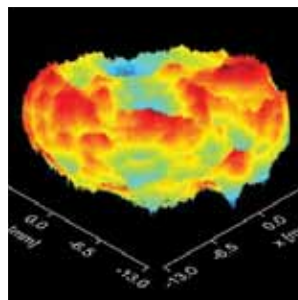
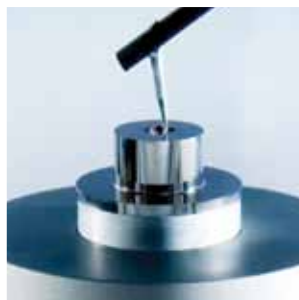
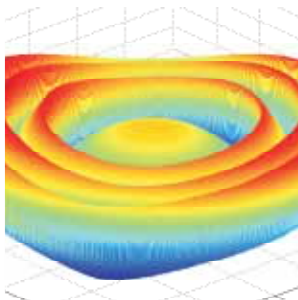
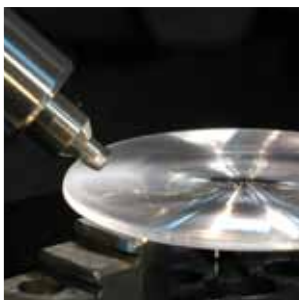
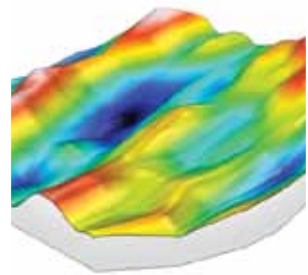
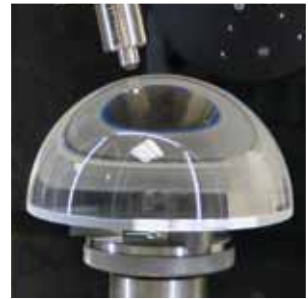
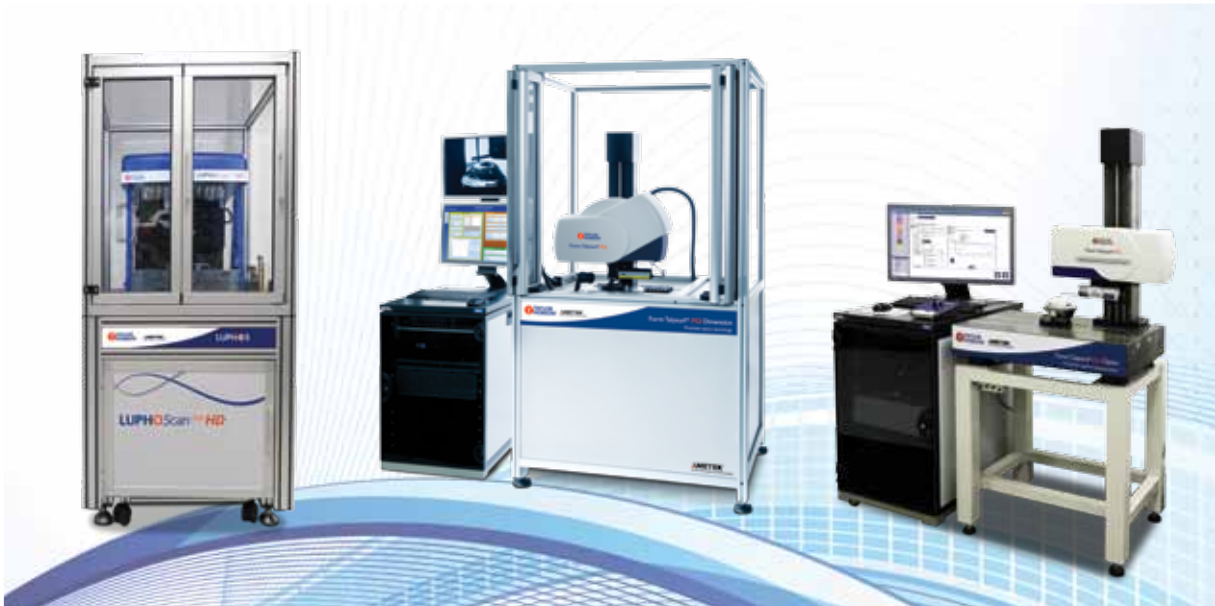


INNOVATION

Optic Product Solutions



Advanced metrology

Taylor Hobson – the experts in automotive, bearings and optics metrology

Established in 1886, Taylor Hobson is the world leader in surface and form metrology and developed the first roundness and surface finish measuring instruments.

Taylor Hobson is part of the Ultra Precision Technologies Division of AMETEK, Inc. which is a leading global manufacturer of electronic instruments and electromechanical devices with 2014 sales of \$4 billion. AMETEK has over 15,000 colleagues at more than 120 manufacturing locations around the world. Supporting those operations are more than 100 sales and service locations across the United States and in 30 other countries around the world.

We provide contact and non-contact measurement solutions for the most demanding applications on a global basis, with a worldwide infrastructure to support our clients; we are a truly global ultra precision metrology company.

We are pioneers, continually developing our products to meet the ever-increasing demands of next generation technologies, particularly in optics, bearings, automotive, aerospace, medical and renewable energy technologies.



This forward thinking philosophy is captured perfectly in our diverse range of product solutions. Recent developments include new optics measurement systems and a full suite of dedicated software analysis packages.

Manufactured components require exceptional levels of quality, durability, precision and reliability in order to meet the demanding requirements of modern applications. Recent developments by Taylor Hobson deliver an in depth understanding of characteristics such as surface finish, contour, form, radius, roundness and harmonic analysis, providing vital feedback for improvements in design and production.



LuphoScan



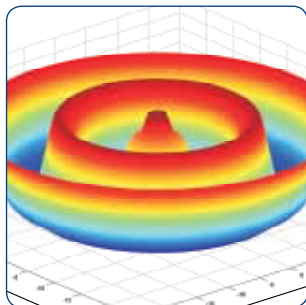
Form Talysurf® PGI Dimension



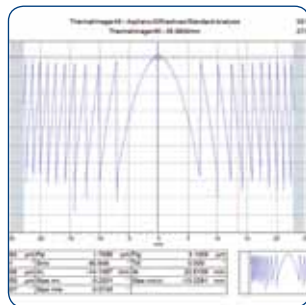
Form Talysurf® PGI Optics



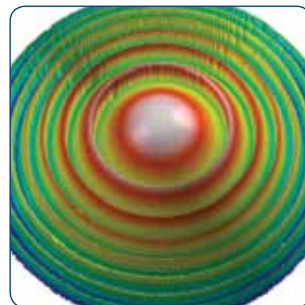
Form Talysurf® PGI Matrix



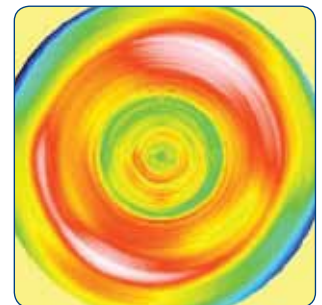
Form and angular errors of axicons



Diffractive measurement with aspheric form removed



3D view of asphero-diffractive optic

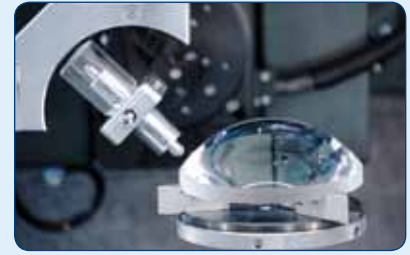


3D astigmatism of single lenslet

LuphoScan

Ultra-precision non-contact 3D form measurement of aspheric surfaces based on MWLI® technology (multi-wavelength interferometry)

