

REVO-2 and RSP2 probes

The REVO-2 dynamic measuring system is designed to maximise measurement throughput whilst maintaining high system accuracy

REVO-2 is the only scanning system for CMMs that simultaneously controls the motion of three machine and two head axes whilst collecting work piece data using its range of 2D and 3D tactile probes, surface roughness measurement probe and now non-contact vision probe too.

The head's design incorporates sophisticated laser measurement and electrical signal transmission technology for precise work piece measurement at extremely high rates of data capture. The 5-axis control system removes unwanted dynamic errors associated with machine movement because the measuring head performs most of the work. As the head is much lighter and more dynamic than the CMM, it is able to quickly follow changes in the part geometry without introducing large dynamic errors.



RSP2 probe for REVO

RSP2 is a probe capable of 2D-scanning (x, y) and 3D touch-trigger measurement (x, y, z). A number of different length RSH stylus holders with a minimum reach of 175 mm* and a maximum reach of 500 mm*, can be fitted to the probe's universal body.

The RSP2 utilises Renishaw's tip-sensing technology, specifically designed for high speed scanning with low scanning forces and minimal stylus wear.

To ensure optimal metrology performance, the type of stylus used with RSP2 is managed by the UCCserver software.

* The number behind RSH represents length from head centre of rotation to stylus ball centre when carrying a 10 mm stylus.

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Россия +7(495)268-04-70

Казахстан +7(7172)727-132

Киргизия +996(312)96-26-47

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

RSP2 and RSH# changing system

The RCP TC-2 (thermally controlled REVO change port) is used for changing RSP2, whereas the RCP2 (REVO change port) is configured to change RSP2 stylus holders (RSH175, RSH250, RSH350, RSH450 and RSH500).

Specification

Scan speed	Up to 500 mm / sec (19.68 in / sec)
Data collection rate	Up to 4000 points / sec (RSP2 and RSP3)
Operating temperature	+10 °C to +40 °C (+50 °F to +104 °F)
Storage temperature	-25 °C to +70 °C (-13 °F to +158 °F)
Weight (excluding probe and cables)	2.1 kg (4 lb 10 oz)
Height (overall)	176.5 mm (6.95 in) (Quill to probe mount, including 4 mm mounting plate)
B-axis dimensions	92 mm × 93 mm (3.62 in × 3.66 in)
A-axis swept diameter	116 mm (4.65 in)
Movement speed	3 revs/sec
A-axis rotation	-5° to +120° (for measurement with RSP2 and RVP) -100° to +120° (used for calibration and measurement with RSP3 and SFP1)
B-axis rotation	Continuous
Angular resolution	0.02 arc sec (0.01 µm / 100 mm)
Bearings	Air - consumption rate up to 50 l / min (5 bar to 8.5 bar) (Refer to user's guide for detail)
Change rack system	RCP TC-2 for probe changing / RCP2 for stylus changing VPCP and VMCP for vision system
Mounting	Quill mounting in the vertical orientation only (adaptor may be required)

REVO-2 probe comparison chart

	RSP2	RSP3-1 to -4	RSP3-6	SFP1	RVP
Tip sensing	Yes	No	No	Yes	n/a
Non-contact	No	No	No	No	Yes
Head scanning	Yes	No	No	No	No
Cranked styli	No	Yes	Max. 50 mm	n/a	n/a
Sensing axes	XY scan XYZ touch	XYZ scan XYZ touch	XY scan XYZ touch	n/a	2D sensor array
Automatic probe changing	Yes	Yes	Yes	Yes	Yes
Automatic stylus / module changing	Yes	Yes	Yes	Yes	Yes

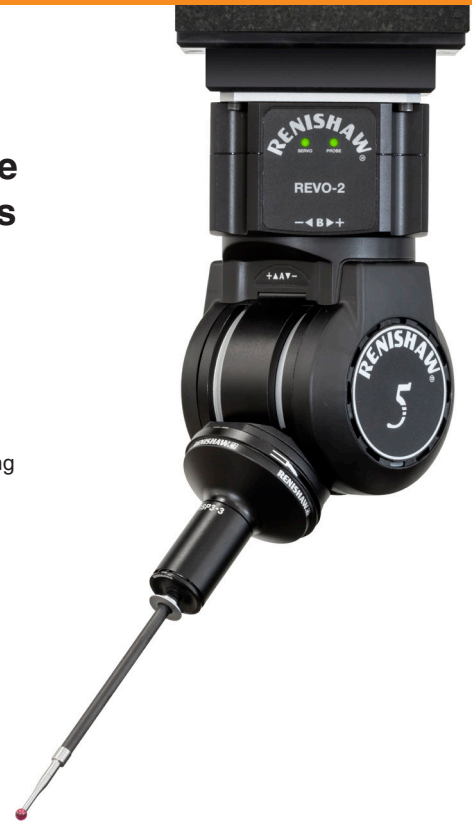
RSP3-1 to RSP3-4 probes

REVO 3-D scanning probes

The RSP3 range of probes gives REVO-2 the ability to carry cranked stylus arrangements while maintaining optimum metrology performance.

The probes can be used for both 3-D scanning (X, Y, Z) and touch-trigger applications. They enable accurate scanning measurement with effective stylus lengths ranging from 20 mm to 394 mm.

The RSP3 range is used for 3-axis scanning with fixed REVO-2 head angles during measurement. Each probe is designed to provide optimised accuracy and contact force over a specified stylus range. Consequently, the RSH3 stylus holders are intended for use only with their respective RSP3 probe.



Key benefits

Workpiece access

REVO's infinite positioning and crank stylus carrying capabilities provide better part access. Each RSP3 probe has been optimised for maximum performance over their specific stylus range and crank carrying capabilities.

High accuracy 3-D scanning

RSP3 probes can be used with both straight and cranked styli for high accuracy 3-D scanning.

Part of the REVO 5-axis multisensor system

RSP3 probes are automatically interchangeable with all other probes available for REVO-2, including surface finish analysis and non-contact inspection probes. As a result, the system provides the optimum tool to measure multiple features all on one CMM platform.

Specification

Probe attributes	Scanning with 3-axis measurement (X, Y, Z) and 3-axis touch-trigger	
Measurement range	±0.5 mm deflection in all directions in all orientations	
Overtravel range	X, Y	2 mm
	+Z	1.7 mm
	-Z	1.2 mm
Resolution	Capable of <0.1 µm	
Spring rate	Nominally 0.6 N/mm - when using shortest specified stylus Nominally 0.2 N/mm - when using longest specified stylus	
Weight	RSP3-1	86 g (3.03 oz) (excluding stylus holder and stylus)
	RSP3-2	90 g (3.17 oz) (excluding stylus holder and stylus)
	RSP3-3	94 g (3.32 oz) (excluding stylus holder and stylus)
	RSP3-4	101 g (3.56 oz) (excluding stylus holder and stylus)
Effective stylus length range Always observe the specified stylus range for the scanning module being used. Stylus holders incorporate M3 thread.	RSP3-1 + RSH3-1	EWL 20 mm - 50 mm (0.79 in - 1.97 in) using 20 mm - 50 mm stylus
	RSP3-2 + RSH3-2	EWL 44 mm - 99 mm (1.73 in - 3.90 in) using 20 mm - 75 mm stylus
	RSP3-3 + RSH3-3	EWL 114 mm - 194 mm (4.49 in - 7.64 in) using 20 mm - 100 mm stylus
	RSP3-4 + RSH3-4	EWL 214 mm - 394 mm (7.64 in - 15.51 in) using 20 mm - 200 mm stylus
Mounting	Magnetised kinematic coupling	
Crash protection	±X, ±Y, Z	Via break out of probe or stylus holder
	+Z	Via integral bump-stop design
Change rack options	RCP TC-2	Thermally controlled change port used for RSP3 probe changing (only). This port mounts to the MRS or MRS2.
	FCR25 with FCR25 front spacer kit	Triple port unit which mounts on MRS. Used for changing RSH3-1/2/3/4 stylus holders.

RSP3-6 extended reach probe

Enhanced access and inspection capability with RSP3-6

The RSP3-6 provides enhanced capability for accessing deep bores and inspecting features within large parts. It is available with a range of stylus holders for applications requiring straight and cranked extensions and can be used for both touch-trigger and 2D scanning applications.

The other RSP3 probes within the range (RSP3-1, -2, -3, -4) can be used for 3-axis scanning with fixed REVO head angles during measurement, providing the REVO system with 3D-scanning (X, Y, Z) with crank stylus capabilities. It also allows different lengths of styli to be used whilst maintaining optimum metrology performance.

Key benefits

Reach

Available with straight extensions up to 800 mm from REVO's A-axis centre of rotation, and cranked extensions up to 600 mm from REVO's A-axis centre of rotation.

Accuracy

Scanning accuracy: Typically better than 10 µm form error (filtered) and 5 µm diameter error.

Touch-trigger accuracy: Typically better than 3 µm form and diameter error.

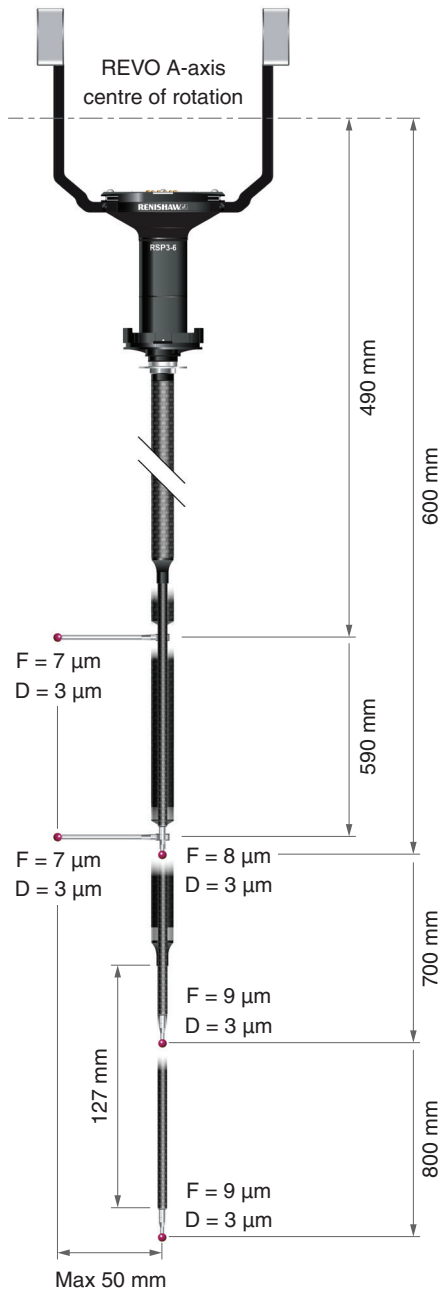
Part of the REVO 5-axis multi-sensor system

Long extensions combined with 5-axis movements for better part access, and multi-sensor changing for increased flexibility.



