

Talyrond® 595H

A revolutionary concept in automated roundness inspection



The Talyrond 595H series

A new concept in roundness measurement



Measure three critical performance elements...

Roundness,
Surface finish,
and now **Contour**

...exactly as they were produced





High precision emulation of your manufacturing process

The all-new Talyrond 595H roundness instruments use rotary, vertical and horizontal measuring datums to duplicate your machine tool's movement and exactly reproduce the workpiece shape. This ultra high precision simulation of the cutting tool path enables precise control of your manufacturing process.

Reproducible measurement results

Decades of experience, ultra precision machining expertise and FEA optimized design combine to provide low noise and near flawless mechanical execution of the measuring axes. Further enhancement via the use of traceable standards and exclusive algorithms effectively eliminates instrument influence from the measurement results.

Monitoring manufacturing

 Gauge	 Roundness	 Roughness	 Contour
Gauge Range Up to 4 mm	Radial Accuracy $\pm 0.008 \mu\text{m}$	Noise Less than 20 nm Rq all axes	LS Arc measurement 5 μm
Resolution Down to 0.3 nm		Ra values Less than 0.05 μm	Pt 0.5 μm

Unparalleled measurement capability

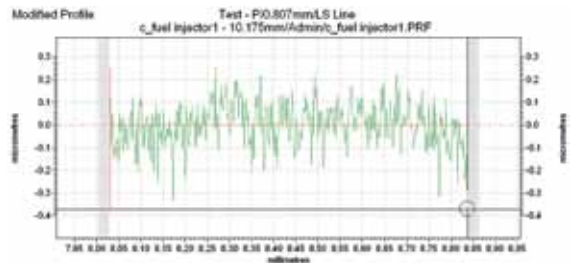
Five measurements in one

Emulating the manufacturing process with a higher degree of precision allows all features to be measured on one instrument

1

Roughness

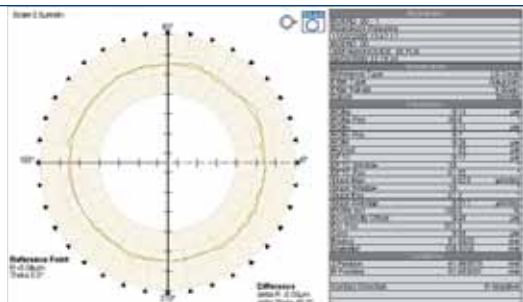
High resolution gauge and low axis noise enables linear or circumferential surface roughness measurement.



2

Roundness

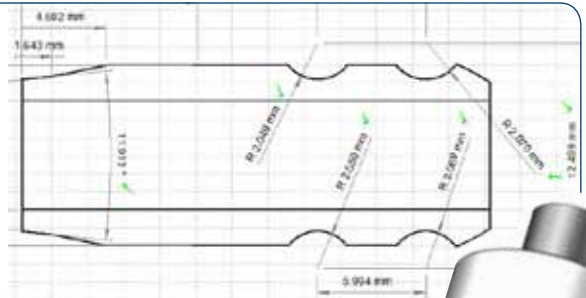
Frictionless air bearing spindle and precision column for roundness, cylindricity and straightness measurements.



3

Contour

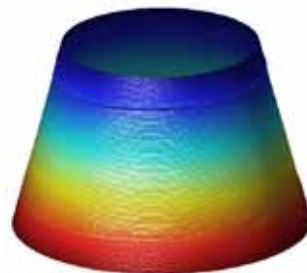
Our patented calibration technique enables measurement of radius, angle, height, length, distance and more.



4

Cylindrical mapping

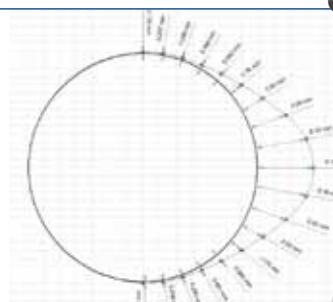
Precision control and low noise in all axes allows in depth analysis of cylindrical components including wear scars and material volume.



5

Cams and pistons

A precision encoder and linear scales in all axes enables measurement of non round parts such as cams and pistons.

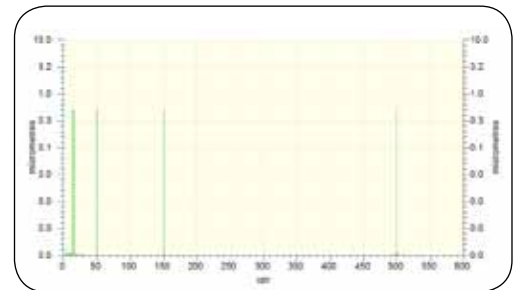
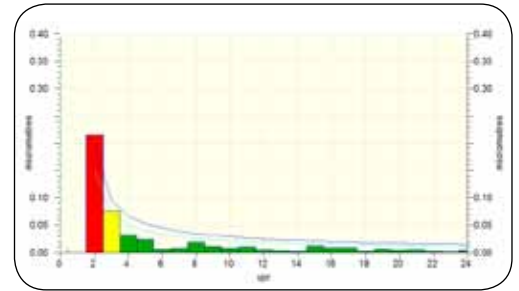
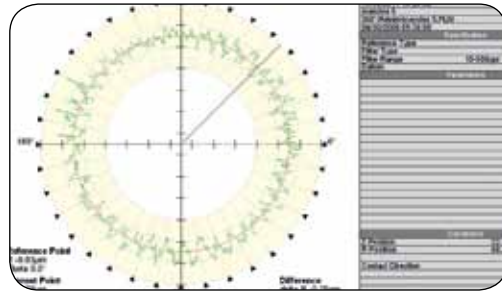


Powerful software tools help improve your process

Advanced harmonics – identify the cause of bad parts

Ordinary inspection might detect bad components but Talyrd 595H can help you fix the production issues that are causing them. Deviation in form on a workpiece can be broken down into irregularities that have both frequency and amplitude. Harmonic analysis identifies these imperfections allowing you to pinpoint and correct their cause, reducing the need for ever tighter tolerances on size.

