

Form Talysurf® PGI Bearings

Dedicated measurement systems for
high precision bearings



Unparalleled measurement capability

The Form Talysurf® PGI Bearings

The world's leading bearing measurement system

The Form Talysurf® PGI Bearings is an easy to set-up, easy to use measurement system designed for critical analysis of high precision bearings.

Bearings require exceptional levels of quality, durability, precision and reliability in order to meet the demanding requirements of modern applications.

Taylor Hobson products deliver an in depth understanding of bearing characteristics such as radius, form, surface finish, contour and dominant wavelength, providing vital feedback for improvements in design and production.

Buy with confidence - results everyone trusts

The Form Talysurf® PGI systems use a patented ball calibration routine.

This routine uses high-precision spherical calibration artefacts that have been produced to exacting standards and calibrated for radius, form and surface finish in our own UKAS approved laboratory.

The elements that have been verified include:

- Arcuate stylus motion error
- Gauge non-linearity
- Stylus tip geometry
- Gauge / stylus mechanical stiffness

Our automated routine delivers a true system calibration.



20 Gauge	 Roughness	 Contour	 Radius Accuracy
Gauge Range Up to 20 mm	Noise Less than 2 nm Rq Less than 10nm Rz	Form Accuracy Less than 0.20 µm over full gauge displacement	Radius Accuracy 0.006%
Resolution Down to 0.3 nm			



Unparalleled measurement capability

Taylor Hobson is the only company that can prove measurement capability over the full gauge range.

Taylor Hobson quote world leading specification capabilities over the **full** gauge range. Other manufacturers quote less radius accuracy and form capability over a significantly reduced gauge range, indicating less confidence in their measurement results.

“World leading radius and form accuracy”

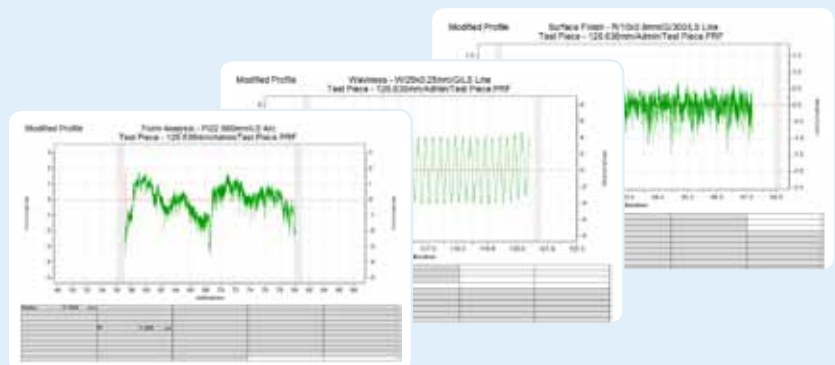
“World leading dynamic range”

Save time and money - one measurement multiple results

Key measurements for design and production

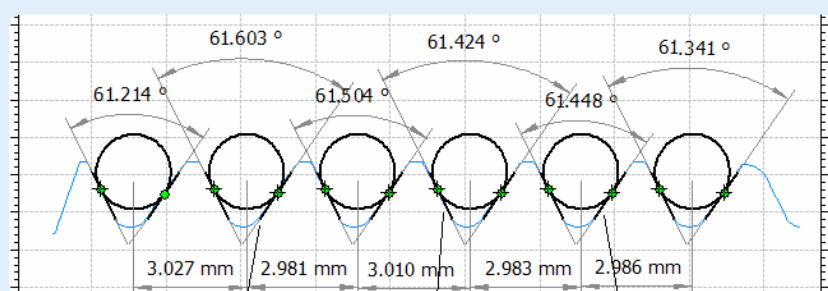
Surface analysis

- Form
- Radius
- Roughness
- Waviness
- Dominant wavelength



Contour analysis

- Gothic arch with helix angle correction
- Radius
- Angle
- Height
- Length
- Distance and more



Complete trust in your metrology platform

The world leading gauge supported by the world leading noise floor

Taylor Hobson take great pride in our measurement integrity and reproducibility.

Fundamental to any metrology system is its noise floor capability. Measurement accuracy and repeatability performance is directly related to a stable platform and therefore Taylor Hobson take great pride in boasting the worlds best noise floor.

Our products are underpinned by decades of measurement experience, ultra-precision manufacturing expertise and FEA optimized design. These provide low noise and near flawless mechanical execution of the measuring axes.

“World leading system noise floor -
Less than 2 nm Rq, Less than 10 nm Rz”

Composite granite construction

Both the column and the base are made of this unique material to provide high vibration dampening, thermal inertia and stiffness throughout the event cycle.

Large base

This stable base isolates the instrument from vibration and offers plenty of room for staging large components. Two tee slots, parallel to each other within 0.3mm (0.01in), are provided for precise mounting of accessories.

Steel support frame

Welded steel frame for rigid support of granite instrument base and motorized column; includes heavy duty leveling mechanism on all four legs.

