nm
- Low power consumption minimizes heat dissipation
- No unvented voids
- Adaptive electronics offer high performance, long-term reliability and low sub-divisional error (SDE) ( $\pm 40$  nm for RESOLUTE UHV,  $\pm 30$  nm for TONiC UHV,  $\pm 50$  nm for RGH25F UHV and RGH20F UHV)
- UHV compatible cables
- TONiC UHV encoder features optical reference mark
- Range of high-accuracy linear and rotary scales

Products	Scale options	Features
<b>RESOLUTE UHV</b>	<i>FASTRACK</i> RTLA track-mounted scale system	True-absolute with no movement required to determine absolute position, position-checking algorithm, safe extraction after power-outs, pure serial communications with CRC check, excellent motion control performance and easiest installation.
	RTLA-S stainless steel tape scale	
	RSLA stainless spar	
	RELA low expansion ZeroMet spar	
	RESA ring	
<b>TONiC UHV</b>	REXA ultra-high accuracy ring	High-accuracy scales, <i>IN-TRAC</i> ™ optical reference mark technology, advanced Auto Gain Control (AGC) and Auto Offset Control (AOC), lowest noise (jitter) and SDE for the best motion control performance, and easy installation.
	RGSZ20-S tape scale	
	<i>FASTRACK</i> RTLC track-mounted scale system	
	RTLC-S stainless tape scale	
	RSLM stainless spar	
	RELM low expansion ZeroMet spar	
<b>RGH25F UHV</b>	RESM ring	Easy installation, high repeatability, AGC and AOC.
	REXM ultra-high accuracy ring	
<b>RGH20F UHV</b>	RESR ring	Angle encoder version of RGH25F UHV.

## RGH34 series readhead



Renishaw's RGH34 series is a non-contact optical encoder system that offers the performance and reliability of the established RG2 linear encoder system with the versatility of a miniaturized component system.

Renishaw's unique patented filtering optical technology eliminates friction, hysteresis and wear while giving high contamination tolerance and exceptional reliability. The versatile system can read Renishaw's RGS40-S self-adhesive scale, RGS40-G glass scale and RESR rings as well as industry-standard 40 µm chrome/glass etched scale, making it suitable for a wide range of applications.

The component style construction allows integration flexibility for even the smallest motion systems, while the generous set-up tolerances, easy-to-install adhesive scale and patented set-up LED make installation quick and easy.

Designed for OEM applications where a conventional enclosed readhead cannot be fitted, the RGH34 brings reliable state-of-the-art performance to size-sensitive precision linear and rotary motion applications such as ultra-small linear actuators, microscopes and microstages.

### Common readhead

RGH34U

### Digital range

RG134T – 10 µm resolution  
 RG134D – 5 µm resolution  
 RG134G – 2 µm resolution  
 RG134X – 1 µm resolution  
 RG134N – 0.4 µm resolution  
 RG134W – 0.2 µm resolution  
 RG134Y – 0.1 µm resolution

### Analog range

RG134B – Vpp differential

- Non-contact open optical system
- Compact component style readhead
- Large installation tolerances
- High-speed operation
- Industry-standard digital and analog output options
- Resolutions from 10 µm to 0.1 µm
- Optional reference or limit sensor
- Integral set-up LED
- Uses low profile RGS40-S self-adhesive scale, RGS40-G glass scale, RESR rings and other reflective scale types

## RGH40 series readhead



Renishaw's RGH40 readhead offers all the benefits of the market-proven RG4 linear encoder system – high-speed, non-contact performance with filtering optics to guarantee reliable performance over light oils, dust and scratches.

The RGH40 readhead is designed for use with Renishaw's RGS40-G (40 µm pitch chrome grating) glass scale and RESR angle encoder. Enclosed within a rugged, die-cast housing, the readhead uses proven solid state components to give outstanding reliability.

Dual limit switch sensing is also included as standard to provide dedicated signals for each end-of-axis indication, together with a repeatable reference or datum mark.

Installation is quick and easy to achieve thanks to generous set-up tolerances and Renishaw's unique set-up LED that indicates when optimum conditions have been achieved. This removes the need for expensive oscilloscopes or set-up equipment.

These added benefits give RGH40 readheads greater flexibility, broadening the range of applications of the existing RG2 and RG4 systems, from coordinate measuring and layout machines to electronics assembly and test, high-speed motion control, semiconductor manufacture and a host of custom linear motors.

### Digital range

RGH40T – 10 µm resolution  
 RGH40D – 5 µm resolution  
 RGH40G – 2 µm resolution  
 RGH40X – 1 µm resolution  
 RGH40N – 0.4 µm resolution  
 RGH40W – 0.2 µm resolution  
 RGH40Y – 0.1 µm resolution  
 RGH40H – 50 nm resolution

### Analog range

RGH40A – 1 Vpp differential

- Non-contact open optical system
- Large installation tolerances
- High-speed operation – up to 10 m/s
- Industry-standard digital and analog output options
- Resolutions from 10 µm to 50 nm
- Integral reference and dual limit sensors
- Integral set-up LED
- Uses Renishaw RGS40-G glass scale and RESR angle encoder

## RGH41 series readhead



Renishaw's 40 µm RGH41 series readheads offer all the benefits of the established 20 µm RG2 linear encoder system, such as reflective tape scale, patented filtering optics, set-up LED, good dirt immunity and high speed.

These compact readheads with integral interpolation provide an increased range of resolutions to match the demands of a wide range of applications, whilst their high speed enables an increase in the productivity of the end-user's system.

The 40 µm RGH41 increases the already generous set-up tolerances of the RG2, whilst maintaining Renishaw's famous contamination immunity.

For added flexibility, dual limit switch sensing is included as standard to enable dedicated signals for each end-of-axis indication, along with a repeatable reference or datum mark.

These benefits give the RGH41 greater flexibility complementing the breadth of applications in which the RG2 is already used, from coordinate measuring and layout machines to electronics assembly and test, linear motors and a host of custom linear motor solutions.

### Digital range

RGH41T – 10 µm resolution  
 RGH41D – 5 µm resolution  
 RGH41G – 2 µm resolution  
 RGH41X – 1 µm resolution  
 RGH41N – 0.4 µm resolution  
 RGH41W – 0.2 µm resolution  
 RGH41Y – 0.1 µm resolution  
 RGH41H – 50 nm resolution

### Analog range

RGH41B – 1 Vpp differential (single limit)  
 RGH41A – 1 Vpp differential (dual limit)

- Non-contact open optical system
- Large installation tolerances
- High-speed operation up to 15 m/s
- Industry-standard digital and analog output options
- Resolutions from 10 µm to 50 nm
- Integral reference and dual limit sensors
- Integral set-up LED
- Uses Renishaw RGS40-S self-adhesive scale

## RGS40-G glass scale



The RGS40-G is a 40 µm chrome on glass scale designed for use with Renishaw's RG4 series RGH40 filtering readheads.

The RGS40-G system offers many of the features that have made Renishaw's famous RGS tape scale such a success – high-speed, non-contact optical performance that is immune to dust, light oil and scratches.

The RGH40 benefits from filtering optics and an integral set-up LED which ensure easy installation and reliable operation.

The RGS40-G scale is easy to install and can be mounted directly to the substrate using either mechanical clips or specially-formulated adhesive.

In addition to these features, the RGS40-G is ideally suited for applications where the scale does not need to be mastered to the substrate. The thermal behaviour of RGS40-G can be compensated for by simply entering the coefficient of expansion of the scale into the host controller.

The RGS40-G boasts an extensive list of application areas, e.g. linear motion stages, linear motors, scientific instruments, metrology instruments, optical inspection, XY stages, medical equipment.

- Suitable for use with RGH40 series readheads
- Available in 8 convenient lengths
- Defined thermal behaviour
- Reliable dirt immunity
- Compatible with reference marks and limit switches
- Clamp or adhesive mounting options
- Can be mounted on any substrate
- 3 × 18 mm cross section for compact installation

## SiGNUM series readhead



Renishaw's SR readhead and Si interface are part of the SiGNUM range of optical encoders.

They have been designed for use with Renishaw's range of high-accuracy RESM and REXM angle encoders and RSLM and RELM linear encoders which incorporate the *IN-TRAC*™ bi-directional reference mark.

Like all Renishaw encoders, the SiGNUM range offers high-speed, reliable operation and open, non-contact performance with excellent immunity to dirt and electrical noise.

The interface incorporates dynamic signal control which, combined with the patented filtering optics, ensure excellent signal integrity and exceptionally low cyclic error.

The Si interface can be mounted remotely and a small connector on the readhead cable allows it to be fed easily through machines where access is restricted.

### Readhead (SR)

SR005A – 0.5 m cable  
SR010A – 1.0 m cable  
SR015A – 1.5 m cable  
SR030A – 3.0 m cable  
SR050A – 5.0 m cable  
SR100A – 10.0 m cable

### Interface unit (Si)

Si-NN-0004 – 5 µm  
Si-NN-0020 – 1 µm  
Si-NN-0040 – 0.5 µm  
Si-NN-0100 – 0.2 µm  
Si-NN-0200 – 0.1 µm  
Si-NN-0400 – 50 nm  
Si-NN-1000 – 20 nm  
Si-HN-2000 – 10 nm  
Si-HN-4000 – 5 nm  
Si-NN-0000 – Analog  
Si-NN-0001 – Low noise analog

- *IN-TRAC* bi-directional reference mark and on-scale dual limit outputs
- Compatible with RESM and REXM (rotary) and RELM and RSLM (linear) scales
- Operating temperature up to 85 °C
- Speeds up to 12.5 m/s (4591 rev/min @ Ø52 mm)
- Dynamic signal control to give cyclic error of typically ±30 nm
- SiGNUM software for easy installation and system diagnostics
- Integral LEDs for optimum set-up and system diagnostics
- Industry-standard analog and digital outputs with resolutions from 5 µm to 5 nm (40 to 0.0038 arc seconds)
- Non-contact open optical system
- Filtering optics provide excellent dirt immunity
- High flex, UL approved cable



## System features

### IN-TRAC optical reference mark

- Integrated within the graduation for compact dimensions and simplified alignment
- Electronically phased, requiring no physical adjustment
- Sub-micron repeatability in both directions of travel over full operating temperature and speed range
- Mid-point (RELM and RSLM), end-point (RELE and RSLE), customer-selectable (RSLC) or distance-coded\* (RSLD) location on linear scale system

\* Distance-coded only available for digital systems with a resolution of 1  $\mu$ m or finer.  
 The maximum speed for referencing is as per the speed table or 5 m/s, whichever is the lowest



### Dynamic signal control

- Real-time signal conditioning for optimized performance across a range of operating conditions
- Includes Auto Gain Control (AGC), Auto Offset Control (AOC) and Auto Balance Control (ABC)
- Ultra-low cyclic errors, typically  $\pm 30$  nm

### Calibration at the touch of a button

- Click of a mouse via SiGNUM software or CAL button on Si interface
- Optimization for all output signals

### Integrated LED diagnostics

- Simplifies initial alignment and set-up
- Reference mark and limit status

### Dual optical limit switch

- For linear and rotary axes, provides end-of-travel indication
- User-selectable positioning
- Independent output for each limit position
- Ideal for linear and partial arc rotary applications

### In-line connector (option)

- In-line connector between readhead and interface for easy connectivity
- IP68
- Protective caps available

### SiGNUM software

- PC-based, providing real-time set-up, calibration and diagnostics
- USB connection to SiGNUM Si interface
- Simultaneous multiple axis connectivity
- Can be connected during full servo-loop operation
- 

Recommended minimum PC requirements for the software:

- USB1.1
- .NET Framework 1.1 (redistributable version included with the software)
- Microsoft® Windows® 2000, Vista, XP or Windows® 7
- Microsoft® Internet Explorer 5.01 or later
- Pentium® II processor
- 128 MB RAM
- Screen resolution 800 x 600, 16-bit colors



## SiGNUM with FANUC serial interface



The FANUC serial compatible Si-FN interface is part of the SiGNUM family of optical position encoders featuring the *IN-TRAC* autophase reference mark.

The interface connects to a standard SR readhead which works with the RESM high-accuracy angle encoder providing FANUC serial output to work with FANUC CNC controllers.

Like all Renishaw encoders, the SiGNUM range offers high-speed, reliable operation and open, non-contact performance with excellent immunity to dirt and electrical noise.

The interface incorporates dynamic signal control which, combined with the patented filtering optics, ensure excellent signal integrity and low cyclic error.

The Si-FN interface can be mounted remotely and a small connector on the readhead cable allows it to be fed easily through machines where access is restricted.

### Readhead (SR)

SR005A – 0.5 m cable  
SR010A – 1.0 m cable  
SR015A – 1.5 m cable  
SR030A – 3.0 m cable  
SR050A – 5.0 m cable  
SR100A – 10.0 m cable

### Interface unit (Si)

Si-FN-0052 – Ø52 mm ring  
Si-FN-0104 – Ø104 mm ring  
Si-FN-0209 – Ø209 mm ring  
Si-FN-0417 – Ø417 mm ring

- FANUC compatible serial communication eliminates need for FANUC 'High Resolution Serial Output Circuit'
- Resolutions up to  $2^{26}$  positions per revolution
- *IN-TRAC* bi-directional reference mark and on-scale dual limit outputs
- IP64 sealed readhead
- Compatible with RESM (52 mm, 104 mm, 209 mm and 417 mm diameters)
- Operating temperature up to +85 °C
- Speeds up to 12.5 m/sec (4,591 rev/min @ Ø52 mm)
- Dynamic signal control to give cyclic error of less than  $\pm 40$  nm
- SiGNUM software for ease of installation and system diagnostics
- Integral LEDs for optimum set-up and system diagnostics
- Non-contact design for exceptional dynamic performance
- High flex, UL approved cable

## System features

### IN-TRAC optical reference mark

- Integrated within the scale graduations for compact dimensions and simplified alignment
- Electronically phased, requiring no physical adjustment
- Sub arc second repeatability in both directions of travel over full operating temperature and speed range



### Dynamic signal control

- Real-time signal conditioning for optimized performance across a range of operating conditions
- Includes Auto Gain Control (AGC), Auto Offset Control (AOC) and Auto Balance Control (ABC)
- Ultra-low cyclic error, typically  $\pm 30$  nm

### Calibration at the touch of a button

- Click of a mouse via SiGNUM software or CAL button on Si interface
- Optimization for all output signals

### Integrated LED diagnostics

- Remote access for convenient viewing
- Simplifies initial alignment and set-up
- Reference mark and limit status



### Dual optical limit switch

- Provides end-of-travel indication
- User-selectable positioning
- Independent output for each limit position
- Ideal for partial rotation applications, eg machine tool A or B axes (RESM ring encoder)



### SiGNUM software

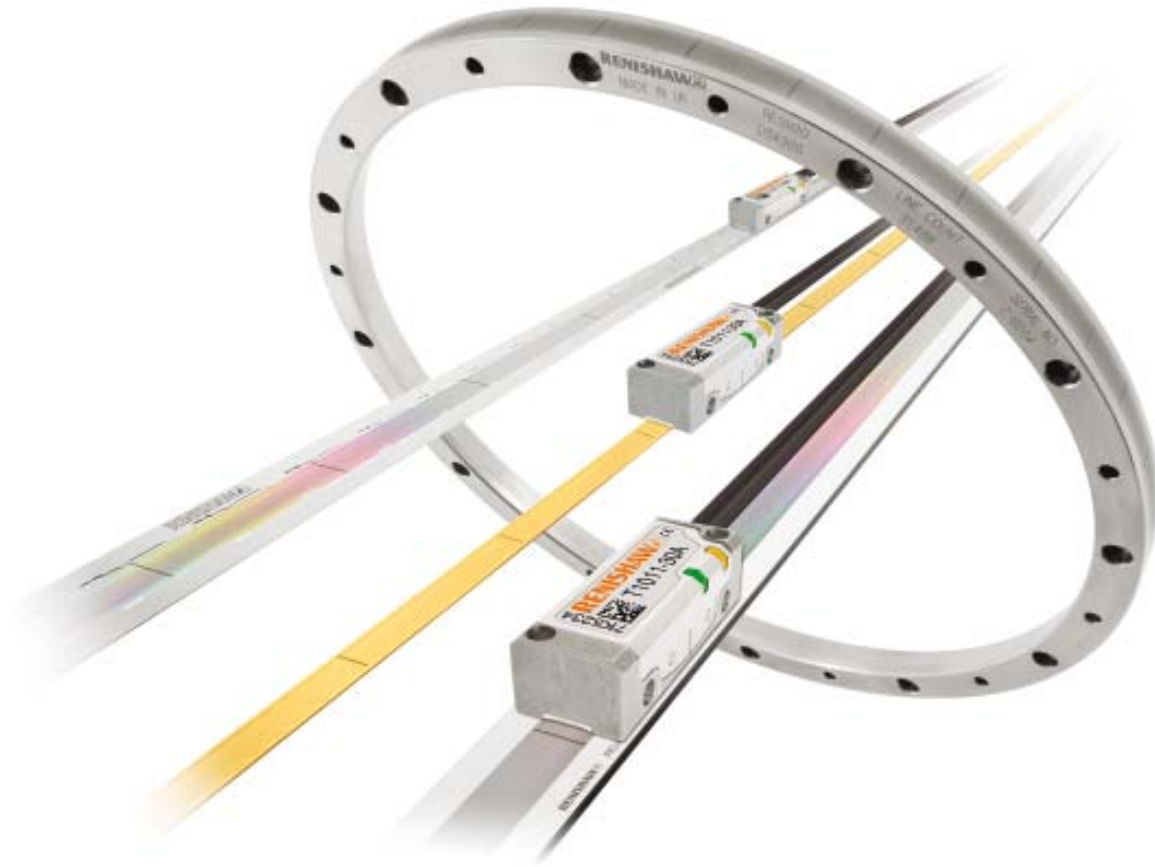
- PC-based, providing real-time set-up, calibration and diagnostics
- Full function DRO capability
- USB connection to SiGNUM Si interface
- Simultaneous multiple axis connectivity

Recommended minimum PC requirements for the software:

- USB1.1
- .NET Framework 1.1 (redistributable version included with the software)
- Microsoft® Windows®, Millennium edition (Me), XP or Windows® 7
- Microsoft® Internet Explorer 5.01 or later
- Pentium® II processor
- 128 MB RAM
- Screen resolution 800 × 600, 16-bit colors



## TONiC encoder system



Renishaw's TONiC series represents a new generation of super-compact encoders, designed for highly-dynamic precision motion systems, bringing higher accuracy, speed and greater reliability to a wide variety of demanding industry sectors.

The readhead is complemented by the latest evolution of RGSZ20 gold tape scale, REXM ultra-high accuracy angle encoder and *FASTRACK*/RTLC scale system with bi-directional optical *IN-TRAC* reference marks, in addition to established RSLM stainless steel scale, RELM high-accuracy ZeroMet scale and RESM rotary rings.

For ultimate reliability and high dirt immunity, TONiC readheads incorporate third-generation filtering optics, tuned for even lower noise (jitter), further enhanced by dynamic signal processing including Auto Gain Control and Auto Offset Control. The result is low sub-divisional error (SDE) giving smoother velocity control for improved scanning performance and increased positional stability.

TONiC readheads also feature a detachable analog or digital interface in the form of a robust, convenient connector that can be located up to 10 m from the readhead. The interface offers digital interpolation to 1 nm resolution, with clocked outputs for optimized speed performance at all resolutions for industry-standard controllers.

- Compact readhead (35 × 13.5 × 10 mm)
- Compatible with RGSZ20 gold tape scale, *FASTRACK*/RTLC scale system RSLM, RELM, RESM, RESD and REXM with customer-selectable *IN-TRAC* auto-phase optical reference mark (datum)
- Third-generation filtering optics optimized for even lower noise (jitter)
- Dynamic signal processing inside the readhead, provides ultra-low cyclic error of ±30 nm
- Auto Gain Control ensures consistent signal strength for long-term reliability
- Increased ride height tolerance and patented set-up LED for ease of installation
- Maximum speed to 10 m/s (3.24 m/s at 0.1 μm resolution)
- Detachable analog or digital connector with integral interpolation to 1 nm resolution (0.00075 arc seconds)
- Integral dual limits (linear only)
- Operating temperature to 70 °C
- Dual resolution version available

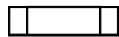
## System features

### Reference mark

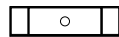
Form	<p><i>IN-TRAC</i> reference mark, directly in incremental track</p> <p>Refer to RGSZ, <i>FASTRACK</i>/RTLC, RELM, RSLM, RESM, RESD or REXM data sheets for reference mark location</p> <p>Bi-directionally repeatable across full speed and temperature range</p> <p>Electronically phased, requires no physical adjustment</p>
Selection	<p><b>T1xx0</b>: Single reference mark selection by magnetic actuator (A-9653-0143), customer-positioned</p> <p><b>T1xx1</b> and <b>T2xx1</b>: No selector required, all reference marks output</p>
Repeatability	Unit of resolution repeatability, over full operating temperature and speed

### Dual limit switches (linear systems only, not available on TD interfaces)

Form	<p>Magnetic actuators for P and Q limit switches</p> <p>10 mm P limit, North pole facing – A-9653-0138</p> <p>10 mm Q limit, South pole facing – A-9653-0139</p> <p>20 mm P limit, North pole facing – A-9653-0237</p> <p>20 mm Q limit, South pole facing – A-9653-0238</p> <p>50 mm P limit, North pole facing – A-9653-0235</p> <p>50 mm Q limit, South pole facing – A-9653-0236</p>
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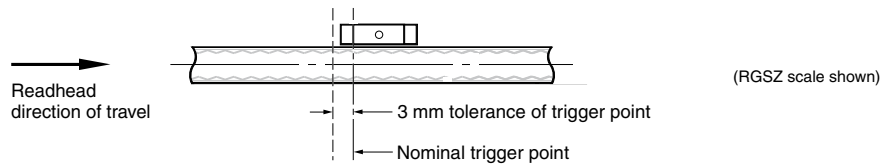
Typical P magnet



Typical Q magnet

Trigger point	Leading edge of magnet from direction of travel
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Trigger point tolerance



Mounting	Self-adhesive
Position	Customer-placed at desired locations
Repeatability	<0.1 mm

### Dynamic signal processing

- Real-time signal conditioning for optimized performance across a range of operating conditions
- Automatic Gain Control (AGC)
- Automatic Offset Control (AOC)
- Ultra-low cyclic error of  $\pm 30$  nm

### Calibration

- Simple calibration at the press of a button, no physical adjustment required
- Optimization of incremental and reference mark signals

### TD dual resolution interfaces

- Allows output to be switched between two resolutions
- NOTE:** It is recommended that movement should be halted before switching resolutions
- No limit outputs

## TONiC DOP (dual output) encoder system



Renishaw's TONiC series encoders are now available with simultaneous dual output interfacing.

The robust DOP interface can be situated up to 10 m from the TONiC readhead and offers simultaneous analog and digital outputs with interpolation to 1 nm resolution. Digital outputs are clocked for optimized speed performance at all resolutions for industry-standard controllers.

The readhead is complemented by the latest evolution of RGSZ20 gold tape scale, REXM ultra-high accuracy angle encoder and *FASTRACK*/RTL scale system with bi-directional optical *IN-TRAC* reference marks, in addition to established RSLM stainless steel scale, RELM high-accuracy ZeroMet scale and RESM rotary rings.

For ultimate reliability and high dirt immunity, TONiC readheads incorporate third-generation filtering optics, tuned for even lower noise (jitter), further enhanced by dynamic signal processing including Auto Gain Control and Auto Offset Control. The result is low sub-divisional error (SDE), giving smoother velocity control for improved scanning performance and increased positional stability.

- Compact readhead (35 × 13.5 × 10 mm)
- Detachable DOP interface with integral interpolation to 1 nm resolution (0.00075 arc seconds) and simultaneous digital and analog outputs
- Compatible with RGSZ20 gold tape scale, *FASTRACK*/RTL scale system, RSLM, RELM, RESM, RESD and REXM with customer-selectable *IN-TRAC* auto-phase optical reference mark (datum)
- Third-generation filtering optics optimized for even lower noise (jitter)
- Dynamic signal processing inside the readhead provides ultra-low cyclic error of ±30 nm
- Auto Gain Control ensures consistent signal strength for long-term reliability
- Increased ride height tolerance and patented set-up LED for ease of installation
- Maximum speed to 10 m/s (3.24 m/s at 0.1 μm resolution)
- Integral dual limits (linear only)
- Operating temperature to 70 °C

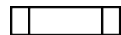
## System features

### Reference mark

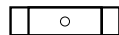
Form	<p><i>IN-TRAC</i> reference mark, directly in incremental track</p> <p>Refer to RGSZ, <i>FASTRACK</i>/RTLC, RELM, RSLM, RESM, RESD or REXM for reference mark location</p> <p>Bi-directionally repeatable across full speed and temperature range</p> <p>Electronically phased, requires no physical adjustment</p>
Selection	<p><b>T1xx0</b>: Single reference mark selection by magnetic actuator (A-9653-0143), customer-positioned</p> <p><b>T1xx1</b> and <b>T2xx1</b>: No selector required, all reference marks output</p>
Repeatability	Unit of resolution repeatability, over full operating temperature and speed

### Dual limit switches (linear systems only)

Form	<p>Magnetic actuators for P and Q limit switches</p> <p>10 mm P limit, North pole facing – A-9653-0138</p> <p>10 mm Q limit, South pole facing – A-9653-0139</p> <p>20 mm P limit, North pole facing – A-9653-0237</p> <p>20 mm Q limit, South pole facing – A-9653-0238</p> <p>50 mm P limit, North pole facing – A-9653-0235</p> <p>50 mm Q limit, South pole facing – A-9653-0236</p>
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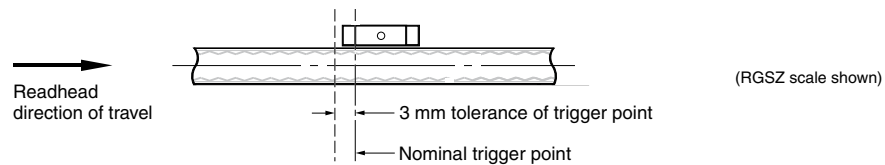
Typical P magnet



Typical Q magnet

Trigger point	Leading edge of magnet from direction of travel
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Trigger point tolerance



Mounting	Self-adhesive
Position	Customer-placed at desired locations
Repeatability	<0.1 mm

### Dynamic signal processing

- Real-time signal conditioning for optimized performance across a range of operating conditions
- Automatic Gain Control (AGC)
- Automatic Offset Control (AOC)
- Ultra-low cyclic error of  $\pm 30$  nm

### Calibration

- Simple calibration at the press of a button, no physical adjustment required
- Optimization of incremental and reference mark signals

## RGSZ20 gold scale



Renishaw's patented RGSZ20 20  $\mu\text{m}$  gold scale features customer-selectable optical *IN-TRAC* reference marks. Uniquely these are directly embedded into the incremental channel to enable electronic auto-phasing simply by pressing a button.

RGSZ20 scale is suitable for use with the new TONiC encoder, featuring dynamic signal processing, ultra-low cyclic error ( $\pm 30$  nm) and resolutions to 1 nm.

The scale is supplied with a specially formulated adhesive backing tape. Installation is quick, easy and suits both high-volume production and one-off field service installations.

To simplify customer inventory and maximize production flexibility, the scale can be supplied on a reel for 'cut-to-suit' convenience at the point of installation.

RGSZ20 is suitable for mounting to most common engineering materials including metals, granites, ceramics and composites, whilst the RGSZ20-P polyester-coated version has an increased resilience to solvent and lubricant attack.

The scale ends are rigidly fixed to the axis substrate by means of epoxy-fastened end clamps, eliminating the need to drill holes. Because the scale has a very small cross section, it is 'mastered' to the substrate and matches its thermal expansion. Differential movement between the scale and the substrate is close to zero, even throughout significant temperature swings.

- *IN-TRAC* optical reference marks embedded directly into the incremental channel
- Compatible with the new TONiC encoder system
- 'Cut-to-length' flexibility
- Lengths from 100 mm to over 50 m
- Protective lacquer or tough polyester coating option for applications using harsh solvents
- Quick and easy one-person installation
- Affixes to most common engineering materials
- Self-adhesive
- Dual limits provide end-of-travel indication
- Linearity of  $\pm 3$   $\mu\text{m}/\text{m}$ ;  $\pm 0.75$   $\mu\text{m}/60$  mm
- RGSN20 version is supplied without *IN-TRAC* reference marks



## Technical specifications

### Scale

<b>Type</b>	<p><b>RGSZ20-S:</b> High-stability gold-plated steel tape with protective polymer coating. Fitted with a self-adhesive backing tape.</p> <p><b>RGSZ20-T:</b> High-stability gold-plated steel tape with protective polymer coating. No self-adhesive backing tape.</p> <p><b>RGSZ20-P:</b> High-stability gold-plated steel tape with tough polyester coating for use in applications requiring resistance to harsh solvents. Fitted with a self-adhesive backing tape.</p> <p><b>RGSZ20-Q:</b> High-stability gold-plated steel tape with tough polyester coating for use in applications requiring resistance to harsh solvents. No self-adhesive backing tape.</p> <p><b>NOTE: RGSN20</b> variants of all above scales are manufactured without reference marks.</p>
<b>Scale pitch</b>	20 µm
<b>Linearity</b>	<p><b>RGSZ20-S</b> and <b>RGSZ20-T:</b> ±3 µm/m; ±0.75 µm/60 mm</p> <p><b>RGSZ20-P</b> and <b>RGSZ20-Q:</b> ±5 µm/m; ±1.5 µm/60 mm</p>
<b>Scale length</b>	100 mm to 50 m in 50 mm increments (>50 m by special order)
<b>Substrate materials</b>	Metals, ceramics and composites with expansion coefficients between 0 and 23 µm/m/°C (e.g. steel, aluminum, ZeroMet, granite, ceramic etc.)
<b>Expansion coefficient</b>	Matches that of substrate material with scale ends fixed by epoxy-mounted end clamps
<b>End fixing</b>	<p>Epoxy-mounted end clamps (A-9523-4015)</p> <p>Approved epoxy adhesive (A-9531-0342)</p> <p>Performance &lt;1 µm movement over temperature range -20 °C to 50 °C</p>
<b>Operating specification</b>	<p>Temperature: -10 to 120 °C (Scale only, also refer to readhead data sheet)</p> <p>Minimum installation temperature: 10 °C</p> <p>Humidity: 80% maximum RH (non-condensing)</p>

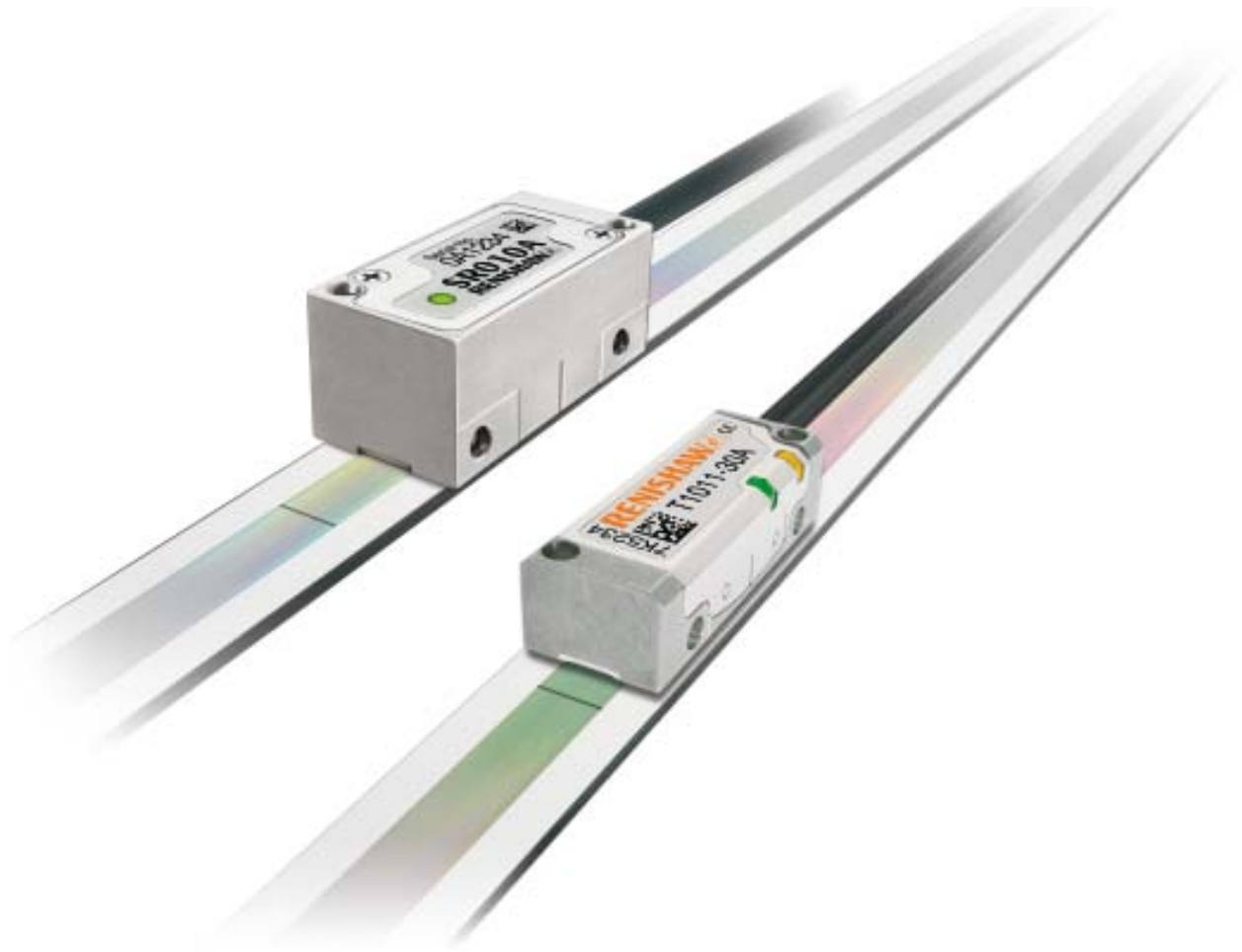
### Reference mark

<b>Type</b>	<p><i>IN-TRAC</i> reference mark, directly embedded into incremental track</p> <p>50 mm (nominal) spacing</p> <p>Bi-directional position repeatability</p>
<b>Selection</b>	Single reference mark selection by magnetic actuator (A-9653-0143), customer-positioned
<b>Repeatability</b>	Unit of resolution repeatability (bi-directional) across full system-rated speed and temperature ranges

### Limit switches

<b>Type</b>	Magnetic actuators; with dimple triggers Q limit, without dimple triggers P limit
<b>Trigger point</b>	The limit output is nominally asserted when the readhead limit switch sensor passes the limit magnet leading edge, but can trigger up to 3 mm before that edge
<b>Mounting</b>	Customer-placed at desired locations
<b>Repeatability</b>	<0.1 mm

## RELM linear ZeroMet scale



RELM high-accuracy scale is compatible with Renishaw's new TONiC encoder system and established SiGNUM range of high-performance encoders, featuring the *IN-TRAC* auto-phase optical reference mark.

RELM offers the highest accuracy of any 20 µm pitch encoder system available today, combined with low thermal expansion ZeroMet to suit the most demanding precision applications. The high performance of the scale is backed up by Renishaw's TONiC and SiGNUM SR and Si encoder systems, offering ±30 nm cyclic error and digital resolution to 1 nm.

RELM offers dirt immunity and ease of set-up, whilst offering levels of performance previously only available from delicate fine pitch systems.

RELM is easy to design into most applications, due to the flexible mounting methods, integral set-up LEDs and optional SiGNUM software.

### System features

- *IN-TRAC* bi-directional auto-phase optical reference mark.
- High accuracy, certified to ±1 µm, calibrated against International Standards.
- Dynamic signal processing offers cyclic error of ±30 nm and helps to maintain optimum signal strength.
- Resolution to 1 nm.
- Robust ZeroMet offers ~0.6 µm/m°C (0 °C to 30 °C) thermal expansion plus ease of handling and installation.
- Dual limits provide on-scale end-of-travel indication.
- Speeds up to 12.5 m/s.
- Integral set-up indicator LEDs and SiGNUM software allow quick, easy set-up and real-time system diagnostics.
- Scale mounting with self-adhesive or clips and clamps.

## RSLM linear stainless steel scale



### System features

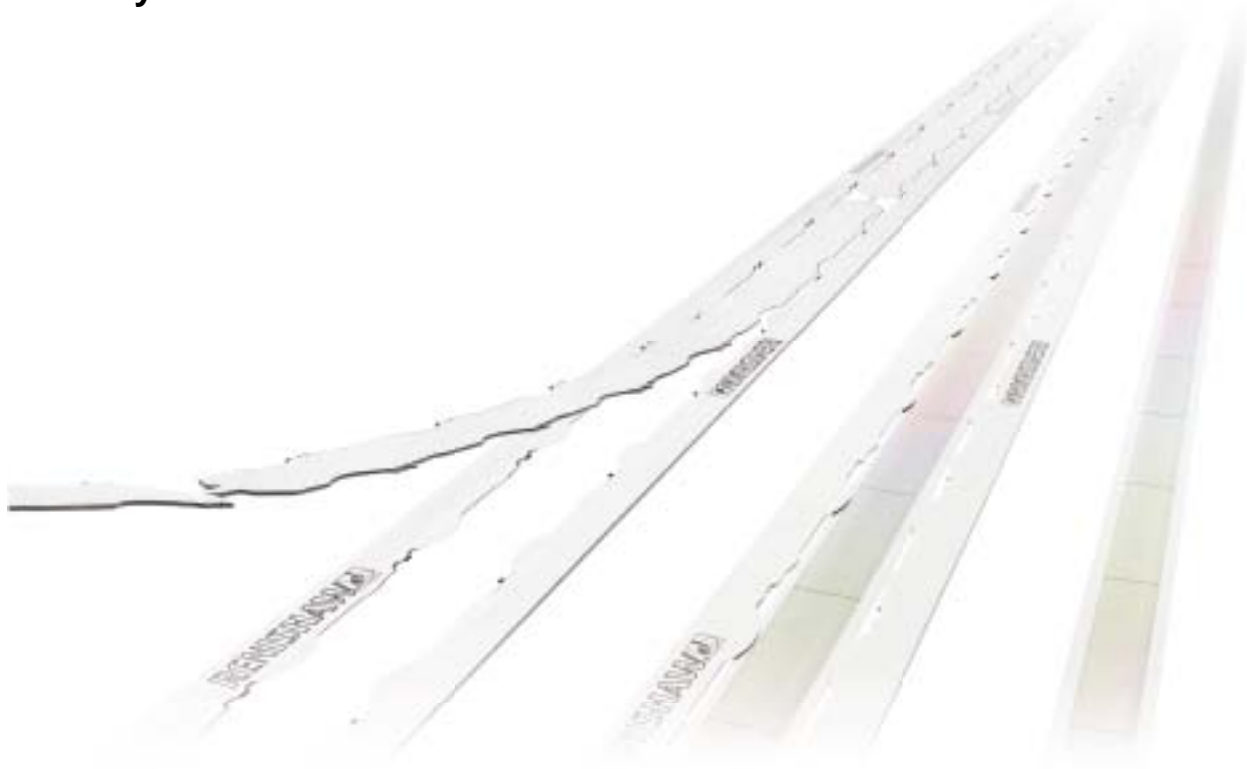
- Total accuracy of  $\pm 4 \mu\text{m}$  over 5 m
- Available in defined lengths up to 5 m
- Coilable for simple storage and handling
- *IN-TRAC* auto-phase optical reference mark
- Robust special composition stainless steel with defined coefficient of thermal expansion  $10.8 \mu\text{m}/\text{m}/^\circ\text{C}$
- Dynamic signal processing offers cyclic error of  $\pm 30 \text{ nm}$  and helps to maintain optimum signal strength
- Dual limits provide on-scale end-of-travel indication
  - Resolution to 1 nm
  - Speeds up to 12.5 m/s.
  - Integral set-up LEDs and SiGNUM software allow quick, easy set-up and real-time system diagnostics

RSLM high-accuracy stainless steel scale is compatible with Renishaw's TONiC encoder system in addition to the established SiGNUM range, both offering advanced features including dynamic signal processing and the *IN-TRAC* optical reference mark.

RSLM scale is available in lengths up to 5 m with an overall accuracy better than  $\pm 4 \mu\text{m}$  on 5 m lengths – an industry first! Combined with readheads featuring ultra-low cyclic error ( $\pm 30 \text{ nm}$ ), unique filtering optics, resolution to 1 nm and simple installation and set-up, RSLM provides all the performance of a fine pitch system with the benefits of a  $20 \mu\text{m}$  encoder.

RSLM offers the ease of use of a tape scale yet the performance of a glass spar; the scale can be coiled for simple storage and handling yet behaves as a spar once uncoiled. Available with a number of *IN-TRAC* reference mark options and a choice of mechanical or adhesive mounting, RSLM is perfect for long-travel applications where metrology cannot be compromised.

## **FASTRACK and RTALC-S high-accuracy incremental linear encoder scale system**



*FASTRACK* is a revolutionary track-mounted linear encoder scale system from Renishaw that combines  $\pm 5 \mu\text{m/m}$  accuracy, with the ruggedness of stainless steel, and the quick and easy installation of a carrier-type encoder system.

Designed for applications that demand high-accuracy and easily removable scale, the *FASTRACK* scale system consists of two miniature, yet rugged, guide rails. These securely retain Renishaw's new low-profile scales and allow them to freely expand at their own thermal expansion coefficient with almost zero hysteresis.

If damaged, the scale can be pulled out of the guide rails and quickly replaced, even where access is limited, thus reducing machine downtime. This feature also makes the new linear encoder system ideal for large machines that need to be sectioned for transportation.

Forming part of a modular solution, *FASTRACK* can be used with either Renishaw's RTALC incremental scale and super-compact TONiC readhead, or the new RESOLUTE linear absolute encoder and RTLA absolute scale. In both cases, the encoders feature advanced optoelectronics conferring resolutions to 1 nm, low sub-divisional error (SDE) and very low jitter for smoother velocity control and rock-solid positional stability.

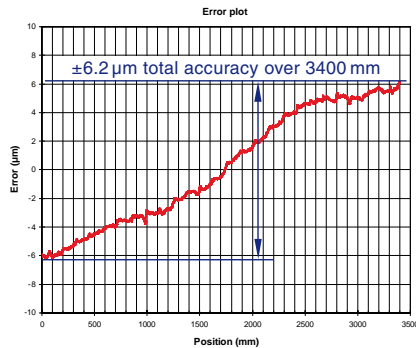
The *FASTRACK* linear encoder scale system is suitable for many applications, such as FPD manufacturing machines, linear motors with aluminum substrates, P-V manufacturing, axes that are exposed to potential damage, large CMMs and other machines that require the scale to be installed/removed for transit, or simply for any application where thermal expansion of the scale must be independent of the machine structure.

- High-accuracy ( $\pm 5 \mu\text{m/m}$ ) RTALC and RTLA scale. Further improvement possible with error correction
- Incremental and absolute versions
- Compatible with TONiC and RESOLUTE readheads
- RTALC/RTLA scale expands at its own low thermal coefficient ( $\alpha = 10.6 \mu\text{m/m}^\circ\text{C}$ )
- Very low hysteresis between scale and *FASTRACK*
- *FASTRACK* guide rails are pre-aligned in reels for cut-to-suit flexibility
- Quick installation and fast scale replacement, even with limited access
- Scale can be locked to the substrate at a single datum point anywhere along the axis
- RTALC/RTLA scale can bridge gaps in the substrate up to 25 mm
- High solvent immunity

### **RTALC-S and RTLA-S self-adhesive versions**

RTALC and RTLA scales are also available with self-adhesive backing for use without *FASTRACK*, in lengths up to 5 m for applications requiring high accuracy with a narrower overall scale installation. These scales, known as RTALC-S and RTLA-S, also benefit from defined, independent thermal expansion coefficient.

## System features



Example accuracy test result of 3400 mm length of RTLC scale

### High-accuracy RTLC and RTLA scale

- Incremental and absolute versions
- $\pm 5 \mu\text{m}/\text{m}$  accuracy @  $20^\circ\text{C}$ , including slope and linearity. Further improvement possible with error correction
- Hardened stainless steel construction is rugged and reliable, with high scratch and solvent resistance
- Independent expansion coefficient ( $\alpha = 10.6 \mu\text{m}/\text{m}/^\circ\text{C}$ )
- Very low hysteresis: sub-micron on a center-clamped 2 m axis over the entire operating temperature range, for example
- 20  $\mu\text{m}$  incremental or 30  $\mu\text{m}$  absolute graduations
- Incremental version features optical *IN-TRAC* reference marks every 200 mm (on scale lengths over 1 m) or every 50 mm (on scale lengths 1 m or less); identify one or more using the reference mark selector magnet(s)
- Scale can be cut to length using a guillotine, for easy customization

### RTLC version is compatible with TONiC readheads

- Filtering optics and Auto Gain Control for high reliability and solid Lissajous signals
- Dynamic signal processing ensures ultra-low SDE of just  $\pm 30 \text{ nm}$ . Result: smoother scanning performance
- High signal-to-noise ratio provides ultra-low jitter (to 0.5 nm RMS) for optimum positional stability
- CAL button enables auto-phasing of *IN-TRAC* reference mark
- Analog outputs or digital resolutions to 1 nm and maximum speed to 10 m/s
- Clocked outputs ensure optimized speed performance for all resolutions, for a wide variety of industry-standard controllers
- DOP Dual output interfaces available to provide simultaneous analog and digital outputs



### Compatible with RESOLUTE readheads

- True absolute optical encoder: absolute position is determined immediately upon switch-on, eliminating reference returns
- Unique single track 30  $\mu\text{m}$  pitch optical scale combines absolute position and incremental phase information into one code
- Resolution to 1 nm
- Low Sub-Divisional Error (SDE =  $\pm 40 \text{ nm}$ ) and low jitter (to 7 nm RMS) for smoother velocity control and rock-solid positional stability
- 100 m/s maximum speed for all resolutions!
- Wide set-up tolerances:  $\pm 150 \mu\text{m}$  ride height,  $\pm 0.5^\circ$  yaw, pitch and roll

## RESM angle encoder scale



The RESM is a one-piece stainless steel ring with 20 µm scale marked directly onto the periphery, featuring the *IN-TRAC* auto-phase optical reference mark.

The RESM offers impressive accuracy with resolution to 0.00075 arc second, suiting the most demanding precision applications.

Read by Renishaw's new TONiC and established SiGNUM encoder systems, it has high tolerance to dirt, scratches and greasy fingerprints that can cause other encoder systems to miscount.

The low profile RESM, with large internal diameter, is easy to design into most installations. Equally important, its low mass, low inertia design does not compromise system performance. Available in a wide range of sizes and line counts, providing compatibility with industry-standard controllers.

### System features

- Compatible with the new TONiC encoder range and the established SiGNUM system to offer industry-standard analog or digital incremental outputs
- *IN-TRAC* bi-directional optical reference mark
- High-speed operation, up to 4,591 rev/min (12.5 m/s)
- Graduation accuracy to ±0.5 arc second (550 mm ring)
- Low-noise analog 1 Vpp version
- New high-resolution, 2 nm and 1 nm digital versions (TONiC only)
- Angular resolution to 0.00075 arc second
- System repeatability to 0.00225 arc second
- Patented taper mount simplifies integration and minimizes installation errors
- Large internal diameter for ease of integration
- Available in sizes from Ø52 mm to Ø550 mm with line counts from 8,192 to 86,400
- Custom sizes also available
- Low mass and low inertia
- Ultra-low inertia versions also available
- Integral set-up LED on readhead for quick set-up and instant 'health check' at any time
- Dual limits (SiGNUM only)

## RESD distance-coded scale



The RESD is a one-piece stainless steel ring with 20 µm scale marked directly onto the periphery, featuring distance-coded *IN-TRAC* auto-phase optical reference marks.

Distance-coded reference marks are spaced at defined unique intervals, allowing a controller to calculate absolute position with only a small movement of the axis. The RESD offers impressive accuracy with resolution to 0.001 arc second, suiting the most demanding precision applications.

Read by Renishaw's TONiC encoder system, it has high tolerance to dirt, scratches and greasy fingerprints that can cause other encoder systems to miscount.

The low profile RESD, with large internal diameter, is easy to design into most installations. Equally important, its low mass, low inertia design does not compromise system performance. RESD is available in a range of sizes and line counts, providing compatibility with industry standard controllers.

### System features

- Compatible with the TONiC T20x1 encoder system offering industry-standard analog or digital incremental outputs
- Distance code *IN-TRAC* bi-directional optical reference marks allow absolute position to be calculated after a small movement
- High-speed operation, up to 3,672 rev/min (10 m/s)
- Graduation accuracy to ±0.99 arc second (209 mm ring)
- New high-resolution, 2 nm and 1 nm digital versions
- Angular resolution to 0.002 arc second
- System repeatability to 0.003 arc second
- Patented taper mount simplifies integration and minimizes installation errors
- Large internal diameter enables easy design-in
- Available in sizes from Ø52 mm to Ø209 mm with line counts from 8,192 to 32,768
- Custom sizes and very large diameters also available
- Low mass and low inertia
- Integral set-up LED on readhead for quick set-up and instant 'health check' at any time
- True absolute encoders also available from Renishaw. Please contact your local representative for details.

## REXM/REXT ultra-high accuracy angle encoder



With zero coupling losses and exceptional repeatability, the REXM/REXT ultra-high accuracy angle encoder achieves better than  $\pm 1$  arc second total installed accuracy.

Like the RESM encoder, the REXM/REXT is a stainless steel ring with the scale graduations marked axially onto the periphery, but with a number of differences to improve upon RESM's already impressive accuracy.

REXM/REXT has a thicker cross section, to ensure that the only significant installation error is eccentricity. Eccentricity is easily removed using two readheads, either with Renishaw's **DSi** (Dual Signal interface), or by combining the signals inside the host controller. The only errors remaining are graduation errors and readhead SDE, both of which are so small they are often negligible.

As a non-contact encoder, REXM/REXT offers dynamic performance advantages, eliminating coupling losses, oscillation, shaft torsion and other hysteresis errors that plague enclosed encoders.

Combining two readheads is easy with the **DSi**, which also offers an angularly repeatable reference position (*propoZ*™) which is unaffected by bearing wander or power cycling.

The REXM/REXT system operates at temperatures up to  $+85$  °C (SiGNUM) and speeds to 4500 rev/min.

REXM/REXT total installed accuracy grades:

REXM/REXT diameter	Total installed accuracy
$\geq 100$ mm	$\pm 1$ arc second
75 mm	$\pm 1.5$ arc second
$\leq 57$ mm	$\pm 2$ arc second

Designed for axes that are limited to partial rotation, REXT rings have two reference marks, oriented diametrically opposed, for use with partial arc versions of DSi. DSi processes these reference marks to give a single, angularly-repeatable *propoZ* reference output.

- Use with two SiGNUM or TONiC encoders, combined with **DSi** to give ultra-high accuracy
- Installed accuracy to  $\pm 1$  arc second with dual readheads
- Sub-divisional error to  $\pm 0.03$  arc second
- Resolutions to 0.001 arc second
- Repeatability to 0.003 arc second
- Wide range of standard sizes from 52 mm to 417 mm
- Large internal diameter for ease of integration
- Flange-mounted with easy 4-point adjustment method
- Angularly repeatable *propoZ* reference position is unaffected by bearing wander or power cycling



## Optical encoder accessories and custom solutions



Scale applicator kits and applicators ensure the easiest, most precise installation for all readhead types.



Magnetic reference mark actuators are required to produce a repeatable home position for all RG2/4 readheads. Limit switch actuators (end-of-travel output) are available in various lengths and types.



Various end clamps for RGS scale.



The RGH22 ribbon cable variant features an integral connector for standard ribbon cable.



3 axis digital readout for resolutions to 0.1  $\mu\text{m}$  and maximum input frequency of 10 MHz.



The magnetic track system is designed for use with longer axes on which the scale requires occasional re-installation. Standard RGS scale is held magnetically in an aluminum extrusion.



Assembled extension cables, bulk cable and connectors to suit all system combinations.



Very long axes present some unique challenges, often requiring a method of maintaining readhead installation tolerance or the ability to read across gaps in the scale. The sprung wheeled guide and dual readhead interface offer practical solutions.



Swipe blocks enable a functional test of readheads without having to install a complete axis.



Not all application needs can be met with standard products. Often a custom solution is necessary, so talk to us about your requirements; anything from a special connector to a purpose designed angle encoder ring.

*To provide complete solutions for optical linear and angle encoders a full range of accessories is available, from reference mark actuators to digital readouts. Renishaw is committed to providing position feedback solutions to satisfy customer specific requirements, such as custom angle encoder diameters and cross sections. Please contact Renishaw for further information on how we can meet your specific requirements.*

## Magnetic encoder overview

### OnAxis™ encoder ICs

AM4096, AM256, AM512B, AM8192B and AM8192B1



### OnAxis encoder modules

RMB20, RMB28, RMB30 and RMF44



### Rotary encoders

RM22, RM36, RM44, RE22, RE36 and RE58



### Linear encoders

LM10, LM15 and magnetic scales MS



### Ring encoders

LM13 and rings



### Accessories

Magnets, magnet actuators, reference marks and USB interfaces



## Rotary magnetic encoders

Based on the proven OnAxis Hall sensor technology, a range of incremental and absolute encoder solutions are produced for use in harsh environments. There are many housing options available for use in a wide range of applications including automotive, industrial, medical and marine. Custom designs can also be offered where needed to match specific design requirements.