- Up to 90° object slopes - ideal for measuring steep, small and large aspheres
- Capable of measuring optics with a diameter of up to 420 mm
- Full 3D form measurement of aspheres, spheres, flats and slight freeforms



Pages 4-7

Form Talysurf® PGI Dimension

Fully automated one-touch aspheric optics measurement, for 2D and 3D analysis of spheres, aspherics and diffractives up to 300 mm in diameter

- Advanced software saves production time and increases output
- Aspherics Analysis Utility (AAU) - save time and improve error detection
- Measurement of virtually any part: steep, shallow, large and small



Pages 8-9

Form Talysurf® PGI Matrix

Designed to measure multiple parts, the Form Talysurf® PGI Matrix is a fully automated, fast and accurate system for precision measurement

- Batch testing of multiple parts increases throughput
- Easy set-up, test and analysis for single or multiple parts
- Batches of parts, moulded lens and wafers can be analysed with ease



Pages 10-11

Form Talysurf® PGI Optics

With high instrument accuracy and versatility you are able to measure new and emerging designs, future-proofing investment

- New gauge design with improved measurement range - up to 28 mm
- Measure large sags - high accuracy and repeatability
- Measurement of plastic lenses, small components, IR glass and crystals



Pages 12-13

Latest developments

Form Talysurf® PGI Freeform and LuphoSharp

- Form Talysurf® PGI Freeform - versatile, high resolution system for high precision freeform optics
- LuphoSharp - highly accurate non-contact form measurement of acylindrical optics and various prisms

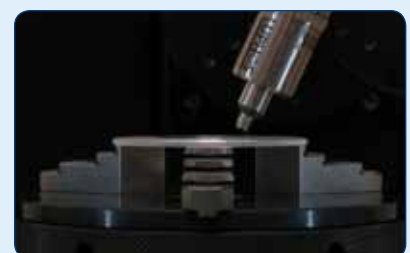


Pages 14-15

Application solutions

The latest optics application solutions from Taylor Hobson

- Groundbreaking analysis of Fresnel lenses with the LuphoScan - Non-contact 3D form measurements of Fresnel and Asphero-Diffractive optics
- Correlation, repeatability and traceability - ensuring measurement data is highly reliable, repeatable and accurate across all measurement platforms



Pages 16-19

Non-contact 3D form measurements of any rotationally symmetric optics

High definition optical metrology.

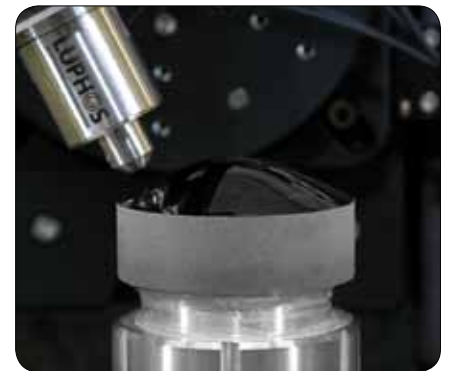
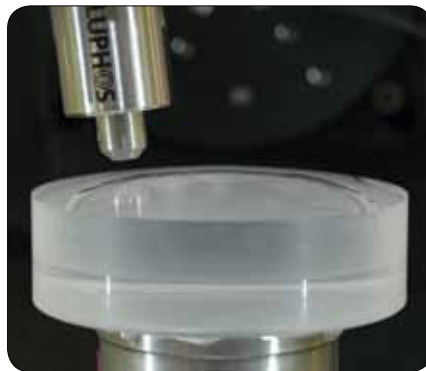
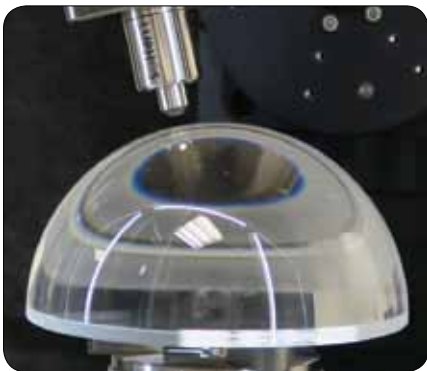
The LuphoScan 260 HD platform ushers in a new era of high precision metrology of optical surfaces. The new generation devices provide for the first time an absolute measurement accuracy of better than ± 50 nm (3σ) up to 90° object slope. This comes along with ultra-high reproducibility of measurement results and a low noise floor.

The new instrument is ideal for applications where the highest accuracy is required and essential to the manufacturing process. This is most beneficial for surfaces with steep slopes, with varying pitch directions, and small surfaces, such as moulds for smartphone lenses.

Buy with confidence - results everyone trusts

The system has been designed and manufactured to the highest standards.

This ensures the stability and accuracy even under the most adverse environmental conditions, such as in manufacturing areas.



System features

- **HD = High Definition**
Fast, reliable non-contact real 3D form measurement of aspheres
- **Highest accuracy - up to 90° object slopes**
Ideal for measuring strong, steep, and small aspheres incl. cell phone lens moulds
- **Extremely good reproducibility of measurement results**
Best shot-to-shot stability of Power and PV determination
- **Very low system noise**
Robust against environmental variations

“Crucial benefits for 3D form measurements of high quality optical surfaces”



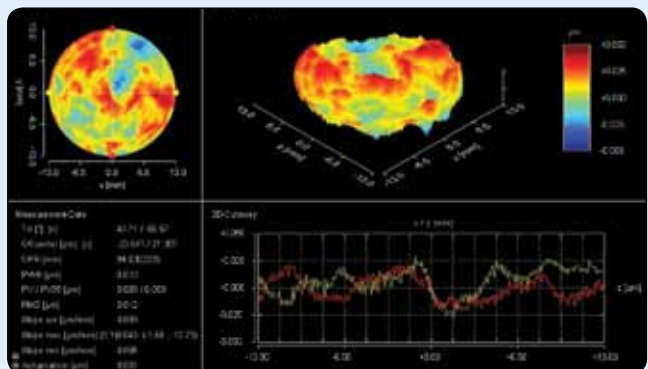
World-leading metrology

LuphoScan HD instruments represent a new class of metrology tools with highest level of reliability for parts with large spherical departures and with an extreme shot-to-shot stability.

