

Portable laser measurement and calibration



XL laser calibration system

Used for comprehensive accuracy and performance measurement of any machine or system.

Linear measurement range	80 meters
Linear measurement accuracy	± 0.5 ppm
Laser frequency accuracy	± 0.05 ppm
Resolution	1 nm
Maximum travel velocity	4 m/s
Dynamic capture rate	10 Hz – 50 kHz

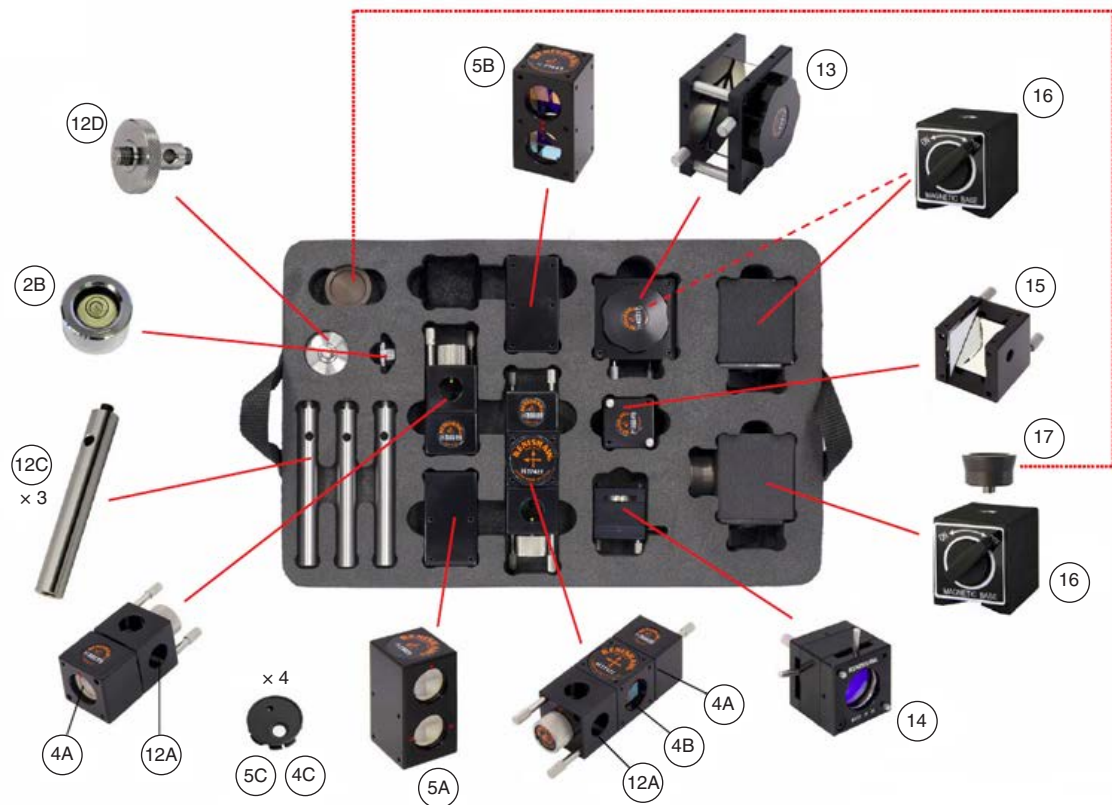


Contents of base XL system case

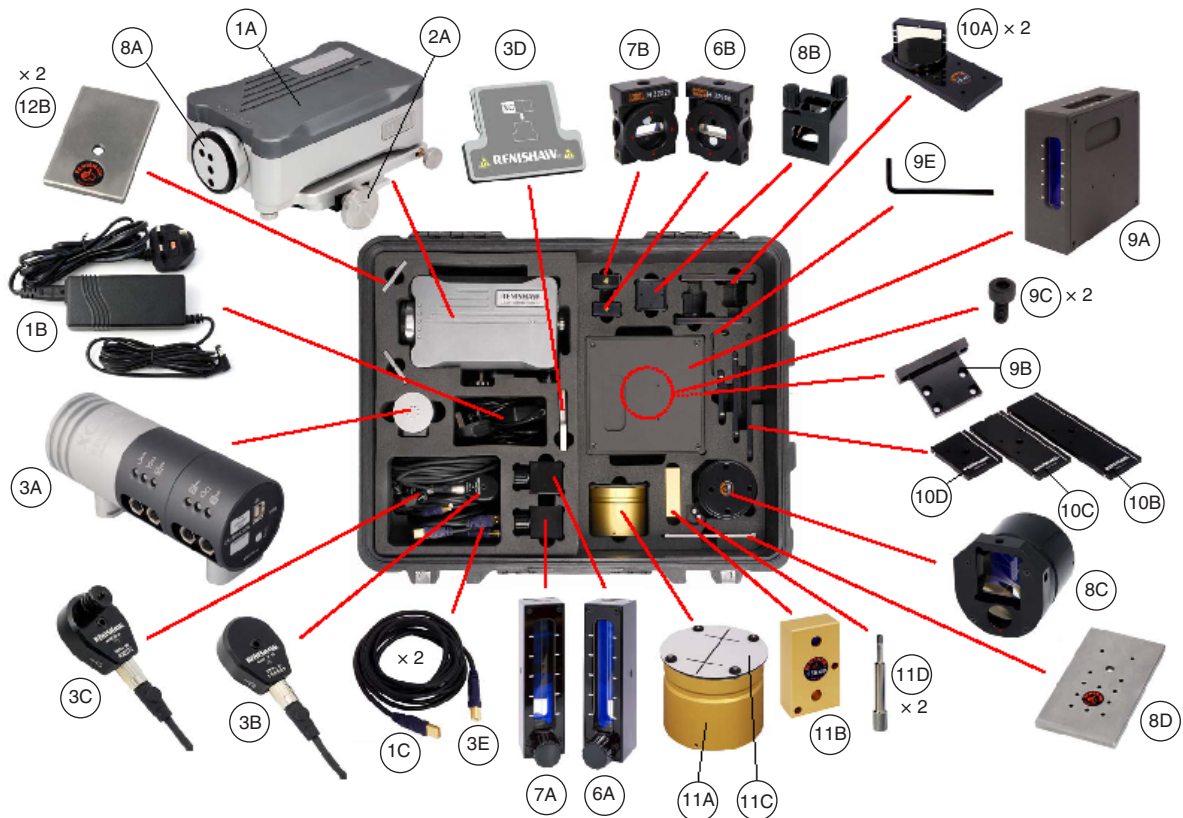
XL laser system components

Kit part number	Kit price	Includes	Part number	Price	Index
A-9908-0405	\$12,761	XL-80 laser	N/A		1A
		Universal power supply	A-9908-0299	\$163	1B
		USB cable	A-9908-0286	\$29	1C
		XL system support disk	A-9908-0303	No charge	Not shown
		AUX I/O connector	A-9908-0329	\$44	Not shown
A-9908-0700	\$1,028	XL translation stage	A-9908-0700	\$1,028	2A
		Spirit level circular	A-9908-0323	\$26	2B
		Tripod adaptor	A-9908-0770	\$32	Not shown
A-9908-0510	\$9,624	XC-80 compensator	A-9908-0564	\$8,000	3A
		Material temperature sensor and cable	A-9908-0879	\$1,388	3B
		Air temperature sensor and cable	A-9908-0878	\$1,388	3C
		XC mounting plate	A-9908-0892	\$93	3D
		USB cable	A-9908-0286	\$29	3E
		LaserXL™ software	A-9925-0201	\$1,839	Not shown
A-8003-0440	\$3,316	Linear reflector (qty 2)	A-8003-0219	\$528 each	4A
		Linear interferometer	A-8003-0557	\$2,631	4B
		Alignment target (qty 2)	A-8003-0478	\$25 each	4C
A-8003-0441	\$3,985	Angular interferometer	A-8003-0186	\$2,688	5A
		Angular reflector	A-8003-0181	\$2,020	5B
		Alignment target (qty 2)	A-8003-0478	\$25 each	5C
A-8003-0443	\$5,517	Short range straightness reflector	A-8003-0615	\$3,888	6A
		Woollaston short range	A-8003-0393	\$3,300	6B
A-8003-0444	\$5,517	Long range straightness reflector	A-8003-0620	\$3,888	7A
		Woollaston long range	A-8003-0430	\$3,300	7B
A-8003-4209	\$840	Straightness shutter	A-8003-4209	\$841	8A
