RENISHAW
apply innovation™

Equator-X™ 500
dual-method gauge

Throughput | Assurance | Flexibility

Equator-X: absolute inspection with the new Equator™ gauge

The new Equator-X system brings unique capability to the shop floor with its dual measurement functionality; Absolute and Compare. Users can select the optimum inspection method for their process challenge, effectively deploying two systems in one.

Two systems in one: a dual-method approach

Absolute mode

In absolute inspection mode, the Equator-X system performs as a high-speed production CMM, providing fully traceable results (ISO 10360-2: 2.1 + L / 300 µm).

Rapid measurement at scanning speeds of up to 250 mm/sec, without the need to maintain master parts, is particularly useful for manufacturers with:

- high part variation
- low to medium production volumes
- high frequency of inspection

Compare mode

When used in Compare mode, the Equator-X system delivers ultra-fast, highly repeatable inspection with scanning speeds up to 500 mm/s and ± 2 µm repeatability across a wide temperature range. This is particularly useful for high volume manufacturing of parts, where throughput is key and environmental temperature changes are a challenge.

Comparison method – explained

The comparison method is based on the traditional comparison of production parts to a reference master part. A master part is measured to generate a master data set. Each production data set is then compared to the master to determine the actual size of the part and whether it is within user defined tolerances. In factories with wide temperature variation, simply re-master and the system is ‘re-zeroed', ready for repeatable comparison to the master.

The Equator-X system explained

Absolute encoders

A RESOLUTE™ optical absolute encoder is fitted to each of the six metrology struts. This provides excellent positional feedback and eliminates the need to home the machine, supporting failsafe recovery methods essential in automated production cells.

Probing system

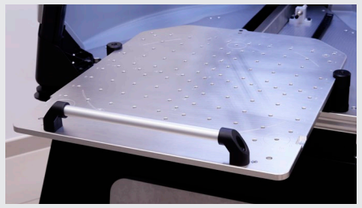
Equator-X scanning systems are supplied with the industry standard SP25M 3-axis analogue scanning probe and SM25-2 scanning module.

Workpiece temperature sensor

The WPS-2 workpiece temperature sensor is used to provide part temperature data for thermal compensation. Compatible with Renishaw modular fixturing, it can be mounted in multiple orientations, ensuring good contact with the workpiece.