- Full histogram view with tolerance bands
- Pass/Fail and warning messages
- Ranking system according to wave depth or harmonic amplitude
- Comparison to CSV or GKD files
- Up to 5000 upr
- Wave depth or harmonic amplitude format



Precision harmonic standard

A precision machined standard with the following undulations in 360 degrees:

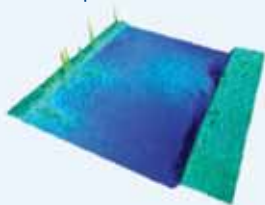
15	upr
50	upr
150	upr
500	upr
1500	upr



“Giving confidence in your instrument.”

3D cylindrical mapping

For production issues beyond the scope of traditional 2D inspection techniques



3D topography of a wear scar



Advanced cone analysis

With high accuracy and high resolution in all axes, Talyrd 595H allows you to measure in 3 dimensions for more thorough examination of flaws, defects and cutting tool geometry effects that influence performance or lead to component malfunction.

- Twist or lead detection
- Machining defects
- Wear scar analysis
- Leak detection and more

Q-Link Production Interface

A simplified interface designed specifically for production environments

- Q-DAS accredited
- Compatible with all instruments
- Simple operation
- User levels
- Traceable fields
- Simple tolerancing
- Automatic summary reports
- Automatic statistical studies



Applications

Inner bearing races

Harmonic analysis



Form & radius analysis



Roundness

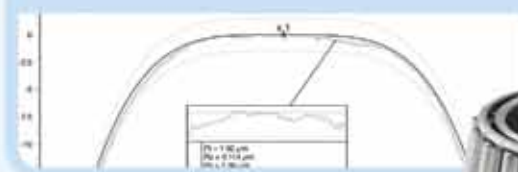


Roller bearings

Roundness



Tilt and form error to axis of rotation

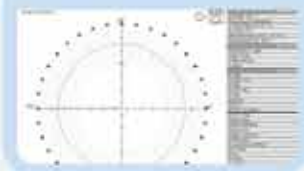


Fuel injectors

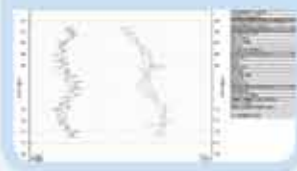
Angle and distance



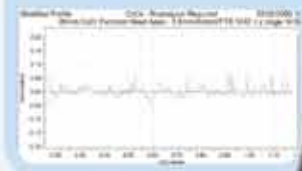
Roundness



Parallelism



Surface finish

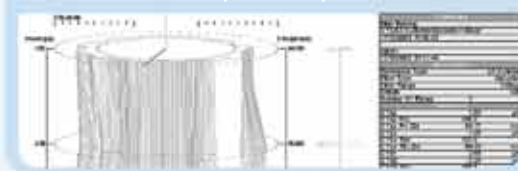


Cylinders

Parallelism

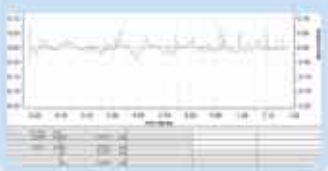


Cylindricity



Turbo chargers

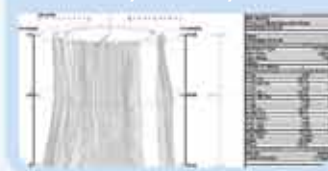
Surface finish



Parallelism



Cylindricity



Testimonial

Ultra precision bearings are produced to the highest standards available. They are used in industries with a necessity for critical tolerances, high speeds and reliable performance under demanding operating conditions. Ultra precision bearings are also used in safety-critical and harsh environment applications.

Industries and applications:

- Automotive
- Aerospace
- Bearings
- Hydraulics
- Optics
- Dental and medical
- Industrial plants

“Having the responsibility to ensure 1.5 million bearings each year are manufactured to the highest quality, means controlling our components at all stages of manufacturing. We have 15 Taylor Hobson roundness measuring instruments that help us maintain high throughput and the accuracies we require to ensure every one of our bearings is of the highest quality.”

Measurement Q/A Coordinator – Leading global bearings manufacturer



Designed for metrology without compromise

The construction of the Talyrond 595H is key to measurement integrity

Reproducing the part

Taylor Hobson's core competencies are in cylindrical grinding, surface grinding and diamond turning. All of these disciplines coupled with knowledge in drive mechanisms go towards constructing an instrument with low noise and high geometric accuracy, ensuring reproducibility of the component.