OnAxis – The IC senses the angular position of a permanent magnet placed above it. The sine and cosine signals produced are then converted to absolute angle position data with a fast flash interpolator.



The sensor chip can be used directly on a circuit board or packaged into a protective housing.



The ability of the encoder to operate with a gap between the magnetic actuator and the encoder chip allows its incorporation into designs that need isolation of the moving elements.



Standard interface flanges with bearing/shafts can be provided for easy integration to existing designs.



### Why rotary magnetic?

- Resolutions to 13 bit (8,192 cpr)
- High-speed operation to 60,000 rpm
- Non-contact, frictionless design
- Excellent dirt immunity to IP68
- Operational temperature from -40 °C to +125 °C
- Industry standard absolute, incremental and analog output formats
- Accuracy to  $\pm 0.2^\circ$
- Simple installation – with self-locating design

### Optional 58 mm mounting flanges



## RM08 / RE08 incremental and SSI encoder

### RM08



### RE08



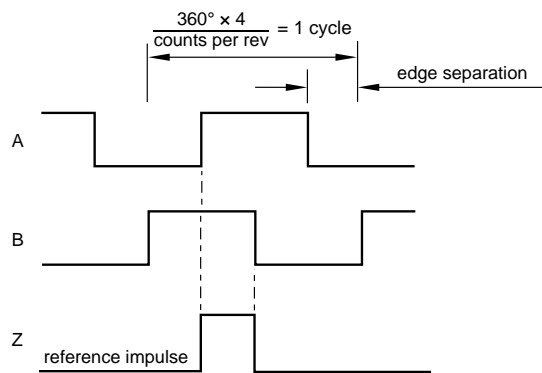
### Features

- Super-small size 8 mm encoder
- 5V power supply version
- Non-contact
- High-speed operation to 60,000 rpm
- Protection grade IP68
- Incremental resolution up to 4096 cpr
- SSI output up to 12 bit
- Accuracy to  $\pm 0.3^\circ$
- RoHS compliant (lead free)
- For limited space application

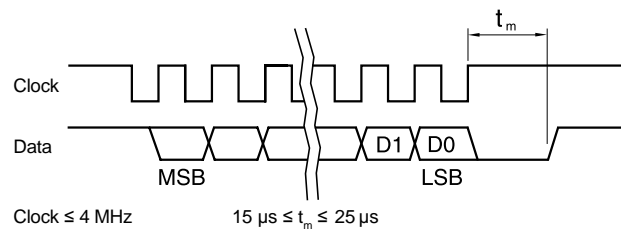
## Technical specifications

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	26 mA typical
Incremental output	Resolution up to 4096 cpr Signals: A, B, Z
SSI output	Resolution up to 12 bit Signals: Serial data, Clock
Temperature	Operating $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$ Storage $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

### Timing diagram for incremental outputs

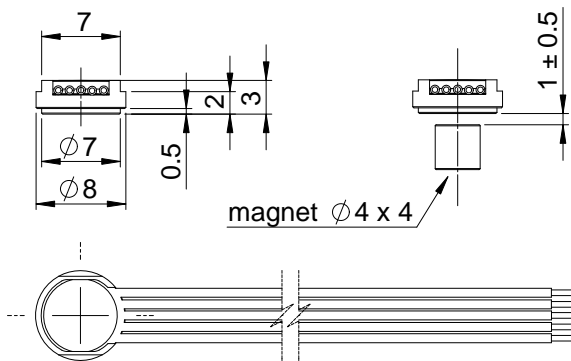


### Timing diagram for SSI

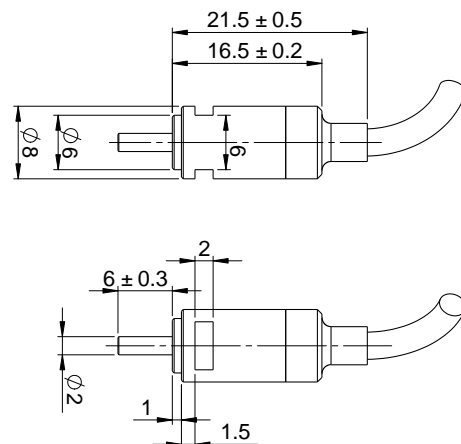


## RM08 / RE08 dimensions

### RM08



### RE08



Dimensions and tolerances in mm

## NEW! Wrap-up incremental rotary encoder for large diameters



### Features

- For external diameter installation
- Full circle measurement
- Spring-supported magnetized scale with built-in tensioning mechanism
- Substrate thermal expansion compensation
- Excellent dirt and moisture immunity
- Wrap-around diameter from 250 mm to 1,500 mm
- Large diameter tolerance  $\pm 0.5$  mm
- Resolution to 0.1 arc sec at 1 m diameter
- Maximum rotational speed 560 rpm at 1 m diameter
- Accuracy  $\pm 0.01^\circ$  ( $\pm 36$  arc sec) at 1 m diameter
- Wide temperature range from  $-20^\circ\text{C}$  to  $+85^\circ\text{C}$
- Single, periodic or distance coded reference mark
- Compatible with LM10, LM13 and LM15 readheads

### Applications

Wind turbine



Radio telescope



Medical scanning



Robots on assembly line



## Technical specifications

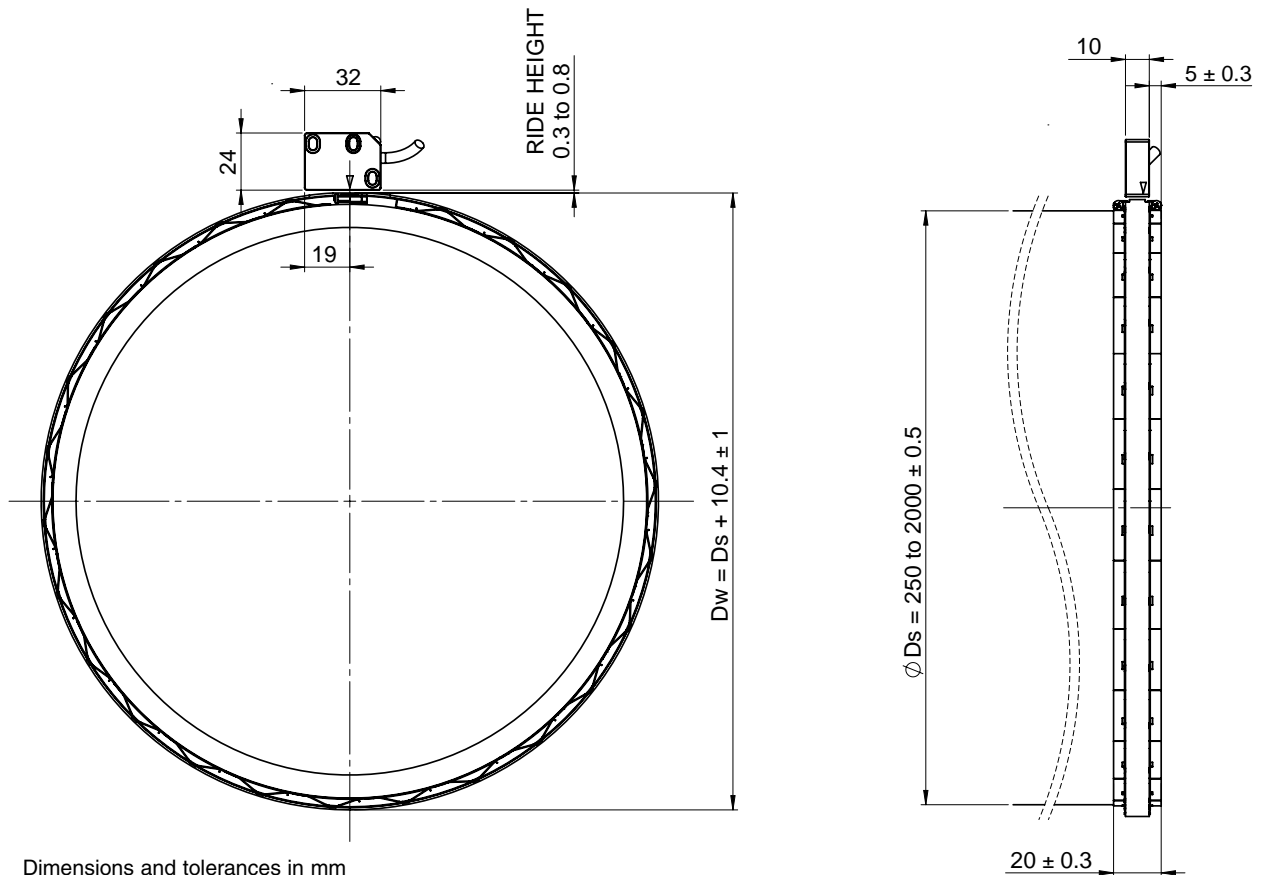
Readhead type	LM10, LM13	LM15
Acceptable substrate diameter	250 mm – 1500 mm	
Number of poles N (approx)	$N = Dw \times \pi / 2 *$	$N = Dw \times \pi / 5 *$
Resolution (max)	cpr = $2000 \times N$	
Measuring tape accuracy**	$\pm 40 \mu\text{m/m}$	
Hysteresis	$< 3 \mu\text{m}$ at 0.5 mm ride height	$< 15 \mu\text{m}$ at 2 mm ride height
Reference mark	Single, periodic, or distance coded***	
Maximum permissible speed (mechanical limit)	rpm = $1800 / (\pi \times Dw / 1000)$	
Operating temperature	from $-20 \text{ }^\circ\text{C}$ to $+85 \text{ }^\circ\text{C}$	
Storage temperature	from $-40 \text{ }^\circ\text{C}$ to $+85 \text{ }^\circ\text{C}$	

\* Dw is outside diameter of assembled tape in mm (see drawing below)

\*\* Accuracy does not include influence of eccentricity and/or circularity of substrate

\*\*\* Basic increment of distance coded reference depends on selected diameter

## Wrap-up dimensions



Dimensions and tolerances in mm

## NEW! AksIM™ off-axis absolute rotary encoder



### Features

- True absolute
- Single track
- Resolution to 18 bits
- No hysteresis
- Non-contact
- High speed
- Low profile
- Custom ASIC-based magnetic sensor
- Built-in self-monitoring
- Integrated status LED
- CAN, SSI, SPI, I<sup>2</sup>C, PWM or analog communication interface
- Corrosion-resistant magnetic ring
- Protection degree IP67

### Applications

Robotic arm joints



Pan/tilt positioning



Precise gearbox



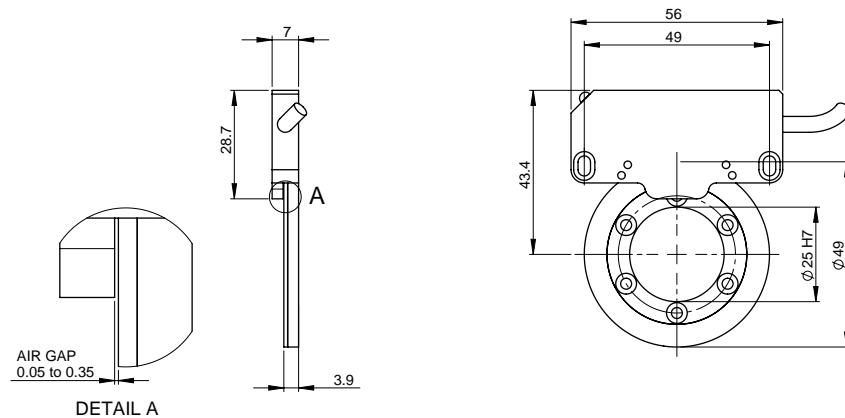


## Technical specifications

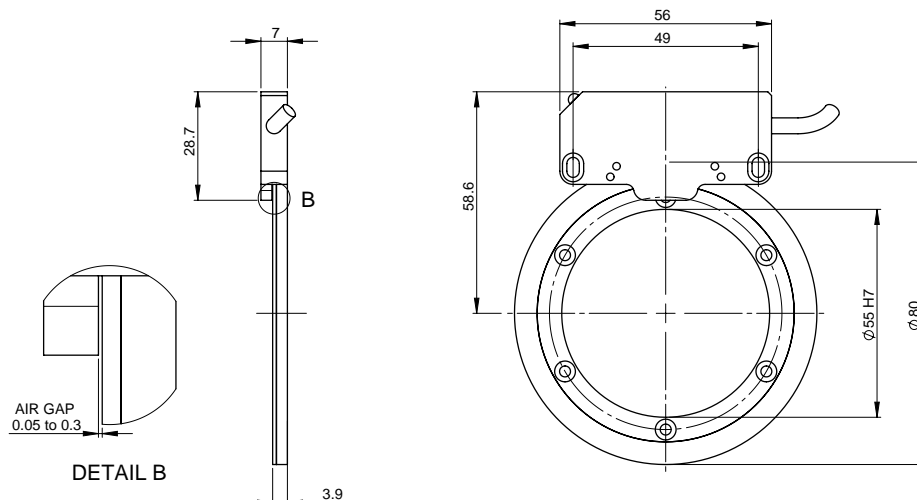
<b>System data</b>	<b>Ring sizes</b>	Type 7 – 49 mm outer diameter, 25 mm inner diameter, holes on the inside
		Type 8 – 80 mm outer diameter, 55 mm inner diameter, holes on the inside
	<b>Maximum speed</b>	> 10,000 rpm
	<b>System accuracy</b>	±15 mdeg (±54 arcsec)
	<b>Hysteresis</b>	0 µm
<b>Electrical data</b>	<b>Supply voltage</b>	5 V ±10%, other voltages on request
	<b>Current draw</b>	Max. 150 mA
<b>Mechanical data</b>	<b>Materials</b>	Ring      Stainless steel based ring (AISI 416)
		Readhead    Aluminum
	<b>Ride height</b>	0.05 mm – 0.30 mm
<b>Environmental data</b>	<b>Operating temperature</b>	-40 °C to +85 °C (-40 °F to +185 °F)
	<b>Protection</b>	IP67

## Dimensions

### Ring type 7



### Ring type 8



Dimensions and tolerances in mm

## Linear magnetic encoders

The linear encoder range is based on the magnetoresistive sensing principle. The readhead detects the magnetic signature of the magnetized scale as it moves over it. The analog signals are then processed to produce a range of digital resolutions to 1  $\mu\text{m}$ . The system is suitable for linear and partial arc applications.



Sine and cosine signals are produced as the sensor moves along the scale. These analog signals can then be interpolated internally to produce a range of resolutions to 1  $\mu\text{m}$ .



The system is easy to install with a set-up LED on the readhead and an applicator tool for the tape scale.



A stick-on reference mark can be easily installed at the required position using the provided tool. Alternatively, the reference mark can be ordered at a set position within the scale.



The scale can be supplied on a reel or cut to a specific length. A stainless steel cover strip can be provided to protect the scale.

### Why linear magnetic?

- Selectable resolutions from 250  $\mu\text{m}$  to 1  $\mu\text{m}$
- High-speed operation
- Excellent dirt immunity to IP68
- Stick-on reference mark
- Integral set-up LED
- Axis lengths of up to 100 m
- Industry standard digital and analog output options



## NEW! LMA10 absolute linear magnetic encoder system



### Features

- True absolute system
- Suitable for high bandwidth control loops
- System accuracy  $\pm 40 \mu\text{m/m}$
- Resolutions to  $0.244 \mu\text{m}$
- Lengths up to 16.2 m
- Speeds up to 7 m/s at  $0.977 \mu\text{m}$  resolution
- Integral status LED
- BiSS-C unidirectional communication protocol
- Simple and fast installation
- Excellent degree of protection to IP68
- Double-shielded, drag-chain compatible cable
- For limited space application
- Built-in diagnostic system
  - Error output if position data is not valid
  - Warning output if operation is close to limits

### Applications

SMT pick and place



Printing technology



Machine tools



Assembly lines



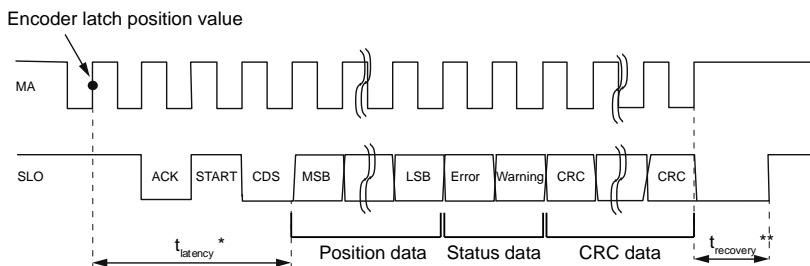
Medical



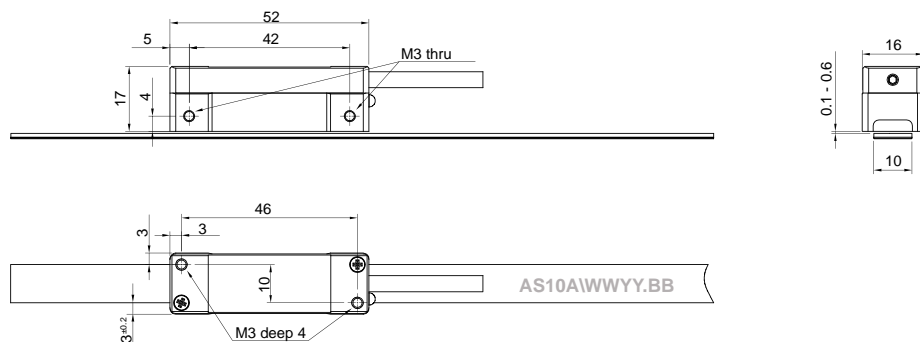
## Technical specifications

System data		Environmental data	
Incremental pole length	2 mm	Temperature	Operating 0 °C to +55 °C Storage -20 °C to +85 °C
Maximum scale length	16.2 m	Vibration (55 Hz to 2000 Hz)	300 m/s <sup>2</sup> (IEC 60068-2-6)
System accuracy	±40 µm/m	Shock (11 ms)	300 m/s <sup>2</sup> (IEC 60068-2-27)
Short range accuracy	< ±10 µm/10 mm	Humidity	100% (condensation permitted)
Hysteresis	< 1 µm (at 0.1 mm ride height)	EMC immunity	IEC 61000-6-2 (particularly: ESD: IEC 61000-4-2; EM fields: IEC 61000-4-3; Burst: IEC 61000-4-4; Surge: IEC 61000-4-5; Conducted disturbances: IEC 61000-4-6; Power frequency magnetics fields: IEC 61000-4-8; Pulse magnetic fields: IEC 61000-4-9)
Unidirectional repeatability	Unit of resolution	EMC emission	IEC 61000-6-4 (for industrial, scientific and medical equipment: IEC 55011)
Available resolutions	0.244 µm 0.488 µm 0.976 µm 1.953 µm	Environmental sealing	IP68 (according to IEC 60529)
Maximum traverse velocity	1.75 m/s 3.5 m/s 7 m/s 14 m/s	<b>Communication protocol – BiSS-C unidirectional</b>	
Maximum velocity during power on	0.5 m/s	Type of interface	BiSS-C unidirectional (point to point)
Electrical data		Signal level	RS422
Power supply	5 V ±5%	Maximum MA frequency	5 MHz
Set-up time after switch-on	< 50 ms	Length of position data	26 bit
Power consumption (without any load)	< 250 mA	Length of status data	2 bit (Error 1 bit; Warning 1 bit)
Mechanical data		Length of CRC	6 bits, MSB first, transmitted inverted. Generator polynomial: $x^6 + x + 1$
Mass	Readhead (with 1 m cable, no connector) 41 g, magnetic scale 60 g/m	Position data encoding	Pure binary
Cable	PUR high-flexibility cable, drag-chain compatible, double-shielded 8 × 0.05 mm <sup>2</sup> ; durability: 20 million cycles at 20 mm dynamic bend radius	Latency time *	< 1 µs at 5 MHz MA frequency
		Recovery time **	< 5 µs

## Timing diagram



## LMA dimensions



Dimensions and tolerances in mm

## Magnetic ring encoders

The ring encoder system consists of a compact readhead and a magnetized ring. As the ring rotates, the readhead detects the magnetic signature of the ring and processes these signals to the required output.



The LM13 features a compact sealed readhead that rides at up to 1.5 mm from the ring's surface. Simple to install, the LM13 features an integral set-up LED.



Integral bidirectional reference mark.



We offer a range of standard ring sizes for easy system integration.

### Why magnetic ring?

- Resolutions from 1,280 to 327,680 cpr
- High-speed operation to 25,000 rpm
- Excellent dirt immunity to IP68
- Integral set-up LED
- Industry standard digital output options



## RoLin component level magnetic encoder

RoLin is a component level encoder consisting of an RLM readhead and MS magnetic scale or MR ring. It has been designed for embedded motion control applications as a position control loop feedback element.



**Dimensions:** 12 × 5 × 11 mm  
**Mass:** 1.4 g (without flex)



The position information is output in incremental quadrature format with the option of a periodic reference mark (every pole) or a unique reference mark.

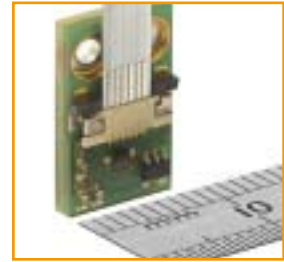


A wide range of resolutions is available: for linear applications from 0.244 μm, for ring applications up to 753,664 cpr. The maximum traverse velocity depends on the chosen resolution and minimum edge separation time, to 4 m/s at 1 μm and to 40 m/s at 10 μm.



Pin / flex options available.

## NEW! RLB incremental encoder module



### Features

- Miniature dimensions
- For rotary and linear measurement
- Incremental quadrature TTL output signals A, B, Z
- Periodic, bidirectional reference
- Accuracy to  $\pm 40 \mu\text{m}$
- Resolution from  $0.244 \mu\text{m}$  for linear
- Speed up to  $4.16 \text{ m/s}$  at  $1 \mu\text{m}$  resolution and  $0.12 \mu\text{s}$  edge separation
- Zif flat flex connection
- RoHS compliant

### Applications

Medical



Printing technology



Security cameras



Robots on assembly line



UAV

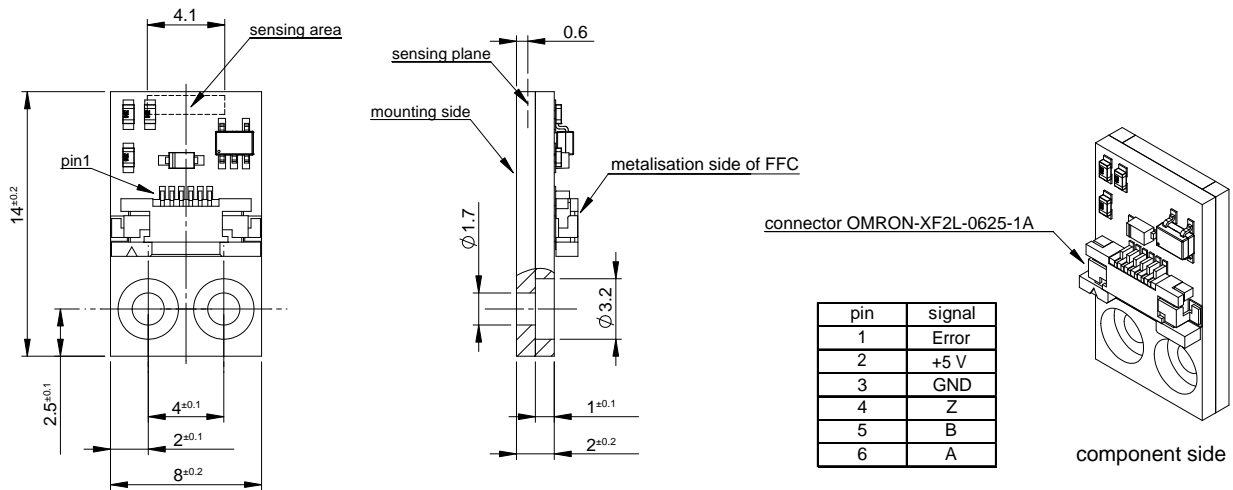


## Technical specifications

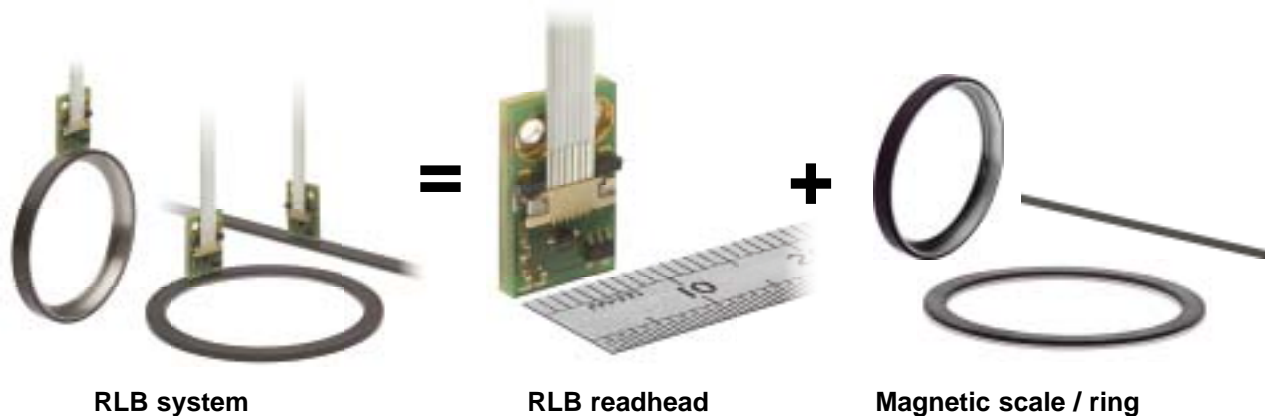
<b>System data</b>	Incremental pole length	2 mm	
	Hysteresis	< 3 $\mu\text{m}$ (at 0.2 mm ride height)	
	Unidirectional repeatability	< 2 $\mu\text{m}$	
<b>Electrical data</b>	Power supply	5 V $\pm$ 0.25 V	
	Saturation voltage hi (I = -4 mA)	Vdd - 0.4 V	
	Saturation voltage lo (I = 4 mA)	0.4 V	
	Power consumption (without any load)	< 25 mA	
	Rise and fall time (CL = 50 pF)	60 ns	
<b>Mechanical data</b>	Weight of module	0.5 g	
<b>Environmental data</b>	Temperature	Operating	-20 °C to +85 °C
		Storage	-40 °C to +85 °C
	Vibrations (55 Hz to 2000 Hz)	300 m/s <sup>2</sup> (IEC 60068-2-6)	
	Shocks (11 ms)	300 m/s <sup>2</sup> (IEC 60068-2-27)	

Available resolutions	Maximum traverse velocity
0.244 $\mu\text{m}$	1.01 m/s
0.488 $\mu\text{m}$	2.02 m/s
1 $\mu\text{m}$	4.16 m/s
2 $\mu\text{m}$	8.32 m/s
5 $\mu\text{m}$	20.80 m/s
10 $\mu\text{m}$	40 m/s
20 $\mu\text{m}$	40 m/s
50 $\mu\text{m}$	26 m/s

## Dimensions



## System configuration





## Interferometric feedback solutions

The RLE system is a unique, advanced homodyne laser interferometer system, specifically designed for position feedback applications.

Simple system architecture reduces hardware requirements to an RLU laser unit, one or two RLD10 detector heads and measurement optics.

Optical configurations within the range of RLD10 detector heads enable linear, planar (X-Y) and differential measurements to be performed.

The fully compatible range of user selectable system components enables a unique configuration to match a specific application, and provides sub-nanometer resolution capability at velocities to 2 m/s for axis lengths up to 4 m.

The RLU laser unit, containing the HeNe laser tube, the majority of system electronics and the fiber optic launch mechanism, forms the heart of the RLE system.

Fiber optic launch capability allows the laser unit to be mounted remotely from the measurement axis, thereby eliminating a potential heat source without increasing the demands on alignment stability.

Two models of RLU are available – RLU10 and RLU20. Each model is available in either single or dual axis configuration, with the main difference between the two models being the frequency stability specification:  $\pm 50$  ppb (parts per billion) over one hour for the RLU10 and  $\pm 2$  ppb over one hour for the RLU20. The choice of RLU laser unit determines the designation of the complete system: a system incorporating an RLU10 laser unit is referred to as an RLE10, a system incorporating an RLU20 laser unit is referred to as an RLE20 system.

Position output signals from the RLU are directly available in differential digital RS422 format and/or 1 Vpp analog sine/cosine formats. From the digital output, resolutions to 10 nm are available. The signal period for the analog output is 158 nm when using a double pass plane mirror or differential interferometer, and 316 nm for a single pass retroreflector based system. Optionally, an REE interpolator or RPI20 parallel interface can be used in combination with the analog output to provide resolutions to 0.39 nanometers or 38.6 picometers respectively.



RLE10 laser system



RLU10 laser user



X-Y stage application  
– Anorad – Rockwell  
Automation

## RLE laser interferometer systems

### RLD detector units

Most RLD10 detector units contain the fringe detection scheme, interferometer optic and integrated laser beam steerer(s). Six different RLD detector heads are available based on four variants.

- **Single pass interferometer** – Uses an external retroreflector target optic for linear applications with axis lengths up to 4 m. Available with 0° or 90° beam launch orientation. 316 nm signal period enables resolutions to 20 nm, or 77.2 picometers when used with the optional RPI20 parallel interface.
- **Double pass interferometer** – Requires an external plane mirror target optic for X-Y applications with axis lengths up to 1 m. Available with 0° or 90° beam launch orientation. 158 nm signal period enables resolutions to 10 nm, or 38.6 picometers when used with the optional RPI20 parallel interface.
- **No internal interferometer** – The absence of interferometer optics within this head enables the RLE system to be configured with external optics that allow linear, angle and straightness measurements to be made. 0° beam launch orientation only.
- **Double pass differential interferometer (column reference)** – Requires external plane mirror targets for both reference and measurement arms for X-Y applications with axis lengths to 1 m. 158 nm signal period enables resolutions to 10 nm, or 38.6 picometers when used with the optional RPI20 parallel interface.

As the measurement and reference beam paths have an element of commonality, this detector head offers a number of benefits.

- Measures stage versus column or workpiece versus tool for a true differential measurement.
- Removal of errors due to thermal translation of the interferometer mounting position.
- Minimization of the effects of laser frequency instability as the differential path length (between measurement and reference paths) is reduced.
- Common mode environmental effects enable the detector head to be mounted outside the process chamber with minimal effect on positioning accuracy.

### RLE system benefits

The unique fiber optic launch based architecture provides interferometer system performance with the ease of use normally associated with glass or tape scale based encoder systems.

These architectural advantages are achieved through a combination of the following features:

- **Fiber optic laser launch** – Enables the laser light to be taken directly to where the axis position needs to be measured, eliminating the requirement for remote beam benders, splitters and associated mounts.
- **Integrated laser beam steerers** – Incorporated in all RLD10 detector heads to further reduce alignment complexity.
- **Integrated interferometer optics** – Most RLD detector heads include prealigned interferometer optics and fringe detection system, making installation simple: align the RLD10 with the external optic on the moving element.
- **Removal of potential heat error source** – Fiber optic launch enables the RLU laser head to be mounted in a location that is insensitive to dissipated heat without affecting alignment or stability.



RLD10 single pass interferometer



RLD10 double pass interferometer



RLD10 differential interferometer



## RLE system accessories

### RCU10 compensation system

When using any laser interferometer system in a non-vacuum environment, some form of refractive index compensation is required to maintain accuracy under varying environmental conditions. This is because the fundamental fringe spacing (unit of count) is a function of the wavelength of the laser light which varies fractionally depending on the refractive index of the air through which it travels.

To counter these refractive index changes, Renishaw offers the RCU10 real-time quadrature compensation system, providing the following features and benefits:

- $\pm 1$  ppm positioning over a broad range of environmental conditions
- Simultaneous implementation of multiple error correction algorithms
- Individual air temperature sensors for each axis
- RCU10-CS configuration software enables the RCU10 system to be configured to match the specific requirements of the application
- One to six axis capability: multi-axis systems can be formed using a number of individual RCU10 compensators connected via a high-speed serial link

### RPI parallel interface

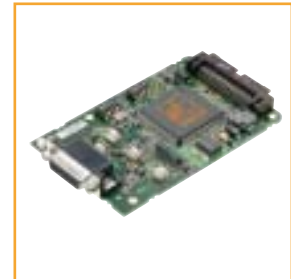
Renishaw's RLE laser interferometer systems directly produce 1 Vpp sine/cosine signals with periods of 316 nm and 158 nm from single and double pass interferometers respectively. These sinusoidal signals can be interpolated to provide ultra-high resolution positional feedback.

Although sine/cosine interpolation is available within a number of proprietary control systems, the analog bandwidth of these systems is often designed for tape and glass scale based encoders. These scale systems produce relatively coarse signal periods and the sinusoidal frequencies for any given velocity are considerably lower than those produced by an interferometer. This bandwidth limitation means that laser interferometer feedback systems can only be used in low velocity motion applications.

The Renishaw RPI20 parallel interface has been specifically designed to overcome this limitation by providing ultra-high resolution parallel format output at high speed. The RPI20 interpolates by 4096, produces resolutions of up to 38.6 picometers and has an analog input bandwidth of  $<6.5$  MHz, enabling the interferometer system to be used in applications that have velocity requirements of up to 1 m/s.



RCU10 compensator and sensors

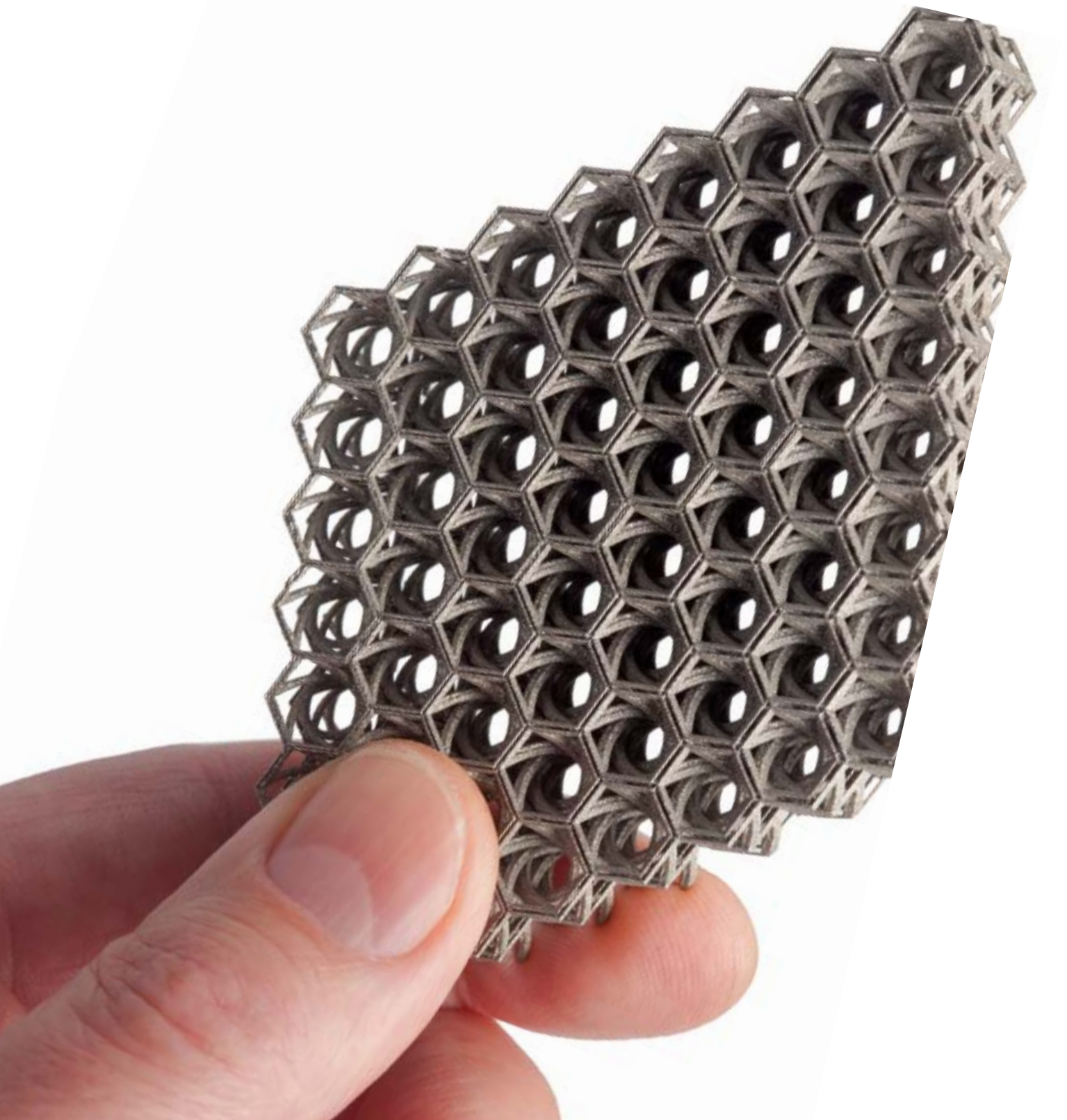


RPI20 parallel interface



The RCU10 can be used to compensate digital position feedback signals from a variety of sources and can produce compensated output signals in analog or digital format.

# Additive manufacturing solutions



## CAD-driven direct manufacturing in a wide range of metals

Renishaw's laser melting is a pioneering, additive manufacturing process capable of producing fully dense metal parts direct from 3D CAD, using a high-powered fiber laser. Parts are built from a range of fine metal powders that are melted in a tightly controlled atmosphere, in layer thicknesses ranging from 20 microns to 100 microns.

The technology is already widely employed for the manufacture of custom medical implants, lightweight aerospace and motorsports parts, efficient heat exchangers, and injection molding inserts with conformal cooling channels.

The capability to safely process reactive materials such as titanium and aluminum is a standard feature on all Renishaw laser melting machines, with safe systems for process emissions and powder handling. Laser melting machine users also benefit from minimal waste product, as over 98% of the material is reusable after refinement in the Renishaw powder conditioning system.



### Technical specification

	AM 250	AM 125
Maximum part building area	245 mm × 245 mm × 300 mm (X, Y, Z) (360 mm Z axis by request)	120 mm × 120 mm × 125 mm (X, Y, Z)
Build rate *	5 cm <sup>3</sup> – 20 cm <sup>3</sup> per hour	
Scan speed	up to 2000 mm/s	
Positioning speed (maximum)	7000 mm/s	
Layer thickness	20 µm – 100 µm	
Laser beam diameter	70 µm diameter at powder surface	35 µm diameter at powder surface
Laser options	200 W or 400 W	100 W or 200 W
External dimensions **	1700 mm × 800 mm × 2025 mm (L × W × H)	1350 mm × 800 mm × 1900 mm (L × W × H)
Weight	1225 kg gross, 1100 kg net	1125 kg gross, 900 kg net
Power supply	230 V 1 PH, 16 A	
Qualified materials	Stainless steel 316L and 17-4PH, H13 tool steel, aluminum Al-Si-12 and Al-Si-10, titanium CP, Ti-6Al-4V and Ti-6Al-7Nb, cobalt-chrome (ASTM75), inconel 718 and 625	
Materials in development	We have a range of materials in development. Please contact Renishaw for an up-to-date list.	

\* Build rate is dependent upon material, density and geometry. Not all materials process at the highest build rate.

\*\* Dimensions are without accessories.

## Applications

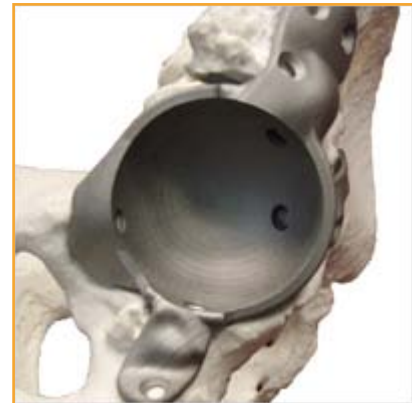
Early adopters of laser melting for medical orthopedics benefit significantly from the ability of laser melting to manufacture complex geometries and structures in high grade materials, such as titanium.

From custom orthopedic implants to volume production of medical devices featuring hybrid structures and textures, laser melting has the potential to unlock manufacturing capabilities that combine free-form shapes and intricate lattice structures. This improves osseointegration in orthopedics, leading to much improved patient outcomes. It also allows aerospace and motorsport companies to 'add lightness' to components in a range of demanding applications.

From tooling inserts, featuring conformal cooling, to lightweight structures for aerospace and high technology applications, laser melting gives designers more freedom, resulting in structures and shapes that would otherwise be constrained by conventional processes or the tooling requirements of volume production. Laser melting is complementary to conventional machining technologies and forms part of a manufacturing system including heat treatment and surface post-processing, and directly contributes to a reduction in lead times, tooling costs and material waste.



Industrial components



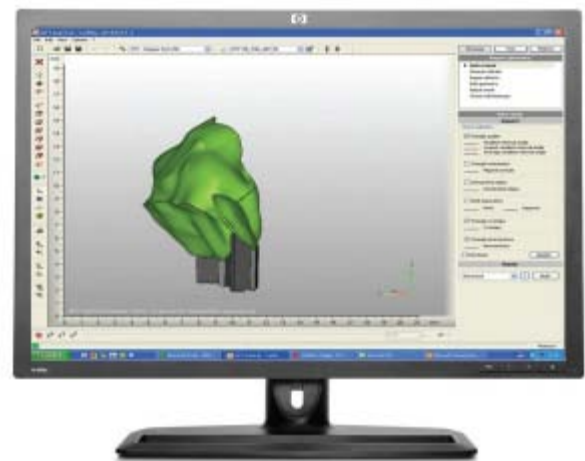
Medical devices

## Laser melting software applications

All additive manufacturing technologies rely on the interpretation of 3-dimensional CAD data to create the necessary machine-specific file format. The most common file input type is STL data, an output option available in most 3D CAD software packages. Using STL data, the file preparation software creates structures to anchor the part to the build substrate, support overhanging sections, and securely locate parts of the geometry that are separate at the start of the build, but join as the build progresses.

The machine input file contains process variables, unique to the Renishaw laser melting system, that contain the laser power, exposure and other critical parameters that are suited to each individual material, build geometry type and productivity requirements.

Renishaw offers a consultation service advising which package is most suited to the individual customer's requirements and will include the preferred choice as part of a turnkey solution.



## The huge potential for Additive Manufacturing

In the world of manufacturing technology, we occasionally experience breakthroughs that have the potential to transform the industry, enabling existing products to be made faster, cheaper and better, and opening up a world of new product possibilities.

Just like the advent of CNC machining, CAD/CAM, co-ordinate measuring machines and lasers, metal-based Additive Manufacturing will transform part production, but we are only at the start of this exciting journey.

At the core of metal-based Additive Manufacturing is the use of focused laser energy to fuse fine metallic powders to form highly complex functional components that go way beyond the designs of today.

In comparison to other technological advances, lasers are something of a quiet revolution, spanning the last 50 years, but their influence on fields as diverse as bio-medical, surface analysis, electronics, ship building, molecular diagnostics, precision measurement and a multitude of others is immeasurable.

Yet, just like Additive Manufacturing, in their early years, lasers were something of a solution in search of an application – not unusual in disruptive technologies.

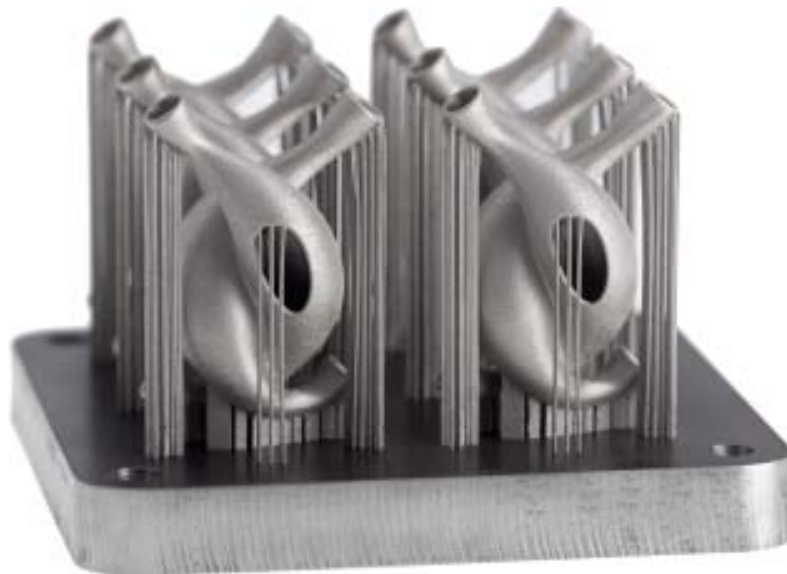
Renishaw's laser melting technology has the power to unlock this hidden potential and, in the hands of talented engineers, the full commercial and technical advantages offered by Additive Manufacturing can be enjoyed by manufacturers like you.



Laser melting machine build chamber



Tool with conformant cooling



# Styli and accessories



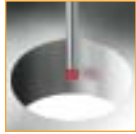




**Page 7-3**

### **Technical specifications and quick reference guides**

Quick selection from our extensive range.



**Page 7-8**

### **Accuracy at the point of contact**

An explanation of why it is important to choose the right stylus for your application, and an overview of the entire range of stylus types.



**Page 7-13**

### **M2 threaded stylus range**

Styli for use with the industry-standard CMM probes TP2, TP20 and TP200.



**Page 7-21**

### **M3 threaded stylus range**

Styli for use with manual CMM probes TP1 and TP6 and the most flexible scanning probe, SP25M.



**Page 7-27**

### **M4 threaded stylus range**

Optimised for stiffness and weight, styli purposely designed for the high accuracy TP7M and our comprehensive range of probing for machine tools.



**Page 7-38**

### **M5 threaded stylus range**

A premium range specifically designed for highest accuracy scanning probes from Renishaw and other manufacturers.



**Page 7-53**

### **Styli for Faro arms and Zeiss probing systems**

These styli have been designed especially for use on Faro portable arm CMMs and with Zeiss probing systems.



**Page 7-87**

### **Accessories**

All of the 'bits and pieces' that you need to assemble anything from the most complex stylus clusters to a simple star.

## Technical specifications

### Ball material properties

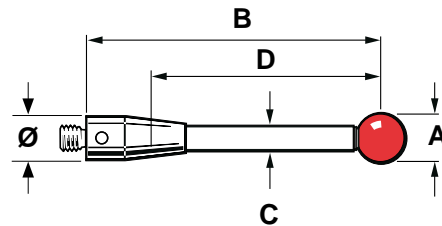
Stylus type	Material	Grade	Deviation from spherical form ( $\mu\text{m}$ )	Structure	Composition (wt%)	Purity (%)	Density (g/cm <sup>3</sup> )	Hardness HV	Compression strength (MPa)	Bending strength (MPa)	Fracture toughness K1c (MN/m <sup>3/2</sup> )
AL <sub>2</sub> O <sub>3</sub> ruby balls	Synthetic ruby monocrystalline	Grade 5*	0.13	mono	99% AL <sub>2</sub> O <sub>3</sub>	99.90	3.90	2300	2100	400-700	1
Silicon nitride balls	Hard pressed Si <sub>3</sub> N <sub>4</sub>	Grade 5*	0.13	poly	Si <sub>3</sub> N <sub>4</sub>	90	3.0-3.2	1600	3000	850	6
Zirconia oxide balls	Sintered ZrO <sub>2</sub>	Grade 5*	0.13	poly	ZrO <sub>2</sub>	90-95	6.05	1200	2000	1000	10
Alumina hollow balls	White ceramic sintered alumina AL <sub>2</sub> O <sub>3</sub>	-	1	poly	AL <sub>2</sub> O <sub>3</sub>	99.80	3.8-3.9	1900	2500	350	3.5
Silver steel disks	Silver steel	-	1	-	-	-	8	450	-	-	-
Silver steel simple cylinder	Silver steel	-	Roundness 4 $\mu\text{m}$	-	-	-	8	200	-	-	-
Ruby ball ended cylinder	Synthetic ruby	Ball: Grade 5*	Ball deviation from spherical form: 0.13 Concentricity: Ball/cylinder 4 $\mu\text{m}$	mono	99% AL <sub>2</sub> O <sub>3</sub>	99.90	3.99	2300	2300	400-700	1
Tungsten carbide ball ended cylinder	Tungsten carbide	-	+ 20 $\mu\text{m}$ end radius	-	92-93.5% WC 6.5-8% CO	14.8	14.95	1550	6000	-	-
Silver steel simple pointer	Silver steel	-	Cone angle 30°	-	-	-	8	300	-	-	-
Tungsten carbide radius end pointer	Tungsten carbide	-	Cone angle 30°	-	92-93.5% WC 6.5-8% CO	99.90	15	1550	6000	-	-
Aluminum hollow balls	Al. alloy 6082-T6	-	30 $\mu\text{m}$	-	95.2-98.3% AL	-	2.7	95	-	-	-

\* Refers to DIN-5401 ball grade standard

\* Grade 3 sphericity balls are available on request.

### Extension material properties

Material	Coefficient of expansion @ 25 °C
Stainless steel	16x10 <sup>-6</sup> /°C
Tungsten carbide	5x10 <sup>-6</sup> /°C
White ceramic sintered alumina	8.1x10 <sup>-6</sup> /°C
Carbon fiber	-0.4x10 <sup>-6</sup> /°C
Titanium	9.2x10 <sup>-6</sup> /°C
Ruby	4.5x10 <sup>-6</sup> /°C
Silicon nitride	3.2x10 <sup>-6</sup> /°C
Zirconia	10.5x10 <sup>-6</sup> /°C



- A** Ball diameter
- B** Overall length
- C** Stem diameter
- D** Effective working length
- $\emptyset$  M2 = 3 mm
- $\emptyset$  M3 = 4 mm
- $\emptyset$  M4 = 7 mm
- $\emptyset$  M5 = 10 mm

## M2 styli and extensions quick reference guide

These are a selection of the most popular styli.

### Ruby ball / stainless steel stem

Ball diameter	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
Length 10 mm	A-5000-7806	A-5000-7802	A-5000-7807	A-5000-7803	A-5000-3604	A-5000-4154	A-5000-4155	A-5000-4156	A-5000-4158
20 mm	–	–	A-5000-3603	A-5000-7804	A-5000-4160	A-5000-4161	–	–	–

### Ruby ball / tungsten carbide stem

Ball diameter	0.3 (0.012)	0.5 (0.02)	0.7 (0.03)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
Length 10 mm	A-5000-7800	A-5000-7805	A-5000-7801	A-5003-1325	–	–	–	–	–	–
20 mm	–	A-5003-1345	A-5003-0577	SEE DRAWING	A-5003-0034	A-5003-3822	A-5003-1896	A-5003-0938	A-5003-1029	A-5003-0046
30 mm	–	–	–	A-5000-8663	A-5003-0035	A-5003-0036	A-5003-0038	A-5003-0040	A-5003-0043	A-5003-0047
40 mm	–	–	–	–	–	A-5003-0037	A-5003-0039	A-5003-0041	A-5003-0044	A-5003-0048
50 mm	–	–	–	–	–	–	–	A-5003-0042	A-5003-0045	A-5003-0049

### Ruby ball / ceramic stem

Ball diameter	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
Length 30 mm	A-5003-4177	A-5003-1370	A-5003-4779	A-5003-4780
50 mm	A-5003-0064	A-5003-0065	A-5003-0066	A-5003-0470

### Ruby ball / carbon fiber stem

Ball diameter	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
Length 30 mm	A-5003-4241	A-5003-4781	A-5003-4782
50 mm	A-5003-2285	A-5003-2286	A-5003-2287
75 mm	A-5003-4784	A-5003-4785	A-5003-4786
100 mm	A-5003-2289	A-5003-2290	A-5003-2291

### Stylus extensions

Length	5.0 (0.20)	10.0 (0.40)	20.0 (0.80)	30.0 (1.19)	40.0 (1.58)	50.0 (1.97)	70.0 (2.76)	90.0 (3.55)
Stainless steel	M-5000-7634	M-5000-3647	M-5000-3648	M-5000-4162	M-5000-7779	–	–	–
Ceramic	–	–	–	A-5003-0070	A-5003-0071	A-5003-0072	–	–
Carbon fiber	–	–	–	–	A-5003-2280	A-5003-2281	A-5003-2282	A-5003-2283

## M3 styli and extensions quick reference guide

These are a selection of the most popular styli.

