User guide

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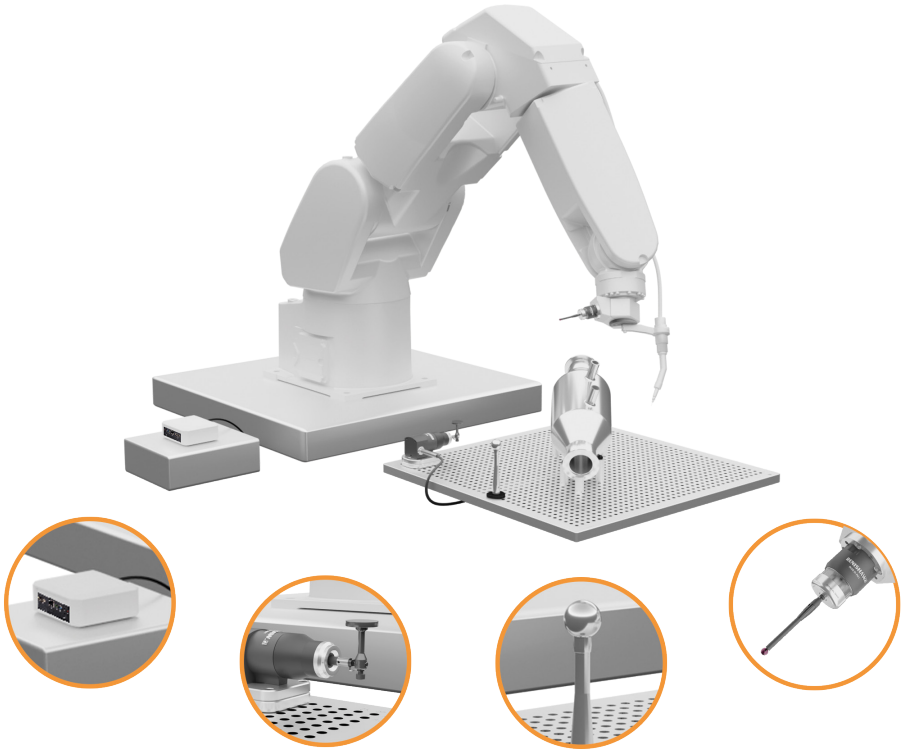
RCS P-series



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Contents

Legal information

Warranty

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.

Equipment and/or software purchased by you from a third-party supplier is subject to separate terms and conditions supplied with such equipment and/or software. You should contact your third-party supplier for details. If you purchased the equipment from any other supplier, you should contact them to find out what repairs are covered by their warranty.

Packing material

Packaging component	Material	94/62/EC Code	94/62/EC number
Outer box	Non-corrugated fibreboard	PAP	21
Bag	Low density Polyethylene	LDPE	4

Renishaw software EULA

Renishaw software is licensed in accordance with the Renishaw licence at: **www.renishaw.com/legal/en/software-licence-agreement--47112**.

This product also contains third-party software from dotnet which is subject to the following licence:

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Regulations and conformance

Regulatory information for each RCS P-series product can be found within the individual product Installation guides. These can be found at: **www.renishaw.com/rcs-support**.

Intended use

The intended use of this equipment and accompanying software is to improve the accuracy and repeatability of industrial robots and any associated equipment. There are risks associated with installation and activities undertaken within the hazard zone of robotic machinery and other hazardous equipment. These risks should be fully considered and managed down to an acceptable level by the user.

Safety

WARNING: To ensure the safety of the user and other personnel in the vicinity, it is recommended that a comprehensive risk assessment of the robot system under test is carried out before starting.

The risk assessment should be carried out by qualified users (requiring machine competency, application technical knowledge, and advice from a trained risk assessor) with consideration for the safety of all personnel. The risks identified must be mitigated prior to using the systems. The risk assessment should pay particular attention to robot system movement (in both manual and automatic modes), manual handling, and electrical safety.

CAUTION: Refer to individual Installation guides for list of user serviceable parts.