Metrology becomes faster than ever at minimal operator influence since every shot is a hit. In conjunction with their flexibility LuphoScan HD platforms facilitate production of more complex lens designs and are ready for future challenges in lens production.

High precision manufacturing

- **More components made of Invar**
Upgrade of crucial components to Invar for improved thermal stability
- **4 temperature sensors, 1 air pressure sensor**
Real time compensation of ambient conditions
- **Extended calibration procedure**
Take into account the thermal response of system
- **Adapted LuphoSmart sensor control and internal calibration**
Reduce variations in power error determination
- **Improved air flow control**
Minimize characteristic noise
- **Tighter manufacturing tolerances**
Process development on the Precitech Nanoform Diamond Turn machining centre
- **Improved assembly**
Advanced instrument assembly techniques to ensure repeatability and standardise results
- **Extended customer calibration procedure**
Improve steep slope performance



Fast non-contact 3D form measurement of aspheric optics

LuphoScan platforms are interferometric, scanning metrology systems based on MWLI® technology (multi-wavelength interferometry). They are designed to perform ultra precision non-contact 3D form measurements mainly of rotationally symmetric surfaces such as aspheric lenses.

Measurement accuracy

Due to the use of a sophisticated arrangement of reference sensors and a unique reference frame concept, the systems enable ultra high measurement accuracies better than $\pm 50 \text{ nm}$ (2σ).

Reference frame concept

The LuphoScan platform is based on an open loop metrology frame with three reference sensors together with one cylindrical and two plane mirrors. This facilitates continuous determination of the position of the object sensor within this frame. The reference frame concept in conjunction with the extremely high accuracy of the MWLI® sensor technology and an ultra precise C stage guarantee a form measurement accuracy better than $\pm 50 \text{ nm}$ (2σ) and a reproducibility better than $\pm 20 \text{ nm}$ (2σ).

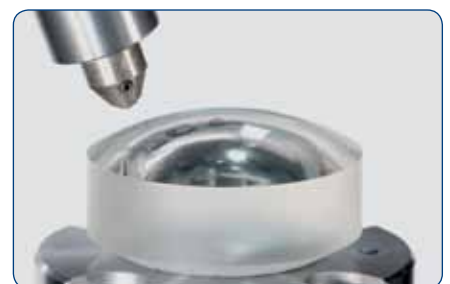
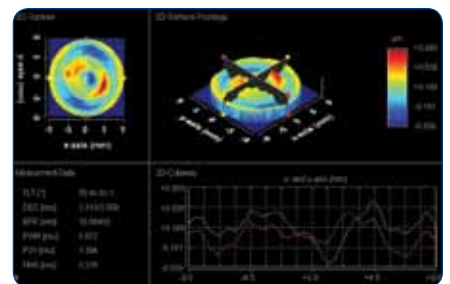


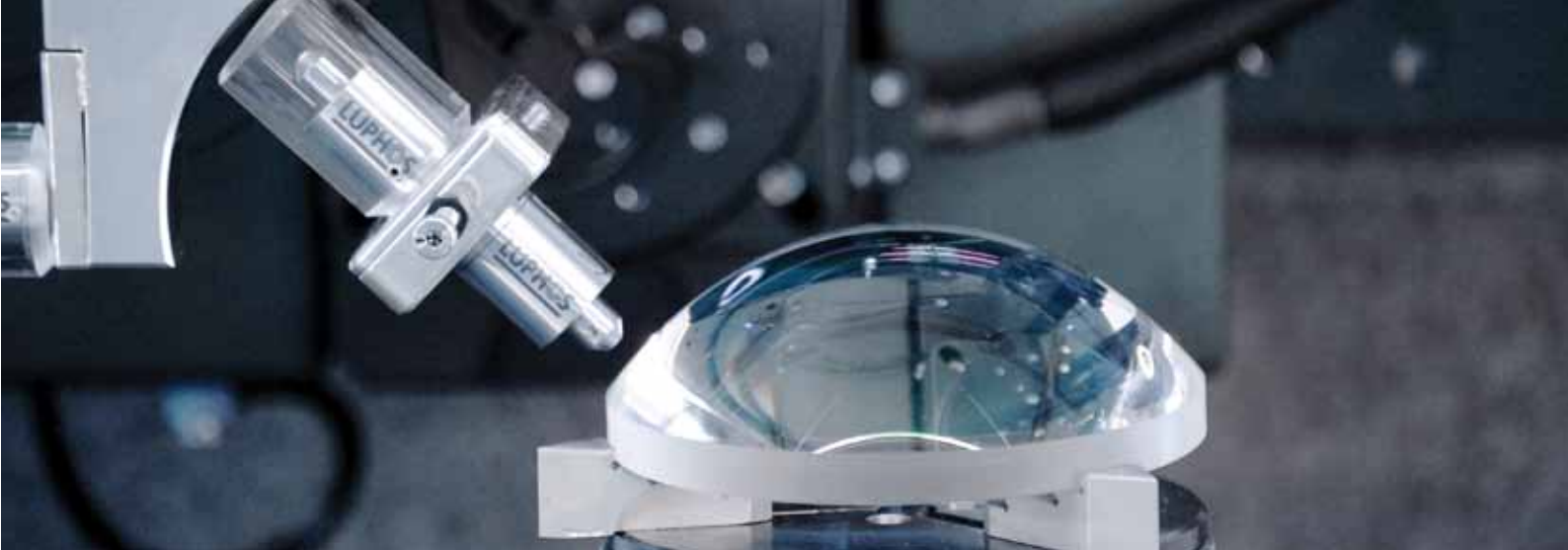
Further applications

Besides the standard measurement applications, it is also possible to utilise LuphoScan platforms for complete characterisation of optical elements by means of the LuphoSwap extension. This tool facilitates thickness measurement of lenses, as well as determination of wedge and decentre errors. In addition, several add-on software modules are available that enable straightforward measurement of discontinuous optics such as segmented surfaces including rectangular parts, annular optics, or surfaces with diffractive steps, and axicons.

Special shapes

Although the platforms are designed to measure rotationally symmetric parts, they are also able to measure slight freeform parts, if the departure from an aspheric, spheric or flat shape is small.





Flexible 3D form measurement

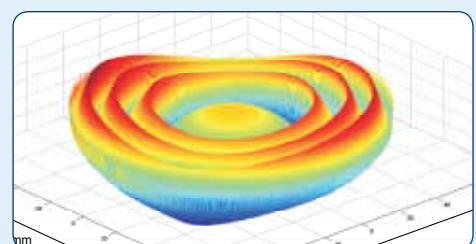
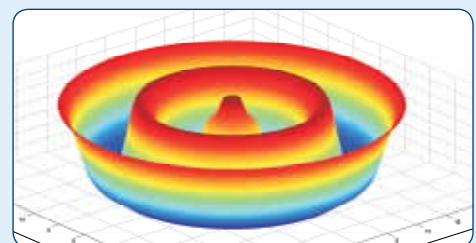
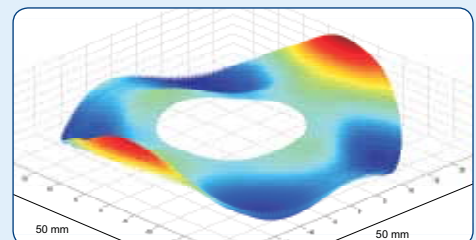
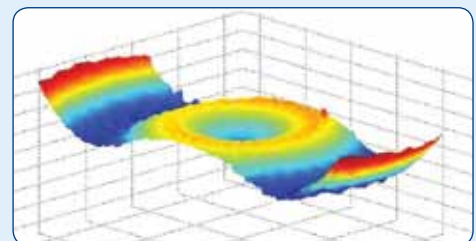
LuphoScan software enables predefinition of measurement procedures, analysis of measurement results, and print out of test reports.

