

## SFP2 installation and user's guide

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# SFP2 installation and user's guide

Document part number H-1000-5365-05-E



## SFP2 installation and user's guide

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# SFP2 general information

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 ORIGINAL LANGUAGE VERSION

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Unless you and Renishaw have agreed and signed a separate written agreement, the equipment and/or software are sold subject to the Renishaw Standard Terms and Conditions supplied with such equipment and/or software, or available on request from your local Renishaw office.

Renishaw warrants its equipment and software for a limited period (as set out in the Standard Terms and Conditions), provided that they are installed and used exactly as defined in associated Renishaw documentation. You should consult these Standard Terms and Conditions to find out the full details of your warranty.

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### Care of equipment

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

### Changes to Renishaw products

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

### Company registration details

Renishaw plc. Registered in England and Wales. Company no: 1106260. Registered office: New Mills, Wotton-under-Edge, Gloucestershire, GL12 8JR, UK.

### Packaging

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

Packaging component	Material	94/62/EC code	94/62/EC number
Probe box	Polypropylene	PP	05
Inner foam inserts	Plastazote LD15	LDPE	04
Outer box	Cardboard	PAP	21
Outer foam inserts	Polyurethane foam	PUR	113
Accessory packaging	High density polyethylene bag (HDPE)	HDPE	02



**CAUTION:** If it is necessary to return any part of the system please ensure it is packaged carefully. Failure to do so could result in transit damage for which the customer would be liable. Products supplied in plastic boxes must be returned in the original packaging.

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### Patents

Features of Renishaw's SFP2 and associated products (such as REVO-2) are the subjects of one or more of the following patents and patent applications:

CN100453970	EP1877727	JP2016-533484	US10260856	WO2014/191729
CN101166951	EP1877732	JP2019-536032	US10627259	WO2015/049341
CN101166953	EP1989504	JP2020-507787	US2020-0049498	
CN101405563	EP2002206	JP5196356	US2020-0132452	
CN101405564	EP2002207	JP5350216	US7533574	
CN101490430	EP2035719	JP5425476	US7809523	
CN101675317	EP2140318	JP5555159	US7861430	
CN101772690	EP2142880	JP5653581	US7885777	
CN101959642	EP2167911	JP5658863	US7971365	
CN102305613	EP2259897	JP5706158	US8006398	
CN102906533	EP2431707	JP5851969	US8186882	
CN103842766	EP2564151	JP6013533	US8302321	
CN105408723	EP2764324	JP6199870	US8381588	
CN105793695	EP3004797	JP6348577	US8425119	
CN107532930	EP3052926	JP7042620	US8468672	
CN109964098	EP3289314		US8474148	
CN110291360	EP3542130		US8511898	
	EP3583383		US8601701	
			US8756973	
			US8978261	
			US9038282	
			US9366519	
			US9903713	

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# SFP2 product compliance

## EU declaration of conformity

Contact Renishaw plc or visit [www.renishaw.com/EUCMM](http://www.renishaw.com/EUCMM) for the full EU declaration.

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## UK declaration of conformity

Contact Renishaw plc or visit [www.renishaw.com/UKCMM](http://www.renishaw.com/UKCMM) for the full UK declaration.

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## EMC conformity

This equipment must be installed and used in accordance with this installation guide. This product is intended for industrial use only and should not be used in a residential area or connected to a low voltage power supply network which supplies buildings used for residential purposes.

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## FCC (USA only)

### Information to user (47 CFR 15.105)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

### Information to user (47 CFR 15.21)

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

### Equipment label (47 CFR 15.19)

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

1. This device may not cause harmful interference.
  2. This device must accept any interference received, including interference that may cause undesired operation.
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### ICES-001 (Canada only)

This ISM device complies with Canadian ICES-001(A) / NMB-001(A).

Cet appareil ISM est conforme à la norme ICES-001(A) / NMB-001(A) du Canada.

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### REACH regulation

Information required by Article 33(1) of Regulation (EC) No. 1907/2006 ("REACH") relating to products containing substances of very high concern (SVHCs) is available at:

[www.renishaw.com/REACH](http://www.renishaw.com/REACH)

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### China RoHS

Contact Renishaw plc or visit [www.renishaw.com/ChinaRoHSCMM](http://www.renishaw.com/ChinaRoHSCMM) for the full China RoHS tabulation.



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# SFP2 safety

**CAUTION:** Before unpacking and installing the REVO-2 system and accompanying probes, the user should carefully read the safety instructions below and ensure that they are followed at all times by all operators.

The SFP2 is only to be used with the Renishaw REVO-2 head.



Operators must be trained in the use and application of the REVO-2 system and accompanying products, in the context of the machine it is fitted to, before being allowed to operate that machine.

Permanent magnets are used in some components of the REVO-2 system and associated products. It is important to keep them away from items which may be affected by magnetic fields, e.g. data storage systems, pacemakers and watches etc.

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# SFP2 warnings



Beware of unexpected movement. The user should remain outside of the full working envelope of probe head and stylus. The machine supplier should ensure the user is aware of the full working envelope of the system.

In all applications involving the use of machine tools or CMMs, eye protection is recommended.

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product documentation, and to ensure that adequate guards and safety interlocks are provided.

Refer to the machine supplier's operating instructions.

The system components contain no user serviceable parts, with the exception of FCR25. No attempt should be made to disassemble any part of the product. In the event of a problem please contact your supplier for assistance.

Under certain circumstances the probe signal may falsely indicate a probe-seated condition. Do not rely on probe signals to stop machine movement.

Probe trigger override on the MCU joystick should be used with care, since it will prevent the CMM from stopping in the event of a collision.

The probe joints are designed to release the probe and / or the stylus holder in the event of a crash.

This equipment is not suitable for use in a potentially explosive atmosphere.

Pinch hazards exist between parts. Do not hold the probe or probe head during movements.

It is essential for continued safety that all fuses are replaced by the correct type and rating.

REVO must be transported in Renishaw supplied packaging.

The cables must meet Renishaw specifications. Incorrect cabling could cause damage to the equipment.



**WARNING:** Avoid touching the probes (including counter balance arms), stylus holders and other modules when the REVO-2 head is engaged (servo LED green) and the system is ready for measurement.



**NOTE:** The SFM surface finish modules are consumable items subject to wear. The system has the ability to check the module condition. Please contact your local Renishaw office to arrange stylus repair or module replacement via RBE.



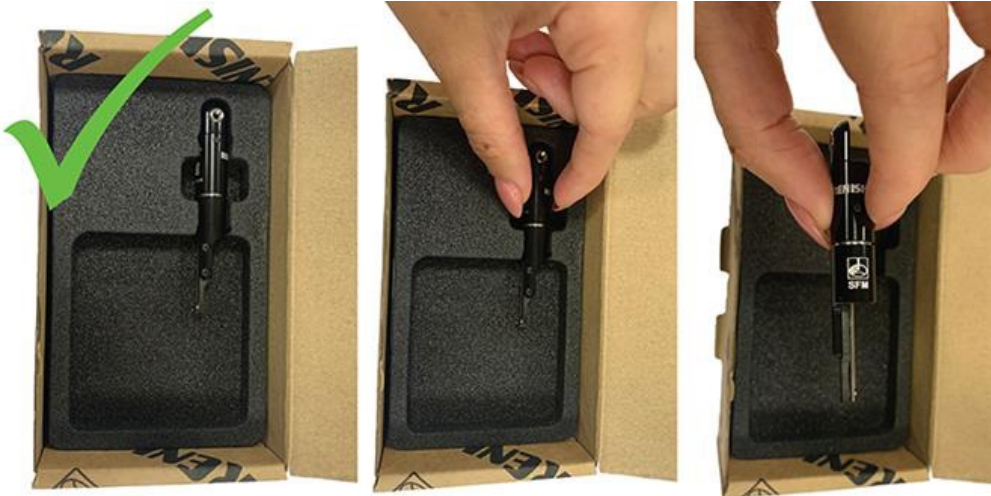
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## SFM-# handling

The SFM-# modules are sensitive measuring devices and should be handled with care.