A-8003-STAK	\$3,691	Laser beam steerer LS350	A-8003-3072	\$1,719	14
		Fixed turning mirror	A-8003-1325	\$942	8B
		Large straightness retroreflector	A-8003-0604	\$1,093	8C
		Straightness base	A-8003-0576	\$311	8D
A-8003-0665	\$5,772	Optical square	N/A		9A
		Bracket squareness optic	M-8003-1680	\$44	9B
A-8003-0442	\$3,498	Flatness mirror (qty 2)	A-8003-0630	\$1,267 each	10A
		Base (150 mm)	A-8003-0256	\$367	10B
		Base (100 mm)	A-8003-0257	\$358	10C
		Base (50 mm)	A-8003-0258	\$326	10D
A-8003-4270	\$3,081	Long range retroreflector	A-8003-2061	\$2,308	11A
		Periscope	A-8003-2039	\$2,005	11B
		Long range target	M-8003-2081	\$32	11C
		Clamp screw (qty 2)	M-8003-0221	\$15 each	11D
A-8003-0447	\$1,350	Clamp block (qty 2)	A-8003-0262	\$263 each	12A
		Base plate (qty 2)	A-8003-0522	\$276 each	12B
		Mounting pillar (qty 3)	M-8003-0470	\$94 each	12C
		M8 adaptor	A-8003-0979	\$113	12D
		XL-80Q quad laser head	A-9908-0455	\$14,002	Not shown
		Base case	M-9908-0313	\$667	
		Full system case	M-9908-0314	\$934	
		Tripod	A-9908-0295	\$1,329	Not shown
		Tripod case	M-9908-0527	\$255	Not shown
		Swivel mirror	A-8003-1304	\$1,451	13
		Fixed turning mirror	A-8003-1325	\$942	15
		Magnetic base	A-9908-0780	\$78	16
		Magnetic base adaptor	A-9908-0760	\$36	17

Portable laser measurement and calibration



Contents of full XL system case (tray)



Contents of full XL system case (tray removed)

XL laser calibration systems

Base system kit

Includes: XL-80 laser head
XC-80 environmental compensator kit
LaserXL™ software
Software support disk
XL tripod stage kit

Part number: XL80-BASE

Price: \$25,250



XL-80 laser head

Linear system kit

Includes: Components of base system kit	XL80-BASE
Linear measurement optics	A-8003-0440
Beam steerer LS350	A-8003-3072
Optics mounting kit	A-8003-0447
2 magnetic bases	A-9908-0780
Magnetic base adaptor	A-9908-0760
Tripod	A-9908-0295
Tripod case	M-9908-0527
Base system case	M-9908-0313