### Ruby ball / stainless steel stem

Ball diameter		1.0 (0.04)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
Length	21 mm	A-5000-3551	A-5000-3552	A-5000-3553	A-5000-7606	A-5000-7630
	31 mm	–	–	–	A-5000-3554	A-5000-7648

### Ruby ball / tungsten carbide stem

Ball diameter		0.5 (0.02)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
Length	21 mm	A-5000-7632	A-5003-0050	–	A-5003-0054	–	–	–
	30 mm	–	A-5003-0051	A-5003-0052	A-5003-0055	A-5003-0057	–	–
	40 mm	–	–	A-5003-0053	A-5003-0056	A-5003-0058	A-5003-0060	A-5003-0062
	50 mm	–	–	–	–	A-5003-0059	A-5003-0061	A-5003-0063

### Ruby ball / ceramic stem

Ball diameter		3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
Length	50 mm	A-5003-0067	A-5003-0068	A-5003-0069

### Ruby ball / carbon fiber stem

Ball diameter		6.0 (0.24)	8.0 (0.32)
Length	75 mm	A-5003-4860	A-5003-4861
	100 mm	A-5003-4862	A-5003-4863

### Stylus extensions

Length	10.0 (0.40)	20.0 (0.80)	35.0 (1.38)	50.0 (1.97)	70.0 (2.76)
Stainless steel	M-5000-7633	M-5000-3592	M-5000-3593	–	–
Ceramic	–	–	–	A-5003-0075	–
Carbon fiber	–	–	–	A-5003-4864	A-5003-4865

## M4 styli and extensions quick reference guide

These are a selection of the most popular styli.

### Ruby ball / stainless steel stem

Ball diameter	1.0 (0.04)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
Length 10 mm	–	–	–	–	A-5000-6350	–	–
20 mm	A-5000-7545	A-5000-7547	A-5000-7549	A-5000-7551	SEE DRAWING	A-5000-7555	A-5000-7557
30 mm	–	–	–	–	A-5000-6352	–	–
50 mm	–	–	–	–	A-5000-7521	–	–
100 mm	–	–	–	–	A-5000-7522	–	–

### Ruby ball / tungsten carbide stem

Ball diameter	1.0 (0.04)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
Length 20 mm	A-5003-4792	A-5003-2932	A-5003-4793	A-5003-4794	A-5003-4795	A-5003-4796
50 mm	–	A-5003-4797	A-5003-3680	A-5003-4799	A-5003-4800	A-5003-4801

### Ruby ball / ceramic stem

Ball diameter	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
Length 50 mm	A-5003-0235	A-5000-3709	A-5000-7795
75 mm	A-5003-0236	A-5003-2764	A-5003-4802
100 mm	A-5000-9761	A-5000-3712	A-5000-7796

### Ruby ball / carbon fiber stem

Ball diameter	6.0 (0.24)	8.0 (0.32)
Length 50 mm	A-5003-1436	–
100 mm	A-5003-1358	–
150 mm	A-5003-1255	–
200 mm	A-5003-1075	–
300 mm	–	A-5003-3461

### Stylus extensions

Length	10.0 (0.41)	15.0 (0.60)	20.0 (0.79)	30.0 (1.19)	50.0 (1.97)	100.0 (3.94)
Stainless steel	M-5000-7583	M-5000-7584	M-5000-7585	M-5000-7586	–	–
Ceramic	–	–	–	A-5000-7754	A-5000-7755	A-5000-7727

## M5 styli and extensions quick reference guide

These are a selection of the most popular styli.

### Ruby ball / tungsten carbide stem

Ball diameter	0.3 (0.012)	0.5 (0.02)	0.7 (0.03)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
Length 20 mm	A-5003-5201	A-5003-5202	A-5003-5203	A-5003-5204	A-5003-5205	A-5003-5206	A-5003-5207	A-5003-5208	A-5003-5209	A-5003-5210
30 mm	A-5003-5211	A-5003-5212	A-5003-5213	A-5003-5214	A-5003-5215	A-5003-5216	A-5003-5217	A-5003-5218	A-5003-5219	A-5003-5220
40 mm	–	–	–	–	A-5003-5221	A-5003-5222	A-5003-5223	A-5003-5224	–	–
50 mm	A-5003-5225	A-5003-5226	A-5003-5227	A-5003-5228	A-5003-5229	SEE DRAWING	A-5003-5232	A-5003-5234	A-5003-5235	A-5003-5236
75 mm	A-5003-5240	A-5003-5241	A-5003-5242	A-5003-5243	A-5003-5244	–	–	A-5003-5253	SEE DRAWING	SEE DRAWING
100 mm	–	–	–	–	–	–	A-5003-5254	–	–	–

### Ruby ball / carbon fiber stem

Ball diameter	2.5 (0.10)	6.0 (0.24)	8.0 (0.32)	10.0 (0.40)
Length 20 mm	–	–	–	–
30 mm	–	–	–	–
40 mm	–	–	–	–
50 mm	–	A-5003-5237	A-5003-5238	A-5003-5239
75 mm	–	A-5003-5250	A-5003-5251	A-5003-5252
100 mm	–	SEE DRAWING	SEE DRAWING	SEE DRAWING
150 mm	–	A-5003-5265	A-5003-5266	A-5003-5267
200 mm	–	A-5003-5268	A-5003-5269	A-5003-5270
300 mm	–	A-5003-5271	A-5003-5272	A-5003-5273

### Stylus extensions

Length	10.0 (0.41)	20.0 (0.79)	30.0 (1.19)	40.0 (1.58)	50.0 (1.97)	60.0 (2.37)	70.0 (2.76)	80.0 (3.15)	90.0 (3.55)	100.0 (3.94)
CF/titanium (Ø11 mm)	–	–	–	A-5555-0647	A-5555-0648	A-5555-0649	A-5555-0623	A-5555-0650	A-5555-0651	A-5555-0652
CF/titanium (Ø20 mm)	–	–	–	A-5555-0620	A-5555-0657	A-5555-0658	–	A-5555-0621	–	A-5555-0659
Stainless steel	A-5555-0142	A-5555-0140	A-5555-0669	–	A-5555-0670	–	–	–	–	A-5555-0136
Aluminum tube	–	–	–	–	A-5555-0671	–	–	–	–	A-5555-0127

Length	120.0 (4.76)	150.0 (5.91)	180.0 (7.09)	200.0 (7.88)	250.0 (9.85)	300.0 (11.82)	400.0 (15.76)	500.0 (19.70)	600.0 (23.64)
CF/titanium (Ø11 mm)	A-5555-0425	A-5555-0424	A-5555-0653	A-5555-0654	A-5555-0655	A-5555-0642	A-5555-0656	–	–
CF/titanium (Ø20 mm)	A-5555-0660	A-5555-0661	A-5555-0662	A-5555-0663	A-5555-0427	A-5555-0664	A-5555-0665	A-5555-0667	A-5555-0668
Stainless steel	–	–	–	–	–	–	–	–	–
Aluminum tube	–	–	–	A-5555-0125	–	–	–	–	–

## Accuracy at the point of contact

As industry has developed its requirement for increasingly diverse and complex manufactured parts, inspection systems have had to work hard to keep up. The use of co-ordinate measuring machines (CMMs) with probing systems and in-process inspection on machine tools are two of the solutions offered by Renishaw to help you maximize your productivity and maintain the highest quality.

Successful gaging depends very much on the ability of the probe's stylus to access a feature and then maintain accuracy at the point of contact. At Renishaw, we have used our expertise in probe and stylus design to develop a comprehensive range of CMM and machine tool styli to offer you the greatest possible precision.

These notes explain the critical features of every stylus type, helping you to choose the right design for each inspection need.

## What is a stylus?

A stylus is that part of the measuring system which makes contact with the component, causing the probe's mechanism to displace. The generated signal enables a measurement to be taken. The feature to be inspected dictates the type and size of stylus used. In all cases, however, maximum rigidity of the stylus and perfect sphericity of the tip are vital.

To achieve this, Renishaw's stylus stems are produced on CNC machine tools to exacting standards. Great care is taken to ensure that location faces give maximum stiffness whilst stylus mass is optimized to suit Renishaw's range of probes.

Genuine Renishaw stylus balls are produced to the highest standards and are bonded to the stems in such a way as to ensure maximum joint integrity.

The performance of your gaging can easily be degraded if you use a stylus with poor ball roundness, poor ball location, bad thread fit or a compromised design that allows excessive bending during measurement. To ensure the integrity of the data you gather, make certain that you specify and use a stylus from the comprehensive range of genuine Renishaw styli.

## What naming protocol do Renishaw use to describe their styli range?

Renishaw uses the following naming protocol to allow easy identification of styli by name and part number. The examples below show how this protocol is assigned and describe the abbreviations used:

### Straight styli

#### **M2 STY D2R L20 EWL14 d1.4SS**

The above protocol describes an M2 threaded straight stylus fitted with a 2 mm diameter ruby ball. It has an overall length of 20 mm, has an effective working length (EWL) of 14 mm and has a 1.4 mm diameter stainless steel stem.

### Star styli

#### **M2 STR D2R L20 5BALL L19.5 S32**

The above protocol describes an M2 threaded star stylus fitted with a 2 mm diameter ruby ball. It has five balls on the star and an overall length of 19.5 mm (from the center of the ball to the rear of the star mounting face when assembled to a probe). The span of the star cluster is 32 mm.

### Disk styli

#### **M2 DSC SD18 SLVS T2.2 L2.6 BR-Y**

The above protocol describes an M2 threaded disk stylus with a spherical diameter disk of 18 mm. It is made from silver steel with a disk thickness of 2.2 mm and a length of 2.6 mm. BR stands for balls/rollers followed by yes (Y) or no (N).

### Cylinder styli

#### **M2 CYL D3 SLVS L13 EWL4**

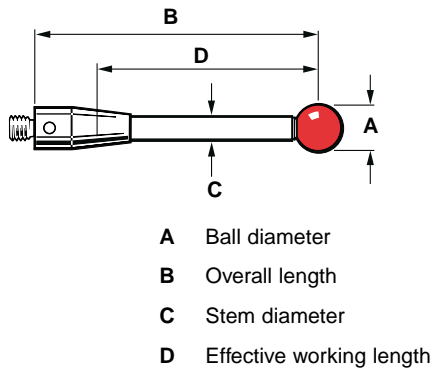
The above protocol describes an M2 threaded cylinder stylus with a critical measuring element diameter of 3 mm made from silver steel. It has an overall length of 13 mm and an EWL of 4 mm.

### Extensions

#### **M4 EXT L15 d7 SS**

The above protocol describes an M4 threaded extension with a length of 15 mm and a diameter of 7 mm. The extension is made from stainless steel.

## Terminology



### Overall length

Renishaw uses a standard description of overall length, measuring from the rear mounting face of the stylus to the center of the ball.

### Effective working length (EWL)

This is measured from the center of the ball to the point at which the stem will foul against the feature when measuring 'normal' to the part.

### Choosing a stylus

To maintain accuracy at the point of contact, we recommend that you:

#### Keep styli short

The more a stylus bends or deflects, the lower the accuracy. Probing with the minimum stylus length for your application is the best option.

#### Minimize joints

Every time you join styli and extensions, you introduce potential bending and deflection points. Try, wherever possible, to keep to the minimum number of pieces for your application.

#### Keep the ball as large as possible

There are two reasons for this:

- firstly, it maximizes your ball/stem clearance, thereby reducing the chances for false triggers caused by 'shanking out' on the stylus stem
- secondly, the larger ball reduces the effect of the surface finish of the component being inspected.

## The range of genuine Renishaw styli

### Ball material

#### Ruby

The industry standard and the optimum stylus ball material for a vast majority of measurement applications, ruby is one of the hardest known materials. Synthetic ruby is 99% pure aluminum oxide which is grown into crystals (or "boules") at 2000 °C using the Verneuil process.

The boules are then cut and gradually machined into a highly spherical form. Ruby balls are exceptionally smooth on the surface, have great compressive strength and a high resistance to mechanical corrosion.

Very few applications exist where ruby is not the preferred ball material, however there are two applications where balls manufactured from other materials are recommended.

The first is for heavy-duty scanning applications on aluminum. Because the materials attract, a phenomenon known as 'adhesive wear' can occur, which involves build up of aluminum from the surface onto the ball. A better ball material for such applications is silicon nitride.

The second is in heavy-duty scanning applications on cast iron. Interaction between the two materials can result in 'abrasive wear' of the ruby ball surface. For such applications, zirconia balls are recommended.

#### Silicon nitride

Silicon nitride possesses many similar properties to ruby. It is a very hard and wear-resistant ceramic which can be machined into very high precision spheres. It can also be polished to an extremely smooth surface finish. Silicon nitride does not have the attraction to aluminum and so does not exhibit the adhesive wear seen with ruby in similar applications. However, silicon nitride does show significant abrasive wear characteristics when scanning on steel surfaces and so its applications are best confined to aluminum.

#### Zirconia

Zirconia is a particularly tough ceramic material with hardness and wear characteristics approaching those of ruby. Its surface properties make it an ideal material for aggressive scanning applications on cast iron components.

### Stem material

#### Steel

Stylus stems manufactured from stainless steel are used widely for styli with ball/tip diameters of 2 mm or greater and with lengths up to 30 mm. Within this range, one-piece steel stems offer the optimum stiffness-to-weight ratio, giving adequate ball/stem clearance without compromising stiffness with a joint between the stem and threaded body.

Please contact us if you require any styli with special ball materials. We can recommend the most suitable material for scanning different materials.



### Tungsten carbide

Tungsten carbide stems are best used for maximizing stiffness with either small stem diameters required for ball diameters of 1 mm and below, or lengths up to 50 mm. Beyond this, weight can become a problem and stiffness is lost due to deflection at the stem to body joint.

### Ceramic

For ball diameters greater than 3 mm, and lengths over 30 mm, ceramic stems offer stiffness comparable to steel but are significantly lighter than tungsten carbide. Ceramic stemmed styli can also offer additional crash protection to your probe as the stem will shatter in a collision.

### Carbon fiber (Renishaw GF)

There are many grades of carbon fiber materials, however Renishaw GF combines optimum stiffness characteristics, both longitudinally and in torsion (important in star constructions), with extremely low weight. Carbon fiber is inert and this, combined with a special resin matrix, provides excellent protection in the most hostile of machine tool environments.

Renishaw GF is ideal for maximizing stiffness while giving very low mass for styli above 50 mm in length. It is the optimum stem material for high-accuracy strain gage technology probes with excellent vibration-damping characteristics and negligible co-efficient of thermal expansion.

The genuine Renishaw stylus range comprises several types:

### Straight styli



These are the simplest form of stylus, incorporating highly spherical industrial ruby balls and a choice of stem material.

Ruby is an extremely hard material and hence stylus wear is minimized. It is also of low density, keeping tip mass to a minimum, which avoids unwanted probe triggers caused by machine motion or vibration.

Mounted on stems made from a range of materials – stainless steel, tungsten carbide, ceramic and a specialized carbon fiber material, “Renishaw GF” – these simple ruby ball styli are suitable for most inspection applications.

Each stylus has an effective working length (EWL) which is the penetration that can be achieved by the ball before the stem fouls against the feature.

The size of the ball and the EWL of the stylus chosen are dictated by the size of the feature to be inspected. However, keeping the stylus ball as large as possible and the stem as short as possible will ensure maximum ball/stem clearance, whilst providing a greater yet still rigid EWL. Using larger ruby balls also reduces the effect of the surface finish of the component being inspected.

Probing with very long stylus/extension combinations is not recommended with standard kinematic touch trigger probes as the rigidity is reduced and accuracy lost due to stylus bending.

This is not the case with other types of probe such as those with strain gage technology, as their very low trigger forces permit the use of long stylus/extension combinations without a significant loss of accuracy.

### Star styli



These stylus clusters provide you with multiple-tip probing of complex features and bores. Four or five ruby ball systems are mounted rigidly on a stainless steel center. Three standard sizes are offered – alternatively, you can create custom-made star styli using a 5-way stylus center and any of the genuine Renishaw stylus range.

Star styli can be used to inspect a variety of different features. Their use can reduce inspection cycle times by allowing multi-tip probing, minimizing the need to move the probe to extreme points of internal features such as the sides or grooves in a bore. Using star styli also allows effective probing in the –Z (upwards) direction when using a 5-way probe, provided that the stylus tips extend beyond the diameter of the probe body. Each tip on a star stylus requires datuming (sometimes referred to as ‘qualifying’ or ‘calibrating’) in the same manner as a single-ball stylus. The ‘span’ of star styli is taken from ball center to ball center.

### Disk styli



These styli are used to probe undercuts and grooves within bores which may be inaccessible to star styli. They are ‘sections’ of highly spherical balls and are available in various diameters and thicknesses. Full rotational adjustment and the ability to add a center stylus are features of the Renishaw range of disk styli that make them particularly flexible and easy to use.

## Styli and accessories

Probing with the 'spherical edge' of a simple disk is effectively the same as probing on or about the equator of a large stylus ball. However, only a small area of this ball surface is available for contact and hence thinner disks require careful angular alignment in order to ensure correct contact with the feature being probed.

A simple disk requires datuming for only one diameter (usually in a ring gage), but limits effective probing to only X and Y directions.

Adding a 'radius end roller' allows you to datum and hence probe in the Z direction, provided that the center of the 'radius end roller' extends beyond the diameter of the probe. The 'radius end roller' can be datumed on a sphere or a slip gage. Rotating and locking the disk about its center axis allows the 'radius end roller' to be positioned to suit the application.

Disks may also have a threaded center to allow the fixing of a center stylus, giving the additional flexibility of probing the bottom of deep bores (where access for the disk may be limited).

## Styli for specialist applications

A range of specialist styli is available to enable probing of features such as thread form, thin sectioned material, tool setting and other specialist applications.

### Cylinder styli



These are used for probing holes in thin sheet material. In addition, various threaded features can be probed and the centers of tapped holes located. Ball-ended cylinder styli allow full datuming and probing in X, Y and Z directions, thus allowing surface inspection to be performed.

### Pointer and ceramic hollow ball styli



Pointer styli are designed for the inspection of thread forms, specific points and scribed lines (to lower accuracy). The use of a radius end pointer stylus allows more accurate datuming and probing of features as detailed above and can also be used to inspect the location of very small holes.

Ceramic hollow ball styli are ideal for probing deep features and bores in X, Y and Z directions, with the need to datum only one ball. There are two versions in the range, 18 mm and 30 mm diameter, specially designed for the TP2 / TP20 / TP200 and TP6 probes respectively. Probing with such a large diameter ball can average out the effects of very rough surfaces.

## Tool setting styli



Typically, these are fitted with a square tip and can have threaded or plain shaft attachments. The tip faces are ground to ensure high squareness and parallelism. The TS27R tool setting probe for machining centers can also be fitted with a tungsten carbide disk stylus.

## Crash protection devices



Renishaw's stylus crash protection devices are designed to break in the event of impact and protect the probe from damage.

## Accessories and tools

A wide range of accessories including extensions, 4 and 5-way centers and stylus knuckles complement the genuine Renishaw stylus range to achieve fully flexible inspection.

## Stylus centers



These provide maximum probing flexibility with a single probe. Taking up to five styli of the same mounting thread, this accessory allows you to build stylus configurations to your own specification.

## Stylus knuckles



These give full adjustment about two axes, allowing the stylus to be orientated to probe angled features. This adjustment is especially useful when the probe cannot be correctly orientated by the probe head, or when access for the head is limited.

### Stylus extensions



These provide additional probing penetration by extending the stylus away from the probe. However, using stylus extensions can reduce probe accuracy due to loss of rigidity. This is not the case with electronic probes, whose extremely low trigger forces render them less sensitive to this type of inaccuracy.

### Stylus thread adaptors



These allow M2, M3, M4 and M5 threaded styli to be interchanged on the majority of touch trigger probes. They are particularly useful for adapting the extensive range of specialized application M2 styli for use on larger probes.

### Stylus tools

Specifically designed for mounting styli correctly onto probes and for the construction of specialized stylus combinations, Renishaw's stylus tools protect your investment.

#### S7 stylus tool



The S7 stylus tool is used for tightening styli and accessories when connecting to one another or directly into the probe. It is specifically designed to yield if excessive tightening force is applied, avoiding damage to the threads of stylus and probe.

#### Stylus crank



A stylus crank can allow access to features that are otherwise difficult to reach, and are often used in lathe inspection applications.

### Renishaw stylus kits

Renishaw styli and accessories are available in a wide selection of kits, ranging from a small precision set of the most frequently used styli, to a comprehensive set to meet virtually every inspection need.

Some sets are housed in a quality wooden case for maximum protection and superb presentation. The styli are held in a wood insert, individually located in a nylon sleeve providing protection for the mounting threads. This type of box features a removable module which houses up to twelve ruby ball styli and contains a tray for disks, tools and accessories. This allows the stylus selection for a particular inspection task to be brought to the CMM's table. The sloping lid design of this kit provides easy access to styli, minimizing handling of ruby balls and contact surfaces, thus aiding cleanliness.

Probing kits are also available to include a probe, probe head, extension bars and styli.

### Custom design service

If you cannot achieve your objectives using our extensive range of standard products, Renishaw's Styli and Custom Products Division offers a unique service by providing customers with a total solution for their probing needs for CMM, machine tool or scanning applications.

The Division includes expertise in applications, design, engineering and manufacturing with extensive experience in providing tailor-made product solutions to specific customer's requirements.

In many application problems, the solution lies in the choice of the stylus which influences access of the workpiece features, inspection times and probe performance. All of these aspects are considered within the design of a custom stylus, ensuring that the solution incorporates the ideal choice of materials and optimizes probe performance for your particular application.

Renishaw's Styli and Custom Products Division has supplied over 5,000 different custom styli into probing applications worldwide, so the solution to your application problem may already exist.

For advice and further details, please contact your nearest Renishaw distributor.

Always use genuine Renishaw styli or your probe performance will be compromised!

## M2 threaded stylus range

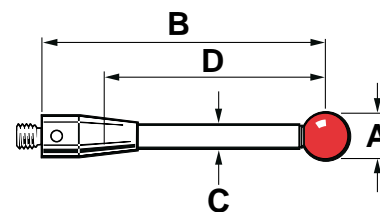
### Ruby ball styli (stainless steel stems)

Ball material	Part number									
Ruby	A-5000-7806	A-5000-7802	A-5000-7807	A-5000-7803	A-5000-3604	A-5000-4154	A-5000-4155	A-5000-4156	A-5000-4158	
Silicon nitride	A-5004-0210	A-5004-1918	A-5003-6120	A-5004-1920	A-5003-2138	A-5003-9524	A-5004-1921	A-5004-0237	A-5004-1922	
Zirconia	A-5003-7757	A-5004-0165	A-5003-7723	A-5004-2913	A-5004-2914	A-5003-7261	A-5003-2186	A-5004-2203	A-5004-2915	
A	Ball dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
B	Length mm (inch)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	11.0 (0.44)
C	Stem dia. mm (in.)	0.7 (0.03)	0.7 (0.03)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)	1.5 (0.06)	2.5 (0.10)	2.5 (0.10)	2.5 (0.10)
D	EWL* mm (inch)	4.5 (0.18)	4.5 (0.18)	6.0 (0.24)	6.5 (0.26)	7.0 (0.28)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	11.0 (0.44)
	Mass grammes	0.3	0.3	0.3	0.3	0.4	0.4	0.7	0.9	1.5
<b>10 mm range</b>										

Ball material	Part number				
Ruby	A-5000-3603	A-5000-7804	A-5000-4160	A-5000-4161	
Silicon nitride	A-5003-1730	A-5004-1923	A-5003-6691	A-5004-0236	
Zirconia	A-5004-2916	A-5004-2917	A-5004-1057	A-5004-2918	
A	Ball dia. mm (inch)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)
B	Length mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
C	Stem dia. mm (in.)	1.4 (0.06)	1.4 (0.06)	1.5 (0.06)	1.5 (0.06)
D	EWL* mm (inch)	14.0 (0.56)	16.4 (0.65)	17.0 (0.67)	20.0 (0.79)
	Mass grammes	0.4	0.4	0.5	0.6
<b>20 mm range</b>					

### Ruby ball styli (tungsten carbide stems)

Ball material	Part number				
Ruby	A-5000-7800	A-5000-7805	A-5000-7801	A-5003-1325	
Silicon nitride	A-5004-2016**	A-5003-2020**	-	A-5004-2018	
Zirconia	-	A-5003-7672	A-5004-2632**	A-5004-2919**	
A	Ball dia. mm (inch)	0.3 (0.012)	0.5 (0.02)	0.7 (0.03)	1.0 (0.04)
B	Length mm (inch)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)
C	Stem dia. mm (in.)	0.2 (0.01)	0.4 (0.02)	0.5 (0.02)	0.7 (0.03)
D	EWL* mm (inch)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	4.0 (0.16)
	Mass grammes	0.3	0.3	0.3	0.3
<b>10 mm range</b>					

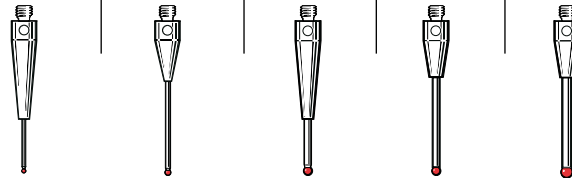


\*\* Special \* Effective working length

**Ruby ball styli (tungsten carbide stems) – continued**

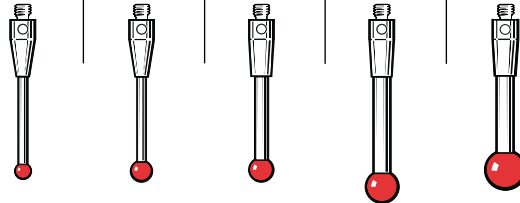
Ball material	Part number					
Ruby	A-5003-1345	A-5003-0577	A-5000-7808	A-5003-0033	A-5003-0034	
Silicon nitride	A-5004-2019**	–	A-5004-1508	A-5004-2021	A-5004-1925	
Zirconia	A-5004-2920	A-5004-1714**	A-5004-0435	A-5004-2921	A-5004-2922	
A	Ball dia. mm (inch)	0.5 (0.02)	0.7 (0.03)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)
B	Length mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
C	Stem dia. mm (in.)	0.3 (0.012)	0.5 (0.02)	0.7 (0.03)	0.8 (0.04)	1.0 (0.04)
D	EWL* mm (inch)	7.0 (0.28)	12.0 (0.48)	7.0 (0.28)	12.5 (0.50)	12.5 (0.50)
	Mass grammes	0.48	0.32	0.50	0.41	0.50

20 mm range



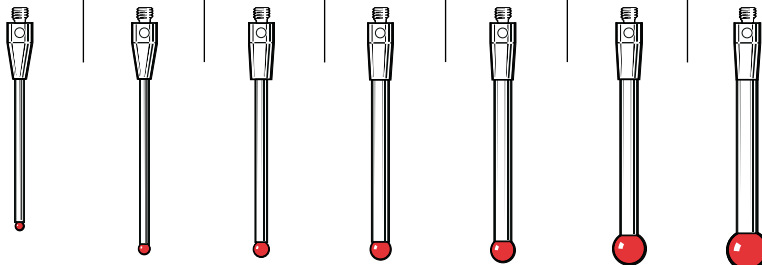
Ball material	Part number					
Ruby	A-5003-3822	A-5003-1896	A-5003-0938	A-5003-1029	A-5003-0046	
Silicon nitride	A-5004-1017	A-5004-1928	A-5004-1021	A-5004-1929	A-5004-1930	
Zirconia	A-5004-2923	A-5004-2924	A-5004-0437	A-5004-2925	A-5004-2926	
A	Ball dia. mm (inch)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	22.0 (0.87)	20.0 (0.79)
C	Stem dia. mm (in.)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)
D	EWL* mm (inch)	14.0 (0.55)	15.5 (0.62)	17.0 (0.67)	22.0 (0.87)	20.0 (0.79)
	Mass grammes	0.48	0.50	0.77	1.24	1.98

20 mm range



Ball material	Part number							
Ruby	A-5000-8663	A-5003-0035	A-5003-0036	A-5003-0038	A-5003-0040	A-5003-0043	A-5003-0047	
Silicon nitride	A-5004-2022	A-5004-1931	A-5003-7573	A-5004-1932	A-5004-1933	A-5004-1944	A-5004-1945	
Zirconia	A-5004-2927	A-5004-1711	A-5004-1058	A-5004-2928	A-5004-0264	A-5004-2929	A-5004-2930	
A	Ball dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	27.5 (1.08)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
C	Stem dia. mm (in.)	0.7 (0.03)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)
D	EWL* mm (inch)	20.5 (0.81)	22.5 (0.89)	22.5 (0.89)	22.5 (0.89)	27.0 (1.06)	30.0 (1.19)	30.0 (1.19)
	Mass grammes	0.40	0.58	0.99	1.48	1.49	1.57	2.57

30 mm range



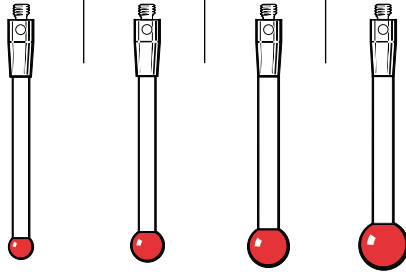
\* Effective working length

\*\* Special

**Ruby ball styli (ceramic stems)**

Ball material	Part number			
Ruby	A-5003-4177	A-5003-1370	A-5003-4779	A-5003-4780
Silicon nitride	A-5004-1946	A-5004-1952	A-5004-1953	A-5004-1954
Zirconia	A-5004-2931	A-5004-2932	A-5004-2933	A-5004-2934
<b>A</b> Ball dia. mm (in)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
<b>B</b> Length mm (in)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
<b>C</b> Stem dia mm (in)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)
<b>D</b> EWL* mm (in)	27.0 (1.06)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
Mass grammes	0.44	0.68	0.93	1.11

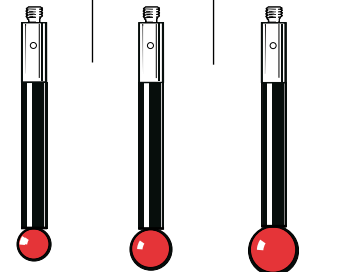
30 mm range



**Ruby ball styli (carbon fiber stems)**

Ball material	Part number		
Ruby	A-5003-4241	A-5003-4781	A-5003-4782
Silicon nitride	A-5004-1955	A-5004-1956	A-5004-1957
Zirconia	A-5004-2935	A-5004-2936	A-5004-0618
<b>A</b> Ball dia. mm (in)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
<b>B</b> Length mm (in)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
<b>C</b> Stem dia mm (in)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)
<b>D</b> EWL* mm (in)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
Mass grammes	0.57	0.79	0.96

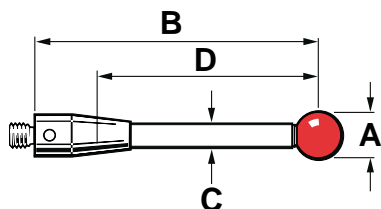
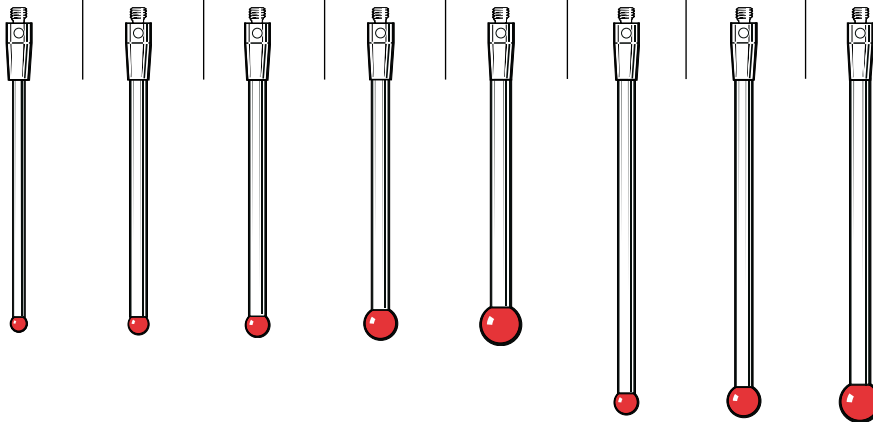
30 mm range



**Ruby ball styli (tungsten carbide stems)**

Ball material	Part number							
Ruby	A-5003-0037	A-5003-0039	A-5003-0041	A-5003-0044	A-5003-0048	A-5003-0042	A-5003-0045	A-5003-0049
Silicon nitride	A-5003-7269	A-5004-1959	A-5004-1960	A-5004-1961	A-5004-1962	A-5004-1963	A-5004-1964	A-5004-1965
Zirconia	A-5004-2937	A-5004-2938	A-5004-1059	A-5004-2939	A-5004-2940	A-5004-2942	A-5004-2943	A-5004-2944
<b>A</b> Ball dia. mm (inch)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
<b>B</b> Length mm (inch)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
<b>C</b> Stem dia. mm (in.)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)
<b>D</b> EWL* mm (inch)	32.5 (1.28)	32.5 (1.28)	37.0 (1.46)	40.0 (1.58)	40.0 (1.58)	47.0 (1.85)	50.0 (1.97)	50.0 (1.97)
Mass grammes	1.29	1.95	1.97	2.04	3.17	2.44	2.52	3.75

40 mm – 50 mm range

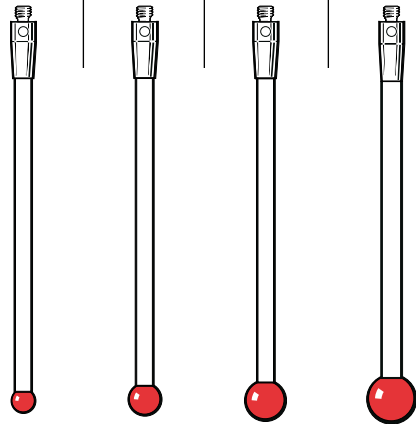


\* Effective working length

**Ruby ball styli (ceramic stems)**

Ball material	Part number				
Ruby	A-5003-0064	A-5003-0065	A-5003-0066	A-5003-0470	
Silicon nitride	A-5004-1967	A-5004-1519	A-5004-1968	A-5004-1969	
Zirconia	A-5004-2945	A-5004-2946	A-5004-2947	A-5004-2948	
A	Ball dia. mm (in)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
B	Length mm (in)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)
D	EWL* mm (in)	47.0 (1.85)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
	Mass grammes	0.83	0.91	1.31	1.49

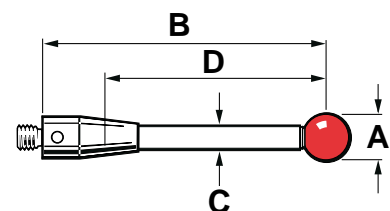
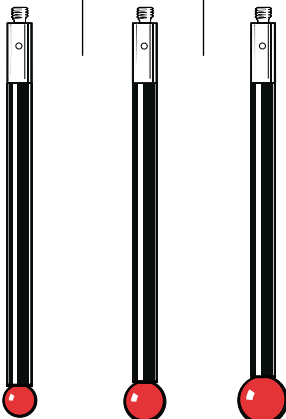
50 mm range



**Ruby ball styli (carbon fiber stems)**

Ball material	Part number			
Ruby	A-5003-2285	A-5003-2286	A-5003-2287	
Silicon nitride	A-5004-1970	A-5004-1971	A-5004-1972	
Zirconia	A-5004-1331	A-5004-1330	A-5004-1329	
A	Ball dia. mm (in)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
B	Length mm (in)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)
D	EWL* mm (in)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
	Mass grammes	1.00	1.10	1.20

50 mm range

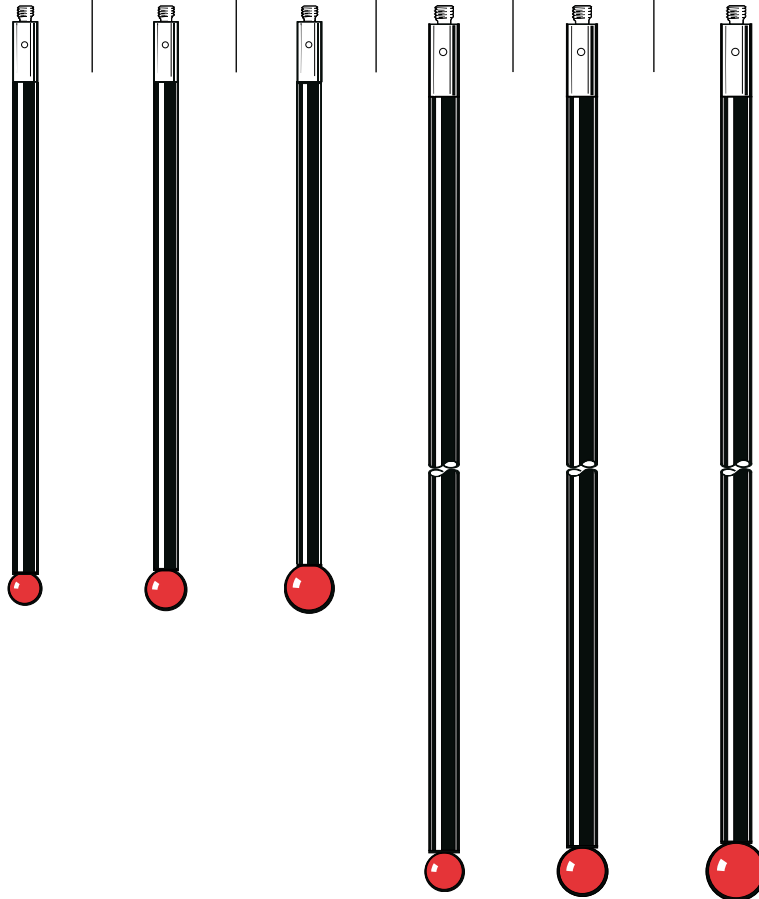


\* Effective working length

**Ruby ball styli (carbon fiber stems)**

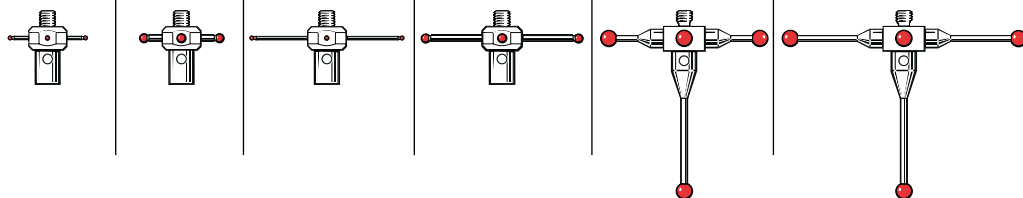
Ball material	Part number						
Ruby	A-5003-4784	A-5003-4785	A-5003-4786	A-5003-2289	A-5003-2290	A-5003-2291	
Silicon nitride	A-5004-1973	A-5004-1974	A-5004-1975	A-5004-1976	A-5004-1977	A-5004-1978	
Zirconia	A-5004-2949	A-5004-2950	A-5004-2951	A-5004-2952	A-5004-2953	A-5004-2954	
A	Ball dia. mm (inch)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
B	Length mm (inch)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)
C	Stem dia. mm (in.)	2.0 (0.08)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)
D	EWL* mm (inch)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)
	Mass grammes	0.75	1.35	1.45	1.50	1.59	1.78

75 mm – 100 mm range



**Star styli (fixed)**

Part number	A-5003-4011	A-5000-7811	A-5003-4787	A-5003-4788	A-5000-7629	A-5000-3626
Span mm (inch)	10.0 (0.40)	10.0 (0.40)	20.0 (0.79)	20.0 (0.79)	18.0 (0.71)	30.0 (1.19)
Ball mm (inch)	0.5 (0.02)	1.0 (0.04)	0.5 (0.02)	1.0 (0.04)	2.0 (0.08)	2.0 (0.08)
Stem dia. mm (inch)	0.3 (0.012)	0.7 (0.03)	0.3 (0.012)	0.7 (0.03)	1.4 (0.06)	1.4 (0.06)
EWL* mm (inch)	N/A	N/A	N/A	N/A	12.0 (0.48)	12.0 (0.48)
Mass grammes	0.7	0.5	0.7	0.9	1.3	1.8

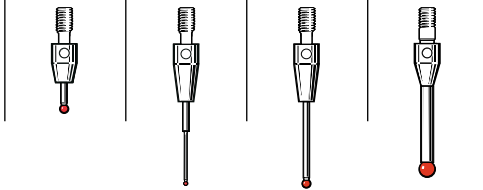


\* Effective working length




**Star stylus centers**

Part number	A-5003-4789	A-5003-4790	A-5003-4791	A-5000-3609
Ball mm (inch)	1.0 (0.04)	0.5 (0.02)	1.0 (0.04)	2.0 (0.08)
Stem dia. mm (inch)	0.7 (0.03)	0.4 (0.02)	0.7 (0.03)	1.4 (0.06)
EWL* mm (inch)	3.5 (0.14)	7.0 (0.28)	11.0 (0.44)	12.0 (0.48)
Mass grammes	0.31	0.43	0.45	0.44

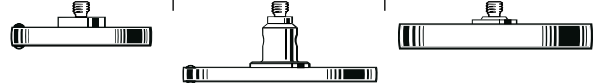


**Disk styli**

Part number	A-5000-3611 Ruby	A-5004-1387 Silver steel	A-5004-1395 Silver steel	A-5004-1396 Silver steel	A-5000-7809 Silver steel
Disk dia. mm (inch)	6.0 (0.24)	10.0 (0.39)	12.0 (0.47)	14.0 (0.55)	18.0 (0.71)
Disk depth mm (inch)	1.2 (0.05)	1.2 (0.05)	1.6 (0.06)	1.6 (0.06)	1.6 (0.06)
Roller depth mm (inch)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)	2.5 (0.10)
Stem dia. mm (inch)	2.0 (0.08)	2.0 (0.08)	4.2 (0.17)	4.2 (0.17)	4.2 (0.17)
Mass grammes	0.6	1.0	2.0	2.5	3.0

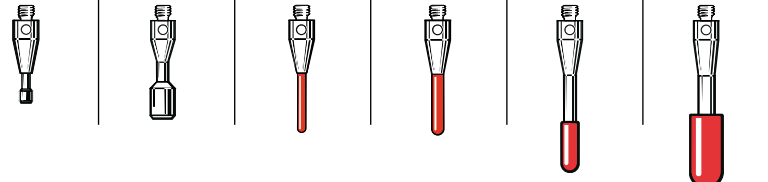


Part number	A-5000-3613 Silver steel	A-5000-7810 Silver steel	A-5000-4187 Silver steel
Disk dia. mm (inch)	18.0 (0.71)	25.0 (0.99)	25.0 (0.99)
Disk depth mm (inch)	2.3 (0.10)	1.6 (0.06)	3.1 (0.13)
Roller depth mm (inch)	3.0 (0.12)	2.5 (0.10)	N/A
Stem dia. mm (inch)	N/A	4.2 (0.17)	N/A
Mass grammes	2.7	4.0	3.8



**Cylinder styli**

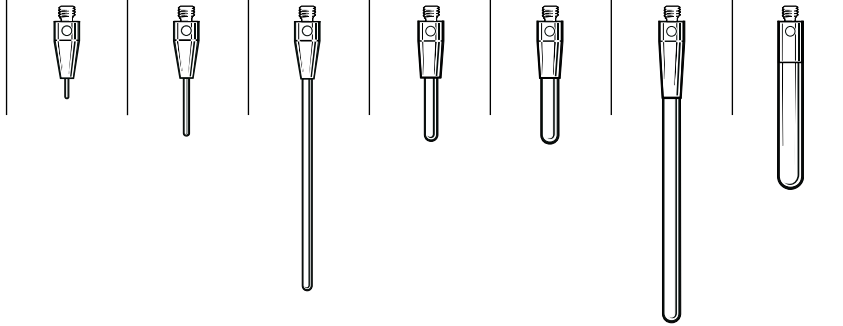
Part number	M-5000-4152 Silver steel	M-5000-4153 Silver steel	A-5000-8876 Ruby	A-5000-8877 Ruby	A-5000-7812 Ruby	A-5003-0073 Ruby
Cylinder dia. mm (inch)	1.5 (0.06)	3.0 (0.12)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	4.0 (0.16)
Overall length mm (inch)	10.75 (0.42)	12.75 (0.50)	15.0 (0.60)	15.0 (0.60)	21.2 (0.83)	22.0 (0.87)
Stem dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	N/A	N/A	1.6 (0.07)	2.0 (0.08)
EWL* mm (inch)	1.25 (0.05)	3.8 (0.15)	8.0 (0.32)	8.0 (0.32)	7.2 (0.29)	10.0 (0.40)
Mass grammes	0.3	0.6	0.3	0.3	0.5	0.9



\* Effective working length

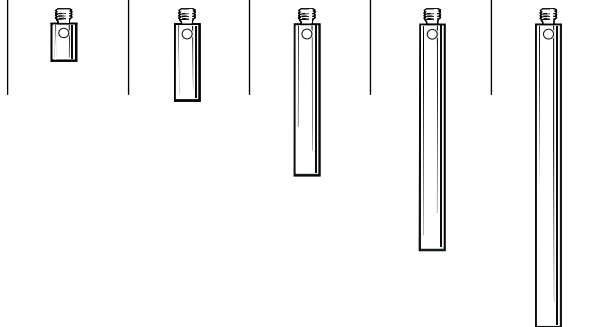
**Parallel hemispherical-ended styli (tungsten carbide)**

Part number	A-5003-1208	A-5003-1210	A-5003-1218	A-5003-1219	A-5003-1228	A-5003-0074	A-5003-1258
Cylinder dia. mm (inch)	0.3 (0.012)	0.5 (0.02)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	3.0 (0.12)
Overall length mm (inch)	10.2 (0.41)	15.3 (0.61)	35.5 (1.40)	15.8 (0.63)	16.0 (0.63)	40.0 (1.58)	22.5 (0.89)
EWL* mm (inch)	2.7 (0.11)	7.8 (0.31)	28.0 (1.10)	8.3 (0.33)	8.5 (0.34)	32.0 (1.26)	22.5 (0.89)
Mass grammes	0.3	0.3	0.7	0.6	0.8	2.0	2.0



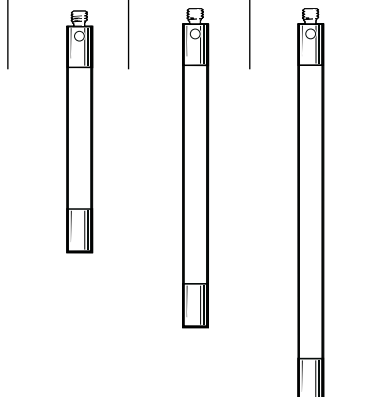
**Stylus extensions (stainless steel)**

Part number	M-5000-7634	M-5000-3647	M-5000-3648	M-5000-4162	M-5000-7779
Length mm (inch)	5.0 (0.20)	10.0 (0.40)	20.0 (0.79)	30.0 (1.19)	40.0 (1.58)
Stem dia. mm (inch)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)
Mass grammes	0.2	0.4	0.9	1.4	1.8



**Stylus extensions (ceramic)**

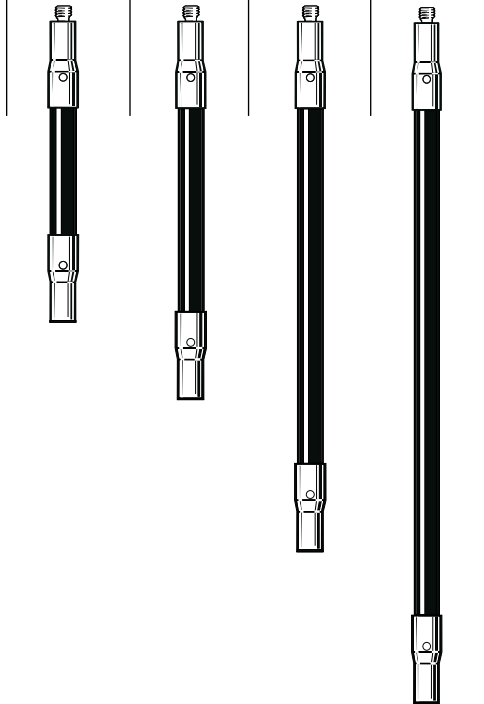
Part number	A-5003-0070	A-5003-0071	A-5003-0072
Length mm (inch)	30.0 (1.19)	40.0 (1.58)	50.0 (1.97)
Stem dia. mm (inch)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)
Mass grammes	0.97	1.22	1.51



\*\* Special \* Effective working length

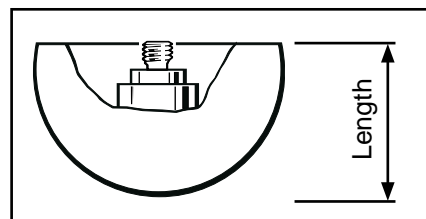
**Stylus extensions (carbon fiber)**

Part number	A-5003-2280	A-5003-2281	A-5003-2282	A-5003-2283
Length mm (inch)	40.0 (1.58)	50.0 (1.97)	70.0 (2.76)	90.0 (3.55)
Stem dia. mm (inch)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)
Outer dia. mm (inch)	3.5 (0.14)	3.5 (0.14)	3.5 (0.14)	3.5 (0.14)
Mass grammes	0.9	1.0	1.3	1.5



**Special purpose styli**

Part number	M-5000-4150 Silver steel	A-5000-7813 Tungsten carbide	A-5000-3614 Ceramic
Length mm (inch)	15.0 (0.60)	10.0 (0.40)	11.0 (0.44)
Ball dia. mm (inch)	N/A	N/A	18.0 (0.71)
End feature mm (inch)	Flat rad. 0.05 (0.002)	Spherical rad. 0.1 (0.004)	N/A
Angles	30° inclusive	30° inclusive	N/A
Mass grammes	0.7	0.7	3.3

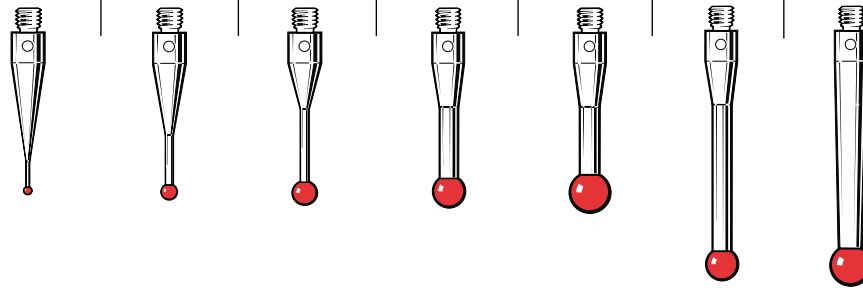


## M3 threaded stylus range

### Ruby ball styli (stainless steel stems)

Ball material	Part number							
Ruby	A-5000-3551	A-5000-3552	A-5000-3553	A-5000-7606	A-5000-7630	A-5000-3554	A-5000-7648	
Silicon nitride	A-5004-1979	A-5003-5723	A-5003-6257	A-5003-5061	A-5003-6695	A-5004-1980	A-5004-1981	
Zirconia	A-5004-2955	A-5003-5736	A-5004-2956	A-5003-5737	A-5003-9500	A-5004-2957	A-5004-2958	
A	Ball dia. mm (inch)	1.0 (0.04)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	21.0 (0.83)	21.0 (0.83)	21.0 (0.83)	21.0 (0.83)	21.0 (0.83)	31.0 (1.23)	31.0 (1.23)
C	Stem dia. mm (in.)	0.7 (0.03)	1.4 (0.06)	1.5 (0.06)	2.5 (0.10)	2.5 (0.10)	2.5 (0.10)	3.5 (0.14)
D	EWL* mm (inch)	4.0 (0.16)	9.6 (0.38)	14.7 (0.58)	17.2 (0.68)	21.0 (0.83)	27.0 (1.07)	31.0 (1.23)
	Mass grammes	1.0	1.0	1.0	1.3	1.5	2.5	3.0

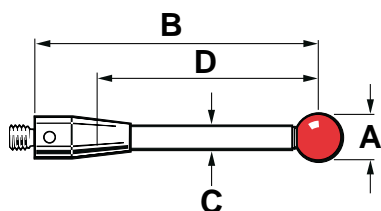
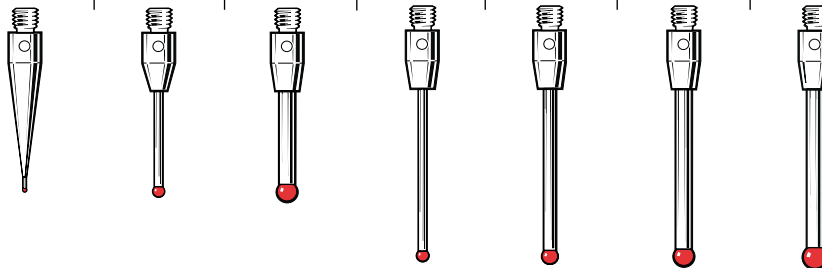
21 mm – 31 mm range



### Ruby ball styli (tungsten carbide stems)

Ball material	Part number							
Ruby	A-5000-7632	A-5003-0050	A-5003-0054	A-5003-0051	A-5003-0052	A-5003-0055	A-5003-0057	
Silicon nitride	A-5004-2023**	A-5004-1198	A-5004-1982	A-5003-8091	A-5003-5724	A-5004-1983	A-5004-1984	
Zirconia	A-5004-2959	A-5004-2960	A-5004-2961	A-5004-2962	A-5003-5738	A-5004-2963	A-5003-6766	
A	Ball dia. mm (inch)	0.5 (0.02)	1.5 (0.06)	2.5 (0.10)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)
B	Length mm (inch)	21.0 (0.83)	20.0 (0.79)	20.2 (0.80)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
C	Stem dia. mm (in.)	0.4 (0.02)	1.0 (0.04)	2.0 (0.08)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)
D	EWL* mm (inch)	2.0 (0.08)	12.5 (0.50)	12.5 (0.50)	22.5 (0.89)	22.8 (0.90)	22.5 (0.89)	24.0 (0.94)
	Mass grammes	1.0	0.8	1.3	0.93	1.32	1.81	1.83