Frictionless air bearing spindle

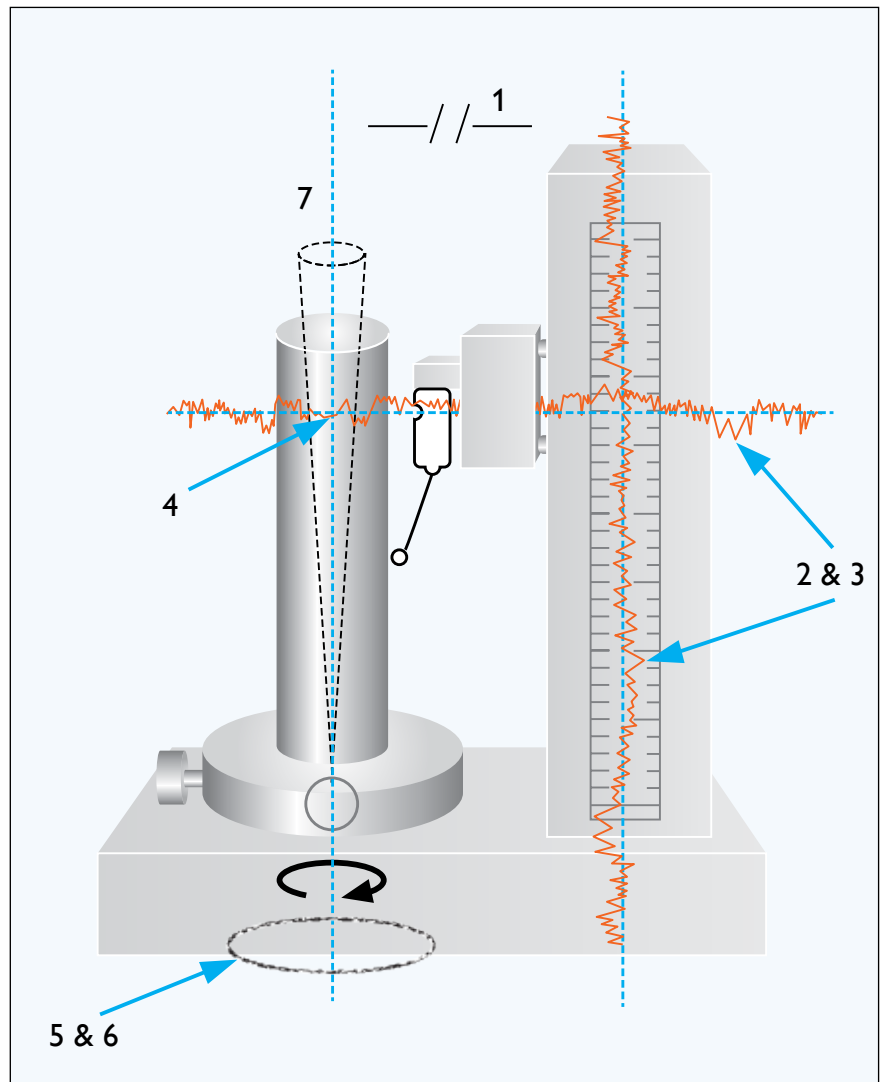
The instrument's spindle axis, like any spindle based machine tool, is paramount in ensuring integrity of measurement. Utilising Taylor Hobson's own diamond turning lathe we are able to create a reference datum unsurpassed in accuracy and reliability.

Instrument base

Using finite element analysis software, the cast iron base provides a solid foundation for both the high precision air bearing spindle and vertical straightness datum, ensuring movement and weight do not effect results. A choice of passive or active isolation mounts are available, which have been designed for either inspection laboratories or production environments.

Straightness datums

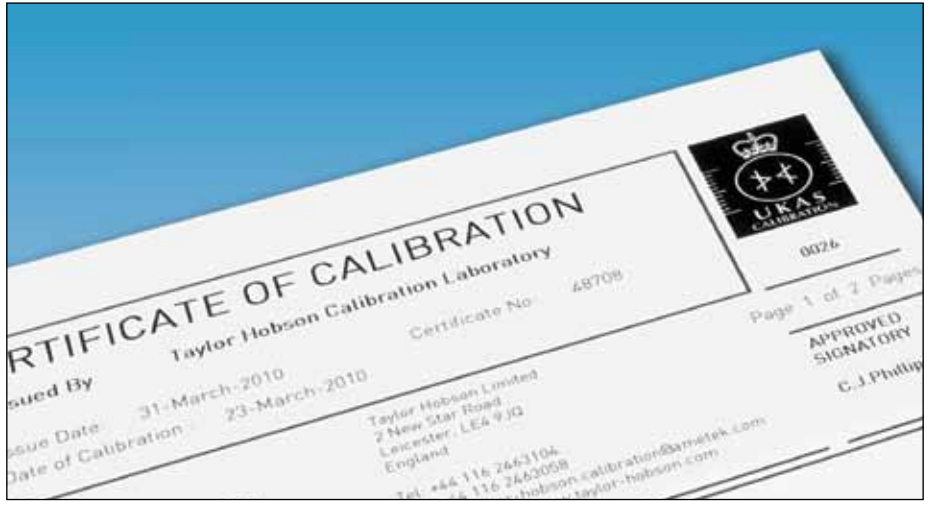
The vertical column is machined for straightness, waviness and roughness to an exacting standard, using traceable standards and techniques developed by Taylor Hobson. The straightness datums are further enhanced to ensure reproducibility of the part with little or no instrument influence.



