

RCS L-series



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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/softwarelicensing/en/activations.

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

The MIT License (MIT)

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Regulations and conformance

EU and UK

Declaration of conformity



Renishaw plc hereby declares that RCS L-series system complies with the essential requirements and other relevant provisions of:

- the applicable EU directives and regulations
- the relevant statutory instruments under UK law
- the full text of the declaration of conformity is available upon request

Safety

In compliance with BS EN 61010-1:2010 the product is safe to use in the following environmental conditions:

- Indoor use only
- Altitude up to 2,000 m
- Maximum relative humidity (non-condensing) of 80% for temperatures up to 31° C, decreasing linearly to 50% relative humidity at 40° C
- Pollution degree 2

RoHS compliance

Compliant with EC directive 2011/65/EU (RoHS)

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.

SCIP

Substances of concern in products (EU waste framework directive).

SCIP numbers can be found at: www.renishaw.com/REACH.

Disposal of waste electrical and electronic equipment



The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, contact your local waste disposal service or Renishaw distributor.

USA

FCC Compliance Statement



47 CFR Section 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, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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.

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 used in accordance with this user guide, 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.

Supplier's Declaration of Conformity

47 CFR § 2.1077 compliance information

Unique Identifier: RCS L-series

Responsible Party – U.S. Contact Information

Renishaw Inc.

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West Dundee

Illinois

IL 60118

United States

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Email: usa@renishaw.com

US Government notice

NOTICE TO UNITED STATES GOVERNMENT CONTRACT AND PRIME CONTRACT CUSTOMERS.

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Canada

EMC

ICES-01 (Canada only)

This ISM device complies with Canadian ICES-003(A) / NMB-003(A).

Cet appareil ISM est conforme à la norme ICES-003(A) / NMB-003(A) du Canada.

China

RoHS compliance

Compliant with EC directive 2011/65/EU (RoHS)

China RoHS

The L-series China RoHS is available on request. Please contact Renishaw plc support for the full China RoHS tabulation.



Intended use

The intended use of this equipment is to improve the precision and repeatability of the motion 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

Overview

The RCS L-series system can be used in a variety of environments and applications.

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: There are no user-serviceable parts inside the RCS L-series robot ballbar and L interface box. Do not remove any part of the housing; to do so could cause personal harm and damage the system irreparably.

Ensure that you have read and fully understood the RCS L-series user guide before using the system.

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



CAUTION: The system contains magnets which may cause pinch injuries with metal objects or interfere with electronic and implanted medical devices.

Electrical and power safety

- It is recommended that contact with fluids; for example, coolant should be avoided where possible. The RCS L-series must only be powered by the interface modules provided.
- The RCS L interface box is compatible with any USB 2.0 port (or above) on a laptop or desktop computer.
- Only use the extension cable and the USB A-Male to B-Male cable provided with the system.
- Never connect the interface modules to devices that are not intended to be used as part of the RCS L-series.

Mechanical safety

- When setting up and mounting the RCS L-series, be aware of pinch and/or crush hazards that may be created, for example, due to magnetic coupling and/or the extending or closing of the robot ballbar.
- Be aware of trip hazards that may be created between the cables of the RCS L-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.
- Any program that is generated should be first verified in manual mode by the operator before running in automatic mode.
- When values in the robot controller (tool frame, part frame, joint offsets) are updated the production programs should be tested.

Metric and imperial accessory kits

Both metric and imperial versions of the accessory kits are available. The measurement unit is detailed in the product names. The RCS L-90 kit (Renishaw part no. A-6827-6100) is supplied with metric mounting screws. Check that you have the correct accessories before set-up.

Cleaning the balls

Prior to use, check all datum balls are clean and undamaged. Where required, use the supplied Renishaw cleaning kit to ensure that end joints are clean and free from debris.

Primary cleaning should be undertaken with a dry, lint free cloth. Isopropyl alcohol (IPA) can be used for any stubborn grime and debris.

NOTE: Check datum balls regularly for imperfections. For details of replacement kits, contact your local Renishaw representative.

Cleaning the joints

Prior to mounting the system, ensure all contact points are free from debris (for example, metal shavings on either magnetic mounting interface) using the Renishaw-supplied cleaning kit.

With clean hands, tear off a small piece of material and shape it into a ball.