20 mm – 30 mm range



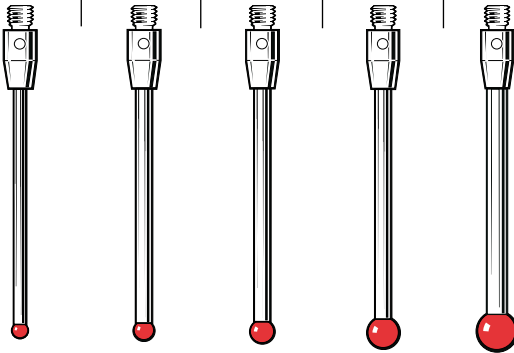
\*\* Special

\* Effective working length

**Ruby ball styli (tungsten carbide stems) – continued**

Ball material	Part number					
Ruby	A-5003-0053	A-5003-0056	A-5003-0058	A-5003-0060	A-5003-0062	
Silicon nitride	A-5004-1985	A-5004-1986	A-5004-1987	A-5004-1195	A-5004-1718	
Zirconia	A-5003-2043	A-5004-2964	A-5004-2965	A-5003-6767	A-5004-2966	
A	Ball dia. mm (inch)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)
C	Stem dia. mm (in.)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)
D	EWL* mm (inch)	32.5 (1.28)	32.5 (1.28)	33.7 (1.33)	36.0 (1.42)	40.0 (1.58)
	Mass grammes	1.58	2.28	2.30	2.38	3.50

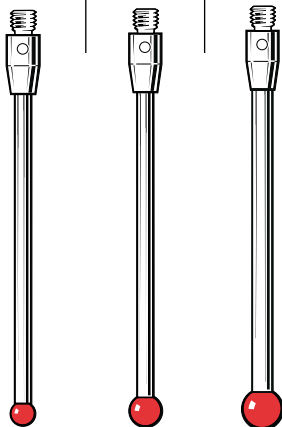
40 mm range



**Ruby ball styli (tungsten carbide stems)**

Ball material	Part number			
Ruby	A-5003-0059	A-5003-0061	A-5003-0063	
Silicon nitride	A-5004-1199	A-5004-1988	A-5004-1201	
Zirconia	A-5004-2968	A-5003-6768	A-5003-7665	
A	Ball dia. mm (inch)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in.)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)
D	EWL* mm (inch)	43.7 (1.72)	46.0 (1.82)	50.0 (1.97)
	Mass grammes	2.78	2.85	4.10

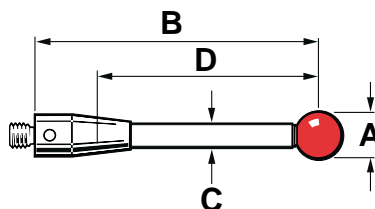
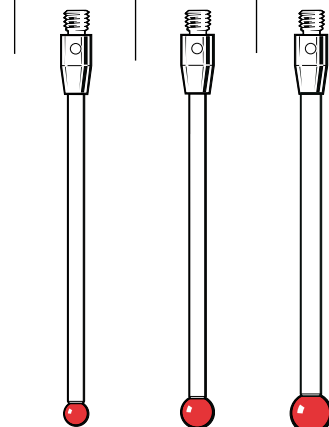
50 mm range



**Ruby ball styli (ceramic stems)**

Ball material	Part number			
Ruby	A-5003-0067	A-5003-0068	A-5003-0069	
Silicon nitride	A-5004-1989	A-5003-5725	A-5004-1990	
Zirconia	A-5004-2969	A-5003-5739	A-5004-2970	
A	Ball dia. mm (inch)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in.)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)
D	EWL* mm (inch)	43.7 (1.72)	46.0 (1.82)	50.0 (1.97)
	Mass grammes	1.17	1.24	1.33

50 mm range

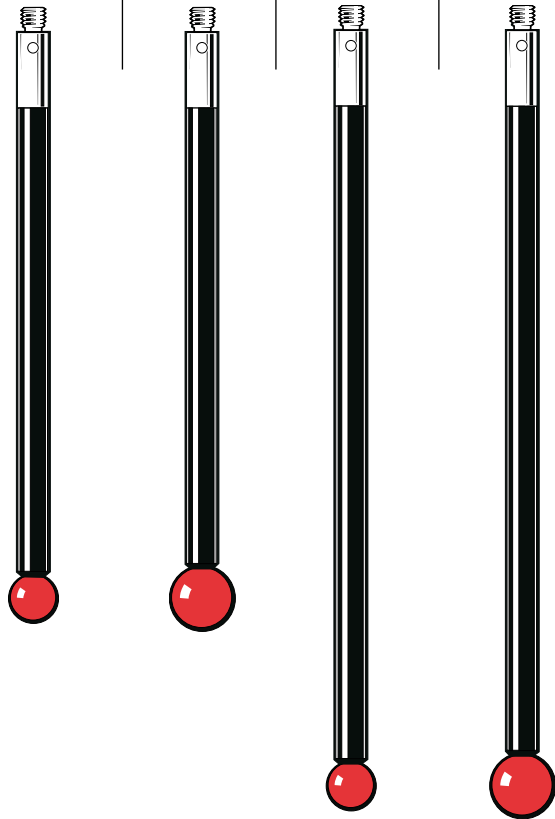


\* Effective working length

**Ruby ball styli (carbon fiber stems)**

Ball material	Part number			
Ruby	A-5003-4860	A-5003-4862	A-5003-4861	A-5003-4863
Silicon nitride	A-5003-5726	A-5004-1991	A-5003-5727	A-5004-5466
Zirconia	A-5003-5740	A-5003-6771	A-5003-5741	A-5003-6778
<b>A</b> Ball dia. mm (inch)	6.0 (0.24)	8.0 (0.32)	6.0 (0.24)	8.0 (0.32)
<b>B</b> Length mm (inch)	75.0 (2.96)	75.0 (2.96)	100.0 (3.94)	100.0 (3.94)
<b>C</b> Stem dia. mm (in.)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)
<b>D</b> EWL* mm (inch)	75.0 (2.96)	75.0 (2.96)	100.0 (3.94)	100.0 (3.94)
Mass grammes	2.40	2.98	2.89	3.47

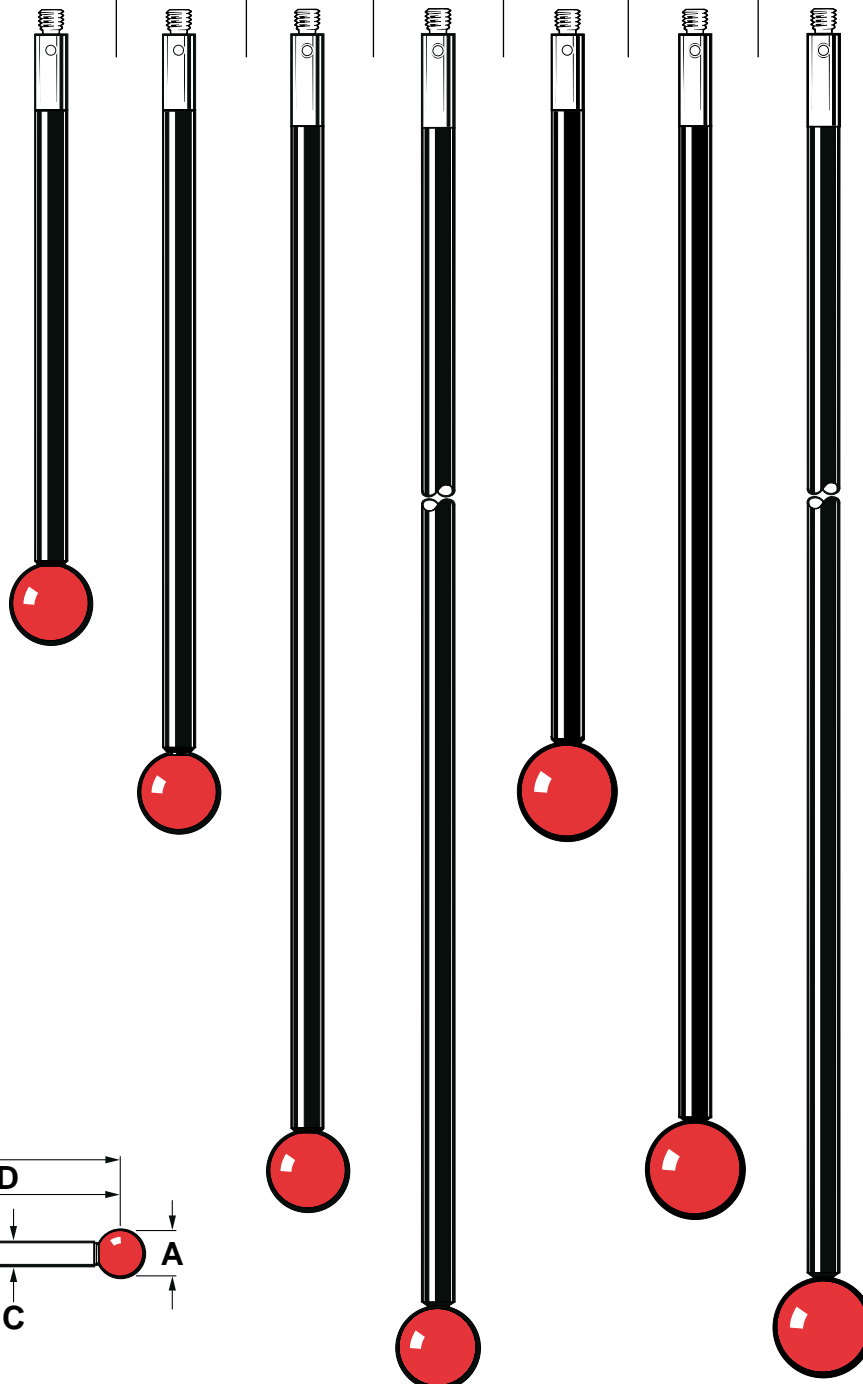
**75 mm – 100 mm range**



\* Effective working length

Ruby ball styli (carbon fiber stems) – continued

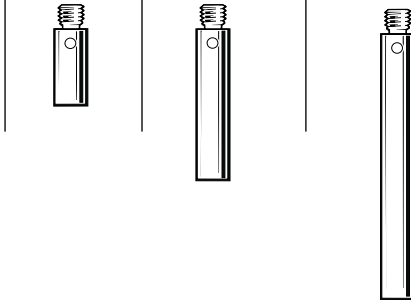
Ball material	Part number							
Ruby	A-5003-7057	A-5003-7056	A-5003-7055	A-5003-7054	A-5003-7445	A-5003-7446	A-5003-7447	
Silicon nitride	A-5004-1992	A-5004-1993	A-5004-1994	A-5004-1995	A-5004-1996	A-5004-1997	A-5004-1998	
Zirconia	A-5004-2972	A-5003-9495	A-5004-2973	A-5004-2974	A-5004-2975	A-5004-2976	A-5004-2977	
A	Ball dia. mm (inch)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	10.0 (0.40)	12.0 (0.48)	12.0 (0.48)	12.0 (0.48)
B	Length mm (inch)	75.0 (2.96)	100.0 (3.94)	150.0 (5.91)	200.0 (7.88)	100.0 (3.94)	150.0 (5.91)	200.0 (7.88)
C	Stem dia. mm (in.)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)
D	EWL* mm (inch)	75.0 (2.96)	100.0 (3.94)	150.0 (5.91)	200.0 (7.88)	100.0 (3.94)	150.0 (5.91)	200.0 (7.88)
	Mass grammes	4.05	4.53	5.49	6.47	5.9	6.9	7.9



\* Effective working length

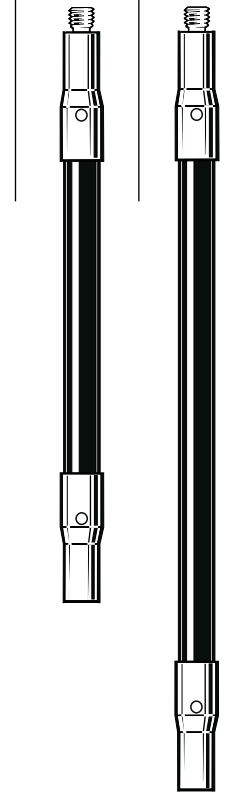
**Stylus extensions (stainless steel)**

Part number	M-5000-7633	M-5000-3592	M-5000-3593
Length mm (inch)	10.0 (0.40)	20.0 (0.79)	35.0 (1.38)
Stem dia. mm (inch)	4.0 (0.16)	4.0 (0.16)	4.0 (0.16)
Mass grammes	0.9	1.6	2.9



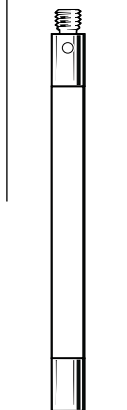
**Stylus extensions (carbon fiber)**

Part number	A-5003-4864	A-5003-4865
Length mm (inch)	75.0 (2.96)	100.0 (3.94)
Stem dia. mm (inch)	4.0 (0.16)	4.0 (0.16)
Mass grammes	2.53	3.02



**Stylus extensions (ceramic)**

Part number	A-5003-0075
Length mm (inch)	50.0 (1.97)
Stem dia. mm (inch)	4.0 (0.16)
Mass grammes	2.95

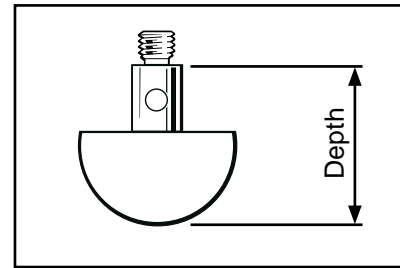




**Disk and hollow ball styli**

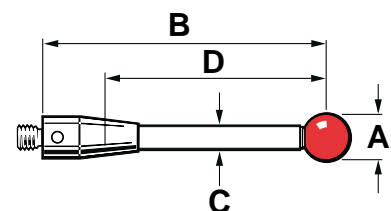
Part number	A-5000-3615 Silver steel	A-5000-7612 Silver steel	A-5000-7669 Carbon steel
Disk dia. mm (inch)	12.7 (0.50)	35.0 (1.38)	63.5 (2.51)
Disk depth mm (inch)	2.2 (0.09)	5.0 (0.20)	6.0 (0.24)
Stem dia. mm (inch)	3.5 (0.14)	N/A	N/A
Mass grammes	4.0	10.0	45.0

Part number	A-5000-7814 Ceramic	A-5003-7098 Ceramic
Disk dia. mm (inch)	30.0 (1.19)	30.0 (1.19)
Disk depth mm (inch)	17.0 (0.67)	1.5 (0.06)
Stem dia. mm (inch)	N/A	4.0 (0.16)
Mass grammes	13.0	3.6



**Star styli (fixed)**

Part number	A-5003-0076	A-5003-0077
Span mm (inch)	30.0 (1.19)	50.0 (1.97)
Ball mm (inch)	2.0 (0.08)	2.0 (0.08)
Stem dia. mm (inch)	1.4 (0.06)	1.4 (0.06)
EWL* mm (inch)	11.0 (0.44)	11.0 (0.44)
Mass grammes	2.38	5.25

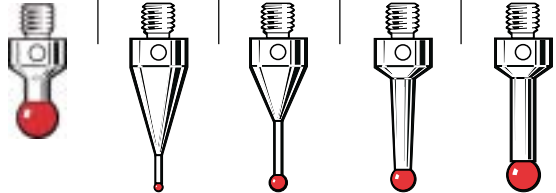


\* Effective working length

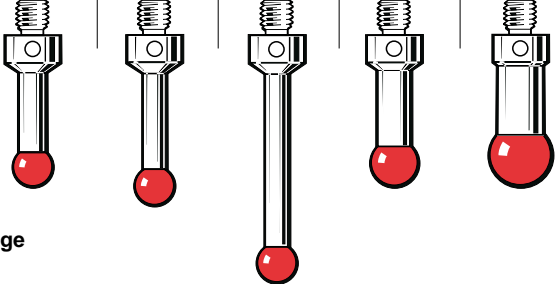
## M4 threaded stylus range

### Ruby ball styli (stainless steel stems)

Ball material		Part number				
Ruby		A-5000-6350	A-5000-7545	A-5000-7547	A-5000-7549	A-5000-7551
Silicon nitride		–	–	A-5003-5728	–	A-5003-5729
Zirconia		–	–	A-5003-5742	–	A-5003-5743
A	Ball dia. mm (inch)	5.0 (0.20)	1.0 (0.04)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)
B	Length mm (inch)	10.0 (0.39)	19.5 (0.77)	19.0 (0.75)	18.5 (0.73)	18.0 (0.71)
C	Stem dia. mm (in.)	3.0 (0.12)	0.7 (0.03)	1.4 (0.05)	2.0 (0.08)	3.0 (0.12)
D	EWL* mm (inch)	5.0 (0.20)	4.5 (0.18)	9.2 (0.36)	13.0 (0.52)	13.7 (0.54)
	Mass grammes	1.9	2.5	2.3	2.0	2.1



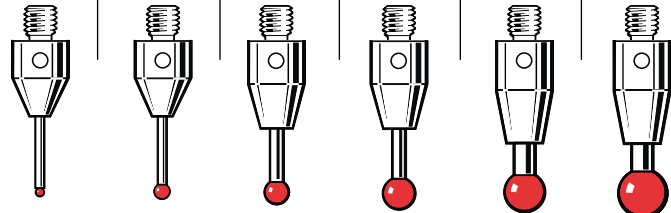
Part number		A-5000-7553	A-5000-6731	A-5000-6352	A-5000-7555	A-5000-7557
A	Ball dia. mm (inch)	5.0 (0.20)	5.0 (0.20)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
B	Length mm (inch)	17.5 (0.69)	20.0 (0.79)	30.0 (1.19)	17.0 (0.67)	16.0 (0.63)
C	Stem dia. mm (in.)	3.5 (0.14)	3.0 (0.12)	3.0 (0.12)	4.5 (0.18)	6.0 (0.24)
D	EWL* mm (inch)	13.6 (0.54)	15.89 (0.63)	26.0 (1.03)	13.3 (0.52)	16.0 (0.63)
	Mass grammes	2.3	2.4	3.0	3.0	3.9



10 mm – 30 mm range

### Ruby ball styli (tungsten carbide stems)

Part number		A-5003-4792	A-5003-2932	A-5003-4793	A-5003-4794	A-5003-4795	A-5003-4796
A	Ball dia. mm (inch)	1.0 (0.04)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
B	Length mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
C	Stem dia. mm (in.)	0.7 (0.03)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)
D	EWL* mm (inch)	10.0 (0.40)	10.0 (0.40)	8.5 (0.33)	8.5 (0.33)	7.9 (0.31)	10.7 (0.42)
	Mass grammes	2.39	3.01	3.53	3.53	4.52	4.66



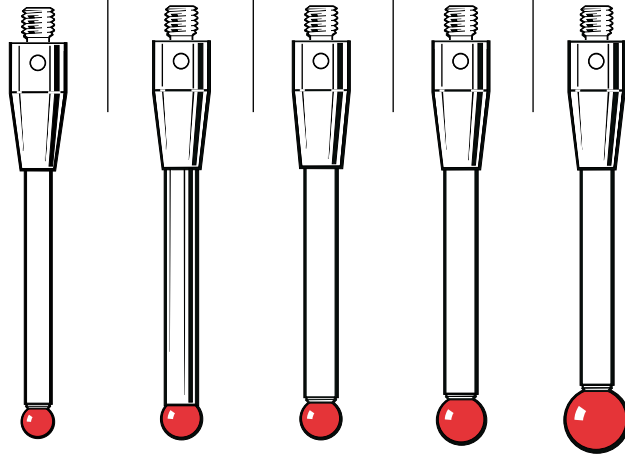
20 mm range

\* Effective working length

**Ruby ball styli**

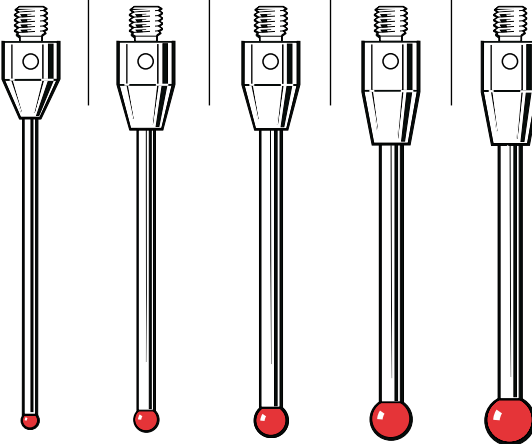
Part number	A-5003-0233 Ceramic	A-5000-7521 Stainless steel	A-5003-0235 Ceramic	A-5000-3709 Ceramic	A-5000-7795 Ceramic	
A	Ball dia. mm (inch)	4.0 (0.16)	5.0 (0.20)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in.)	3.0 (0.12)	4.5 (0.18)	3.8 (0.15)	4.5 (0.18)	4.5 (0.18)
D	EWL* mm (inch)	33.5 (1.32)	33.5 (1.32)	33.5 (1.32)	38.5 (1.52)	50.0 (1.97)
	Mass grammes	3.9	5.8	5.0	4.8	5.4

50 mm range



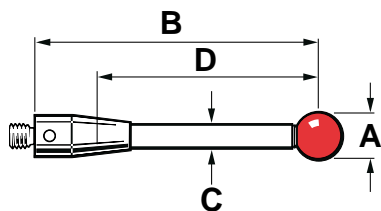
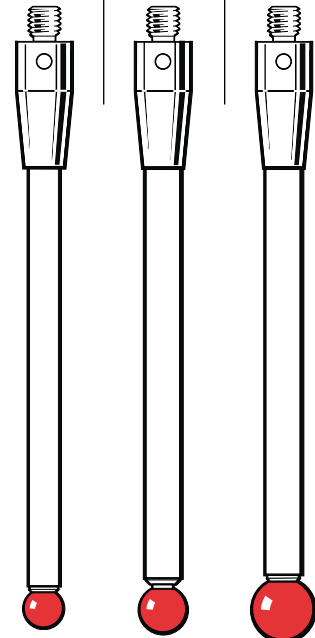
Part number	A-5003-4797 Tungsten carbide	A-5003-3680 Tungsten carbide	A-5003-4799 Tungsten Carbide	A-5003-4800 Tungsten carbide	A-5003-4801 Tungsten carbide	
A	Ball dia. mm (inch)	2.0 (0.08)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in.)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)
D	EWL* mm (inch)	40.0 (1.58)	38.5 (1.52)	38.5 (1.52)	37.9 (1.49)	40.7 (1.60)
	Mass grammes	3.80	4.94	4.99	6.72	6.86

50 mm range



Part number	A-5003-0236 Ceramic	A-5003-2764 Ceramic	A-5003-4802 Ceramic	
A	Ball dia. mm (inch)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)
B	Length mm (inch)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)
C	Stem dia. mm (in.)	3.8 (0.15)	4.5 (0.18)	4.5 (0.18)
D	EWL* mm (inch)	58.5 (2.30)	63.5 (2.51)	75.0 (2.96)
	Mass grammes	5.63	5.64	6.20

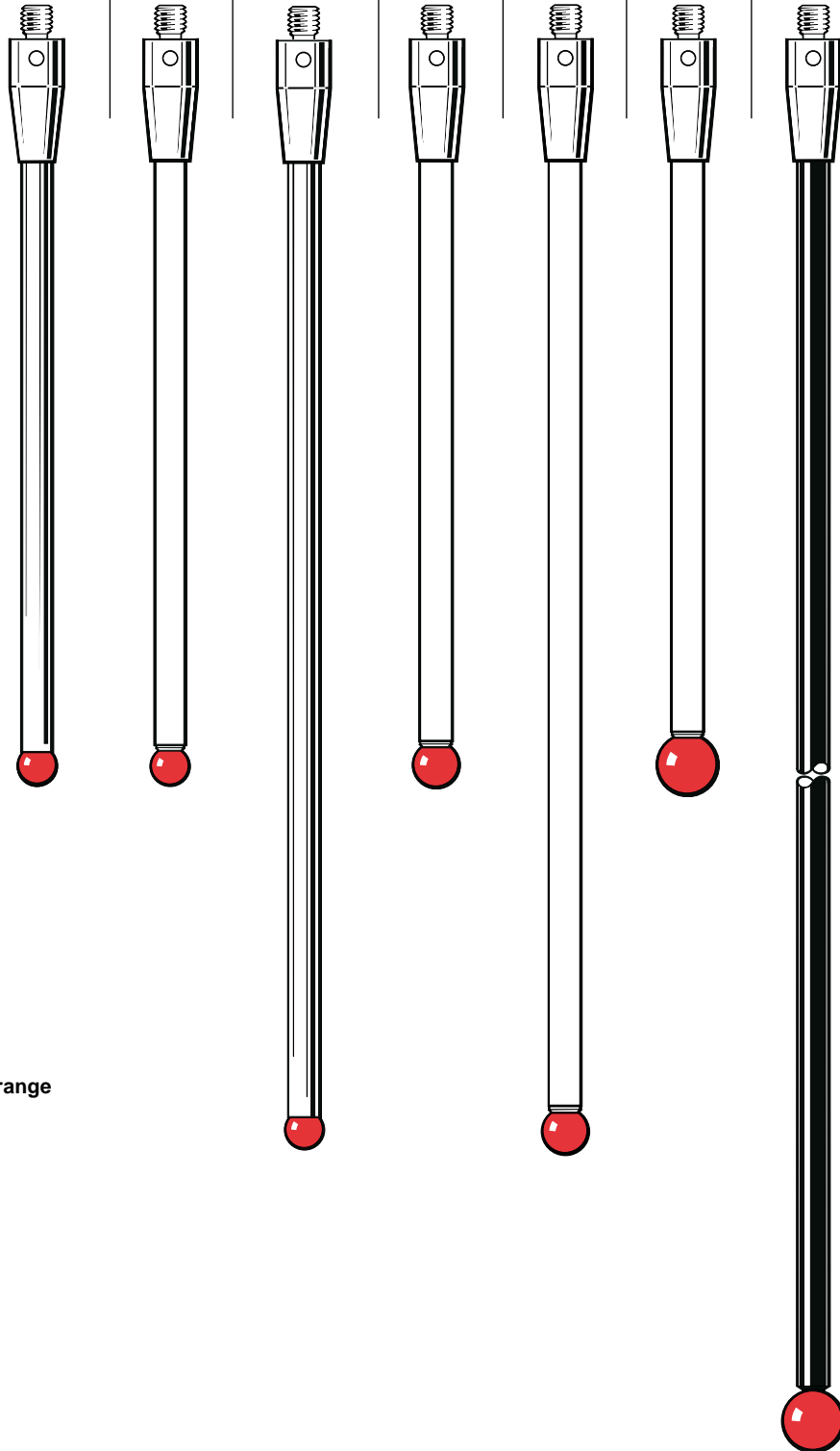
75 mm range



\* Effective working length

**Ruby ball styli**

Part number	A-5000-7522 Stainless steel	A-5000-9761 Ceramic	A-5000-7523 Stainless steel	A-5000-3712 Ceramic	A-5000-8156 Ceramic	A-5000-7796 Ceramic	A-5003-3461 Carbon fiber
A Ball dia. mm (in)	5.0 (0.20)	5.0 (0.20)	5.0 (0.20)	6.0 (0.24)	6.0 (0.24)	8.0 (0.32)	8.0 (0.32)
B Length mm (in)	100.0 (3.94)	100.0 (3.94)	150.0 (5.91)	100.0 (3.94)	150.0 (5.91)	100.0 (3.94)	300.0 (11.82)
C Stem dia mm (in)	4.5 (0.18)	3.8 (0.15)	4.4 (0.17)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
D EWL* mm (in)	83.2 (3.38)	83.5 (3.29)	133.00 (5.24)	88.5 (3.48)	135.0 (5.31)	100.0 (3.94)	300.0 (11.82)
Mass grammes	11.3	6.3	17.4	6.3	7.9	7.5	10.4



100 mm – 300 mm range

\* Effective working length

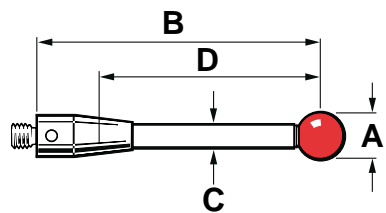
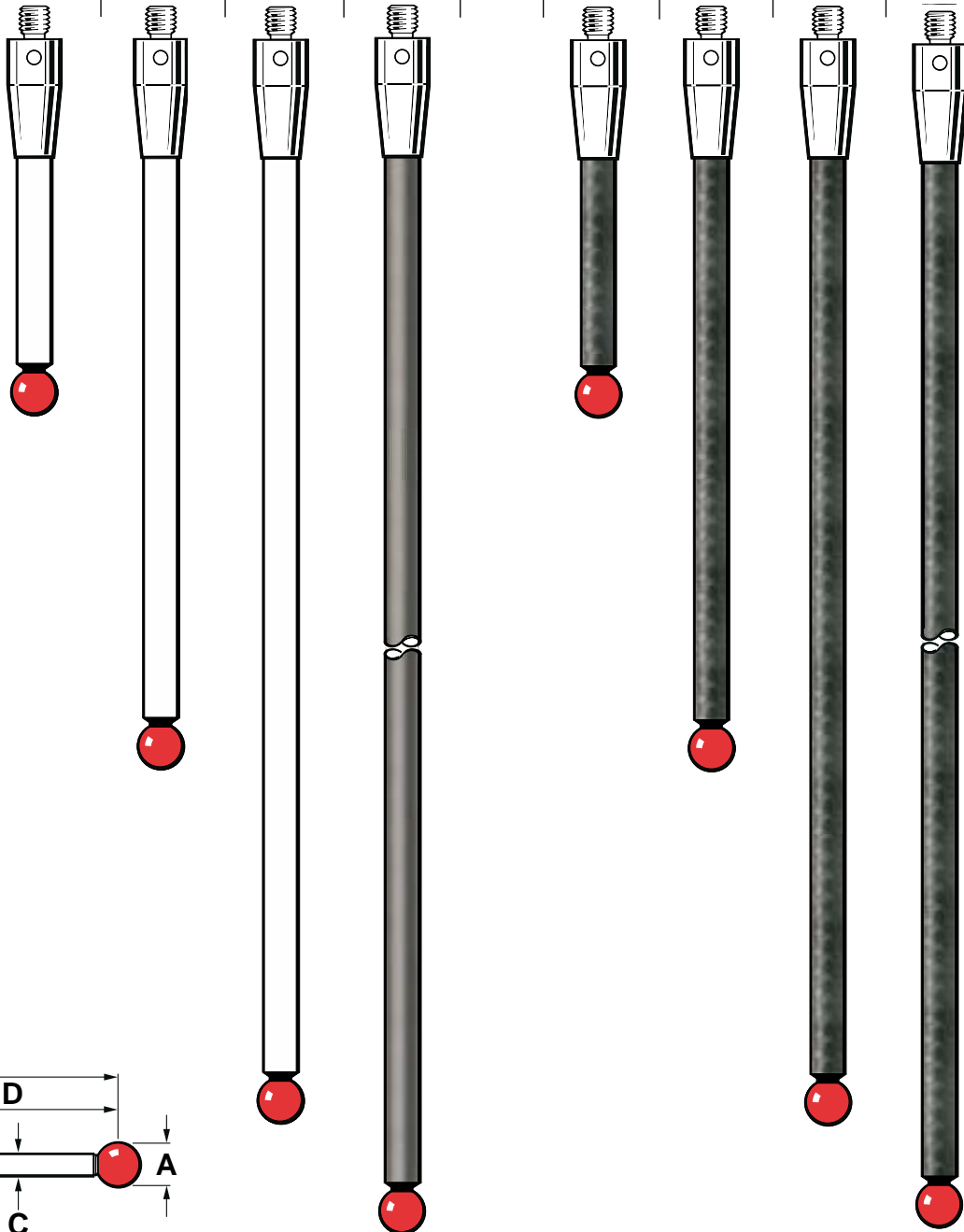
**Ruby ball styli (carbon fiber stems)**

Recommended for use with OMP400 and RMP600

Ball material	Part number				
Ruby	A-5003-7306	A-5003-6510	A-5003-6511	A-5003-6512	
Silicon nitride	A-5003-5730	A-5003-5731	–	–	
Zirconia	A-5003-5744	A-5003-5745	–	–	
A	Ball dia. mm (in)	6.0 (0.24)	6.0 (0.24)	6.0 (0.24)	6.0 (0.24)
B	Length mm (in)	50.0 (1.97)	100.0 (3.94)	150.0 (5.91)	200.0 (7.88)
C	Stem dia mm (in)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
D	EWL* mm (in)	38.5 (1.52)	88.5 (3.48)	138.5 (5.45)	188.5 (7.42)
	Mass grammes	4.1	6.2	7.5	8.7

Recommended for use with MP700

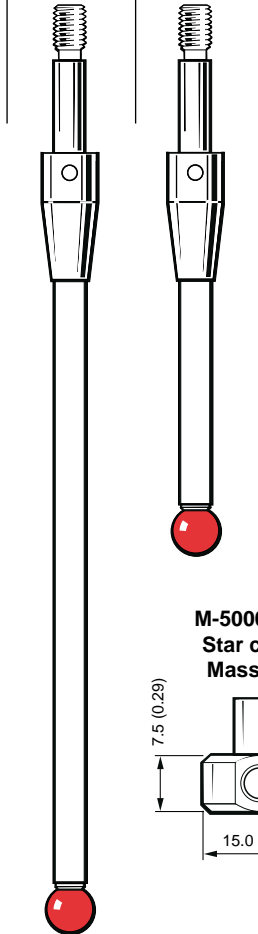
A-5003-1436	A-5003-1358	A-5003-1255	A-5003-1075
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
6.0 (0.24)	6.0 (0.24)	6.0 (0.24)	6.0 (0.24)
50.0 (1.97)	100.0 (3.94)	150.0 (5.91)	200.0 (7.88)
4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)
38.5 (1.52)	88.5 (3.58)	138.5 (5.46)	188.5 (7.42)
4.1	6.2	7.5	8.7



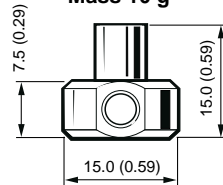
\* Effective working length

**Star styli**

Part number	A-5000-6462 Ceramic	A-5000-7098 Ceramic
Ball mm (inch)	6.0 (0.24)	6.0 (0.24)
Length mm (inch)	100.0 (3.94)	50.0 (1.97)
Stem dia. mm (in.)	4.5 (0.18)	4.5 (0.18)
EWL* mm (inch)	88.5 (3.48)	38.5 (1.52)
Mass grammes	7.5	6.0

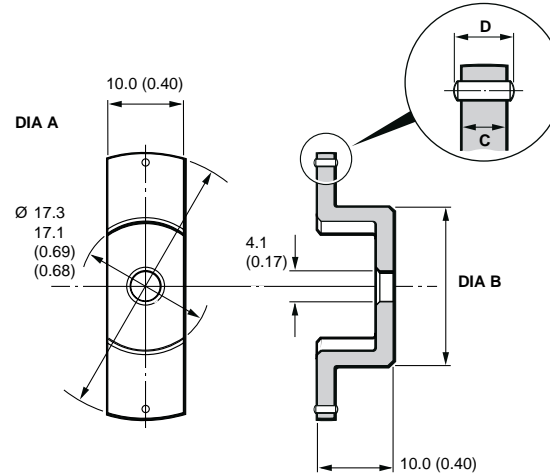


**M-5000-6460  
Star center  
Mass 10 g**

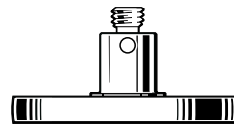


**Disk styli**

Part number	A-5000-7596	A-5000-7597	A-5000-7598
Diameter A mm (inch)	30.0 (1.19)	35.0 (1.38)	50.0 (1.97)
Diameter B mm (inch)	21.0 (0.83)	21.0 (0.83)	23.0 (0.91)
C mm (inch)	2.2 (0.09)	2.2 (0.09)	3.0 (0.12)
D mm (inch)	3.0 (0.12)	3.0 (0.12)	4.0 (0.16)
Mass grammes	8.01	9.57	13.55

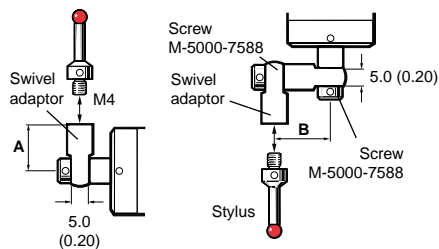


Part number	A-5000-6351 Silver steel
Disk dia. mm (inch)	30.0 (1.18)
Disk depth mm (inch)	3.0 (0.12)
Length mm (inch)	10.0 (0.39)
Rollers	NO
Mass grammes	7.9



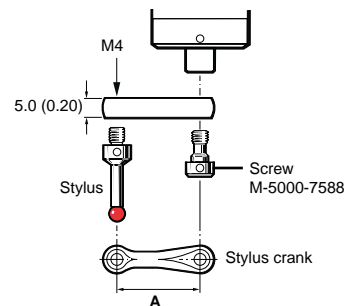
**Swivel adaptor**

Part number	M-5000-7591	M-5000-7592
Length A mm (inch)	10.0 (0.40)	13.5 (0.54)
Length B mm (inch)	12.5 (0.50)	16.0 (0.63)
Mass grammes	2.76	3.70










**Stylus crank**

Part number	M-5000-7589	M-5000-7590
Length A mm (in)	21.9 (0.86)	27.6 (1.09)
Mass grammes	6.07	6.94



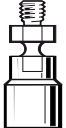
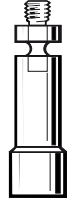


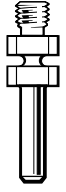
\* Effective working length

**Crash protection devices**

Part number	M-5000-7582	M-5000-7587	M-5000-7588	M-2085-0069	* A-5003-0661	M-2197-0156	M-2197-0150
	Stainless steel	Stainless steel	Stainless steel	Silver steel	Silver steel	Silver steel	Silver steel
For pack of ten	-	-	-	-	A-5004-1865	A-5004-1867	A-5004-1869
Length mm (inch)	8.0 (0.32)	8.0 (0.32)	10.0 (0.40)	12.0 (0.48)	15.2 (0.60)	9.0 (0.36)	16.0 (0.63)
Mass grammes	1.8	1.4	1.5	2.7	4.6	1.5	2.1
For use on	LP2	LP2	LP2	MP10	TS27R	HPMA	HPMA
	-	-	-	MP12	-	HPRA	HPRA
	-	-	-	RMP60	-	HPPA	HPPA
	-	-	-	OMP60	-	-	-
	-	-	-	MP3	-	-	-
	-	-	-	MP11	-	-	-
							

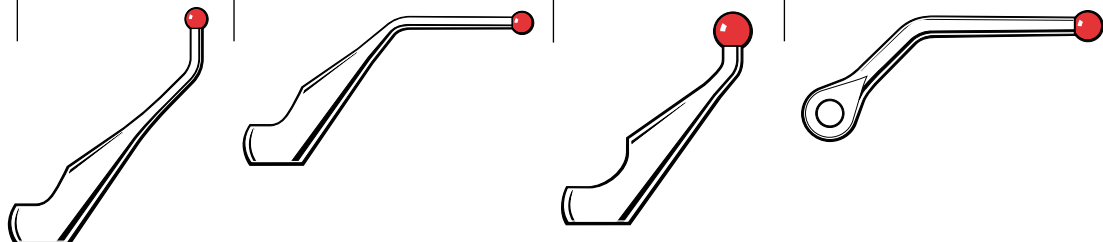
Use P-TL09-0003  
to tighten

\* Please note: If you require the full TS27R break stem kit, please order A-5003-5171.

Part number	M-2008-0333	M-2008-0604	M-2008-0605	M-2048-2093	M-2116-0127
	M3	M3	M3	M4	M4
	Silver steel	Silver steel	Silver steel	Silver steel	Silver steel
Length mm (inch)	13.3 (0.52)	22.3 (0.88)	30.3 (1.19)	13.5 (0.53)	19.0 (0.75)
Mass grammes	2.43	3.6	4.5	1.37	2.2
For use on	TS20	TS20	TS20	RP1/RP2	TSA
					

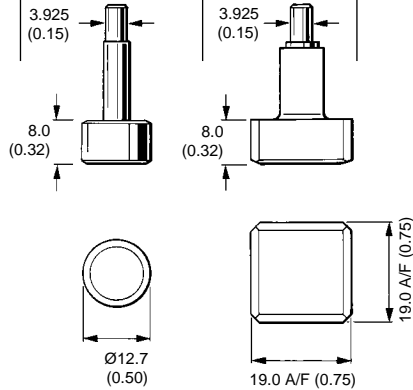
**Cranked styli**

Part number	A-5000-5302	A-5000-5307	A-5000-6620	A-5000-7580
	M4	M4	M4	M4
	Tungsten steel	Tungsten steel	Tungsten steel	Tungsten steel
Length mm (inch)	32.0 (1.26)	21.6 (0.85)	27.4 (1.08)	38.8 (1.53)
Mass grammes	3.8	3.85	4.7	2.5
For use on	LP2	LP2	LP2	LP2

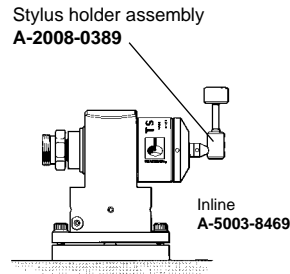


**TS27R styli – parallel shafted (not M4) – not compatible with TS27 probes**

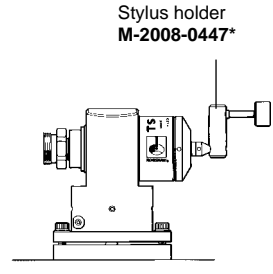
Part number	A-2008-0382 Tungsten carbide	A-2008-0384 Ceramic
Overall length mm (inch)	23.0 (0.91)	22.0 (0.87)
Mass grammes	12.1	7.1



Stylus conversion kit for TS27R to allow horizontal machining applications (**A-2008-0448**)



Vertical machining applications

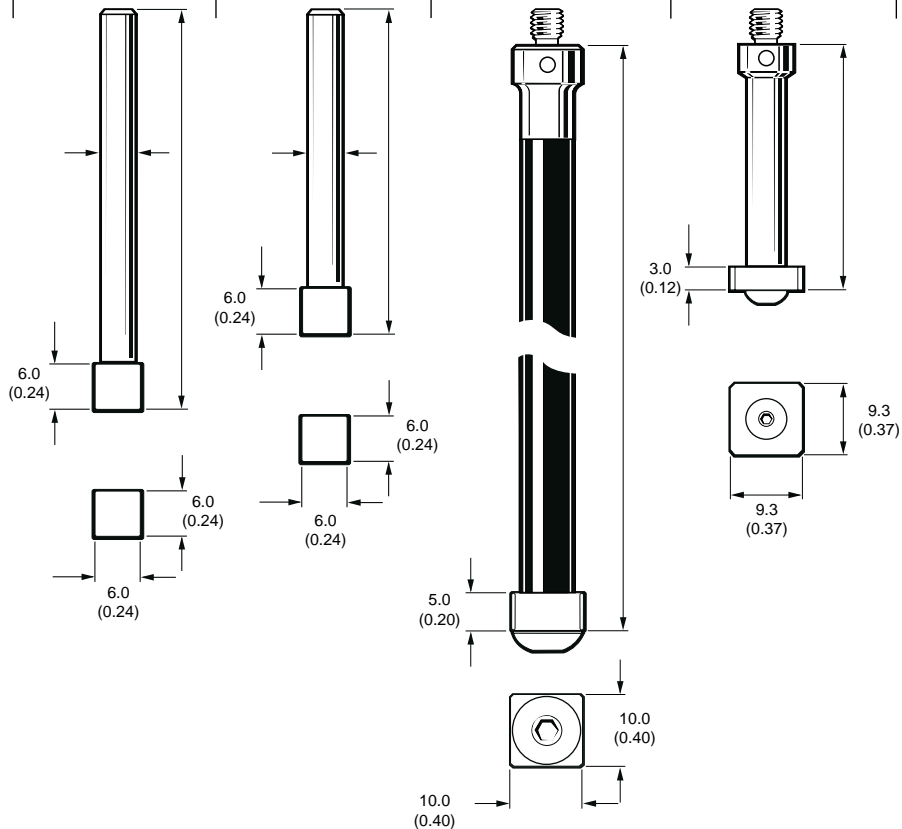


Horizontal machining applications

\* Order also requires 2 x P-SC13-0404

**Tool datuming styli**

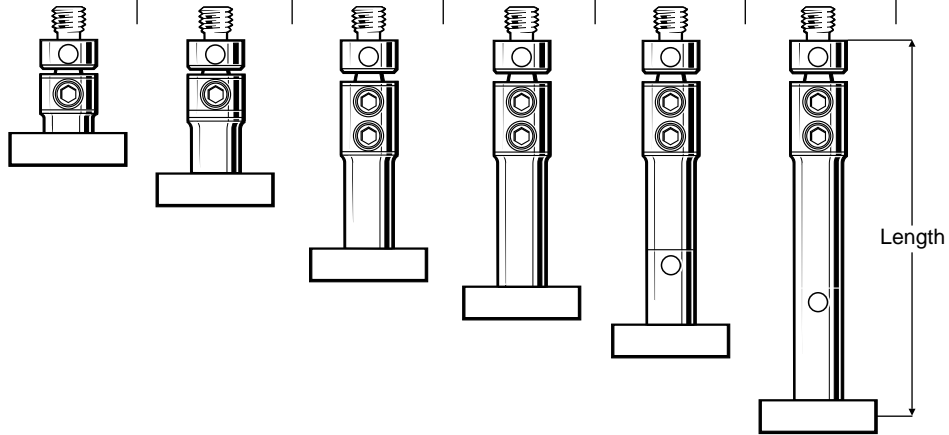
Part number	A-5000-3212 Stainless steel	A-5000-6701 Stainless steel	A-5000-6713 Aluminum	A-5000-6403 Stainless steel
Overall length mm (inch)	53.0 (2.09)	43.0 (1.70)	96.5 (3.80)	32.5 (1.28)
Stem dia. mm (inch)	4.5 (0.18)	4.5 (0.18)	7.5 (0.30)	5.4 (0.22)
Mass grammes	4.5	4.3	21.9	11.0



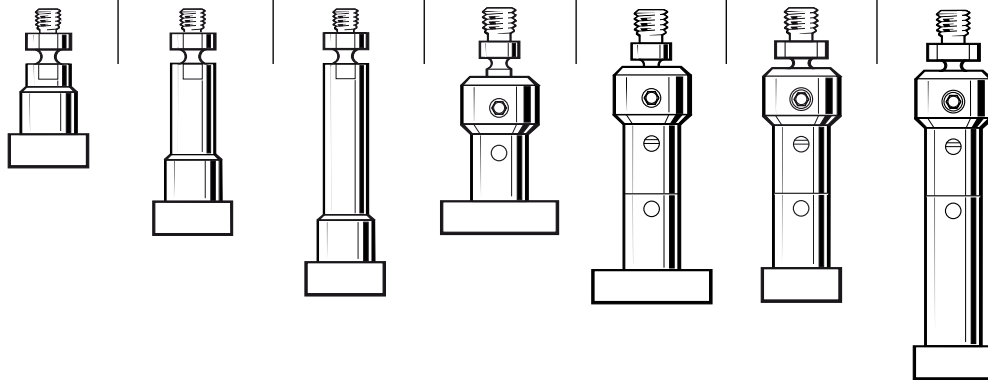


**Tool datuming styli – continued**

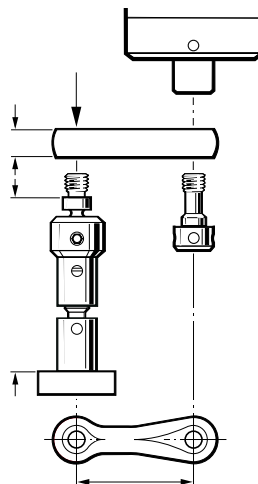
Part number	A-2197-0157 Tungsten steel	A-2197-0158 Tungsten steel	A-2197-0159 Tungsten steel	A-2197-0160 Tungsten steel	A-2197-0161 Tungsten steel	A-2197-0162 Tungsten steel
Length mm (inch)	14.2 (0.56)	19.5 (0.77)	29.5 (1.16)	34.5 (1.36)	39.5 (1.55)	49.5 (1.95)
Mass grammes	14.86	16.0	20.0	20.7	21.8	23.5
For use on	HPPA HPMA	HPPA HPMA	HPPA HPMA	HPPA HPMA	HPPA HPMA	HPPA HPMA
	HPRA RP3	HPRA RP3	HPRA RP3	HPRA RP3	HPRA RP3	HPRA RP3



Part number	A-2008-0601 M3	A-2008-0602 M3	A-2008-0603 M3	A-2048-2050 M4	A-2048-2051 M4	A-2116-0140 M4	A-2116-0141 M4
	Tungsten steel	Tungsten steel	Tungsten steel	Tungsten steel	Tungsten steel	Tungsten steel	Tungsten steel
Length mm (inch)	15.4 (0.61)	24.0 (0.96)	32.4 (1.27)	23.2 (0.91)	32.0 (1.26)	32.0 (1.26)	42.0 (1.65)
Mass grammes	9.1	8.0	8.95	18.14	20.64	13.56	16.05
For use on	TS20	TS20	TS20	HPA (M6 MTG)	HPA (M6 MTG)	TSA	TSA

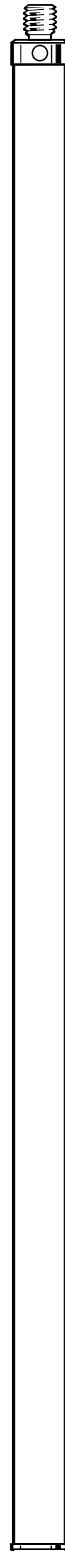
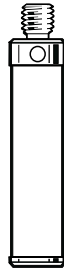
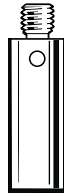


Part number	A-2116-0142
Length mm (inch)	30.3 (0.40)
Mass grammes	22.6
For use on	TSA



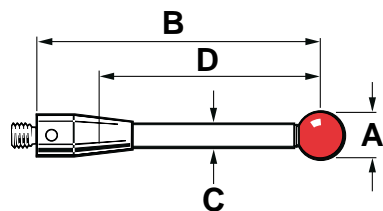
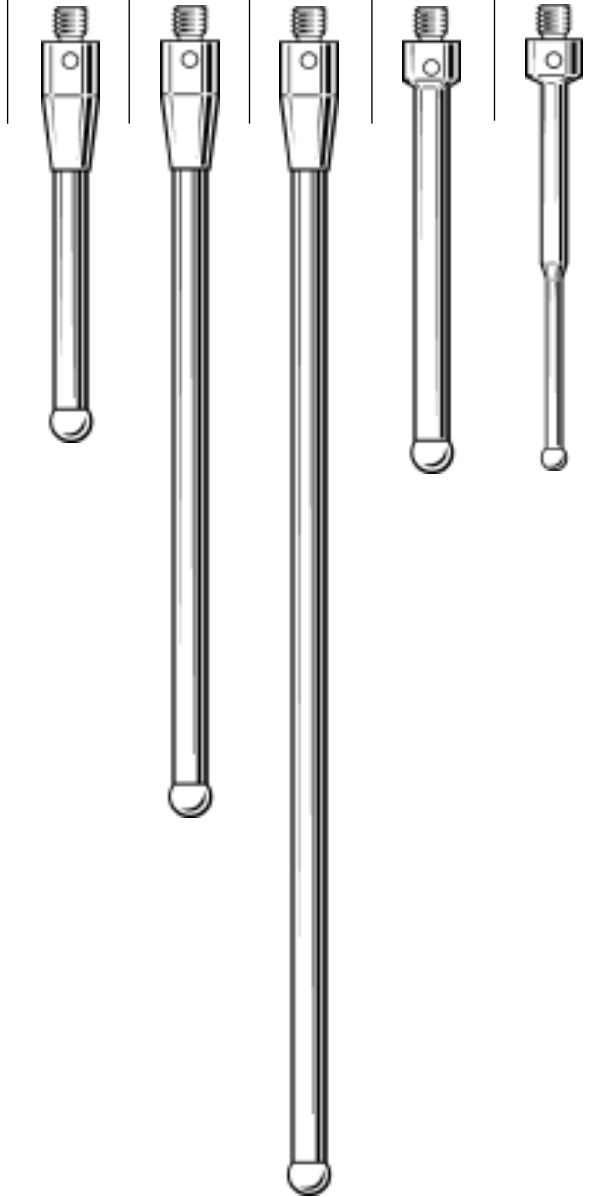
**Stylus extensions**

Part number	M-5000-7583 Stainless steel	M-5000-7584 Stainless steel	M-5000-7585 Stainless steel	M-5000-7586 Stainless steel	A-5000-7754 Ceramic	A-5000-7755 Ceramic	A-5000-7727 Ceramic	A-5003-0587 Ceramic
Length mm (inch)	10.0 (0.40)	15.0 (0.60)	20.0 (0.79)	30.0 (1.19)	30.0 (1.19)	50.0 (1.97)	100.0 (3.94)	200.0 (7.87)
Stem dia. mm (in.)	7.0 (0.28)	7.0 (0.28)	7.0 (0.28)	7.0 (0.28)	7.4 (0.29)	7.4 (0.29)	7.4 (0.29)	7.4 (0.29)
Mass grammes	2.4	3.7	4.8	7.4	5.1	6.7	10.6	18.4