Correct:



Incorrect:



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### SFM-# warnings

- Avoid dropping the SFM modules or colliding with workpieces or parts of the CMM structure.
- Particular care should be given to the stylus tip. Avoid contact with the stylus unless it is being used for measurement.
- Visually examine the stylus tip for accumulation of dirt or dust.
- Ensure measurement surfaces are dry and clear of debris before being inspected with SFP2.



**NOTE:** The SFM surface finish modules are consumable items subject to wear. The system has the ability to check the module condition. Please contact your local Renishaw office to arrange stylus repair or module replacement via RBE.

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# SFP2 references and associated documents

The following Renishaw documents are referred to in this document or may be a source of further relevant information. They can easily be acquired from Renishaw website [www.renishaw.com](http://www.renishaw.com).

User guide: REVO-2 (H-1000-7590)  
Installation & user's guide: RSP3 (H-1000-5124)  
Installation & user's guide: SFP2 (H-1000-5365)  
User guide: RVP (H-1000-3322)  
Installation & user's guide: RUP1 (H-1000-5396)  
Installation & user's guide: RTP1 (H-1000-5406)  
Installation guide: UCC S5 REVO-2 CMM controller (H-1000-7598)  
Installation guide: SPA3-2 (H-1000-5364)  
Installation & user's guide: MCUlite-2, MCU5-2 and MCU W-2 (H-1000-5280)  
Installation & user's guide: MRS (H-1000-5088)  
Installation guide: MRS2 (H-1000-5255)  
Installation guide: REVO-2 change system port spacing guide (H-1000-5408)  
Technical specifications: Styli and accessories (H-1000-3200)

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# SFP2 system description

## SFP2 system

The SFP2 probe system brings automated surface finish (roughness) measurement to CMMs as part of the REVO 5-axis multi-sensor measuring system.

The SFP2 system hardware is comprised of a probe, a module holder, a range of modules and accessories to enable automatic interchange of surface finish modules or between different probe types. Calibration and gain setting artefacts are also available to ensure that the system is performing at its optimum capability at all times.

Specific surface finish analysis software is also required to interpret the data collected by the REVO system.

Because the SFP2 system is used as part of a multi-sensor system, and uses specially designed calibration routines, the location of the stylus tip is known precisely. Surface finish data can therefore be collected from a specific location, even if there is significant variation between nominally identical parts. The surface data, together with its analysis results, can then be stored alongside the part's dimensional data for future reference.



**NOTE:** The SFM surface finish modules are consumable items subject to wear. The system has the ability to check the module condition. Please contact your local Renishaw office to arrange stylus repair or module replacement via RBE.

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### System components overview

#### SFP2 probe



The SFP2 probe houses electronics to condition the signals from the transducer within the SFM module so that they can be communicated to the controller via the REVO-2 head. The probe also houses a C-axis motor arrangement with  $\pm 180^\circ$  rotational ability which complements the A and B axes provided by the REVO-2 head. C-axis rotation is used in combination with the SFM knuckle angle and the tip shape of the SFM to access a large range of parts and part features. The C-axis motion is not synchronised with the head or CMM motion. Care should be taken when programming C-axis rotations within or near to parts under inspection.

#### SFH holder



The SFH holder fits onto the SFP2 probe via a kinematic magnetic joint. It carries the required surface finish module using a manually adjustable knuckle joint. The holder can be stored in the MRS or MRS2 rack either fitted to an SFP2 probe (in an RCP TC-3 port) or separately in an RCP2 port. In both cases they will have a surface finish module attached whilst in the rack.

There are two holders available; SFH-1 and SFH-2. The SFH-2 is 50 mm longer than SFH-1 and may need to be used for accessing certain features. However, there are usage restrictions associated with SFH-2 the extent of which depend on the SFM module being used. For details of the restrictions, please refer to the module data sheet.

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### SFM-##



There is a range of surface finish modules which are optimised for specific applications. The module contains the stylus tip, skid and electronics to transduce the 'vertical' motion of the tip as it moves across the surface. The module is supplied as an assembly which is fitted to the knuckle joint on the SFH holder. The SFM is not a user servicable part.

Please refer to your local Renishaw supplier or the Renishaw website for information on the latest range of modules.

**i** **NOTE:** The SFM surface finish modules are consumable items subject to wear. The system has the ability to check the module condition. Please contact your local Renishaw office to arrange stylus repair or module replacement via RBE.

### MST

The module setting tool is used to assist in setting the knuckle angle between the SFM module and the SFH holder. It clips on to the SFH and enables access to the knuckle joint adjusting screw. It is possible to adjust the angle to within 0.5 degrees of a required angle.



### RCP TC-3



The thermally controlled RCP TC-3 port maintains its stored probe at operating temperature. It is compatible with Renishaw's MRS and MRS2 rack systems. It should be used for SFP2 and RSP3-6 probes.

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### RCP2



The RCP2 enables rapid and repeatable changing of holder / module configurations. It is compatible with Renishaw's MRS and MRS2 rack systems.

### SFA

There are three SFA plates, each one supplied with screws for fixing to a single or triple SFAH artefact holder. The SFP2 gain is set using the SFA1 - 3.0 SIN fitted to the appropriate artefact holder accessory. It must be mounted on Renishaw's MRS and MRS2 rack systems.

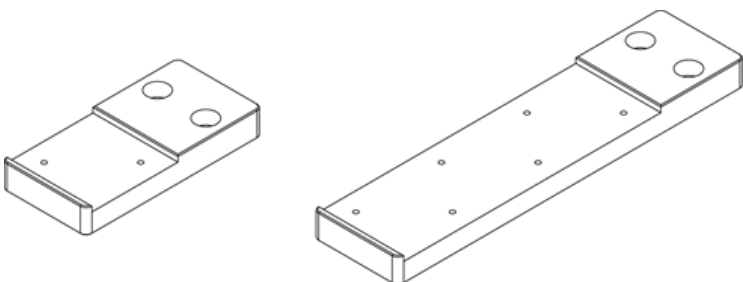
The module gain can be validated using the SFA2 - 0.5 SIN.

The condition of the 2 µm radius diamond tip can be verified using the SFA3 - 0.4 ST.

SFA1 - 3.0 SIN	SFA2 - 0.5 SIN	SFA3 - 0.4 ST

### SFAH-#

The SFAH is used to hold the calibration artefact plates. There is an SFAH-1 for holding one plate and SFAH-2 which holds up to three plates. The SFAH holders fix to the rail adaptor or the OFA optical flat artefact.

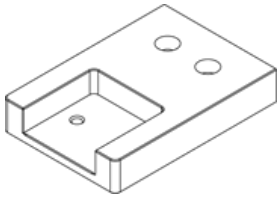


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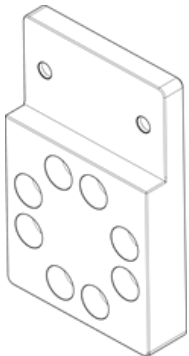
### SFAH-R

The SFAH-R rail adaptor supports the single or triple artefact holding plate and can be fixed to the MRS2 rail or MRS2 leg via the SFAH-M universal mounting plate.



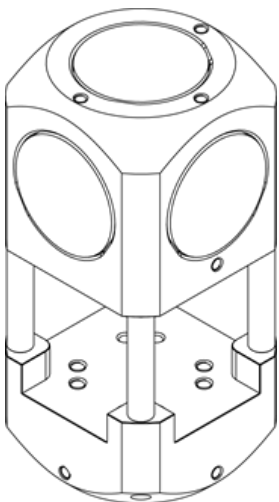
### SFAH-M

The SFAH-M is a universal mounting plate for the SFAH artefact holders. It can be fitted to an MRS2 rail or leg and provides 20° adjustment steps for the artefact holders so that the optimum angle can be selected for calibrating the SFM modules.