Scanning of a ring gauge

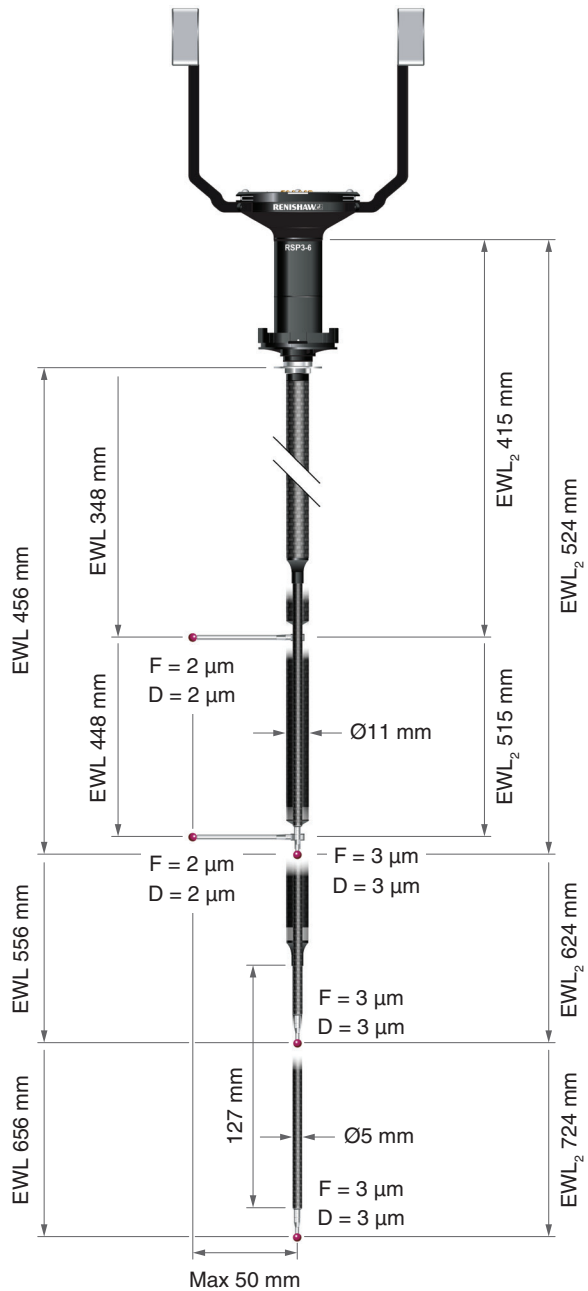
Form error (F) and diameter error (D)



Touch-trigger probing of a ring gauge

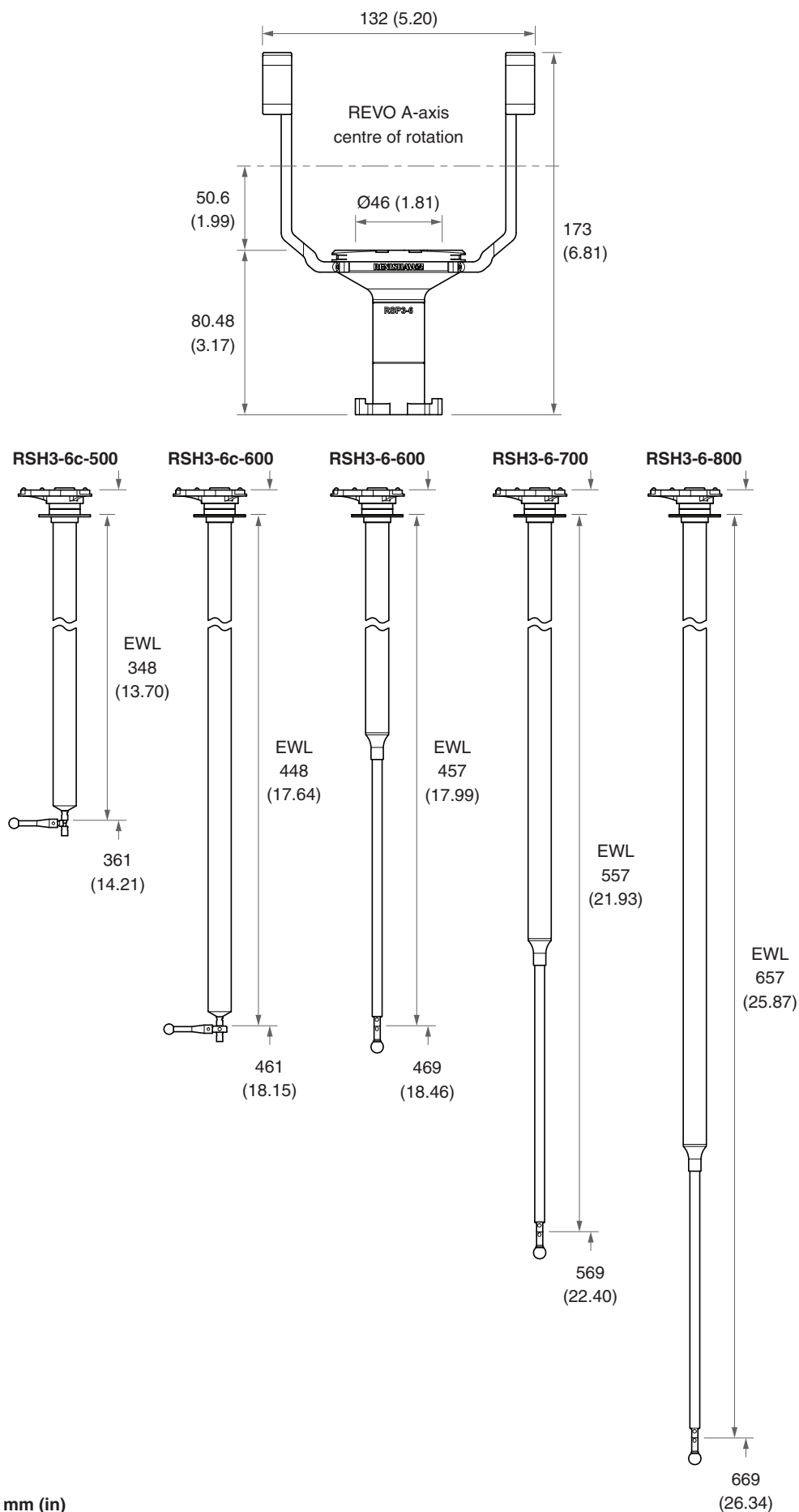
Form error (F) and diameter error (D)

EWL = effective working length



Test setup criteria

Stylus used	Renishaw's M2 stylus range
CMM specification	U3 = 3.1 μ m + L / 250
CMM controller	UCC S5
Data filter used	Harmonic simple cut off order = 60 UPR (undulation values)
Artefacts used	Ø45 mm (nom) calibration sphere (for the calibration) Ø50 mm (nom) ring gauge (for the ring gauge tests)
Scanning speed	5 mm/s (for the ring gauge scan tests)
Touch speed	2 mm/s (for the ring gauge touch tests)
Back off speed	2 mm/s
Bi-directional scans	Bi-directional scan data is quoted to demonstrate the performance of the Renishaw probe calibration method



Dimension in mm (in)

Specification

Probe attributes	2-axis scanning (X,Y) and 3-axis touch-trigger (X,Y,Z)	
Measurement range	±0.5 mm deflection in all directions in all orientations	
Overtravel range	X, Y:	±2 mm
	+Z:	1.7 mm
	-Z:	1.2 mm
Resolution	Capable of <0.1 µm	
Weight	300 g (10.58 oz) (excluding stylus holder and stylus)	
Mounting	Magnetised kinematic coupling	
Crash protection	±X, ±Y, -Z	Via break out of probe or stylus holder
	+Z	Via integral bump-stop design
Change rack options	RCP TC-3	For probe changing only This single port unit mounts to the MRS or MRS2
	RCP2	For stylus holder changing only This single port unit mounts to the MRS or MRS2
Interface options	UCC S5	

Effective stylus length range

RSP3-6 + RSH3-6c-500	EWL 348 mm (13.70 in)	EWL2 415 mm (16.34 in)	Using M2 star centre
RSP3-6 + RSH3-6c-600	EWL 448 mm (17.64 in)	EWL2 515 mm (20.28 in)	
RSP3-6 + RSH3-6-600	EWL 456 mm (17.95 in)	EWL2 524 mm (20.63 in)	Using 10 mm stylus
RSP3-6 + RSH3-6-700	EWL 556 mm (21.89 in)	EWL2 624 mm (24.57 in)	
RSP3-6 + RSH3-6-800	EWL 656 mm (25.83 in)	EWL2 724 mm (28.50 in)	

Maximum permissible stylus length vs mass

RSP3-6 + RSH3-6c-500	50 mm (8 g)*
RSP3-6 + RSH3-6c-600	50 mm (4.6 g)*
RSP3-6 + RSH3-6-600	10 mm (3.42 g)
RSP3-6 + RSH3-6-700	10 mm (3.42 g)
RSP3-6 + RSH3-6-800	10 mm (3.42 g)

* Includes weight of stylus centre

RVP vision probe for REVO-2

The REVO vision probe (RVP) provides non-contact vision measurement on an infinitely positioning, 5-axis platform.

Now, tactile scanning measurement, surface finish analysis and non-contact inspection can all be performed on one CMM.

The RVP system is a breakthrough in technology in the world of non-contact CMM inspection. The combination of non-contact vision measurement and a 5-axis, infinitely positioning platform makes the RVP system truly unique.

RVP further expands the range of applications for the REVO-2 system with a non-contact edge detecting sensor automatically interchangeable with all other REVO probe options. As a result, the system provides the optimum tool to measure multiple features, and a wider variety of parts can be inspected.

System components

The RVP system comprises a vision probe body, a number of vision modules, an angle change mirror, rack ports and a calibration artefact. The image capture and processing components of the system are held inside the vision probe body and include an industry standard, robust, CMOS sensor for reliable image capture.

The vision modules allow a range of features with different sizes and shapes to be inspected. The ACM accessory provides enhanced access allowing vision inspection of bore surfaces and other features previously inaccessible to RVP. All vision modules contain integral LED lighting to achieve a sharp contrast between holes and part material. Background feature enhancement is also available using backlighting combined with bespoke part fixturing.

Benefits

Added part inspection capability

Small features and delicate or flexible parts that cannot be measured using tactile probes can now be inspected on a 5-axis non-contact measurement platform.

Added value multi-sensor system

A machine equipped with REVO-2 can be used for a large range of inspection applications including scanning measurement, surface finish analysis and now, non-contact inspection.

High speed data collection

5-axis motion between part features and real time image processing dramatically increase data collection rates.



Innovations

5-axis movement, infinite positioning

RVP benefits from REVO's infinite positioning and 5-axis movement, which ensure accurate and unrestricted placement in front of features at any angle.

Automatically interchangeable sensors

The RVP non-contact probe is automatically interchangeable with all other probe options available for REVO-2, and data from multiple sensors is automatically referenced to a common datum.

3D feature reconstruction

5-axis motion and infinite positioning provide access to the data required for 3D feature reconstruction.

System specification

Probe specification	RVP
Weight	551g
Dimensions	158 mm x 131 mm x 134 mm
Rack port compatibility	VPCP (heated)
Sensor type	1/1.8" CMOS sensor
Head compatibility	REVO-2
Operating temperature	+10 °C to +40 °C
Software compatibility	UCCsuite 5.0 onwards MODUS 1.7 onwards
Integration	I++ DME protocol

Module type	Feature size error (circle diameter) ¹		
	Ø25 mm	Ø10 mm	Ø2 mm
VM10	3 µm	2 µm	2 µm
VM11-2	n/a ²	1 µm	1 µm
VM12	n/a ²	n/a ²	TBC

¹ Feature size diameter error measured using calibrated glass artefact (uncertainty ±0.5 µm) with backlighting.

² Circle diameter not applicable to lens specification.

Tests completed using REVO-2 with RVP and VM10 and VM11-2 modules.

Test machine specification: MPE(E150) 3 µm + L / 333 mm MPE(PFTU) 1.6 µm



Module specification	VM10	VM11-2	VM12
Weight	153 g	134 g	138 g
Dimensions	86 mm x 39 mm	74 mm x 67 mm	144 mm x 67 mm
Rack port compatibility	VMCP (heated)	VMCP (heated)	VMCP (heated)
Measurement range	1 mm diameter or greater	0.4 mm diameter or greater	0.05 mm diameter or greater
Field of view	50 mm x 40 mm	12.5 mm x 10 mm	3.1 mm x 2.5 mm
Stand-off	80 mm	120 mm	50 mm
Depth of field	5 mm	5 mm	0.2 mm
Resolution	40 µm	20 µm	2.5 µm
LED illumination	24 LEDs	10 LEDs	10 LEDs
Backlight compatibility	Yes	Yes	Yes
ACM compatible	No	Yes	No

RFP1 fringe probe

Highly accurate structured light measurement probe for REVO-2

The REVO® fringe probe (RFP1) is a non-contact structured light sensor for the REVO system offering highly accurate measurement of surface topology on an infinite positioning, 5-axis CMM platform.

RFP1 increases the multi-sensor capability of the REVO system, which now offers interchangeable tactile scanning, touch-trigger, surface finish, non-contact structured light and vision probes.

The RFP1 probe is designed for inspection of free-form surfaces and complex geometry, rapidly delivering patches of surface data with a high point density. The probe projects a fringe pattern onto the part surface, capturing variations in the fringe pattern with the camera to build a point cloud of 3D surface data.

Automatic exposure controls compensate for different surface materials, colours and textures, ensuring optimal data results without the need for matt coatings.

Unlike other non-contact structured light systems, the RFP1 fringe probe does not require reference markers to stitch together data from different patches – this is done automatically by the REVO system.

Two new software tools provide easy-to-use inspection planning and digitising. The RFP inspection planner is a tool for path planning and generating DMIS part programs from CAD, whilst the RFP digitiser collects data from parts without CAD models as part of a reverse engineering process.



Key benefits

Multi-sensor system with unrivalled feature access

RFP1 data is automatically stitched together in one co-ordinate frame with no need for reference markers, and combined with data from all other REVO-2 sensors maximises part inspection capability on one CMM.

Automatic exposure compensation

Ensures optimal data results with automatic compensation for different materials, surface colours and textures without the need for matt coatings.