Anti-Vibration system

Passive air mounts fitted to all systems work in conjunction with the steel support frame to reduce measurement noise in shop floor environments.

Environmental enclosure

Clear polycarbonate panels set in a rigid aluminium frame completely surround the measuring station to suppress contamination, air currents and temperature fluctuations.





Taylor Hobson instruments aid the study of the International Space Station Solar Array Anomaly

Unique patented ball calibration routine

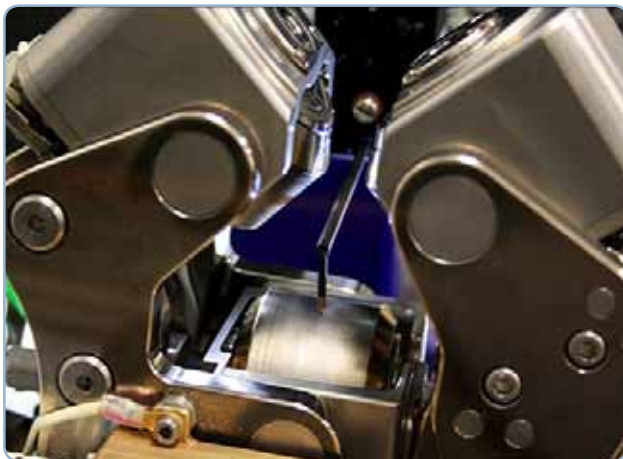
Artefacts from Taylor Hobson's UKAS approved laboratory are used throughout the process

The benefit

The Form Talysurf® PGI systems use a patented ball calibration routine to ensure that the dimensional measurement capability and gauge linearity are dealt with in a single, automated operation. This routine uses high-precision spherical calibration artefacts that have been produced to exacting standards and then calibrated for radius, form and surface finish in our own UKAS approved laboratory.

The process

In operation the user simply completes a dialog confirming parameters such as the percentage of gauge range to be used and the traverse speed. Working from knowledge of the stylus geometry and the dimensions of the calibration standard, the software automatically calculates the measurement properties and drives the traverse unit and column appropriately, completing the calibration with the minimum of operator intervention.

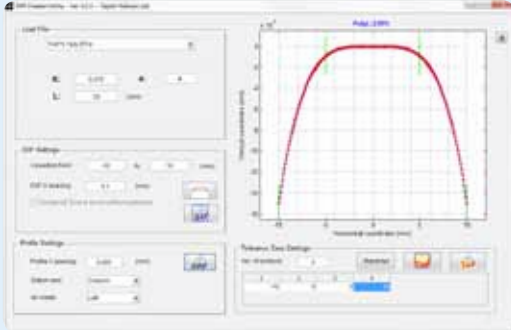


A damaged Space Station trundle bearing assembly measured on a Form Talysurf® PGI system

“When the results really matter, people trust Taylor Hobson”

Full suite of dedicated software analysis packages

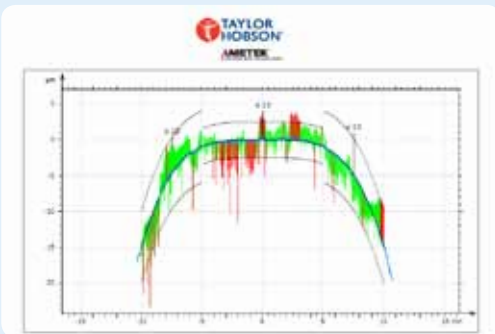
Taylor Hobson has a long history with the bearings industry, this association has helped to evolve powerful software solutions to suit your applications



DXF Creator

A utility that allows creation of DXF data, enabling comparison of design profile to part profile.

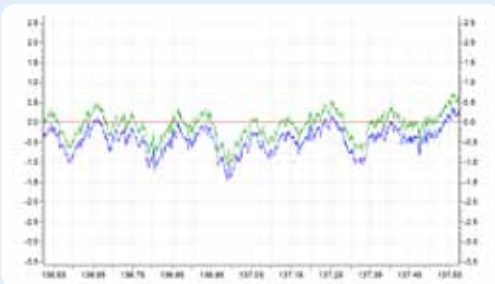
- Logarithmic equation
- Free form equations
- Tolerance zones



TalyMap Contour

Allows alignment of measured profiles to design data as well as automated dimensioning.