Ensure that you have read and fully understood the RCS P-series User guide before using the devices.

NOTE: Appropriate safety wear must be worn during installation and operation of the product within a robotic cell.

Electrical and power safety

- The RCS P-series RPU should not come into contact with fluids at any time.
- The RCS P-series RPU can be powered by the robots power supply or an external power supply. See the appropriate RPU Installation guide for further details.
- Never connect any part of the system to devices that are not intended to be used as part of the RCS P-series.
- The RCS RMI-QE and hard-wired probe, or any wired device, must be wired into the electrical panel before use. This task must be performed by a competent person and, prior to doing so, they must first confirm that the electrical panel is made safe.

Mechanical safety

- Be aware of trip hazards that may be created between the cables of the RCS P-series, interface modules and the laptop or desktop computer.
- Exercise caution if the system is mounted to an external axis that moves or rotates. Beware of cables becoming entangled.
- If operating the robot system with guards or any safety features removed or disabled, it is the responsibility of the operator to ensure that alternative safety measures are taken in line with the operating instructions for the robot system or relevant codes of practice.
- If operating the robot system within a guarded cell, it is the responsibility of the operator to ensure safe practice is followed.

Transmission systems

Radio

Certain variations of the RCS P-series kits contain devices which utilise radio transmission systems.

The RCS P-series devices comply with FCC regulations and operate in the 2.4 GHz band. They deliver interference-free transmission through the use of hybrid FHSS (frequency-hopping spread spectrum) technology, which allows multiple systems to operate in the same machine shop without risk of cross-interference.

The robot and its control system will be exposed to these radio transmissions.

The user must ensure that the use of this Renishaw equipment, when in close proximity to the industrial robot and other equipment, will not cause hazards, particularly from unintended motion.

Optical

Certain variations of the RCS P-series kits contain devices which utilise forms of optical transmission.

These products contain LEDs that emit both visible and invisible light. Renishaw recommends that you do not stare at or look directly into any LED device.

Cleaning and maintenance

Datum balls

Prior to use, check all datum balls are clean and undamaged. To order replacement balls at any time, contact your local Renishaw representative.

Probes

It is important that the probe stylus is kept clean. A Renishaw cleaning kit can be purchased separately.

Liquids or dust accumulating on the RCS R-PK1, RCS O-PK1, RCS RMI-QE or RCS OMI-2 may have a detrimental effect on transmission performance.

RPU

Do not clean the RCS RPU device with liquids. Use a dry cloth to remove dust regularly.

If one of the following occurs, have the equipment checked by service personnel:

- The power cord is damaged.
- Liquid has penetrated the equipment, or it has been exposed to moisture.
- The equipment is malfunctioning or does not operate according to the user guide.
- The equipment has been dropped or damaged.
- The equipment shows obvious signs of breakage.

Further dismantling and repair of Renishaw equipment is a highly specialised operation which must be carried out at an authorised Renishaw Service Centre. Equipment requiring repair or attention under warranty should be returned to your supplier.

RCS P-series system overview

General system functionality

The RCS P-series offers hard-wired, radio, and optical probing solutions for robot cells; in combination with analysis tools, bespoke robot macros, and teach pendant applications.

The dedicated RCS probing server improves robot accuracy, utilising proven Renishaw expertise in geometry and machine calibration to precisely locate tool and part frames within automated systems.

The combination of hardware and software increases the precision of robots, automates their set-up, measures drift over time, and allows for easy recovery. An RCS P-series set-up enables you to:

- Calibrate the touch probe TCP and diameter.
- Locate a part frame.
- Best fit basic geometrical features such as planes, cylinders, or spheres.
- Inspect the relative orientation and position between these features.
- Calibrate a spindle axis, tool length and diameter.