Easy-to-use inspection planning and digitising software

RFP inspection planner generates DMIS part programs from CAD quickly and easily, whilst the RFP digitiser collects data from parts without CAD models as part of a reverse engineering process.

Specification

RFP1		
Field of view	50 mm x 50 mm	
Depth of field	20 mm	
Stand-off	160 mm	
Rotational capability	A-axis (from REVO-2)	+120° / -5°
	B-axis (from REVO-2)	Infinite positioning
XY point density (resolution)	65 µm	
Probe repeatability (plane)	4 µm (2σ)	
Probe accuracy (position error of a plane)	9 µm	
Measurement form error (plane)	15 µm RMS	
Equivalent scanning speed	50,000 pts/s	
Mounting	Magnetised coupling	
Sensor type	1/1.8" CMOS sensor	
Projector type	Fixed sinusoidal filtering grating	
Illumination	A wavelength of 450 nm blue LED	
Operating modes	3D surface point capture 2D vision measurement	
Probe head	REVO-2 only	
Rack port compatibility	VPCP	
Change rack	MRS2 recommended	
Software compatibility	UCCsuite 5.6 onwards MODUS 1.11 onwards	
Integration	I++ DME protocol	
Weight	530 g	
Operating temperature range	+10 °C to +40 °C	
Metrology specification range	20 °C ± 2 °C	
Storage temperature range	-25 °C to +70 °C	
Operating humidity	0% to 80% (non-condensing)	
Calibration artefact	FA10	
Output	Point cloud data file (.xyz)	

SFP2 surface finish probe

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 probe increases the surface finish measurement ability of the REVO® system, which offers multi-sensor capability providing touch-trigger, high speed tactile scanning and non-contact vision measurement on a single CMM.

Powered by 5-axis measurement technology, the SFP2's automated surface finish inspection offers significant time savings, reduced part handling and greater return on CMM investment.

The SFP2 system consists of a probe and a range of modules and is automatically interchangeable with all other probe options available for REVO, providing the flexibility to easily select the optimum tool to inspect a wide range of features, all on one CMM platform. Data from multiple sensors is automatically referenced to a common datum.

The surface finish system is managed by the same I++ DME compliant interface as the REVO system, and full user functionality is provided by Renishaw's MODUS metrology software.

Key benefits

Unrivalled feature access

SFP2 benefits from REVO's infinite positioning and 5-axis movement, and features an integral motorised C-axis. The SFM variants offer a range of tip arrangements which, combined with the knuckle joint between module and holder, provide access to the features most difficult to reach.

Operator independent data collection

CMM programs can now include automated and operator-independent surface finish measurement. All results, including surface finish data, are recorded and stored in a single location for easy retrieval.

Greater return on investment in CMMs

Integrated surface finish and dimensional inspection can remove the need for dedicated surface measurement equipment, reducing factory footprint, part handling and associated costs.



Specification

SFM-A1 and SFM-A2 modules		
Surface finish range	0.05 - 6.3 μm Ra	
Surface finish accuracy (of nominal Ra)	\pm (5% +15 nm)	
Surface forces (nominal)	Skid:	0.2 N
	Stylus tip:	0.003 N
Encoder resolution	1 nm	
Nominal stylus tip protrusion beyond skid	0.5 mm	
Measurement speed	Up to 1 mm/s	
SFM range of adjustment	\pm 90° at the knuckle joint	

SFP2 probe		
C-axis positioning accuracy	\pm 0.25°	
C-axis rotation speed	Up to 90°/sec	
Rotational capability	A-axis (from REVO-2):	+120° / -110°
	B-axis (from REVO-2):	Infinite positioning
	C-axis:	\pm 180°
Mounting (probe and holder)	Magnetised coupling	

System features		
Probe head	REVO-2 only	
Change rack	MRS2 recommended for full capability	
Software compatibility	UCCsuite 5.2 onwards MODUS 1.8 onwards	
Weight	SFP2 probe:	330 g
	SFH1 holder:	33 g
	SFM-A1 module:	12 g
	SFM-A2 module:	12 g
Operating temperature range	+10 °C to +40 °C	
Storage temperature range	-25 °C to +70 °C	
Operating humidity	0% to 80% (non-condensing)	
Calibration and verification artifacts	SFA1:	3.0 μm Ra sinusoid
	SFA2:	0.5 μm Ra sinusoid
	SFA3:	0.4 μm Ra sawtooth
	TFP:	Uses LF TP20 module; PICS interface to SPA3 amplifier
Outputs	MODUS basic:	Ra, Rms(Rq)
	MODUS standard surface texture:	Rt, R3z, Rz, Rz1max, RzDIN, RzJIS, Rseg Rp, Rv Rpm, Rvm, Rc, Rsm
	MODUS advanced surface texture:	Rk, Rpk, Rvk, Rmr, Rmr1, Rmr2, Rpq, Rvq, Rmq, Rvoid, Rvdd, Rvddl, Rcvx, Rcvxl
Sampling rate	4 kHz	

SFM-A1

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The A-series of modules is designed to deliver high performance with a good level of capability to access part features.

Typical applications

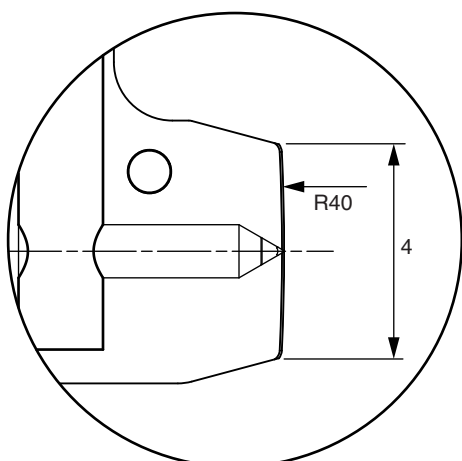
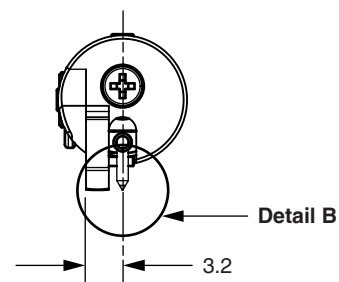
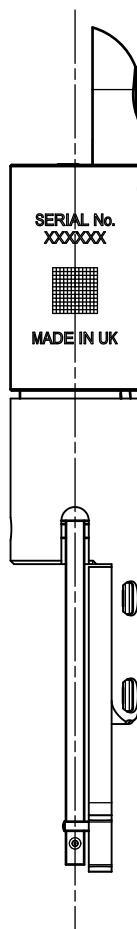
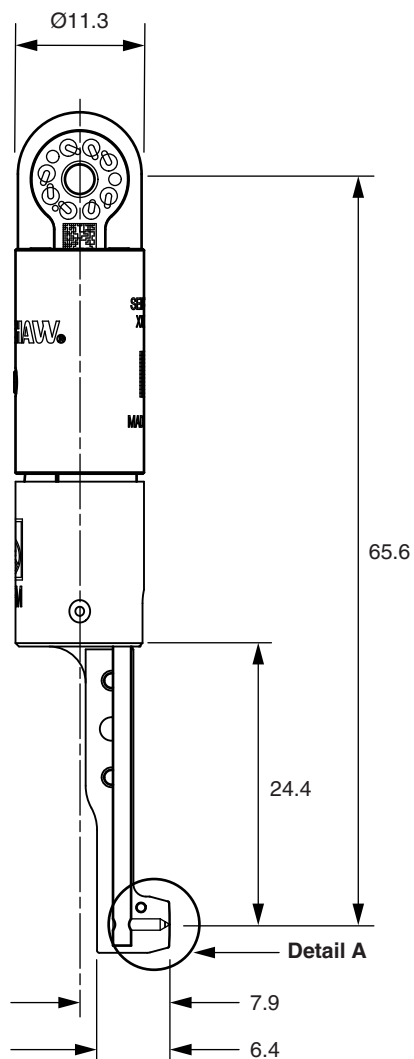
General purpose; engine block gasket face.

Specification

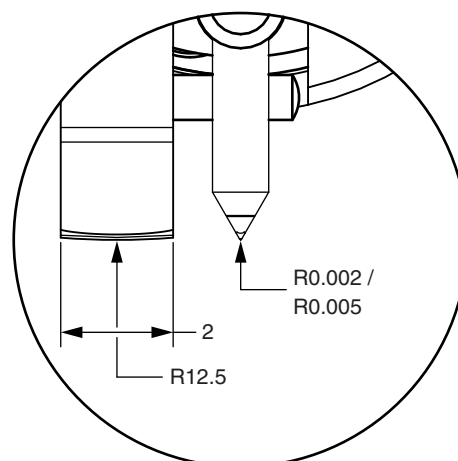
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(5% + 15 nm)
Skid / stylus arrangement		Side-by-side
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Skid length / radius (mm)		4 / 40
Skid width / radius (mm)		2 / 12.5
Skid contact force (N)		0.2
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1, SFH-2
Lateral scanning capability		Yes

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-A2

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The A-series of modules is designed to deliver high performance with a good level of capability to access part features. The cranked skid arm design of the A2 module provides additional clearance around part features.

Typical applications

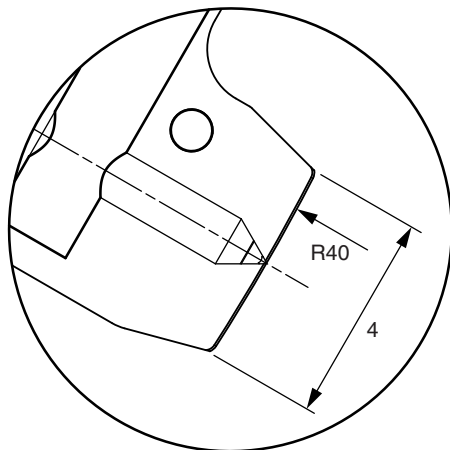
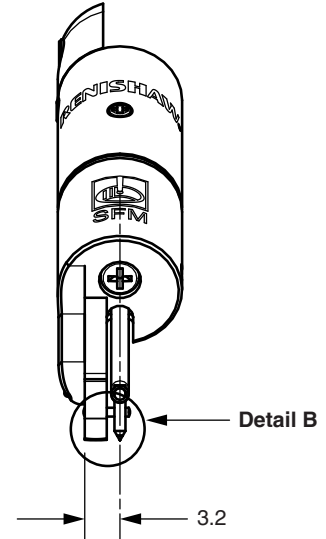
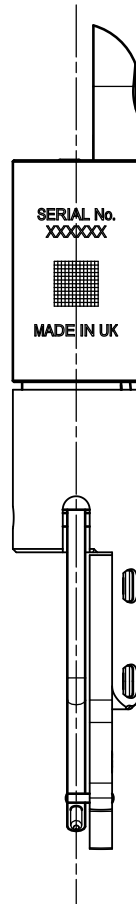
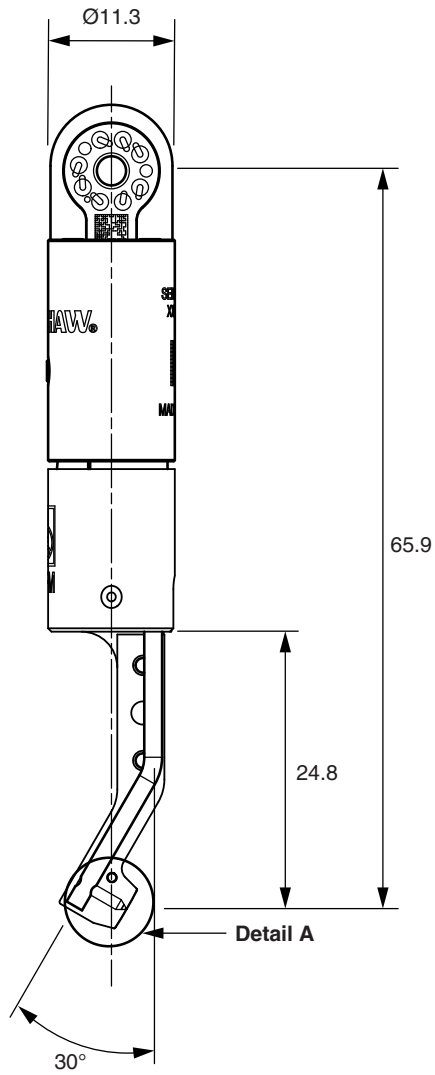
General purpose; engine block gasket face, lateral scanning of crank shaft bearing journals.