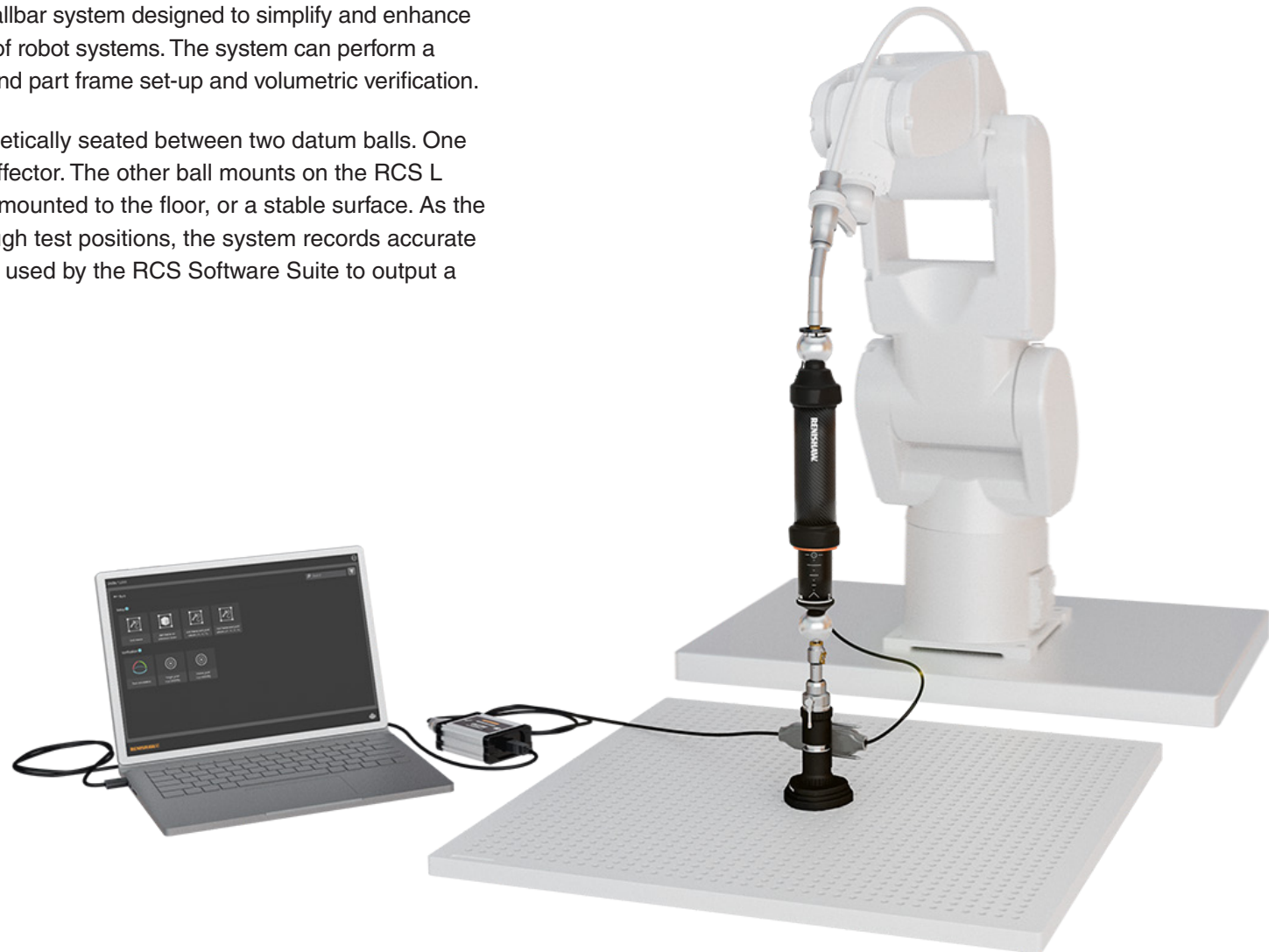
Press into or onto each feature, taking care to ensure none of the cleaning material is left behind.



System overview

The RCS L-series is a linear ballbar system designed to simplify and enhance the installation and calibration of robot systems. The system can perform a variety of tests, including tool and part frame set-up and volumetric verification.

The RCS L-90 ballbar is magnetically seated between two datum balls. One ball mounts to the robot end-effector. The other ball mounts on the RCS L central pillar, which should be mounted to the floor, or a stable surface. As the robot manipulator moves through test positions, the system records accurate measurements which are then used by the RCS Software Suite to output a result.



Guidelines for best practice

Handling the RCS L-90 ballbar with care

The RCS L-series has been designed to be robust, however the equipment is a precision measurement system and must be handled with care. The RCS L-90 contains an encoder readhead and scale to deliver accurate measurements.

CAUTION: Rough handling of the ballbar may damage it and cause the encoder to malfunction, leading to the need for re-homing. When handling, ensure the ballbar is fully closed wherever possible.

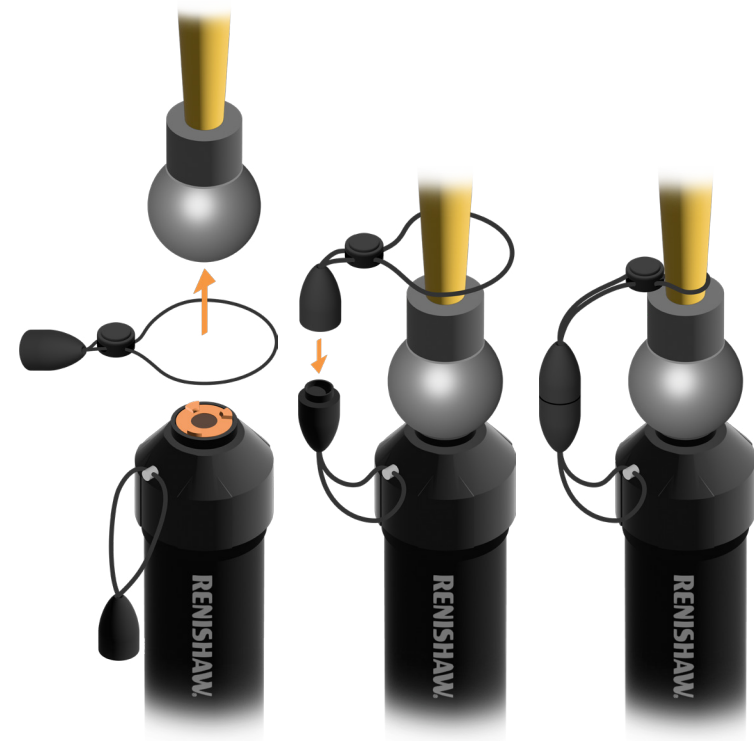
When extending or closing the ballbar, use the thumb tag identified in the image below.



Tether use

Some robot movements may cause the RCS L-90 to detach unintentionally. Secure the ballbar to the robot end-effector with the RCS tether connector to protect it from drop damage.