### OFA

The OFA optical flat artefact is used as a check on the suitability of a CMM for surface roughness measurement. It comprises six optical flats mounted in the faces of the cube and can also accommodate two SFAH artefact holders. The OFA can be secured to the bed of the CMM where required using the adaptors supplied.





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### TFP

The TFP tip find probe with a low force module is fitted to the MRS or MRS2 rack. It is used to calibrate the C-axis geometry, knuckle angle and the tip position. Routines for using the TFP are managed as part of an automated calibration routine from UCCserver. The TFP is connected with a PICS cable to an SPA3, UCC BI or UCC AI.



### MPS1

The MPS1 is a spacing tool to enable correct spacing of the RCP TC-3 on an MRS2 rail and its adjacent ports.



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# SFP2 specifications

## Environmental specification

Operating temperature range	+10 °C to +40 °C (+50 °F to +104 °F)
Storage temperature range	-25 °C to +70 °C (-13 °F to +158 °F)
Operating humidity	0% to 80% (non-condensing)
Storage humidity	0% to 80% (non-condensing)

## Electrical specification

The REVO-2 head and probe electronics are powered from the UCC S5.

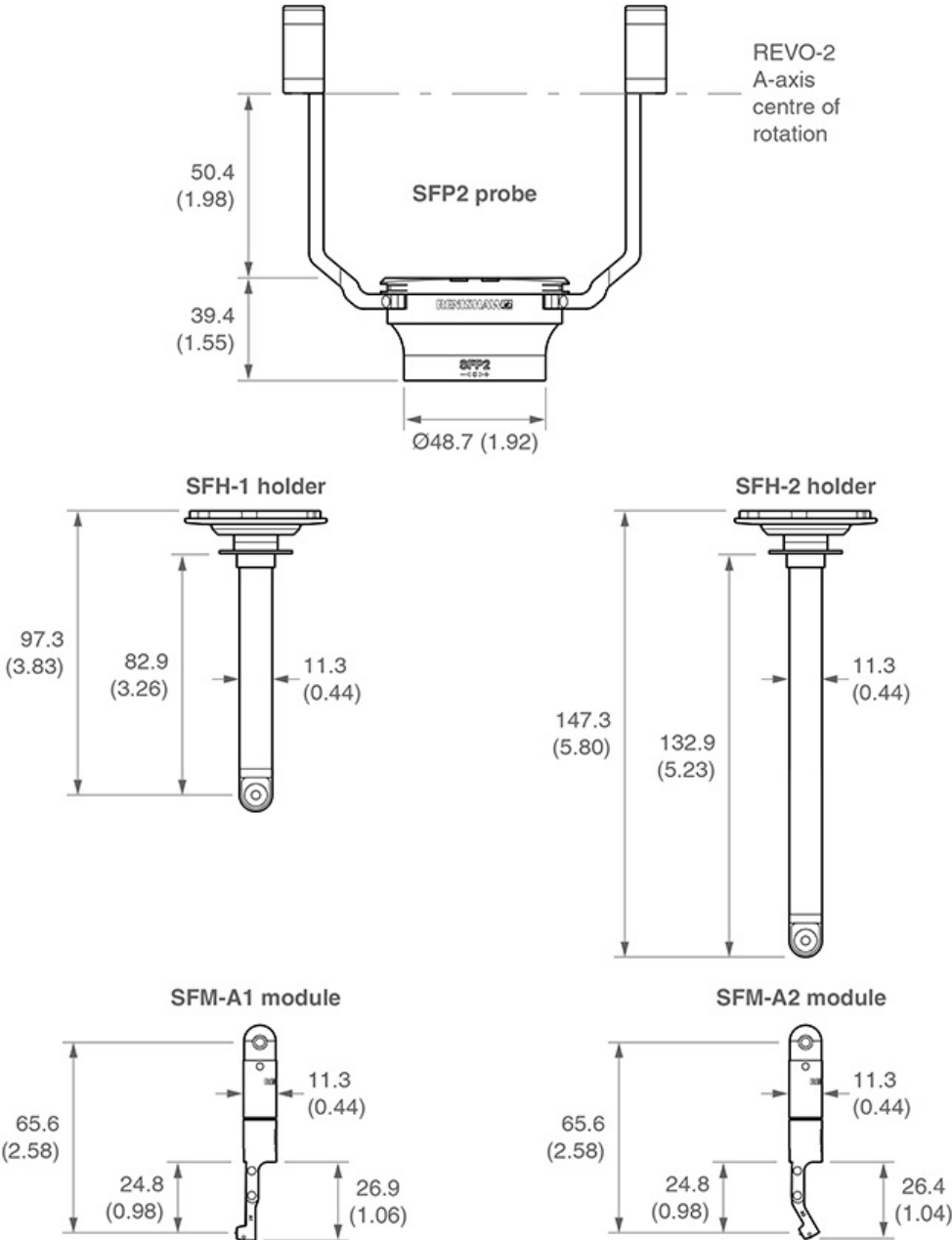
The RCP TC-3 is powered by a separate power supply that is supplied by Renishaw.

No other additional power supplies are required.

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# SFP2 dimensions



**i** NOTE: Dimensions in mm (in). Overall dimensions are to the kinematic planes.

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# Manually mounting / removing the module holder from SFP2

To manually mount or remove the module holder from the SFP2 you need to:

1. Align the front of the probe with the stylus (look at the "Renishaw" engraving on the side of probe or alignment marks as applicable).
2. Carefully align the module holder and the probe, allowing the magnetic attraction to gently connect the kinematic joints.
3. Gently rotate the module holder to ensure correct location.
4. To remove, securely hold the module holder, gently tilt the module holder to break the kinematic joint.



**i** **NOTE:** Manually mounting the module holder may compromise the repeatability of the tip position so is not recommended.

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# Manually mounting / removing the SFP2 probe from REVO

To manually mount or remove the probe from the REVO head you need to:

1. Align the front of the head with the probe (look at the "Renishaw" engraving on the front of probe or alignment marks as applicable).
2. Carefully align the probe to the head, allowing the magnetic attraction to gently connect the kinematic joints.
3. Gently rotate the probe to ensure correct location.
4. To remove, securely hold the probe and gently tilt to break the kinematic joints.



**WARNING:** Avoid touching the probe (including counter balance arms), stylus holders and other modules when the REVO-2 head LEDs are both green and the head is ready for measurement. Green LEDs indicate that the head is engaged and the controller has a valid probe calibration.

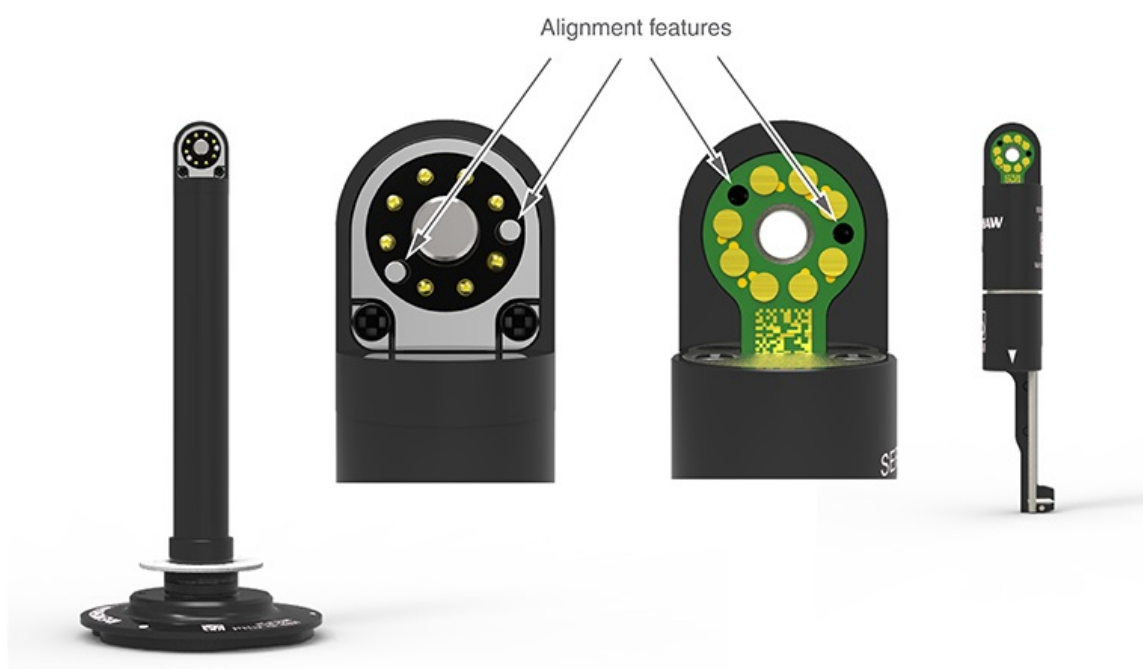
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# Assembling SFH holders and SFM modules