Important features of a roundness system

- 1 Parallelism of column to spindle axis
- 2 Column and arm straightness
- 3 Low vertical and radial arm noise
- 4 Squareness of arm to spindle axis
- 5 Radial run-out of spindle
- 6 Low spindle noise
- 7 Minimised coning error of spindle
- 8 Accurate glass scales in all axes

“World-beating noise floor”



Traceability

Full traceability to international standards

Traceability

All calibration standards can be provided with traceability to international standards using Taylor Hobson's own UKAS laboratory.

Arcuate correction (contour option)

Taylor Hobson's patented calibration routine and calibration ball corrects for the arcuate motion of the stylus allowing dimensional measurement. This routine is critical to measurement of radius and angled parts when normal calibration routines will not suffice.

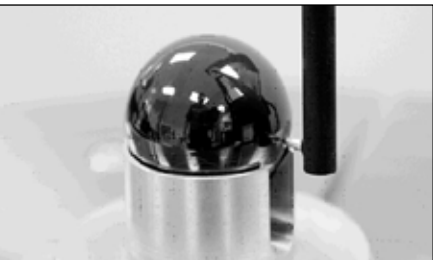


Roundness

Using a precision polished glass hemisphere calibrated to an uncertainty of less than 5nm Taylor Hobson can guarantee your spindle is within specification and maintain quality of results.

Gain correction

The Talyrond 595H has a unique automated gain calibration for the instrument's gauge; the routine is automated and takes a matter of seconds to set. Alternatively a set of calibrated slip blocks traceable to primary standards are also supplied.



Straightness, squareness and parallelism

To ensure the column and radial straightness unit conform to specification we can provide standards that are either cylindrical or flat. These standards provide certainty of the measurement axes. These artefacts are combined with special software routines to enhance all axes for correct geometrical form.

Axis calibration

Automated or manual routines are supplied allowing the user to set coordinates to the part or instrument axes. The fully automated routine calibrates the arm, column and spindle.

Surface finish

A unique standard is available that provides measurement traceability for roughness in both a vertical and circumferential direction

Industry specific software

Velocity analysis allows bearing manufacturers to evaluate harmonics with respect to amplitude and predict function with respect to speed



Accessories

All the accessories you need to begin using Taylor Hobson roundness measuring systems are supplied as standard. However, for more demanding requirements or improved measurement throughput, we have a range of accessories which may be ordered separately.

1 Environmental cabinet and active AV mounts

Recommended for use in production or non controlled environments

Environmental cabinet

The environmental cabinet forms part of the instrument structure and protects against airflow, dust and external influence
code 112/4276

Active anti-vibration mounts

The active AV mounts protect the system from external vibration by use of piezo actuated mounts
code 112/4277

Active AV mounts with environmental cabinet

Provides isolation from airflow, dust and external vibration
code number 112/4278

2 Talyrond ball calibration standard

Required for use with contour or form software, this calibration standard corrects for gain, tip and arcuate motion of the stylus

Talyrond ball standard rad 7.5mm
 (Not recommended for 4 mm range)
code 112-4305UC

Talyrond ball standard rad 12.5mm
 (Not recommended for 4 mm range)
code 112-4319UC

Talyrond ball standard rad 22.5mm
code 112-4092UC

3 Calibration standard for vertical and circumferential roughness

code 112/4341 UCR

4 Six jaw component chuck

A 6 jaw precision scroll chuck.
 Capacity - Inside diameter
 20 mm - 95 mm (0.78 in - 3.74 in).

Capacity - Outside diameter
 2 mm - 32 mm (0.08 in - 1.26 in).
code 112/1859 optional

5 Standard stylus arms

Ruby ball x 100 mm (3.9 in)
 1 mm (0.039 in), **code 112/3245**
 2 mm (0.078 in), **code 112/3244**
 4 mm (0.157 in), **code 112/3243**

6 Precision collet chuck - removable three ball type location (for use with manual or automated tables)

Note: Collet required - see list below.
code 112/3662

code 112/3554-1.0 1 mm Collet
 code 112/3554-1.5 1.5 mm Collet
 code 112/3554-2.0 2 mm Collet
 code 112/3554-2.5 2.5 mm Collet
 code 112/3554-3.0 3 mm Collet
 code 112/3554-3.5 3.5 mm Collet
 code 112/3554-4.0 4 mm Collet
 code 112/3554-4.5 4.5 mm Collet
 code 112/3554-5.0 5 mm Collet
 code 112/3554-5.5 5.5 mm Collet
 code 112/3554-6.0 6 mm Collet
 code 112/3554-6.5 6.5 mm Collet
 code 112/3554-7.0 7 mm Collet
 code 112/3554-7.5 7.5 mm Collet
 code 112/3554-8.0 8 mm Collet

code 112/3555 Adjustable End Stop
 Recommended for use with 112/3549 or 112/3662; may require modification to suit the component under test.