Specification

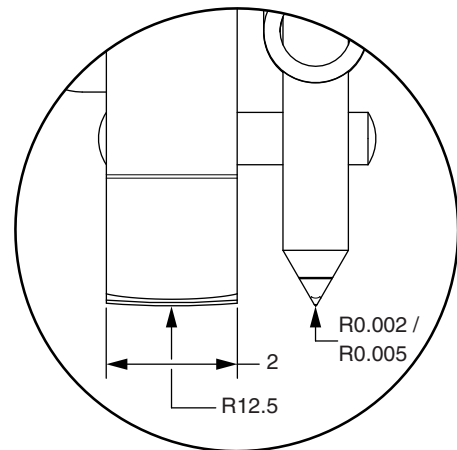
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(5% + 15 nm)
Skid / stylus arrangement		Side-by-side
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Skid length / radius (mm)		4 / 40
Skid width / radius (mm)		2 / 12.5
Skid contact force (N)		0.2
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1, SFH-2
Lateral scanning capability		Yes

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-B1

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The B-series of modules features a small skid which allows the stylus to be placed close to the edge of surfaces of interest. The range of skid-arm designs provides access into awkward to reach features and parts with surface form and curvature.

Typical applications

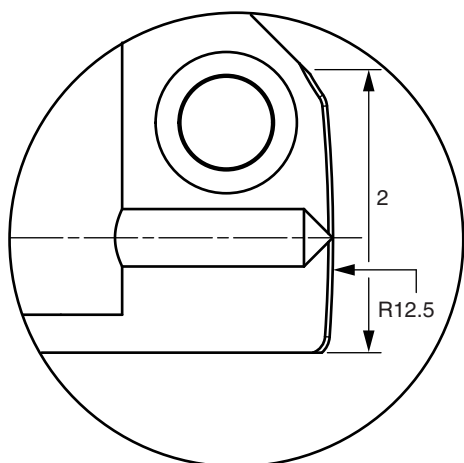
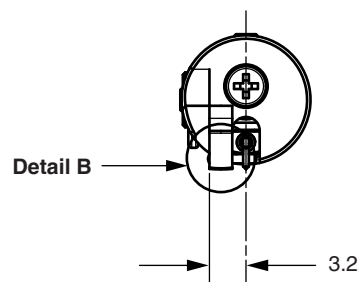
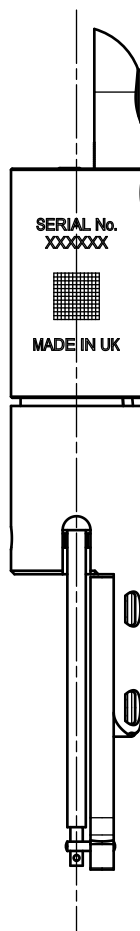
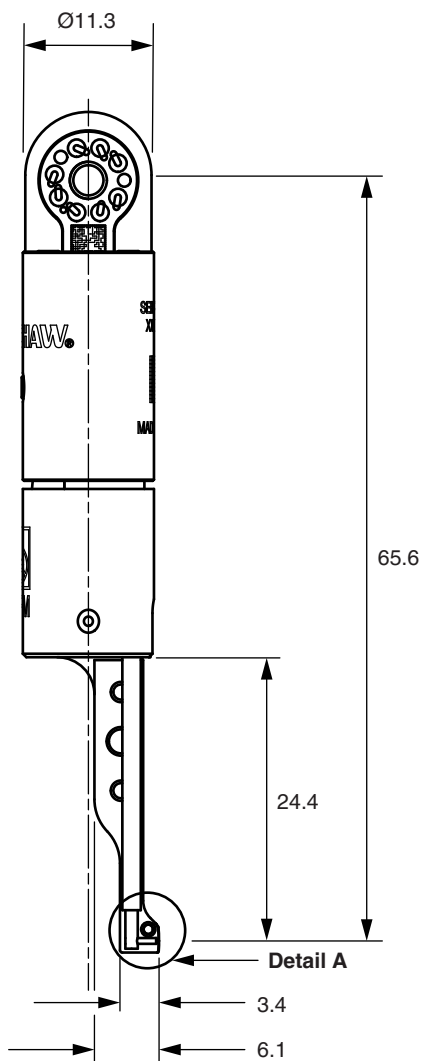
Scanning close to obstructive faces.

Specification

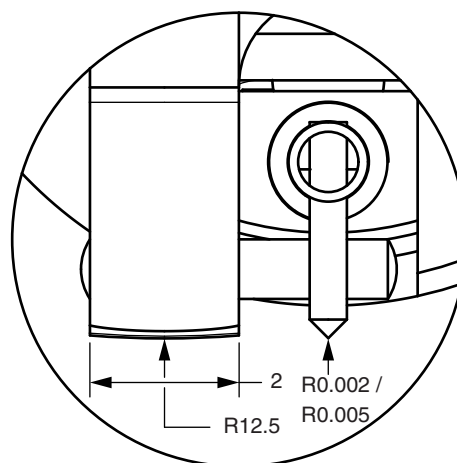
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(5% + 15 nm)
Skid / stylus arrangement		Side-by-side
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Skid length / radius (mm)		2 / 12.5
Skid width / radius (mm)		2 / 12.5
Skid contact force (N)		0.2
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1, SFH-2
Lateral scanning capability		Yes

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-B2

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own mini measuring device, incorporating Renishaw's proprietary scale and readhead system, to transduce the motion of the stylus tip.



Features

The B-series of modules feature a small skid which allows the stylus to be placed close to the edge of surfaces of interest. The modules can provide access into awkward to reach features.

Typical applications

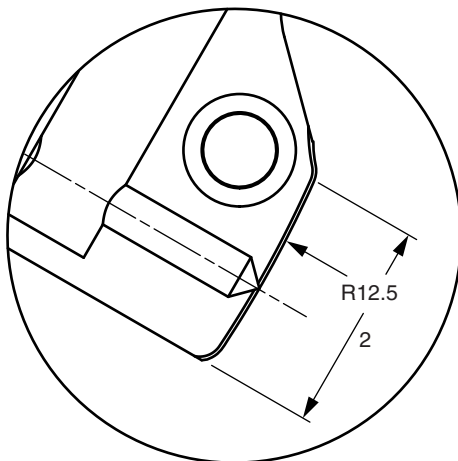
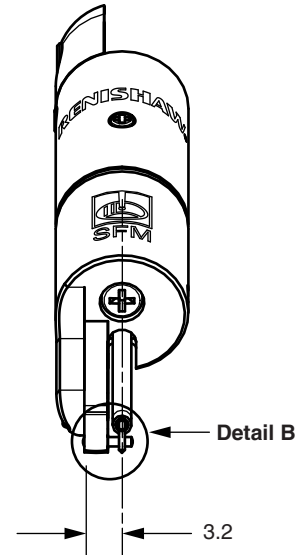
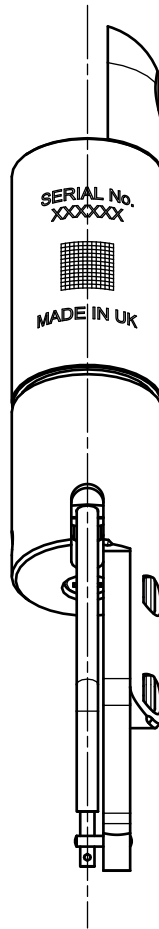
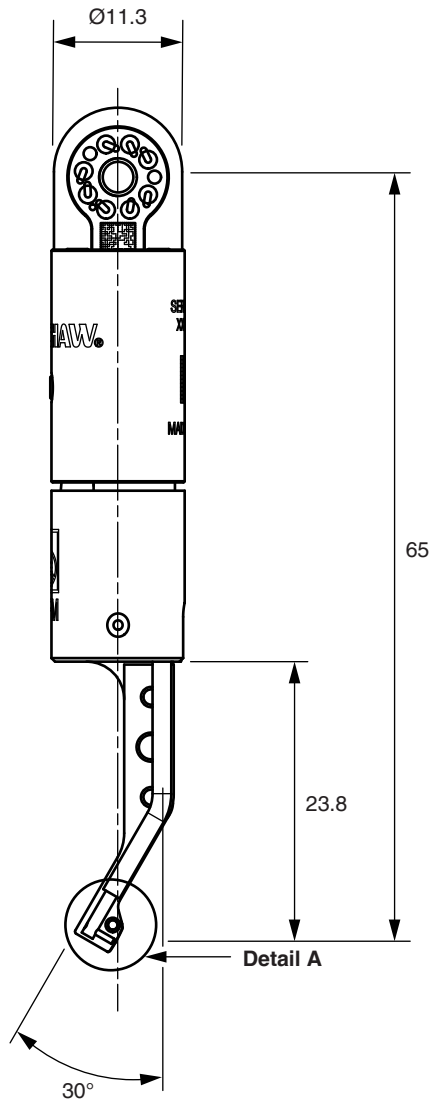
Scanning close to obstructive faces; lateral scanning of crankshaft bearing journals.

Specification

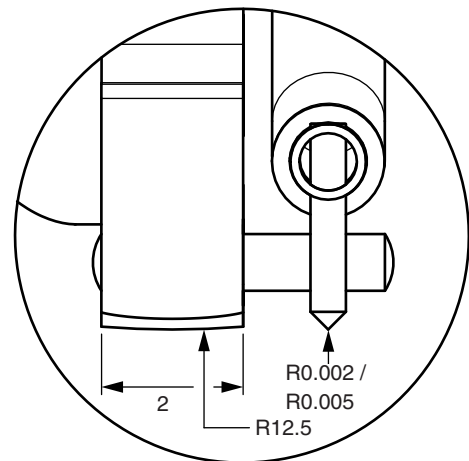
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(5% + 15 nm)
Skid / stylus arrangement		Side-by-side
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Skid length / radius (mm)		2 / 12.5
Skid width / radius (mm)		2 / 12.5
Skid contact force (N)		0.2
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1, SFH-2
Lateral scanning capability		Yes

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-B3

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own mini measuring device, incorporating Renishaw's proprietary scale and readhead system, to transduce the motion of the stylus tip.



Features

The B-series of modules feature a small skid which allows the stylus to be placed close to the edge of surfaces of interest. The modules can provide access into awkward to reach features.

Typical applications

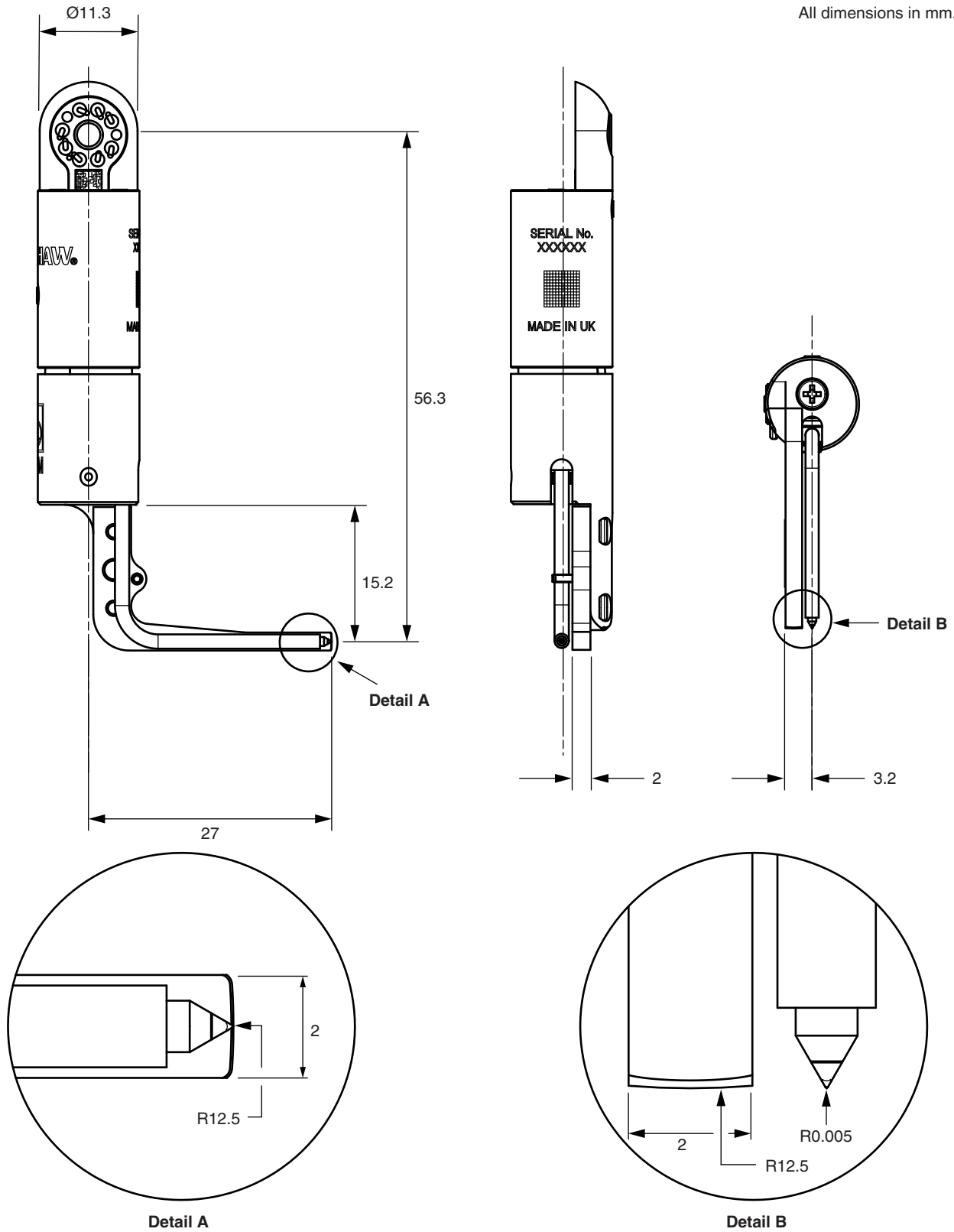
Awkward to reach pockets and grooves.