Price: \$33,998



XC-80 environmental
compensation unit

Linear/angular system kit

Includes: Components of base system kit	XL80-BASE
Linear measurement optics	A-8003-0440
Angular measurement optics	A-8003-0441
Beam steerer LS350	A-8003-3072
Optics mounting kit	A-8003-0447
2 magnetic bases	A-9908-0780
Magnetic base adaptor	A-9908-0760
Tripod	A-9908-0295
Tripod case	M-9908-0527
Base system case	M-9908-0313

Price: \$37,983

Advanced system kit

Includes: Components of base system kit	XL80-BASE
Linear measurement optics	A-8003-0440
Angular measurement optics	A-8003-0441
Swivel mirror	A-8003-1304
Long range straightness optics	A-8003-0444
Short range straightness optics	A-8003-0443
Straightness accessory kit	A-8003-STAK
Straightness shutter	A-8003-4209
Squareness measurment kit	A-8003-0665
Optics mounting kit	A-8003-0447
2 magnetic bases	A-9908-0780
Magnetic base adaptor	A-9908-0760
Tripod	A-9908-0295
Tripod case	M-9908-0527
Full system case	M-9908-0314

Price: \$59,310



XL system case and
tripod case

Portable laser measurement and calibration

Optics

All Renishaw optics housings are lightweight aluminum with a hard anodized finish for durability and good thermal stability.

Linear kit (standard 40 m)

Includes: 1 linear beam splitter
2 linear reflectors
2 alignment targets

Part number: A-8003-0440

Price: \$3,316



Small linear accessory kit

Please call for details.

Part number: A-8003-3244

Price: \$1,824



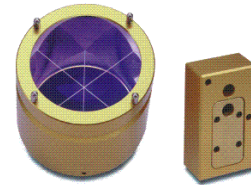
Long range linear optics kit (80 m max)

For use with the ML10X for linear measurements in excess of 40 m.

Includes: Periscope
Large retroreflector

Part number: A-8003-4270

Price: \$3,081



Angular kit

Includes: 1 angular beam splitter
1 angular reflector
2 alignment targets

Part number: A-8003-0441

Price: \$3,986



Linear/angular combination kit

This combination kit is a cost-saving solution, allowing linear and angular measurement to be made with a single set-up.

Includes: 1 angular beam splitter
1 angular reflector
1 linear reflector
2 alignment targets

Part number: A-8003-2774

Price: \$4,220



Straightness measurement kits

Short range

Suitable for measurements up to 4 m (160 in)

Part number: A-8003-0443

Price: \$5,517

Long range

Suitable for measurements from 1 m to 30 m (40 in to 1200 in)

Part number: A-8003-0444

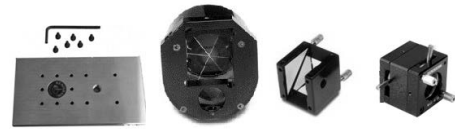
Price: \$5,517



Straightness accessory kit

Facilitates measurements on vertical axes and in other difficult configurations.

Includes: 1 fixed turning mirror
1 large retroreflector
1 stainless steel base
1 LS350 beam steerer



Note: XL-80 and ML10 users require straightness shutter, part number A-8003-4209, shown on page 4-8.

Part number: A-8003-STAK

Price: \$3,691

Squareness measurement

This precision pentaprism is used in conjunction with straightness optics to measure squareness of machine axes. It includes a mounting bracket for a fixed turning mirror and LS350 beam steerer.

Part number: A-8003-0665

Price: \$5,773



Flatness measurement kit

The turning mirrors rotate and tilt for easy alignment and are fitted with non-slip pads. The lightweight aluminum bases have precision stainless feet and guides.

Includes: 2 turning mirrors
1 50 mm flatness base
1 100 mm flatness base
1 150 mm flatness base

Part number: A-8003-0442

Price: \$3,498



Standard optics mounting kit

This universal mounting kit is designed for use with the complete range of Renishaw measuring optics.

Includes: 2 mounting blocks
3 stainless pillars
1 stainless M8 adaptor
2 stainless bases

Part number: A-8003-0447

Price: \$1,350



Magnetic base

Suitable for mounting optics and XL80 laser head when fitted with A-9908-0760 magnetic base adaptor (sold in pairs).

Part number: A-9908-0780

Price: \$78



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CMM optics mounting kit

Designed specifically to aid the mounting of laser optics and other accessories on coordinate measuring machines. Recommended for UCC error mapping requirements.

Part number: A-1333-0174

Price: \$848

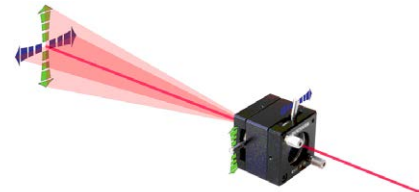


Beam steerer LS350

This is the best time-saving device a laser system user could buy. It works with all the measuring optic kits, including HP optics using the HP optic adaptor plate. Included in straightness accessory kit.

Part number: A-8003-3072

Price: \$1,720



Swivel mirror

This is used for directing the laser beam through any angle from 0° to 106°, for example for diagonal measurement and slant bed lathes. It works with all the optics kits, including HP optics using the HP optic adaptor plate.