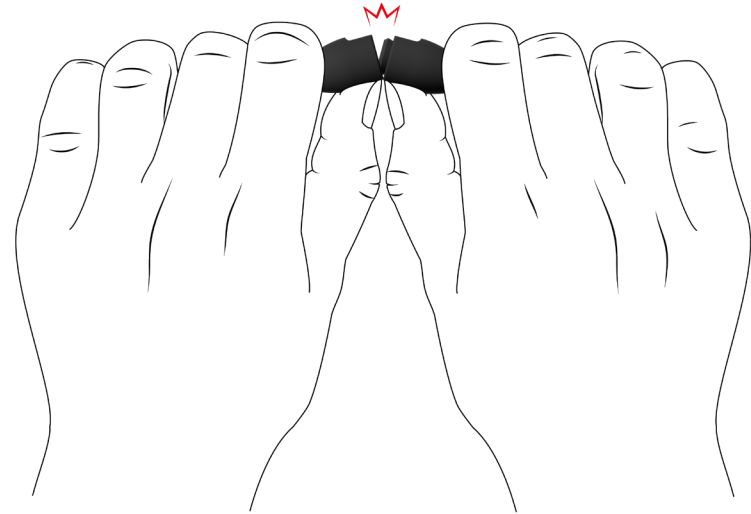
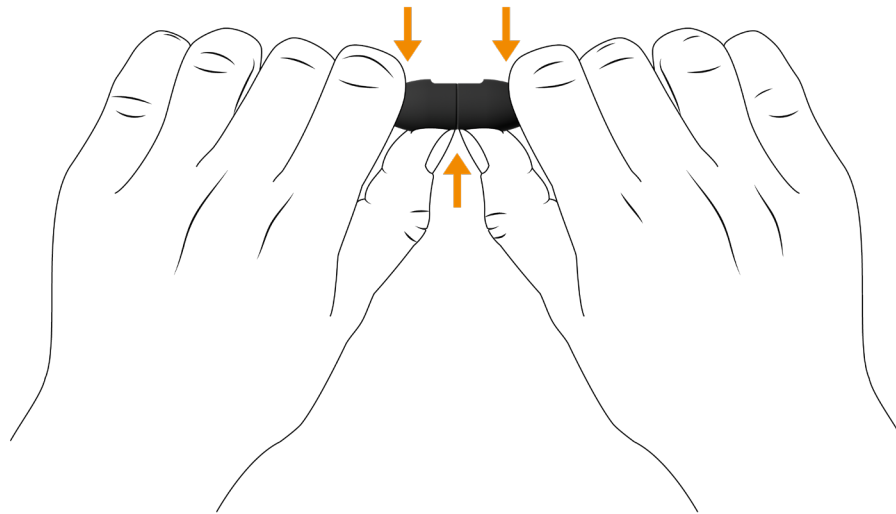
Adjust the size of the tether loop using the attached toggle and secure it above the datum ball as illustrated below:



Tether detachment

CAUTION: Do not pull apart by the tether cords.

Grip one connector in each hand and snap in half to disconnect them.



Mounting the RCS L central pillar on a fixture plate

The RCS L-series central pillar is magnetic. You can mount the pillar directly to a steel bed (Figure 1), or onto a threaded fixture plate using the RCS base mount (Figure 2). M6 to M10 bolt options are supported, as well as the imperial equivalents of 5/16 in to 13/32 in.

NOTE: Metric bolts are supplied, imperial bolts are not supplied.