Specification

Diamond tip radius (µm)	5
Surface finish measurement range (µm)	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *	±(10% + 20 nm)
Skid / stylus arrangement	Side-by-side
Skid material	DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)	0.5
Skid length / radius (mm)	2 / 12.5
Skid width / radius (mm)	2 / 12.5
Skid contact force (N)	0.2
Stylus contact force (N)	0.006
SFM / SFH knuckle adjustment range	±90°
Weight (g)	13
Resolution (nm)	1
Measurement speed (mm/s)	Up to 1
Stylus holder compatibility	SFH-1, SFH-2
Lateral scanning capability	No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



SFM-B4

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own mini measuring device, incorporating Renishaw's proprietary scale and read head system, to transduce the motion of the stylus tip.



Features

The B-series of modules feature a small skid which allows the stylus to be placed close to the edge of surfaces of interest. The modules can provide access into awkward to reach features.

Typical applications

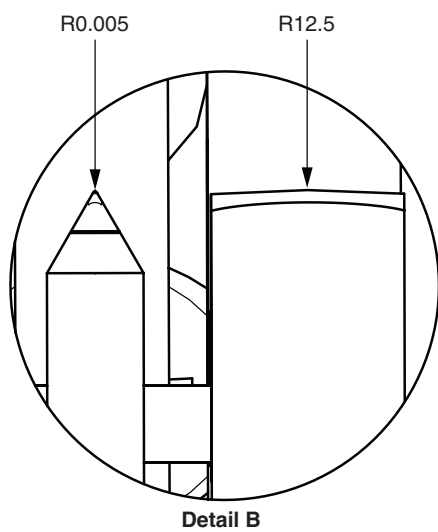
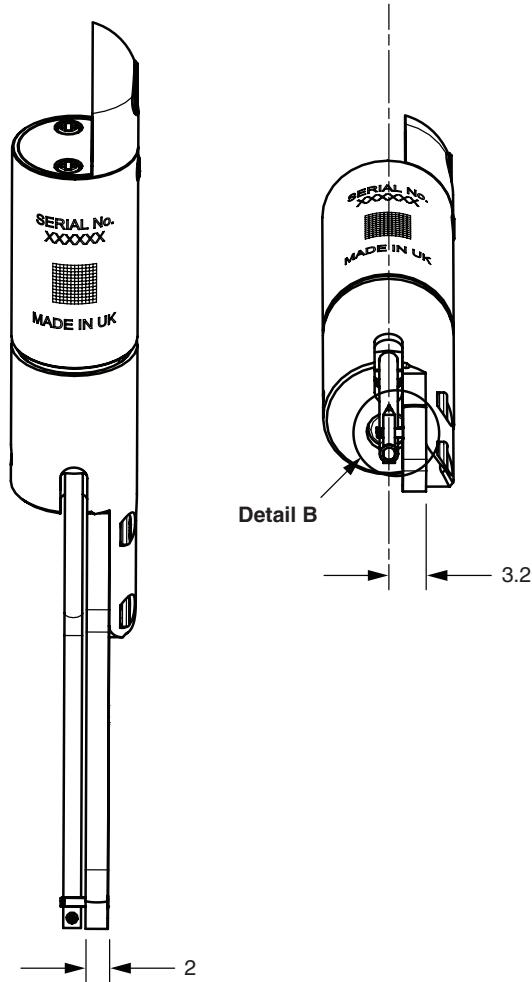
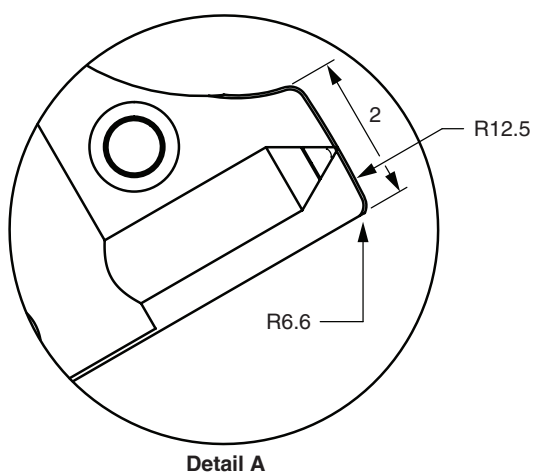
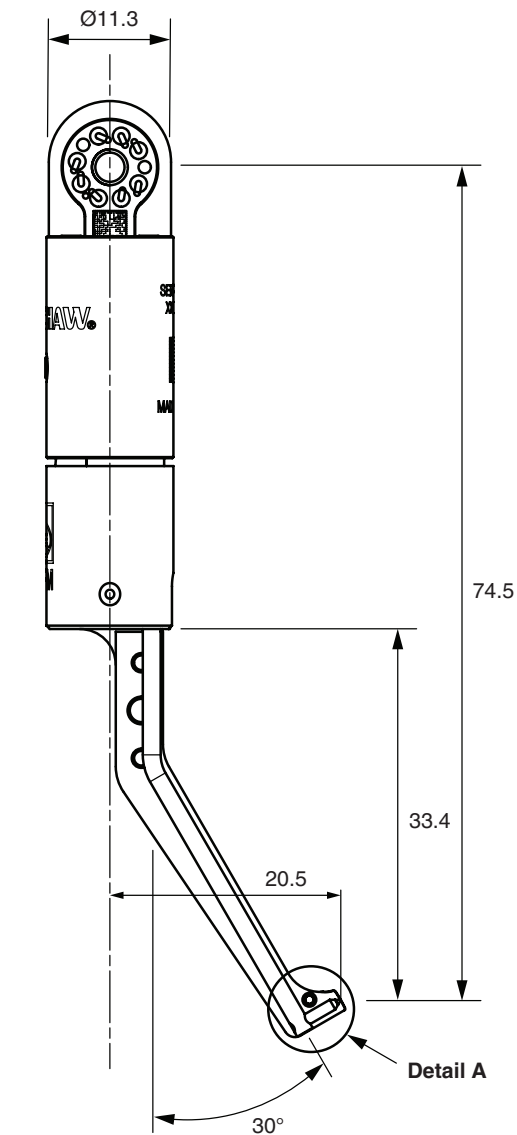
Extended reach into confined areas; integrated bladed rotors (IBRs) with small blades.

Specification

Diamond tip radius (µm)	5
Surface finish measurement range (µm)	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *	±(10% + 35 nm)
Skid / stylus arrangement	Side-by-side
Skid material	DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)	0.5
Skid length / radius (mm)	2 / 12.5
Skid width / radius (mm)	2 / 12.5
Skid contact force (N)	0.2
Stylus contact force (N)	0.006
SFM / SFH knuckle adjustment range	±90°
Weight (g)	13
Resolution (nm)	1
Measurement speed (mm/s)	Up to 1
Stylus holder compatibility	SFH-1, SFH-2
Lateral scanning capability	No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



SFM-B5

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own mini measuring device, incorporating Renishaw's proprietary scale and read head system, to transduce the motion of the stylus tip.



Features

The B-series of modules feature a small skid which allows the stylus to be placed close to the edge of surfaces of interest. The modules can provide access into awkward to reach features.

Typical applications

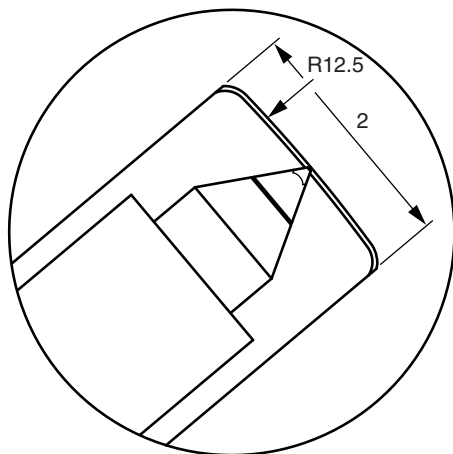
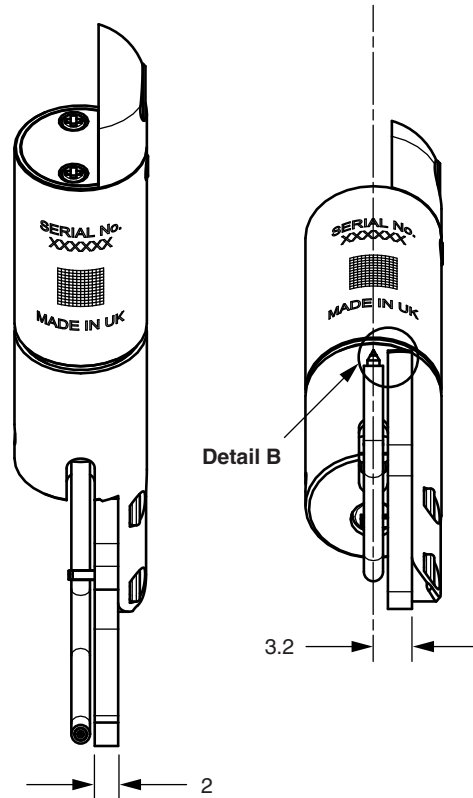
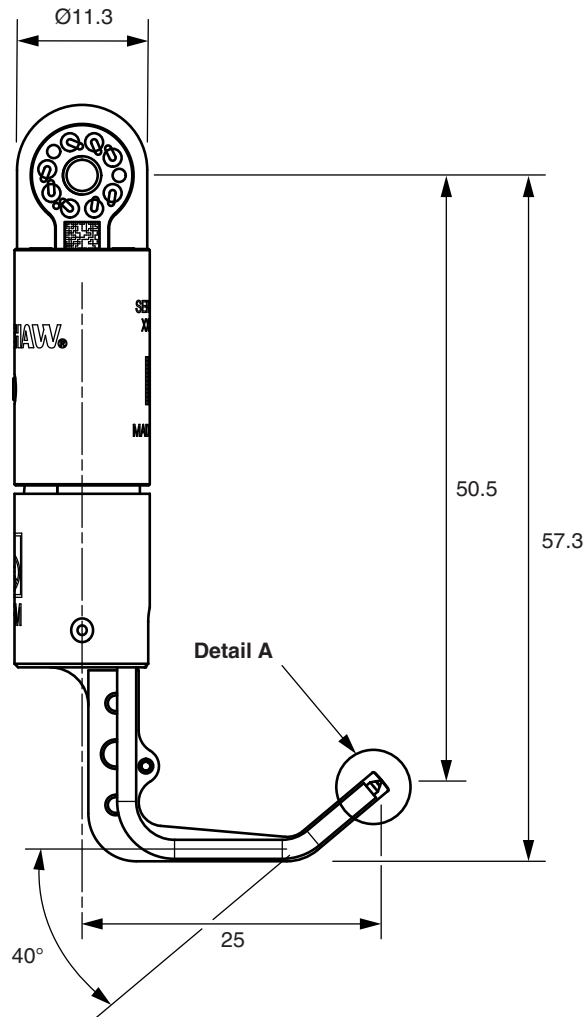
Undercuts and grooves.