Bar stylus

A 100mm (3.9in) stylus for measuring small diameter components.
code 112/3489 optional

Diamond styli

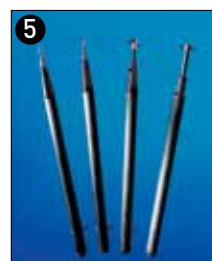
Conisphere stylus with 90° included angle; required for cylindrical mapping or surface finish applications.
code 112/3806 optional 5 µm Rad
code 112/3807 optional 10 µm Rad

Kinematic dowel support set

For stable workpiece mounting.
code 112/1861 standard

Reservoir assembly kit

If the air supply is unreliable or of poor quality then the reservoir assembly is recommended to provide an even flow of air to the spindle.
code 112/2869 optional



Force setting gauge

Recommended with diamond styli and where specific stylus forces are required.
code 112/3808 optional

7 High precision glass hemisphere

For checking total system performance; UKAS calibration certificate is optional.
Roundness < 0.02 μm (0.8 μm)
code 112/2324 optional

Glass hemisphere

For checking total system performance; UKAS calibration certificate is optional.
Roundness < 0.05 μm (2 μm)
code 112/436 optional

8 High precision test cylinder

For verification of the instrument's vertical straightness accuracy and parallelism of the vertical axis to the spindle axis. UKAS calibration certificate is optional.
code 112/3670-01 optional

Precision test cylinder

For checking the instrument's vertical straightness accuracy and parallelism of the vertical axis to the spindle axis. UKAS calibration certificate is optional.

300 mm (11.8") cylinder
Roundness < 0.25 μm (10 μm)
Straightness < 0.5 μm (20 μm)*
code 112/1888 optional

500 mm (19.7") cylinder
Roundness < 0.25 μm (10 μm)
Straightness < 0.5 μm (20 μm)*
code 112/1997 optional

1000 mm (39.4") cylinder
Roundness < 0.75 μm (30 μm)
Straightness < 3 μm (120 μm)*
code 112/3604 optional

* Straightness over central 90% of test cylinder length

9 Cresting standard

For checking the vertical and horizontal alignment of the gauge head.
code 112/1876 optional

10 Flick standard

For rapid calibration of the gauge head; alternative to the standard gauge calibration set.
20 μm (788 μm) range
code 112/2308 Optional
300 μm (0.012") range
code 112/2233 optional

11 Calibration set

For calibrating the gauge head. The set comprises a circular glass flat and four gauge blocks. UKAS calibration certificate is optional.
code 112/2889 standard

Glass flat 250 mm (10") diameter
For checking the straightness and alignment of the horizontal arm with respect to the spindle axis.
code 112/1998 optional

Instrument cover

To protect the instrument when not in use.
code 112/1393 optional

ECU Fuse kit

code 112/4234 optional

Pre-filter element

code 112/3351 optional

Accessory case

A useful case for carrying standard and optional accessories.
code 48/453 optional

Set of hexagonal wrench keys

To assist with minor adjustments on the instrument.
code 630/412 optional

Coalescing filter element

Secondary filter to be changed every 3 months to maintain a clear air supply, (1 included with the instrument).
code 112/3378 optional



Customised solutions for special applications

Our strategy for success is simple, instead of just selling products, we provide solutions. If our standard instruments and accessories do not satisfy your needs, we can customise a solution to exactly match your application. This may include such things as work holding devices or special styli for applications such as small bores, shoulders or undercuts.

Specifications are subject to change without notice.

Talyrond 595H Specification

Analysis capability

Standard software		Optional software	Filters
Roundness	Parallellism	Piston measurement	Roundness • Gaussian • 2 CR Phase corrected
Squareness	Vertical straightness	Commutator analysis	
Concentricity	Partial arc flatness	Disk thickness variation	
Coaxiality	Partial arc roundness	Velocity analysis	
Slope	Partial arc roundness	Wall thickness variation	
Cylindricity	Cylindrical mapping	Advanced harmonics	Surface • Gaussian • Robust Gaussian • 2 CR Phase corrected • 2 CR
Total run-out	Departure from True Plane (DFTP)	Groove analysis	
Flatness	Departure from True Circle (DFTC)	Harmonics	
Eccentricity	Radial straightness (RSU)	TalyMap Contour Software	
Run-out	Multiplane flatness (RSU)	TalyMap 3D analysis Software	
		Circumferential Surface finish analysis	
		Surface finish analysis	
		Twist analysis	

Measurement capability

Column axis	300 mm column	500 mm column
Straightness over column length	0.2 µm / 300 mm (8 µin / 11.8 in)	0.2 µm / 500 mm (8 µin / 19.7 in)
Straightness over any 100mm (3.94in)	0.12 µm / 100 mm (4.7 µin / 3.94 in)	0.15 µm / 100 mm (5.9 µin / 3.94 in)
Vertical axis to spindle axis parallelism	0.5 µm / 300 mm (20 µin / 11.8 in)	0.5 µm / 500 mm (20 µin / 19.7 in)
Length measurement	(0.03 µm/mm + 1.5 µm)	
Column noise †	<20 nm Rq	
Spindle axis		
Radial limit of error	± 0.008 µm (1-15 upr) or ± 0.01 µm (1-50 upr)	
Axial limit of error	± 0.01 µm (1-15 upr) or ± 0.015 µm (1-50 upr)	
Coning Error (height above table)	± 0.00025 µm/mm	
Coning Error (radius from centre)	± 0.00025 µm/mm	
Horizontal arm axis		
Radial straightness unit		
Straightness over full length of travel	0.2 µm / 200 mm (4 µin / 7.9 in)	
Straightness over any length of travel	0.125 µm + 0.000375 µm/mm (5 µin + 0.015 µin/in)	
Squareness to spindle axis	1 µm / 200 mm (39.4 µin / 7.9 in)	
Radial measurement*	(0.1 µm/mm + 1.5 µm)	
Arm noise †	<20 nm Rq	
Gauge		
Range/resolution		
High range	± 2 mm , 0.016 µm resolution (0.078 in range, 0.6 µin resolution)	
Normal range	+/- 1 mm range, 0.008 µm resolution (0.039 in range, 0.3 µin resolution)	
Mid range	+/- 0.2 mm range, 0.0016 µm resolution (0.0078 in range, 0.06 µin resolution)	
Low range	+/- 0.04 mm range, 0.0003 µm resolution (0.003 in range, 0.012 µin resolution)	