Part number: A-8003-1304

Price: \$1,451



Fixed turning mirror

This can be used with angular optics for 90° accessories. Included in straightness accessory kit.

Part number: A-8003-1325

Price: \$942



Quarter wave plate

Used with linear optics for plane mirror interferometry applications.

Part number: A-8003-1998

Price: \$1,635



Straightness shutter

Required for vertical straightness measurements.

Part number: A-8003-4209

Price: \$841



Tripod and cases

Universal tripod

Tripod only, without the stage.

Part number: A-9908-0295

Price: \$1,329



XL translation stage

Part number: A-9908-0700

Price: \$1,028



Tripod adaptor

This allows the XL translation stage to be used with the Renishaw universal tripod or any other tripod with a standard camera mounting thread.

Part number: A-9908-0770

Price: \$32



Tripod converter ML-XL

Part number: A-9908-0765

Price: \$76



Magnetic base adaptor

This allows the XL translation stage to be mounted on any base or fixture with an M8 x 1.25 mounting hole.

Part number: A-9908-0760

Price: \$37



Universal tripod case

Lightweight fabric.

Part number: M-9908-0527

Price: \$256



System cases

Base system case

Suitable for basic laser system including linear and angle optics with accessories.

Part number: M-9908-0313

Price: \$667



Full system case

Suitable for an advanced laser system including linear, angle, short range and long range straightness, squareness and flatness optics with accessories.

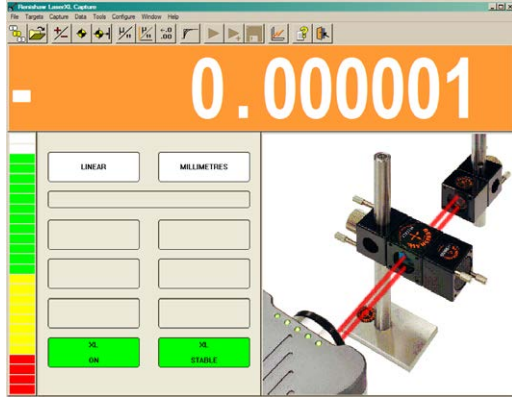
Part number: M-9908-0314

Price: \$935



Software

LaserXL™ calibration software



This is the standard software package for use with the Renishaw XL80 laser system. It provides for linear, angle, straightness, squareness and parallelism measurement. Data can be analyzed to many national and international machine tool and CMM standards. LaserXL™ is not compatible with ML10 lasers. Windows® XP or Vista only.

Part number: A-9925-0201 **Price:** \$1,839

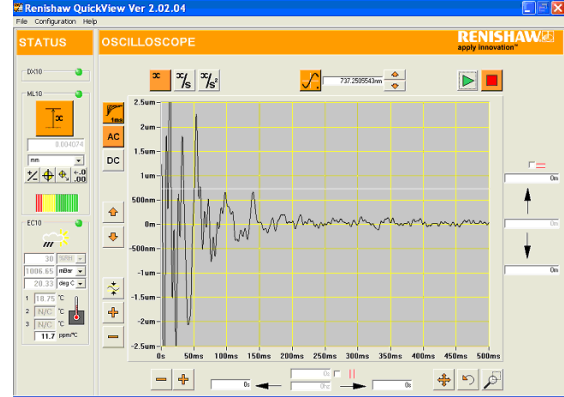
XCAL View (single user)

Part number: A-9925-0200 **Price:** \$956

XCAL View (10 users)

Part number: A-9925-0203 **Price:** \$3,832

QuickView XL software



QuickView is the simple, intuitive software package that allows you to understand the dynamic performance of many different machines and devices such as stages, machine tools and CMMs. It brings the functionality of an oscilloscope to the mechanical engineer, right on your desktop.

- Capture, review, and save dynamic data
- Measure distance, velocity and acceleration against time
- Display continuous “streaming” data or set trigger levels to capture single or multi-shot “events”
- Linear, angular or straightness modes
- Optional hardware – compact low mass optics kit

Applications

- Measure consistency of position, velocity and acceleration
- Determine movement in a locked rotary axis (torsional vibration)
- Detect dynamic yaw and lateral play (slop)
- Measure vibration
- Perform ASME B5.54 CNC tests such as Feedrate and acceleration, Minimum Block Execution Time (MBET) and Least Increment

Benefits include:

- Live data display allowing analysis of motion and positional characteristics
- Save data for analysis in other applications such as Excel® and MathCad
- Flexible measurement – avoids the need for defined measurement targets and sequences

Part number: A-9908-0302

Price: \$742

Spare parts

The following items are normally supplied as parts of system kits but can be purchased as individual components for replacement purposes.

Clamp block

Part number: A-8003-0262

Price: \$263



Locking screw assembly

For use with clamp block.

Part number: A-8003-4501

Price: \$53



Locking screw pressure pad

Brass pad and rubber retaining ring.

Part number: A-8003-4500

Price: \$8



Clamp screws

Long (for use with clamp block)

Part number: M-8003-0264

Price: \$15



Short (for use with linear and angular optics)

Part number: M-8003-0221

Price: \$15



LS350 (for use with LS350 beam steerer)

Part number: M-8003-3083

Price: \$15



For use with fixed turning mirror.

Part number: M-8003-1070

Price: \$16



For use with swivel mirror.

Part number: M-8003-1063

Price: \$16



Mounting pillar

110 mm long with M8 × 1.25 male thread at one end, female at the other.