Further features include sophisticated adjustment of apertures and various filtering tools, such as low pass or high pass filters, filters for eliminating peaks caused by dust particles etc. The measurement data can be interpreted as being obtained from a polished or ground surface (after the measurement).

System benefits

Critical measurements for design and production

- **Investigation of any rotationally symmetric surface**
Aspheres, spheres, flats and slight freeforms
- **Ultra high, reproducible accuracy**
 $\leq \pm 50 \text{ nm}$
- **Almost every material**
Transparent, specular, opaque, polished, ground
- **Large spherical departures**
Unrestricted, e.g. can measure pancake or gullwing surfaces, and profiles with points of inflection
- **Steep slopes**
Up to 90° (i.e. measurement of hemispheres)
- **Highly flexible**
Measures segmented surfaces, annular optics, rectangular surfaces, surfaces with diffractive structures, axicons
- **Complete lens characterisation**
Lens thickness, wedge error, decentre error, lens–mount positioning
- **Fast measurement speeds**
E.g. 1:58 min ($\varnothing = 30 \text{ mm}$, $R_{oc} = 60 \text{ mm}$, 100 points / mm^2),
or 5:29 min ($\varnothing = 130 \text{ mm}$, $R_{oc} = 150 \text{ mm}$, 50 points / mm^2)



Form Talysurf[®] PGI Dimension

A versatile automated system for precision optics measurement

Fully automated one-touch aspheric optics measurement.

Based on two of Taylor Hobson's core technologies - Aspheric profilometry and high accuracy roundness. The Form Talysurf[®] PGI Dimension delivers rapid optics cresting and precise measurement.

Versatile 2D and 3D analysis for spheres, aspherics and diffractives

Form repeatability of <100 nm and slope angles of up to 85 degrees mean that the Form Talysurf[®] PGI Dimension instrument is a versatile instrument for spherical, aspheric, diffractive lenses and moulds, which allows a wide range of accurate 2D and 3D measurements and analysis. The fully automatic centre and levelling feature includes new routines to ensure the accurate alignment of virtually any part: steep, shallow, large and small.

Designed for ease of use in the production environment

The new production interface gives fully automated operation, ideal for use on the shop-floor. The easy-to-use 'single-click' operation is quick to learn and will provide an automatic 2D or 3D analysis and output display. The instrument can be initially set up by quality specialists for the use of a wide range of manufacturing staff. After commencing the measurement Form Talysurf[®] PGI Dimension can then be left unmanned to complete the cycle.



“The new AAU software from Taylor Hobson has increased our capability to manufacture high accuracy Infrared optics with enhanced diffractive analysis capabilities.”

**Tim Olsen, Director of Engineering
Janos Technology**



Measurement

Up to 300 mm diameter



Resolution

0.2 nm



Slope

Slope up to 85 degrees



SAG

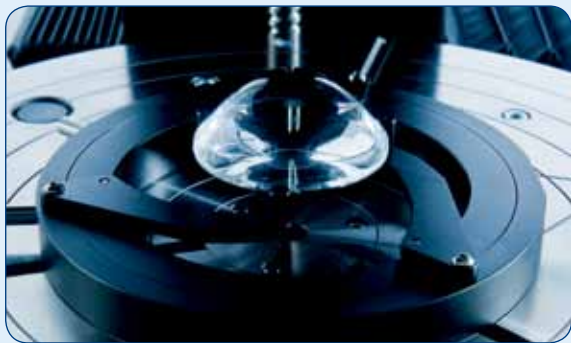
Up to 50 mm



Software functionality to save time and improve error detection

Industry leading accuracy for the competitive edge

Aspherics Analysis Utility (AAU)



Expressly designed for aspheric optical components the software fits measurement data to the component design formula, and aligns the resulting error profile with respect to the aspheric axis.

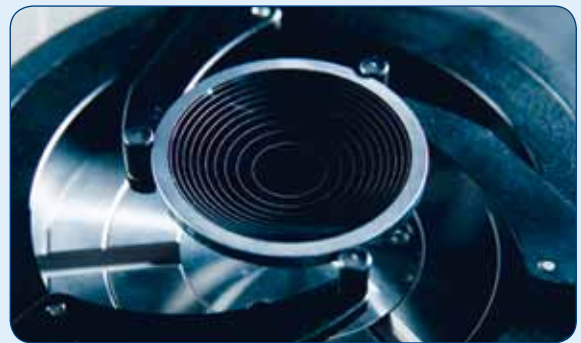
Base radius optimization (PV or rms) to highlight base radius variation in production, allowing users to quickly determine the best-fit radius within a set radius tolerance for the component, which can then be checked against allowable production tolerances.

Automatic spike removal can be defined by set width and heights to save time, eliminate user subjectivity and give more repeatable results.

Derived coefficients module for calculation of best fit asphere through a particular measurement. Resulting values can be used in conjunction with optical design software to assess the impact of form deviations on the optical performance of critical systems.

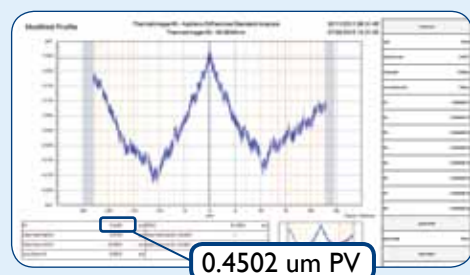
“Only Taylor Hobson can extract the true form”

Diffractive analysis



Software for the analysis of diffractive components An increasing number of applications, particularly in infra-red applications, are making use of asphero- diffractive designs. Diffractive analysis software is written specifically to enable the assessment of these complex surfaces, providing the user with form error and zone parameters.

Diffractive analysis when used in conjunction with the aspheric analysis software, allows the user to examine the underlying form of an asphero-diffractive component. Individual zone results are tabulated and can be output to a CSV file for further analysis. Diffractive polynomial settings can be saved and restored, enabling the user to quickly change between different designs.



A fully automated, fast and accurate system for precision optics measurement

Easy set-up, test and analysis for single or multiple parts make this the perfect system for fast and accurate testing of optical components.