The SFH holder and SFM modules are supplied as separate items and need to be assembled before use:

1. Bring the SFH holder and SFM module together making sure that the alignment features are correctly mated.



**WARNING:** Ensure alignment pins are correctly located before tightening the joint.

2. Use the supplied 2 mm hexagonal wrench to tighten the joint using a torque of 0.4 Nm to 0.5 Nm.



**WARNING:** Avoid overtightening this joint.

3. Use the MST setting tool to adjust the knuckle angle to the required angle (see 'Using the module setting tool').

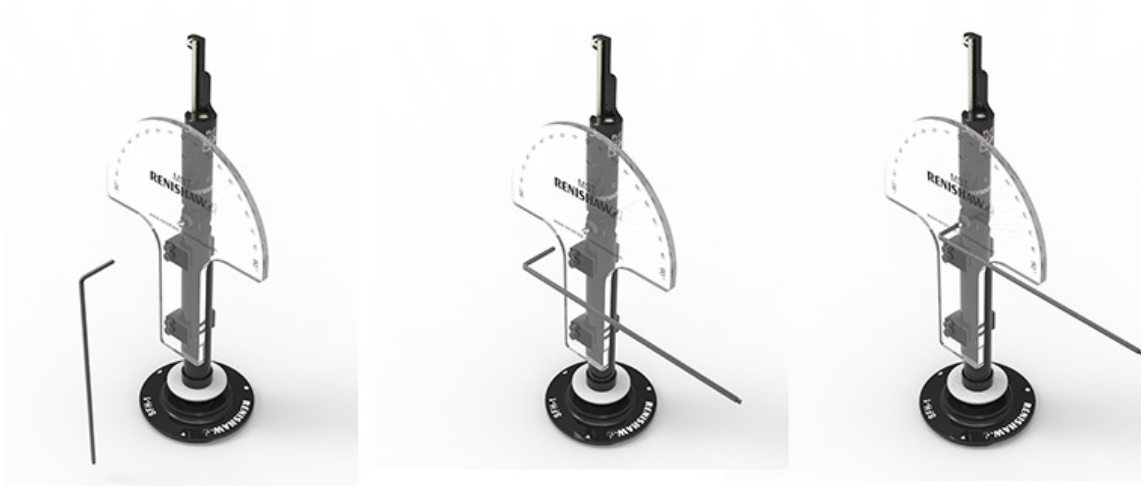
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# Module setting tool (MST)

## Using the module setting tool

1. Place the SFH holder within the MST clips so that the knuckle adjustment screw is accessible via the hole in the MST.



2. Pass the 2 mm hexagonal key through the hole and loosen the knuckle joint enough to freely move the SFM module.
3. Position the SFM module to the required angle using the alignment mark as a guide.

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4. Tighten the knuckle joint using a torque of 0.4 Nm to 0.5 Nm, then remove the MST from SFH holder.



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# SFP2 calibration

Calibration of the SFP2 system is done for several reasons:

- To map the rotation of the probe's C-axis.
- To calibrate the SFH holder and SFM module geometry (including the knuckle angle)
- To set the gain of each SFM module

There can be many different holder / module configurations attached to an SFP2. Each arrangement must have its SFM module geometry calibrated and sensor gain found. However, the probe's C-axis only needs calibrating once, and is good for all the SFH holders and SFM modules. This mapping of the C-axis is applied together with the head and probe corrections.



Mapping of the C-axis and calibration of the holder / module configuration geometry requires use of the TFP tip find probe with a TP20 LF low force module, which is mounted to an MRS or MRS2 system.

The probe's C-axis, and one holder / module configuration can be calibrated in the same operation. Points will be taken on the SFH holder at three different C angles and then points will be taken on the SFM module.

**NOTE:** If the probe's C-axis is remapped, all the module calibrations will be considered out of date and will require recalibration.

Any additional holder / module configurations require a module calibration routine which is a shortened calibration that takes one set of points on the SFH holder at a specific C angle and points on the SFM module.

Setting the sensor gain requires the SFA1-3.0 SIN calibration plate. The calibration plate can be attached to an MRS / MRS2 rail or an MRS2 leg. The gain calibration routine is run from UCCserver. The part of the plate scanned during calibration is randomly set to minimise wear of the plate.

In addition to the SFA1-3.0 SIN calibration plate, there is an SFA2-0.5 SIN artefact to verify the linearity of the module if required. There is also an SFA3-0.4 ST plate which is used to identify damage to the 2 µm radius diamond tip of the stylus.

These last two items are for use by the client software as required.

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### Calibration summary

#### Calibration of probe and first holder / module configuration

Function	Artefact	Pre-requisites	Status
Probe's C-axis mapping Holder / module geometry calibration	TFP	None	Configuration not yet available for use.
Sensor gain calibration	Calibration plate artefact (SFA1 - 3.0 SIN)	Probe's C-axis mapping and holder / module geometry calibration	Configuration can now be used.

#### Calibration of additional holder / module configurations

Function	Artefact	Pre-requisites	Status
Holder / module geometry calibration	TFP	Probe's C-axis mapping	Configuration not yet available for use.
Sensor gain calibration	Calibration plate artefact (SFA1 - 3.0 SIN)	Probe's C-axis mapping and holder / module geometry calibration	Configuration can now be used.

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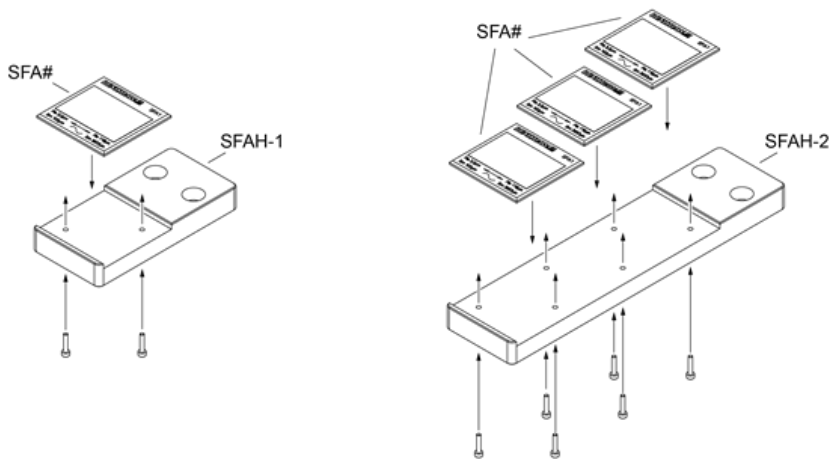
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# Fitting the SFA to the MRS2 rail / leg

The SFAs are designed to be fitted onto the Renishaw modular rack system.

It is recommended that they are attached to the MRS2 rail using the following procedure, where it is assumed that the MRS2 system is correctly installed. For full details, please refer to the MRS2 modular rack system installation guide (Renishaw part number H-1000-5255).