Part number: M-8003-0470

Price: \$94



Portable laser measurement and calibration

Straightness accessory base

Part number: A-8003-0576

Price: \$312



Large retroreflector

For use with vertical straightness measurements.

Part number: A-8003-0604

Price: \$1,093



M8 adaptor

Part number: A-8003-0979

Price: \$113



Alignment target

Part number: A-8003-0478

Price: \$25



Linear beam splitter

Part number: A-8003-0557

Price: \$2,631



Linear reflector

Part number: A-8003-0219

Price: \$528



Angular reflector

Part number: A-8003-0181

Price: \$2,020



Angular beam splitter

Part number: A-8003-0186

Price: \$2,688



Cables

USB single port extension cable (5 m)

Part number: CBL-USBX-1

Price: \$65



USB dual port extension cable (5 m)

Part number: CBL-USBX-2

Price: \$86



XC80 temperature sensor cable (5 m)

Part number: A-9908-0932

Price: \$145



USB to serial adaptor

Allows QC10 ballbar and other serial devices to be used with notebook PCs that do not have an RS232 serial port.

Part number: A-8014-0670

Price: \$145



DX10 interface kit (USB)

Connects ML10 and EC10 to any Windows® XP based computer via USB. Compatible with Laser10.06 and subsequent versions. (Driver update may be required for older versions of Laser10.) Operational indicators provide status condition. Supplied with 3 m USB cable.

Part number: A-8003-3116

Price: \$2,122



XR20-W rotary axis calibrator and components



XR20-W rotary axis calibrator

The XR20-W rotary axis calibrator allows the measurement of rotary axis positional accuracy to within 1 arc second. Totally wireless operation and modular mounting systems ensure suitability for a wide range of machines.

Includes: XR20-W
Mounting ring
Adaptor plate
Centration aid
Chuck adaptor
Battery charger
Batteries Li-polymer × 3
Electrical adaptor for use in any territory
USB cable and mains adaptor
Rotary XL software including system manual
Peli™ system case

Part number: A-9920-0400

Price: \$23,987

Rental

XR20-W

Price: \$1,289 per week

XR20-W with angular optic

Price: \$1,334 per week



Off Axis Rotary Software (OARS) package

This optional software package enables the XR20-W to be used on machines where it is difficult or impossible to mount the device on the center of rotation.

Please note: Additional mounting hardware may be required for some machines. Please contact Renishaw for further information.

Part number: A-9920-0304 **Price:** \$1,319

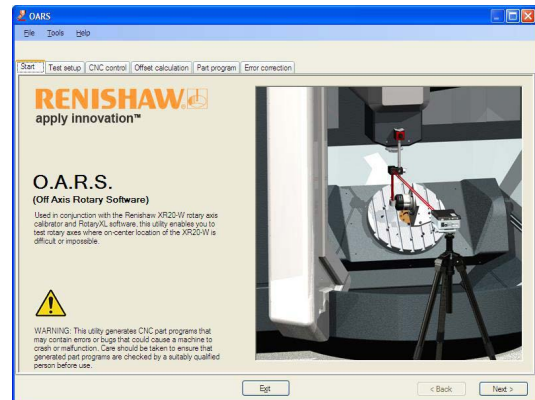
OARS bracket

Part number: A-9920-0700 **Price:** \$3,543

Complete OARS kit

Includes bracket, OARS software and carrying case.

Part number: OARS-KIT1 **Price:** \$4,713



XR20-W rotary axis calibrator upgrade

Part number: XR20W-UPG **Price:** See below

When trading in an RX10 less than 7 years old: \$11,994

When trading in an RX10 more than 7 years old: \$15,592

NOTE: The standard trade-in allowance quoted is on the basis that a complete and fully functional RX10 kit is returned. Non-functional, damaged or incomplete kits may be considered for trade-in at Renishaw's discretion. If accepted, the trade-in allowance will be reduced.

Rotary software kit

Part number: A-9925-0202 **Price:** \$1,571

XR20-W kit components

Mounting ring

The mounting ring bolts or clamps directly to the test surface for ease of centring the system on the test axis.

Part number: A-9920-0440 **Price:** \$615



Mounting ring adaptor 150 mm

The adaptor plate enables fitting to rotary tables with unsuitable centre recesses. It can also be used to secure the XR20-W to the chuck adaptor and custom mounts.

Part number: A-9920-0270 **Price:** \$385



Chuck (lathe) adaptor

The adaptor has a 40 mm diameter to fit most popular chuck sizes. It can also be used to secure the XR20-W to users' own custom mounts.

Part number: A-9920-0280 **Price:** \$512



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Centration aid

The centration aid fits temporarily inside the mounting ring to assist visual centration before XR20-W insertion.

Part number: A-9920-0340

Price: \$10



Fixings kit

A complete set of screws and allen keys for XR20-W.

Part number: A-9920-0430

Price: \$10



Battery Li-Polymer 3.7 V

High-power rechargeable lithium battery (three batteries supplied with each XR20-W).

Part number: A-9920-0330

Price: \$65



Battery charger and cables

Battery charger and a set of power cables for any territory (UK, Europe and USA).

Part number: A-9920-0320

Price: \$155



Battery cover

Replacement battery cover for XR20-W.

Part number: A-9920-0460

Price: \$23



USB cover plug

Replacement protective plug for USB socket on XR20-W.

Part number: A-9920-0380

Price: \$7



USB power supply

USB power supply adaptors for any territory (UK, Europe and USA).