**Tungsten carbide styli (stainless steel stems)**

Part number	A-5000-7670	A-5000-7671	A-5000-7672	A-5000-9685	A-5000-9697	
A	Ball dia. mm (inch)	5.0 (0.20)	5.0 (0.20)	5.0 (0.20)	3.0 (0.12)	
B	Length mm (inch)	50.0 (1.97)	100.0 (3.94)	150.0 (5.91)	54.0 (2.12)	55.0 (2.17)
C	Stem dia. mm (in.)	4.5 (0.18)	4.5 (0.18)	4.5 (0.18)	3.9 (0.15)	1.9 (0.07)
D	EWL* mm (inch)	35.0 (1.38)	85.0 (3.35)	135.0 (5.31)	50.0 (1.97)	25.0 (0.99)
	Mass grammes	6.2	11.9	18.2	6.9	3.8



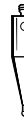
\* Effective working length

## M4 styli

## Walter styli

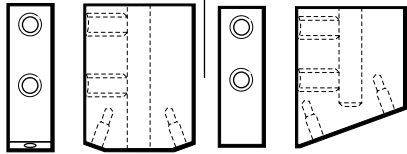
## M1.4 thread styli

Part number	A-5003-3814	A-5003-3045	A-5003-3042	A-5000-9860	A-5003-1699
	M1.4	M1.4	M1.4	M1.4	M1.4
Stem material	Tungsten carbide	Stainless steel	Tungsten carbide	Tungsten carbide	Stainless steel
Ball material	Tungsten carbide	Tungsten carbide	Ruby	Tungsten carbide	Tungsten carbide
A Ball dia. mm (inch)	0.5 (0.02)	1.0 (0.04)	0.5 (0.02)	1.0 (0.04)	0.6 (0.02)
B Length mm (inch)	12.5 (0.49)	25.0 (0.98)	12.5 (0.49)	13.0 (0.51)	12.75 (0.50)
D EWL* mm (inch)	1.5 (0.059)	1.5 (0.059)	3.0 (0.12)	1.0 (0.04)	1.0 (0.04)
Mass grammes	0.2	1.1	0.19	0.22	0.41



## Adaptors

Part number	A-5003-1448	A-5000-9724
D3 MTG	2 x M1.4 adaptor 20°	M1.4 adaptor 20°
Mass grammes	9.73	8.31

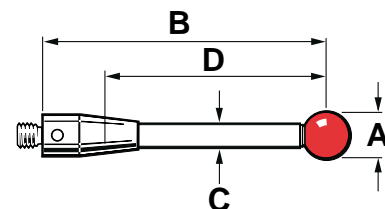


## Crash protection device

Part number	M-5000-9712
Length mm (inch)	16.0 (0.63)
Mass grammes	2



\* Effective working length

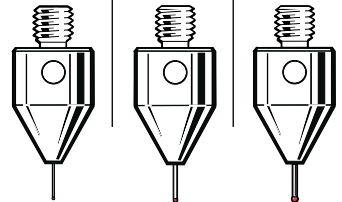


## M5 threaded stylus range

### Ruby micro ball styli (tungsten carbide stems)

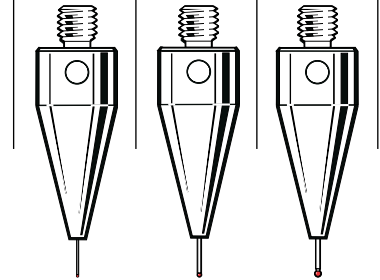
Part number	A-5003-5201	A-5003-5202	A-5003-5203	
A	Ball dia. mm (inch)	0.3 (0.012)	0.5 (0.02)	0.7 (0.03)
B	Length mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
C	Stem dia. mm (in.)	0.2 (0.01)	0.4 (0.02)	0.5 (0.02)
D	EWL* mm (inch)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
	Mass grammes	6.5	6.5	6.5

20 mm range



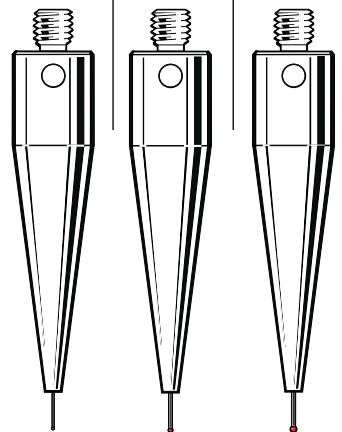
A-5003-5211	A-5003-5212	A-5003-5213
0.3 (0.012)	0.5 (0.02)	0.7 (0.03)
30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
0.2 (0.01)	0.4 (0.02)	0.5 (0.02)
3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
8.95	8.95	8.98

30 mm range



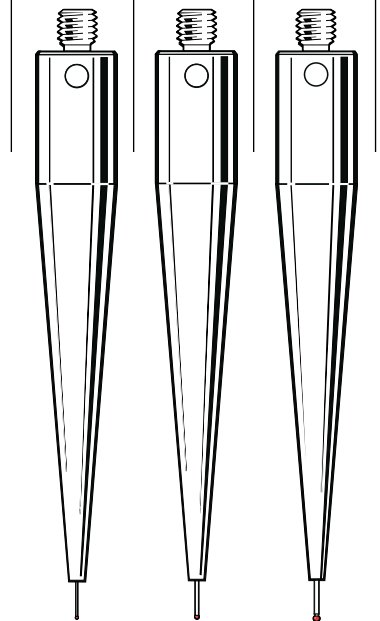
Part number	A-5003-5225	A-5003-5226	A-5003-5227	
A	Ball dia. mm (inch)	0.3 (0.012)	0.5 (0.02)	0.7 (0.03)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in.)	0.2 (0.01)	0.4 (0.02)	0.5 (0.02)
D	EWL* mm (inch)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
	Mass grammes	15.79	15.79	15.79

50 mm range



A-5003-5240	A-5003-5241	A-5003-5242
0.3 (0.012)	0.5 (0.02)	0.7 (0.03)
75.0 (2.96)	75.0 (2.96)	75.0 (2.96)
0.2 (0.01)	0.4 (0.02)	0.5 (0.02)
3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
23.84	23.84	23.84

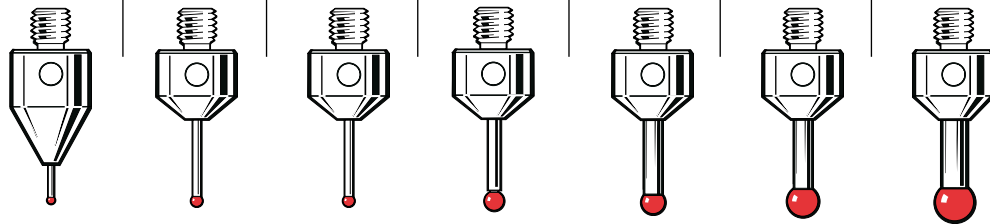
75 mm range



**Ruby ball styli (tungsten carbide stems)**

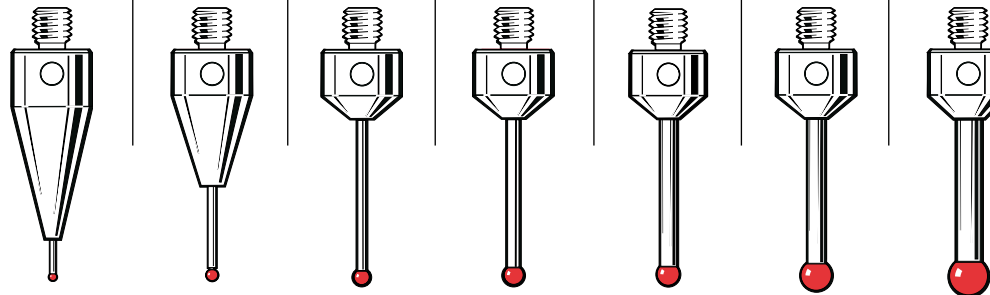
Ball material	Part number							
Ruby	A-5003-5204	A-5003-5205	A-5003-5206	A-5003-5207	A-5003-5208	A-5003-5209	A-5003-5210	
Silicon nitride	-	-	A-5003-5732	-	-	A-5003-5733	-	
Zirconia	-	-	A-5003-5746	-	-	A-5003-5747	-	
A	Ball dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
C	Stem dia. mm (in.)	0.7 (0.03)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	3.0 (0.12)
D	EWL* mm (inch)	5.0 (0.20)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.9 (0.47)	11.5 (0.45)
	Mass grammes	6.52	4.68	4.70	4.84	5.12	5.19	6.06

**20 mm range**



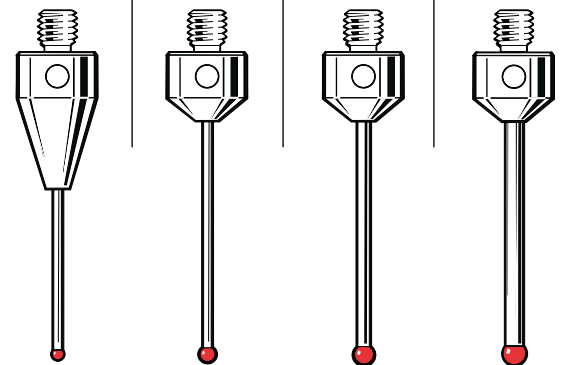
Part number	A-5003-5214	A-5003-5215	A-5003-5216	A-5003-5217	A-5003-5218	A-5003-5219	A-5003-5220	
A	Ball dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)	5.0 (0.20)
B	Length mm (inch)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)	30.0 (1.19)
C	Stem dia. mm (in.)	0.7 (0.03)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	3.0 (0.12)
D	EWL* mm (inch)	5.0 (0.20)	12.0 (0.48)	21.0 (0.83)	21.0 (0.83)	21.0 (0.83)	21.9 (0.86)	21.5 (0.85)
	Mass grammes	9.01	7.28	4.81	5.14	5.58	5.64	7.10

**30 mm range**



Part number	A-5003-5221	A-5003-5222	A-5003-5223	A-5003-5224	
A	Ball dia. mm (inch)	1.5 (0.06)	2.0 (0.08)	2.5 (0.10)	3.0 (0.12)
B	Length mm (inch)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)	40.0 (1.58)
C	Stem dia. mm (in.)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)
D	EWL* mm (inch)	22.0 (0.87)	31.0 (1.23)	31.0 (1.23)	31.0 (1.23)
	Mass grammes	7.39	4.93	5.40	6.04

**40 mm range**

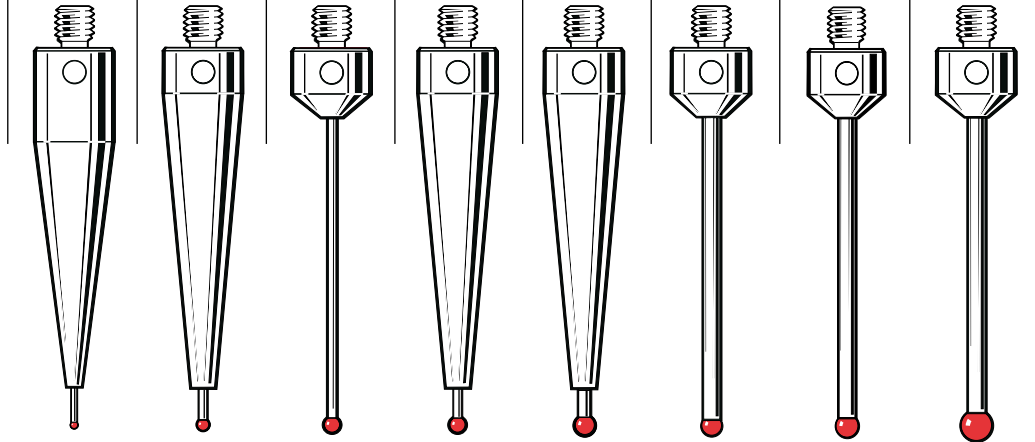


\* Effective working length

**Ruby ball styli (<5 mm ball diameter) (tungsten carbide stems)**

Part number	A-5003-5228	A-5003-5229	A-5003-5230	A-5003-5231	A-5003-5233	A-5003-5232	A-5003-5234	A-5003-5235	
A	Ball dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.5 (0.10)	2.5 (0.10)	3.0 (0.12)	4.0 (0.16)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (in.)	0.7 (0.03)	1.0 (0.04)	1.0 (0.04)	1.0 (0.04)	1.5 (0.06)	2.0 (0.08)	2.0 (0.08)	2.0 (0.08)
D	EWL* mm (inch)	5.0 (0.20)	5.0 (0.20)	41.0 (1.62)	5.0 (0.20)	5.0 (0.20)	41.0 (1.62)	41.0 (1.62)	41.9 (1.65)
	Mass grammes	15.81	14.82	5.05	14.85	14.94	6.48	6.50	6.55

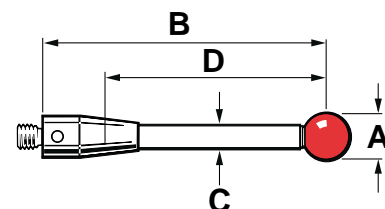
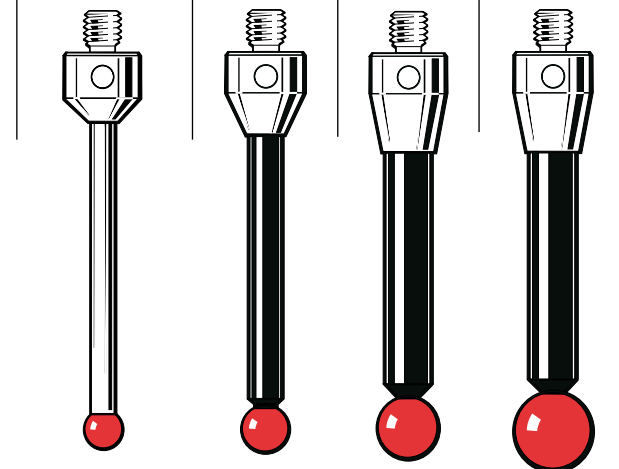
50 mm range



**Ruby ball styli (≥5 mm ball diameter)**

Ball material	Part number				
Ruby	A-5003-5236	A-5003-5237	A-5003-5238	A-5003-5239	
Silicon nitride	-	A-5003-5734	-	-	
Zirconia	-	A-5003-5748	-	-	
	<b>Tungsten carbide</b>	<b>Carbon fiber</b>	<b>Carbon fiber</b>	<b>Carbon fiber</b>	
A	Ball dia. mm (inch)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)	10.0 (0.40)
B	Length mm (inch)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
C	Stem dia. mm (inch)	3.0 (0.12)	4.0 (0.16)	6.0 (0.24)	6.0 (0.24)
D	EWL* mm (inch)	41.5 (1.63)	39.5 (1.56)	39.5 (1.56)	44.5 (1.75)
	Mass grammes	9.19	6.10	7.96	8.91

50 mm range

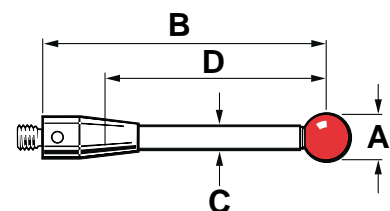
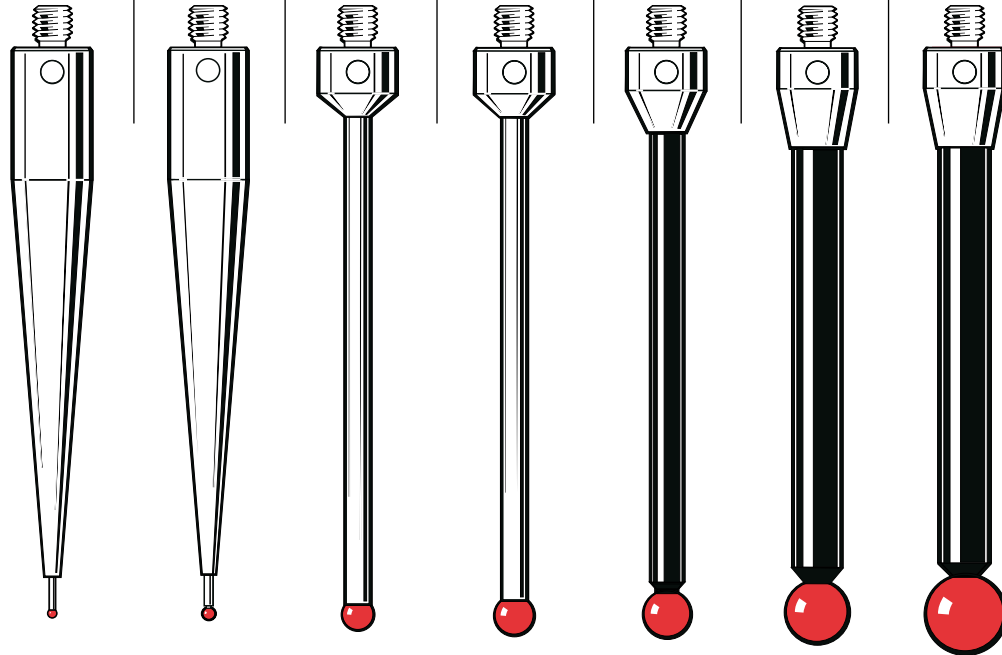


\* Effective working length

**Ruby ball styli (1 mm – 10 mm ball diameter)**

Part number	A-5003-5243 Tungsten carbide	A-5003-5244 Tungsten carbide	A-5003-5248 Tungsten carbide	A-5003-5249 Tungsten carbide	A-5003-5250 Carbon fiber	A-5003-5251 Carbon fiber	A-5003-5252 Carbon fiber
<b>A</b> Ball dia. mm (inch)	1.0 (0.04)	1.5 (0.06)	4.0 (0.16)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)	10.0 (0.40)
<b>B</b> Length mm (inch)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)	75.0 (2.96)
<b>C</b> Stem dia. mm (inch)	0.7 (0.03)	1.0 (0.04)	3.0 (0.12)	3.0 (0.12)	4.0 (0.16)	6.0 (0.24)	6.0 (0.24)
<b>D</b> EWL* mm (inch)	5.0 (0.20)	5.0 (0.20)	66.0 (2.60)	66.0 (2.60)	65.1 (2.56)	64.5 (2.54)	69.5 (2.74)
Mass grammes	23.86	23.90	11.61	11.80	6.59	9.06	10.01

75 mm range



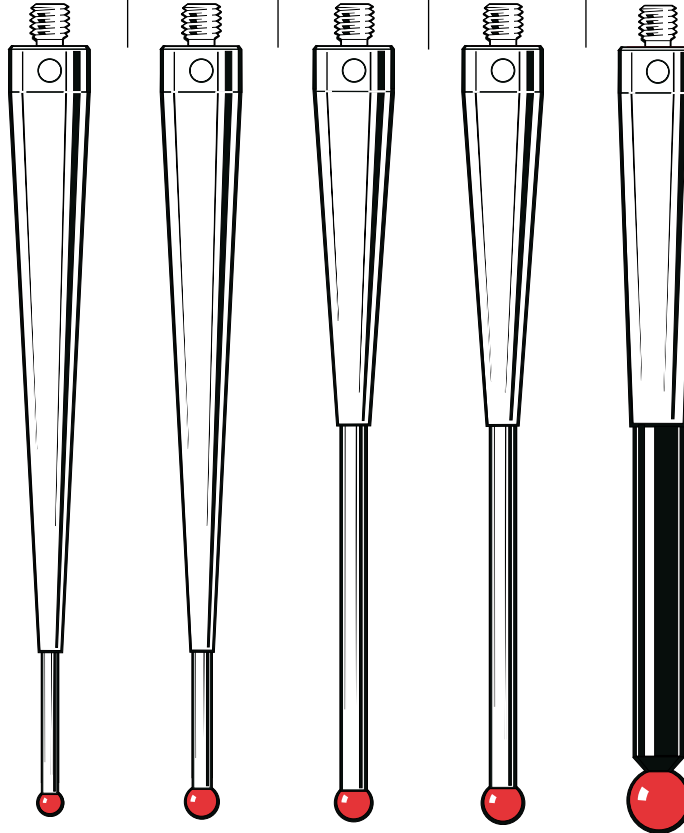
\* Effective working length



**Ruby ball styli (≤50 mm EWL)**

Part number	A-5003-5253 Tungsten carbide	A-5003-5255 Tungsten carbide	A-5003-5256 Tungsten carbide	A-5003-5257 Tungsten carbide	A-5003-5261 Carbon fiber
<b>A</b> Ball dia. mm (inch)	3.0 (0.12)	4.0 (0.16)	4.0 (0.16)	5.0 (0.20)	8.0 (0.32)
<b>B</b> Length mm (inch)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)
<b>C</b> Stem dia. mm (inch)	2.0 (0.08)	2.0 (0.08)	3.0 (0.12)	3.0 (0.12)	6.0 (0.24)
<b>D</b> EWL* mm (inch)	20.0 (0.79)	30.5 (1.20)	50.0 (1.97)	50.0 (1.97)	50.0 (1.97)
Mass grammes	25.71	25.75	23.07	23.31	22.97

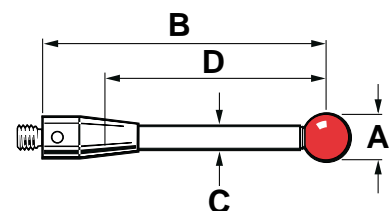
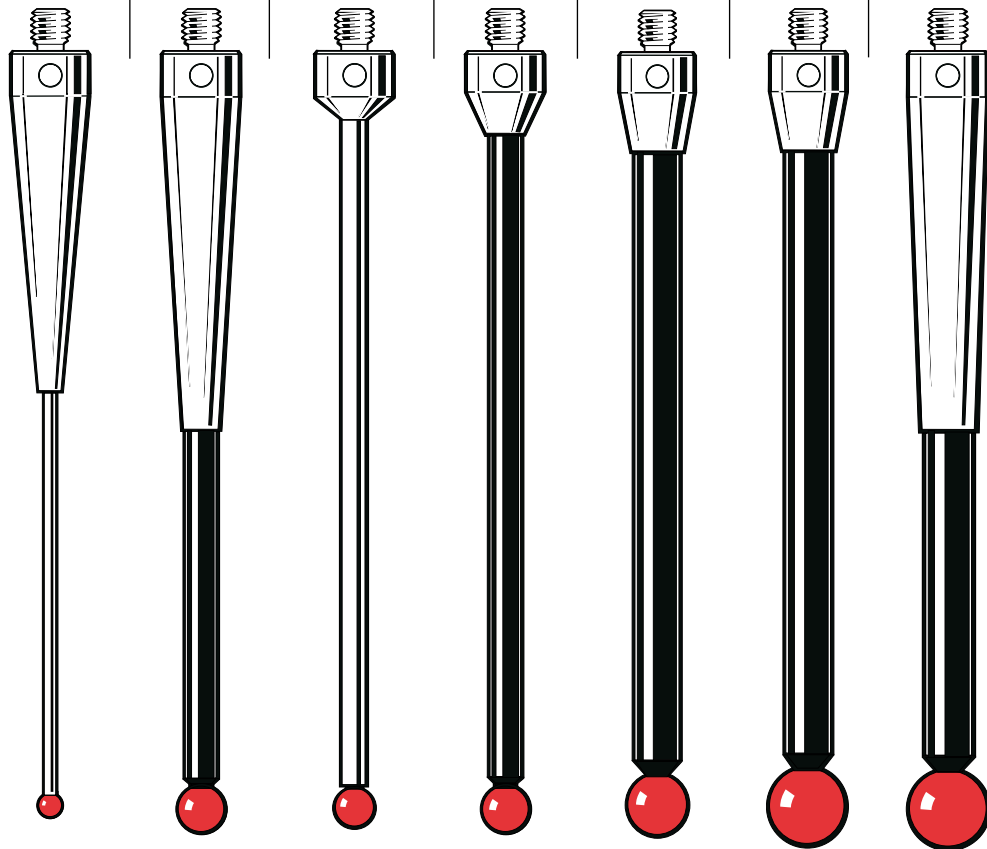
100 mm range



**Ruby ball styli (>50 mm EWL)**

Ball material		Part number						
Ruby		A-5003-5254	A-5003-5259	A-5003-5258	A-5003-5260	A-5003-5262	A-5003-5264	A-5003-5263
Silicon nitride		-	A-5003-5735	-	-	-	-	-
Zirconia		-	A-5003-5749	-	-	-	-	-
		Tungsten carbide	Carbon fiber	Tungsten carbide	Carbon fiber	Carbon fiber	Carbon fiber	Carbon fiber
A	Ball dia. mm (inch)	3.0 (0.12)	6.0 (0.24)	5.0 (0.20)	6.0 (0.24)	8.0 (0.32)	10.0 (0.40)	10.0 (0.40)
B	Length mm (inch)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)	100.0 (3.94)
C	Stem dia. mm (inch)	1.5 (0.06)	4.0 (0.16)	3.0 (0.12)	4.0 (0.16)	6.0 (0.24)	6.0 (0.24)	6.0 (0.24)
D	EWL* mm (inch)	55.0 (2.17)	58.9 (2.32)	91.0 (3.59)	90.1 (3.55)	89.5 (3.52)	94.5 (3.72)	95.5 (3.76)
	Mass grammes	16.30	19.66	14.40	7.08	10.17	11.11	23.91

100 mm range



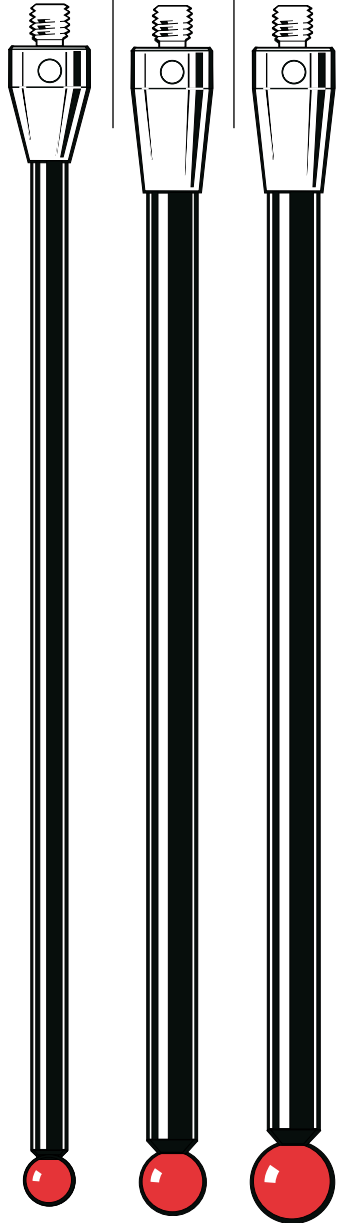
\* Effective working length

# M5 styli

## Ruby ball styli (carbon fiber stems)

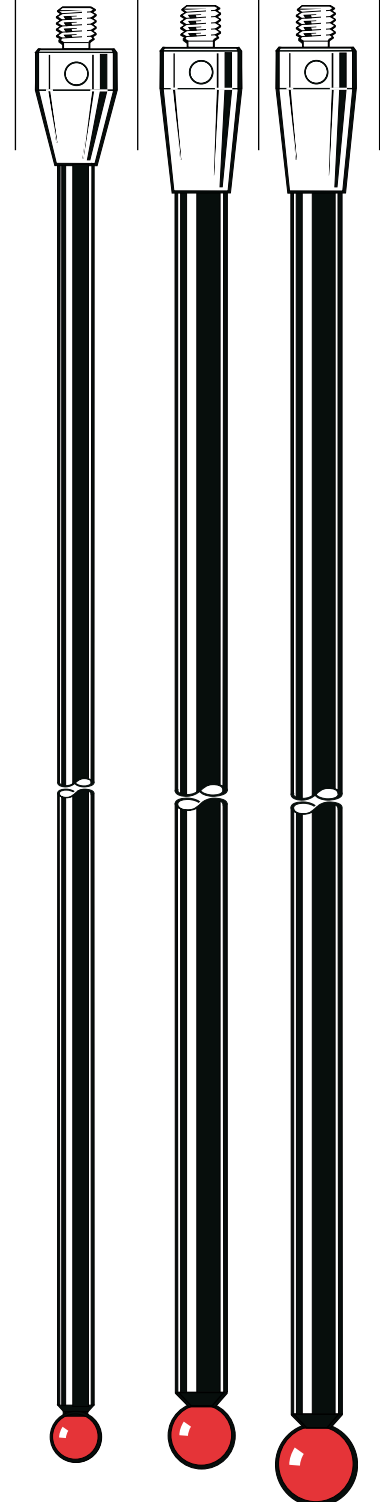
Part number	A-5003-5265	A-5003-5266	A-5003-5267
A Ball dia. mm (inch)	6.0 (0.24)	8.0 (0.32)	10.0 (0.40)
B Length mm (inch)	150.0 (5.91)	150.0 (5.91)	150.0 (5.91)
C Stem dia. mm (in.)	4.0 (0.16)	6.0 (0.24)	6.0 (0.24)
D EWL* mm (inch)	137.0 (5.39)	135.0 (5.31)	144.5 (5.69)
Mass grammes	9.09	13.71	14.66

150 mm range



A-5003-5268	A-5003-5269	A-5003-5270
6.0 (0.24)	8.0 (0.32)	10.0 (0.40)
200.0 (7.88)	200.0 (7.88)	200.0 (7.88)
4.0 (0.16)	6.0 (0.24)	6.0 (0.24)
187.0 (7.36)	180.0 (7.09)	194.5 (7.66)
10.07	15.92	16.87

200 mm range

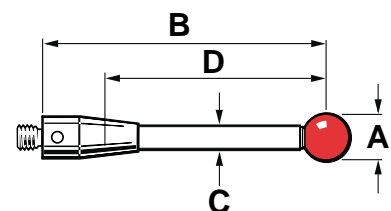
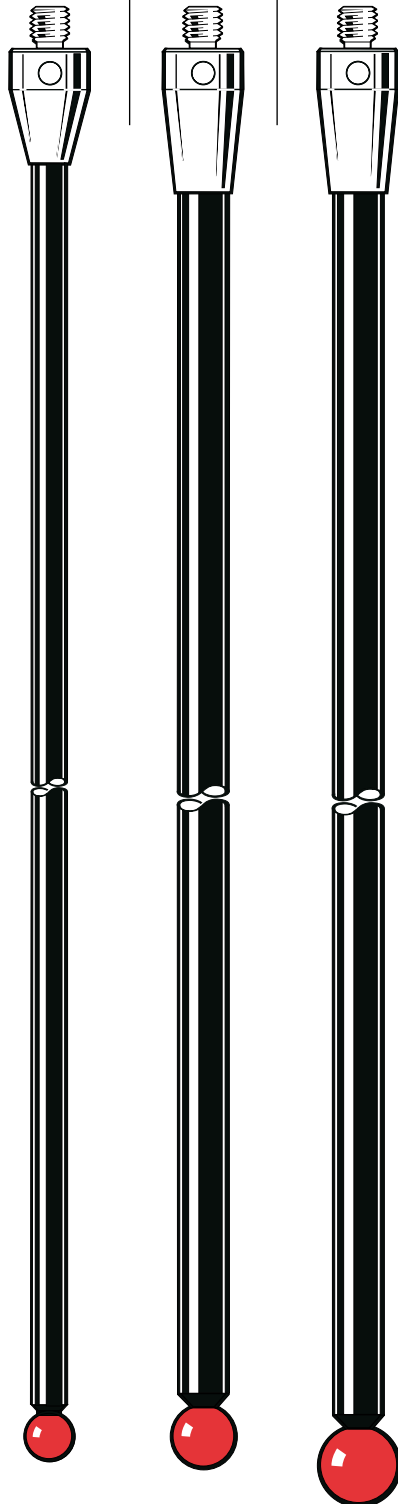


\* Effective working length

**Ruby ball styli (carbon fiber stems)**

Part number	A-5003-5271	A-5003-5272	A-5003-5273	
A	Ball dia. mm (inch)	6.0 (0.24)	8.0 (0.32)	10.0 (0.40)
B	Length mm (inch)	300.0 (11.82)	300.0 (11.82)	300.0 (11.82)
C	Stem dia. mm (inch)	4.0 (0.16)	6.0 (0.24)	6.0 (0.24)
D	EWL* mm (inch)	287.0 (11.30)	280.0 (11.03)	294.5 (11.59)
	Mass grammes	12.02	20.33	21.28

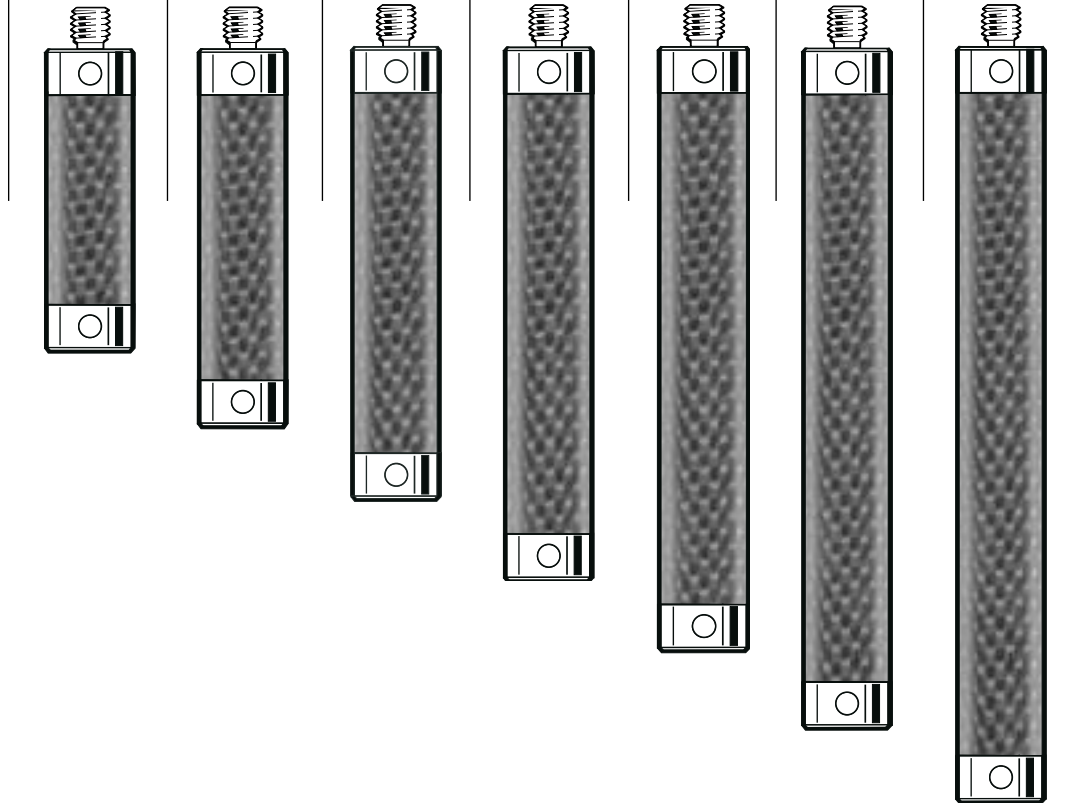
300 mm range



\* Effective working length

**Stylus extensions – thermo stable carbon fiber stems, titanium ends**

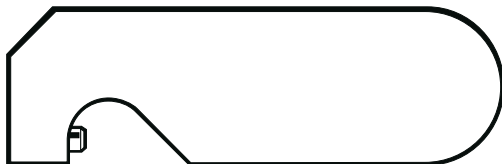
Part number	A-5555-0647	A-5555-0648	A-5555-0649	A-5555-0623	A-5555-0650	A-5555-0651	A-5555-0652
Length mm (inch)	40.0 (1.58)	50.0 (1.97)	60.0 (2.37)	70.0 (2.76)	80.0 (3.15)	90.0 (3.55)	100.0 (3.94)
Stem dia. mm (inch)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)
Mass grammes	7.6	8.3	9.0	9.7	10.4	11.1	11.8



**M5 extension tools**

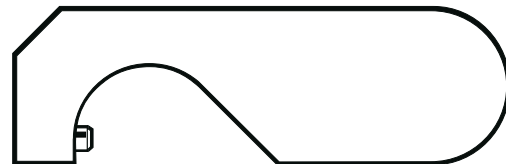
**A-5003-6134**

For M5 threaded extensions with  
11 mm (0.44 mm stem diameter



**A-5003-6135**

For M5 threaded extensions with  
20 mm (0.79 in) stem diameter

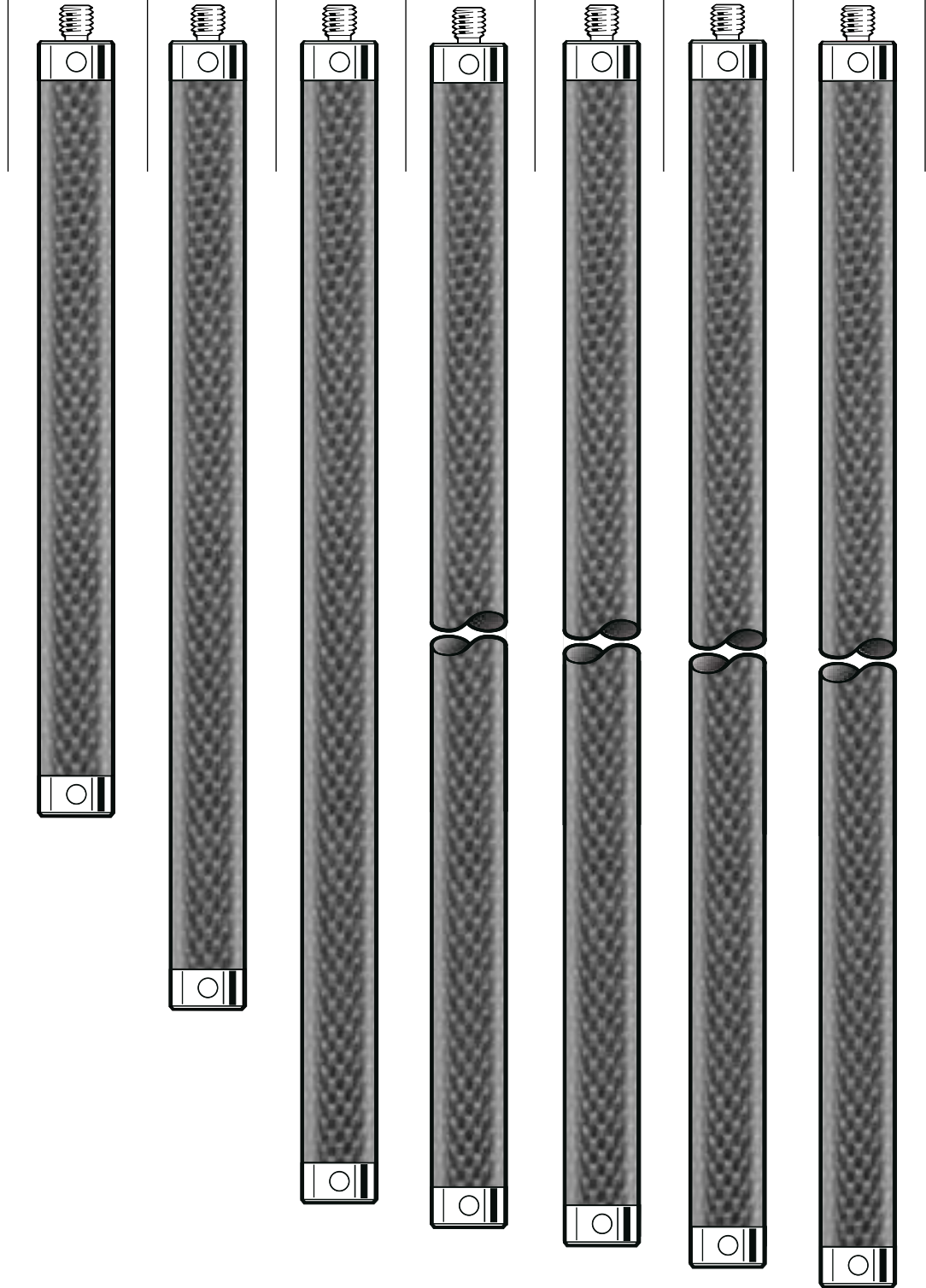


**Note:** These tools are designed to fit stylus extensions for Renishaw probes without causing any internal damage.

\*\* Special

**Stylus extensions – thermo stable carbon fiber stems, titanium ends**

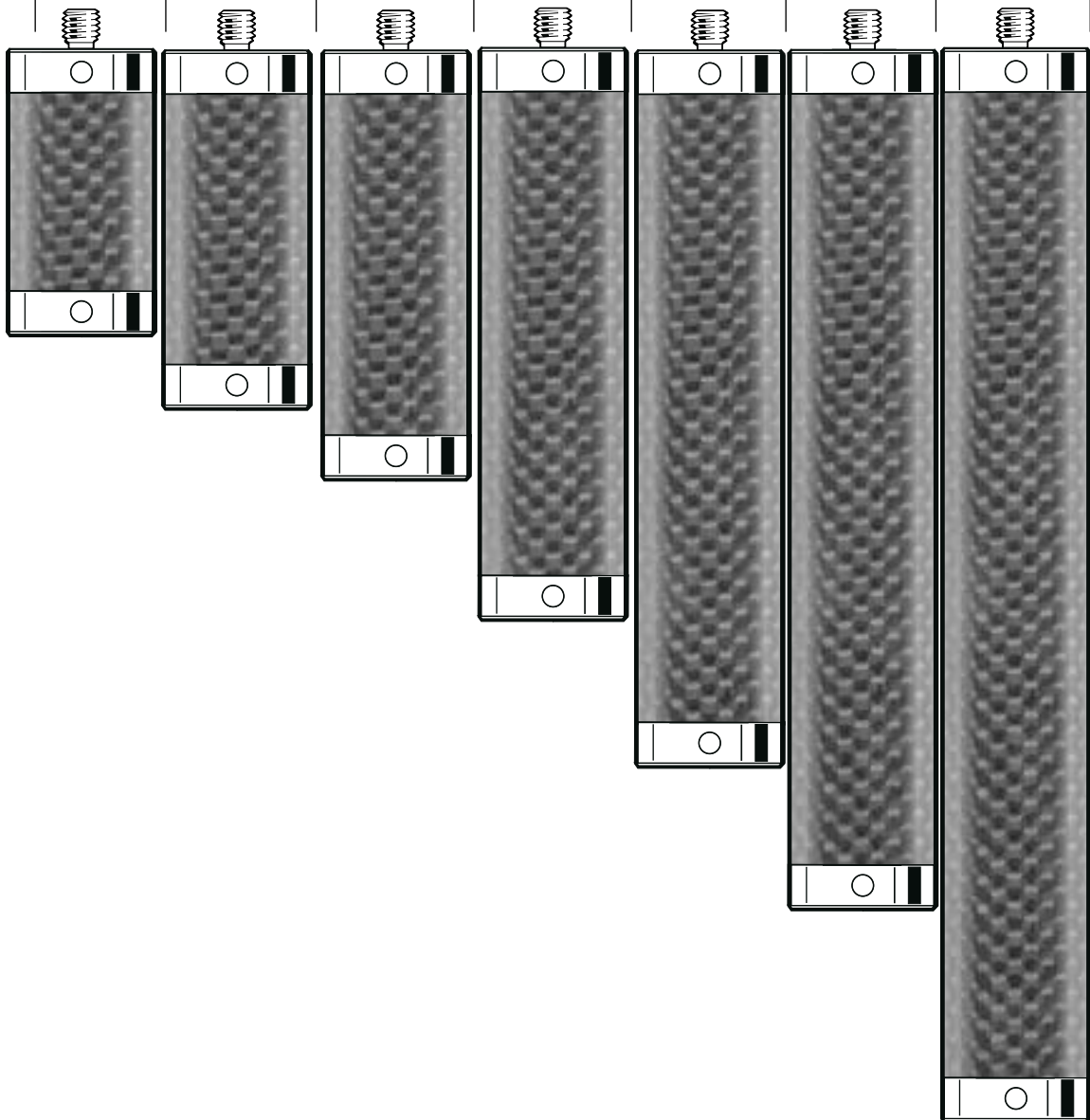
Part number	A-5555-0425	A-5555-0424	A-5555-0653	A-5555-0654	A-5555-0655	A-5555-0642	A-5555-0656
Length mm (inch)	120.0 (4.73)	150.0 (5.91)	180.0 (7.09)	200.0 (7.88)	250.0 (9.85)	300.0 (11.82)	400.0 (15.76)
Stem dia. mm (inch)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)
Mass grammes	13.2	15.4	17.5	18.9	22.4	25.9	33.0



\*\* Special

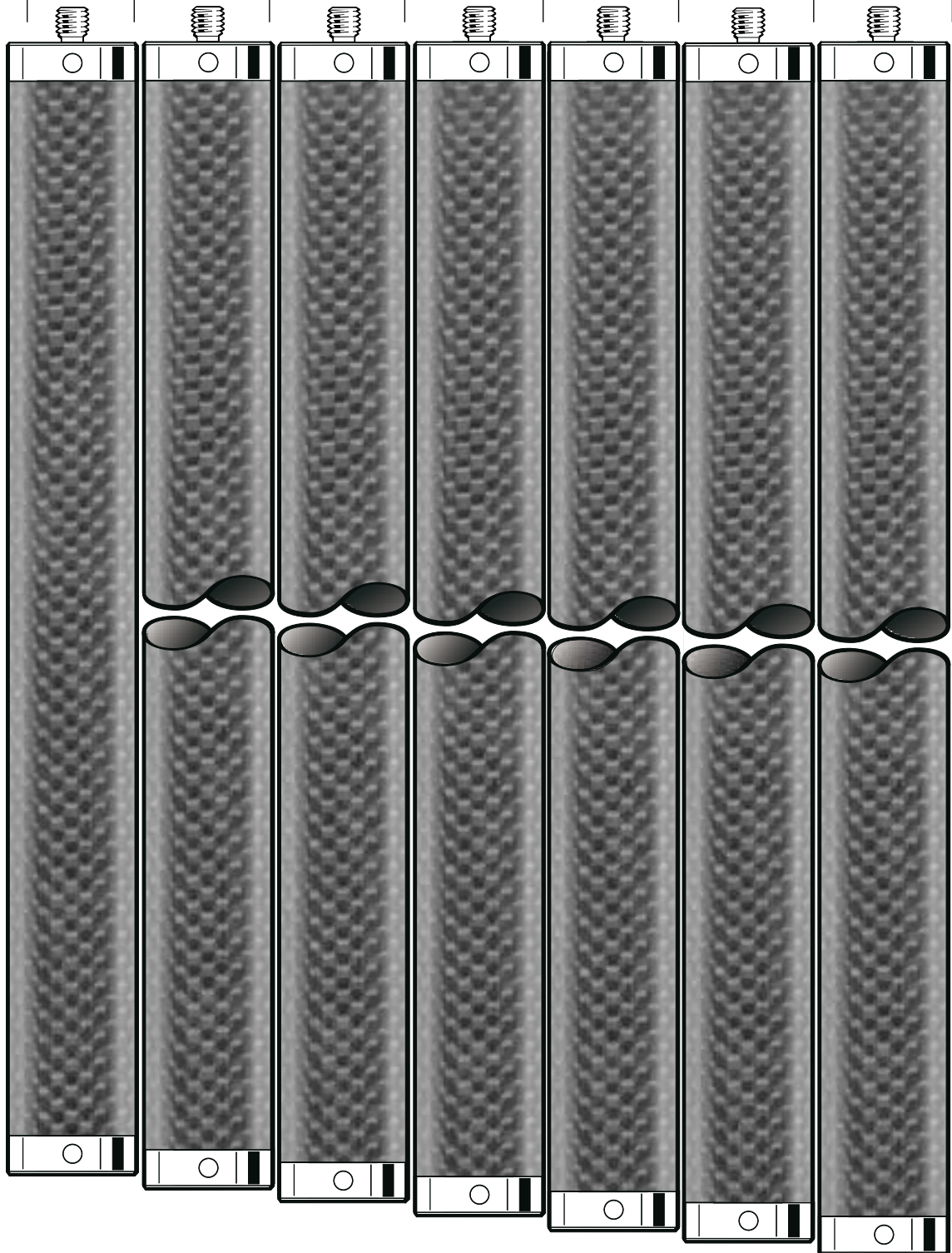
**Stylus extensions – thermo stable carbon fiber stems, titanium ends**

Part number	A-5555-0620	A-5555-0657	A-5555-0658	A-5555-0621	A-5555-0659	A-5555-0660	A-5555-0661
Length mm (inch)	40.0 (1.58)	50.0 (1.97)	60.0 (2.37)	80.0 (3.15)	100.0 (3.94)	120.0 (4.73)	150.0 (5.91)
Stem dia. mm (in.)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
Mass grammes	23.8	25.1	26.5	29.3	32.1	34.9	39.0



**Stylus extensions – thermo stable carbon fiber stems, titanium ends**

Part number	A-5555-0662	A-5555-0663	A-5555-0427	A-5555-0664	A-5555-0665	A-5555-0667	A-5555-0668
Length mm (inch)	180.0 (7.09)	200.0 (7.88)	250.0 (9.85)	300.0 (11.82)	400.0 (15.76)	500.0 (19.70)	600.0 (23.64)
Stem dia. mm (in.)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
Mass grammes	43.2	46.0	52.9	59.9	73.8	87.7	101.5

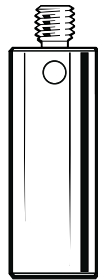
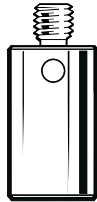


\*\* Special



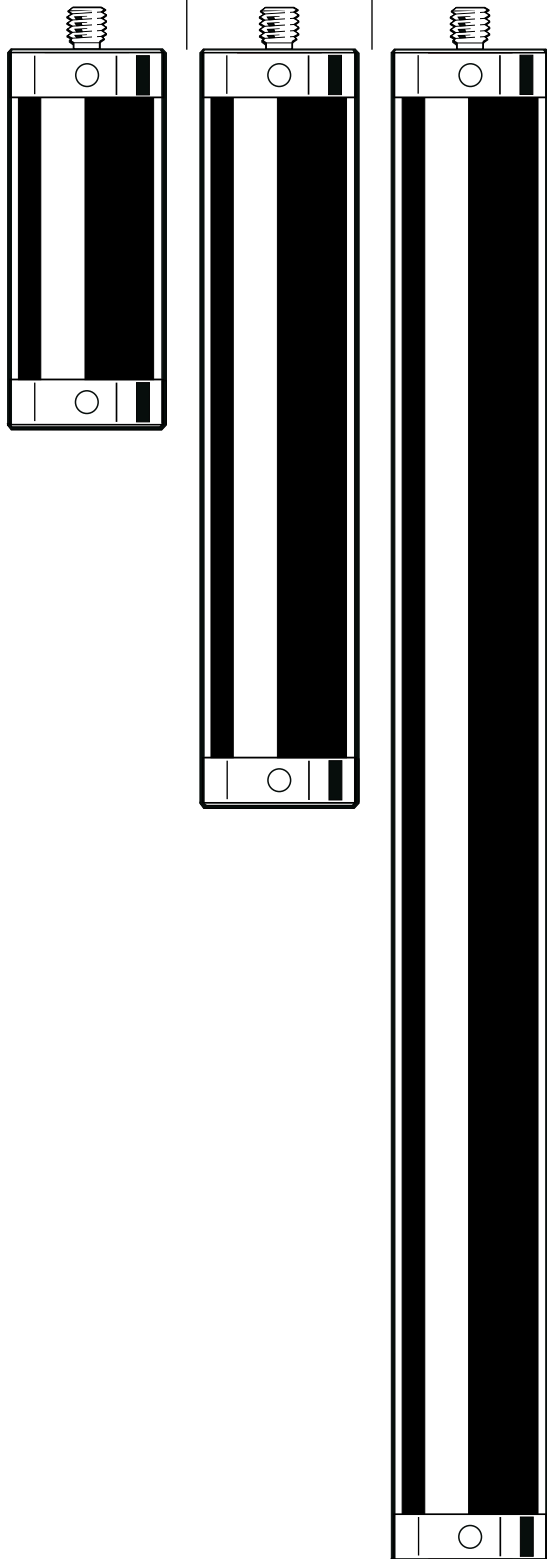
**Stylus extensions – stainless steel**

Part number	A-5555-0142	A-5555-0140	A-5555-0669	A-5555-0670	A-5555-0136
Length mm (inch)	10.0 (0.40)	20.0 (0.79)	30.0 (1.19)	50.0 (1.97)	100.0 (3.94)
Stem dia. mm (inch)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)	11.0 (0.44)
Mass grammes	6.0	13.0	20.0	34.8	73.0



**Stylus extensions – aluminum**

Part number	A-5555-0671	A-5555-0127	A-5555-0125
Length mm (inch)	50.0 (1.97)	100.0 (3.94)	200.0 (7.88)
Stem dia. mm (inch)	20.0 (0.79)	20.0 (0.79)	20.0 (0.79)
Mass grammes	47.2	50.0	85.0

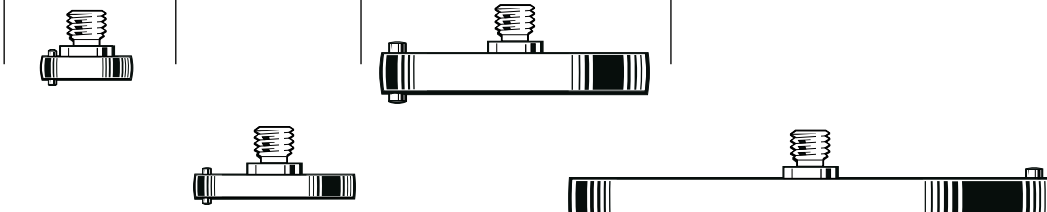


\*\* Special

## M5 styli

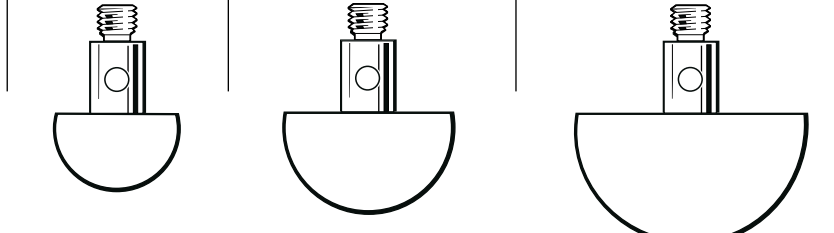
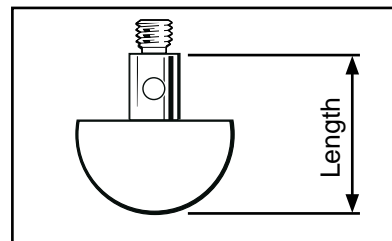
### Disk styli

Part number	A-5003-5288 Silver steel	A-5003-5289 Silver steel	A-5003-5290 Silver steel	A-5003-5291 Silver steel
Disk diameter mm (inch)	12.0 (0.48)	21.0 (0.83)	35.0 (1.38)	63.5 (2.51)
Disk depth mm (inch)	3.0 (0.12)	3.0 (0.12)	5.0 (0.20)	5.0 (0.20)
Roller depth mm (inch)	5.0 (0.20)	5.0 (0.20)	8.0 (0.32)	8.0 (0.32)
Mass grammes	2.52	5.23	14.00	51.00

### Hemispherical styli

Part number	A-5003-5275 Ceramic	A-5003-5276 Ceramic	A-5003-5277 Ceramic
Ball diameter mm (inch)	16.0 (0.63)	22.0 (0.87)	30.0 (1.19)
Length mm (inch)	19.5 (0.77)	20.5 (0.81)	24.5 (0.96)
Mass grammes	7.0	14.0	19.7

## Styli for FARO® arms

These styli have been designed especially for use on FARO® portable arm CMMs. Their robust design and construction utilizes Grade 5 Zirconia balls that have a high fracture toughness. The balls are bonded to the high strength tungsten carbide stem with impact resistant adhesive, and specialist construction techniques have been incorporated to ensure that the joint between the body and stem is extremely rigid and virtually indestructible.