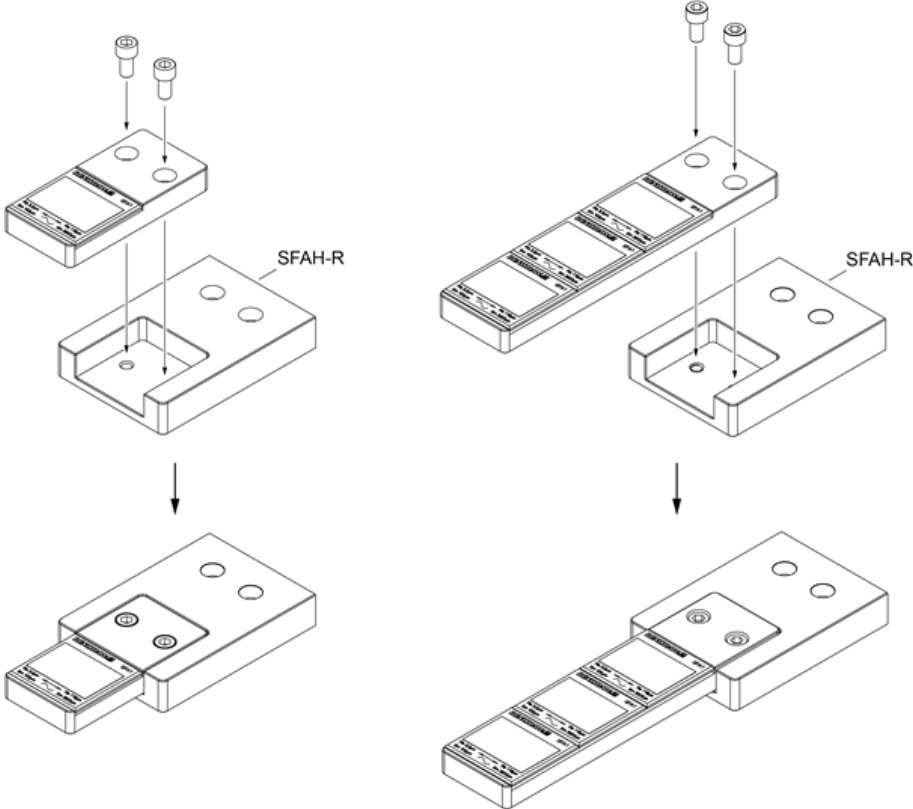
1. Place the SFA artefact within the slot of the SFAH holder. When the holes are aligned use a 1 mm hexagonal key and two M2 × 10 screws to secure the SFA within the SFAH.



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2. Slot the holder into the SFA extension plate, align the holes and fasten together using a 5 mm hexagonal key and two M6 × 12 screws.



**i** NOTE: This angle selection allows for calibration to be completed with all surface finish module types.

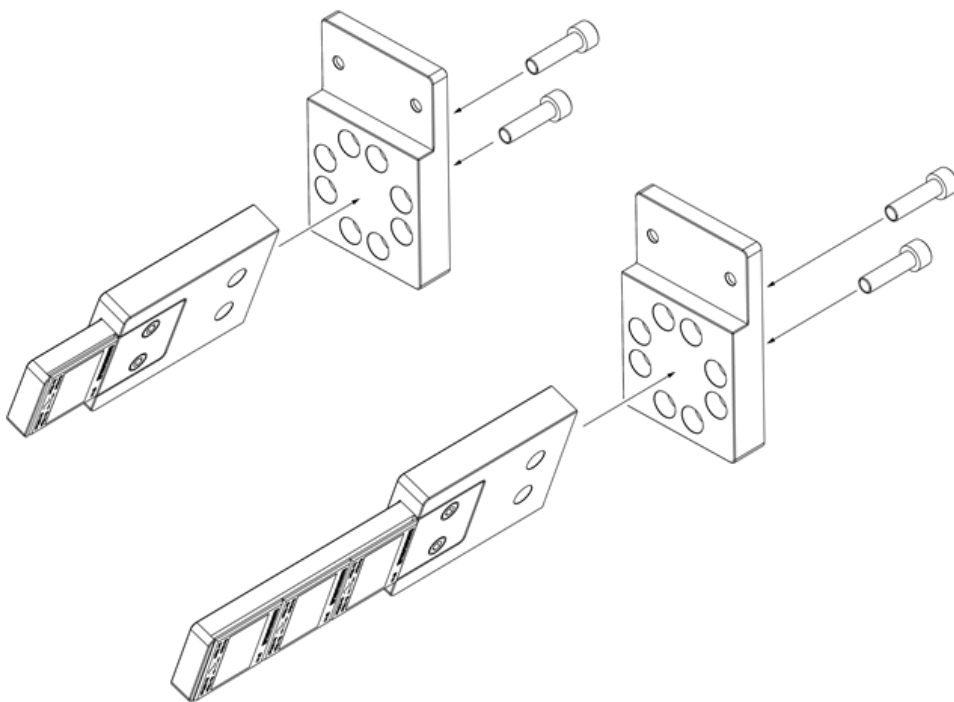
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3. The resulting assembly can now be attached to an MRS2 rail or leg using the SFAH-M calibration mount. The SFAH-M has a hole pattern that enables the calibration artefact to be orientated at the following angles; 20°, 70°, 110°, 160°, 200°, 250°, 290°, 340°.

The ability to adjust the orientation of the artefacts means that all surface finish modules, and associated geometries, can be calibrated.

To attach the assembly to the SFAH-M component, align the holes accordingly then use a 6 mm hexagonal key and two M8 × 30 screws to fasten in place.



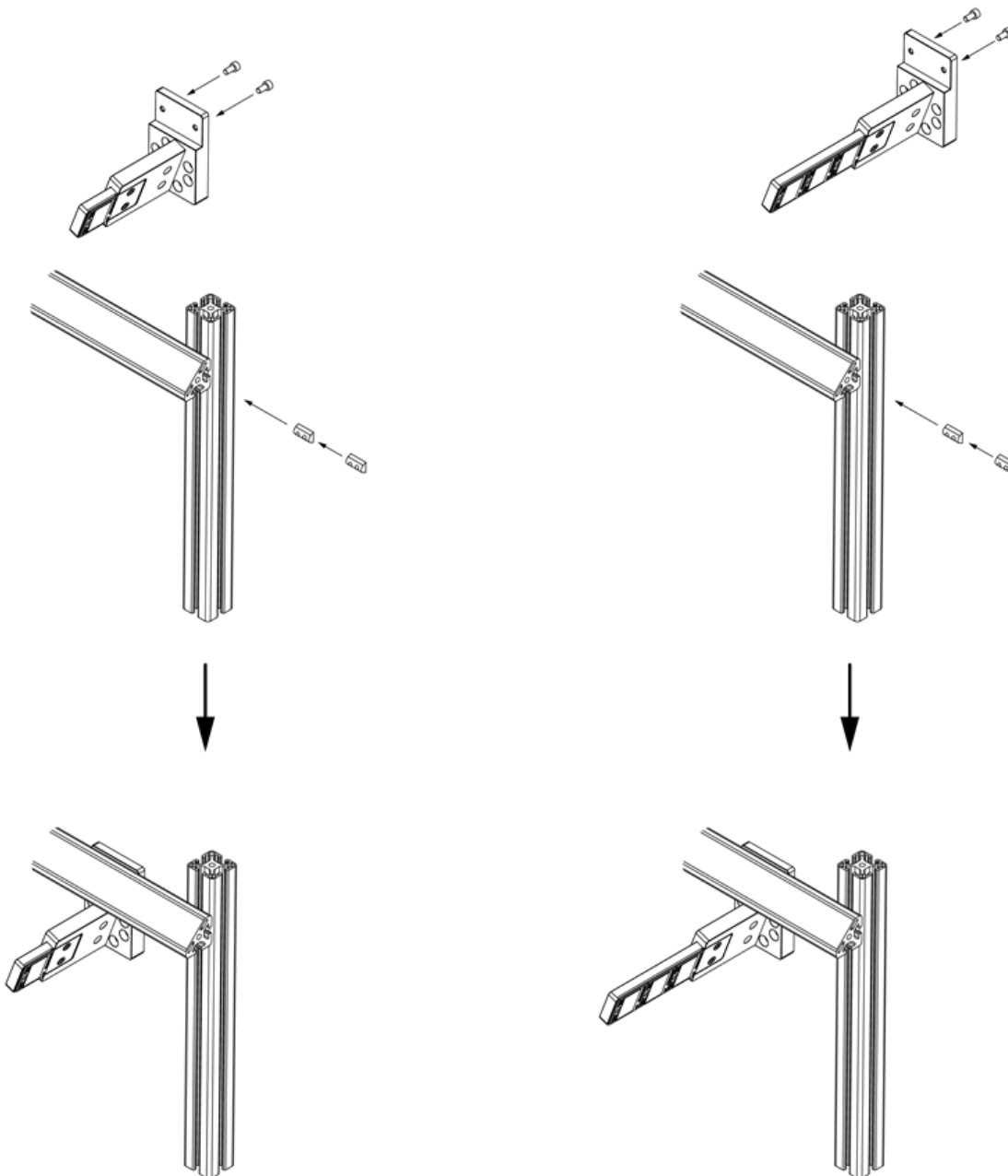
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### Installing the artefact assembly onto the MRS2 rail / leg