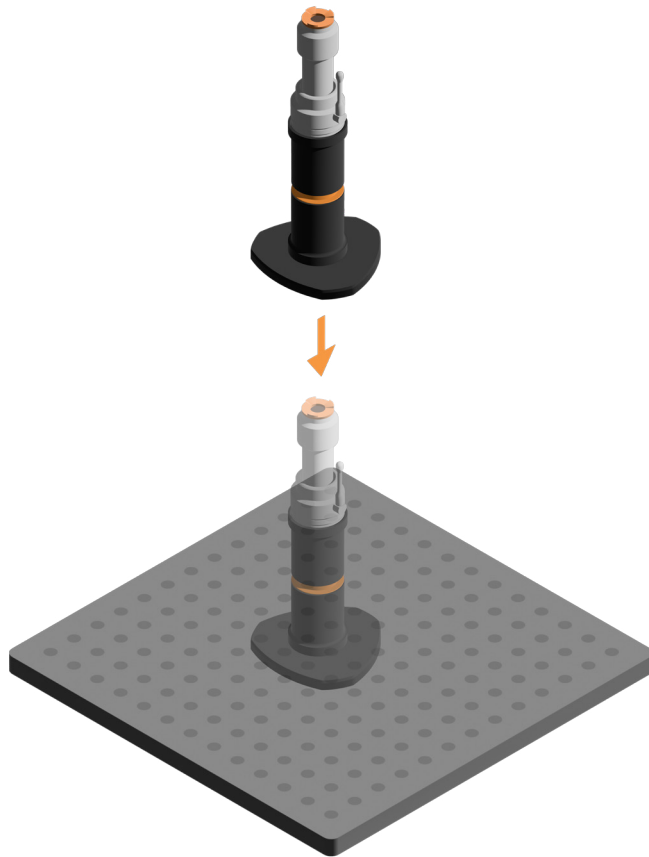


Figure 1 Magnetically mounted

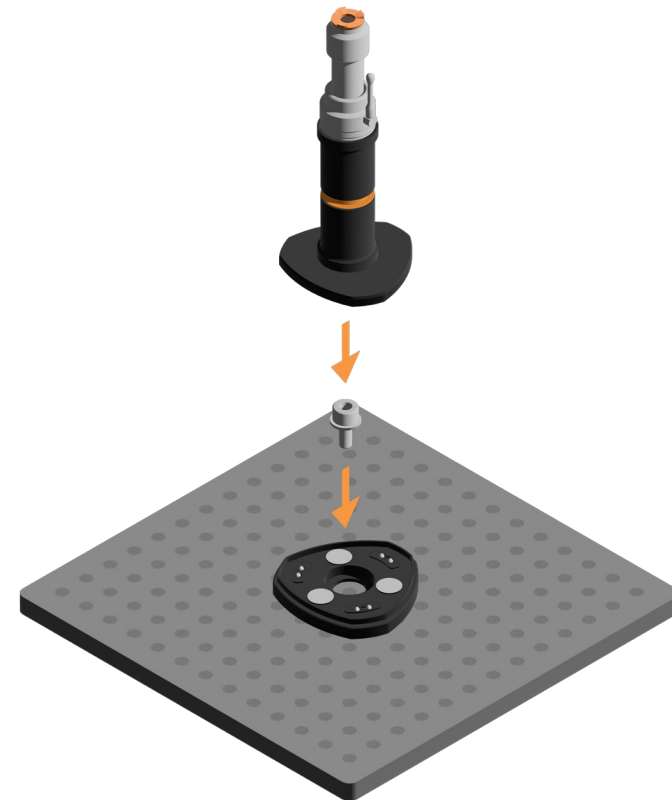


Figure 2 Threaded fixture plate

Mounting the RCS L central pillar on a tripod

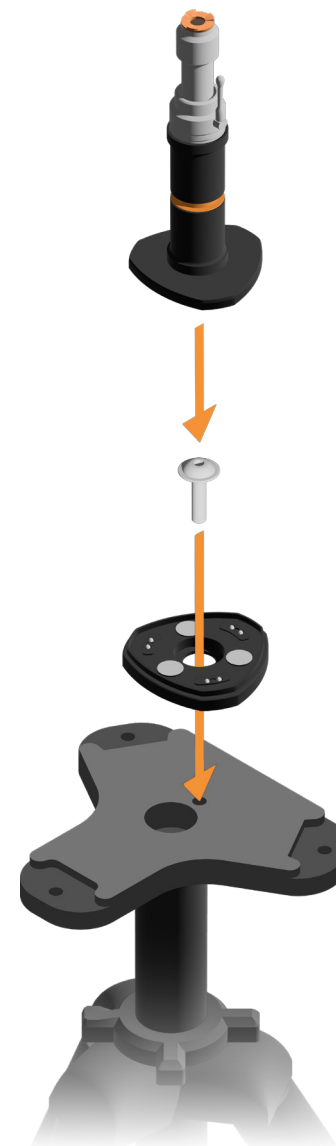
For best results, mount the RCS L-90 system to a normal fixture plate within the robot working volume. However, there may be times when the system needs to be mounted and operated from a tripod set-up.

The tripod provides a stable mounting for the RCS L-90 system whilst allowing for the height to be adjusted.

Fix the RCS base mount using a single M6 bolt through the central screw hole in the tripod adaptor plate.

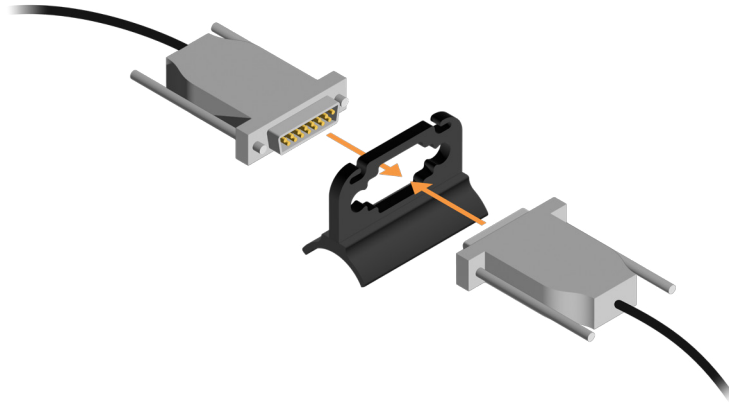
NOTE: Ensure all cables are routed in a way that avoids potential trip hazards.

NOTE: For best results, tighten all tripod legs and clamps before capturing robot data with RCS L-90.