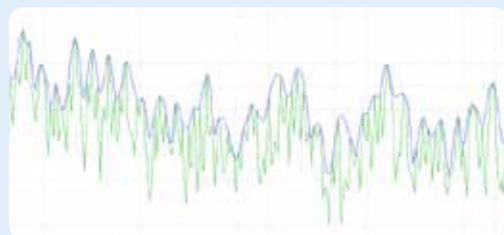
- Tolerance zones
- Error deviation
- x-offset calculation



Advanced Dual Profile

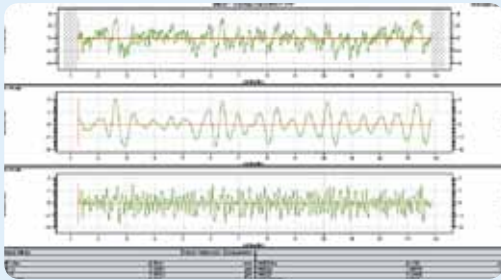
A sophisticated comparison tool that allows testing of:

- Wear
- Repeatability
- Noise



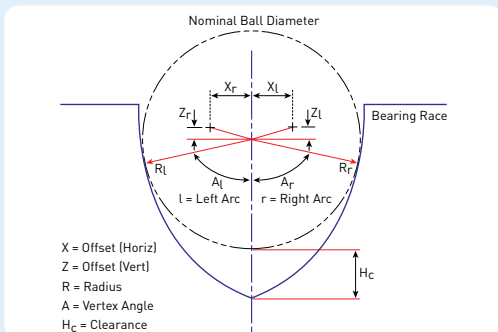
Morphological Filtering

Measure roughness using a diamond stylus and simulate form measurement using a ball stylus - one measurement two results saving time.



Dominant Wavelength

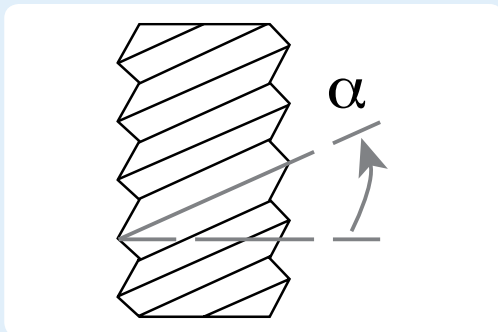
This analysis function isolates the two most dominant wavelengths contained within a surface. This allows manufacturers to track and isolate errors, control process and predict function.



Gothic Arch Analysis

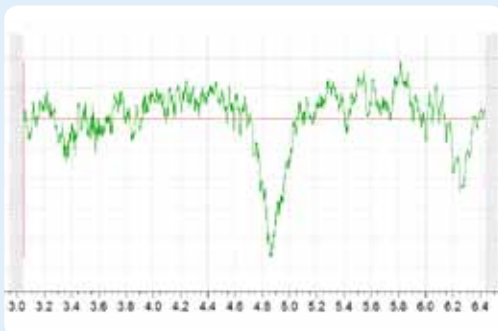
Allows manufacturers to predict how a bearing is going to function based on where the ball sits within the bearing race.

- Contact angle
- Radius
- Offset and more



Helix Angle Correction

Compensate for the helix angle enabling profile measurement in line with the component axis.



LS Arc Auto

Non operator influenced analysis of spherical raceway by use of an automated routine. This simple algorithm will work regardless of part position or size.

Key features in Talymap Contour

Powerful software for the analysis of length, radius, angle and more...

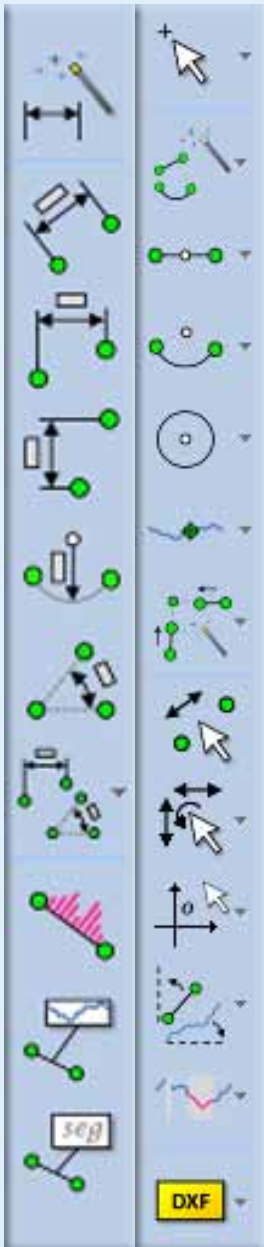
Desktop publishing

Quick and instant report generation



Ease of use

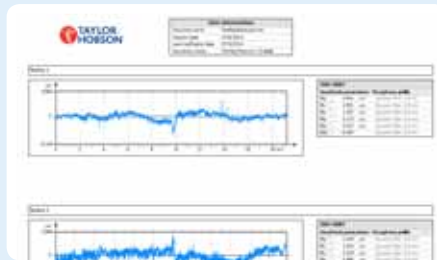
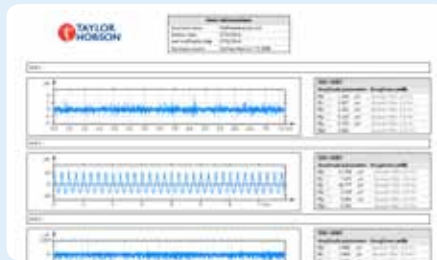
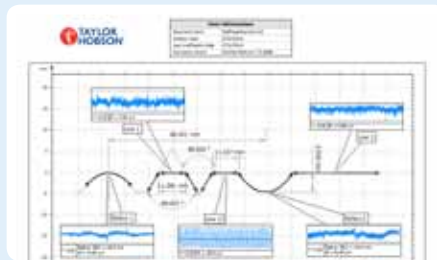
Contour software is easy to use and requires minimal training. Intuitive icon based tools allow the user to define and modify elements and dimensions with the click of a button.