Component capacity

Measuring capacity	300 mm column	500 mm column
Maximum component height	300 mm (11.82 in)	500 mm (19.7 in)
Maximum component diameter	Ø 400 mm (15.7 in)	
Maximum measuring depth	155 mm (6.1 in)	
Maximum measuring diameter	Ø 350 mm (13.8 in)	
Maximum component weight	Auto Center and Level: 40 kg (88 lb)	
Maximum worktable moment loading	Auto C&L: 1250 kg/mm (108 lb/in) within a central 80 mm (3.15 in) equilateral triangle	

† Vertical traverse measured with a 10 Kg load at 200 mm height; horizontal traverse measured with a 20 Kg load at 400 mm height. All measurements based on a nominally leveled glass flat using the specified stylus; analyzed using a Gaussian filter; 0.8 mm cut off, 300:1 bandwidth and parameter Rq.

* Based on measurements made within 2 mm radius of a calibrated ring or plug gauge

Technical

Column axis	300 mm column	500 mm column
Column construction	Precision machined cast iron datum	
Movement range	300 mm (11.8 in)	500 mm (19.7 in)
Speed of traverse - moving	0.1 - 105 mm/s (0.04 - 4.1 in/s) stepped	
- measuring	0.1 - 20 mm/s (0.01 - 0.8 in/s) stepped	
- contacting	0.5 - 5 mm/s (0.02 - 0.2 in/s) stepped	
Positional control	4 µm (160 µin)	
Positional resolution	0.25 µm (0.98 µin)	
Number of data points (selectable)	200,000 maximum	

Horizontal arm axis	
Arm construction	Lapped ceramic datum
Movement range	200 mm (7.9 in)
Speed of traverse - moving	0.25 - 15 mm/s (0.01 - 0.6 in/s) stepped
- measuring	0.25 - 15 mm/s (0.01 - 0.6 in/s) stepped
- contacting	0.5 - 5 mm/s (0.02 - 0.2 in/s) stepped
Over-center travel	25 mm (0.98 in)
Positional control	+/- 5 µm (200 µin)
Positional resolution	0.25 µm (10 µin)
Minimum movement	0.05 mm (0.002 in)
Number of data points (selectable)	200,000 maximum

Spindle axis	
Spindle construction	Ultra precision air bearing
Speed of rotation	0.3 - 10 rpm, bi-directional
Positional control	+/- 0.2 °
Positional resolution	0.02 °
Number of data points (selectable)	3600 and 18,000 (optional 72,000)

Centering and leveling table	Automatic
Achievable accuracy of auto centering	<0.3 µm (12 µin)
Achievable accuracy of auto leveling	<0.8 arc secs
Construction	Patented 3 point kinematic support
Center and leveling table control	Automatic with continuous spindle rotation
Follow mode center and leveling	Yes
Centering range	2.5 mm (0.2 in)
Leveling range	+/- 0.5 °
Worktable diameter	300 mm (11.8 in)

Gauge attitude/orientation	
Control	Automatic
Attitude	Horizontal and Vertical
Attitude Vertical	Internal/External
Attitude Horizontal	Up/Down Extend/Retract
Orientation	Rotation in steps of 1 °

Gauge	
Gauge type	Talymin 6 single bias inductive transducer
Stylus tip force	0 to 4 g adjustable (roundness mode)
Crutch angle	Adjustable
Cresting (TR585)	Dual cresting facility (horizontal & vertical)

Electrical (alternating supply, single phase with earth, 3-wire)	
Instrument & computer voltage	90V - 130V or 200V - 260V (switch selectable)
Frequency	47 Hz to 63 Hz
Power consumption	500 VA maximum
Safety	BS EN 61010-1, BS EN 349, BS EN 13850, BS EN 983, BS EN 60204 Machinery Directive standards.
EMC	BS EN 61000-6-1: 2001 BS EN 61000-6-4: 2001

Air supply	
Air pressure	550 to 1030 kPa (5.5 to 8 bar) (80 to 116 psi)
Regulator (pre-set)	350 kPa (3.5 bar) (50 psi)
Max. particle size	5 micron (0.0002 in)
Moisture content – dew point	+3 °C (37 °F)
Flow rate at operating pressure	150 litres/minute (minimum) 5.3 ft ³ /minute
Max oil content	25 mg/m ³ (0.01 grains/ft ³)
Solid Particle Content	5 mg/m ³ (0.002 grains/ft ³)