Accurate, fast and easy to use

The Form Talysurf[®] PGI Matrix offers the renowned accuracy of the PGI coupled with fast, motorized stages and a new software interface designed for ease of use.

Loading and programming one lens or a batch of hundreds is made easy and guarantees accurate results with automatic alignment, measurement and even analysis. Automated spike removal and radius optimization help to give the most repeatable results.

Advanced Software saves production time and increases output

Aspherics Analysis Utility (AAU) software verifies the quality of optics and saves time with instant analysis of form error; radius, slope error; zone depth and spacing. Unique patented technology delivers nanometre level residual form error analysis, and advanced algorithms can extract a sub-micron lens form error from much larger diffractive zone depths. Derived co-efficient functions enable reverse engineering of aspheric and diffractive components, giving feedback to designers of the as-is manufactured lens (with error) to enable adjustment of critical design systems to improve performance.

New features such as automatic spike removal, P-V/ RMS radius optimization, cycle-time calculator and go-no-go indicators enable you to quickly optimize set-up parameters, and automate the measurement and analysis process, in a production environment.

Designed for ease of use in the production environment

The Form Talysurf[®] PGI Matrix interface gives fully automated operation, ideal for use on the shop-floor. The software is quick to learn and will provide an easy solution to programming multipart (batch) measurements for high volume applications. Alignment and measurement speeds coupled with quick and useful analysis tools have been streamlined to simplify and automate the complete measurement cycle.

Powerful software

Powerful analysis software for all parameters and run by our production interface automates control and reporting



Electrical cabinet

Industrial electrical and PC cabinet

pneumatic anti-vibration System

The pneumatic anti-vibration mounts protect the system from external vibration

Column

Motorised column for large range of sample sizes

Environmental enclosure

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



Traverse unit

200 mm traverse unit straightness datum

PGI gauge

World leading phase grating interferometer (PGI) gauge with 28 mm range

High precision rotary and Y-stage

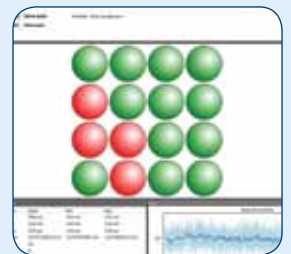
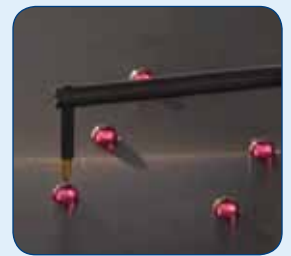
For accurate and automated positioning of parts

“The Form Talysurf® PGI Matrix is a modular system, adaptable to differing budgets and technical needs”

Connection to manufacturing process

Our new X-offset and radius compensation algorithms enable quick feedback to the manufacturing machines to improve process yields. This capability dramatically reduces set-up time for CNC grinding and diamond turning operations, and enables quick compensation for temperature drift issues throughout the day.

Batch parameters of Pt, RMS, radius and slope error can be set as tolerances. Once set, each part will indicate a pass or fail condition to quickly alert users of yield. Operation of such programmes results in fully automated measurement, analysis and results output.



UKAS calibration and testing

A quick and simple automated routine enabling gauge calibration over the full range. This unique calibration delivers world leading surface and form accuracy.

Taylor Hobson provides full certification for artefacts and instruments in our purpose built ISO graded clean room UKAS facility. Our UKAS laboratory is able to measure all of the parameters associated with surface texture, including French, German, USA and Japanese derivatives.



0026



2624

Simply the best form accuracy when measuring aspheric and diffractive optics

Following its first release in 1984, the Form Talysurf[®] quickly became the number one system for optics manufacturers in measuring aspheric form error. Since then, we have installed thousands across the globe and have become a true industry standard.

Our patented PGI technology enables you to measure large sags with short length styli. This enables us to combine very high stiffness and low force offering much greater accuracy and repeatability than our competitors.

- ✓ Easy to program
- ✓ Easy to use
- ✓ Fast and accurate
- ✓ Packed with powerful analysis tools

Traceable & repeatable results

Lens testing is made easy, with guaranteed accurate results. Automatic cresting, measurement and analysis coupled with automated spike removal and radius optimisation help to give the most repeatable results.

The Form Talysurf[®] PGI Optics family

The Form Talysurf[®] PGI Optics offers premium optics metrology packages designed to optimise performance and enhance your manufacturing capability. We offer a large range of instrument sizes and software packages to optimise your measurement needs as well as your budget.



“Measurement of large sag lenses without compromise”

New software tools to eliminate operator error

A sag and slope calculator is provided to allow quick check of lens drawing equation against the instrument equation to verify sign convention, while also checking for flanking conditions based on stylus/part combination.



Applications include:

- Plastic lenses
- IR glass and crystals
- Diffractive optics
- Large diameter optics
- Small components

Gauge range

Up to 28 mm

Noise

< 2 nm Rq

Measurement

Up to 300 mm diameter

Form error

< 100 nm



Measurable benefits

Meeting the ever increasing demands of next generation technologies

New gauge design with improved measurement range!

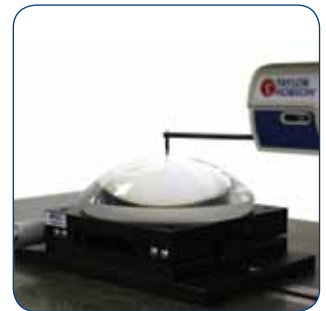
The Form Talysurf® PGI Optics large range gauge enables measurement of large sag lenses without compromise of accuracy. The latest PGI gauge will measure up to 14 mm of sag with a 60 mm long stylus and up to 28 mm with a 120 mm stylus.

Reverse engineering

Derived co-efficient functions enable reverse engineering of aspheric and diffractive components. The user can reverse fit the raw sag data to the asphere and/or diffractive equations giving a new, as-is manufactured lens, to enable evaluation and adjustment of critical optical design parameters to improve the imaging system performance.

Connection to manufacturing process

Our new X-offset and radius compensation algorithms enable quick and effective feedback to the manufacturing machines to improve process yields. This capability dramatically reduces set-up time for CNC grinding and diamond turning operations, and enables quick compensation for temperature drift issues throughout the day.



Reduced costs and improved manufacturing yields

The Form Talysurf® PGI Optics new easy-to-use interface and automated analysis reduces labour and training costs. Common mobile phone lenses and commercial optics can be quickly measured and analysed automatically with robust algorithms to improve repeatability and accuracy giving numbers you can trust, every time.

Improve your competitiveness

With the Form Talysurf® PGI Optics' accuracy and flexibility your products could improve in quality and deliver more repeatable performance. With the option for derived fitting of aspheres and diffractives, the true form derivation you can receive will add valuable feedback to your design team.