### 1¼–20 UN thread styli

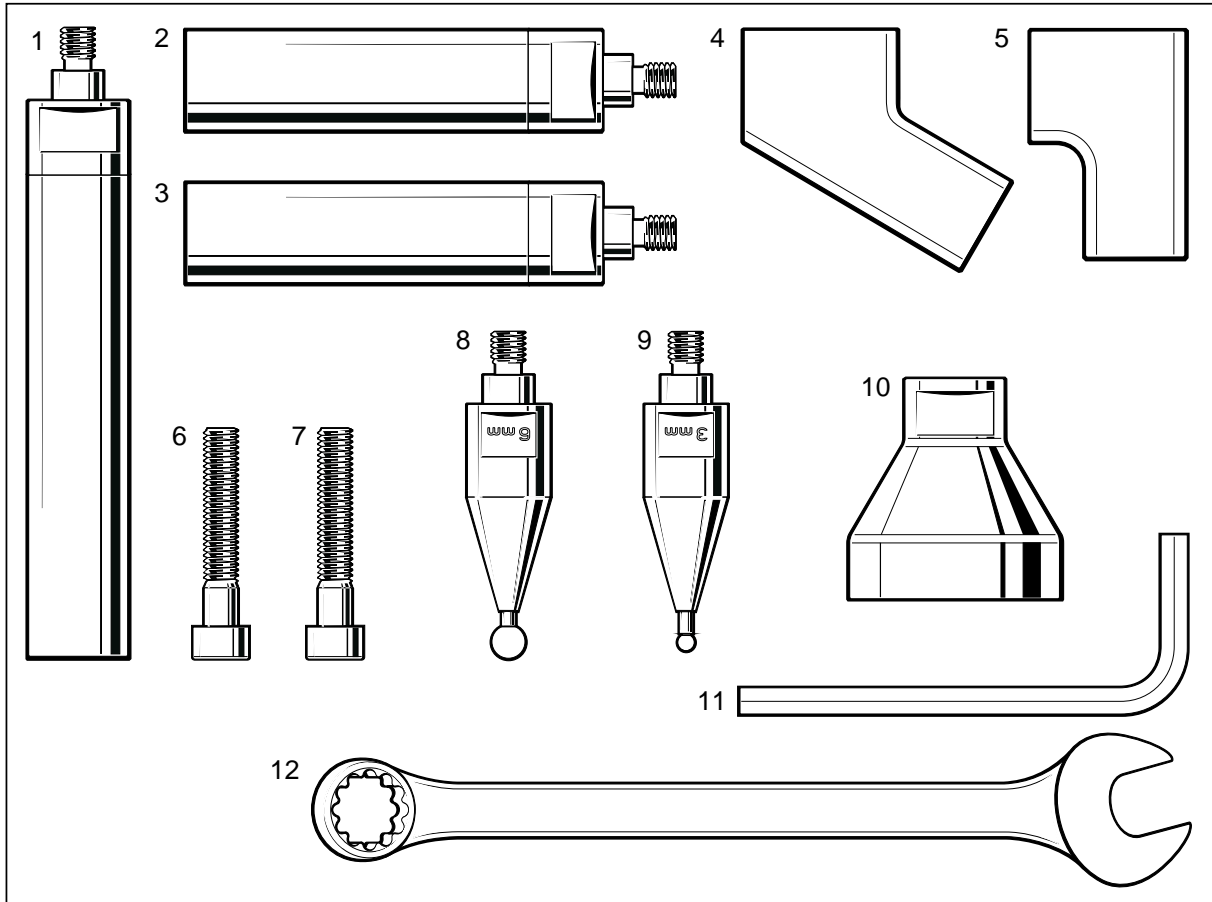
Part number	A-5003-7673	A-5003-7674	A-5003-7675
Ball dia (mm)	3	6	N/A
Length (mm)	57	57	57

### M6 styli

Part number	A-5003-7676	A-5003-7677	A-5003-7678	A-5003-7679
Ball dia	1/8 in	1/4 in	3 mm	6 mm
Length (mm)	43	43	43	43

**FARO® kit**

**A-5003-9190 FARO® probe kit 0073 12 piece**



Position	Part number	Description
1	A-5003-9127	M6M - M6F EXT L101.6 (4.0) D18 AL
2 and 3	A-5003-9126	M6M - M6F EXT L76.2 (3.0) D18 AL
4	A-5003-9186	M6F FARO EXT 60 DEG ADAPTOR
5	A-5003-9187	M6F FARO EXT 90 DEG ADAPTOR
6 and 7	P-SC08-0635	SCREW HEX SKT CAPHD M6X35 STST
8	A-5003-7679	STYLUS M6 DIA 6 MM 21 PROBE 0067
9	A-5003-7678	STYLUS M6 DIA 3 MM 21 PROBE 0065
10	M-5003-9133	FARO ADAPTOR 1.25-20 UN-M6
11	P-TL01-0500	SKT WRENCH 5MM A/F
12	P-TL09-0012	12 MM A/F OPEN/RING SPANNER

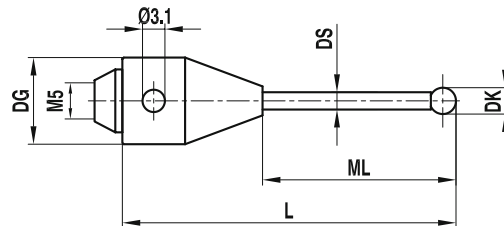
# M5 styli, adaptors and accessories for Zeiss analog probe systems

Schematics not shown to scale

## Styli with conical stem base, titanium base, tungsten carbide stem, ruby ball

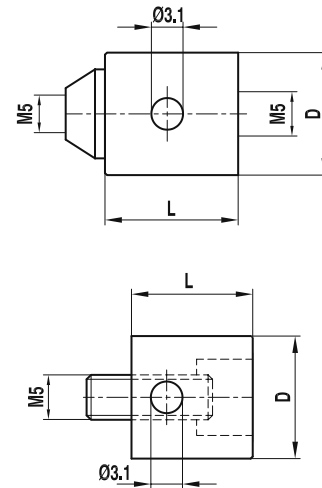
Part number	A-5555-0001	A-5555-0002	A-5555-0003	A-5555-0004	A-5555-0005	A-5555-0006	A-5555-0007	A-5555-0008
Zeiss order number	600331-9096	602030-9003	602030-9004	600331-9098	602030-9005	602030-9006	602030-9007	600331-9097
DK (mm)	3	3	3	3	5	5	5	8
L (mm)	50	75	75	115	75	75	100	80
DG (mm)	19	19	19	19	19	19	19	19
ML (mm)	21.5	35	50	18	35	50	60	57
DS (mm)	2	2	2	2	3.5	3.5	3.5	6
Weight (g)	23	30	22	56	34	28	38	45

Part number	A-5555-0009	A-5555-0010	A-5555-0011
Zeiss order number	600331-9099	602030-9008	602030-9009
d (mm)	8	8	8
L (mm)	100	115	140
D (mm)	19	19	19
ML (mm)	60	56.5	100
ds (mm)	6	6	6
Weight (g)	57	68	74



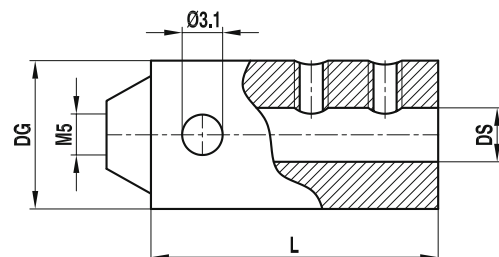
## Adaptor with thread/conical stem base, stainless steel

Part number	A-5555-0013	A-5555-0014
Zeiss order number	600331-0001	602030-0018
D (mm)	18	18
L (mm)	10	12
Weight (g)	12	10



## Conical holder, stainless steel

Part number	A-5555-0015	A-5555-0016	A-5555-0017
Zeiss order number	602030-8350	602030-8351	602030-8352
DS (mm)	2	3.5	6
L (mm)	24	24	24
DG (mm)	19	19	19
Weight (g)	29	29	29



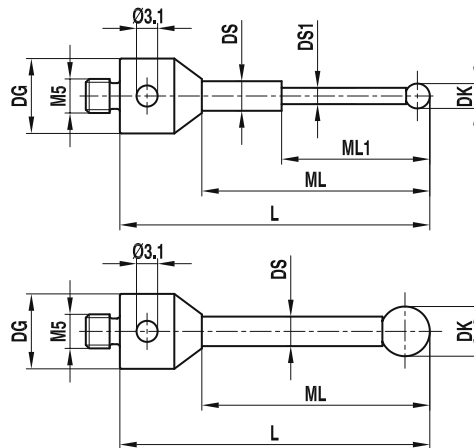
**Tungsten carbide styli, titanium base, tungsten carbide stem, ruby ball**

Schematics not shown to scale

Part number	A-5555-0018	A-5555-0019	A-5555-0020	A-5555-0021	A-5555-0022	A-5555-0023	A-5555-0024	A-5555-0025
Zeiss order number	602030-9010	600342-8020	602030-9011	600342-8021	600342-8025	602030-9012	602030-9013	600342-8022
DK (mm)	3	3	3	3	4	4	5	5
L (mm)	25	33.5	50	58	33.5	64	50	53
DG (mm)	11	11	11	11	11	11	11	11
ML (mm)	15	23.5	40	48	23.5	54	40	43
DS (mm)	2	2	2	2	2	2	3.5	3.5
Weight (g)	4	4.5	5.2	5.5	4.5	5.9	9	9.8

Part number	A-5555-0026	A-5555-0027	A-5555-0028	A-5555-0029	A-5555-0030	A-5555-0031	A-5555-0032	A-5555-0033
Zeiss order number	602030-9015	600342-8026	600342-8027	600342-8023	600342-8123	602030-9014	602030-9016	602030-9017
DK (mm)	5	6	7	8	8	8	8	8
L (mm)	75	54	55	63.5	63.5	74	75	100
DG (mm)	11	11	11	11	19	11	11	11
ML (mm)	65	44	45	50.5	41.5	61	62	87
DS (mm)	3.5	3.5	3.5	6	6	6	6	6
Weight (g)	12.5	10	10	24.8	36.7	29.5	30	40

Part number	A-5555-0034	A-5555-0035	A-5555-0036	A-5555-0037	A-5555-0038	A-5555-0039	A-5555-0040
Zeiss order number	600342-8024	600342-8124	600342-8028	600342-8128	600342-8029	600342-8129	602030-9018
DK (mm)	8	8	9	9	10	10	10
L (mm)	114.5	114.5	64.5	64.5	65.5	65.5	118
DG (mm)	11	19	11	19	11	19	11
ML (mm)	101.5	92.5	51.5	42.5	52.5	43.5	105
DS (mm)	6	6	6	6	6	6	6
Weight (g)	45.8	57.5	26.3	36.8	25.8	37.5	47.3



## Tungsten carbide styli, titanium base, tungsten carbide stem, silicon nitride ball

Schematics not shown to scale

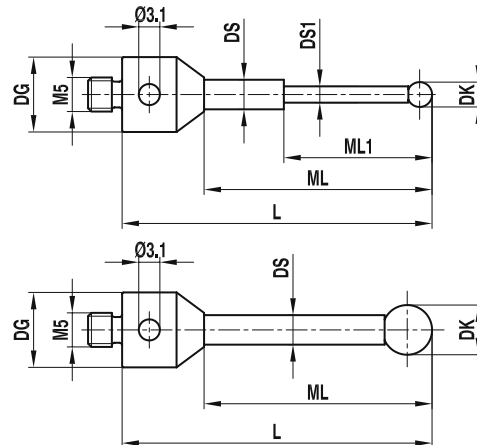
Part number	A-5555-3777	A-5555-3778	A-5555-3779	A-5555-3780	A-5555-3781	A-5555-3782	A-5555-3783	A-5555-3784
Zeiss order number	-	-	-	-	-	-	-	-
DK (mm)	1	1	1	1.5	2	2	2	2
L (mm)	20	25	30	30	20	25	30	40
DG (mm)	11	11	11	11	11	11	11	11
ML1 (mm)	5	5	5	8	-	-	-	-
ML (mm)	10	15	20	20	10	15	20	30
DS1 (mm)	0.8	0.8	0.8	1	-	-	-	-
DS (mm)	1	1	1	1.5	1	1	1.5	1.5
Weight (g)	3.5	3.5	3.8	3.5	3.5	3.5	3.8	4

Part number	A-5555-3785	A-5555-3786	A-5555-3787	A-5555-3734	A-5555-3788	A-5555-3789
Zeiss order number	626115-0303-025	626115-0300-033	626115-0302-050	626115-0300-058	626115-0400-034	6262115-0401-064
DK (mm)	3	3	3	3	4	4
L (mm)	25	33.5	50	58	33.5	64
DG (mm)	11	11	11	11	11	11
ML (mm)	15	23.5	40	48	23.5	54
DS (mm)	2	2	2	2	2	2
Weight (g)	4	4.5	5.3	5.5	4.5	5.9

Part number	A-5555-3790	A-5555-3791	A-5555-3792	A-5555-3793	A-5555-3794	A-5555-3795
Zeiss order number	-	626115-0501-050	626115-0501-053	626115-0500-075	-	-
DK (mm)	5	5	5	5	5	6
L (mm)	30	50	53	75	100	54
DG (mm)	11	11	11	11	11	11
ML (mm)	20	40	43	65	90	44
DS (mm)	3.5	3.5	3.5	3.5	3.5	3.5
Weight (g)	8	9	9.8	12.5	18	10

Part number	A-5555-3796	A-5555-3797	A-5555-3798	A-5555-3799	A-5555-3800	A-5555-3801
Zeiss order number	-	626115-0800-064	626115-0800-075	626115-0801-100	626115-0800-115	-
DK (mm)	7	8	8	8	8	9
L (mm)	55	63.5	75	100	114.5	64.5
DG (mm)	11	11	11	11	11	11
ML (mm)	45	50.5	62	87	101.5	51.5
DS (mm)	3.5	6	6	6	6	6
Weight (g)	10	36.6	29.4	39.9	45.7	26.3

Part number	A-5555-3802	A-5555-3803	A-5555-3804
Zeiss order number	-	-	-
DK (mm)	10	10	10
L (mm)	65.5	118	150
DG (mm)	11	11	11
ML (mm)	52.5	105	135
DS (mm)	6	6	6
Weight (g)	25.8	47.3	60

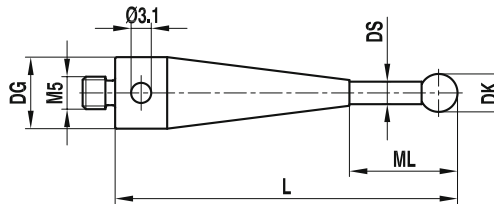




Reference styli (red dot), high-strength stainless steel base and stem, ruby ball

Schematics not shown to scale

<b>Part number</b>	<b>A-5555-3805</b>
<b>Zeiss order number</b>	600342-8023-010
<b>DK (mm)</b>	8
<b>L (mm)</b>	63.5
<b>DG (mm)</b>	11
<b>ML (mm)</b>	50.5
<b>DS (mm)</b>	6
<b>Weight (g)</b>	24.8



Thermo stable carbon fiber styli, titanium base, thermo stable carbon fiber stem, ruby ball

Part number	A-5555-1916	A-5555-1847	A-5555-0730	A-5555-3806	A-5555-1917	A-5555-0731
<b>Zeiss order number</b>	626105-0300-025	626105-0300-033	626105-0300-050	626105-0300-058	626105-0400-033	626105-0400-064
<b>DK (mm)</b>	3	3	3	3	4	4
<b>L (mm)</b>	25	33.5	50	58	33.5	64
<b>DG (mm)</b>	11	11	11	11	11	11
<b>ML (mm)</b>	15	23.5	40	48	23.5	54
<b>DS (mm)</b>	2	2	2	2	2	2
<b>Weight (g)</b>	4	4.2	4.5	4.9	4.2	4.6

Part number	A-5555-0732	A-5555-2013	A-5555-0735	A-5555-0410	A-5555-0733	A-5555-0734
<b>Zeiss order number</b>	626105-0510-050	–	626105-0510-075	626105-0510-100	626105-0610-054	626105-0710-055
<b>DK (mm)</b>	5	5	5	5	6	7
<b>L (mm)</b>	50	53	75	100	54	55
<b>DG (mm)</b>	11	11	11	11	11	11
<b>ML (mm)</b>	40	43	65	90	44	45
<b>DS (mm)</b>	3.5	3.5	3.5	3.5	3.5	3.5
<b>Weight (g)</b>	4.8	4.9	5	5.4	4.9	4.9

Part number	A-5555-3807	A-5555-2011	A-5555-1918	A-5555-3808	A-5555-9361	A-5555-1112
<b>Zeiss order number</b>	626105-0820-063	626105-0820-075	626105-0820-100	626105-0820-114	626105-0820-150	626105-0820-200
<b>DK (mm)</b>	8	8	8	8	8	8
<b>L (mm)</b>	63.5	75	100	114.5	150	200
<b>DG (mm)</b>	11	11	11	11	11	11
<b>ML (mm)</b>	50.5	62	87	101.5	137	187
<b>DS (mm)</b>	6	6	6	6	6	6
<b>Weight (g)</b>	7	7.3	7.5	9.5	11	13

Part number	A-5555-3809	A-5555-3810	A-5555-3811	A-5555-0643	A-5555-0644
<b>Zeiss order number</b>	–	626105-1020-065	626105-1020-118	626105-1020-150	626105-1020-200
<b>DK (mm)</b>	9	10	10	10	10
<b>L (mm)</b>	64.5	65.5	118	150	200
<b>DG (mm)</b>	11	11	11	11	11
<b>ML (mm)</b>	51.5	52.5	105	137	187
<b>DS (mm)</b>	6	6	6	6	6
<b>Weight (g)</b>	7.2	8	14.5	16	19

## Thermo stable carbon fiber styli, titanium base, thermo stable carbon fiber stem, silicon nitride ball

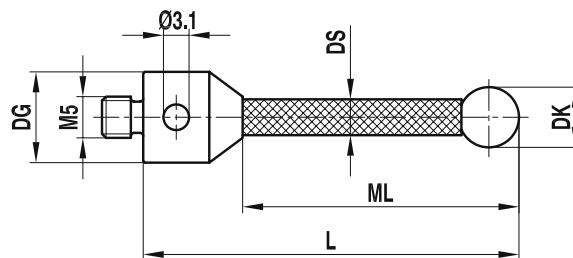
Schematics not shown to scale

Part number	A-5555-3812	A-5555-1828	A-5555-3813	A-5555-3814	A-5555-3815	A-5555-3816
Zeiss order number	-	626105-0301-033	-	626103-0301-058	-	-
DK (mm)	3	3	3	3	4	4
L (mm)	25	33.5	50	58	33.5	64
DG (mm)	11	11	11	11	11	11
ML (mm)	15	23.5	40	48	23.5	54
DS (mm)	2	2	2	2	2	2
Weight (g)	4	4.2	4.5	4.9	4.2	4.6

Part number	A-5555-3817	A-5555-0759	A-5555-2012	A-5555-9045	A-5555-3818	A-5555-3819
Zeiss order number	626105-0511-050	-	626105-0511-075	626105-0511-100	-	-
DK (mm)	5	5	5	5	6	7
L (mm)	50	53	75	100	54	55
DG (mm)	11	11	11	11	11	11
ML (mm)	40	43	65	90	44	45
DS (mm)	3.5	3.5	3.5	3.5	3.5	3.5
Weight (g)	4.8	4.9	5	5.4	4.9	4.9

Part number	A-5555-0720	A-5555-2010	A-5555-3820	A-5555-3821	A-5555-1169	A-5555-1179
Zeiss order number	626105-0821-063	-	626105-0821-100	626105-0821-114	626105-0821-150	626105-0821-200
DK (mm)	8	8	8	8	8	8
L (mm)	63.5	75	100	114.5	150	200
DG (mm)	11	11	11	11	11	11
ML (mm)	50.5	62	87	101.5	137	187
DS (mm)	6	6	6	6	6	6
Weight (g)	7	7.3	7.5	9.5	11	13

Part number	A-5555-3822	A-5555-3823	A-5555-3824	A-5555-3825	A-5555-1171
Zeiss order number	-	-	626105-1021-118	626105-1021-150	626105-1021-200
DK (mm)	9	10	10	10	10
L (mm)	64.5	65.5	118	150	200
DG (mm)	11	11	11	11	11
ML (mm)	51.5	52.5	105	137	187
DS (mm)	6	6	6	6	6
Weight (g)	7.2	8	14.5	16	19

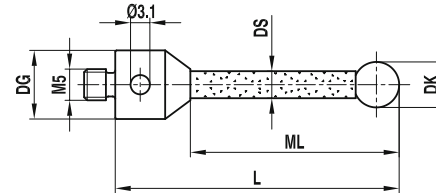


**Ceramic styli, titanium base, ruby ball**

Schematics not shown to scale

Part number	A-5555-0041	A-5555-0042	A-5555-0043	A-5555-0044	A-5555-0045	A-5555-0046	A-5555-0047	A-5555-0048
Zeiss order number	600342-8013	600342-8016	600342-8017	600342-8014	600342-8018	600342-8118	600342-8019	600342-8119
DK (mm)	5	6	7	8	9	9	10	10
L (mm)	53	54	55	63.5	64.5	64.5	65.5	65.5
DG (mm)	11	11	11	11	11	19	11	19
ML (mm)	43	44	45	50.5	51.5	42.5	52.5	43.5
DS (mm)	3.5	3.5	3.5	6	6	6	6	6
Weight (g)	4.6	4.7	5	8.3	8.4	21	9	38

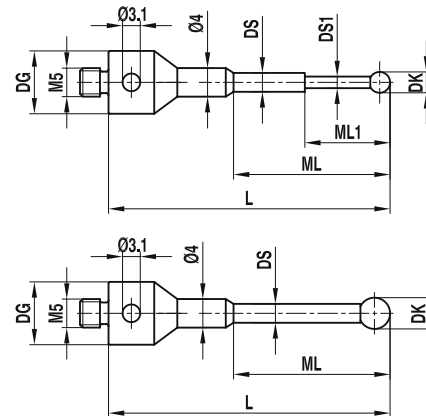
Part number	A-5555-0049	A-5555-0050	A-5555-0051
Zeiss order number	600342-8114	600342-8015	600342-8115
DK (mm)	8	8	8
L (mm)	63.5	114.5	114.5
DG (mm)	19	11	19
ML (mm)	41.5	101.5	92.5
DS (mm)	6	6	6
Weight (g)	33	11.8	38



**Small ball styli, stepped stem, stainless steel base, tungsten carbide stem, ruby ball**

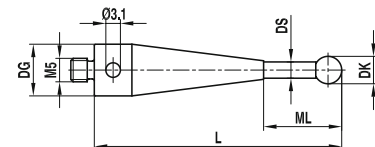
Part number	A-5555-0052	A-5555-0053	A-5555-0054	A-5555-0055	A-5555-0056	A-5555-0057	A-5555-0058	A-5555-0059
Zeiss order number	602030-8060	602030-8061	602030-8062	602030-8063	602030-8064	602030-8065	602030-8066	602030-8067
DK (mm)	0.8	1	1.35	1.35	1.5	1.5	2	2
L (mm)	32	32	32	44	32	44	32	44
DG (mm)	11	11	11	11	11	11	11	11
ML (mm)	12	12	12	19	12	19	12	19
ML1 (mm)	4.8	5.0	-	-	-	-	-	-
DS (mm)	1	1	1	1	1	1	1.5	1.5
DS1 (mm)	0.6	0.8	-	-	-	-	-	-
Weight (g)	6.8	6.8	6.9	7.5	6.5	7.5	7.3	8

Part number	A-5555-0060	A-5555-0061	A-5555-0062	A-5555-0063
Zeiss order number	602030-8068	602030-8069	602030-8070	602030-8071
DK (mm)	2	2.5	2.5	2.5
L (mm)	58	32	44	58
DG (mm)	11	11	11	11
ML (mm)	33	12	19	33
DS (mm)	1.5	1.5	1.5	1.5
Weight (g)	8	7.3	8	8



**Small ball styli, titanium base, tungsten carbide stem, ruby ball**

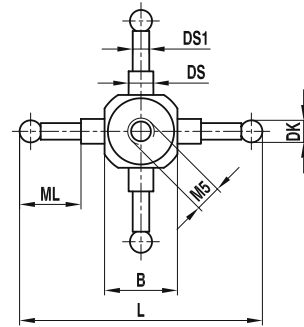
Part number	A-5555-0064	A-5555-0065	A-5555-0066	A-5555-0067	A-5555-0068
Zeiss order number	602030-9019	602030-9020	602030-9021	602030-9022	602030-9023
DK (mm)	1	1.5	2	2.5	3.5
L (mm)	55	55	55	55	55
DG (mm)	11	11	11	11	11
ML (mm)	5	5	5	5	10
DS (mm)	0.8	1	1.5	2	2.5
Weight (g)	11.9	11.9	11.9	11.9	11.9



## Cube star, titanium base, tungsten carbide stem, ruby ball

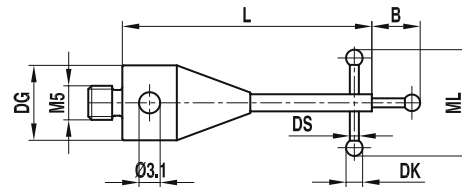
Schematics not shown to scale

Part number	A-5555-0069	A-5555-0070	A-5555-0071	A-5555-0072	A-5555-0073
Zeiss order number	602030-9024	602030-9025	602030-9026	602030-9027	602030-9028
DK (mm)	1	1.5	2	2.5	3.5
L (mm)	45	45	45	45	45
ML (mm)	7	7.5	7.5	8	15
DS (mm)	2	2	2	2	2
DS1 (mm)	0.8	1	1.5	1.5	-
B (mm)	15	15	15	15	15
Weight (g)	17.3	17.3	17.3	17.3	17.3



## Styli for thread measurement, stainless steel base, tungsten carbide stem, ruby ball

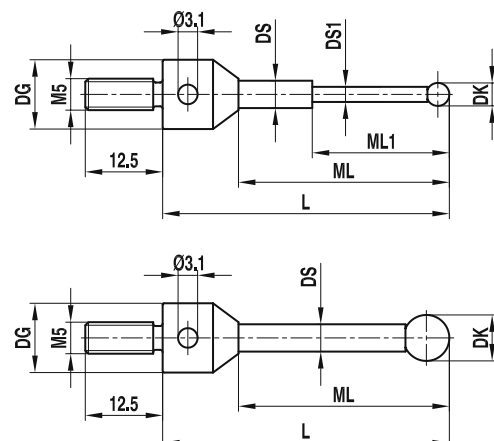
Part number	A-5555-0074	A-5555-0075	A-5555-0076	A-5555-0077
Zeiss order number	602030-9070	602030-9071	602030-9072	602030-9073
DK (mm)	1.35	2.3	1.8	0.8
L (mm)	40	40	40	40
DG (mm)	11	11	11	11
ML (mm)	9	12	10	5
DS (mm)	1	1	1	0.6
B (mm)	2	2.5	2	1.9
Weight (g)	11	13	12	7



## Long threaded styli, thread length 12.5 mm, stainless steel base, tungsten carbide stem, ruby ball

Part number	A-5555-0078	A-5555-0079	A-5555-0080	A-5555-0081	A-5555-0082	A-5555-0083	A-5555-0084
Zeiss order number	600342-8200	600342-8201	600342-8202	600342-8203	600342-8221	600342-8222	600342-8250
DK (mm)	1.35	1.5	2	2.5	3	5	0.3
L (mm)	32.85	33	33.5	34	34.5	43.5	21.8
DG (mm)	11	11	11	11	19	19	11
ML (mm)	23.85	24	24.5	25	16.5	25.5	12.8
ML1 (mm)	-	-	-	-	-	-	2.3
DS (mm)	1	1	1.5	1.5	2	3.5	1
DS1 (mm)	-	-	-	-	-	-	0.2
Weight (g)	6	7	7	7	20	23	6

Part number	A-5555-0085	A-5555-0086	A-5555-0087	A-5555-0088
Zeiss order number	600342-8251	600342-8252	600342-8253	600342-8254
DK (mm)	0.5	0.6	0.8	1
L (mm)	22	22.1	22.3	22.5
DG (mm)	11	11	11	11
ML (mm)	13	13.1	13.3	13.5
ML1 (mm)	2.5	4.6	4.8	5.0
DS (mm)	1	1	1	1
DS1 (mm)	0.3	0.4	0.6	0.8
Weight (g)	6	6	6	6



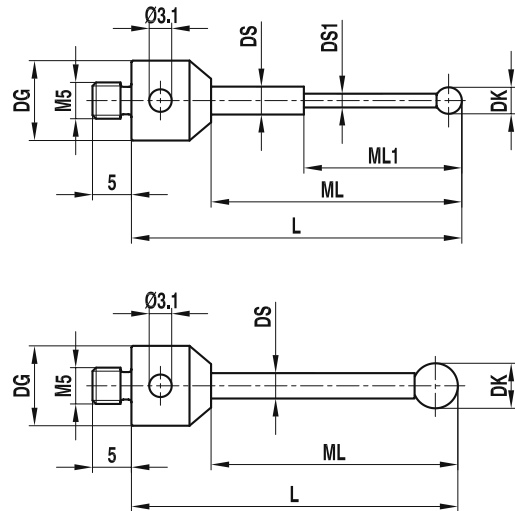
## Long threaded styli, thread length 5 mm, stainless steel base, tungsten carbide stem, ruby ball

Schematics not shown to scale

Part number	A-5555-0799	A-5555-9324	A-5555-3826	A-5555-3827	A-5555-0686	A-5555-3828
Zeiss order number	626115-0140-033	626115-0150-033	626115-0200-034	–	626115-0250-034	–
DK (mm)	1.35	1.5	2	2.5	2.5	3
L (mm)	32.85	33	33.5	34	34	25.5
DG (mm)	11	11	11	11	11	11
ML (mm)	23.85	24	24.5	25	25	16.5
DS (mm)	1	1	1.5	1	1.5	2
Weight (g)	6	7	7	7	7	9

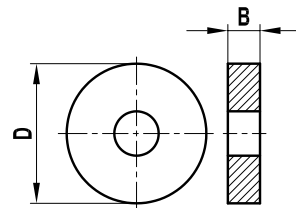
Part number	A-5555-3829	A-5555-0331	A-5555-1157	A-5555-1842	A-5555-1844	A-5555-1843
Zeiss order number	–	626115-0030-022	626115-0050-022	626115-0060-022	626115-0080-022	626115-0100-022
DK (mm)	5	0.3	0.5	0.6	0.8	1
L (mm)	34.5	21.8	22	22.1	22.3	22.5
DG (mm)	11	11	11	11	11	11
ML (mm)	25.5	12.8	13	13.1	13.3	13.5
ML1 (mm)	–	2.3	2.5	4.6	4.8	1.5
DS (mm)	3.5	1	1	1	1	1
DS1 (mm)	–	0.2	0.3	0.4	0.6	0.8
Weight (g)	9	6	6	6	6	6

Part number	A-5555-1873
Zeiss order number	–
DK (mm)	1.5
L (mm)	33
DG (mm)	11
ML (mm)	24
ML1 (mm)	7
DS (mm)	1.5
DS1 (mm)	1
Weight (g)	7



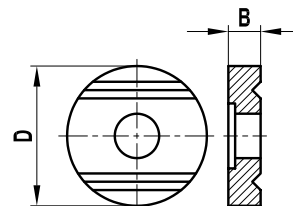
## Flat washer for star styli, stainless steel

Part number	A-5555-0089	A-5555-0090
Zeiss order number	600341-0140	600341-0141
D (mm)	11	19
B (mm)	1.5	2
Weight (g)	1	4



## Grooved washer for star styli, stainless steel

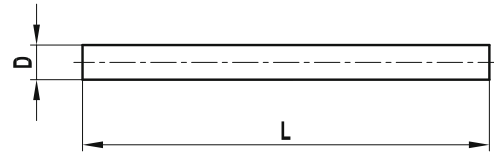
Part number	A-5555-0091	A-5555-0092
Zeiss order number	600341-0150	600341-0151
D (mm)	11	19
B (mm)	2	4
Weight (g)	1	7



## Tungsten carbide pin for star styli

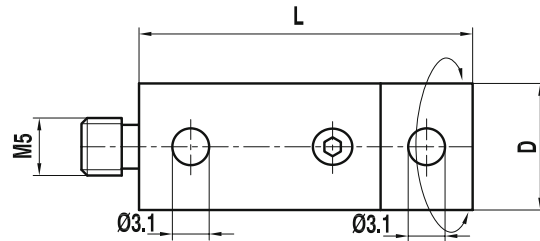
Schematics not shown to scale

Part number	A-5555-0093	A-5555-0094	A-5555-0095	A-5555-0096
Zeiss order number	600341-0520	600341-0521	600341-0522	600341-0523
L (mm)	10	10	18	18
D (mm)	1	1.5	2	3.5
Weight (g)	1	1	1	3



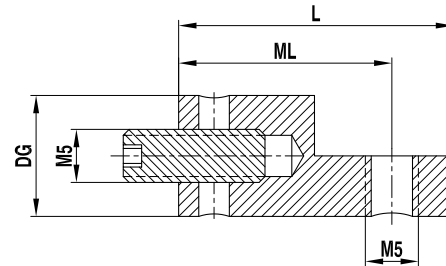
## Rotary adaptor, titanium

Part number	A-5555-0099	A-5555-0713
Zeiss order number	602030-9095	612030-9737
L (mm)	30	29
D (mm)	18	11
Weight (g)	43	13



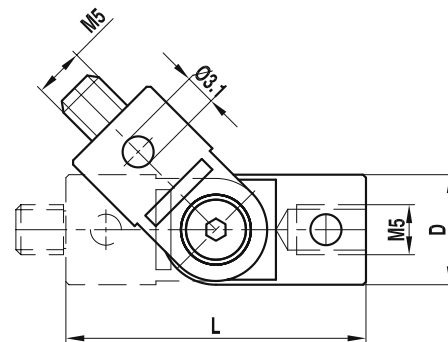
## Holder, 90 degree offset, titanium

Part number	A-5555-1097
Zeiss order number	626105-6901-001
ML (mm)	17
DG (mm)	11
L (mm)	22.5
Weight (g)	6



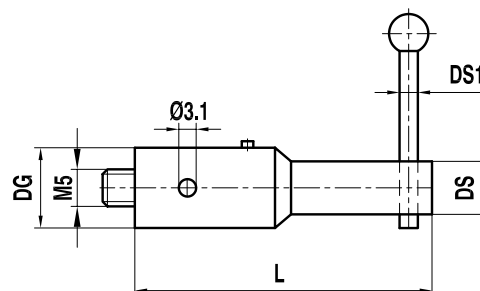
## Rotary knuckle, slewing range 360 degrees, swing range 180 degrees, titanium

Part number	A-5003-5278	A-5555-3841
Zeiss order number	-	-
L (mm)	51	58
D (mm)	11	18
Weight (g)	19	58



## Holder, 90 degrees, stainless steel

Part number	A-5555-0104
Zeiss order number	600341-8160
DS1 (mm)	1-1.5
L (mm)	45
DG (mm)	11
DS (mm)	6
Weight (g)	16



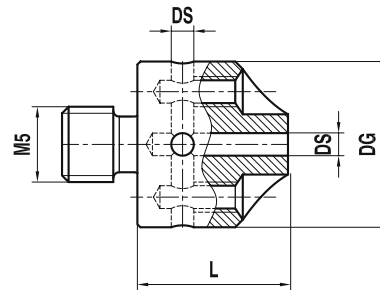
Fits with styli A-5555-0107 to A-5555-0115

## M5 styli for Zeiss probing systems

### 5-way holder, stainless steel

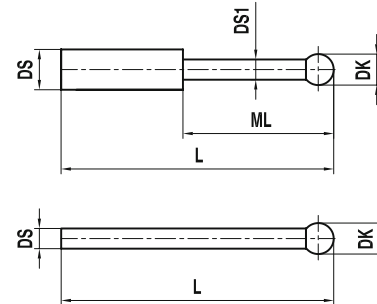
Schematics not shown to scale

Part number	A-5555-0105	A-5555-0106	A-5555-1245
Zeiss order number	600341-8367	600341-8368	626115-5000-199
DS (mm)	1	1.5	2
L (mm)	10	10	10
DG (mm)	11	11	11
Weight (g)	3.2	3.2	3.2



### Styli for holder, tungsten carbide stem, ruby ball

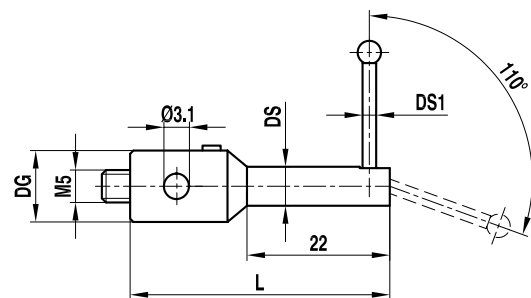
Part number	A-5555-0107	A-5555-0108	A-5555-0109	A-5555-0110	A-5555-0111
Zeiss order number	600341-8454	600341-8450	600341-8451	600341-8452	600341-8453
DK (mm)	1	0.3	0.5	0.6	0.8
L (mm)	16	15.3	15.5	15.6	15.8
DS (mm)	1	1	1	1	1
DS1 (mm)	0.8	0.2	0.3	0.4	0.6
ML (mm)	5	2.3	2.5	4.6	4.8
Weight (g)	1	1	1	1	1



Part number	A-5555-0112	A-5555-0113	A-5555-0114	A-5555-0115	A-5555-0116	A-5555-0117
Zeiss order number	600341-8500	600341-8501	600341-8502	600341-8503	600341-8510	600341-8511
DK (mm)	1.35	1.5	2	2.5	3	5
L (mm)	26.35	26.5	27	27.5	38	45
DS (mm)	1	1	1.5	1.5	2	3.5
Weight (g)	1	1	1	1	2	6

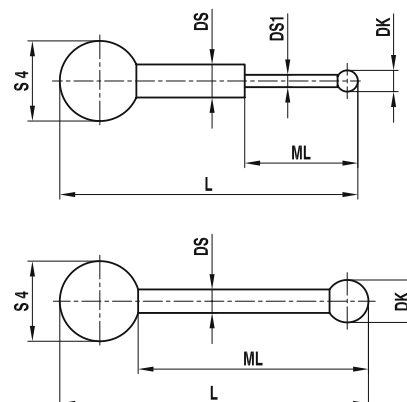
### Holder for swivel styli, stainless steel

Part number	A-5555-0118
Zeiss order number	600341-8180
L (mm)	40
DG (mm)	11
DS (mm)	6
DS1 (mm)	1-1.5
Weight (g)	15



### Styli for swiveling components, S4 steel ball, tungsten carbide stem, ruby ball

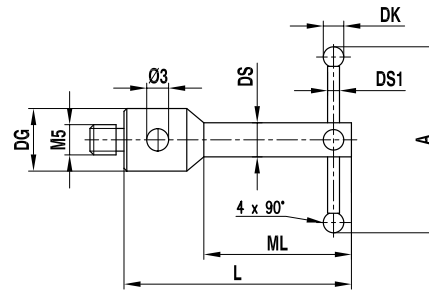
Part number	A-5555-0119	A-5555-0120
Zeiss order number	600341-8183	600341-8185
DK (mm)	1	2
L (mm)	17.5	28.5
DS (mm)	1	1.5
DS1 (mm)	0.8	-
ML (mm)	5	24.5
Weight (g)	1	1



**Star styli, stainless steel base, tungsten carbide stem, ruby ball**

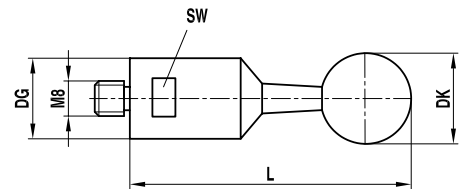
Part number	A-5555-1153	A-5555-1135	A-5555-3839
Zeiss order number	-	-	-
DK (mm)	0.6	0.8	1
L (mm)	40	40	40
DG (mm)	11	11	11
DS (mm)	4	4	4
DS1 (mm)	0.4	0.6	0.8
ML (mm)	30	30	30
A (mm)	8	8	8
Weight (g)	9	9	9

Schematics not shown to scale



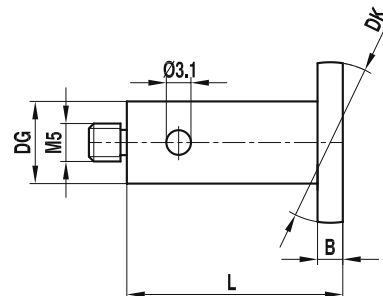
**Reference sphere with stem, M8 thread, stainless steel, ceramic ball including certificate**

Part number	A-5555-3842	A-5555-3843	A-5555-3844	A-1034-0124
Zeiss order number	-	-	-	-
DK (mm)	15	20	25	30
L (mm)	130	135	140	145
DG (mm)	24	24	24	24
SW (mm)	22	22	22	22



**Spherical disk styli, aluminum base, high-strength steel disk**

Part number	A-5555-0121	A-5555-0122	A-5555-0123	A-5555-0124
Zeiss order number	600341-8090	600341-8095	602030-8091	000000-1165-629
DK (mm)	10	15	20	15
L (mm)	21.5	21.5	60	40
DG (mm)	7	10	7	7
B (mm)	1.5	1.5	1	1
Weight (g)	3	6	8	5





## Extensions

Schematics not shown to scale

### Aluminum, stainless steel ends

Part number	A-5555-0125	A-5555-0126	A-5555-0127	A-5555-0128	A-5555-0129	A-5555-0130	A-5555-0131	A-5555-0132
Zeiss order number	600341-8420	600341-8421	600341-8422	600341-8423	600341-8424	600341-8425	600341-8265	600341-8264
L (mm)	200	150	100	80	60	40	120	100
D (mm)	20	20	20	20	20	20	11	11
Weight (g)	84.7	67.4	50.7	44.8	37.7	29	30.9	25.6

Part number	A-5555-0133	A-5555-0134	A-5555-0135
Zeiss order number	600341-8263	600341-8262	600341-8261
L (mm)	80	60	40
D (mm)	11	11	11
Weight (g)	20.6	15.4	10.3

### Stainless steel

Part number	A-5555-0136	A-5555-0137	A-5555-0138	A-5555-0139	A-5555-0140	A-5555-0141	A-5555-0142
Zeiss order number	600341-0260	600341-0258	600341-0256	600341-0254	600341-0252	600341-0251	600341-0250
L (mm)	100	80	60	40	20	15	10
D (mm)	11	11	11	11	11	11	11
Weight (g)	73	58	42	28	13	9	6

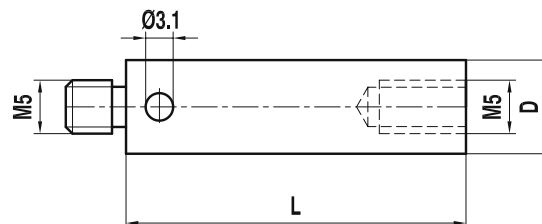
### Titanium

Part number	A-5555-0143	A-5555-0144	A-5555-0145	A-5555-0146	A-5555-0147	A-5555-0148	A-5555-0149	A-5555-0150
Zeiss order number	602030-9044	602030-9045	602030-9046	602030-9047	602030-9048	602030-9049	602030-9050	602030-9051
L (mm)	10	15	20	25	25	40	40	50
D (mm)	11	11	11	11	18	11	18	11
Weight (g)	3.9	5.7	7.5	9.5	24.6	12.6	31.5	13.2

Part number	A-5555-0151	A-5555-0152	A-5555-0153	A-5555-0154	A-5555-0155	A-5555-0156	A-5555-0157	A-5555-0158
Zeiss order number	602030-9052	602030-9053	602030-9054	602030-9055	602030-9056	602030-9057	602030-9058	602030-9059
L (mm)	50	60	60	75	75	80	80	90
D (mm)	18	11	18	11	18	11	18	11
Weight (g)	33.3	14.2	35.1	15.3	37.9	15.6	38.8	16.5

Part number	A-5555-0159	A-5555-0160	A-5555-0161	A-5555-0162	A-5555-0163	A-5555-0164	A-5555-0165	A-5555-0166
Zeiss order number	602030-9060	602030-9061	602030-9062	602030-9063	602030-9064	602030-9065	602030-9066	602030-9067
L (mm)	90	100	100	120	120	150	150	200
D (mm)	18	11	18	11	18	11	18	18
Weight (g)	40.6	17.2	42.5	19.8	46.1	22.5	51.6	61

Part number	A-5555-0167	A-5555-0168
Zeiss order number	602030-9068	602030-9069
L (mm)	250	300
D (mm)	18	18
Weight (g)	70	79



## Black thermo stable carbon fiber, titanium ends

Schematics not shown to scale

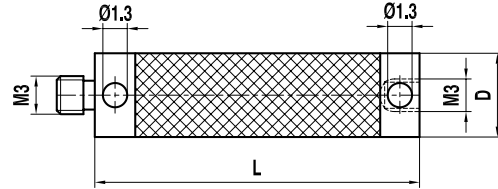
Part number	A-5555-0647	A-5555-0648	A-5555-0649	A-5555-0623	A-5555-0650	A-5555-0651
Zeiss order number	626107-1040-100	626107-1050-100	626107-1060-100	626107-1070-100	626107-1080-100	626107-1090-100
L (mm)	40	50	60	70	80	90
D (mm)	11	11	11	11	11	11
Weight (g)	9	10	11	10	12	13

Part number	A-5555-0652	A-5555-0425	A-5555-0424	A-5555-0653	A-5555-0654	A-5555-0655
Zeiss order number	626107-1100-100	626107-1120-100	626107-1150-100	626107-1180-100	626107-1200-100	626107-1250-100
L (mm)	100	120	150	180	200	250
D (mm)	11	11	11	11	11	11
Weight (g)	14	15	17	19	21	24

Part number	A-5555-0642	A-5555-0656	A-5555-0620	A-5555-0657	A-5555-0658	A-5555-0621
Zeiss order number	626107-1300-100	626107-1400-100	626107-2040-100	626107-2050-100	626107-2060-100	626107-2080-100
L (mm)	300	400	40	50	60	80
D (mm)	11	11	21	20	21	21
Weight (g)	27	34	26	28	29	32

Part number	A-5555-0659	A-5555-0661	A-5555-0663	A-5555-0427	A-5555-0664	A-5555-0665
Zeiss order number	626107-2100-100	626107-2150-100	626107-2200-100	626107-2250-100	626107-2300-100	626107-2400-100
L (mm)	100	150	200	250	300	400
D (mm)	21	21	21	21	21	20
Weight (g)	34	41	48	55	62	75

Part number	A-5555-0667	A-5555-0668
Zeiss order number	626107-2500-100	626107-2600-100
L (mm)	500	600
D (mm)	20	20
Weight (g)	89	103



**Adaptor plate extension for MT/VAST. Black thermo stable carbon fiber, titanium cube and plate adaptor**

Schematics not shown to scale

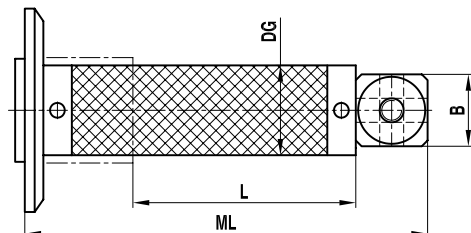
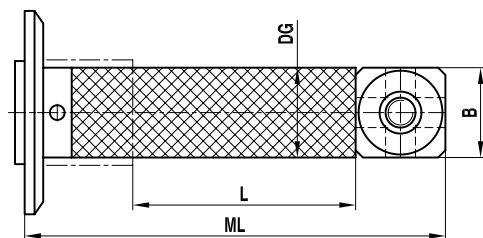
Part number	A-5555-3845	A-5555-3846	A-5555-3847	A-5555-3848	A-5555-3849	A-5555-3850
Zeiss order number	-	-	-	-	-	-
L (mm)	25	40	50	60	80	100
DG (mm)	11	11	11	11	11	11
ML (mm)	66.5	81.5	91.5	101.5	121.5	141.5
B (mm)	15	15	15	15	15	15
Weight (g)	60	62	64	66	68	70

Part number	A-5555-3851	A-5555-3740	A-5555-3852	A-5555-0699	A-5555-1985	A-5555-1986
Zeiss order number	-	-	-	625107-2025-130	625107-2040-130	625107-2050-130
L (mm)	120	150	200	25	40	50
DG (mm)	11	11	11	20	20	20
ML (mm)	161.5	191.5	241.5	66.5	81.5	91.5
B (mm)	15	15	15	15	15	15
Weight (g)	72	77	84	60	62	64

Part number	A-5555-1987	A-5555-0700	A-5555-1988	A-5555-1989	A-5555-0701	A-5555-1990
Zeiss order number	626107-2060-130	626107-2080-130	626107-2100-130	625107-2120-130	625107-2150-130	625107-2200-130
L (mm)	60	80	100	120	150	200
DG (mm)	20	20	20	20	20	20
ML (mm)	101.5	121.5	141.5	161.5	191.5	241.5
B (mm)	15	15	15	15	15	15
Weight (g)	66	68	70	72	77	84

Part number	A-5555-1979	A-5555-1980	A-5555-1855	A-5555-1981	A-5555-1982	A-5555-1983
Zeiss order number	626107-2025-110	626107-2040-110	626107-2050-110	625107-2060-110	625107-2080-110	625107-2100-110
L (mm)	25	40	50	60	80	100
DG (mm)	20	20	20	20	20	20
ML (mm)	71.5	86.5	96.6	106.5	126.5	146.5
B (mm)	20	20	20	20	20	20
Weight (g)	74	76	78	80	82	84

Part number	A-5555-1938	A-5555-1937	A-5555-1984
Zeiss order number	626107-2120-110	626107-2150-110	626107-2200-110
L (mm)	120	150	200
DG (mm)	20	20	20
ML (mm)	166.5	196.5	246.5
B (mm)	20	20	20
Weight (g)	86	91	98

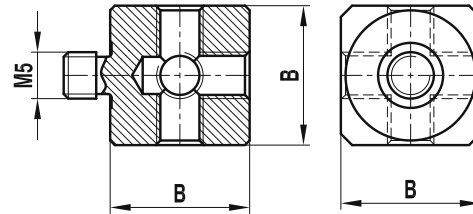


## M5 styli for Zeiss probing systems

### Cube, titanium

Schematics not shown to scale

Part number	A-5555-0189	A-5555-0190
Zeiss order number	600341-8361	600341-8002
B (mm)	15	20
Weight (g)	12.6	31.5