When satisfied with the plate set-up, position two M6 D-nuts as desired within the MRS2 rail or leg. Pass the M6 × 12 screws through the universal calibration plate, align with previously placed D-Nuts and then fasten using a 5 mm hexagonal key.

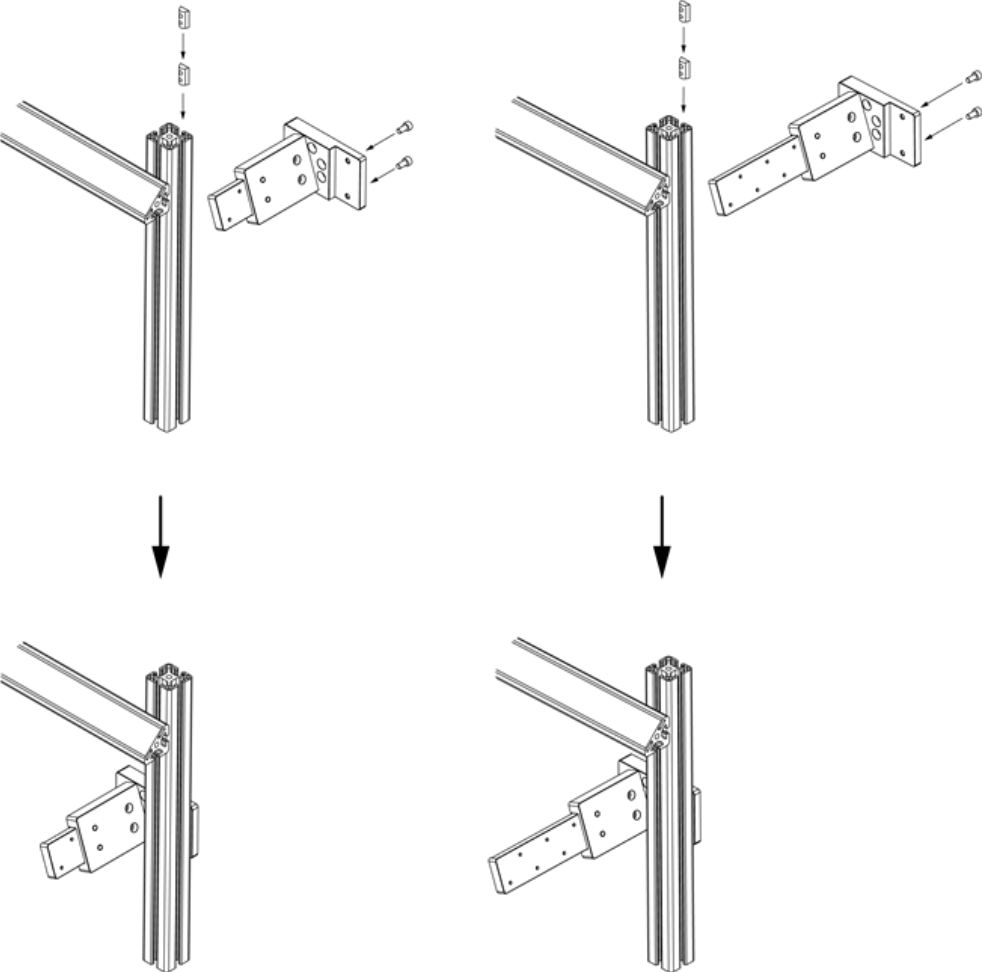
#### Fitting to the MRS2 rail



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## Fitting to the MRS2 leg

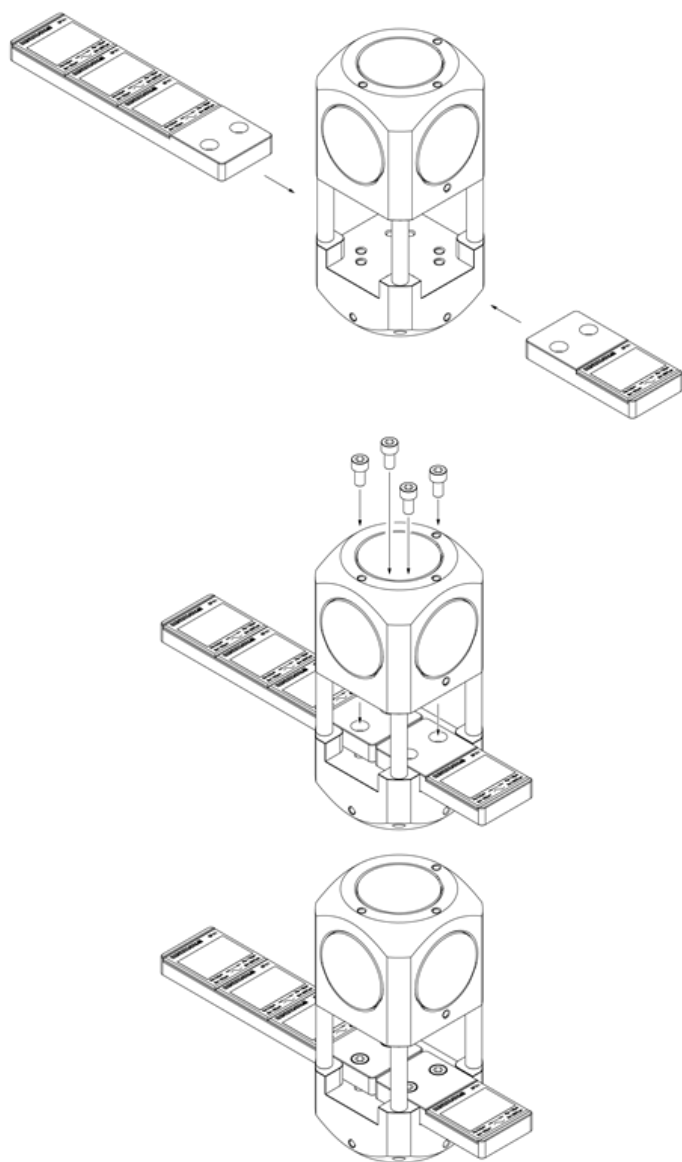


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### Fitting the SFAH-1 / SFAH-2 to the OFA

1. Align the SFAH-1 / SFAH-2 with the appropriate mounting holes of the OFA and secure each one using 2 M6 × 20 screws and the 5 mm hexagonal key (supplied).