Automation

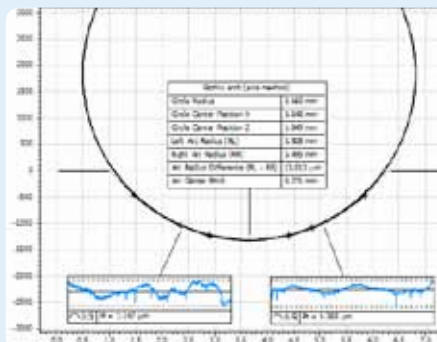
Reports and analysis routines can be saved as single templates and re-applied to component batches.

Special software routines allow full automation regardless of part variation or positional set up ensuring repeatable results.



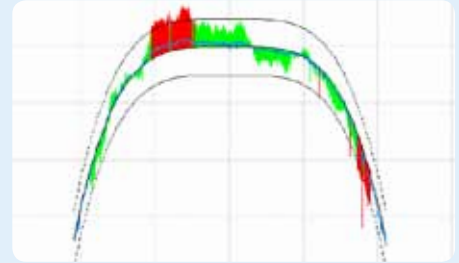
Further analyses

Gothic arch profile analysis as standard



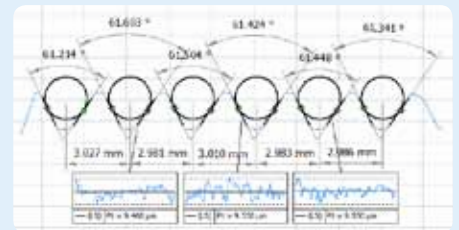
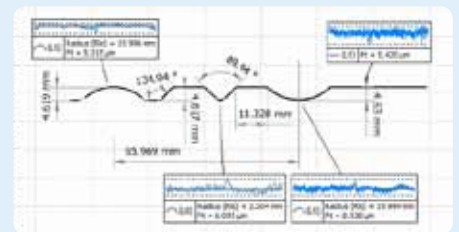
Comparison with CAD models

Load DXF models and automatically fit to the measured profile, results will display deviations, tolerance limits and deviation parameters.



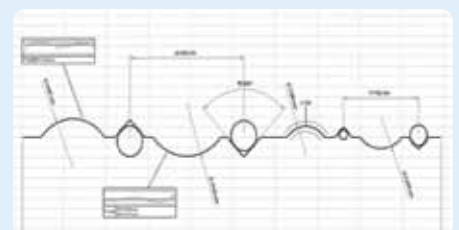
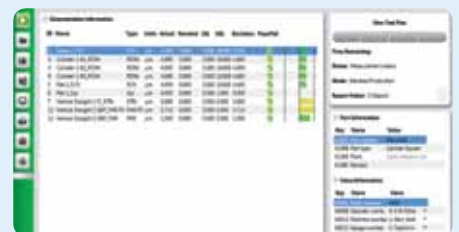
Full dimensional analysis

Linear, Angular, Radial and more



Q-Link Compatible

Take advantage of automatic reporting and exporting in Q-Das or text format.













Q-Link Production Interface

A simplified interface designed specifically for production environments

Q-Link offers simplicity, versatility and traceability and provides direct communication with SPC software which delivers feedback to your manufacturing process.

	<p>QDAS accredited Meets the demands of the Advanced Quality Data Exchange Format</p>		<p>Protection Allows different user levels and configurations</p>
	<p>Reporting Instant screen report summary with pass/fail results</p>		<p>Traceability Configurable fields; serial number, operator name, machine number etc...</p>
	<p>Implementation Easy to learn, simple to operate</p>		<p>Statistical studies Automatic R&R Studies available as standard</p>
	<p>Tolerancing Visually identifies the parameter and its tolerance band</p>		<p>Compatibility Across the range of roundness and surface finish products</p>

“Widely used in aerospace component manufacturing where data and strict standard operating procedure control is mandatory”



World leading gauge technology

Phase Grating Interferometer (PGI)

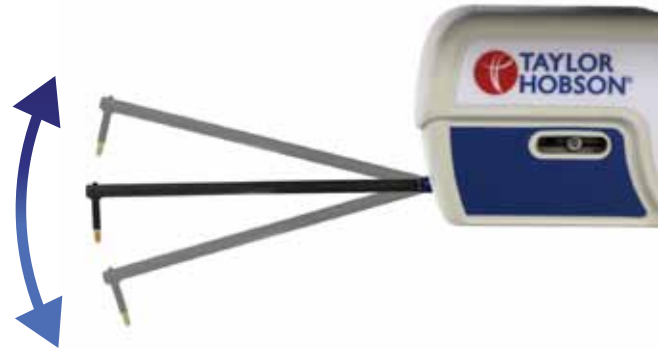
The PGI gauge has been developed and patented by Taylor Hobson, delivering new levels of measurement capability.