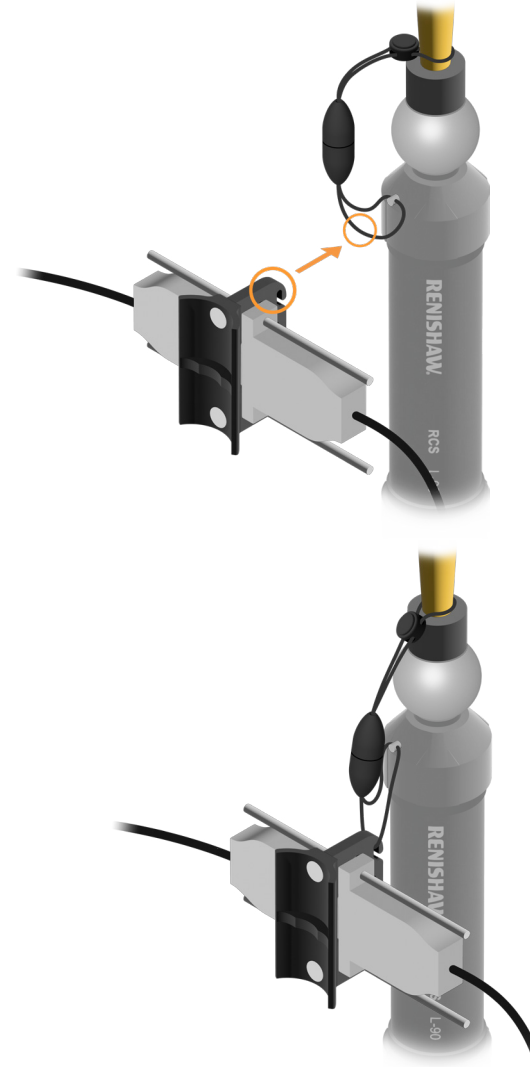


Cable management prior to part frame set-up

1. Connect the RCS L-90 and L interface cables together through the supplied magnetic cable clip.



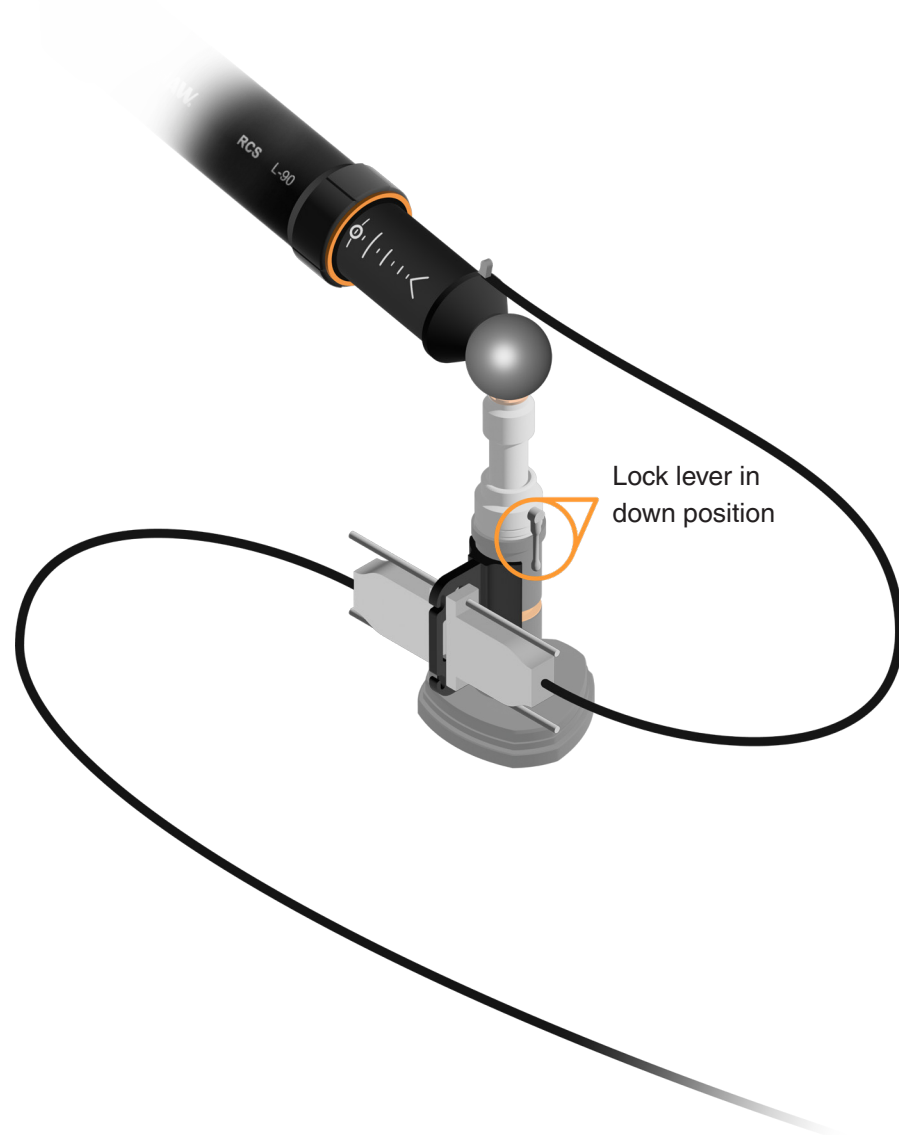
2. Using one of the cable clip hooks, attach to the RCS L-90 tether as illustrated.



Cable positioning prior to volumetric testing

CAUTION: When undertaking a volumetric test, ensure the cable makes a clean 180° loop from the RCS L-90 ballbar in its starting position to a correctly mounted cable clip as illustrated. Failure to do so may lead to snagging of the cable and damage to the equipment.

Prior to running a volumetric test, ensure that the locking lever is in the down position.



RCS product calibration

Calibration certificates

Each RCS L-90 ballbar and calibrator is delivered with a calibration certificate. This demonstrates that the system has been calibrated at the Renishaw factory with traceability to national standards. It is proof of the equipment's performance as tested prior to delivery. Visit the **Calibration product quality and conformance** webpage (www.renishaw.com/en/calibration-product-quality-and-conformance--6872) for more information.

The certificates are important documents which may be required to demonstrate compliance with quality assurance requirements.

Replacement documents can be purchased. Contact Renishaw support for more information.



Certificate content

Each certificate is unique and is identified by a certificate number. All RCS calibration certificates provide the following key information:

- Serial number of calibrated RCS product
- Specific test results
- Statement of accuracy
- Traceability data (calibration details)
- Test conditions and methodology

To enable traceability, details of the test equipment used are given. The date of testing and the date of printing the certificate are separately noted and the results are signed by an authorised Renishaw employee.

Details of the test procedure, test environment, and applicable standards, all in accordance with the requirements of Renishaw's ISO 9001 quality assurance system, are also supplied.

RCS L-90 calibration and homing

Calibration of the RCS L-series system should be completed with the supplied calibrator.

For best results, calibrate the RCS L-90 ballbar using the supplied calibrator regularly and following any notable changes:

- Once every 12 hours
- Before first use in each new location
- After any notable change in room temperature (greater than $\pm 5^{\circ}\text{C}$)

CAUTION: For best results, keep the calibrator in its protective foam tray during use. When removal from the foam tray is required, handle the calibrator with care.

The RCS L-90 ballbar is automatically homed when it passes over a reference mark.



RCS L-90 ballbar calibration procedure

1. To calibrate your RCS L-90, connect it to your computer via the RCS L interface box.
2. Start the RCS Software Suite program.
3. Open or create a robot system.
4. Click the **RCS L-90** icon in the bottom right corner of the screen to check if it needs calibrating.
5. You must home your RCS L-90 before calibrating. For more information, see “RCS L-90 calibration and homing” on page 17.
6. If required, click **Recalibrate** and follow the on-screen instructions. You will need the calibration certificate for your calibrator if you are using it for the first time.

Calibrating your RCS L-90 is recommended for best results. RCS Software Suite will warn you if your ballbar requires calibration before capturing data.

The following instructions ensure best practice is followed when fitting the RCS L-90 ballbar to the calibrator.

1. With the RCS L-90 ballbar closed, carefully attach the cabled end of the RCS L-90 ballbar to one end of the calibrator.



2. Extend the ballbar so that the opposite end of the strut reaches the opposite ball surface of the calibrator. Ensure the RCS L-90 ballbar is magnetically attached to the calibrator.



3. For removal, the process must be reversed. Close the device by retracting the 'non-cable end', before removing from the calibrator.