Specification

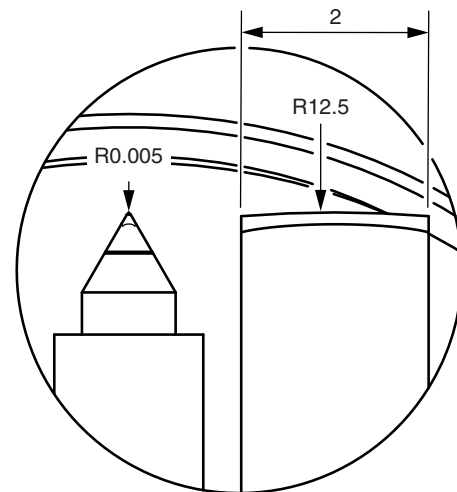
Diamond tip radius (µm)	5
Surface finish measurement range (µm)	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *	±(10% + 20 nm)
Skid / stylus arrangement	Side-by-side
Skid material	DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)	0.5
Skid length / radius (mm)	2 / 12.5
Skid width / radius (mm)	2 / 12.5
Skid contact force (N)	0.2
Stylus contact force (N)	0.006
SFM / SFH knuckle adjustment range	±90°
Weight (g)	13
Resolution (nm)	1
Measurement speed (mm/s)	Up to 1
Stylus holder compatibility	SFH-1, SFH-2
Lateral scanning capability	No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-C3

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.

Features

The C-series of modules have the ability to locate the stylus in small diameter bores. The skid and stylus are inline so that both travel along the axis of the bore.

The SFM-C3 is a replacement for SFM-C2, offering more stylus range and increased robustness without any degradation in performance.

Typical applications

Automotive engine valve guide ways.

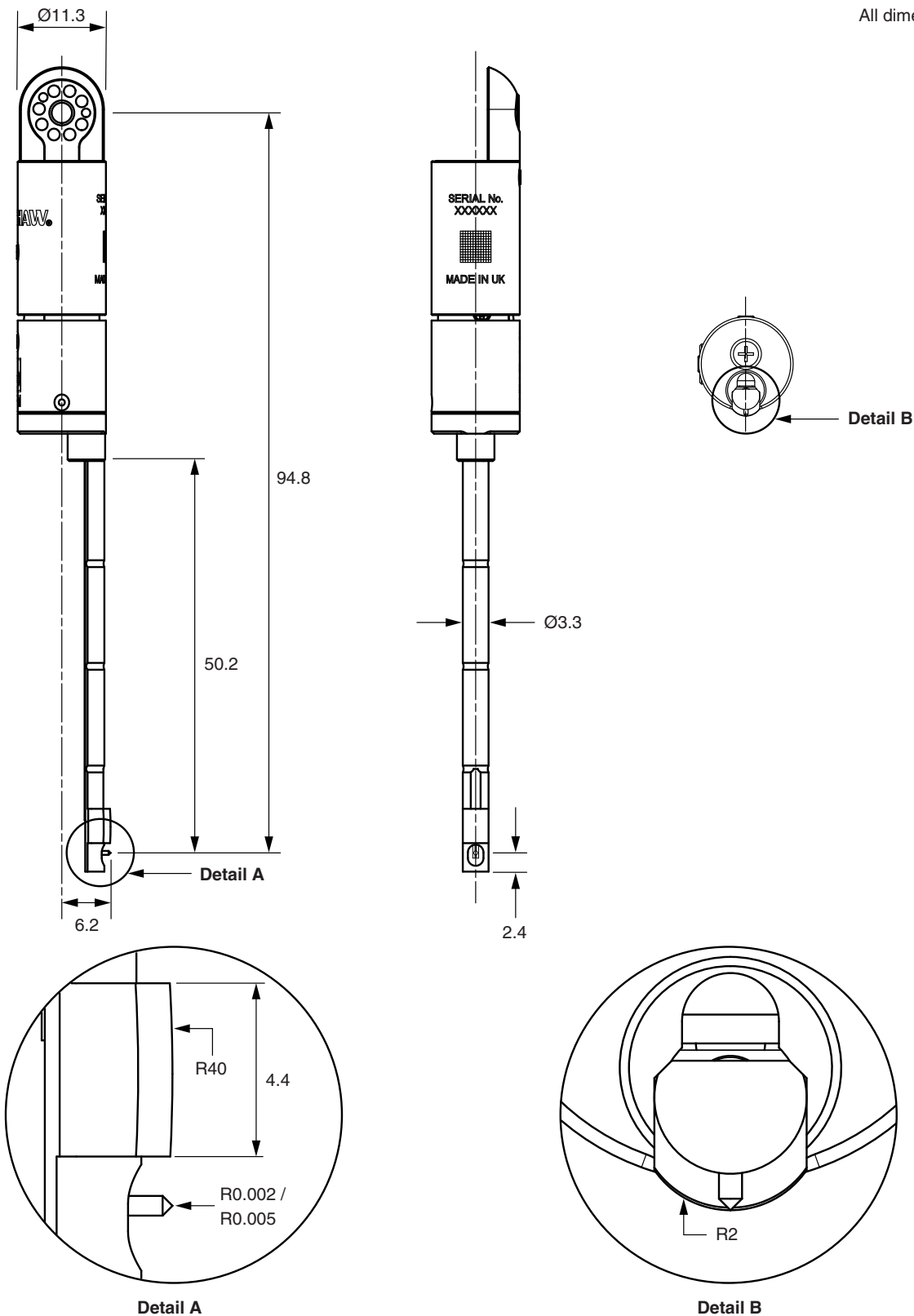


Specification

Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(10% + 35 nm)
Skid / stylus arrangement		In-line (stylus lagging skid)
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Minimum feature access (mm)		Ø5 × 50
Skid length / radius (mm)		4.4 / 40
Skid width / radius (mm)		3.3 / 2
Skid contact force (N)		0.15
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1 only
Lateral scanning capability		No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



SFM-D1

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The D-series of modules employ a cranked skid arm with the stylus in line with the skid to facilitate access on to formed surfaces.

Typical applications

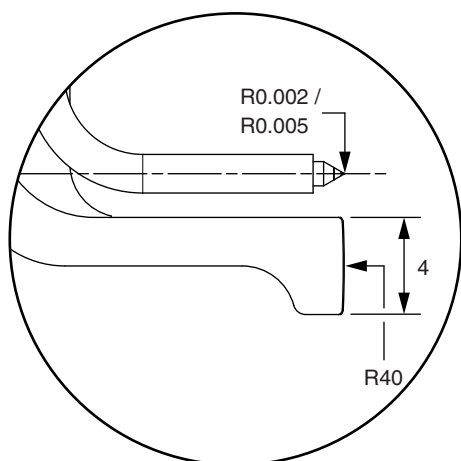
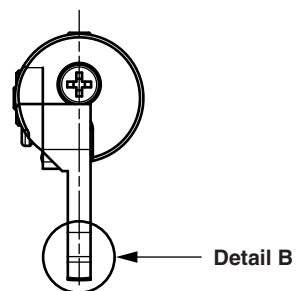
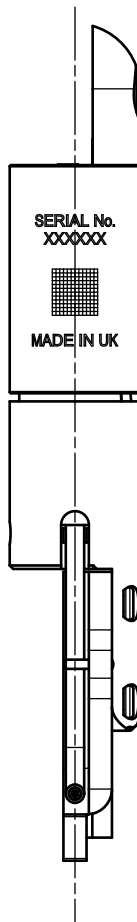
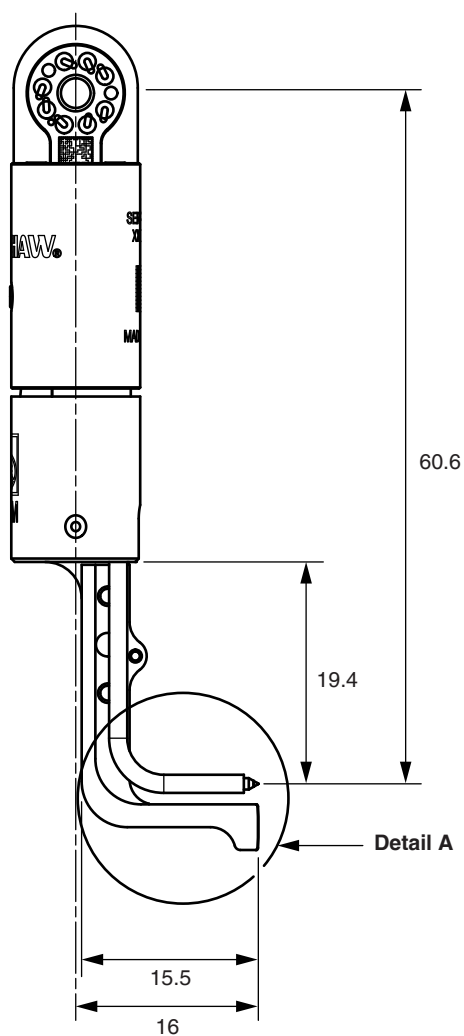
Rotors, blisks and blades, especially fillet radii.

Specification

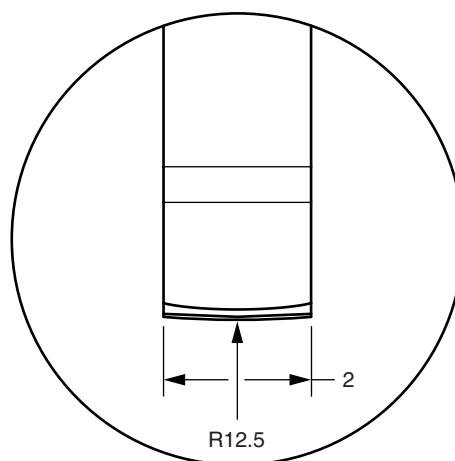
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(10% + 20 nm)
Skid / stylus arrangement		In-line (stylus leading skid)
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Skid length / radius (mm)		4 / 40
Skid width / radius (mm)		2 / 12.5
Skid contact force (N)		0.2
Stylus contact force (N)		0.0036
SFM / SFH knuckle adjustment range		±90°
Weight (g)		13
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1, SFH-2
Lateral scanning capability		No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-E1

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The E-series of modules use dual skids with a central stylus. This makes them ideal for short scans on small to medium sized bores which may be deep within the workpiece.

Typical applications

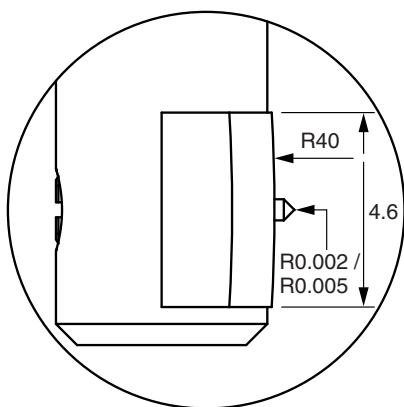
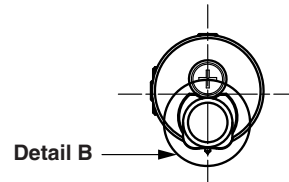
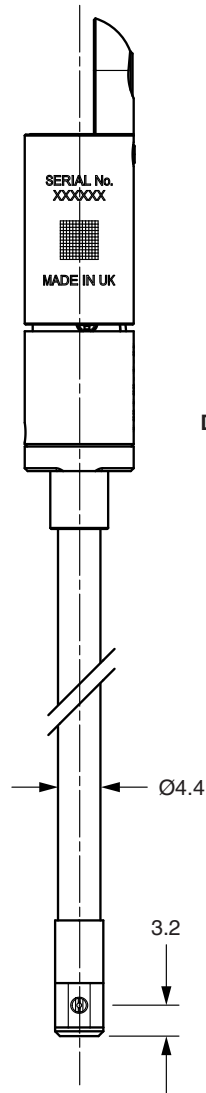
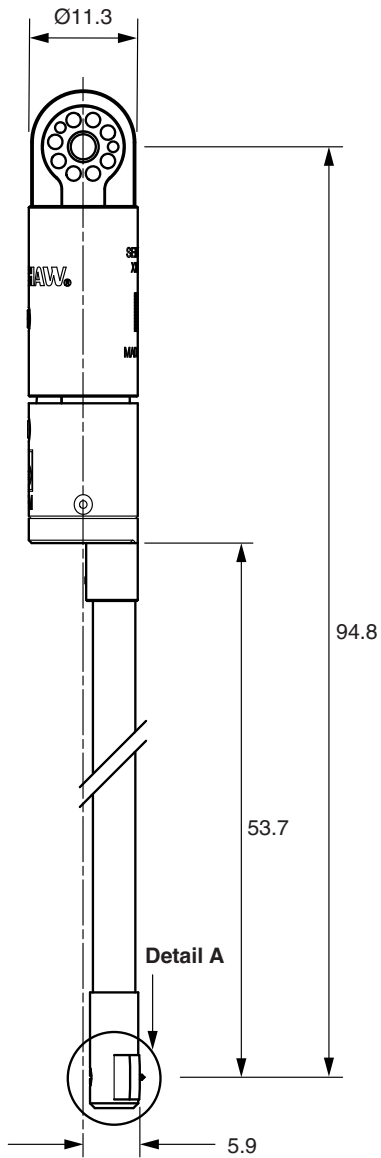
Automatic transmission valve bodies, valve seats, minimum feature access (mm): Ø9 × 52 (max. depth).