Versatile, high resolution freeform measurement system

The new Form Talysurf[®] PG Freeform is a versatile, high resolution system dedicated to the measurement of high precision freeform optics. Providing 3D raster / radial measurement and analysis of:

- Spheres
- Aspheres
- Diffractives
- Freeforms

The Form Talysurf[®] PG Freeform can work with many of the latest equations used for definition of freeform surfaces such as:

- Toric
- Bi-conic
- Anamorphic asphere
- Ellipsoid
- NURBS
- Zernike
- Cloud of points

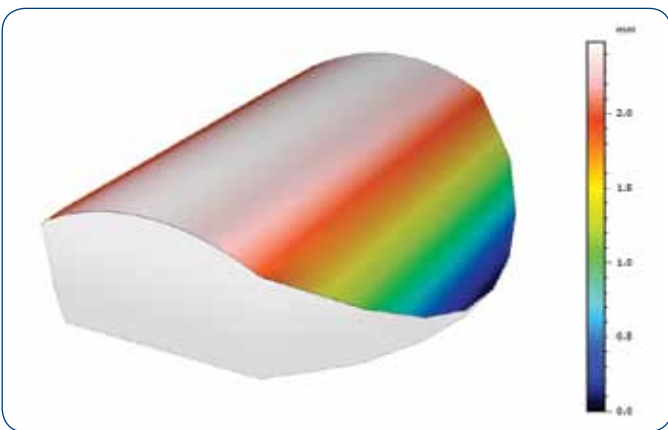
Measurement integrity and reproducibility

Taylor Hobson's Form Talysurf[®] PG Freeform is 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.

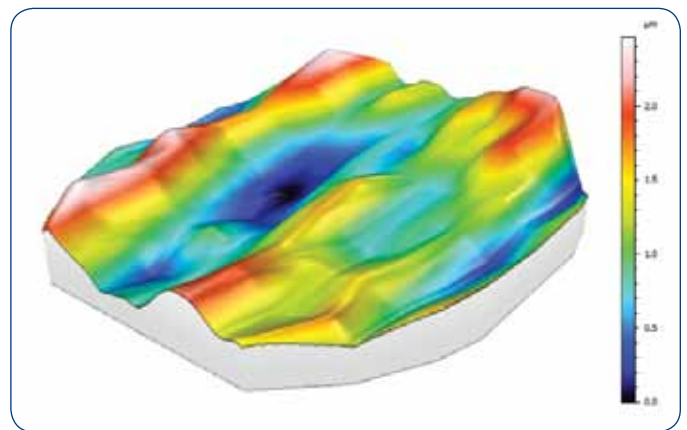
With the new dedicated software interface, accurate freeform measurements are easy to set-up and analyse. The versatility of the Form Talysurf[®] PG Freeform makes it the complete optics metrology solution.



“Accurate measurements of true freeform surfaces”



Raster scan of freeform optic



Form error of freeform optic

Gauge range
Up to 28 mm

Resolution
0.8 nm

Slope
Slope up to 55 degrees

Contour
Low Form Error

LuphoSharp platforms enable highly accurate non-contact form measurement of acylindrical optics and various prisms

Acylindrical optics are used for beam shaping in laser line generators such as laser annealing systems, or for astigmatism correction in imaging systems.

LuphoSharp platforms provide an easy-to-use solution to measure almost any acylindrical surface comprising for instance glass or plastic components and metal mirrors. In addition, also inspection of various prisms and optical elements is possible, including form measurement and high precision determination of chamfer angles.

Now, for the first time, the fast and flexible measurement and analysis capabilities of the new LuphoSharp allow highly accurate complex acylinders to be easily be manufactured. In this way the platforms facilitate more individual lens designs and significantly contribute to enhanced performance of optical systems.

“You can only manufacture as accurately as you can measure...”

LuphoSharp instruments are based on an interferometric scanning metrology system, employing MWLI[®] technology (multi-wavelength interferometry).

Key benefits of the systems include:

- Measurement of objects up to 160 mm width and 150 mm length
- Fast measurement speeds
- High flexibility in terms of surface shapes
- High density 3D data of the whole surface
- Measure objects with slopes up to $\pm 60^\circ$



LuphoSharp systems offer a straightforward way for highly accurate non-contact form measurement of acylindrical optics and prisms.

LuphoSharp applications comprise characterisation of:

- Acylindrical lenses and mirrors
- Plano-concave cylinder lenses
- Right angle prisms
- Plano-convex cylinder lenses
- Laser line generator lenses
- Equilateral prisms and Dove prisms



“The flexible LuphoSharp also enables inspection of various prisms and optical elements, including form measurement and high precision determination of chamfer angles.”

Fresnel lens measurement

Groundbreaking analysis of Fresnel lenses with the LuphoScan

Non-contact 3D form measurements of Fresnel and Asphero-Diffractive optics

LuphoScan F-type probe measurement principle

During measurement the probe performs a spiral scan over the entire surface of the object under test and produces high density 3D data. Scanning is achieved by rotating the object by means of an air-bearing spindle whilst the sensor is moved radially and axially using linear stages.

A rotary stage keeps the sensor normal to the object surface. The layout of movement stages provides high flexibility, even for uncommon surface shapes including steep slopes or profiles with points of inflection.

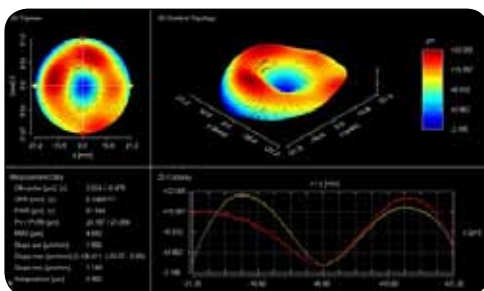
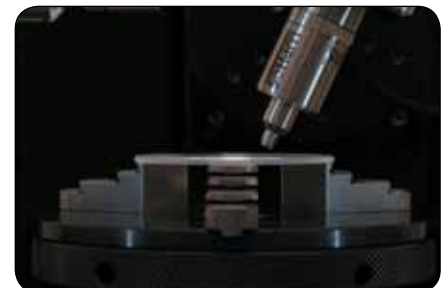
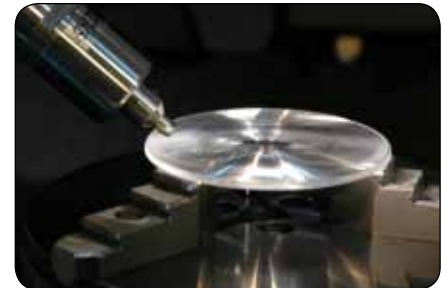


“An industry first - optical metrology of Fresnel lenses”

Measure discontinuous surfaces such as Fresnel lenses and Asphero-Diffractive lenses

The absolute measurement capability of the MWLI® sensor technology enables the LuphoScan instrument to inspect discontinuous optics such as segmented surfaces, including rectangular parts, annular optics or surfaces with steps and axicons.