Part number: A-9920-0450

Price: \$21



XR20 case

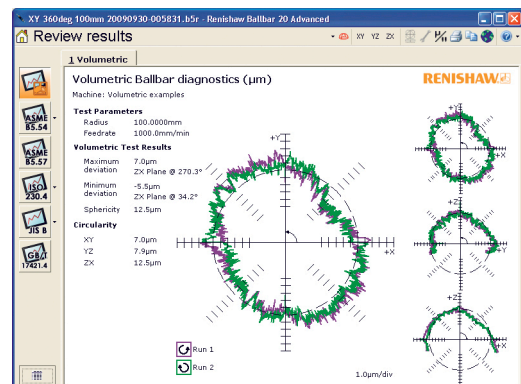
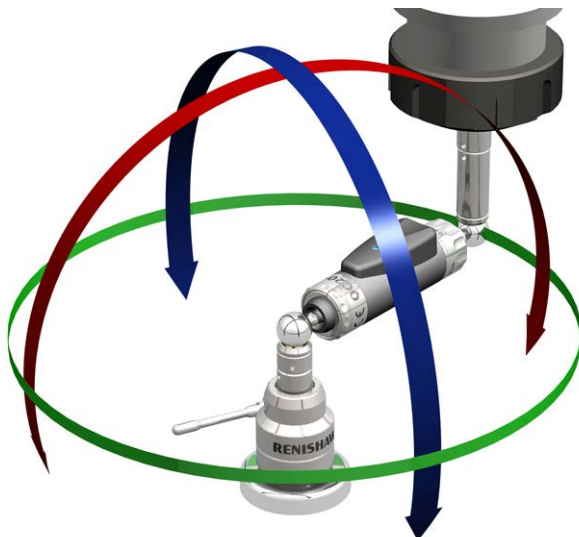
Heavy duty transport and storage case for XR20-W.

Part number: A-9920-0360

Price: \$512



QC20-W wireless ballbar



QC20-W ballbar kit with glass calibrator

The Renishaw QC20-W ballbar contains a precision linear transducer of Renishaw's own design. Signal processing is carried out within the ballbar and data transmitted to a suitable PC using a Bluetooth® Class 2 module.

Includes: QC20-W wireless ballbar (and one CR2 battery)
Center pivot
Tool cup
Extension bars – 50 mm, 150 mm and 300 mm
Glass calibrator
System software (including manuals)
Setting ball
Machine validation cards
Calibration certificate
Bluetooth® adaptor (A-8014-BTA1)
System carry case (the case includes cut-outs for the optional small circle and VTL adaptors)



Part number: A-8014-1510

Price: \$10,478

NOTE: Special “trade-in” offer. Customers can trade-in a complete working QC10 kit and claim a \$3,440 “allowance”. This will give a net price of \$7,038. Contact Renishaw or reseller for further details.

QC20-W ballbar upgrade kit

The lowest cost entry to QC20-W use is with the QC20-W upgrade kit. The kit includes a new ballbar, battery and BB20 software. The packaging fits directly into the later style aluminum framed case. Users with earlier plastic or wooden cases should purchase a new QC20-W case separately (see below).

Includes: QC20-W wireless ballbar upgrade kit (A-8014-1530)

- QC20-W wireless ballbar
- Tool cup
- System software (including manuals)
- Setting ball
- Machine validation cards
- Calibration certificate
- Foam tray (fits aluminium QC10 case only)

Partial arc test kit (A-8014-1575)
Bluetooth® adaptor (A-8014-BTA1)
2nd spare battery (A-8014-CR2)



Part number: A-8014-BBUG

Price: \$4,793

QC20-W system carrying case

The new QC20-W case has dedicated locations to carry the small circle accessory kit and VTL, and is lockable.

Part number: M-8014-1600

Price: \$357



Small circle accessory kit (SCAK)

The small circle accessory kit is used with the QC20-W ballbar to allow tests with a radius of 50 mm. The existing QC10 small circle accessory kit (SCAK) cannot be used with the QC20-W. The SCAK includes a 50 mm glass calibrator, calibration certificate and the small circle adaptor, which is supplied with an additional center ball already fitted.

If you already use the QC10 SCAK, just purchase the new adaptor, which is a simple screw mount to the QC20-W body. You can retain your existing 50 mm glass calibrator (see QC20-W spare parts overleaf).

Part number: A-8014-1540

Price: \$999



VTL adaptor kit

The VTL adaptor is available for 2-axis CNC applications. This replaces the “tool cup” in the standard set-up and gives restricted movement of the center cup in a single axis, enabling typical 2-axis machines such as vertical turning lathes and laser cutting machines etc to benefit from QC20-W ballbar diagnosis.

Part number: A-8014-0417

Price: \$232



Lathe adaptor kit

The lathe adaptor kit allows you to perform 360°, 100 mm radius ballbar tests on a lathe. The kit consists of an arm assembly for attachment to the lathe turret and a spindle bar for attachment in the lathe spindle. Both arm and spindle include magnetic cups in which to locate the ballbar.

Includes:

- Lathe adaptor arm assembly
- Spindle bar assembly
- Spherical adaptor
- Center cup
- Cup screw (with magnetic cup)
- 5 mm long-arm hex key
- 3 mm hex key
- Set of user instructions
- Plastic carrying case

Part number: A-8014-0551

Price: \$1,089



Lathe adaptor kit upgrade

Required for users upgrading from QC10 to QC20-W. Includes spherical adaptor and center cup.