Specification

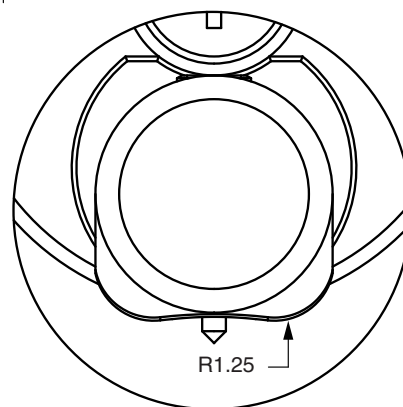
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(10% + 20 nm)
Skid / stylus arrangement		Stylus central to dual skids
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.6
Minimum feature access (mm)		Ø9 × 52 (maximum depth)
Skid length / radius (mm)		4.6 / 40
Skid width / radius (mm)		5.0 (total) / n/a
Skid contact force (N)		0.15
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1 only
Lateral scanning capability		No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-E2

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

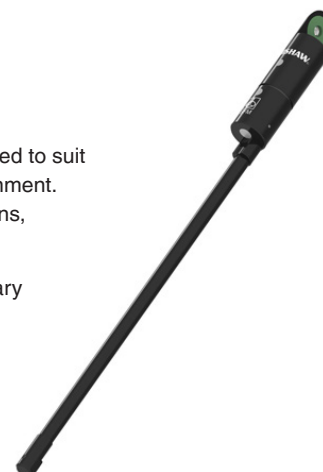
Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.

Features

The E-series of modules use dual skids with a central stylus. This makes them ideal for short scans on small to medium sized bores which may be deep within the workpiece.

Due to the extreme length of this module, Renishaw recommends that the CMM's capability to use the SFM-E2 should be verified before full implementation.

NOTES: Not compatible with SFH-2.
Scan speeds may need to be reduced for finer finishes.



Typical applications

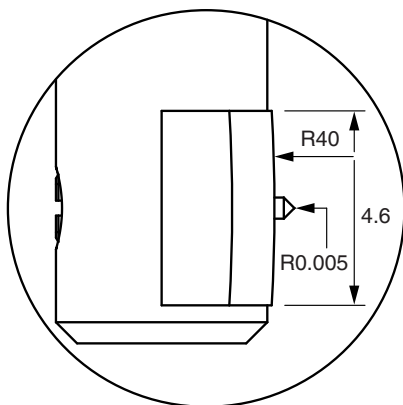
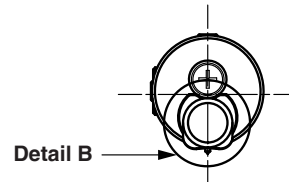
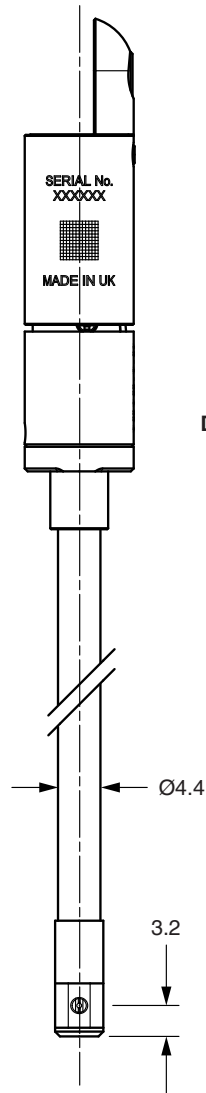
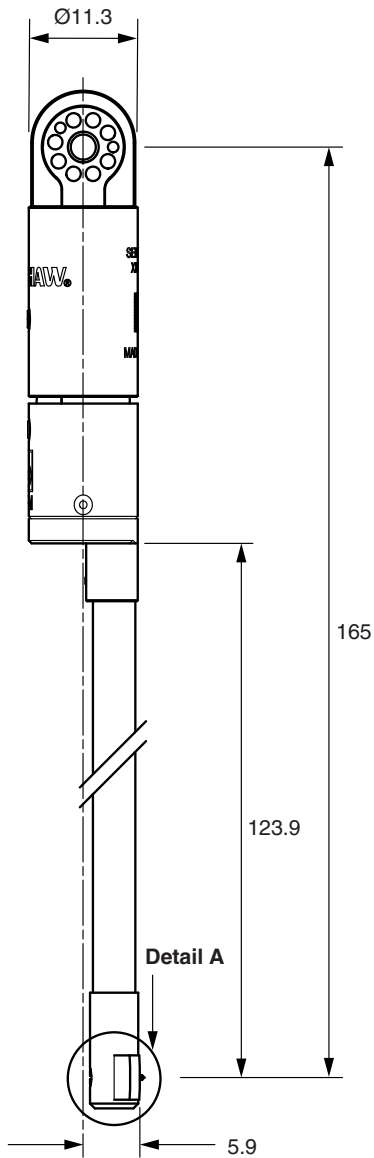
Automatic transmission valve bodies,
minimum feature access (mm):
Ø9 × 122 (max. depth).

Specification

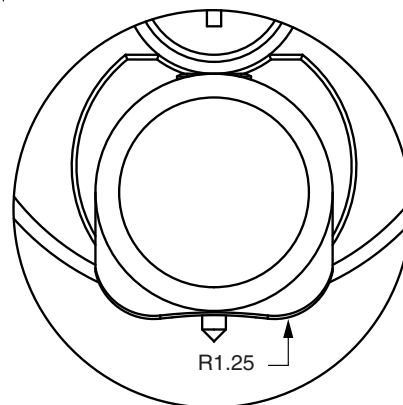
Diamond tip radius (µm)	5
Surface finish measurement range (µm)	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *	±(20% + 60 nm)
Skid / stylus arrangement	Stylus central to dual skids
Skid material	DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)	0.6
Minimum feature access (mm)	Ø9 × 122 (maximum depth)
Skid length / radius (mm)	4.6 / 40
Skid width / radius (mm)	5.0 (total) / n/a
Skid contact force (N)	0.15
Stylus contact force (N)	0.01
SFM / SFH knuckle adjustment range	±90°
Weight (g)	13
Resolution (nm)	1
Measurement speed (mm/s)	Up to 0.5
Stylus holder compatibility	SFH-1 only
Lateral scanning capability	No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-G1

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The G-series of modules is designed for the measurement of small grooves and geometrical features. Feature depth, width, spacing etc. are reported instead of roughness parameter values.

Typical applications

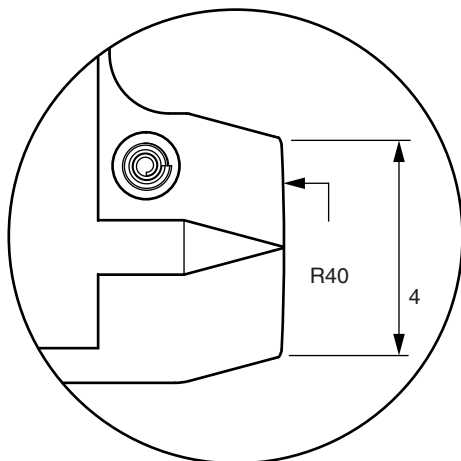
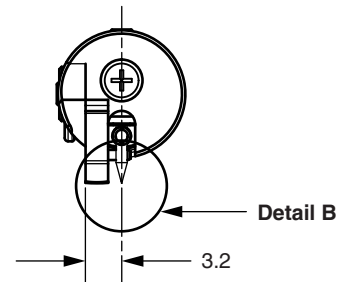
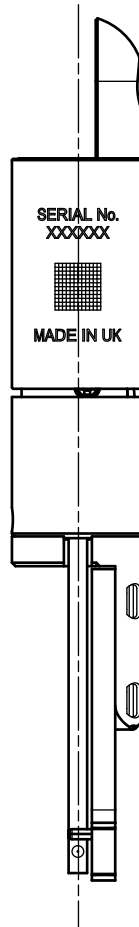
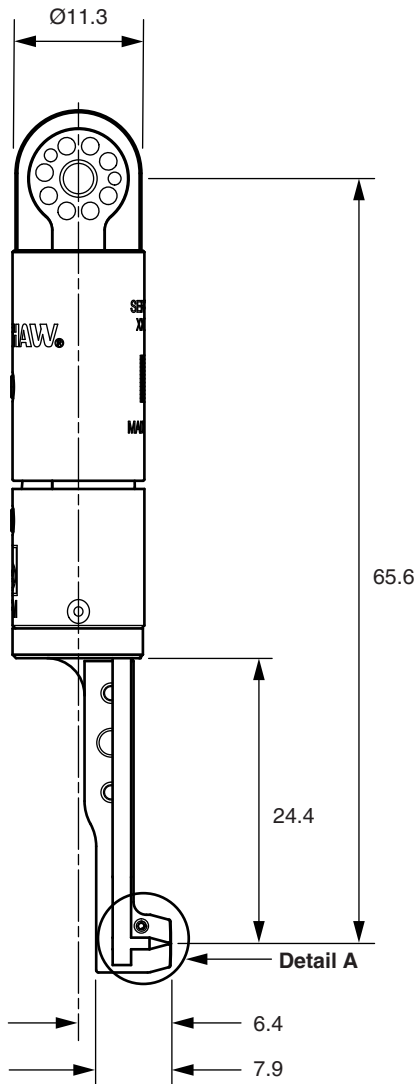
Grooved engine bores prepared for PTWA coating.

Specification

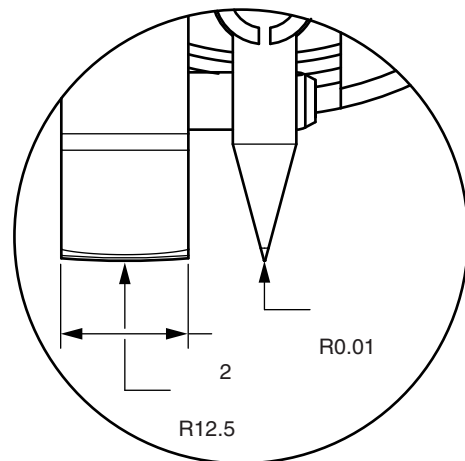
Stylus tip radius (µm)	10
Typical groove feature measurement accuracy *	±10%
Feature depth range (mm)	0.02 - 0.3
Skid / stylus arrangement	Side-by-side
Skid material	DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)	0.5
Skid length / radius (mm)	4 / 40
Skid width / radius (mm)	2 / 12.5
Skid contact force (N)	0.2
Stylus contact force (N)	0.003
SFM / SFH knuckle adjustment range	±90°
Weight (g)	12
Resolution (nm)	1
Measurement speed (mm/s)	Up to 1
Stylus holder compatibility	SFH-1, SFH-2
Lateral scanning capability	No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

SFM-H1

Surface finish probe module

Enhanced access and inspection capability for integrated surface finish measurement

The SFP2 system consists of a probe and a range of SFM modules which have been designed to suit the demands of specific parts and features encountered in a precision manufacturing environment. The probe and modules can be automatically interchanged with all other REVO® probe options, providing the flexibility to easily select the optimum tool to inspect a wide range of features.

Each SFM module is its own miniature measuring device, incorporating Renishaw's proprietary encoder system to transduce the motion of the stylus tip.



Features

The H-series of modules employ a long skid with a large radius, which is appropriate for inspecting surface finish callouts with larger cut-off values.