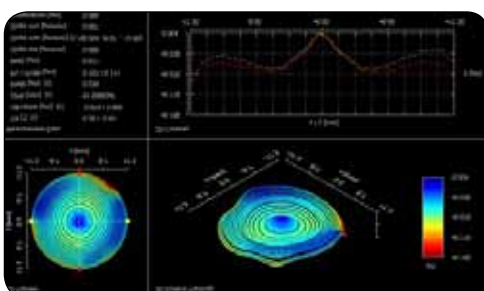
These features are included in the following software modules; “Segmented lenses”, “Annular lenses”, “Axicons”, and “Asphero-Diffractive/Fresnel lenses”. These modules can also be combined, for example, to measure a segment of an asphero-diffractive lens with a hole in the centre.



Data analysis

A 3D surface topography evaluation of the optically active area is provided by the software. Steps of a Fresnel structure can be pre-defined either by a mathematical description for constant step height or constant pitch, or by manually defined positions and heights.

Besides step height evaluation, post-processing offers two different, combinable ways to remove steps for a topographically analysis. Any possibly invalid data at the edges or caused by shadowing effects can be easily masked in a narrow band along each step. Furthermore, a sophisticated algorithm can sort and even selectively remove single invalid data points, without masking a complete band.



Data export

Topographic measurement data can be exported as 3D sets or 2D line scans. Different formats are available that support straightforward import in production machines. An additional auto-export enables integrated manufacturing with closed-loop processing.



For the first time...measurement and analysis of Fresnel lenses

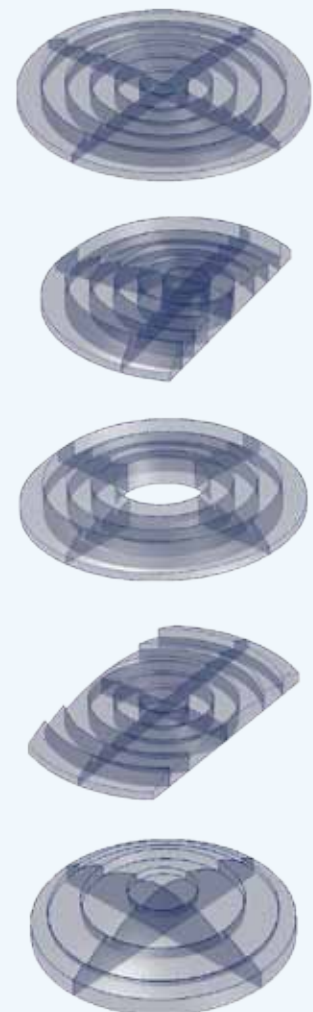
LupoScan instruments represent class-leading non-contact metrology platforms. They offer superior flexibility and ease-of-use for the analysis of rotationally symmetric optics.

Metrology of precision optics becomes faster than ever with minimal operator influence. The LupoScan software enables automation of measurement procedures, measurement results and print out of test reports.

Benefits

Metrology of Fresnel and Asphero-diffractive surfaces

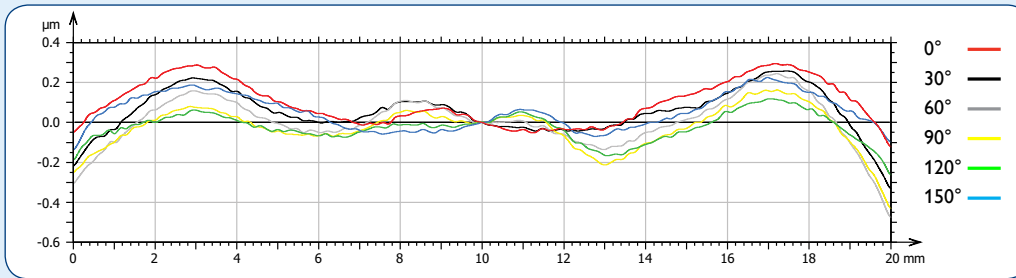
- **Non-contact 3D form measurement of Fresnel lenses**
Optical metrology of discontinuous surfaces (incl. Fresnel and asphero-diffractive lenses)
- **Measures segmented parts**
E.g. D-cut base, rectangular base, centre hole, etc.
- **Short measurement times**
E.g. D = 50 mm, 30 zones: 8 min (full 3D)
- **Steep slopes of Fresnel structures**
Up to 55° on Fresnel lenses (max. slopes on aspheres incl. asphero-diffractive: 90°)
- **Flexible with regard to Fresnel design**
Constant pitch + varying step heights, constant step height + varying pitch, combinations
- **Large step heights**
Up to 600 μm
- **Determination of step heights**
Automatically evaluates step heights of Fresnel and asphero-diffractive lenses
- **Complex base shapes**
Underlying shape (of substrate) can be flat, spheric or aspheric
- **Large diameters**
260 mm and 420 mm



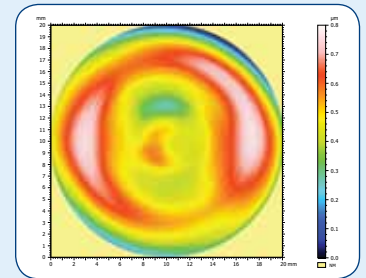
Correlation and repeatability

Taylor Hobson has a long history in optics development and in providing metrology for the optics industry. We know the importance of ensuring measurement data is highly reliable, repeatable and accurate across all measurement platforms. To this end, we carry out extensive correlation studies on our products - just one example of which is shown below.

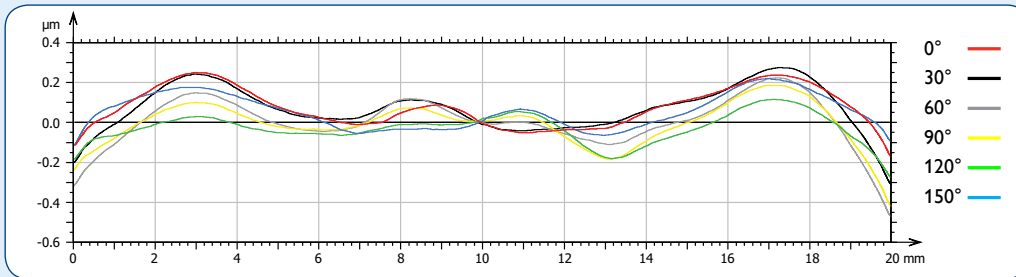
Inter-instrument comparison - LupoScan vs. PGI Dimension vs. PGI Matrix



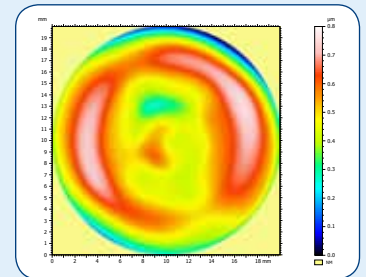
6 individual radial traces from the LupoScan