General system set-up

Overview

An RCS P-series system comprises a combination of probes, tool setters, probing software, and controllers which can address a wide range of automation set-ups for a robot. Each RCS P-series set-up is individual to your specific robot cell; however, Figure 1 demonstrates a typical set-up, including:

1. Probe (hard-wired or wireless with receiver)
2. Tool setter (hard-wired or radio)
3. Licensed RCS probing server
4. Datum sphere

Positioning

When installing the RCS P-series datum sphere and tool setter, consider appropriate placement of these devices within the robot's reach. Ensure there is adequate clearance for movement which won't interfere with other components within the robot cell. The RCS P-series probe is designed to be robot mounted and work alongside any end-of-arm tooling. Its positioning should therefore take into consideration the application tooling and enables efficient probing of the work piece or part.

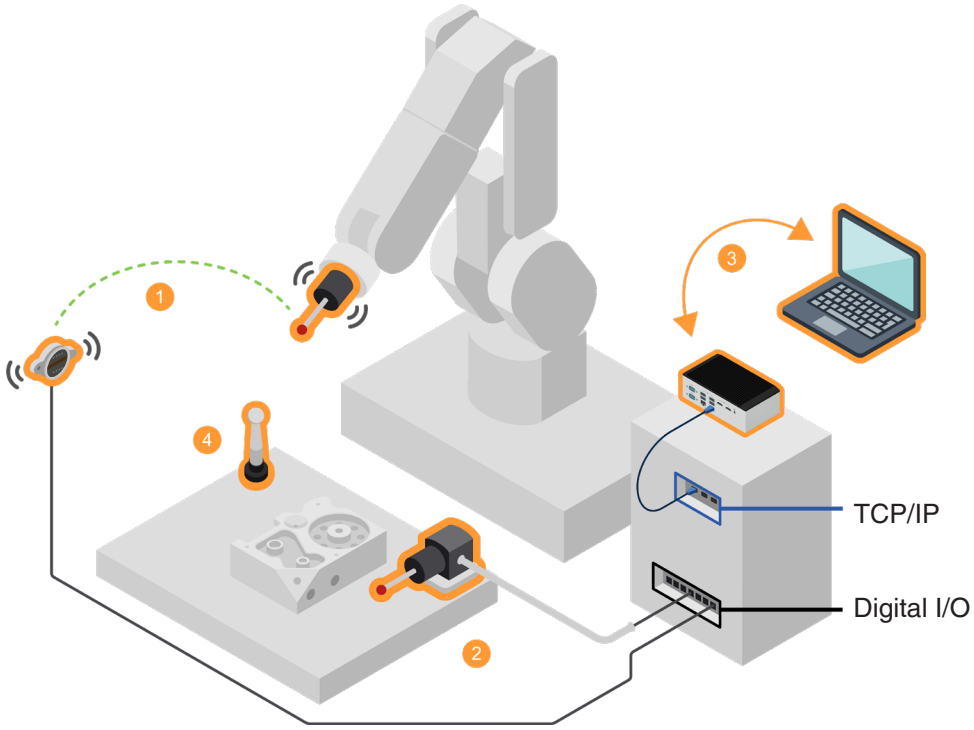


Figure 1 RCS P-series system set-up example

NOTE: All interfaces will connect via digital I/O but probe to receiver communication will vary between radio, optical, and wired devices.

Tools required

The following tools are required for the installation of the RCS P-series:

- Hex keys
- Bootlace ferrule crimps
- Small side cutters
- Small flat head screwdriver
- Cross head screwdriver
- Tape measure

Specialist tools for Renishaw probes and tool setters are included in the product packaging.

NOTE: You will need access to a computer system to set up RCS P-series.

RCS probing server licensing

To communicate with the robot, the RCS P-series uses the RCS probing server application. This application can run on an RCS RPU or your own computer system.

To perform any RCS P-series action you will need a licence, supplied on a USB dongle. The core licence must be present during operation for the RCS probing server to function.

Additional licences can be bought, these include:

- RCS Advanced probing
- RCS Spindle calibration

The RCS Advanced probing licence allows computation of complex alignments. The RCS Spindle calibration licence can be used to calibrate spindles in five degrees of freedom (DoF).