The heart of the PGI gauge is a cylindrical grating. It is this grating that is primarily responsible for the measuring capability of the gauge. The grating rotates about a precision pivot, and is illuminated using a collimated laser beam derived from a low power laser diode. Specially designed optics analyse the diffraction patterns from the grating to provide the movement information.

Stylus lift lower - greater control

Standard on all models; the auto stylus lift lower mechanism can drive in relative or absolute moves delivering the following benefits:

- Fully programmable
- Position of styli for entry in to small bores
- Restricting styli movement over interrupted surfaces



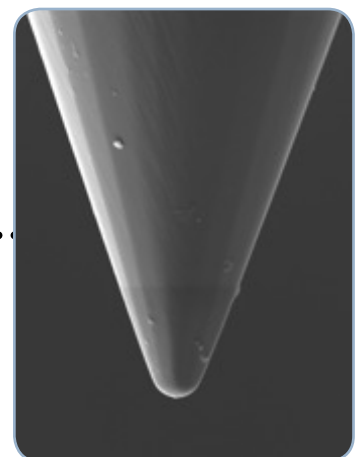
Typical application use

Used during roller bearing measurement to minimise gauge movement when fully evaluating a roller bearing form.

Stylus tip geometry - results you can trust

A critical element in the measurement of form, contour and surface finish is the stylus tip; evaluating our spherical calibration artefact enables the identification of wear, damage or deviations of size and shape.

Accurate reporting of form and contour is directly related to stylus tip size. Taylor Hobson offers the option to calibrate the stylus tip size to further enhance form and radius measurements giving a higher confidence level when measuring these crucial bearing elements.



Taylor Hobson has been designing and manufacturing innovative solutions for form and surface measurement since the introduction of the Talysurf 1 in 1941.

Ultra surface finish parameters

Powerful software for the analysis of surface finish and form

Form removal and analysis functions

Form error

Deviation from nominal form is calculated with reference to a best fit straight line, best fit circular arc or best fit conic section.

Form deviation may also be calculated with reference to a minimum zone straight line (the minimum separation between two parallel lines containing the data set).

Radius

Using a least squares best fit, the radius of concave or convex circular arcs can be automatically calculated from selected data. An option to exclude any unwanted features such as edges is also available.

Alternatively, the absolute radius can be set to analyse the actual deviation from a design master. Other calculated parameters include the centre coordinate.

Angle (slope)

Surface tilt can be determined and removed prior to parameter analysis by means of a straight line or minimum zone algorithm. Other calculated values include intercept and pitch

Dimension

The linear relationship of surface features can be assessed and compared by means of calculated X & Z coordinate positions.

- Datum slope
- Delta slope
- Pitch (between centres)
- Intercept X / Intercept Z

Dual profile

This analysis function enables comparison of one measured profile to another or even to a master profile which has been saved as a template. A 'difference' profile can be displayed at the touch of a button and used for further analyses.

Surface finish parameters

Primary parameters

DFTF, LSLP Ave, LSLP Max, Pa, Pc, PCf, PCI, PCr, Pda*, Pdc*, Pdq*, PHSC*, Pku, Pln, PLo, Plq, Pmr*, Pmr(C)*, Pp, PPC*, Pq, PS, Psk, PSm, Pt, Pv, PVo*, Pz, Pz(JIS)

Roughness parameters

R3y, R3z, Ra, Rc, RCf, RCI, RCr, Rda*, Rdc*, Rdq*, RHSC*, Rku, Rln, RLo, RIq, Rmr*, Rmr(C)*, Rp, Rp1max, Rpc*, Rq, RS, Rsk, RSm, Rt, Rv, Rv1max, RVo*, Rz, Rz(DIN), Rz(JIS), Rz(n)*, Rz1max

Waviness parameters

Wa, Wc, Wcf, WCI, WCr, Wda*, Wdc*, Wdq*, WHSC*, Wku, Wln, WLo, Wlq, Wmr*, Wmr(C)*, Wp, WPC*, Wq, WS, Wsk, WSm, Wsa, Wst, Wt, Wv, WVo*, Wz

Rk parameters and Rk curve

A1, A2, APH, AVH, CV, Mr1, Mr2, Rk, Rpk, Rvk, Rvk/Rk

R & W parameters

AR, AW, Pt, R, Rke, Rn, Rpke, Rvke, Rx, Sar, Saw, Sr, Sw, W, Wn, Wte, Wx

Dominant wavelength

WD1c, WD1Sm, WD1t, WD2c, WD2Sm, WD2t, WDSmMax, WDSmMin

Filters and additional features

Filters

Gaussian, Robust Gaussian, Gaussian VDA, Morphological, ISO 2CR, 2CR PC, Rk, Spline

Cut-off (Lc)

0.08, 0.25, 0.8, 2.5, 8mm, 25mm and operator input

Bandwidth

10:1, 30:1, 100:1, 300:1 and 1000:1 or as defined by data spacing(VDA2006)

Note

Where applicable the parameters conform to and are named as per the standards:

- ISO4287:1997
- ISO13565-2:1996
- ISO12085:1996

* All parameters marked with an asterisk require user assigned single or multiple qualifiers. For example, material ratio may be assessed at one or more slice levels within a single measurement.