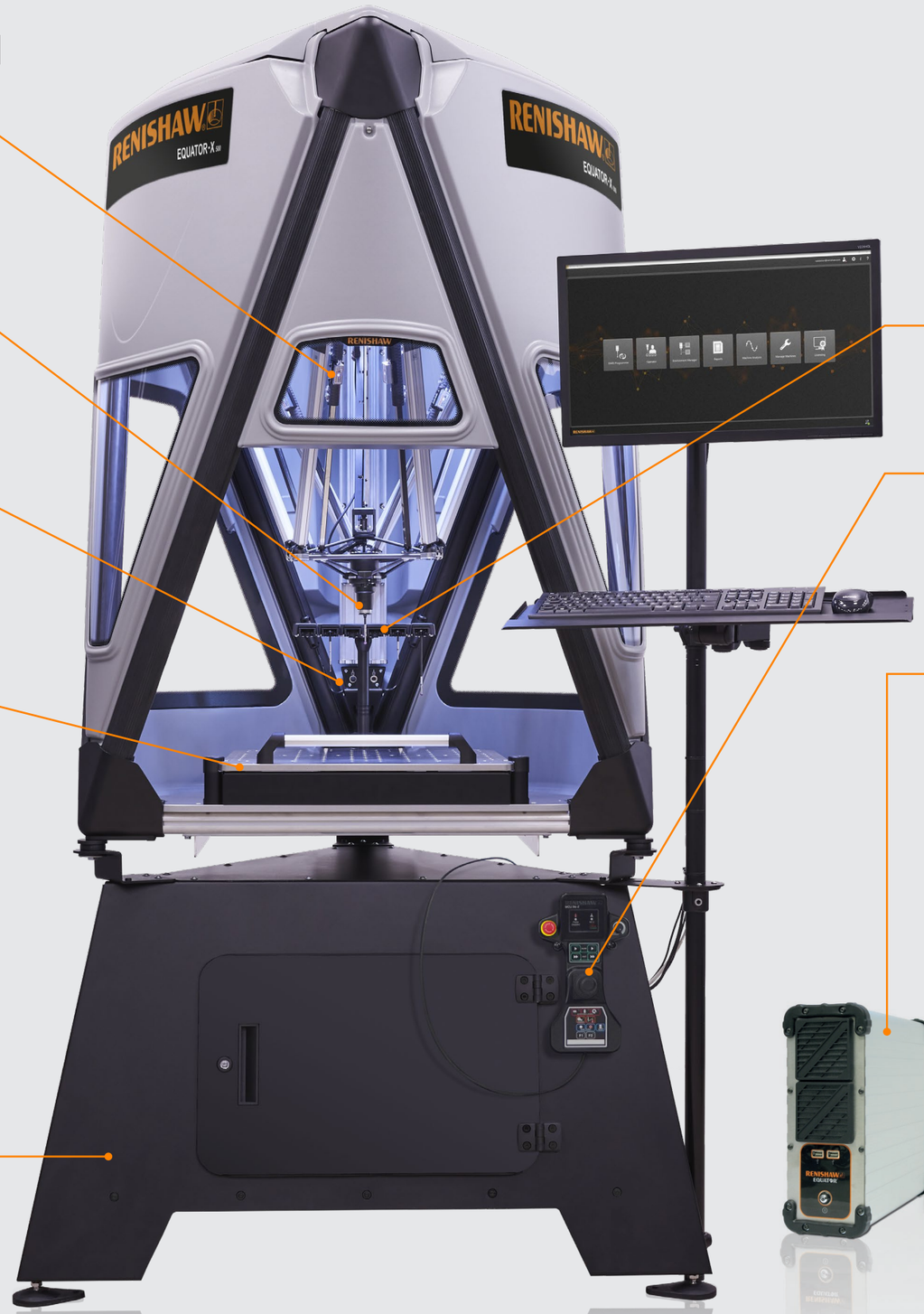
Innovative manual part loader

The mechanism in the Manual Transfer System (MTS) ensures parts are always correctly positioned and allows better access to the fixture plate for loading the workpiece outside the machine. It has a sensor to confirm the MTS is loaded, ready for part inspection. An optional magnetic lock keeps the MTS in place until the inspection program is completed.



Base (housing PC and controller)

The Equator-X base has excellent stability with a small footprint. Passive damping is built-in providing resistance to shop floor vibrations. It has an IPX2 rating and is fitted with two fans to provide a cool, clean environment for storage of PC and controller equipment. The door on the front is lockable.



EQR-6 stylus changing rack

The Equator-X system is supplied with an EQR-6 auto change rack, storing up to six styli configurations.

Joystick

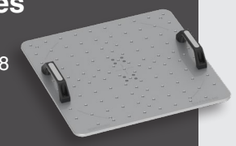
The multi-functional joystick is used to move the probe in X, Y and Z when the Equator-X is in manual mode, facilitating faster programming.

Controller

The Equator-X controller is the heart of the system, controlling rapid machine motion. It requires only the supplied ethernet cable to connect it to a PC hosting the user software.

Optional fixture plates

The Equator-X system can be supplied with either an M6 or M8 fixture plate. Both fixture plates are compatible with Renishaw modular fixturing.



Optional modular fixturing sets and styli solutions

Improve the throughput, reproducibility and accuracy of your measurements with modular fixturing and industry leading styli.