Activating additional licences

Additional licences should be installed by the customer using Renishaw Licence Manager. Your unique licence details and how to apply them to the dongle are given in the email sent to the customer upon purchase (**licensing@renishaw.com**). This email contains your 'Entitlement ID' which is required for the licence activation process.

Further guidance can be found within the RCS RPU Installation guide or **www.renishaw.com/rcs-support**.

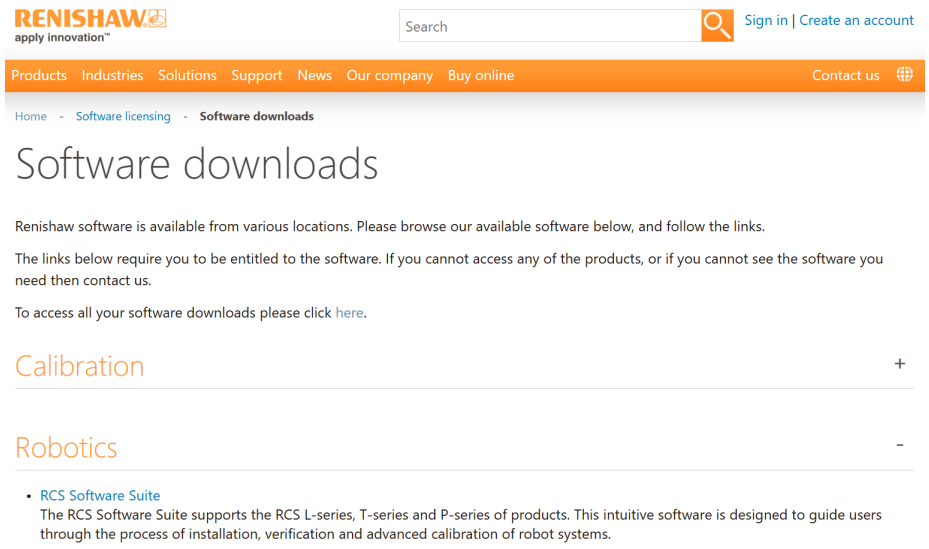
RCS Software Suite

The RCS Software Suite enables the configuration of simple and complex alignments using CAD or nominal surface data. It provides assisted robot templates for tool and part frame alignments.

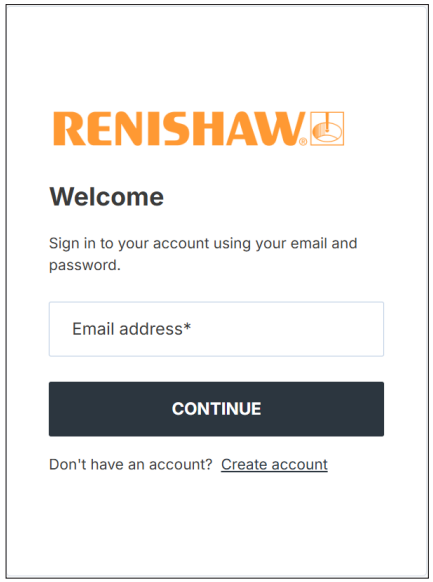
Software download

To download the RCS Software Suite visit: **www.renishaw.com/softwarelicensing**.

1. Scroll down to 'Robotics' and select the **RCS Software Suite**.



2. Sign in using your email address.



3. If you do not have an account, click **Create account**.
4. Download your required software applications.
5. For more information on licensing software, visit Licensing User guides at **www.renishaw.com**.

Probe set-up

Hard-wired probe positioning

To get the best usage from your hard-wired probe, select a sturdy bracket or fixture to securely attach the probe to the robot. Take into consideration shock absorbing or vibration dampening.

Ensure the probe is within the robot's optimal range and does not interfere with any end of arm tooling. For good practice the probe should be positioned on the robot allowing accessibility for maintenance and calibration. Once mounted, ensure that the probe's cables avoid entanglement and do not obstruct the robot's movement.