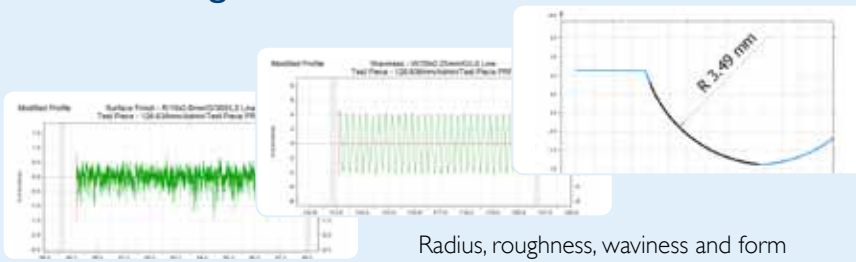


Dual Profile analysis allows two sets of measurement data to be displayed at once and is ideal for testing system noise and repeatability

Designed to suit your application

Meeting the ever increasing demands of next generation technologies

Spherical bearings



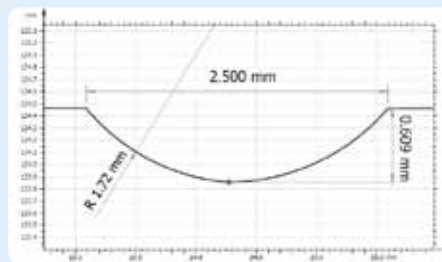
Radius, roughness, waviness and form



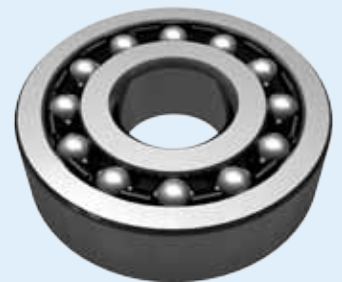
Four point contact bearings



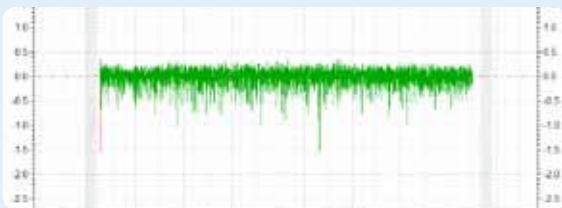
Gothic arch profile



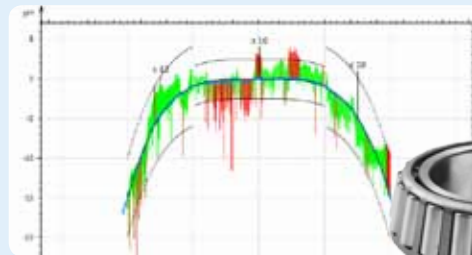
Dimensions



Roller bearings



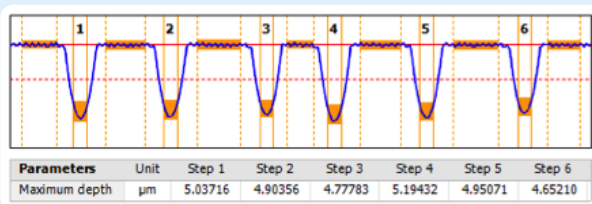
Surface finish



Form error and DXF comparison



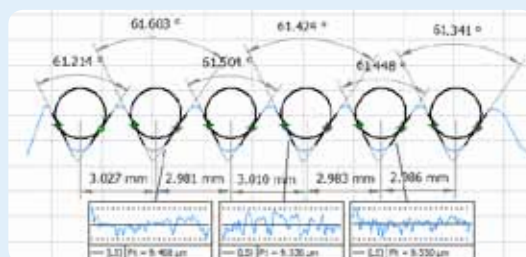
Fluid dynamic bearings



Multiple step height analysis



Ball screw



Pitch, angle, form and linear dimensions



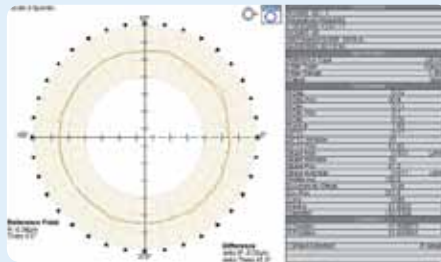


Diverse range of bearing solutions

Taylor Hobson's contact and non-contact measurement systems

Talyrond 500H

- Automated high precision roundness, surface finish, contour
- Powerful software tools help improve your process - harmonic analysis, cylindrical mapping, ball and lead screw analysis