Key benefits

Throughput

The Equator-X system is capable of absolute scanning speeds of 250 mm/sec and comparison speeds of up to 500 mm/sec, far higher than conventional 3-axis CMMs. By measuring faster, inspection capacity is increased. This high performance enables inspection to keep pace with machining operations.

Assurance

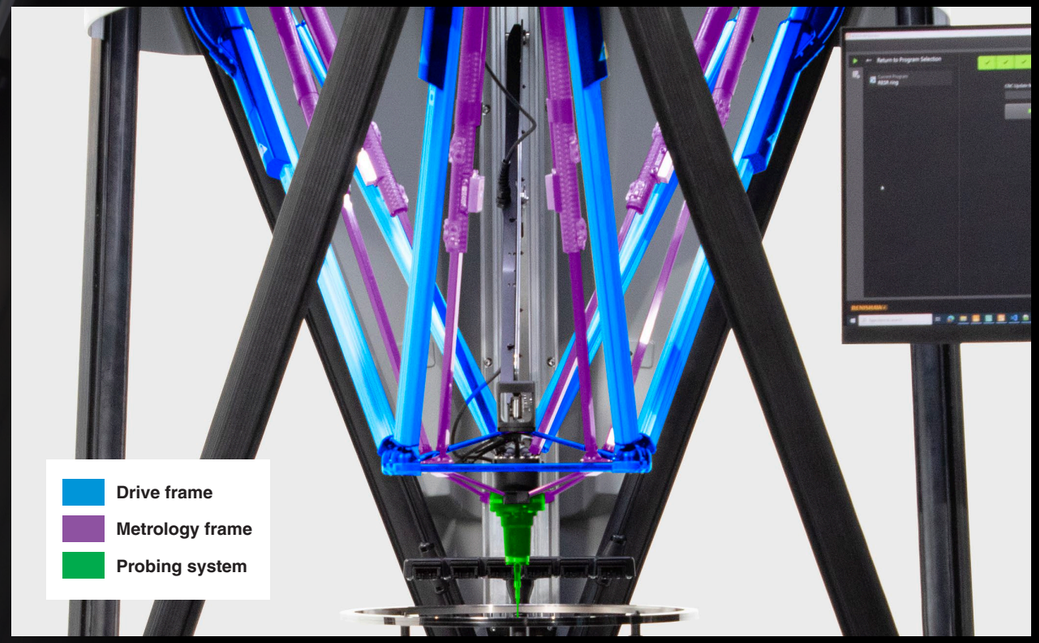
The Equator-X system provides fully traceable in-process verification of parts to ISO 10360 standards, providing assurance when moving measurement out of the measurement lab and onto the shop floor. The Equator-X gauge provides continuous validation of the production process with real-time feedback.

Flexibility

The ability to choose between two methods of measurement on a single device enables the user to select the optimal method for their application. For example, the absolute method for large varieties of parts, or the comparison method for wide variation of environmental temperature.

The compact and lightweight design, without the need for compressed air, makes it easy to deploy exactly where needed, either in-line or at-line.

RENISHAW
apply innovation™



Equator-X: precision and speed redefined

The Equator-X system is engineered to deliver exceptional high-speed motion with unparalleled measurement accuracy. Designed around the dynamically stiff hexapod structure, inertial drive forces act only in tension or compression significantly reducing speed related errors seen in conventional 3-axis CMM systems.

In addition, the drive and metrology frames are independent, making it possible to optimise the drive frame for high speed motion without compromising metrology performance.

Drive frame

The Equator-X system achieves its remarkable speed and performance using six linear motors in a hexapod configuration. These drives apply force directly to the moving probe platform, avoiding the dynamic bending and twisting present in traditional CMMs.

Drives and positional feedback encoders are located above the working volume, away from major sources of contamination.

A high level of performance is maintained even in a shop floor environment.

Metrology frame

The carbon fibre metrology frame is both rigid and lightweight, essential for maintaining high-speed motion and accuracy. Performance is further enhanced by applying a thermal expansion signature for the carbon fibre struts, which is used to build an overall system thermal compensation model.