2. The OFA can be fastened to the bed of the CMM using the supplied adaptors.



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# Fitting the TFP to the MRS rail

The TFP is designed to be fitted onto the Renishaw modular rack system.

1. Position two M6 D-nuts as desired within the MRS rail.
2. Use the M6 × 20 mm screws to secure the TFP in place using the supplied 5 mm hexagonal key.
3. The PICS cable PL24 connects from the TFP to the PICS connector on the SPA3 amplifier, UCC BI interface or UCC AI interface according to your installation.

The TFP is supplied with a low force TP20 module which should be used at all times on the TFP.

There are no special functional requirements for the location of the TFP on the rail but it is worth considering the routing of the PICS cable and it is good practice to locate it near to the SFA calibration artefacts. Locating the port is a manual process and care should be taken when using the joystick to avoid collision with the counter balance arms of probes in adjacent ports. Similarly, safe move points should be chosen so that the probe / holder / module configuration has a clear path to the TFP for the calibration process.

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# SFP2 probe change system

The REVO-2 probe change system is designed to allow automatic REVO-2 probe and accessory changing on a CMM. For optimum metrology, SFP2 probes and holder / module configurations should be changed automatically using REVO-2 change ports (RCP TC-3 and RCP2). These ports are mounted on the modular rack system (MRS or MRS2).



**NOTE:** Please refer to the REVO-2 change port system spacing guide (Renishaw part number H-1000-5408) for full details of the recommended spacing for positioning all sensors and artefacts on the MRS / MRS2 rail.

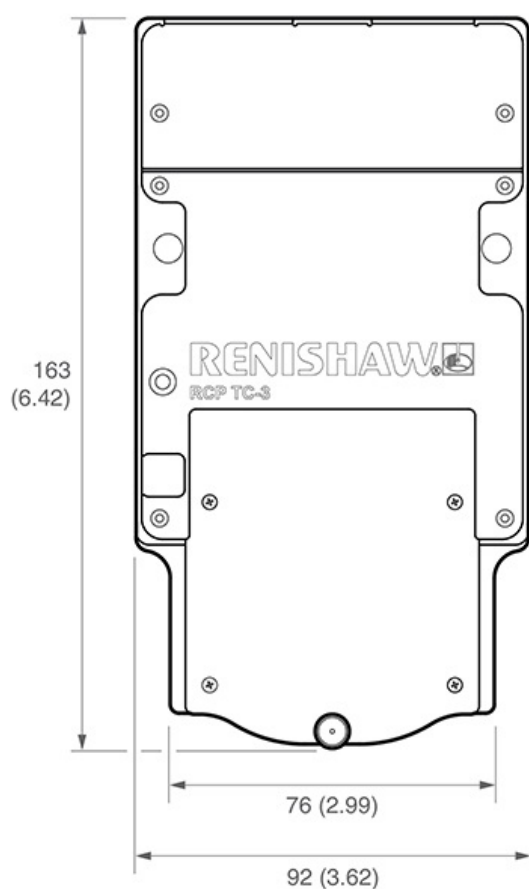
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### RCP TC-3

The RCP TC-3 is a thermally controlled port for changing RSP3-6 and SFP2 probes.

### Dimensions



**i** NOTE: Dimensions in mm (in).

Key features of the RCP TC-3 are:

- Maintains the probe at the operating temperature when not in use, for optimum metrology
- Allows RSP3-6 and SFP2 probes to be rapidly interchanged automatically
- Mounts on the MRS or MRS2 to allow multi-port systems to be created
- Not to be used for changing holder / module configurations, unless it is attached to the SFP2 probe

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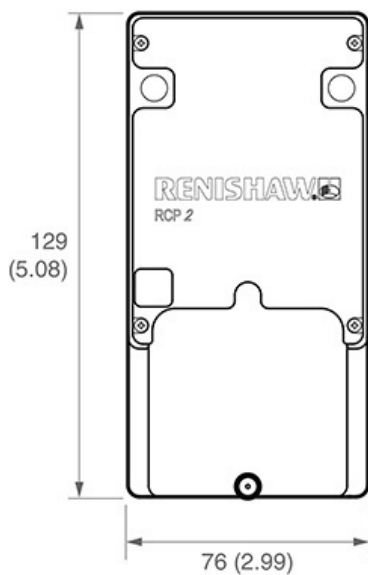
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### RCP2

The RCP2 is configured to change holders for the following probes:

- RSP2
- SFP2
- RSP3-6

### Dimensions



**i** NOTE: Dimensions in mm (in).

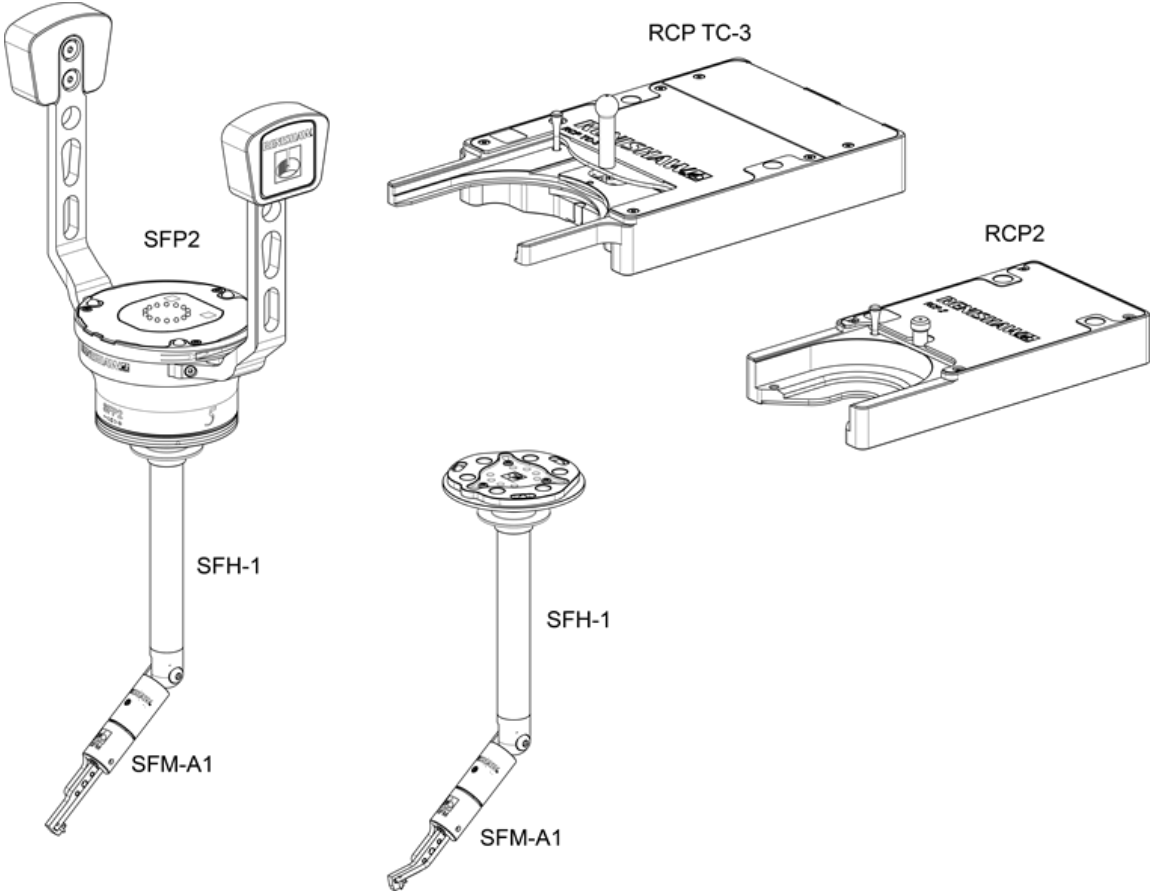
Key features of the RCP2 are:

- Allows RSP2 V2 stylus holders (RSH175 / 250 / 350 / 450 / 500), SFP2 holder / module configurations and RSH3-6 stylus holders (RSH3-6#) to be rapidly interchanged automatically
- Mounts on the MRS or MRS2 to allow multi-port systems to be created
- Not to be used for changing RSH3-1 / 2 / 3 / 4 stylus holders or REVO probes

**i** NOTE: Please observe the orientation of the probe in the RCP TC-3.

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**i** **NOTE:** The stylus tool is used to keep the port lid open during calibration. It must be removed for normal operation. Holder / module configurations should not be manually fitted to the RCP2.