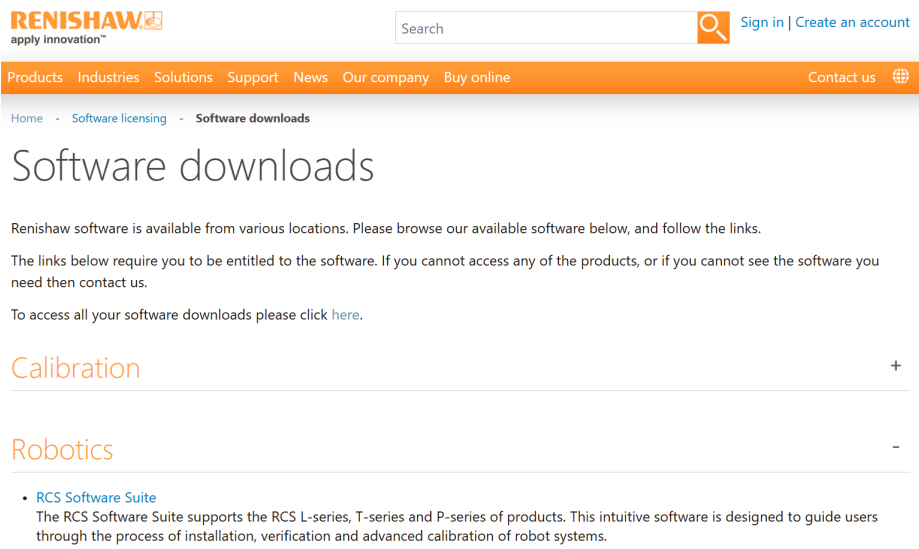
RCS Software Suite

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.

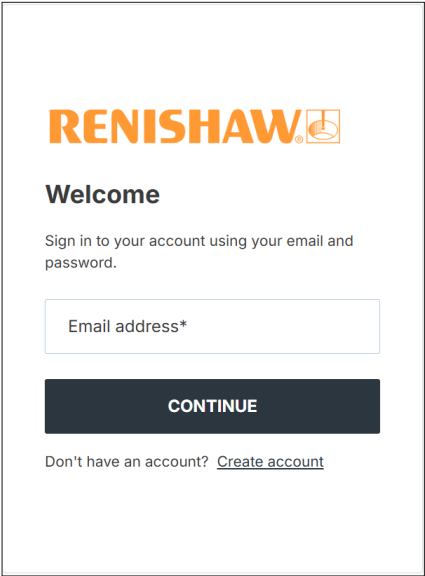
Software download

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.

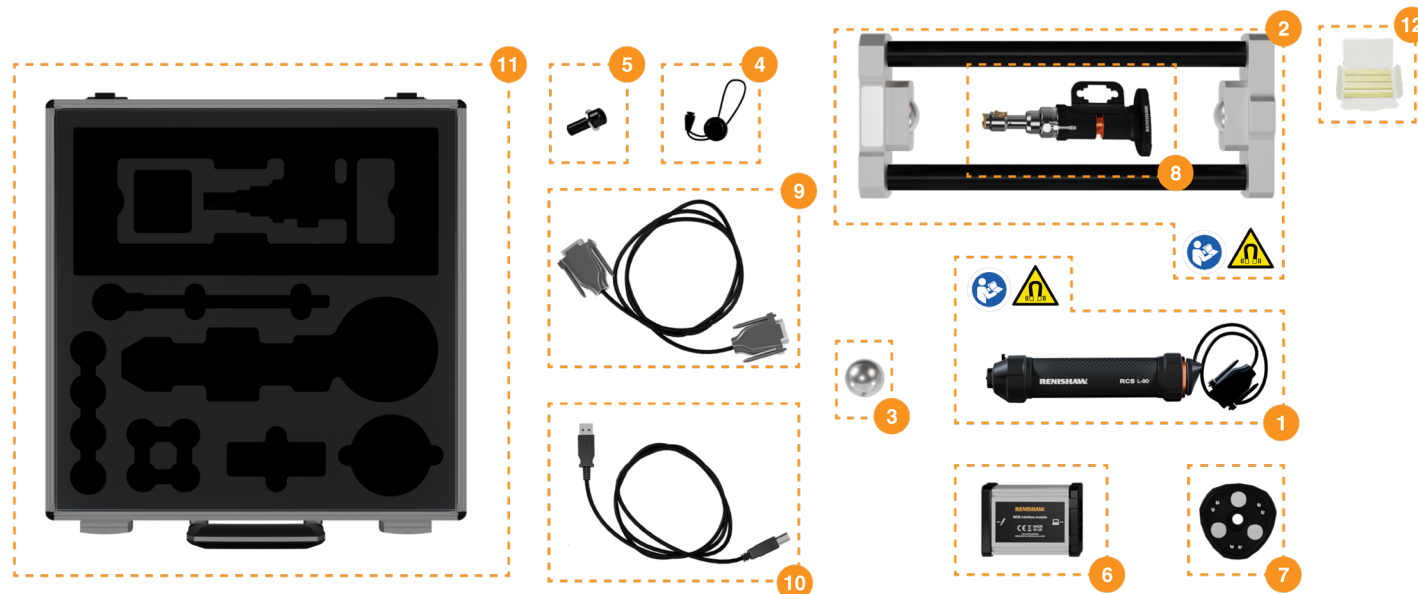


3. If you do not have an account, click **Create account**.
4. Download your required software applications.
5. For more information on licensing software, visit **Licensing User guides** at **www.renishaw.com**.

Kit contents

RCS L-90 system contents

Kit part number: A-6827-6100



CAUTION: Items identified by this warning label contain magnets and may cause pinch injuries with metal objects or interfere with electronic and implanted medical devices.