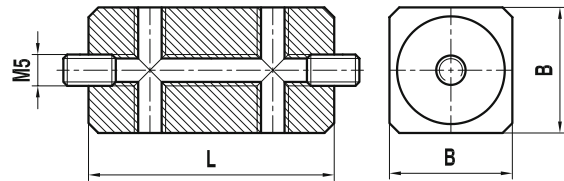


### Cube, aluminum

Part number	A-5555-0191	A-5555-0192
Zeiss order number	602030-8363	602030-8362
B (mm)	15	20
Weight (g)	7.5	20

### Double cube (titanium)

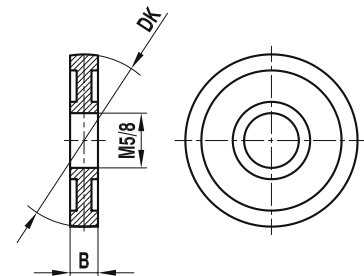
Part number	A-5555-0194
Zeiss order number	600342-8103
B (mm)	20
L (mm)	40
Weight (g)	64



### Spherical disk, high-strength steel

Part number	A-5555-0196	A-5555-0197	A-5555-0198	A-5555-0199	A-5555-0200	A-5555-0201	A-5555-0203
Zeiss order number	602030-0004	602030-0005	602030-0006	602030-0007	602030-0008	602030-0009	602030-0011
B (mm)	4	4	4	5	5	5	4
DK (mm)	15	20	30	40	50	60	20
M5/8 (mm)	M5	M5	M5	M5	M5	M5	8
Weight (g)	5	9	21	42	64	89	8

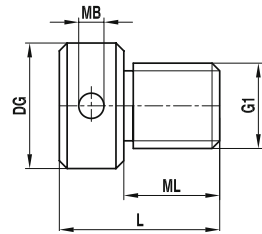
Part number	A-5555-0204	A-5555-0205	A-5555-0206	A-5555-0207	A-5555-0208
Zeiss order number	600341-0200	600341-0203	600341-0204	600341-0205	600341-0206
B (mm)	2	4	4	5	6
DK (mm)	20	30	40	50	60
M5/8 (mm)	8	8	8	8	8
Weight (g)	4	10	21	36	59



## Hole location gage, stainless steel

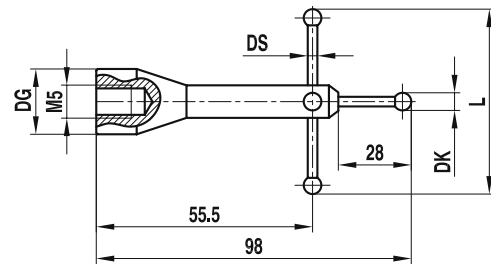
Schematics not shown to scale

Part number	A-5555-0209	A-5555-0210	A-5555-0211	A-5555-0212	A-5555-0213	A-5555-0214
Zeiss order number	602030-0012	602030-0013	600203-0014	602030-0015	602030-0016	600203-0017
G1	M4	M5	M6	M8	M10	M12
L (mm)	16	16	18	20	25	25
DG (mm)	10	10	12	15	18	20
ML (mm)	10	10	12	12	15	15
MB (mm)	1.8	1.8	1.8	3	3	3
Weight (g)	4	4	7	13	25	33



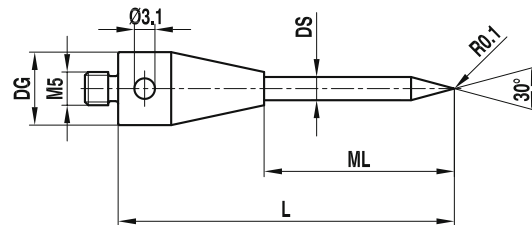
## Star stylus, stainless steel base, tungsten carbide stem, ruby ball

Part number	A-5555-0215
Zeiss order number	600331-8093
DK (mm)	5
L (mm)	80
DG (mm)	19
DS (mm)	3.5
Weight (g)	70



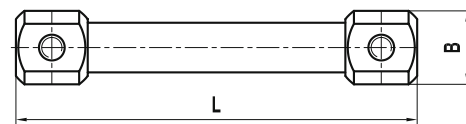
## Pointed stylus, titanium base, tungsten carbide stem

Part number	A-5555-0216
Zeiss order number	600342-8051
L (mm)	61
DG (mm)	11
ML (mm)	39
DS (mm)	3.5
Weight (g)	12



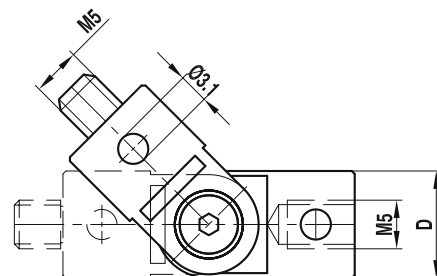
## Cube extension, titanium

Part number	A-5555-0217
Zeiss order number	602030-0019
L (mm)	120
B (mm)	20
Weight (g)	87



## Knuckle, swing range 180 degrees, titanium

Part number	A-5555-0218	A-5555-0219
Zeiss order number	600342-9002	600342-9003
L (mm)	30	36
D (mm)	11	18
Weight (g)	11.2	37.2

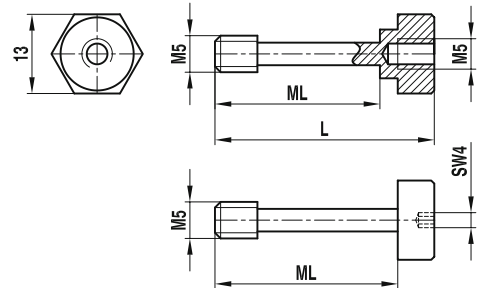


## M5 styli for Zeiss probing systems

### Bolts for spherical disk and cube, stainless steel

Schematics not shown to scale

Part number	A-5555-0221	A-5555-0222	A-5555-0223
Zeiss order number	600341-0210	600341-0211	600341-0212
L (mm)	35	30	17.5
ML (mm)	26	21	9
Weight (g)	9	9	7

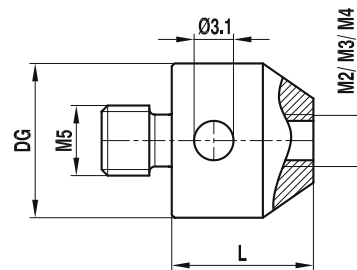


### Bolts for cubes, stainless steel

Part number	A-5555-0224	A-5555-0225
Zeiss order number	600341-0220	600341-0221
ML (mm)	26	21
Weight (g)	4	3

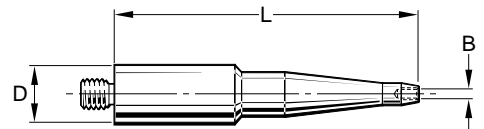
### Adaptor, stainless steel

Part number	A-5555-0226	A-5555-0227	A-5555-0228
Zeiss order number	602030-0215	602030-0315	602030-0318
Threads	M5/M2	M5/M3	M5/M4
L (mm)	10	10	10
DG (mm)	11	11	11
Weight (g)	5.2	5.2	5.2



### Holder for digitalization styli, stainless steel

Part number	A-5555-0231	A-5555-0232
Zeiss order number	602030-9113	602030-9115
L (mm)	119	127
D (mm)	15.81	9.52
B	M2	M2
Weight (g)	126	87

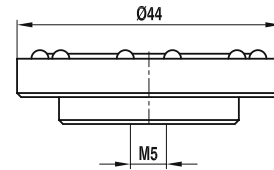


## Adaptor plates for Zeiss probe heads

### Adaptor plate for dynamic systems (ST), aluminum

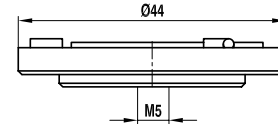
Part number	A-5555-0322	A-5555-0251
Zeiss order number	600660-8240	600660-8251
Quantity in kit	1	2
Weight (g)	72	144

Schematics not shown to scale



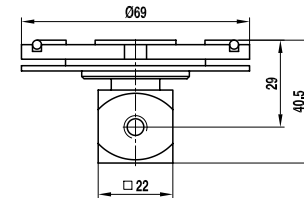
### Adaptor plate for Prismo dynamic systems (ST), aluminum

Part number	A-5555-0253	A-5555-3900
Zeiss order number	620660-8251-000	–
Quantity in kit	2	1
Weight (g)	144	72



### Adaptor plate for measuring systems MT/Vast, aluminum, with active ID chip

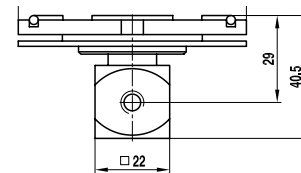
Part number	A-5555-0255	A-5555-0256	A-5555-0258*
Zeiss order number	600667-9601	600667-9611	600667-8571
Quantity in kit	1	2	1
Weight (g)	153	306	130



\* adaptor plate without cube

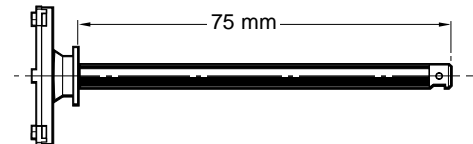
### Adaptor plate for XXT TL1, reference plate for XXT TL1

Part number	A-5555-1235	A-5555-1236
Zeiss order number	620161-8055-000	620161-8058-000
Weight (g)	4.6	4.6



### Adaptor plate for VAST XXT TL2, reference plate for XXT TL2

Part number	A-5555-1237	A-5555-1238
Zeiss order number	620161-8065-000	620161-8068-000
Weight (g)	5.4	5.4



### Adaptor plate for VAST XXT TL3, reference plate for XXT TL3

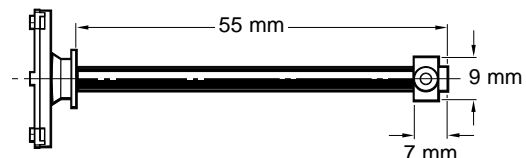
Part number	A-5555-1239	A-5555-1240
Zeiss order number	620161-8075-000	620161-8078-000
Weight (g)	4.6	4.6

### VAST XXT TL1 with star adaptor

Part number	A-5555-1241
Zeiss order number	626103-8031-055
Weight (g)	6.3

### VAST XXT TL3 with star adaptor

Part number	A-5555-1242
Zeiss order number	626103-8033-055
Weight (g)	6.3



# M3 styli, adaptors and accessories for Zeiss analog probe systems

Schematics not shown to scale

## Carbide styli XXT, titanium base, tungsten carbide stem, ruby ball

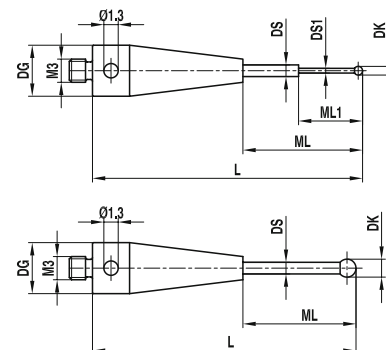
Part number	A-5004-3176	A-5004-2185	A-5004-1702	A-5004-2186	A-5555-3853	A-5004-3179
Zeiss order number	626113-0030-013	626113-0030-020	626113-0050-013	626113-0050-020	626113-0060-014	626113-0060-020
DK (mm)	0.3	0.3	0.5	0.5	0.6	0.6
L (mm)	13	20	13	20	14	20
DG (mm)	5	5	5	5	5	5
ML (mm)	4	11	4	11	5	1
ML1 (mm)	2.3	2.3	2.3	2.3	4.6	4.6
DS (mm)	1	1	1	1	1	1
DS1 (mm)	0.2	0.2	0.3	0.3	0.4	0.4
Weight (g)	0.62	0.69	0.61	0.69	0.61	0.68

Part number	A-5004-3273	A-5004-3274	A-5004-1883	A-5004-3187	A-5555-3854	A-5004-1863
Zeiss order number	626113-0080-014	626113-0080-020	626113-0080-034	626113-0100-014	626113-0101-020	626113-0100-020
DK (mm)	0.8	0.8	0.8	1	1	1
L (mm)	14	20	34	14	20	20
DG (mm)	5	5	5	5	5	5
ML (mm)	5	11	25	5	11	11
ML1 (mm)	-	4.8	4.1	-	5.1	5
DS (mm)	0.6	1	1	0.8	1	1
DS1 (mm)	-	0.6	0.6	-	0.6	0.8
Weight (g)	0.62	0.69	0.8	0.63	0.7	0.69

Part number	A-5004-3519	A-5004-3427	A-5555-9341	A-5004-3272	A-5004-1862	A-5555-9339
Zeiss order number	626113-0130-020	626113-0100-030	626113-0100-040	626113-0150-014	626113-0150-020	626113-0151-030
DK (mm)	1	1	1	1.5	1.5	1.5
L (mm)	20	30	40	14	20	30
DG (mm)	5	5	5	5	5	5
ML (mm)	11	21	31	5	11	21
ML1 (mm)	-	5	5	-	-	-
DS (mm)	0.8	1	1	1	1	1
DS1 (mm)	-	0.8	0.8	-	-	-
Weight (g)	0.7	0.8	1.5	0.65	0.72	0.84

Part number	A-5555-9340	A-5004-1779	A-5004-3188	A-5004-1861	A-5004-0656	A-5555-3855
Zeiss order number	626113-0150-030	626113-0151-040	626113-0200-014	626113-0200-020	626113-0200-030	626113-0021-040
DK (mm)	1.5	1.5	2	2	2	2
L (mm)	30	40	14	20	30	40
DG (mm)	5	5	5	5	5	5
ML (mm)	22.5	31	5	11	21	31
DS (mm)	1	1	1	1	1	1.5
Weight (g)	0.9	1.6	0.66	0.72	0.83	1.7

Part number	A-5555-3856	A-5555-3857	A-5004-3428
Zeiss order number	626113-0250-020	626113-0250-030	626113-0250-040
DK (mm)	2.5	2.5	2.5
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	1.5	1.5	1.5
Weight (g)	1	1.5	2



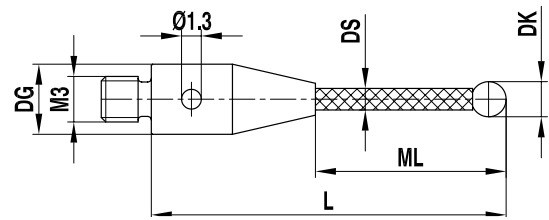


## M3 styli for Zeiss probing systems

### Reference styli **XXT (red dot)**, titanium base, thermo stable carbon fiber stem, ruby ball

Schematics not shown to scale

Part number	A-5555-2033	A-5555-3858
Zeiss order number	626103-0501-030	626103-0501-050
DK (mm)	5	5
L (mm)	30	50
DG (mm)	5	5
ML (mm)	21	41
DS (mm)	3.5	3.5
Weight (g)	1.1	1.4



## Thermo stable carbon fiber styli XXT, titanium base, thermo stable carbon fiber stem, ruby ball

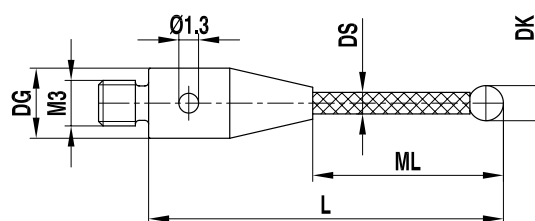
Schematics not shown to scale

Part number	A-5555-3859	A-5004-0802	A-5555-1251	A-5004-1884	A-5004-0803	A-5555-3860
Zeiss order number	626103-0300-025	626103-0300-033	626103-0300-040	626103-0300-042	626103-0300-050	626103-0300-058
DK (mm)	3	3	3	3	3	3
L (mm)	25	33	40	42	50	58
DG (mm)	5	5	5	5	5	5
ML (mm)	16	24	31	33	41	49
DS (mm)	2	2	2	2	2	2
Weight (g)	0.65	0.7	0.8	0.8	0.8	1

Part number	A-5555-3861	A-5555-3862	A-5004-2786	A-5004-2108	A-5003-0062	A-5004-0806
Zeiss order number	626103-0300-059	626103-0300-075	626103-0401-050	626103-0500-030	626103-0500-040	626103-0500-050
DK (mm)	3	3	4	5	5	5
L (mm)	59	75	50	30	40	50
DG (mm)	5	5	5	5	5	5
ML (mm)	50	66	41	21	31	41
DS (mm)	2	2	2	3.5	3.5	3.5
Weight (g)	1	1	1	1.1	1.2	1.4

Part number	A-5555-3864	A-5555-1114	A-5004-3429	A-5555-3865	A-5555-1115	A-5555-3866
Zeiss order number	626103-0500-060	626103-0501-075	626103-0600-050	626103-0610-070	626103-0600-100	626103-0800-030
DK (mm)	5	5	6	6	6	8
L (mm)	60	75	50	70	100	30
DG (mm)	5	5	5	5	5	5
ML (mm)	51	66	40	61	91	30
DS (mm)	3.5	3.5	3.5	3.5	3.5	5
Weight (g)	1.5	1.8	1.5	1.8	2.4	1.86

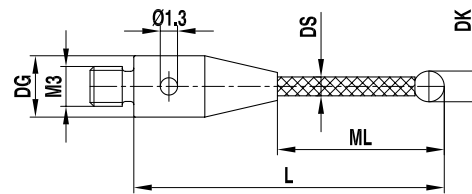
Part number	A-5555-3867	A-5555-3868	A-5555-3869	A-5004-0808
Zeiss order number	626103-0830-050	626103-0830-070	626103-0830-100	626103-0800-125
DK (mm)	8	8	8	8
L (mm)	50	70	100	125
DG (mm)	5	5	5	5
ML (mm)	50	70	100	125
DS (mm)	5	5	5	5
Weight (g)	2.1	2.6	2.7	2.9



**Thermo stable carbon fiber styli XXT, titanium base, thermo stable carbon fiber stem, silicon nitride ball**

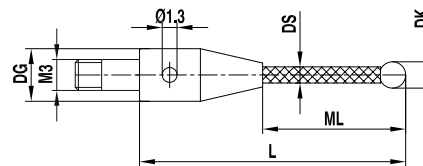
Schematics not shown to scale

Part number	A-5555-3870	A-5555-3871	A-5555-3872	A-5004-1858	A-5555-3873	A-5555-3874
Zeiss order number	626103-0301-033	626103-0301-050	626103-0502-050	626103-0500-075	626103-0801-070	626103-0801-125
DK (mm)	3	3	5	5	8	8
L (mm)	33	50	50	75	70	125
DG (mm)	5	5	5	5	5	5
ML (mm)	24	41	41	66	70	125
DS (mm)	2	2	3.5	3.5	5	5
Weight (g)	0.7	0.8	1.4	1.8	2.6	2.9



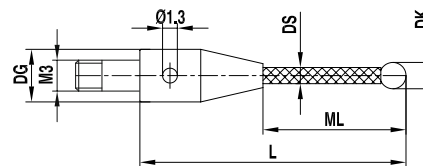
**Thermo stable carbon fiber clamping styli XXT, titanium base, thermo stable carbon fiber stem, ruby ball**

Part number	A-5555-3875	A-5555-3876	A-5004-3282
Zeiss order number	626103-0301-020	626103-0301-030	626103-0301-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	0.7	0.75	0.8



**Thermo stable carbon fiber clamping styli XXT, titanium base, thermo stable carbon fiber stem, silicon nitride ball**

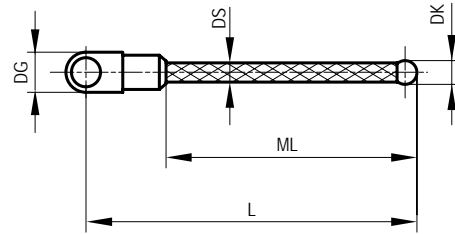
Part number	A-5555-3877	A-5555-3878	A-5555-3879
Zeiss order number	626103-0311-020	626103-0311-030	626103-0311-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	0.7	0.75	0.8



**¼ star styli, thermo stable carbon fiber XXT, titanium base, thermo stable carbon fiber stem, ruby ball**

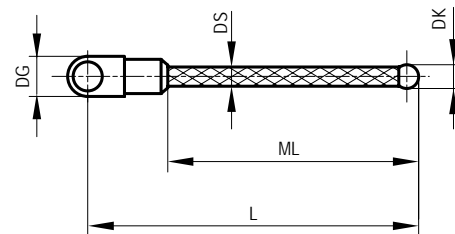
Schematics not shown to scale

Part number	A-5555-1273	A-5555-1274	A-5555-1275
Zeiss order number	626103-0302-020	626103-0302-030	626103-0302-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	0.8	0.9	1



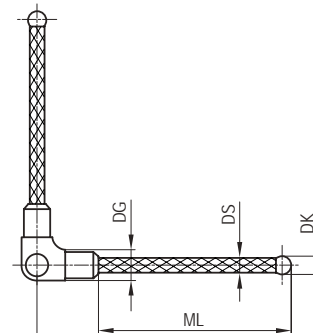
**¼ star styli, thermo stable carbon fiber XXT, titanium base, thermo stable carbon fiber stem, silicon nitride ball**

Part number	A-5555-3880	A-5555-3881	A-5555-3901
Zeiss order number	626103-0312-020	626103-0312-030	626103-0312-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	0.8	0.9	1



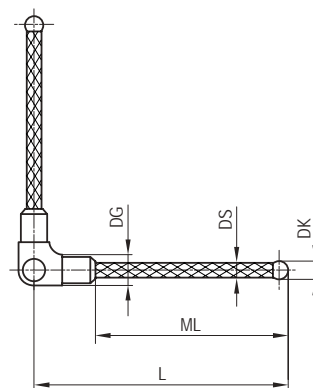
**½ star styli, thermo stable carbon fiber XXT, 90 degrees, titanium base, thermo stable carbon fiber stem, ruby ball**

Part number	A-5555-3882	A-5555-3883	A-5004-3284
Zeiss order number	626103-0303-020	626103-0303-030	626103-0303-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	1.4	1.5	1.6



**½ star styli, thermo stable carbon fiber XXT, 90 degrees, titanium base, thermo stable carbon fiber stem, silicon nitride ball**

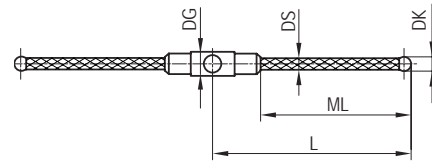
Part number	A-5555-3884	A-5555-3885	A-5555-3886
Zeiss order number	626103-0313-020	626103-0313-030	626103-0313-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	1.4	1.5	1.6



**½ star styli, thermo stable carbon fiber XXT, 180 degrees, titanium base, thermo stable carbon fiber stem, ruby ball**

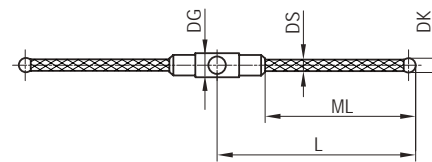
Schematics not shown to scale

Part number	A-5555-3887	A-5555-3888	A-5004-0654
Zeiss order number	626103-0304-020	626103-0304-030	626103-0304-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	1.4	1.5	1.6



**½ star styli, thermo stable carbon fiber XXT, 180 degrees, titanium base, thermo stable carbon fiber stem, silicon nitride ball**

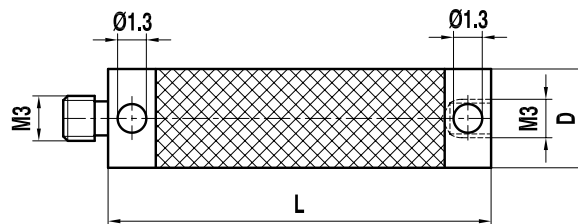
Part number	A-5555-3889	A-5555-3890	A-5555-3891
Zeiss order number	626103-0314-020	626103-0314-030	626103-0314-040
DK (mm)	3	3	3
L (mm)	20	30	40
DG (mm)	5	5	5
ML (mm)	11	21	31
DS (mm)	2	2	2
Weight (g)	1.4	1.5	1.6



**Extension XXT, thermo stable black carbon fiber, titanium ends**

Part number	A-5555-3892	A-5555-1947	A-5004-3430	A-5555-3893	A-5004-0002	A-5555-3894
Zeiss order number	626103-5020-000	626103-5025-000	626103-5030-000	626103-5040-000	626103-5050-000	626103-5060-000
D (mm)	5	5	5	5	5	5
L (mm)	20	25	30	40	50	60
Weight (g)	1.2	1.25	1.3	1.4	1.5	1.7

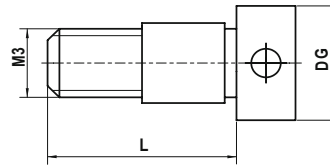
Part number	A-5555-1948	A-5004-2001	A-5004-1859	A-5555-3895	A-5555-1276
Zeiss order number	626103-5075-000	626103-5080-000	626103-5100-000	626103-5130-000	626103-5150-000
D (mm)	5	5	5	5	5
L (mm)	75	80	100	130	150
Weight (g)	1.7	1.8	2	2.5	2.7



**Clamping screw XXT, titanium**

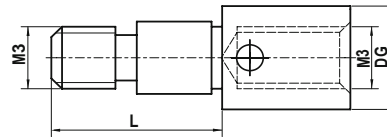
Schematics not shown to scale

Part number	A-5004-1856
Zeiss order number	626103-6110-004
DG (mm)	5
L (mm)	8
Weight (g)	0.5



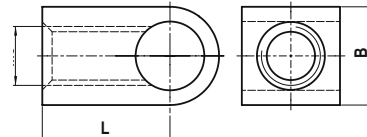
**Clamping screw XXT with internal M3 thread, titanium**

Part number	A-5004-1857
Zeiss order number	626103-6110-005
DG (mm)	5
L (mm)	8
Weight (g)	0.7



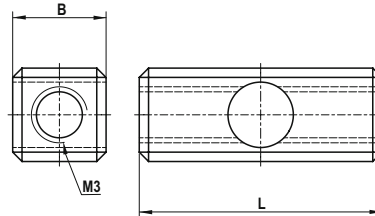
**Cube XXT 90 degrees, 1 way, titanium**

Part number	A-5004-3437
Zeiss order number	626103-6110-001
B (mm)	5
L (mm)	6.5
Weight (g)	0.64



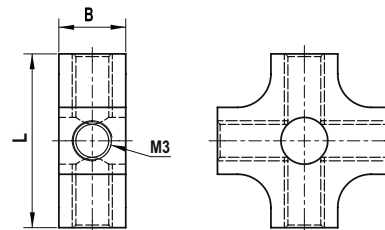
**Cube XXT 180 degrees, 2 way, titanium**

Part number	A-5555-3896
Zeiss order number	626103-6110-002
B (mm)	5
L (mm)	13
Weight (g)	1.05



**Cube star XXT, titanium**

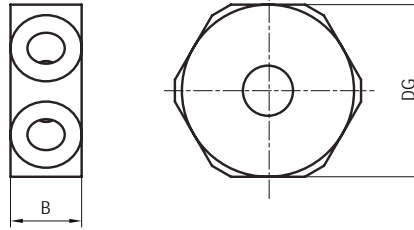
Part number	A-5555-3897
Zeiss order number	626103-6110-003
B (mm)	5
L (mm)	13
Weight (g)	1.8



## Cube XXT, 6 star, titanium

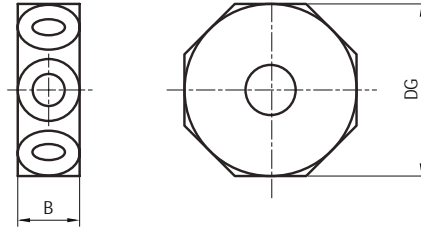
Schematics not shown to scale

<b>Part number</b>	<b>A-5555-3898</b>
<b>Zeiss order number</b>	626103-6110-006
<b>B (mm)</b>	5
<b>DG (mm)</b>	12
<b>Weight (g)</b>	1.8



## Cube XXT, 8 star, titanium

<b>Part number</b>	<b>A-5555-3899</b>
<b>Zeiss order number</b>	626103-6110-007
<b>B (mm)</b>	5
<b>DG (mm)</b>	14
<b>Weight (g)</b>	2.3



## Knuckle XXT, titanium

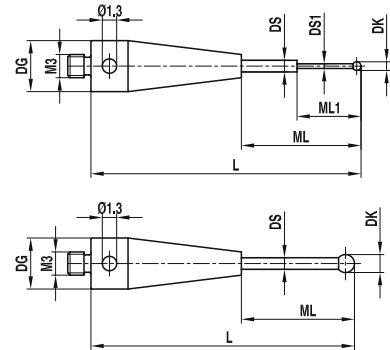
<b>Part number</b>	<b>A-5004-3285</b>
<b>Zeiss order number</b>	626103-6180-001
<b>B (mm)</b>	5
<b>L (mm)</b>	10
<b>Weight (g)</b>	1.65

**Tungsten carbide styli, stainless steel base, tungsten carbide stem, ruby ball**

Schematics not shown to scale

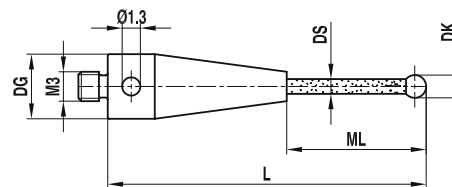
Part number	A-5555-0261	A-5555-0263	A-5555-0265	A-5555-0267	A-5555-0268	A-5555-0269	A-5555-0270	A-5555-0271
Zeiss order number	602030-8104	602030-8113	602030-8112	602030-8115	602030-8116	602030-8117	602030-8118	602030-8119
DK (mm)	2	3	4	0.5	0.6	0.8	1	1.5
L (mm)	22	40	33	22	22	22	22	22
DG (mm)	4	5.5	4	4	4	4	4	4
ML (mm)	9	21.5	23	9	9	9	9	9
ML1 (mm)	-	-	-	2.5	4.6	4.8	5	-
DS (mm)	1	2	2.5	1	1	1	1	1
DS1 (mm)	-	-	-	0.3	0.4	0.6	0.8	-
Weight (g)	1	4	2.5	1	1	1	1	1

Part number	A-5555-0272	A-5555-0273	A-5555-0274	A-5555-0276	A-5555-0277
Zeiss order number	602030-8120	602030-8121	602030-8023	602030-8021	602030-8106
DK (mm)	1	0.3	2	3	3
L (mm)	10.5	22	21	21.5	21
DG (mm)	4	4	4	4	4
ML (mm)	5.5	9	15	15.5	13
ML1 (mm)	5	2.3	-	-	-
DS (mm)	10	1	1	1.5	2
DS1 (mm)	0.8	.02	-	-	-
Weight (g)	1	1	1	1	1



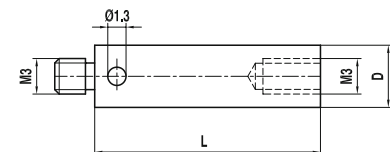
**Ceramic styli, stainless steel base, ceramic stem, ruby ball**

Part number	A-5555-0264	A-5555-0266	A-5555-0275
Zeiss order number	602030-8102	602030-8101	602030-8020
DK (mm)	4	5	6
L (mm)	32	32	13
DG (mm)	4	4	4
ML (mm)	26	19	9
DS (mm)	2	2	2
Weight (g)	1	1	1



**Stainless steel extensions**

Part number	M-5000-7633	M-5000-3592	A-5555-0286	A-5555-0287	A-5555-0288
Zeiss order number	602030-8301	602030-8302	602030-8303	602030-8304	602030-8305
L (mm)	10	20	30	40	50
D (mm)	4	4	4	4	4
Weight (g)	0.7	1.6	2.6	3.7	4.7



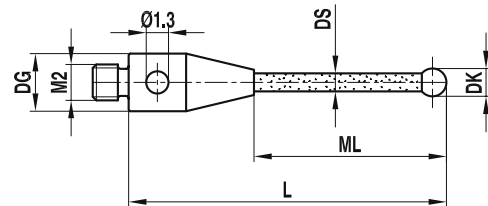


## M2 styli, adaptors and accessories for Zeiss analog probe systems

Schematics not shown to scale

### Ceramic styli, stainless steel base, ceramic stem, ruby ball

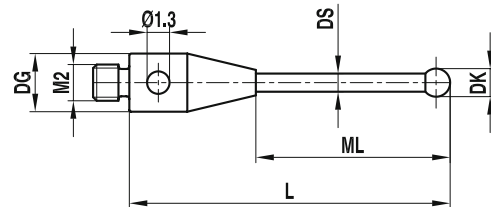
Part number	A-5555-0278	A-5555-0279
Zeiss order number	602030-8002	602030-8004
DK (mm)	6	5
L (mm)	13	22.5
DG (mm)	3	3
ML (mm)	9	16.5
DS (mm)	2	2
Weight (g)	1	1



### Tungsten carbide styli, stainless steel base, tungsten carbide stem, ruby ball

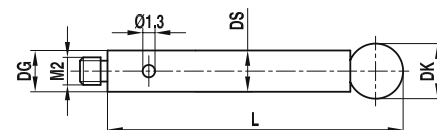
Part number	A-5555-0308	A-5555-0309	A-5555-0282	A-5555-0310	A-5555-0311	A-5003-3822	A-5003-0938	A-5555-0312
Zeiss order number	602030-8006	602030-8007	602030-8001	602030-8008	602030-8009	602030-8005	602030-8003	602030-8015
DK (mm)	1	1	2	2	2	2	3	4
L (mm)	10.5	15.5	11	11	16	21	21.5	12
DG (mm)	3	3	3	3	3	3	3	3
ML (mm)	6.5	11.5	5	7	12	15	15.5	8
DS (mm)	0.8	0.8	1	1	1	1	1.5	2.5
Weight (g)	0.3	0.3	1	1	1	1	1	1

Part number	A-5555-0313	A-5555-0283
Zeiss order number	602030-8016	602030-8034
DK (mm)	4	5
L (mm)	22	22.5
DG (mm)	3	3
ML (mm)	18	16.5
DS (mm)	2.5	2
Weight (g)	1	1



### Steel styli, stainless steel base and stem, ruby ball

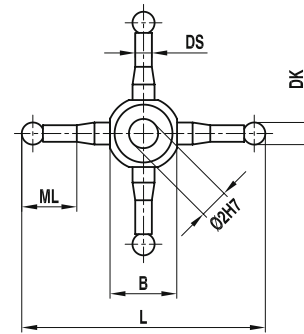
Part number	A-5555-0314	A-5555-0315	A-5555-0316
Zeiss order number	602030-8017	602030-8018	602030-8019
DK (mm)	6	6	8
L (mm)	13	28	13
DS (mm)	3	3	3
DG (mm)	3	3	3
Weight (g)	0.9	1.8	2



## Star styli, stainless steel cube base and stem, ruby ball

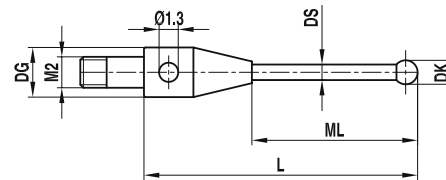
Schematics not shown to scale.

Part number	A-5555-0294	A-5555-0295
Zeiss order number	602030-8011	602030-8010
DK (mm)	2	2
L (mm)	32	22
ML (mm)	9.5	4.5
DS (mm)	1.4	1.4
B (mm)	5.5	5.5
Weight (g)	1	1



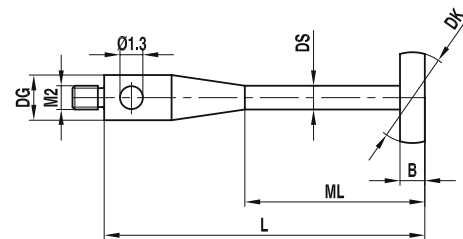
## Styli for star configuration, stainless steel base and stem, ruby ball

Part number	A-5555-0296
Zeiss order number	602030-8012
DK (mm)	2
L (mm)	19.5
DG (mm)	3
ML (mm)	13.5
DS (mm)	1.5
Weight (g)	1



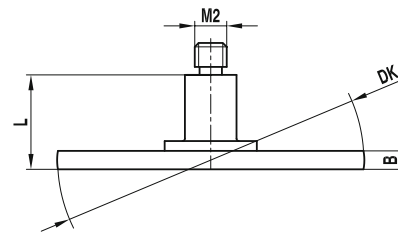
## Spherical disk styli, stainless steel base, tungsten carbide stem, ceramic disk

Part number	A-5555-0297	A-5555-0298
Zeiss order number	602030-8201	602030-8202
DK (mm)	8	4
L (mm)	32	32
DG (mm)	3	3
ML (mm)	19	19
DS (mm)	1.5	1
B (mm)	1.5	1
Weight (g)	1	1



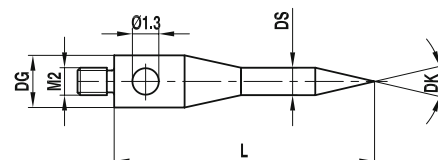
## Spherical disk styli, stainless steel base and stem, ceramic disk

Part number	A-5555-0299	A-5555-0300
Zeiss order number	602030-8203	602030-8204
DK (mm)	14	20
L (mm)	5.5	5.5
B (mm)	2	2.5
Weight (g)	1	3



## Pointer styli, stainless steel base, cone point, tungsten carbide

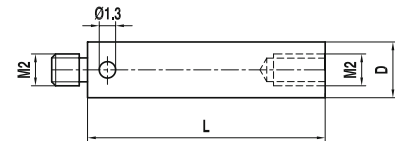
Part number	A-5555-0317	A-5555-0318
Zeiss order number	602030-8342	602030-8343
L (mm)	10	10
DG (mm)	3	3
DS (mm)	1.5	1.5
DK	30°	60°
Weight (g)	1	1



## Stainless steel extension

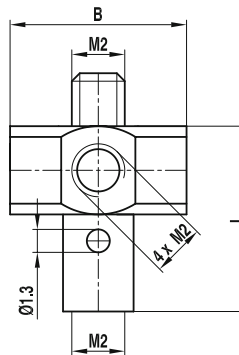
Schematics not shown to scale

Part number	M-5000-7634	M-5000-3647	M-5000-3648	M-5000-4162	M-5000-7779
Zeiss order number	602030-8321	602030-8322	602030-8323	602030-8324	602030-8325
L (mm)	5	10	20	30	40
D (mm)	3	3	3	3	3
Weight (g)	0.2	0.5	1	1.4	2.2



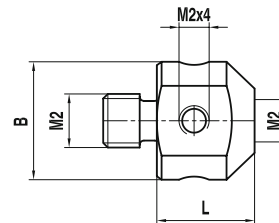
## 5-way holder, rotary, stainless steel

Part number	A-5000-3627
Zeiss order number	602030-8381
L (mm)	7.5
B (mm)	7
Weight (g)	1.2



## 5-way holder, stainless steel

Part number	A-5555-0319	A-5555-0320
Zeiss order number	602030-9104	602030-9103
L (mm)	9.1	5.4
D (mm)	10.5	7
Weight (g)	3.4	1



## Renishaw tools and accessories for the assembly of M2, M3 and M5 styli to Zeiss measuring probe heads

Schematics not shown to scale

### Stylus tool (M2 and M3 styli)

Part number	A-5555-0233
Zeiss order number	602030-0001
DK (mm)	1.2
L (mm)	23
Weight (g)	1



### Allen keys DIN 911

Part number	A-5555-0234	A-5555-0235	A-5555-0236
Zeiss order number	602030-0002	602030-0042	602030-0021
B (mm)	SW1.5	SW0.9	SW2.5
Weight (g)	1	1	2



### Tool kit

consisting of:

Part number	A-5555-0237
Zeiss order number	600341-8595

	1 x offset screwdriver DIN 911-2	1 x offset screwdriver DIN 911-3	1 x offset screwdriver DIN 911-4	2 x pin-type spanner 2.9 mm	1 x single-headed spanner DIN 894
DK (mm)	–	–	–	2.9	–
L (mm)	–	–	–	70	–
D (mm)	–	–	–	5	–
B	SW2	SW3	SW4	–	SW13
Weight (g)	1	5	10	15 each	39

### Stylus tool kit (2 x pin-type spanners 2.9 mm for M5)

Part number	A-5555-0238
Zeiss order number	600341-8596
DK (mm)	2.9
L (mm)	70
D (mm)	5
Weight (g)	15

### Stylus tool 1.7 mm for M5

Part number	A-5555-0239
Zeiss order number	602030-0027
DK (mm)	1.7
L (mm)	49
D (mm)	2.5
Weight (g)	1

## Pin-type spanner 2.9 mm for M5

Part number	A-5555-0240
Zeiss order number	602030-0222
DK (mm)	2.9
L (mm)	70
D (mm)	5
Weight (g)	7.5

## Assortment of screws

Part number	A-5555-0241
Zeiss order number	600341-8590
Weight (g)	27

Includes:

- 10 spring-lock washers FS 5x7
- 2 cheese-head screws M5x12
- 2 cheese-head screws M5x20
- 4 grub screws 10 mm long
- 2 grub screws 25 mm long

## Spring-lock washers

Part number	A-5555-0242
Zeiss order number	600341-0042

Includes:

- 10 x FS 5.7 spring-lock washers

## C spanners DIN 1810

Part number	A-5555-0243	A-5555-0244
Zeiss order number	602030-0045	602030-0044
DK (mm)	11	21

# Accessories

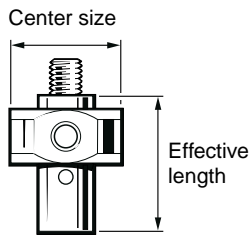
## Stylus knuckles

Part number	A-5000-7534	A-5003-4697	A-5000-9902 Rotary	A-5000-7616	A-5003-4686 Rotary	A-5003-4689 Rotary	* A-5003-5278 Rotary	A-5003-5279 Rotary
Thread size	M2	M2	M2	M3	M3	M4	M5	M5
Effective length mm (inch)	8.0 (0.32)	13.5 (0.54)	16.5 (0.65)	12.0 (0.48)	17.0 (0.67)	33.0 (1.30)	36.5 (1.44)	46.5 (1.84)
Center offset mm (inch)	4.5 (0.18)	N/A	N/A	6.0 (0.24)	N/A	N/A	N/A	N/A
Mass grammes	1.6	1.1	1.3	3.7	1.5	9.8	16.5	64.9






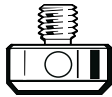
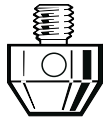
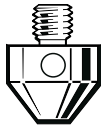
\* Not for use with SP80

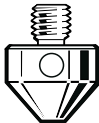
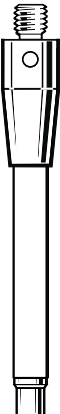

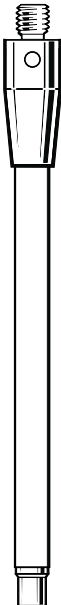


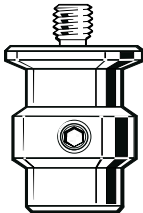
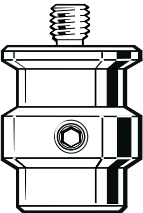
## Stylus centers



Part number	A-5000-8395 4-way	A-5000-3627 5-way	A-5000-7610 5-way	A-5000-7792 5-way
Thread size	M2	M2	M3	M4
Effective length mm (inch)	7.5 (0.30)	7.5 (0.30)	13.0 (0.52)	18.0 (0.71)
Center size mm (inch)	7.5 (0.30)	7.0 (0.28)	10.0 (0.40)	15.0 (0.60)
Mass grammes	1.1	0.8	3.6	12.1

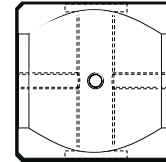
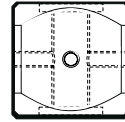
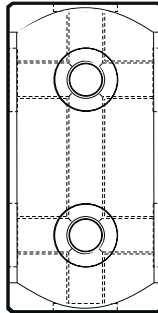
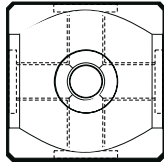
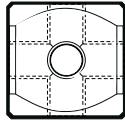
Adaptors

Part number	M-5000-4164 Stainless steel	M-5000-4163 Stainless steel	M-5000-6622 Stainless steel	M-5000-6714 Stainless steel	M-5000-6625 Stainless steel	M-5000-9301 Stainless steel	A-5003-0856 Stainless steel	A-5555-0227 Stainless steel
Male/female thread	M2/M3	M3/M2	M4/M2	M4/M3	M4/M3	M5/M4	M5/M4	M5/M3
Length mm (inch)	7.0 (0.28)	5.0 (0.20)	5.0 (0.20)	9.0 (0.36)	20.0 (0.79)	6.5 (0.26)	9.0 (0.36)	10.0 (0.40)
Mass grammes	0.4	0.6	1.5	1.4	3.2	6.0	4.6	5.0
								

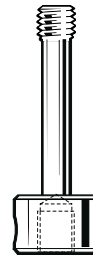
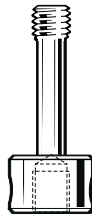
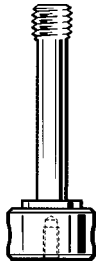
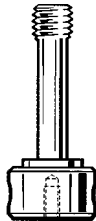
Part number	A-5555-0226 Stainless steel	A-5000-7751 Ceramic	M-5000-8167 Stainless steel	A-5000-7752 Ceramic	A-5000-7753 Ceramic	A-2054-4657 Stainless steel	A-5000-9302 Stainless steel	A-5000-9303 Stainless steel
Male/female thread	M5/M2	M4/M3	TF6/M3	M4/M3	M4/M3	M4/Ø4.5	M5/Ø8.0	M5/Ø10.0
Length mm (inch)	10.0 (0.40)	50.0 (1.97)	18.0 (0.71)	75.0 (2.96)	100.0 (3.94)	10.0 (0.40)	22.0 (0.87)	22.0 (0.87)
Mass grammes	5.0	4.4	1.9	5.2	6.3	5.0	18.0	20.0
								

**Cubes and bolts**

Part number	A-5555-0189 Titanium	A-5555-0190 Titanium	A-5555-0194 Titanium	A-5003-5683 Titanium	A-5003-5684 Titanium
Thread size	M5	M5	M5	M5 – M2	M5 – M2
Length mm (inch)	15.0 (0.60)	20.0 (0.79)	20.0 (0.79)	15.0 (0.60)	20.0 (0.79)
Width mm (inch)	15.0 (0.60)	20.0 (0.79)	40.0 (1.58)	15.0 (0.60)	20.0 (0.79)
Mass grammes	12.85	32.55	63.50	13.75	35.18

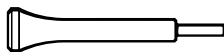


Part number	A-5003-5679 Stainless steel	A-5003-5678 Stainless steel	A-5003-5677 Stainless steel	A-5003-5676 Stainless steel
Thread size	M5 – M2	M5 – M2	M5	M5
Length mm (inch)	28.0 (1.11)	33.0 (1.30)	28.0 (1.11)	33.0 (1.30)
Mass grammes	6.7	7.1	6.0	6.4

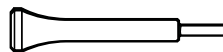


**Stylus tools**

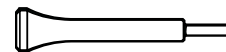
**M-5000-3540**  
For M2 and M3  
threaded styli



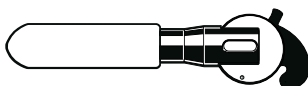
**M-5000-3707**  
For M4  
threaded styli



**M-5000-9304**  
For M5  
threaded styli



**A-5003-2300**  
For the M2 carbon fiber  
range of styli



These tools are designed to fit styli to Renishaw probes without causing any internal damage.