Refer to the RCS PK1 Installation guide for more detailed assistance on installation (Renishaw part no. H-6967-8000).

Radio probe positioning

The probe system should be positioned so that the optimum range can be achieved over the full travel of the robot's reach. Always face the front cover of the RCS RMI-QE in the general direction of the robot and its working volume, ensuring both are within the performance envelope shown. To assist in finding the optimum position of the RCS RMI-QE, the signal quality is displayed on an RCS RMI-QE signal LED.

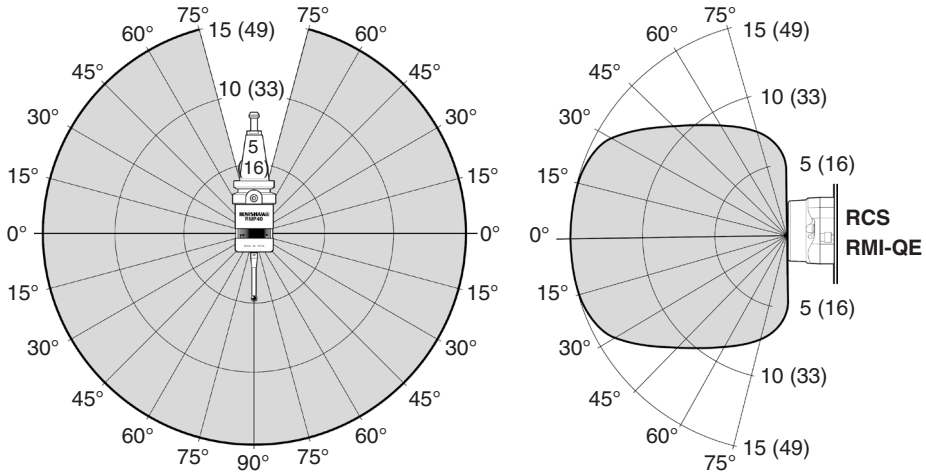
Refer to the RCS R-PK1 and RCS RMI-QE Installation guides for more detailed assistance on installation (Renishaw part no. H-6967-8001 and Renishaw part no. H-6551-8520).

Radio probe operating envelope

Radio transmission does not require line of sight between the probe and transmitter and will pass through most objects. This allows easy installation on the robot, as long as the probe and RCS RMI-QE are kept within the performance envelope shown here.

Fluid residue and debris accumulating on the probe may have a detrimental effect on transmission performance. Wipe clean as often as is necessary to maintain unrestricted transmission.

When operating, do not cover the probe glass window with your hands, as this will affect performance.



Typical plot at +20 °C (+68 °F)
Transmission range in m (ft)

Operating and switch-on / switch-off

Optical probe positioning

When installing the RCS O-PK1, consider placing it in a location that allows efficient probing of your work piece or part. Ensure it has adequate clearance for movement and doesn't interfere with other components in the robot cell.

Refer to the RCS O-PK1 and RCS OMI-2 optical equipment installation guides for more detailed assistance on installation. (Renishaw part no. H-6967-8002 and Renishaw part no. H-5191-8504).

WARNING: Ensure the robot is in a safe condition and power is disconnected before removing covers. Only qualified persons should adjust switches.