Environment	
Operating temperature	10 °C to 35 °C (50 °F to 95 °F)
Storage temperature	-10 °C to 50 °C (14 °F to 122 °F)
Temperature gradient	< 2 °C / hour (< 3.6 °F / hour)
Operating humidity	30 % to 80 % relative humidity, non condensing
Storage humidity	10 % to 90 % relative humidity, non condensing
Maximum RMS vertical	0.05 mm/s (0.002 in/s) at < 50 Hz
Floor vibration	0.10 mm/s (0.004 in/s) at > 50 Hz

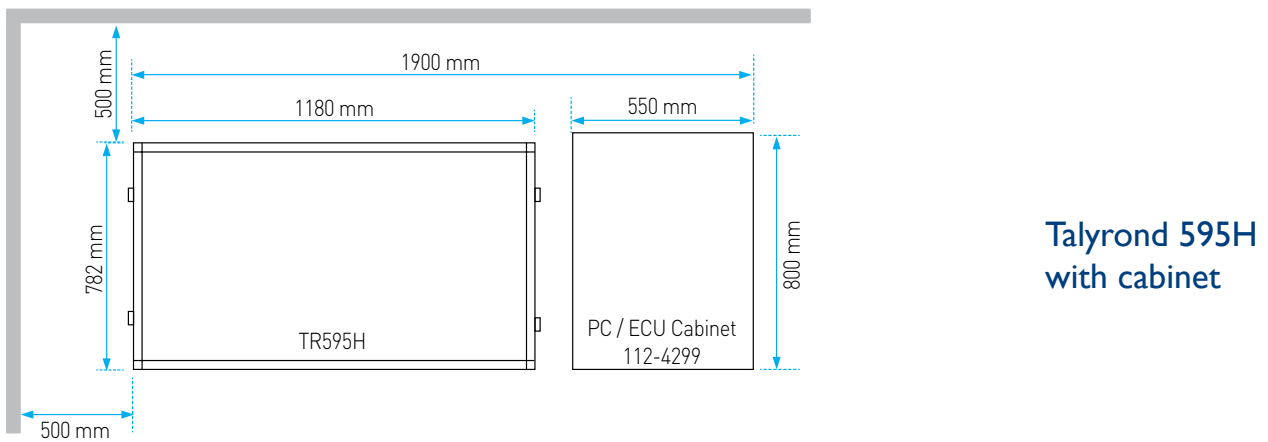
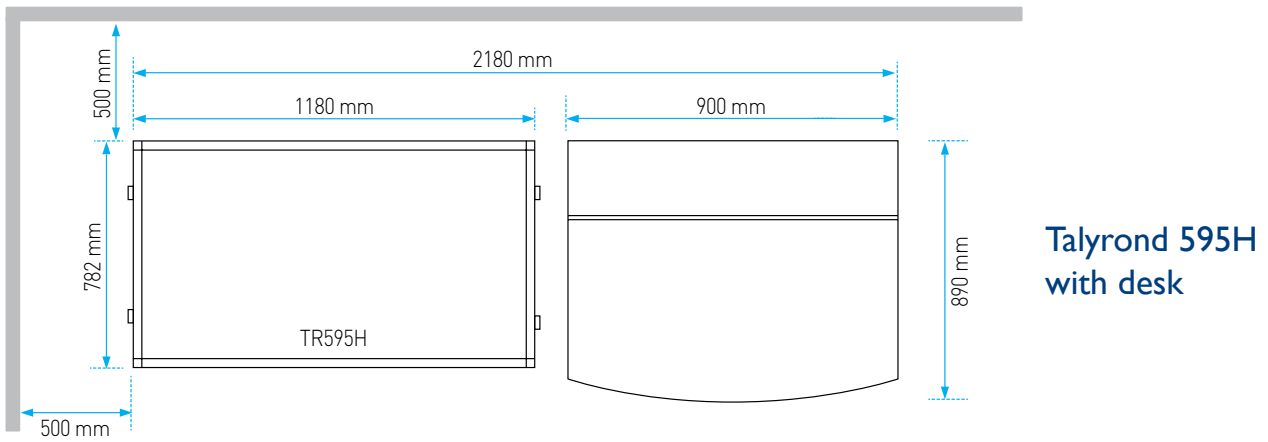
All accuracies are quoted at 20° C ± 1° C (68° F ± 1.8° F). All roundness and flatness results are quoted as the departure from the Least Squares Circle (LSC) at 1-50 and 1-15 µm; Gaussian filter; 6 RPM, clockwise rotation (unless otherwise specified). All errors are quoted as maximum permissible errors (MPE). All straightness / parallelism results are quoted with an 8 mm cut-off, low pass filter; 5mm/s measuring speed, Minimum Zone (MZ) reference. Quoted uncertainties are at 95% confidence in accordance with recommendations in the ISO Guide to the Expression of Uncertainty in Measurement (GUM: 1993).

All measurements are taken using a standard 100 mm-length stylus with 2 mm-diameter ball tip. All measurements of roundness and flatness are quoted using the gauge horizontal orientation. All measurements of roundness are relative to the calibrated form of a glass hemisphere. Calibration error of glass hemisphere is ± 5nm.