Part number: A-8014-LKUG

Price: \$357



QC20-W ballbar system spare parts



Item	Description	Part number
1	QC20-W ballbar assembly (including balls)	Only available as RBE
2	QC20-W system carrying case (not fully shown)	M-8014-1600
3	Transducer ball	A-8014-0182
4	Center cup	A-8014-0522
5	Center ball	A-8014-0141
6	Cover ring	A-8014-1592
7	Center pivot assembly	A-8014-1281
8	50 mm extension bar	A-8014-0231
9	150 mm extension bar	A-8014-0144
10	300 mm extension bar	A-8014-0145
11	Tool cup assembly	A-8014-0521
12	Setting ball	A-8014-1570
13	Tool cup extension	A-8014-1610
14	Glass calibrator	A-8014-0280
15	Spanner set	A-8014-1141
16	Lithium battery	A-8014-CR2
17	Battery end cap assembly	A-8014-1593
Not shown	Getting started DVD	A-8014-1285
Not shown	Validation card (minimum order quantity 10)	A-8014-VCAR
Not shown	Validation card holder (minimum order quantity 10)	A-8014-VCHD
Not shown	Ballbar20 software upgrade	A-8014-0717
Not shown	Cup cleaning kit	A-8014-0423

Small circle accessory kit

Item	Description	Part number
18	50 mm glass calibrator	A-8014-0491
19	Small circle adaptor	A-8014-1560

VTL adaptor kit

Item	Description	Part number
20	VTL adaptor kit	A-8014-0417

Lathe kit (cannot be stored in system case)

Item	Description	Part number
Not shown	Cup screw assembly	A-8014-0552
Not shown	Spindle bar assembly	A-8014-0553

Glass calibrator

A glass calibrator is supplied with all QC20-W kits and is used to calibrate the length of a ballbar. This type of calibrator is manufactured from a material which has a temperature expansion coefficient of almost zero.

Part number: A-8014-0280

Price: \$2,180



Cover ring

The cover ring needs to be removed from the QC20-W body before attaching the small circle adaptor.

Part number: A-8014-1592

Price: \$26



Tool cup assembly

The condition of the phosphor bronze bearings in the tool cups affects the errors measured by the transducer. Tool cups cannot be repaired (if they are damaged they must be replaced).

Part number: A-8014-0521

Price: \$134



Tool cup extension

The tool cup extension will provide the required clearances for conducting a vertical 220° partial arc test on a machine, for collet sizes up to ER40 (63 mm diameter collet nut). It has two different outer diameters, the smaller diameter is 12 mm and the larger diameter is ½ inch, to suit different collets.

Part number: A-8014-1610

Price: \$45



Transducer ball

If a ball joint is dropped onto a hard surface, the ball sphericity may be affected, which will add to the errors measured by the ballbar system. If this happens, discard the ball joint and replace it with a new one, using the special spanner provided.

Part number: A-8014-0182

Price: \$150



Battery end cap assembly

The battery end cap assembly is supplied with a center ball already fitted.

Part number: A-8014-1593

Price: \$220



QC20-W spare parts continued

Center ball

If a ball joint is dropped onto a hard surface, the ball sphericity may be affected, which will add to the errors measured by the ballbar system. If this happens, discard the ball joint and replace it with a new one.

Part number: A-8014-0141

Price: \$150



Center pivot assembly

The magnetic center pivot assembly has a clamping mechanism that can be locked/unlocked by pulling the lever to the horizontal/vertical position. The center pivot assembly is supplied with a center cup fitted.

Part number: A-8014-1281

Price: \$523



Center cup

The condition of the phosphor bronze bearings in the center cups affects the errors measured by the transducer. Center cups cannot be repaired (if they are damaged they must be replaced).

Part number: A-8014-0522

Price: \$150



Setting ball

The setting ball is placed into the center mount cup when setting the zero coordinates for a test.

Part number: A-8014-1570

Price: \$53



Extension bars

By assembling the ballbar with different combinations of extension bars, it is possible to carry out ballbar tests with 100, 150, 250, 300, 400, 450, 550 or 600 mm radii.

Length 50 mm

Part number: A-8014-0231

Price: \$212

Length 150 mm

Part number: A-8014-0144

Price: \$255

Length 300 mm

Part number: A-8014-0145

Price: \$345



Spanner set

The C spanners can be used to ensure the screw joints on the ballbar (including any extension bars) are not loose and the screw joints on the tool cup extension (if used) are tight. The battery end cap spanner is designed to securely hold the battery end cap when unscrewing the center ball.

Part number: A-8014-1141

Price: \$18



Validation card

Double-sided card for recording ballbar test results and displaying on the tested machine (insert into card holder below).

Note: Pack of 10.

Part number: A-8014-VCAR

Price: \$6



Validation card holder

Plastic wallet with self-adhesive back to attach to the machine.

Note: Pack of 10.

Part number: A-8014-VCHD

Price: \$6



Cup cleaning kit

The tool cups are magnetic and may attract steel swarf and chips into the cup during use. Clear any swarf from the cups before storing them away with the cleaning kit.

Part number: A-8014-0423

Price: \$14



50 mm glass calibrator (small circle accessory kit)

The 50 mm glass calibrator includes a calibration certificate.

Part number: A-8014-0491

Price: \$731



Small circle adaptor (small circle accessory kit)

The small circle adaptor is supplied with an additional center ball already fitted. The adaptor is a simple screw fitting to the main ballbar body.

Part number: A-8014-1560

Price: \$316



Spindle bar assembly (lathe adaptor kit)

The spindle bar assembly is fitted with a clamp holder and clamp.