	RCP2	RCP TC-3
SFP2	X	✓
Holder / module configurations	✓	X

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# Put down and pick up routines for RCP TC-3 and RCP2

The following routines are handled through UCCserver for RCP TC-3, RCP2 and FCR25:

- Alignment routine
- Put down and pick up routine
- Safe position

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# Connecting RCP TC-3 to PSU

Using a PSU other than the one supplied by Renishaw is not recommended.

DC extension cables are available for the PSU but the length should not exceed 15 m otherwise the performance can be affected.

It is possible to power up to four RCP TC-3 ports with one PSU using the daisy-chain technique shown below. RCP TC-3 ports can be arranged in any sequence on a rail.



**NOTE:** Nothing other than RCP TC-# should be connected to the PSU. No more than four RCP TC-# units can be powered from one PSU. No more than one PSU should be connected to a daisy chain of ports. RCP TC-#s need to be next to each other on the MRS2 rail for daisy chaining. Power can be connected to either end of the daisy chain. Turn off or disconnect the mains supply to the PSU before fitting dc power cables to the ports.

## Spares

Part description	Renishaw part number
DC daisy-chain cable	P-CA82-0019
DC extension cable (1.5 m)	A-3060-0016
RCP TC-# PSU	P-EA02-0021
DC extension cable (5 m)	A-3060-0017
DC extension cable (10 m)	A-3060-0018

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# RCP TC-3 switch settings

The temperature can be set using the rotary switch on the rear of the RCP TC-3:



## RCP TC-3 switch settings

Position	Description
0 - 3	Reserved for future use
4 (factory set)	Suitable for specified system ambient temperature
5 - 9	Reserved for future use

**NOTE:** Please do not change the settings without contacting your supplier.

**CAUTION:** This unit is not sealed. Please do not insert anything into the gaps under the port lid as it can cause damage to internal components within the product.



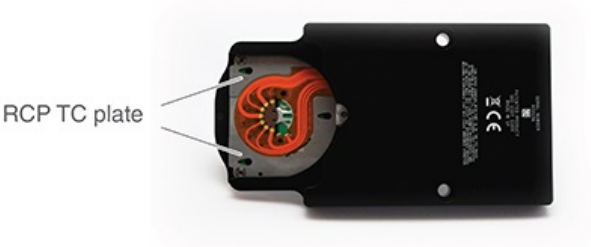
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## RCP TC-3 LED status indication and troubleshooting

LED	Status	Troubleshooting
Green	Power on, probe present, temperature within target	n/a
Flashing green	Power on, probe present, temperature outside of target	Wait for the rack to reach stable temperature.
Amber	Power on, probe not present, temperature within target	If the probe is present, clean the port and probe contacts.
Flashing amber	Power on, probe not present, temperature outside of target	If the probe is present, clean the port and probe contacts. Wait for the rack to reach stable temperature.
Flashing red	Error	Cycle power to restart. If the problem persists, contact your supplier.

**WARNING:** The RCP TC-3 plate may be hot.



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# SFP2 maintenance

**CAUTION:** Always refer to the 'Safety' and 'Warnings' sections of this guide. Failure to do so could lead to personal injury.

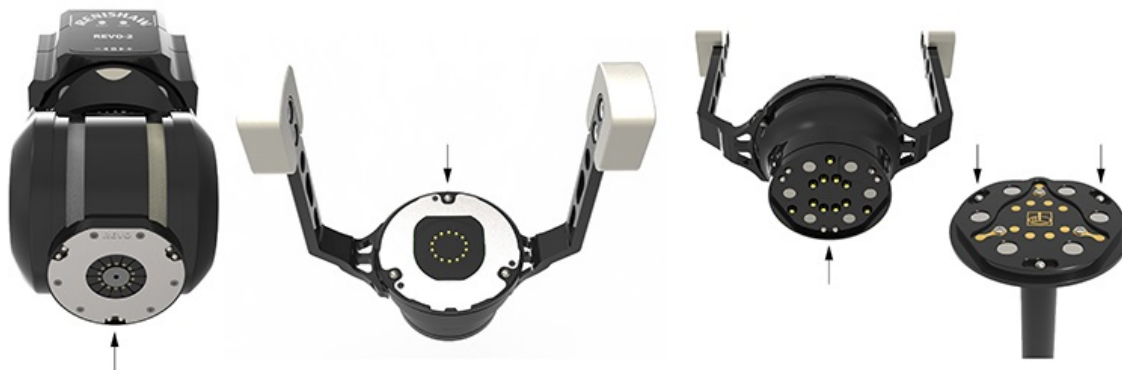
Following the simple procedures given below will prolong the operational life and maintain the high performance of the system. The user should determine the frequency of inspection and maintenance actions according to the conditions of use.

All system components should be cleaned using a soft, lint free cloth and must be kept dry.

## Kinematic couplings

The kinematic coupling mechanisms incorporated throughout the system have precision ball seating and permanent magnets. It is recommended that all these features be cleaned before first use, and thereafter at regular intervals.

A cleaning kit for the precision ball seating and permanent magnet is available from your Renishaw supplier (part number A-1085-0016). It comprises strips of 'yellow tack' material. Use the yellow tack to clean the areas indicated with arrows on the image below.



With clean hands, tear off a small piece, shape into a small ball and press into / onto each of the features in turn, rotating to a fresh piece of material as you work around.

**CAUTION:** Ensure no yellow tack debris is left on the surface. The yellow tack should not be used for electrical contacts.

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### Electrical contacts

The electrical contacts, indicated with arrows in the image below, should be carefully cleaned with an alcohol-based cleaner (e.g. IPA) and a lint-free cloth.




The frequency of cleaning depends on the local environment conditions, but should be at least every 500 changes.

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# SFP2 rack port maintenance

 **CAUTION:** Always refer to the 'Safety' and 'Warnings' sections of this guide. Failure to do so could lead to personal injury.

Periodic cleaning of the ports, lids and outer surfaces using a soft, lint free cloth is recommended to prevent contamination of stored probes and modules.

A port replacement kit for FCR25 is available to allow the user to service ports should they become worn or damaged (Renishaw part number A-5036-0049).

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# SFM care and maintenance

The SFM-# modules are sensitive measuring devices and should be handled with care:

- Avoid dropping the SFM modules or colliding with workpieces or parts of the CMM structure
- Particular care should be given to the stylus tip. Avoid contact with the stylus unless it is being used for measurement
- Visually examine the stylus tip for accumulation of dirt or dust
- Ensure measurement surfaces are dry and clear of debris before being inspected with SFP2

If the SFM module is suspected of giving poor performance, or if the module has been used on unclean surfaces:

- Gently wipe the skid with a lint free cloth to remove any loose debris
- Using an air duster, briefly apply a clean air jet to the stylus tip to remove any contamination around the skid contact point and diamond tip. Support the stylus to prevent over-deflection.
- If badly contaminated with oil or grease, immerse and gently agitate the skid and stylus tip in clean alcohol and blow dry with a clean air jet. Use an air duster for this purpose, not an industrial airline. Again, ensure that the stylus is supported when using the air duster.



**NOTE:** The SFM surface finish modules are consumable items subject to wear. The system has the ability to check the module condition. Please contact your local Renishaw office to arrange stylus repair or module replacement via RBE.

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# SFA maintenance

Periodically visually inspect the SFA plates for scratches and wear, and replace if necessary. Cleaning with a lint free cloth at regular intervals is recommended.

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