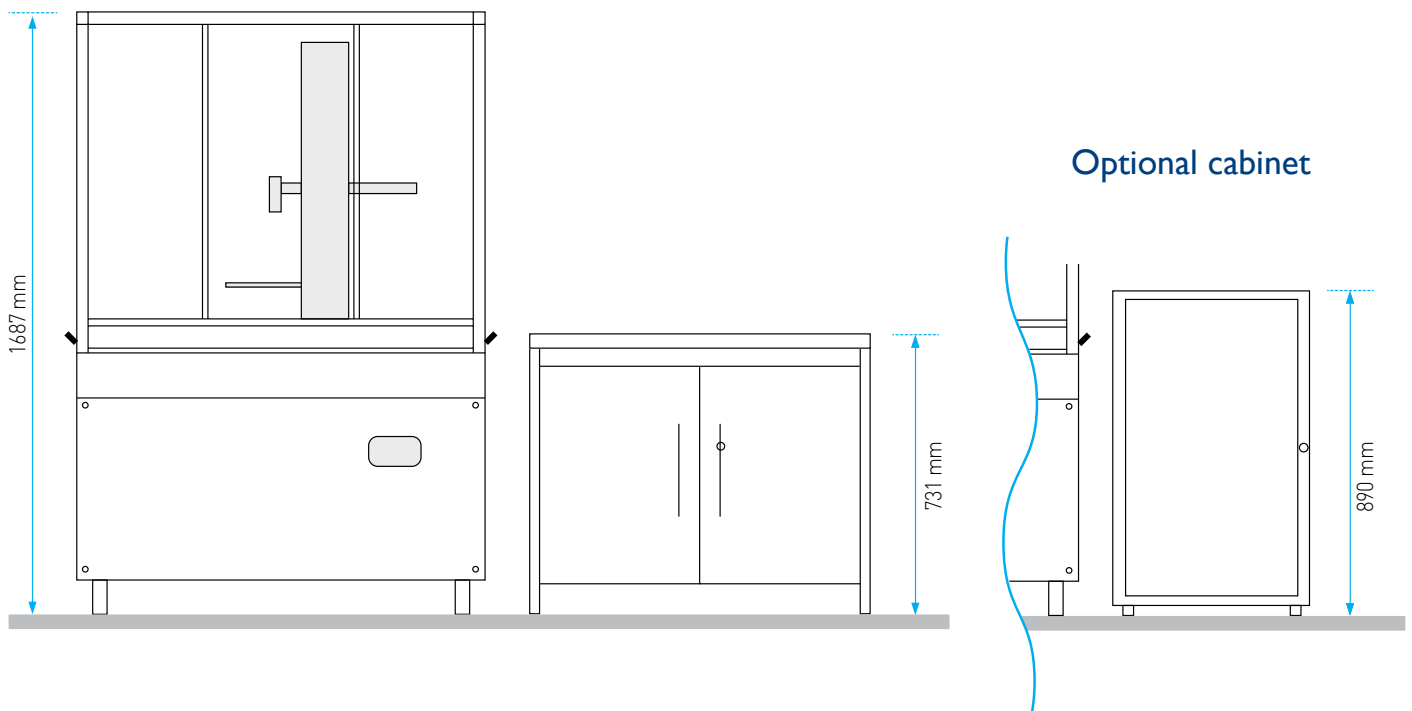
The above quoted technical data is for measurements taken with good metrology practice in a draft free, controlled environment isolated from low frequency floor borne vibration (i.e., metrology laboratory or Taylor Hobson supplied environmental enclosure).

Taylor Hobson pursues a policy of continual improvements due to technical developments. We therefore reserve the right to deviate from catalog specifications.

Talyrond 595H floor plan



Talyrond 595H with desk



Parameters

Type of analysis	Measurement mode	Evaluation diagram	Talyrd 595H	Type of analysis	Measurement mode	Evaluation diagram	Talyrd 595H
Roundness			✓	Radial Runout	Axial		✓
Parallelism			✓		Radial		✓
Cylindricity			✓	Squareness			✓
Straightness			✓	Parallelism			✓
Flatness			✓	Measure Interrupted Surface			✓
Coaxiality			✓	Harmonic Analysis			●
Concentricity			✓	Thickness Variation	Radial		●
Eccentricity			✓		Axial		●

✓ = Included – ● = Optional ✕ = Not available
(Customer specific analysis available on request)

Serving a global market

Taylor Hobson is world renowned as a manufacturer of precision measuring instruments used for inspection in research and production facilities. Our equipment performs at nanometric levels of resolution and accuracy.

To complement our precision manufacturing capability we also offer a host of metrology support services to provide our customers with complete solutions to their measuring needs and total confidence in their results.

Contracted services from Taylor Hobson

Sales department

Email: taylor-hobson.sales@ametek.com

Tel: +44 (0)116 246 2034

- **Design engineering**
special purpose, dedicated metrology systems for demanding applications
- **Precision manufacturing**
contract machining services for high precision applications and industries

Service department

Email: taylor-hobson.service@ametek.com

Tel: +44 (0)116 246 2900

- **Preventative maintenance**
protect your metrology investment with an Amecare support agreement

Centre of Excellence department

Email: taylor-hobson.cofe@ametek.com

Tel: +44 (0)116 276 3779

- **Inspection services**
measurement of your production parts by skilled technicians using industry leading instruments in accord with ISO standards
- **Metrology training**
practical, hands-on training courses for roundness and surface finish conducted by experienced metrologists
- **Operator training**
on-site instruction will lead to greater proficiency and higher productivity
- **UKAS calibration and testing**
certification for artifacts or instruments in our laboratory or at customer's site



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