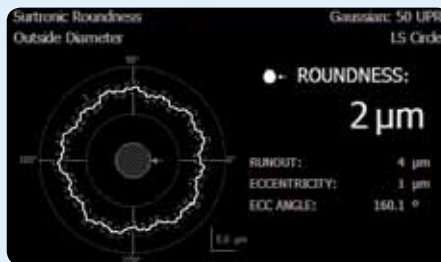
Talyrond NC

- Talyrond contact and non-contact measurements
- Ideal for miniature ball bearings
- Rapid measurements



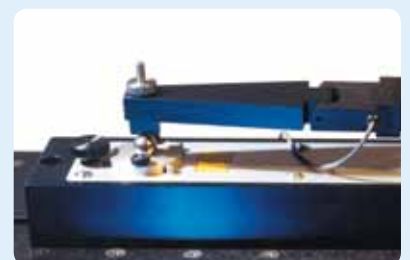
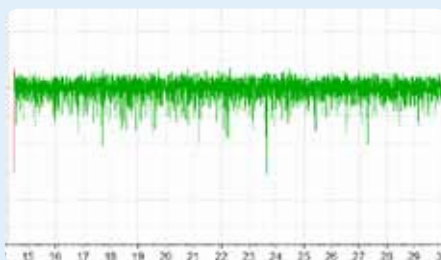
Surtronic R-Series

- Robust, fast and easy-to-use
- Includes Rapid Centre™ attachment
- Throughput 3 parts / minute including set-up



Form Talysurf® Ball unit

- Surface finish
- Circumferential roughness measurement
- Precise and low-noise measurement





Traceability

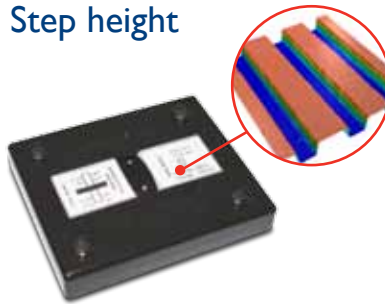
Full traceability to international standards



Grating correction

All our traverse units are tested and enhanced using interferometric techniques ensuring accurate dimensional and surface texture measurement in the x direction.

Step height



To ensure the correct gain setting of your instrument, high precision step height standards are available; calibrated with uncertainties down to $\pm 4\text{nm}$

Traceability



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

Arcuate correction

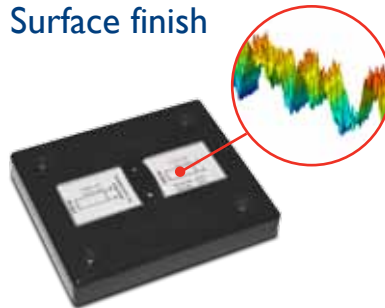


Patented ball calibration routine

The Form Talysurf® systems use a patented ball calibration routine to ensure that both dimensional measurement capability and gauge linearity are dealt with in a single, automated operation.

This fast and simple process uses high-precision spherical calibration artefacts that have been produced to exacting standards and then calibrated for radius and form traceable to international standards.

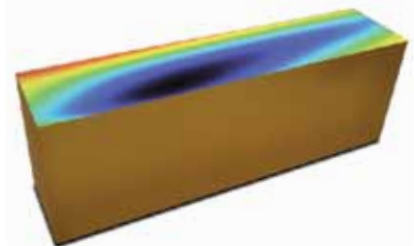
Surface finish



Taylor Hobson can provide glass or metal roughness standards calibrated to an uncertainty of $\pm(2\% + 4 \text{ nm})$ providing measurement confidence and compliance for peak parameters with respect to ISO standards.