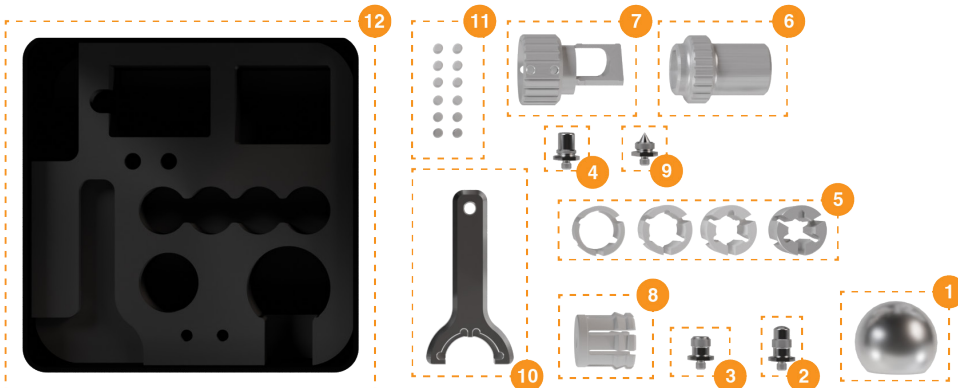
	Part name		Part name
1	RCS L-90 ballbar	7	RCS base mount
2	RCS L-90 calibrator	8	RCS L central pillar
3	RCS D-PB35 datum ball	9	RCS L-15D extension cable
4	RCS tether connector	10	RCS L-USB cable
5	M6, M8 and M10 bolts	11	RCS L-90 case
6	RCS L interface box	12	RCS cleaning kit

For details of purchasing replacement parts, contact your local Renishaw representative.

Hollow ball clamp kit (metric/imperial) contents

Metric kit part number: A-6827-6110

Imperial kit part number: A-6827-6120



NOTE: Use the TCP clamp tool (10) to avoid injury as some parts contain sharp edges.

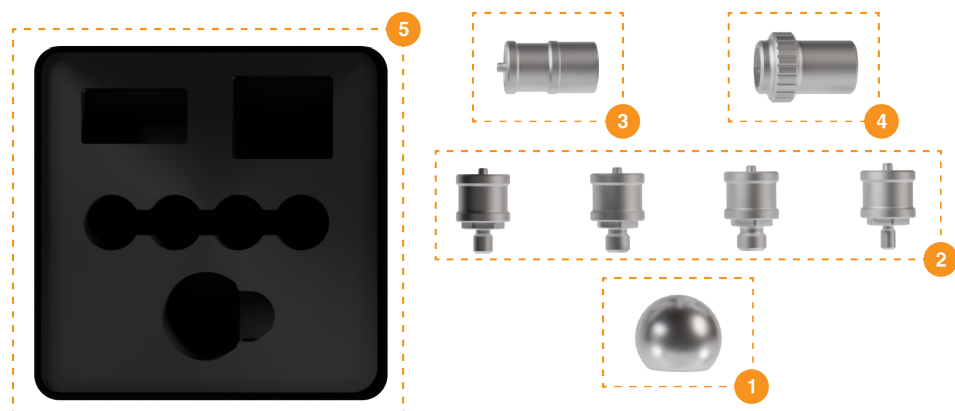
	Part name
1	RCS D-HB35 (hollow ball)
2	TCP setting screw
3	TCP setting screw – flat
4	Universal setting screw cup
5	TCP clamp adaptors – 20 to 16, 20 to 14, 20 to 12 and 20 to 10 (metric)
5	TCP clamp adaptors – 3/4 in to 5/8 in, 3/4 in to 9/16 in, 3/4 in to 1/2 in and 3/4 in to 3/8 in (imperial)
6	RCS hollow ball tool
7	Universal clamp
8	TCP clamp (metric)
8	TCP clamp (imperial)
9	Universal setting screw point
10	TCP clamp tool
11	Grub screws (× 12)
12	Hollow ball kit case

For details of purchasing replacement parts, contact your local Renishaw representative.

Hollow ball threaded kit (metric/imperial) contents

Metric kit part number: A-6827-6160

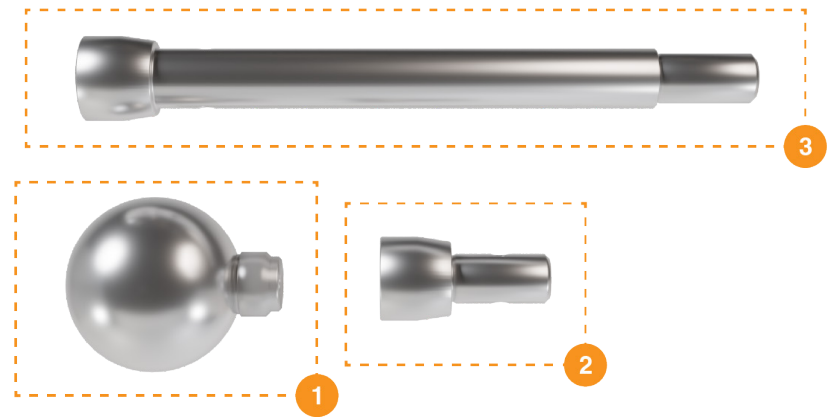
Imperial kit part number: A-6827-6170



	Part name
1	RCS D-HB35 (hollow ball)
2	Hollow ball adaptors – M6, M8, M10 and M12 (metric)
2	Hollow ball adaptors – 1/4 in, 5/16 in, 3/8 in and 1/2 in (imperial)
3	Hollow ball 50 mm extension
4	Hollow ball tool
5	Hollow ball threaded kit case
For details of purchasing replacement parts, contact your local Renishaw representative.	

Solid ball kit contents

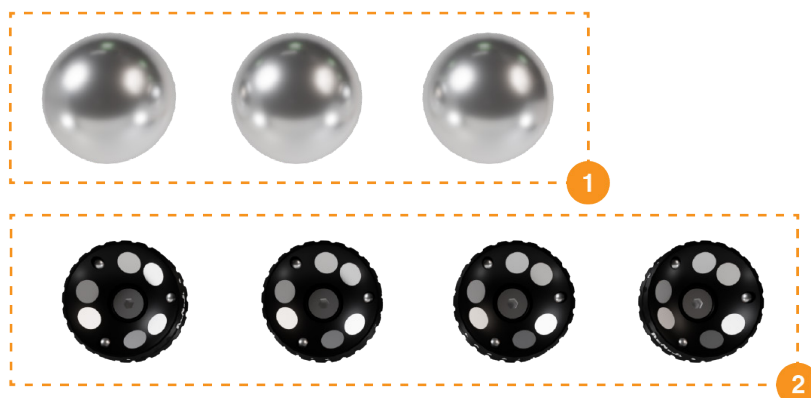
Kit part number: A-6827-6130



	Part name
1	RCS D-SB35
2	Short connection rod
3	Long connection rod
For details of purchasing replacement parts, contact your local Renishaw representative.	