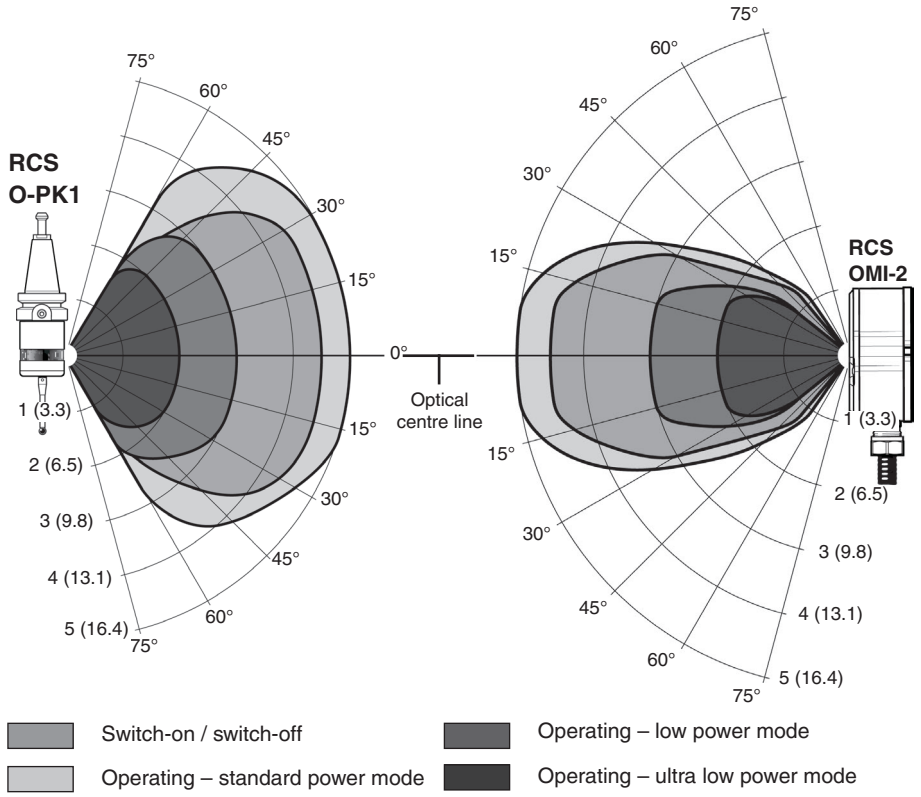
CAUTION: If two systems are operating in close proximity to each other, take care to ensure that the signals transmitted from the RCS O-PK1 on one robot are not received by the receiver on the other robot. When this is the case, it is recommended that the RCS O-PK1 ultra-low power setting is selected.

Optical probe operating envelope

Natural reflective surfaces on the robot may increase the signal transmission range.

For best performance, ensure that the RCS OMI-2 receiver is mounted in a position which is not directly in front of a light source.

Fluid residue and debris accumulating on the probe, interface, or receiver windows will have a detrimental effect on transmission performance. Wipe clean as often as is necessary to maintain unrestricted transmission.



Typical plot at +20 °C (+68 °F) Transmission range in m (ft)

Datum sphere installation

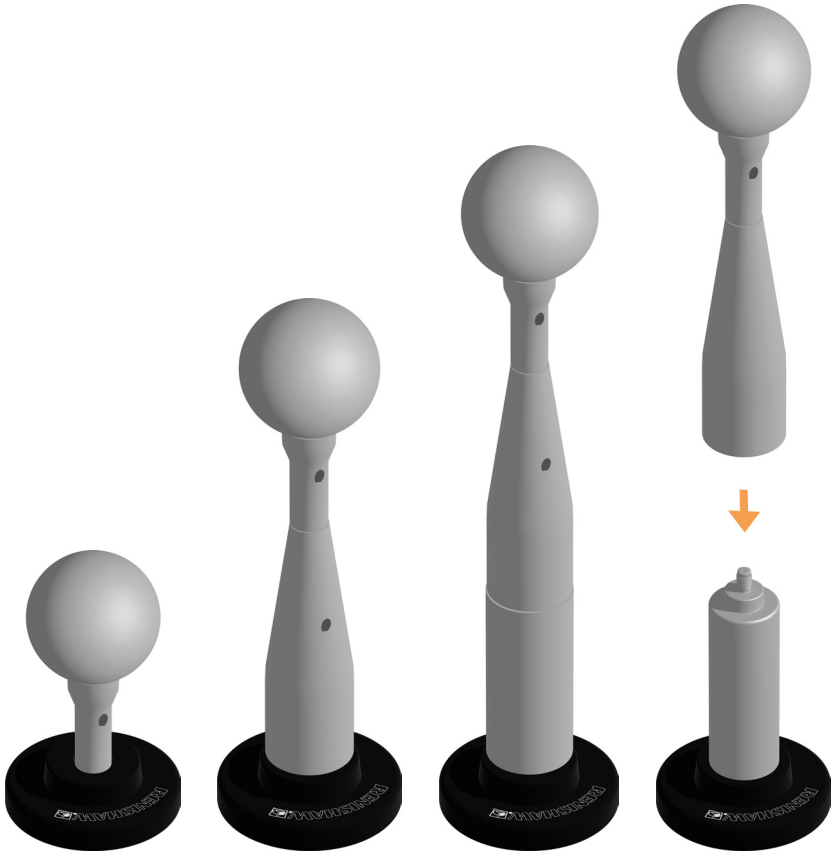
The datum sphere assembly can be attached to fixtures to calibrate a robot-mounted probe. The datum sphere assembly can also be mounted directly to a robot to calibrate a tool setter probe.