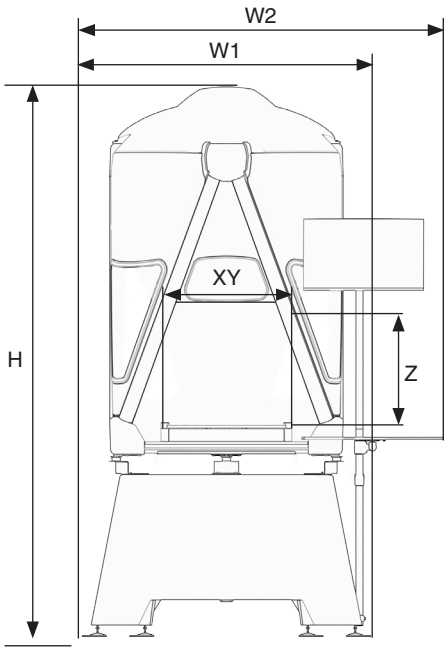
Each metrology strut incorporates the RESOLUTE™ absolute optical encoder system; absolute position is known immediately upon switch on.

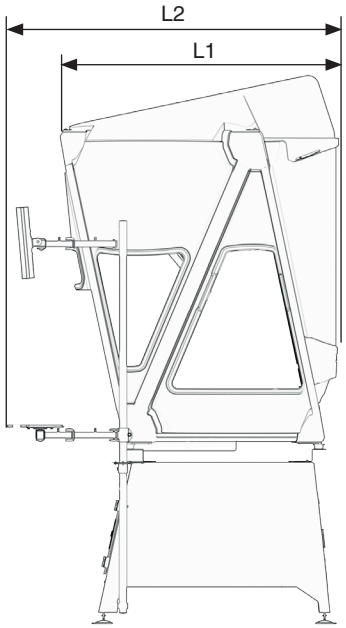
Probing system

The industry-standard SP25M probe is a highly versatile scanning system allowing users to scan for form, size and position. The SP25M probe with SM25-2 scanning module delivers exceptional performance over the entire stylus range from 50 mm to 105 mm effective working length for straight styli and up to 83 mm for cranked styli. The six-port rack supplied with the Equator-X system enables automatic and repeatable changeover between different stylus arrangements.

RENISHAW
apply innovation™

Equator-X™ 500





Dimensions (mm)						
XY	**Z**	**W1**	**W2**	**L1**	**L2**	**H**
Ø 500	250	1188	1250	1228	1452	2390

Environmental specifications	
Indoor use	Machine: IPX0 IEC 60529 (indoor use only) Base: IPx2* (sealed against liquid coming from parts on the transfer system)
Operating temperature	+5 °C to +50 °C
Storage temperature	-25 °C to +70 °C
Humidity	Maximum 80% RH at 40 °C, non-condensing

Specifications	
Weight of machine	140 kg
Weight of base	50 kg
Fixture plate	510 mm x 510 mm
Maximum part weight including fixturing - MTS locked static or no MTS	100 kg
Maximum part weight including fixturing - with MTS operating	25 kg
Thread size	Bed inserts are M8 (M6 and 1/4" fixture plates are available)
Supported probe	SP25 with SM25-2 (scanning and touch points)
Stop circuit	Safety category: CAT 2-PL-b ISO 13849-1: B ISO 13850: 1 - controlled stop and power removed
Joystick	MCU lite-2
Control system	Equator motion controller (MC)
Position measurement	Renishaw RESOLUTE absolute optical encoder system

#renishaw

RENISHAW
apply innovation™

Absolute measurement performance

Criteria	Performance	Temperature range
Length measurement error E0 (1) & E60 (2) ISO 10360-2:2009	± 2.1 µm + L/300 mm (3)	18 - 22 °C
	± 2.6 µm + L/180 mm (3)	18 - 26 °C