Typical applications

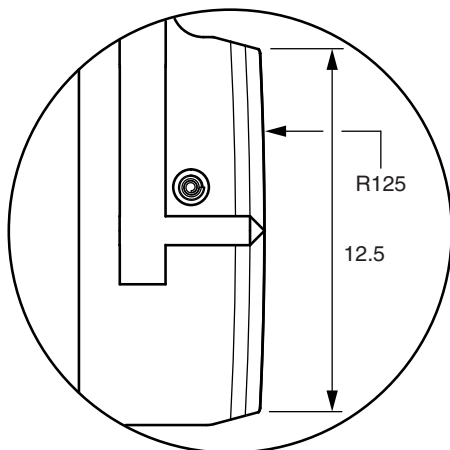
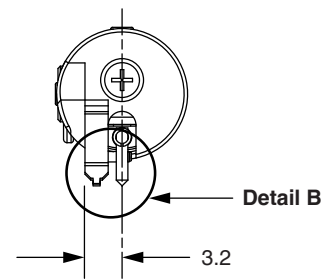
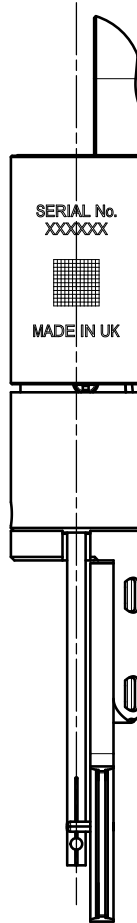
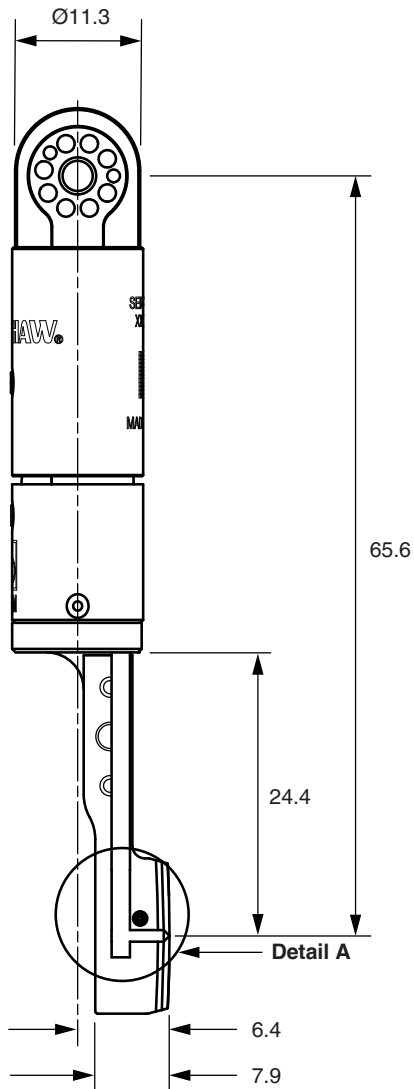
Surface finish callouts with cut-off values of 2.5 mm and above.

Specification

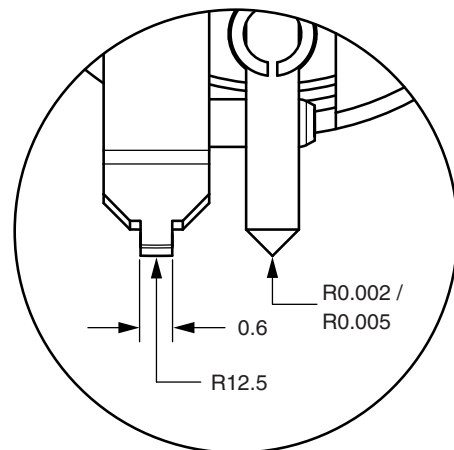
Diamond tip radius (µm)		2 or 5
Surface finish measurement range (µm)	2 µm modules	6.3 to 0.05 Ra
	5 µm modules	6.3 to 0.10 Ra
Typical surface finish accuracy (of nominal Ra) *		±(5% + 15 nm)
Skid / stylus arrangement		Side-by-side
Skid material		DLC coated stainless steel
Nominal stylus tip protrusion beyond skid (mm)		0.5
Skid length / radius (mm)		12.5 / 125
Skid width / radius (mm)		0.6 / 12.5
Skid contact force (N)		0.2
Stylus contact force (N)		0.003
SFM / SFH knuckle adjustment range		±90°
Weight (g)		12
Resolution (nm)		1
Measurement speed (mm/s)		Up to 1
Stylus holder compatibility		SFH-1, SFH-2
Lateral scanning capability		No

* Accuracy values are dependent upon a number of system variables. These include the machine size and configuration, scan orientation, condition of stylus tip, part fixturing system and environmental noise.

All dimensions in mm.



Detail A



Detail B

PH20 motorised probe head



PH20 is a dynamic measuring probe head which delivers a 3-fold increase in measurement throughput whilst maintaining high system accuracy.

Utilising technology developed for the multi-award winning REVO® measurement system, the new PH20 probe head offers unique 'head touches' for rapid touch-trigger measurement, and fast infinite 5-axis positioning to guarantee optimal feature access. Unlike conventional touch trigger measurement methods which rely on speeding up the motion of the CMM's 3 axes to measure quickly, PH20 uses head motion to minimise the dynamic errors of the CMM at higher measurement speeds. Its compact design makes it suitable for new CMM purchases, and as a retrofit to the vast majority of existing CMM touch-trigger installations.

PH20 incorporates the industry standard TP20 touch-trigger probe, affording immediate access to a range of proven probe modules and 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. Current users of TP20 systems will be able to upgrade to PH20 and utilise their existing modules*.

The PH20 probe head offers dramatic time savings with a unique rapid 'inferred calibration' technique which determines head orientation and probe position in a single operation, allowing subsequent measurement at any head angle. The system's design requires no air supply, and it can be mounted to the CMM quill either directly or via a shank using a range of mounting adaptors.

Key features

Compact design – suitable for a wide range of CMMs using shank or quill mounting.

Renishaw CMM controller – I++DME communication; wide selection of metrology software.

Index head compatibility – no requirement to modify existing programs in the majority of cases.

Integral TP20 probe – allows re-use of existing equipment.

Innovations

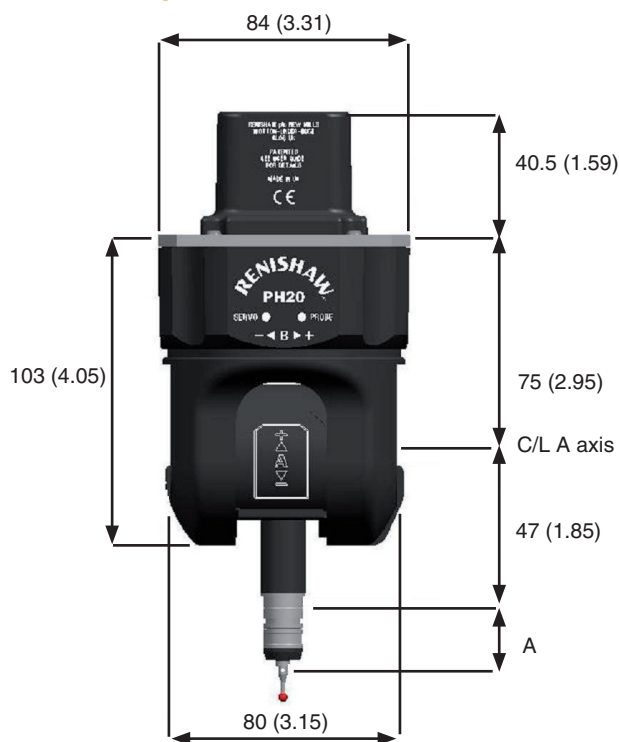
Rapid head touches – where the CMM is stationary and the head moves and takes a touch point.

Rapid 5 axis moves – synchronised motion of the head and CMM between measurements.

Inferred calibration – determines head orientation and probe position in a single operation, allowing subsequent measurement at any head angle.

* Excepting the extended force module

Specification



Dimensions in mm (inch)

Module force	Dimension A	
	mm	inch
Standard	21	0.83
Medium	21	0.83
Low	21	0.83
6-way	25	0.98
EM1	71	2.79
EM2	96	3.78



Weight (excluding module and cables)	810 g (28.6 oz)		
Temperature range	15 °C to 35 °C (59 °F to 95 °F)		
Operating	-25 °C to 70 °C (-13 °F to 158 °F)		
Storage			
Maximum movement speed	3 revs/s (1281 mm/s with standard module & 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	MCR20 NI and MCR20		
Joystick	Multifunction MCULite-2		
ISO 10360-5 (2001) typical performance std force module with 12 x 4 mm stylus on a CMM with ISO 10360-2 (2002) specification of 0.48+ L/1000*	Size	CMM TOUCH 0.0006 mm (0.00002 in)	HEAD TOUCH 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

Additional information

- PH20 can be fitted directly to the CMM quill. A wide range of shank adaptors is also available.
- The PH20 system utilises the Renishaw Universal CMM controller system, which provides functionality particular to 5-axis motion and head-touch measurement.
- I++DME command protocol communication via Renishaw UCCserver™ software application.

Calibration and capability artefacts for SFP2 surface finish probe

Surface finish on CMMs

Surface finish measurement has traditionally involved the use of hand-held sensors or has required the part to be moved onto a costly dedicated measuring machine.

The SFP2 probe for the REVO® 5-axis system changes all this, making surface finish inspection an integral part of CMM measurement, enabling the automatic switching between scanning, optical non-contact and surface finish measurement probe types.

This unique capability allows the surface finish analysis to be fully integrated into a single measurement report.

Calibration and capability artefacts

Renishaw provides a range of products that support the use of REVO SFP2 surface finish measurement probes on CMMs.

The artefact plates are used for calibrating surface finish modules, independently verifying the calibration, checking linearity and tip condition monitoring.

Additionally, Renishaw's condition checking artefact can be used to position optical flats and calibration plates throughout the CMM volume. This may be useful in assessing a machine's capability for surface roughness measurement.

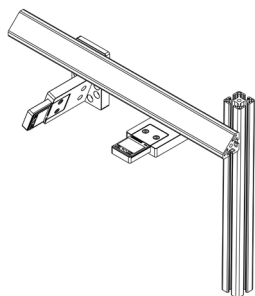
The TFP tip find probe comprises a TP20 probe with low force module. It is used to map the SFP2 probe C-axis and calibrate the geometry of module / holder configurations.

Key benefits

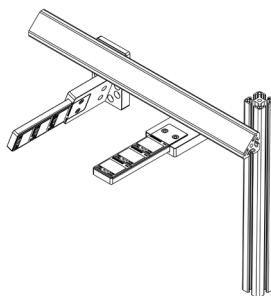
- * Comprehensive range of tools to support surface finish measurement on CMMs
- * Calibration of the full range of surface finish modules
- * Independent linearity and calibration verification plus tip condition monitoring
- * Machine capability testing and fault finding



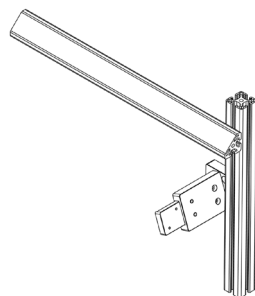
Single artefact on MRS2 rail



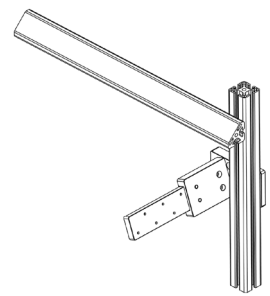
Triple artefact on MRS2 rail



Single artefact on MRS2 leg

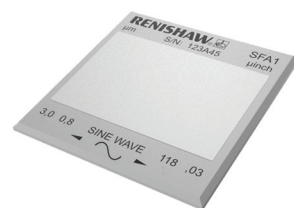


Triple artefact on MRS2 leg

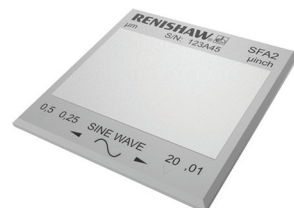


Specification

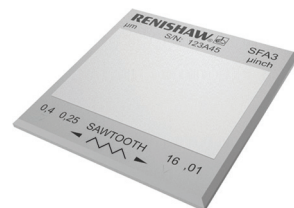
Calibration plate SFA1 *	
Function	Used for calibrating SFM surface finish modules.
Surface details	3.0 µm Ra sinusoidal profile. Electroformed nickel surface.
Traceability	UKAS calibration certificate provided.



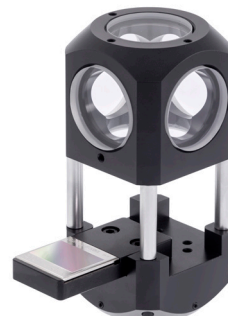
Checking plate SFA2 *	
Function	Used for checking calibration linearity.
Surface details	0.5 µm Ra sinusoidal profile. Electroformed nickel surface.
Traceability	UKAS calibration certificate provided.



Verification plate SFA3 *	
Function	Used for periodic tip condition checking.
Surface details	0.4 µm Ra saw tooth profile. Electroformed nickel surface.
Traceability	UKAS calibration certificate provided.



CMM condition checking artefact OFA **	
Function	A service tool for verifying machine capability and fault finding. It houses six optical flats located within a cube and has mounting holes for additional calibration and checking artefacts.
Surface details	λ/20 fused silica optical flat Diameter 50 mm
Traceability	Optical flats are supplied with calibration certificates.



Location options:

- * SFA1, SFA2 and SFA3 can be fixed to an MRS2 rail, MRS2 leg or the OFA artefact. These artefacts and mounts can be supplied within comprehensive system kits or individually.
- ** OFA can be mounted directly to the bed of a CMM, to a fixture plate or to a universal calibration tower. The OFA is available to special order only. Contact Renishaw for availability.

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Белгород (4722)40-23-64
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Россия +7(495)268-04-70

Казахстан +7(7172)727-132

Киргизия +996(312)96-26-47

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