Fixture attachment

1. Choose the appropriate sized thread adaptor for your set-up. Screw the datum sphere base mount directly onto a threaded fixture plate.

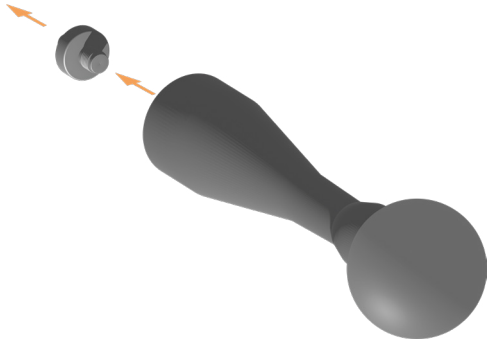
2. Use the supplied spanner to tighten the thread adaptor.

3. There are three options for datum sphere assembly, depending on the height of pillar required. Each extension screws into the next. Once connected, the datum sphere is now ready to be used.



Robot attachment

To attach the datum sphere pillar to a robot, mount the pillar to a threaded hole on the robot using the thread adaptors.



RCS P-series components

	Part name	Description		Part name	Description
1	RCS RPU	Robot processing unit	**11**	RCS Datum ball kit	Datum sphere with adjustable pillar height
2	USB licence key	Dongle containing probing server licence	**12**	RCS PK1	Hard-wired probe
3	RCS R-PK1 F	Radio probe with ISO 9409 bracket mount	**13**	Break stem	Crash protection device for stylus
4	RCS O-PK1 F	Optical probe with ISO 9409 bracket mount	**14**	M4 Stylus L50	50 mm stylus with M4 thread
5	RCS RMI-QE	Radio interface	**15**	M4 Stylus L100	100 mm stylus with M4 thread
6	RCS O-PK1 S	Optical probe with shank mount	**16**	RCS Spindle calibration stem	Spindle artefact – 151 mm
7	RCS R-PK1 S	Radio probe with shank mount	**17**	RCS Spindle calibration stem (small)	Spindle artefact – 75 mm
8	RCS OMI-2	Optical interface and receiver	**18**	Disc stylus	For use with RCS tool setter for spindle calibration
9	RCS TS1	Hard-wired tool setter	**19**	10 mm extension	Extension for stylus measuring 10 mm in length
10	RCS RTS	Radio tool setter			

Refer to the respective device installation guides for product specific user information.

NOTE: Products shown in the above image represent the entire range of RCS P-series devices and hardware and should be used as a reference only.

Further information

Installation guides for the RCS P-series RPU are available at **www.renishaw.com/rcs-support.**

For guidelines on installing the robot macros on different robot systems, refer to specific files available to download at **www.renishaw.com/rcs-support**.

Additional support material is available at **www.renishaw.com/rcs-support**.

If further information is still required, please contact Renishaw support teams at **www.renishaw.com/contact**.

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