Criteria	Performance	Details
Repeatability range of the length measurement error ISO 10360-2:2009	1.2 µm	Repeatability of E0 MPL (maximum limit)
Scanning Mode Test ISO 10360-5:2020	Form: 2.9 µm Size: 1.2 µm Time: 40 seconds (4)	MPE(P[Form.Sph.Scan:NPP:Tact]) MPE(P[Size.Sph.Scan:NPP:Tact]) MPE(t[Sph.Scan:NPP:Tact])
Single Stylus Probing Test ISO 10360-5:2020	Form: 2.4 µm Size: 1.2 µm	MPE(P[Form.Sph.1x25:SS:Tact]) MPE(P[Size.Sph.1x25:SS:Tact])
Multi Stylus Test ISO 10360-5:2020	Form: 3.9 µm Size: 1.2 µm Location: 2.7 µm	MPE(P[Form.Sph.5x25:MS:Tact]) MPE(P[Size.Sph.5x25:MS:Tact]) MPE(L[Dia.5x25:MS:Tact])
Ring Gauge Scanning Form (7) ISO 10360-5:2020 Annex A.6	Up to 50 mm/s: 2.4 µm Up to 250 mm/s (5): 5 µm	MPE(P[Form.Cir.Scan:NPP.0:Tact]) 50 mm/s – 250 mm/s (5): 0.013v + 1.75 µm (6)
Ring Gauge Scanning Size (7) ISO 10360-5:2020 Annex A.6	Up to 50 mm/s: 1.2 µm Up to 250 mm/s (5): 2.16 µm	MPE(P[Size.Cir.Scan:NPP.0:Tact]) 50 mm/s – 250 mm/s (5): 0.0048v + 0.96 µm (6)

(1) - E0: Acceptance test with SM25-2 module; stylus length of 26 mm and stylus tip diameter of 8 mm

(2) - E60: Acceptance test with SM25-2 module; stylus length of 60 mm and stylus tip diameter of 8 mm

(3) - Where L is distance measured in mm

(4) - Completed at scan speed of 75 mm/s

(5) - Scan velocity limited to 250 mm/s or 1 rev/s, whichever is lower

(6) - Where v is the scan velocity in mm/s.

(7) - Using a 50 mm ring gauge, 50UPR filter, SM25-2 with 5x21 stylus, near to calibration location in the centre of the machine volume.

Specifications	
Travel speed (maximum)	750 mm/s vector velocity
Acceleration (maximum)	1500 mm/s² vector acceleration
Scan speed (maximum)	250 mm/s or 1 rev/s - Max speed dependant on feature size
Warm up time	2 hr (until absolute specification applies)
Temperature gradient	2 °C per hour 8 °C per day
Temperature compensation	Compensation for steady state and varying temperature up to 2 °C/hour.

Comparator performance

Specifications	
Travel speed (maximum)	750 mm/s vector velocity
Acceleration (maximum)	1500 mm/s² vector acceleration
Scan speed (maximum)	500 mm/s or 2 rev/s - Max speed dependant on feature size
Comparison uncertainty(4)	± 2 µm

The process of comparator measurement on an Equator-X system involves defining a series of gauge points on the component surface. Periodic calibration of a master part either using the absolute measurement method on the Equator-X system or on a separate CMM establishes datum values for each gauge point. The same gauge points on the same master part are measured on the Equator-X system, – 'mastering' –, to establish a correlation with the certified accuracy of the Equator-X system or separate CMM. Subsequently, a regular 're-mastering' process is used to account for changing environmental conditions. Size and position measurements made immediately following re-mastering will have a comparison uncertainty of ±0.002 mm relative to the certified measurements of the master part. This specification applies where each part is fixtured to within 1 mm relative to the master part.

#renishaw

Part no.: H-6620-8560-01-A
Issued: 06.2025