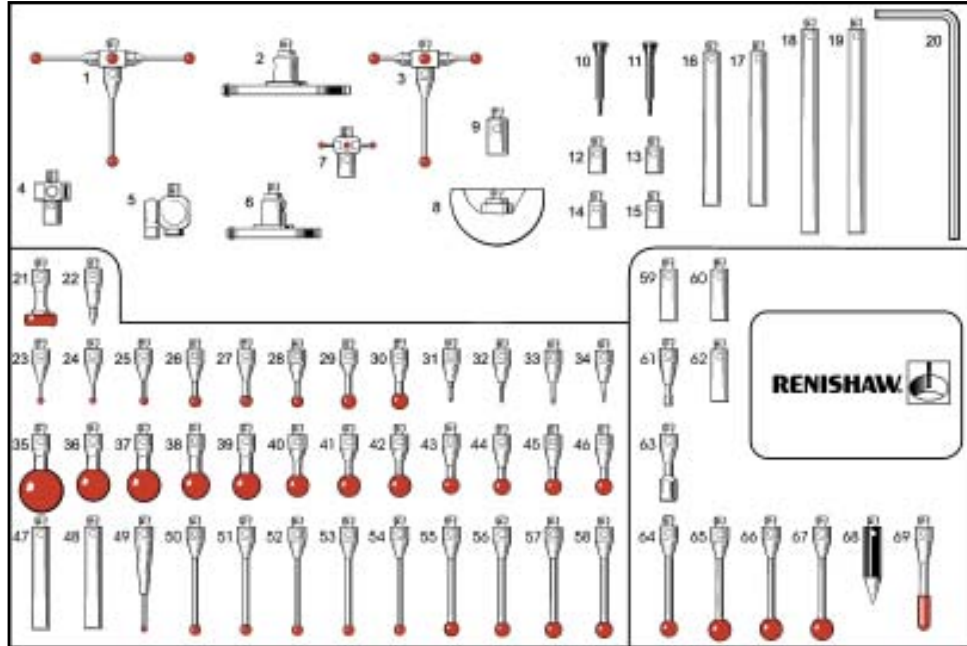


# Stylus kits

## M2 comprehensivestyluskit

A-5000-0001

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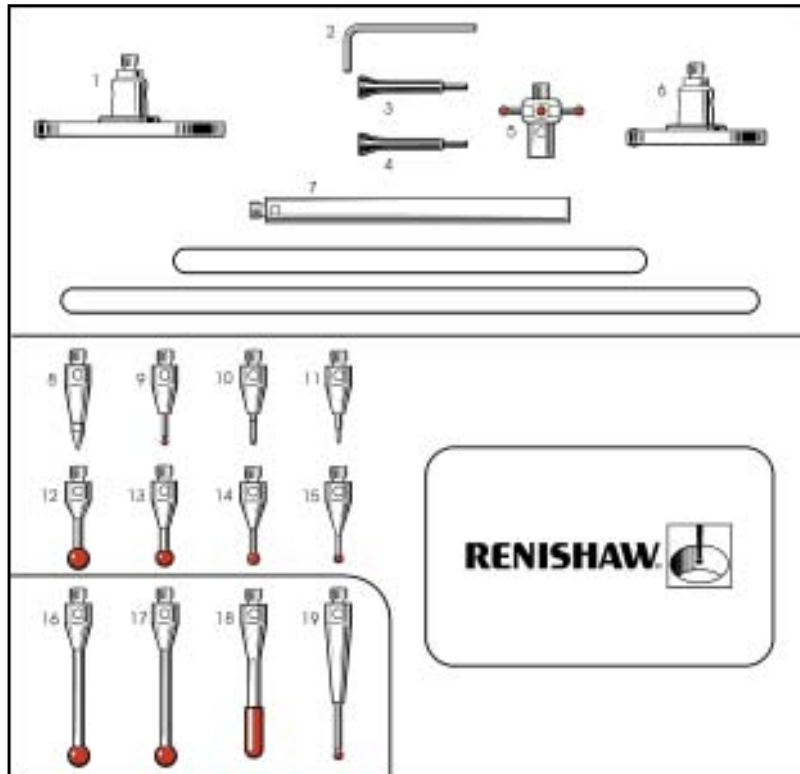


Position	Part number	Description
1	A-5000-3626	M2 STR D2 5BALL L19.2 S30
2	A-5000-7810	M2 DSC D25SLVS T1.5 L8.6 BR-Y2.5
3	A-5000-7629	M2 STR D2 5BALL L19.2 S18
4	A-5000-3627	M2 ACC CENTRE 5WAY
5	A-5000-7534	M2 ACC KNUCKLE OFFSET
6	A-5000-7809	M2 DSC D18SLVS T1.5 L8.6 BR-Y2.5
7	A-5000-7811	M2 STR D1 4BALL L7.5T S10
8	A-5000-3614	M2 HEM D18CE
9	M-5000-4164	M2-M3 EXT L7SS
10-11	M-5000-3540	M2-M3 STYLUS TOOL
12-15	M-5000-7634	M2 EXT L5 D3SS
16-17	M-5000-4162	M2 EXT L30 D3SS
18-19	M-5000-7779	M2 EXT L40 D3SS
20	P-TL01-0150	S3 HEX WRENCH 1.5 MM A/F
21	A-5000-3611	M2 DSC D6R T1.2 L10 BR-Y2
22	A-5000-7813	M2 PNT D1.4TC 30DEG L10
23-24	A-5000-7806	M2 STY D1R L10 EWL4.5 D0.7SS
25	A-5000-7802	M2 STY D1.5R L10 EWL4.5 D0.7SS
26-28	A-5000-7807	M2 STY D2R L10 EWL6 D1SS
29	A-5000-7803	M2 STY D2.5R L10 EWL6 D1SS
30	A-5000-3604	M2 STY D3R L10 EWL7.5 D1.5SS
31-32	A-5000-7805	M2 STY D0.5R L10 EWL3 D0.4TC
33	A-5000-7801	M2 STY D0.7R L10 EWL4 D0.5TC
34	A-5000-7800	M2 STY D0.3R L10 EWL2 D0.2TC
35	A-5000-4158	M2 STY D8R L11 EWL11 D2.5SS
36-37	A-5000-4156	M2 STY D6R L10 EWL10 D2.5SS
38-39	A-5000-4155	M2 STY D5R L10 EWL10 D2.5SS
40-42	A-5000-4154	M2 STY D4R L10 EWL10 D1.5SS
43-46	A-5000-3604	M2 STY D3R L10 EWL7.5 D1.5SS
47-48	M-5000-3648	M2 EXT L20 D3SS
49	A-5000-7808	M2 STY D1R L20 EWL7 D0.7TC
50-54	A-5000-3603	M2 STY D2R L20 EWL14 D1.4SS
55-56	A-5000-7804	M2 STY D2.5R L20 EWL16.5 D1.4SS
57-58	A-5000-4160	M2 STY D3R L20 EWL17.5 D1.5SS
59-60	M-5000-3647	M2 EXT L10 D3SS
61	M-5000-4152	M2 CYL D1.5SLVS L11 EWL1.5
62	M-5000-3647	M2 EXT L10 D3SS
63	M-5000-4153	M2 CYL D3SLVS L13 EWL3.8
64	A-5000-4160	M2 STY D3R L20 EWL17.5 D1.5SS
65-67	A-5000-4161	M2 STY D4R L20 EWL20 D1.5SS
68	M-5000-4150	M2 PNT D3SLVS 30DEG L15
69	A-5000-7812	M2 SPH D2R L20 EWL7.2 SS

**M2 stylus enhancement kit**

A-5000-0002

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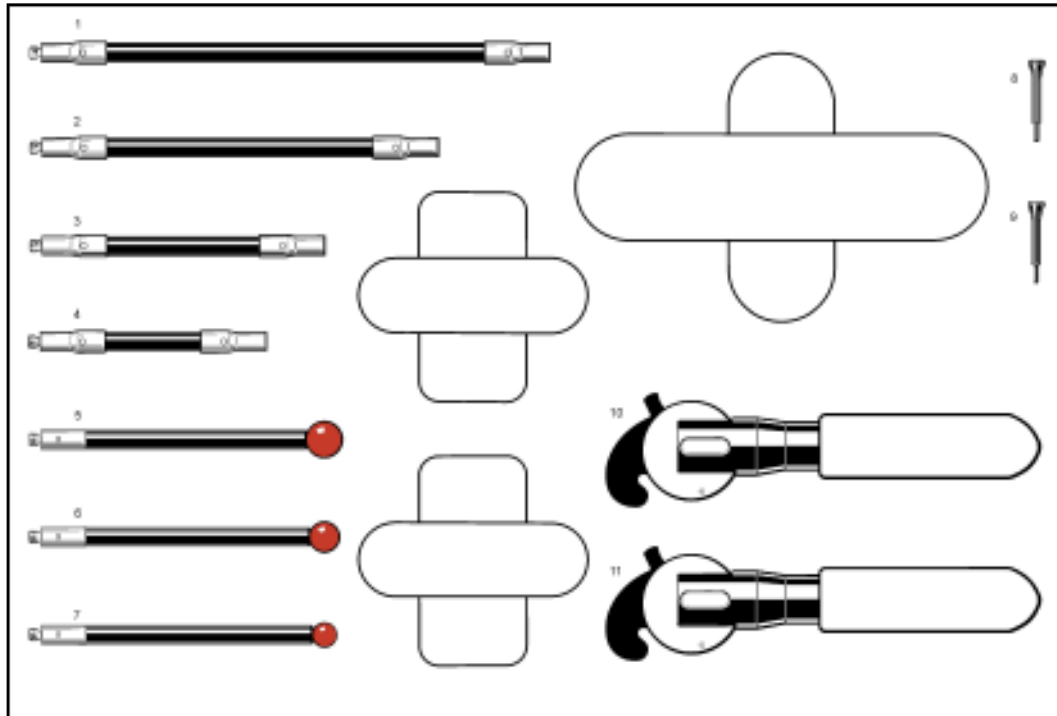


Position	Part number	Description
1	A-5000-7810	M2 DSC D25SLVS T1.5 L8.6 BR-Y2.5
2	P-TL01-0150	S3 HEX WRENCH 1.5 MM A/F
3-4	M-5000-3540	M2-M3 STYLUS TOOL
5	A-5000-7811	M2 STR D1 4BALL L7.5T S10
6	A-5000-7809	M2 DSC D18SLVS T1.5 L8.6 BR-Y2.5
7	M-5000-7779	M2 EXT L40 d3SS
8	A-5000-7813	M2 PNT D1.4TC 30deg L10
9	A-5000-7801	M2 STY D0.7R L10 EWL4 d0.5TC
10	A-5000-7805	M2 STY D0.5R L10 EWL3 d0.4TC
11	A-5000-7800	M2 STY D0.3R L10 EWL2 d0.2TC
12	A-5000-7803	M2 STY D2.5R L10 EWL6 d1SS
13	A-5000-7807	M2 STY D2R L10 EWL6 d1SS
14	A-5000-7802	M2 STY D1.5R L10 EWL4.5 d0.7SS
15	A-5000-7806	M2 STY D1R L10 EWL4.5 d0.7SS
16-17	A-5000-7804	M2 STY D2.5R L20 EWL16.5 d1.4SS
18	A-5000-7812	M2 SPH D2R L20 EWL7.2 SS
19	A-5000-7808	M2 STY D1R L20 EWL7 d0.7TC

**M2 high performance kit**

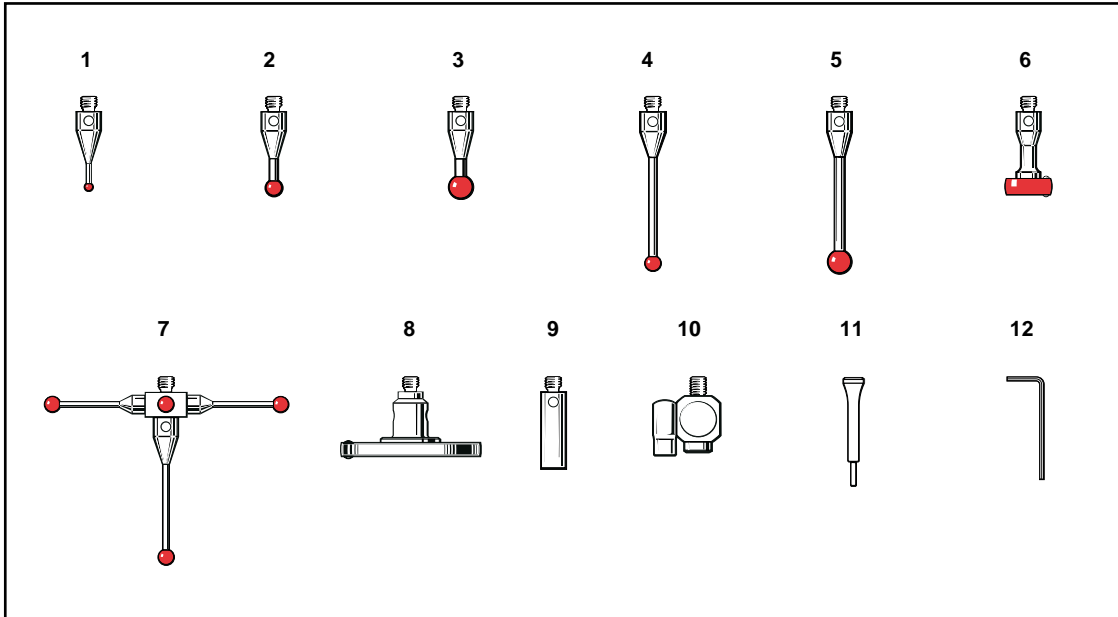
A-5003-2310

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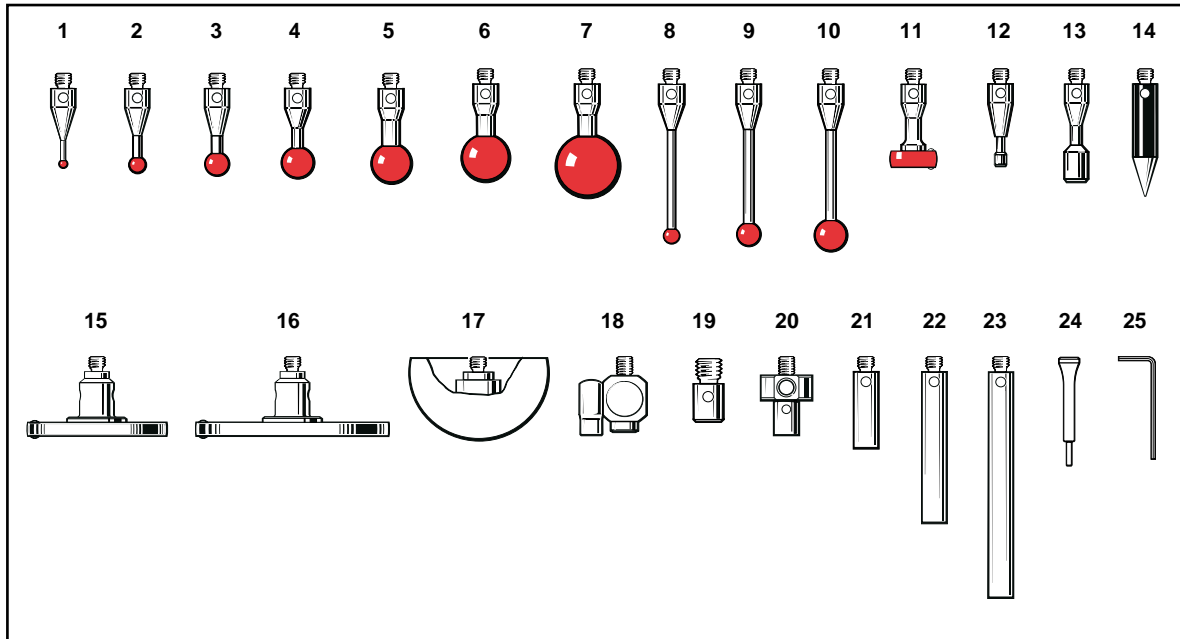
Position	Part number	Description
1	A-5003-2283	M2 EXT L90 d3CF
2	A-5003-2282	M2 EXT L70 d3CF
3	A-5003-2281	M2 EXT L50 d3CF
4	A-5003-2280	M2 EXT L40 d3CF
5	A-5003-2287	M2 STY D6R L50 EWL50 d3CF
6	A-5003-2286	M2 STY D5R L50 EWL50 d3CF
7	A-5003-2285	M2 STY D4R L50 EWL50 d3CF
8-9	M-5000-3540	M2-M3 STYLUS TOOL
10-11	A-5003-2300	M2 STYLUS TOOL CF RANGE

**Styluskit 201 for M2 probes**



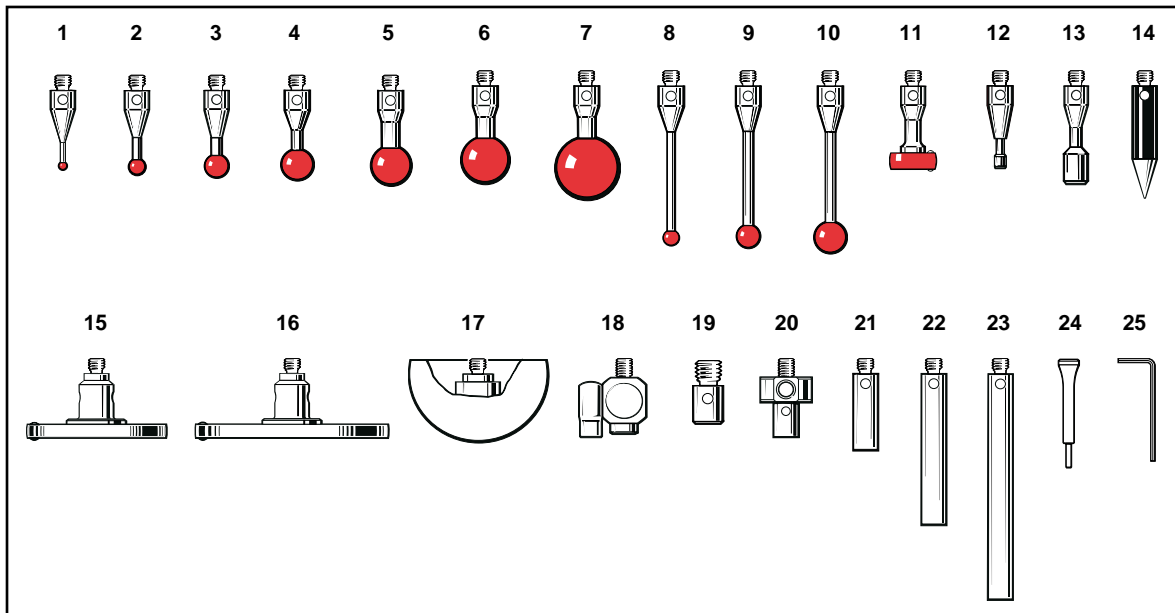
Position	Part number	Quantity	Description
1	A-5000-7806	1	M2 STY D1R L10 EWL4.5 d0.7SS
2	A-5000-7807	1	M2 STY D2R L10 EWL6 d1SS
3	A-5000-3604	1	M2 STY D3R L10 EWL7.5 d1.5SS
4	A-5000-3603	1	M2 STY D2R L20 EWL14 d1.4SS
5	A-5000-4160	1	M2 STY D3R L20 EWL17.5 d1.5SS
6	A-5000-3611	1	M2 DSC D6R T1.2 L10 BR-Y2
7	A-5000-3626	1	M2 STR D2 5BALL L19.2 S30
8	A-5000-7809	1	M2 DSC D18SLVS T1.5 L8.6 BR-Y2.5
9	M-5000-3647	2	M2 EXT L10 d3SS
10	A-5000-7534	1	M2 ACC KNUCKLE OFFSET
11	M-5000-3540	2	M2-M3 STYLUS TOOL
12	P-TL01-0150	1	S3 HEX WRENCH 1.5 MM A/F
13	M-5000-3541	1	S8 TP2 SPANNER (not pictured)
14	A-1015-7658	1	TP2 & STYLI BOX (not pictured)

**Styluskit 204 for M2 probes**



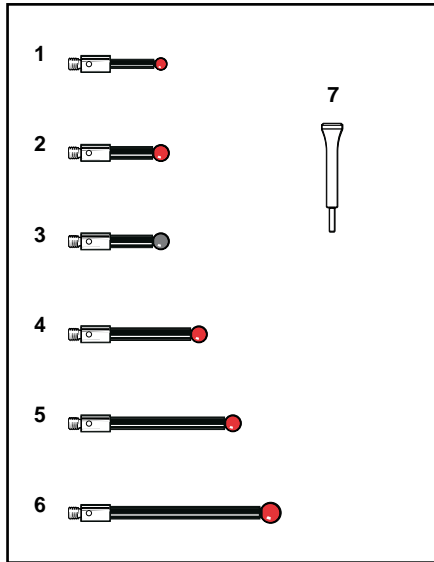
Position	Part number	Quantity	Description
1	A-5000-7806	1	M2 STY D1R L10 EWL4.5 d0.7SS
2	A-5000-7807	1	M2 STY D2R L10 EWL6 d1SS
3	A-5000-3604	1	M2 STY D3R L10 EWL7.5 d1.5SS
4	A-5000-4154	1	M2 STY D4R L10 EWL10 d1.5SS
5	A-5000-4155	1	M2 STY D5R L10 EWL10 d2.5SS
6	A-5000-4156	1	M2 STY D6R L10 EWL10 d2.5SS
7	A-5000-4158	1	M2 STY D8R L11 EWL11 d2.5SS
8	A-5000-3603	1	M2 STY D2R L20 EWL14 d1.4SS
9	A-5000-4160	1	M2 STY D3R L20 EWL17.5 d1.5SS
10	A-5000-4161	1	M2 STY D4R L20 EWL20 d1.5SS
11	A-5000-3611	1	M2 DSC D6R T1.2 L10 BR-Y2
12	M-5000-4152	1	M2 CYL D1.5SLVS L11 EWL1.5
13	M-5000-4153	1	M2 CYL D3SLVS L13 EWL3.8
14	M-5000-4150	1	M2 PNT D3SLVS 30deg L15
15	A-5000-7809	1	M2 DSC D18SLVS T1.5 L8.6 BR-Y2.5
16	A-5000-7810	1	M2 DSC D25SLVS T1.5 L8.6 BR-Y2.5
17	A-5000-3614	1	M2 HEM D18CE
18	A-5000-7534	1	M2 ACC KNUCKLE OFFSET
19	M-5000-4163	1	M3-M2 EXT L5SS
20	A-5000-3627	1	M2 ACC CENTRE 5WAY
21	M-5000-3647	2	M2 EXT L10 d3SS
22	M-5000-3648	2	M2 EXT L20 d3SS
23	M-5000-4162	2	M2 EXT L30 d3SS
24	M-5000-3540	2	M2-M3 STYLUS TOOL
25	P-TL01-0150	1	S3 HEX WRENCH 1.5 MM A/F
26	M-5000-3541	1	S8 TP2 SPANNER (not pictured)
27	A-1015-7749	1	COMP BOX ASSEMBLY (not pictured)

**Styluskit 206 for M2 probes**



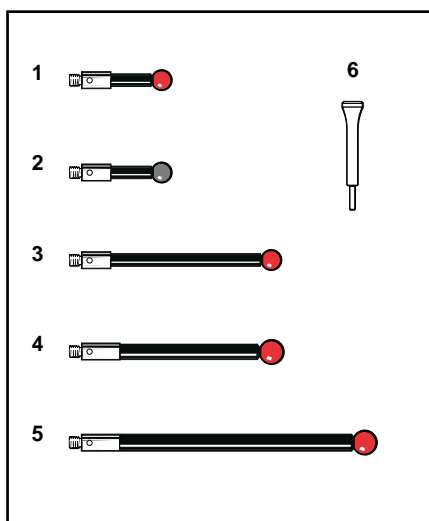
Position	Part number	Quantity	Description
1	A-5000-7806	5	M2 STY D1R L10 EWL4.5 d0.7SS
2	A-5000-7807	3	M2 STY D2R L10 EWL6 d1SS
3	A-5000-3604	5	M2 STY D3R L10 EWL7.5 d1.5SS
4	A-5000-4154	3	M2 STY D4R L10 EWL10 d1.5SS
5	A-5000-4155	2	M2 STY D5R L10 EWL10 d2.5SS
6	A-5000-4156	2	M2 STY D6R L10 EWL10 d2.5SS
7	A-5000-4158	1	M2 STY D8R L11 EWL11 d2.5SS
8	A-5000-3603	5	M2 STY D2R L20 EWL14 d1.4SS
9	A-5000-4160	3	M2 STY D3R L20 EWL17.5 d1.5SS
10	A-5000-4161	3	M2 STY D4R L20 EWL20 d1.5SS
11	A-5000-3611	1	M2 DSC D6R T1.2 L10 BR-Y2
12	M-5000-4152	1	M2 CYL D1.5SLVS L11 EWL1.5
13	M-5000-4153	1	M2 CYL D3SLVS L13 EWL3.8
14	M-5000-4150	1	M2 PNT D3SLVS 30deg L15
15	A-5000-7809	1	M2 DSC D18SLVS T1.5 L8.6 BR-Y2.5
16	A-5000-7810	1	M2 DSC D25SLVS T1.5 L8.6 BR-Y2.5
17	A-5000-3614	1	M2 HEM D18CE
18	A-5000-7534	1	M2 ACC KNUCKLE OFFSET
19	M-5000-4163	1	M3-M2 EXT L5SS
20	A-5000-3627	3	M2 ACC CENTRE 5WAY
21	M-5000-3647	3	M2 EXT L10 d3SS
22	M-5000-3648	2	M2 EXT L20 d3SS
23	M-5000-4162	2	M2 EXT L30 d3SS
24	M-5000-3540	2	M2-M3 STYLUS TOOL
25	P-TL01-0150	1	S3 HEX WRENCH 1.5 MM A/F
26	M-5000-3541	1	S8 TP2 SPANNER (not pictured)
27	A-1015-7749	1	COMP BOX ASSEMBLY (not pictured)

**A-5003-6151 M3 styluskit for SP25M/SM25-1/SH25-1**



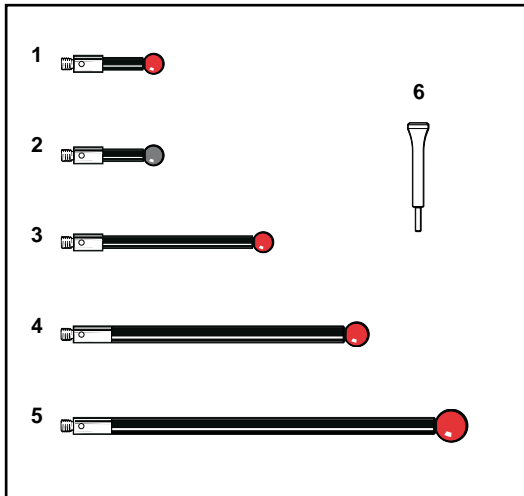
Position	Part number	Description
1	A-5003-5970	M3 STY D3R L21 EWL13.5 d2CF
2	A-5003-5971	M3 STY D4R L21 EWL13.5 d3CF
3	A-5003-5977	M3 STY D4SIN L21 EWL13.5 d3CF
4	A-5003-5972	M3 STY D4R L31 EWL23.5 d3CF
5	A-5003-5973	M3 STY D4R L40 EWL32.5 d3CF
6	A-5003-5974	M3 STY D5R L50 EWL42.5 d3CF
7	M-5000-3540	M2-M3 STYLUS TOOL

**A-5003-6152 M3 stylus kit for SP25M/SM25-2/SH25-2**



Position	Part number	Description
1	A-5003-5975	M3 STY D5R L21 EWL13.5 d3CF
2	A-5003-5978	M3 STY D5SIN L21 EWL13.5 d3CF
3	A-5003-5974	M3 STY D5F L50 EWL42.5 d3CF
4	A-5003-5976	M3 STY D6R L50 EWL50 d4CF
5	A-5003-4860	M3 STY D6R L75 EWL75 d4CF
6	M-5000-3540	M2-M3 STYLUS TOOL

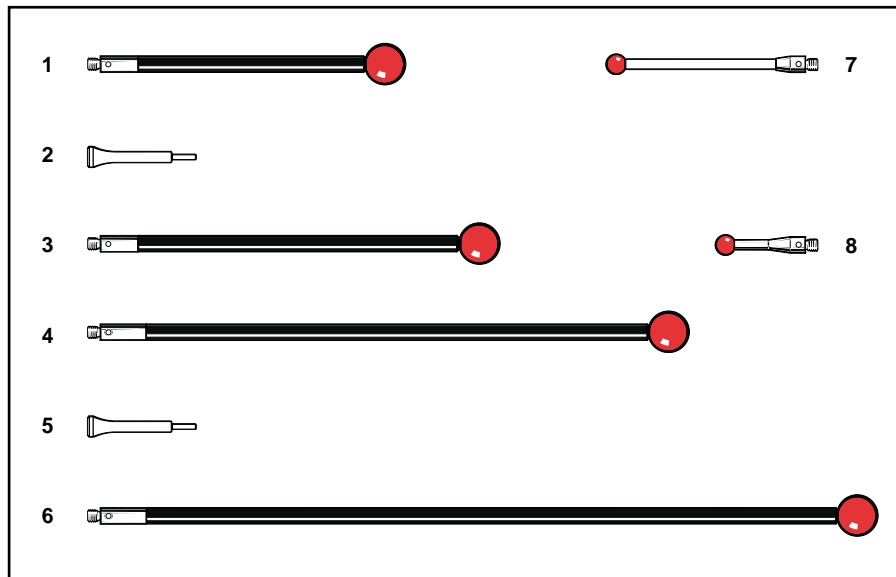
**A-5003-6153 M3 stylus kit for SP25M/SM25-3/SH25-3**



Position	Part number	Description
1	A-5003-5975	M3 STY D5R L21 EWL13.5 d3C/F
2	A-5003-5978	M3 STY D5SIN L21 EWL13.5 d3C/F
3	A-5003-5974	M3 STY D5R L50 EWL42.5 d3C/F
4	A-5003-4860	M3 STY D6R L75 EWL75 d4C/F
5	A-5003-4863	M3 STY D8R L100 EWL100 d4C/F
6	M-5000-3540	M2-M3 STYLUS TOOL

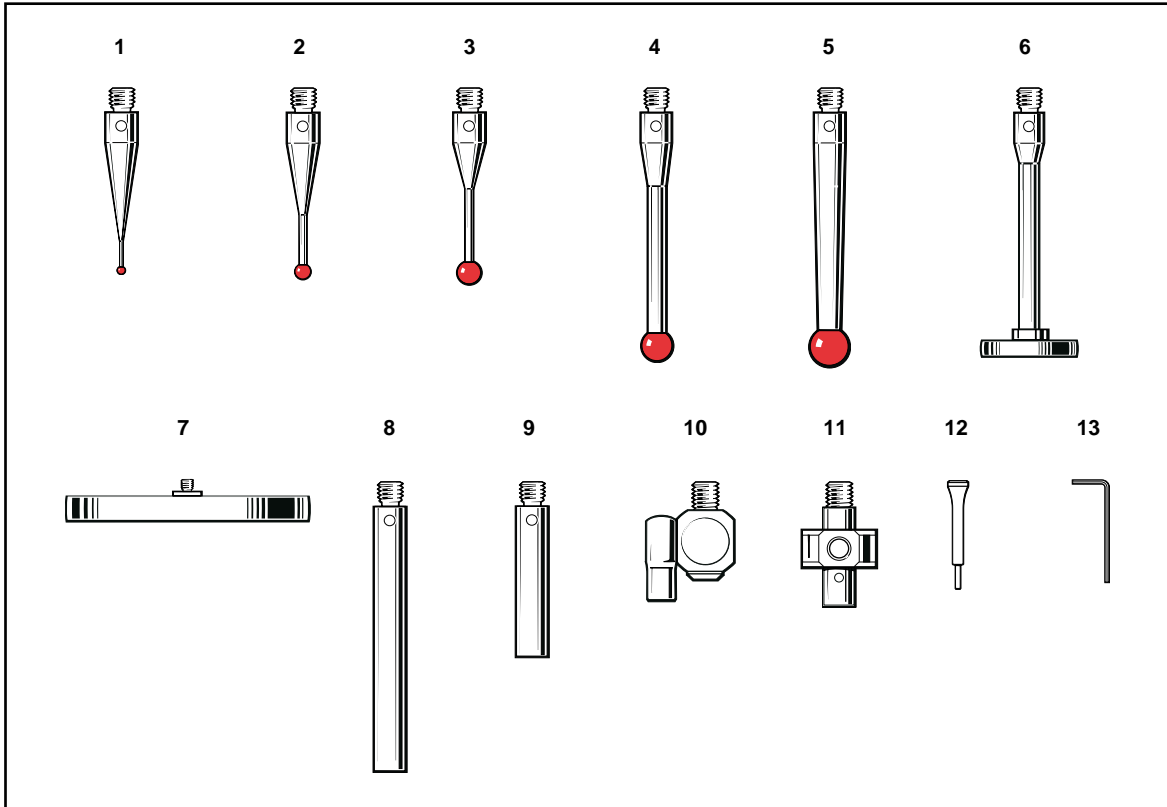


**A-5003-8124 M3 styluskit for SP25M/SM25-4/SH25-4**



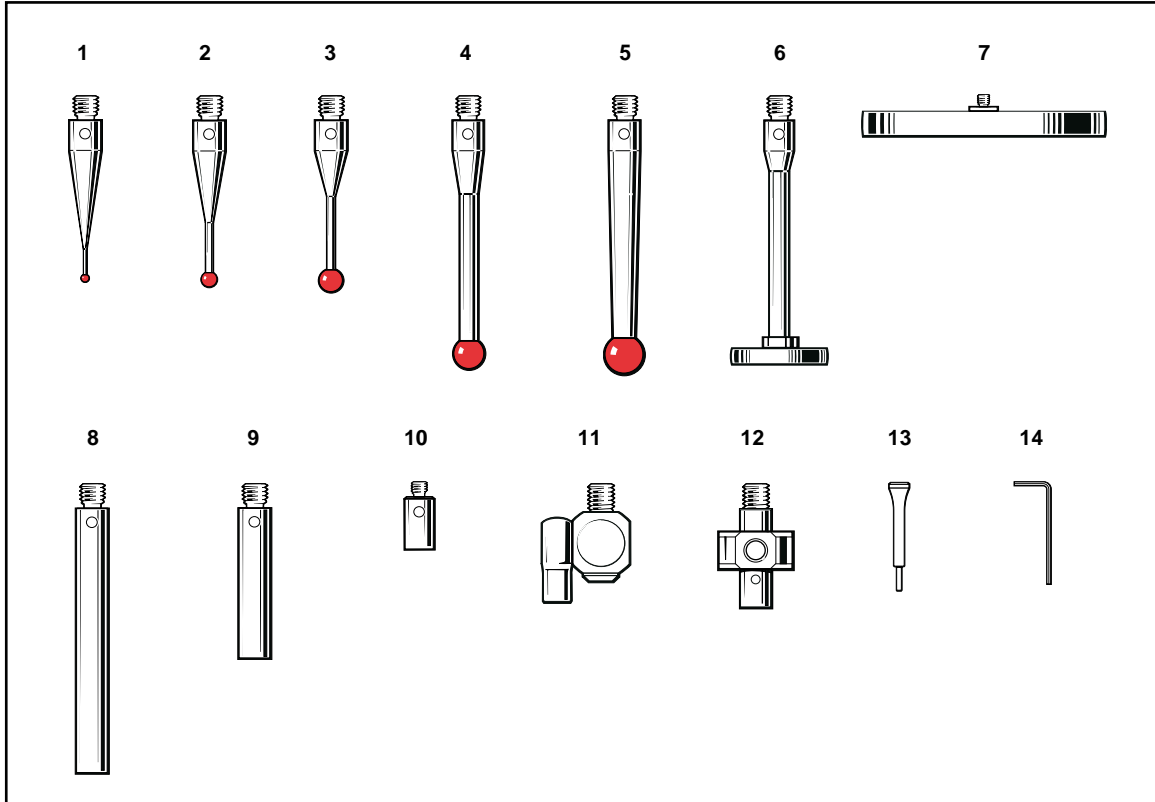
Position	Part number	Description
1	A-5003-7057	M3 STY D10R L25 EWL75 d4C/F
2	M-5000-3540	M2-M3 STYLUS TOOL
3	A-5003-7056	M3 STY D10R L100 EWL100 d4C/F
4	A-5003-7055	M3 STY D10R L150 EWL150 d4C/F
5	M-5000-3540	M2-M3 STYLUS TOOL
6	A-5003-7054	M3 STY D10R L200 EWL200 d4C/F
7	A-5003-0069	M3 STY D5R L50 EWL50 d2.5CER
8	A-5000-7630	M3 STY D5R L21 EWL21 d2.5SS

**Styluskit 101 for M3 probes**



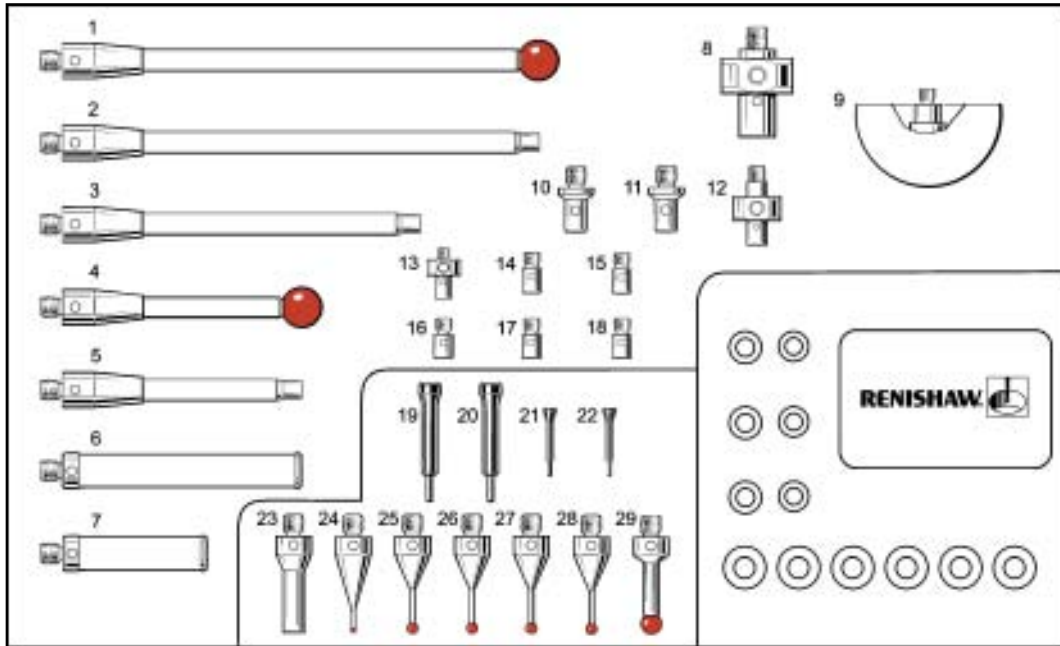
Position	Part number	Quantity	Description
1	A-5000-3551	1	M3 STY D1R L21 EWL4 d0.6SS
2	A-5000-3552	1	M3 STY D2R L21 EWL8 d1.4SS
3	A-5000-3553	1	M3 STY D3R L21 EWL12 d1.5SS
4	A-5000-3554	5	M3 STY D4R L31 EWL27 d2.5SS
5	A-5000-7648	1	M3 STY D5R L31 EWL31 d3.5SS
6	A-5000-3615	1	M3 DSC D12.7SLVS T2 L30.8 BR-N
7	A-5000-7669	1	M3 DSC D63.5CS T6 L4 BR-N
8	M-5000-3593	1	M3 EXT L35 d4SS
9	M-5000-3592	1	M3 EXT L20 d4SS
10	A-5000-7616	1	M3 ACC KNUCKLE OFFSET
11	A-5000-7610	1	M3 ACC CENTRE 5WAY
12	M-5000-3540	2	M2-M3 STYLUS TOOL
13	P-TL01-0150	1	S3 HEX WRENCH 1.5 MM A/F
14	A-1041-7569	1	SA7 ADAPTOR (not pictured)
15	M-5000-3571	2	STYLUS SHANK ADAPTOR (not pictured)
16	A-1015-7650	1	TP1 STYLI BOX (not pictured)

**Styluskit 102 for M3 probes**



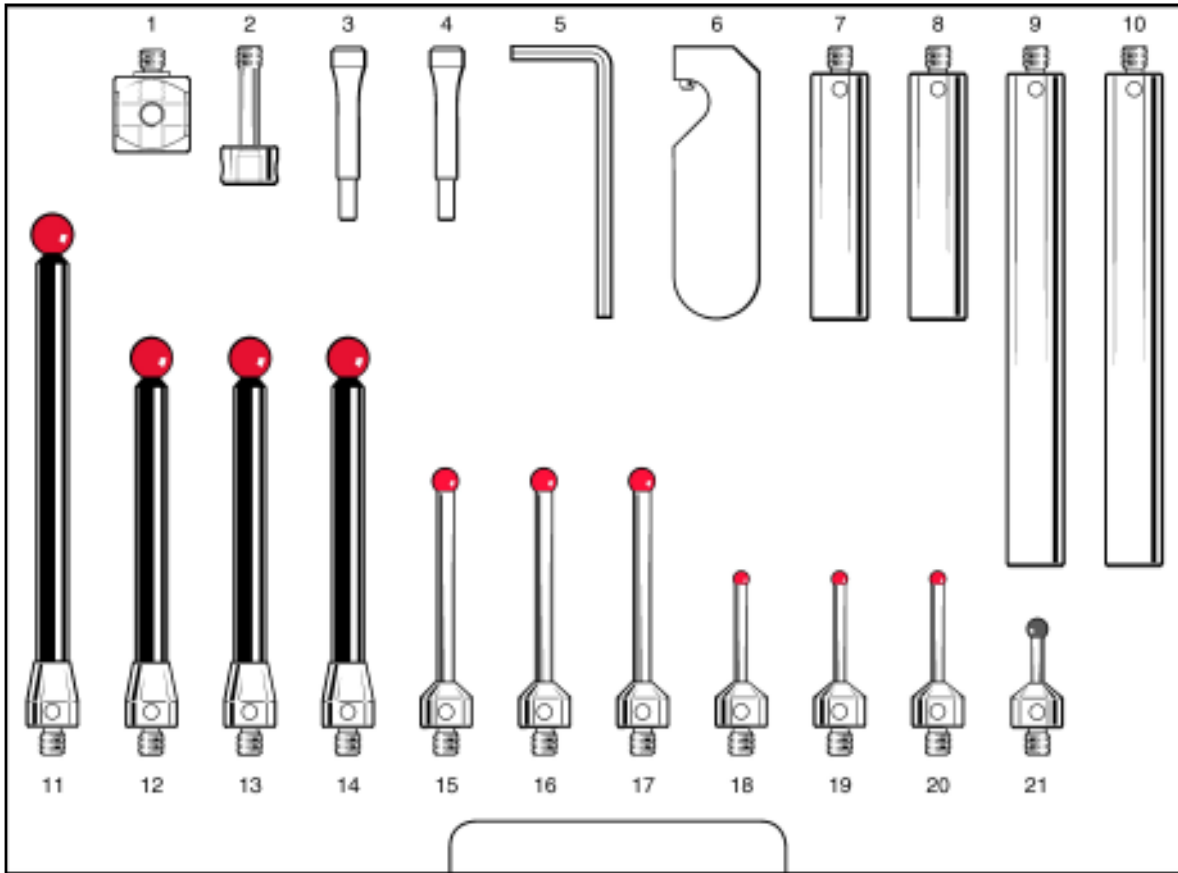
Position	Part number	Quantity	Description
1	A-5000-3551	3	M3 STY D1R L21 EWL4 d0.6SS
2	A-5000-3552	5	M3 STY D2R L21 EWL8 d1.4SS
3	A-5000-3553	3	M3 STY D3R L21 EWL12 d1.5SS
4	A-5000-3554	7	M3 STY D4R L31 EWL27 d2.5SS
5	A-5000-7648	1	M3 STY D5R L31 EWL31 d3.5SS
6	A-5000-3615	1	M3 DSC D12.7SLVS T2 L30.8 BR-N
7	A-5000-7669	1	M3 DSC D63.5CS T6 L4 BR-N
8	M-5000-3593	2	M3 EXT L35 d4SS
9	M-5000-3592	2	M3 EXT L20 d4SS
10	M-5000-4164	1	M2-M3 EXT L7SS
11	A-5000-7616	1	M3 ACC KNUCKLE OFFSET
12	A-5000-7610	2	M3 ACC CENTRE 5WAY
13	M-5000-3540	2	M2-M3 STYLUS TOOL
14	P-TL01-0150	1	S3 HEX WRENCH 1.5 MM A/F
15	A-1041-7569	1	SA7 ADAPTOR (not pictured)
16	M-5000-3571	2	STYLUS SHANK ADAPTOR (not pictured)
17	A-1015-7650	1	TP1 STYLUS BOX (not pictured)

**A-5000-7829 M4 styluskit (TP7M use)**



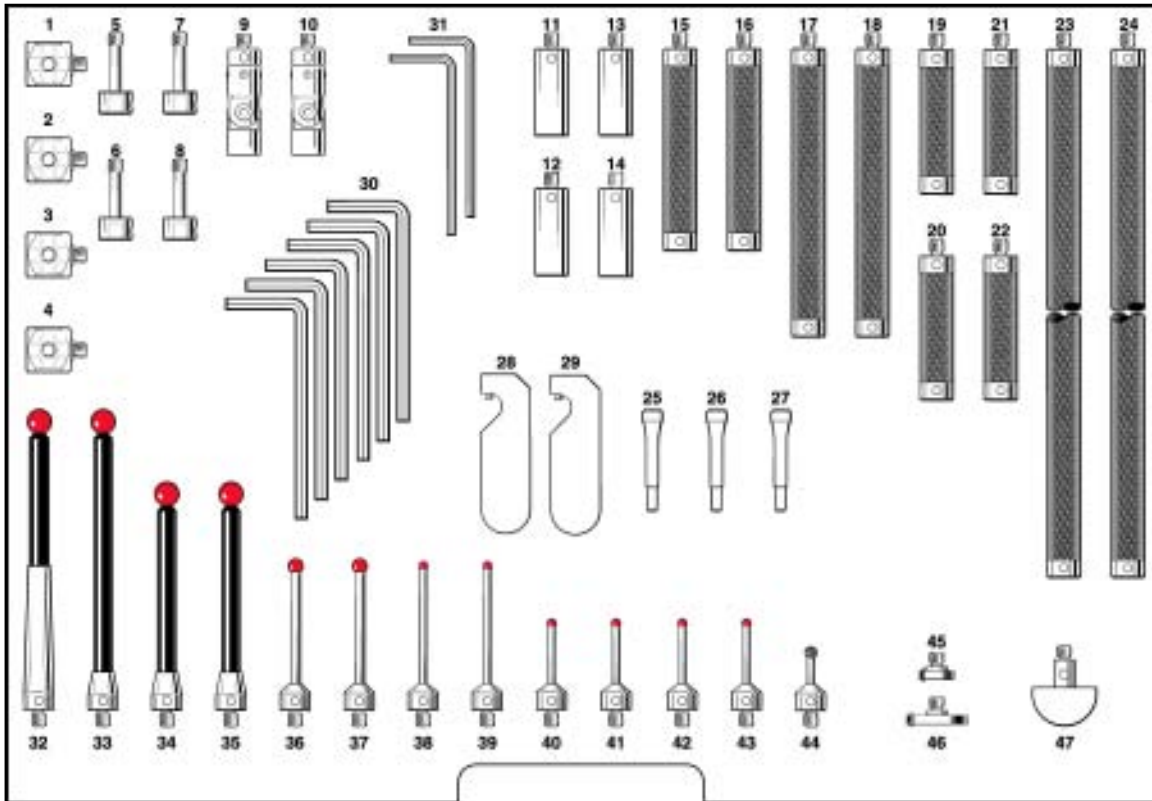
Position	Part number	Description
1	A-5000-7796	M4 STY D8R L100 EWL100 d4.5CE
2	A-5000-7753	M4-M3 EXT L100CE
3	A-5000-7752	M4-M3 EXT L75CE
4	A-5000-7795	M4 STY D8R L50 EWL50 d4.5CE
5	A-5000-7751	M4-M3 EXT L50C
6	A-5000-7755	M4 EXT L50 d7.4CE
7	A-5000-7754	M4 EXT L30 d7.4CE
8	A-5000-7792	M4 ACC CENTRE 5WAY
9	A-5000-7814	M3 HEM D30CE
10-11	M-5000-6714	M4-M3 EXT L9SS
12	A-5000-7610	M3 ACC CENTRE 5WAY
13	A-5000-3627	M2 ACC CENTRE 5WAY
14-18	M-5000-4163	M3-M2 EXT L5SS
19-20	M-5000-3707	M4 STYLUS TOOL
21-22	M-5000-3540	M2-M3 STYLUS TOOL
23	M-5000-6625	M4-M3 EXT L20SS
24	A-5000-7545	M4 STY D1R L19.5 EWL4 d0.7SS
25-28	A-5000-7547	M4 STY D2R L19 EWL8 d1.4SS
29	A-5000-7551	M4 STY D4R L18 EWL13 d3SS

A-5003-5911 M5 styluskit - standard



Position	Part number	Description
1	A-5555-0189	M5 ACC 15X15 CUBE
2	A-5003-5677	M5 ACC CUBE BOLT L28
3-4	M-5000-9304	M5 STYLUS TOOL
5	P-TL01-0250	S3 HEX WRENCH 2.5 MM A/F
6	A-5003-6134	M5 ACC D11 EXTENSION TOOL
7-8	A-5555-0670	M5 EXT L50 d11SS
9-10	A-5555-0136	M5 EXT L100 d11SS
11	A-5003-5262	M5 STY D8R L100 EWL87 d6CF
12-14	A-5003-5251	M5 STY D8R L75 EWL62 d6CF
15-17	A-5003-5236	M5 STY D5R L50 EWL41 d3TC
18-20	A-5003-5218	M5 STY D3R L30 EWL21 d2TC
21	A-5003-5733	M5 STY D4SN L20 EWL11 d2TC

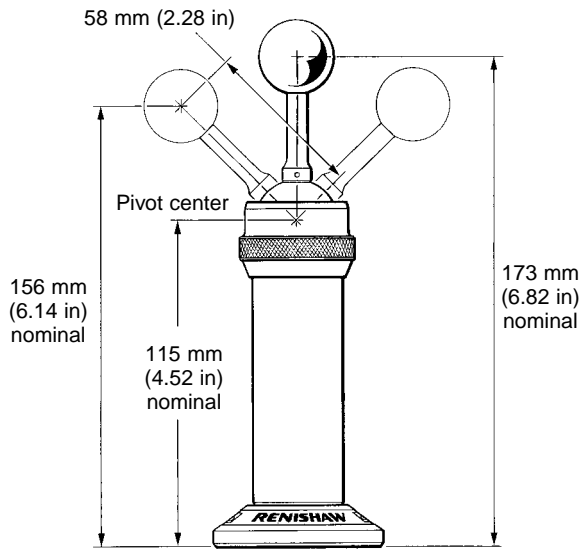
**A-5003-5909 M5 styluskit - comprehensive**



Position	Part number	Description
1-4	A-5555-0189	M5 ACC 15X15 CUBE
5-8	A-5003-5677	M5 ACC CUBE BOLT L28
9-10	A-5003-5278	M5 ACC KNUCKLE d11 ROTARY
11-14	A-5555-0669	M5 EXT L30 d11SS
15-16	A-5555-0623	M5 EXT L70 d11CF
17-18	A-5555-0652	M5 EXT L100 d11CF
19-22	A-5555-0648	M5 EXT L50 d11CF
23-24	A-5555-0654	M5 EXT L200 d11CF
25-27	M-5000-9304	M5 STYLUS TOOL
28-29	A-5003-6134	M5 ACC D11 EXTENSION TOOL
30	P-TL01-0250	S3 HEX WRENCH 2.5 MM A/F
31	P-TL01-0150	S3 HEX WRENCH 1.5 MM A/F
32	A-5003-5261	M5 STY D8R L100 EWL50 d6CF
33	A-5003-5262	M5 STY D8R L100 EWL87 d6CF
34-35	A-5003-5251	M5 STY D8R L75 EWL62 d6CF
36-37	A-5003-5236	M5 STY D5R L50 EWL41 d3TC
38-39	A-5003-5234	M5 STY D3R L50 EWL41 d2TC
40-43	A-5003-5218	M5 STY D3R L30 EWL21 d2TC
44	A-5003-5733	M5 STY D4SN L20 EWL11 d2TC
45	A-5003-5288	M5 DSC D12SLVS T3 L3 BR-Y5
46	A-5003-5289	M5 DSC D21SLVS T3 L3 BR-Y5
47	A-5003-5276	M5 HEM D22CE d7SS

### Datum balls

Datum spheres are made from hard-wearing tungsten carbide and come supplied with individual certificates stating ball diameter and roundness. All sphere measurements are performed on equipment traceable to UK (NPL) standards. Grade 3 sphericity balls are used.



Datum sphere kit	Part number
Ø12 mm datum ball	A-1034-0028
Ø19 mm datum ball	A-1034-0027
Ø25 mm datum ball	A-1034-0026
Ø¾ in datum ball	A-1034-0031
Ø1 in datum ball	A-1034-0035

**Fixingstud** – a fixingstud is required with each kit to attach the pillar to the table surface

Thread size	Part number
M6 x 1	M-1034-0016
M8 x 1.25	M-1034-0015
M10 x 1.5	M-1034-0014
5/16 - 18 x UNC	M-1034-0018
3/8 - 16 x UNC	M-1034-0017

#### Optional extras

Datum ball	Part number
Ø12 mm	A-1034-0005
Ø19 mm	A-1034-0023
Ø25 mm	A-1034-0002
Ø¾ in	A-1034-0032
Ø1 in	A-1034-0036

Adaptors/extension	Part number
2 way adaptor	M-1034-0042
3 way adaptor	M-1034-0052
Pillar extension 75 mm (2.96 in) long	M-1034-0019

### Gram gage

The gram gage allows the optimum trigger force to be set to maximize probe performance on all standard Renishaw touch trigger probes.

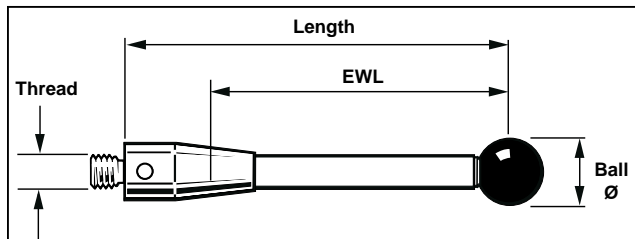
**Part number:** P-GA01-0001



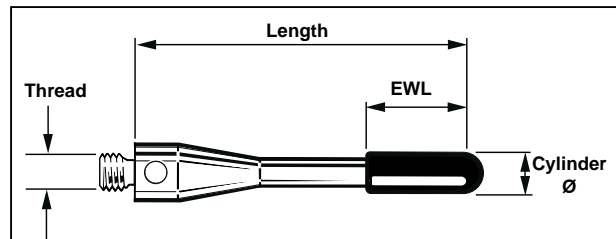
Overall length	95 mm
Needle length	41 mm
Depth	27 mm
Width	43 mm
Range	4 gram to 35 gram range with 1 gram graduations

# Customstylusfax back form

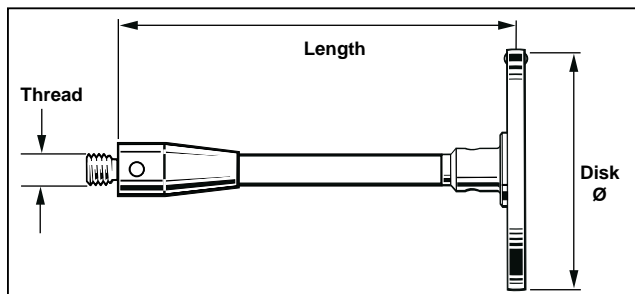
Please fill in your stylus requirements in the space provided and fax back to us. Our design team will carry out a feasibility study and present you with a solution to your application problem.



Thread size	Length	EWL	Ball diameter	Ball material	Stem material	Quantity required



Thread size	Length	EWL	Cylinder diameter	Cylinder material	Quantity required



Thread size	Length	Disk diameter	Disk thickness	Disk material	Disk roller Y or N?	Quantity required

**Notes**

Probe head: \_\_\_\_\_ Probing orientation: \_\_\_\_\_

Application (what are you measuring?) \_\_\_\_\_

\_\_\_\_\_

Company name: \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Telephone: \_\_\_\_\_

Contact name: \_\_\_\_\_ Fax: \_\_\_\_\_

Department: \_\_\_\_\_ Email: \_\_\_\_\_



# Repair services



## Renishaw repair services

### Services offered

#### Repair

Your product is repaired to factory performance specifications, and carries a 3-month warranty.

#### Repair By Exchange (RBE)

Your product is replaced by a refurbished or as new product, shipped to you once we have received your failed product.

RBEs carry a 6-month warranty.

#### Advance RBE

Your product is replaced by a refurbished or as new product, shipped to you on the same day that you report a fault. Advance RBEs carry a 6-month warranty.

#### Replace new

Your product is replaced by a new product, carrying a new factory warranty.

#### Please note:

The services offered on each product vary – please consult the detailed list that follows.

On Advance RBE, in order to get you a replacement product as soon as possible, it is necessary to charge a small additional premium on top of the price of the product to cover additional administration.

Available repair services for Specials are quoted per job.

All the following prices are for guidance only. When units are received with excessive wear and tear, or obsolete product is returned for repair, Renishaw reserves the right to quote a different service/replacement charge.

### Advance replacements

Advance replacement is a Renishaw premium service aimed at minimizing your downtime. This service is only available on products where a Repair By Exchange (RBE) service is offered. Through this service we ship an RBE in advance of receipt of your inoperative product.

Please note:

- 1) A charge applies to each advance replacement.
- 2) Your inoperative product must be returned to Renishaw within 14 working days of receipt of the advance replacement.
- 3) Failure to do so will result in an issuance of a non-return invoice in the amount of the difference between the RBE price and the new list price.
- 4) Return of your inoperative product after the issuance of the non-return invoice will not result in a credit of the non-return invoice, and your inoperative product will be returned to you.
- 5) Advance replacements sent out under a warranty claim will not be credited if the returned product is damaged, or no fault is found with the returned product.
- 6) Returns of advance replacements will be accepted if:
  - a) they are returned unused, and in the original packaging within ten working days of invoice date, and
  - b) the return has been pre-approved by Renishaw through the issuance of a Return Goods Authorization (RGA) number, and
  - c) the return passes Renishaw inspection, and

## About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

### Products include:

- Additive manufacturing, vacuum casting, and injection molding technologies for design, prototyping, and production applications
- Advanced material technologies with a variety of applications in multiple fields
- Dental CAD/CAM scanning and milling systems and supply of dental structures
- Encoder systems for high-accuracy linear, angle and rotary position feedback
- Fixturing for CMMs and gaging systems
- Gaging systems for comparative measurement of machined parts
- High-speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs (co-ordinate measuring machines)
- Styli for CMM and machine tool probe applications