Part frame kit contents

Kit part number: A-6827-6150



	Part name
1	RCS D-PB35 datum ball (× 3)
2	RCS L-BM20 (× 4)
For details of purchasing replacement parts, contact your local Renishaw representative.	

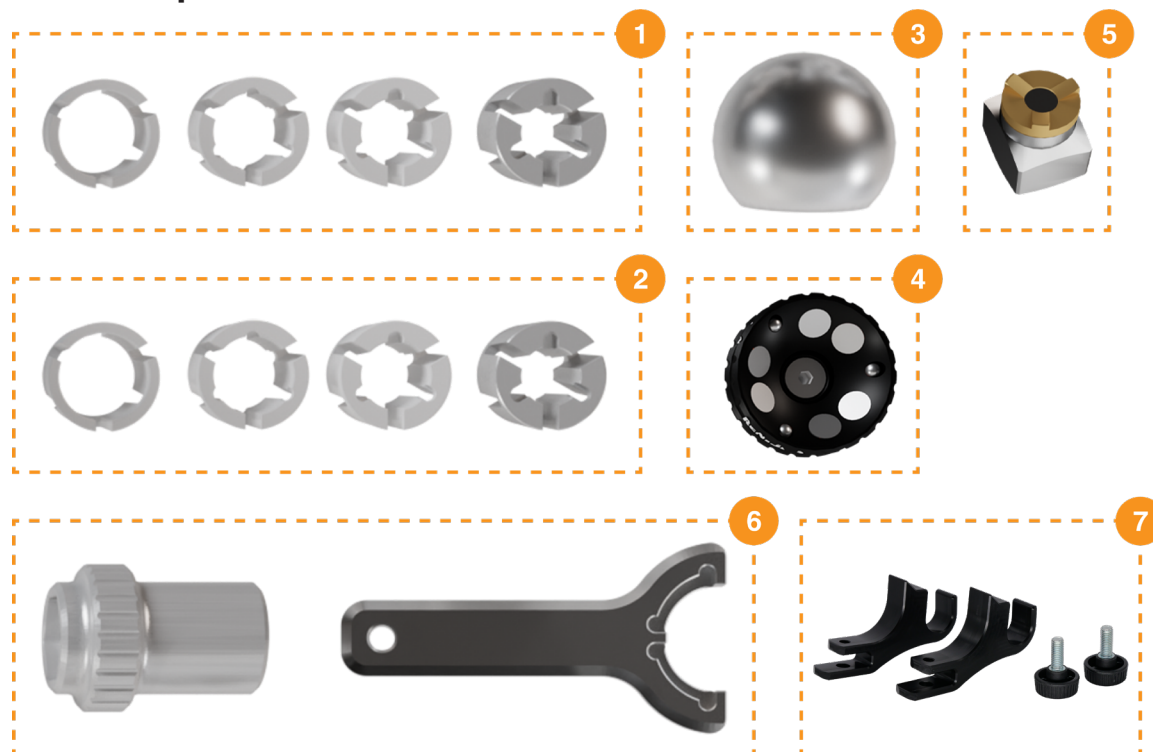
RCS tripod kit

Kit number: A-6828-6120



	Part name
1	RCS tripod with fixed adaptor plate
2	Renishaw fabric tripod case
3	RCS calibrator bracket set

RCS kit spares















	Part number	Part name
1	A-6827-6211	RCS hollow ball clamp spares – 20 to 16, 20 to 14, 20 to 12 and 20 to 10 (metric)
2	A-6827-6212	RCS hollow ball clamp spares – 3/4 in to 5/8 in, 3/4 in to 9/16 in, 3/4 in to 1/2 in and 3/4 in to 3/8 in (imperial)
3	A-6827-6213	RCS D-HB35 hollow ball
4	A-6827-6214	RCS L-BM20 (x1)
5	A-6827-6215	RCS pillar top joint
6	A-6827-6216	RCS universal ball toolkit
7	A-6828-6270	RCS calibrator bracket set

For details of purchasing replacement parts, contact your local Renishaw representative.

Interface LED status

On the right panel of the RCS L interface box is a single LED. When the system is powered on this will display red for 10 seconds during boot mode. See the table below for status/indication:

LED status		Description	Actions
Flashes 3 colours once	  	Start standard mode.	N/A
Red		Error (unseated ballbar, detached ballbar, invalid encoder reading, or invalid encoder signal).	Follow the guidelines in RCS Software Suite to clear the error.
Orange		Requires homing (API connected, no errors).	Extend and collapse the ballbar to find the reference mark.
Cyan		API not connected.	Start the RCS Software Suite.
Cyan flashing		No activity on the USB endpoints.	Ensure RCS Software Suite is connected and running normally, and that the USB cable is not damaged and plugged in fully on both ends. Ensure the RCS L-90 is listed on the device manager (unplug and plug back in the USB cable if necessary).
Blue		Ready (API connected, no errors, homed).	N/A
Green		Streaming.	N/A
Blink	  	Received a command from the API (except for streaming commands).	N/A

Troubleshooting

Equipment mishandling

Recalibrate the RCS L-90 if it is dropped or mishandled. Particularly if the end joints are exposed to shock loading.



IMPORTANT: Recalibrate the RCS L-90 after any automated (robot-driven) compression beyond its minimum length.

In-test robustness

RCS L-90 has been designed to remain in contact with the datum balls during the specified tests.

If the ballbar detaches from the datum balls during the test process, first check to ensure that the datum balls are undamaged and clean. If this does not resolve the issue, consider reducing the acceleration of the robot.

Further information



For further operational information, refer to the step-by-step guides within the RCS Software Suite. Additional support material is available for download at: **www.renishaw.com/rcs-support**.

If further information is still required please contact the support teams via **www.renishaw.com/contact**.

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www.renishaw.com/contact

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