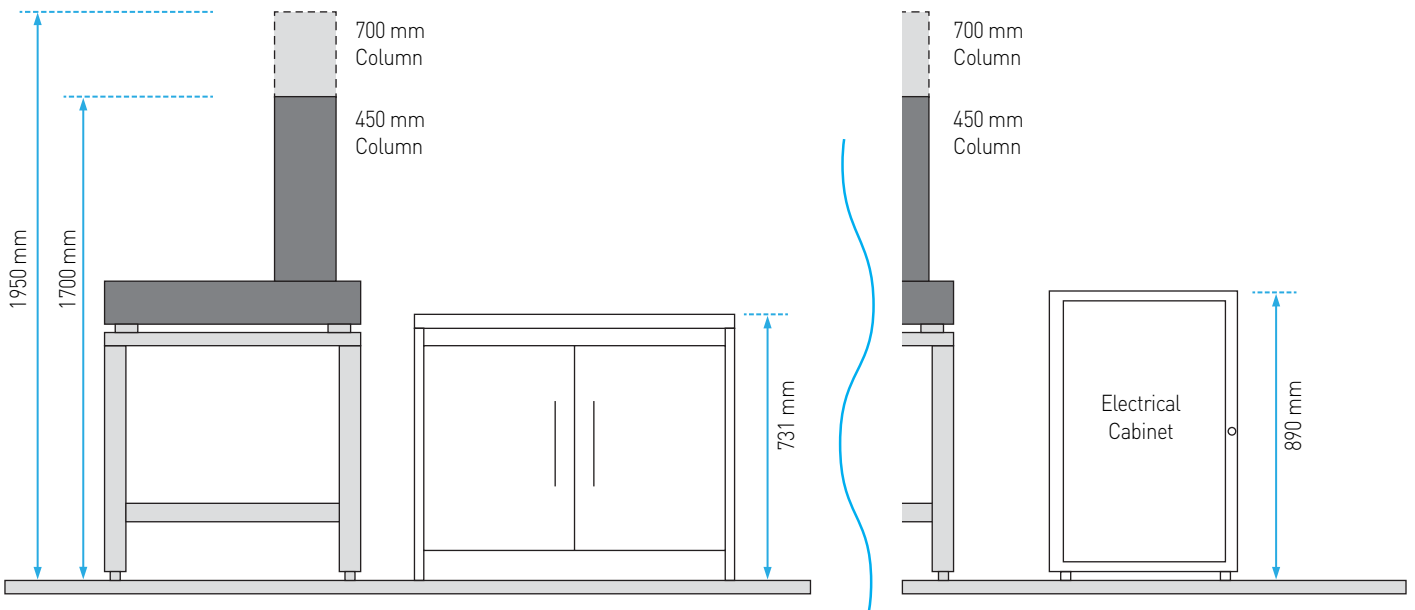
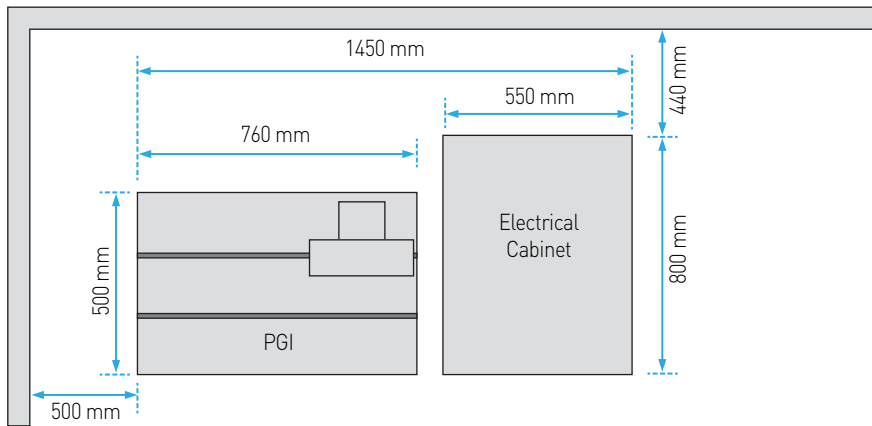
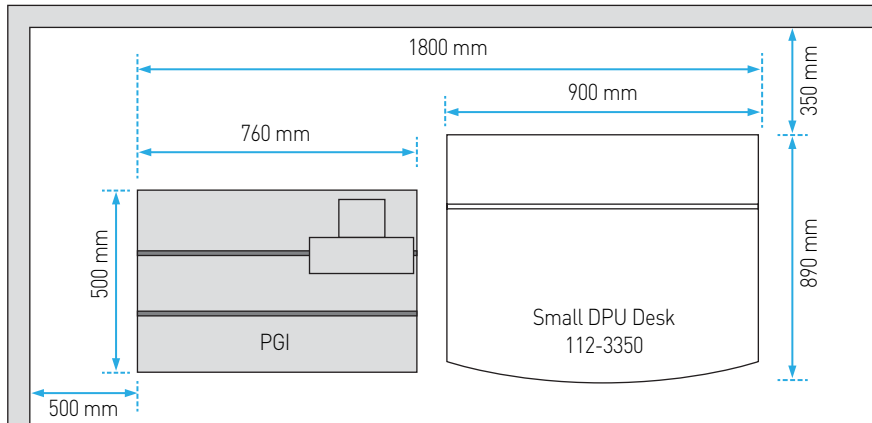
Spacing standards are also available to an uncertainty of $\pm 0.6 \mu\text{m}$.

Datum straightness



To ensure the traverse unit conforms to specifications Taylor Hobson can supply Zerodur straightness standards. These standards provide certainty in the traverse direction and are combined with special software routines to enhance the measuring axis for correct geometrical form.

Form Talysurf® PGI Bearings floor plan



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

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

Service department

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

Centre of Excellence department

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- **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 artefacts or instruments in our laboratory or at customer's site



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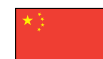
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