Part number: A-8014-0553

Price: \$318



Cup screw assembly (lathe adaptor kit)

The cup screw assembly is supplied with a center cup already fitted.

Part number: A-8014-0552

Price: \$171



QC20-W spare parts continued

Bluetooth® USB wireless adaptor

Provides Windows PC with Bluetooth® communications capability.
Tested and compatible with QC20-W.

Part number: A-8014-BTA1

Price: \$102



Lithium battery for QC20-W

CR2 lithium battery.

Part number: A-8014-CR2

Price: \$9



Machine checking gage

The Renishaw MCG is designed for rapid, volumetric accuracy evaluation for CMMs. The gage takes account of variations due to probe, machine and software errors.

Measuring range: Vertically: $\pm 45^\circ$
Horizontally: 360°
Total gage error: $\pm 0.5 \mu\text{m}$

Two kits are available, each supplied in a hardwood box.

MCG1 – small kit

Suitable for machines up to 40 in (1000 mm) cubed.

Part number: A-1007-0006

Price: \$3,444

MCG2 – large kit

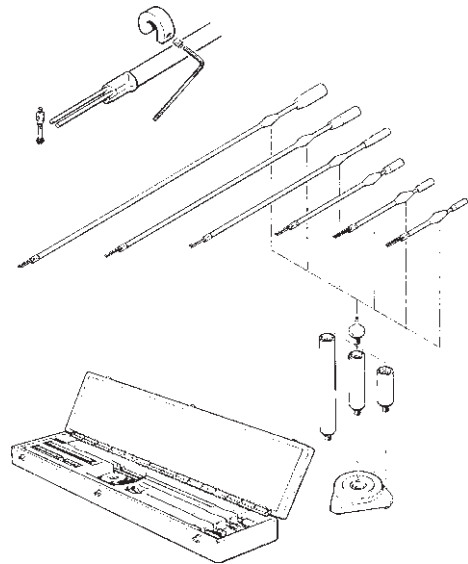
Suitable for machines larger than 40 in (1000 mm) cubed.

Part number: A-1007-0056

Price: \$4,318

MCG spares and accessories

Description	Part number	MCG1	MCG2	Price
SA3-M3/M2 stylus adaptor	M-5000-4163	*	*	\$14
SE2-20 mm stylus extension	M-5000-3592	*	*	\$15
SE7-5 mm stylus extension	M-5000-7634	*	*	\$12
Pivot	A-1007-0017	*	*	\$321
Special stylus	A-5000-7650	*	*	\$91
101 mm arm	A-1007-0007	*	*	\$630
151 mm arm	A-1007-0008	*	*	\$659
226 mm arm	A-1007-0009	*	*	\$689
380 mm arm	A-1007-0010	*	*	\$724
532 mm arm	A-1007-0011		*	\$770
685 mm arm	A-1007-0012		*	\$830
76 mm pillar	M-1007-0023	*	*	\$75
127 mm pillar	M-1007-0024	*	*	\$128
235 mm pillar	M-1007-0025		*	\$162
Baseplate	A-1007-0061	*	*	\$292
Additional weights	A-1007-0018	*	*	\$10



Training

Renishaw offers world class training at their modern facilities in Hoffman Estates, Illinois, only 45 minutes from Chicago's O'Hare airport. Regular classes are held once per month for both laser and ballbar product groups. In-house courses start on Tuesday morning and conclude around midday on the Friday. The training includes a mix of classroom work and hands-on experience in the Renishaw technology center where we have a selection of modern machines for students to work with. If you have a large group, or prefer not to travel, on-site training is also available.

Information on training classes and class schedules can be found on the web at www.renishaw.com/training-usa.

Our standard, in-house training courses cover the following subjects:

- The 21 degrees of freedom
- Accuracy and the environment
- Relative thermal behaviour
- Machine geometry and design
- Determining relative errors
- Interpreting analysis data
- Troubleshooting set-up and machine errors
- Machine tool part programs
- Hardware set-up procedure
- Software set-up and data capture
- Correcting errors on the machine

Two basic training courses are offered:

Learning practical laser interferometry

In addition to the standard metrology subjects, the laser class will cover the following aspects:

- Laser interferometry theory
- Laser kit parts identification
- Current laser technology
- Linear, angular and straightness measurements
- Cosine, deadpath and Abbé errors
- Error compensation
- Using the laser as a diagnostic tool
- Implementing maintenance programs
- Accessories for the laser

Part number: A-8003-LATC **Price:** \$1,728

One-day hands-on ballbar training at Vincennes University

Part number: A-8003-BBVU **Price:** \$510



Using and understanding the QC20-W ballbar and machine metrology

The comprehensive course provides students with a detailed understanding of the most powerful machine tool diagnostic device you can buy.

Specialist features of the course include:

- Why buy a ballbar?
- When to use a ballbar
- Ballbar theory
- Ballbar kit parts identification
- Ballbar accessories

Training materials, lunch and refreshments are provided each day.

Part number: A-8003-BBTC **Price:** \$1,728

Advanced training at Renishaw Inc

Charged per student, per day

Part number: A-8003-0008 **Price:** \$799

Training on-site at customer's premises (1-2 days)

Part number: T-2000-1080-S **Price:** \$6,157

Training on-site at customer's premises (4 days)

Part number: T-2000-1081-S **Price:** \$10,261

Additional day's training on-site at customer's premises

Part number: A-8003-0006 **Price:** \$2,052