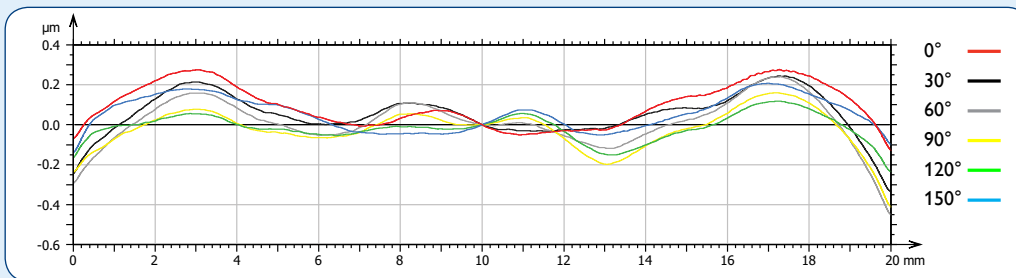
LupoScan: 3D astigmatic plot



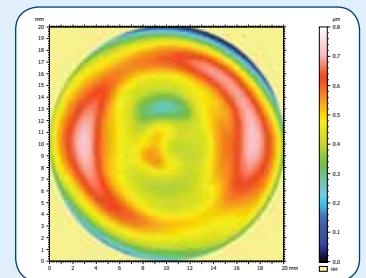
6 individual radial traces from the PGI Dimension



PGI Dimension: 3D astigmatic plot



6 individual radial traces from the PGI Matrix

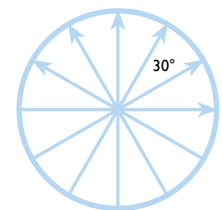


PGI Matrix: 3D astigmatic plot

Outstanding inter-product correlation - results you can trust!

Instrument	Optimised Radius (mm)			Maximum Pt of 6 profiles (nm)		
	Repeat 1	Repeat 2	Repeat 3	Repeat 1	Repeat 2	Repeat 3
LupoScan	22.0693	22.0691	22.0691	756	771	776
PGI Dimension	22.0699	22.0701	22.0697	761	758	749
PGI Matrix	22.0699	22.0700	22.0697	729	716	726
Standard Deviation*	0.0003	0.0006	0.0003	17	29	25

Typical results showing inter-product correlation

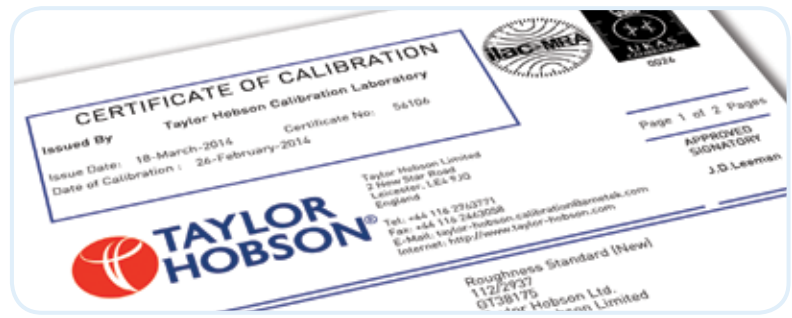


Positions of the radial traces in space from the PGI systems

* Standard deviation is given for 10 repeats

Traceability

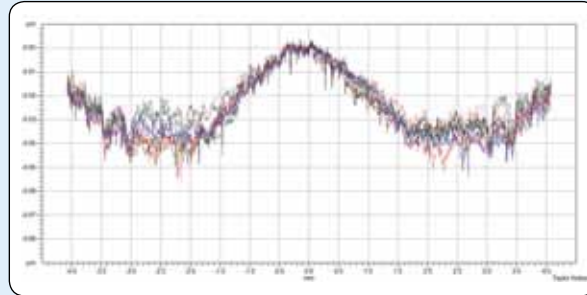
The certificate shown is an example from Taylor Hobson's UKAS accredited laboratory.



Proven traceability to international standards

Traceable results for contact metrology

Taylor Hobson's industry leading PGI systems



10 results superimposed



METAS traceable standard

Certified radius:
4.76273 mm

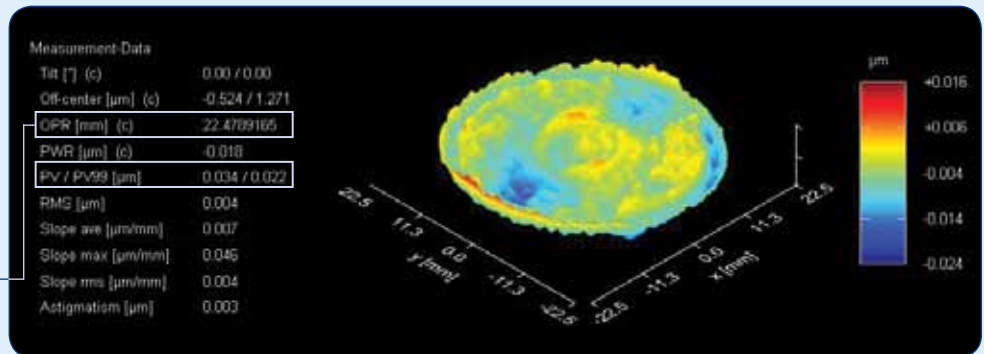
METAS Reference:
No. 115-01452

Measurement	1	2	3	4	5	6	7	8	9	10	Max-Min
Form error (Pt) nm	64	62	55	55	59	55	60	57	60	58	9
Opt. Base Rad. mm	4.76280	4.76278	4.76282	4.76281	4.76284	4.76287	4.76287	4.76287	4.76286	4.76287	90 nm

Form error (Pt) and optimised base radius (mm) results (0–180 deg)

Traceable results for non-contact metrology

Taylor Hobson's industry leading LuphoScan systems



Certified radius:
22.47894 mm

METAS Reference:
No. 111-07979

Typical display of results on LuphoScan system showing traceability

UKAS calibration and testing

To be entirely certain of the measurements you take, your results need to show repeatability, accuracy and traceability to international standards. Taylor Hobson provides full certification for artefacts and instruments in our purpose built ISO graded clean room UKAS facility.

Our UKAS laboratory is able to measure all of the parameters associated with surface texture, including French, German, USA and Japanese derivatives.



The Metrology Experts

Established in 1886, Taylor Hobson is the world leader in surface and form metrology and developed the first roundness and surface finish measuring instruments.

www.taylor-hobson.com

Sales department

Email: taylor-hobson.sales@ametek.com

Tel: +44 (0) 116 276 3771

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

Centre of Excellence department

Email: taylor-hobson.cofe@ametek.com

Tel: +44 (0) 116 276 3779

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- **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.

Service department

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Tel: +44 (0) 116 246 2900

- **Preventative maintenance** – protect your metrology investment with an AMECare support agreement.



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Taylor Hobson UK

(Global Headquarters)

PO Box 36, 2 New Star Road
Leicester, LE4 9JQ, England

Tel: +44 (0)116 276 3771
taylor-hobson.sales@ametek.com



Taylor Hobson France

Rond Point de l'Epine Champs
Batiment D, 78990 Elancourt, France

Tel: +33 130 68 89 30
taylor-hobson.france@ametek.com



Taylor Hobson Germany

Rudolf-Diesel-Straße 16,
D-64331 Weiterstadt, Germany

Tel: +49 6150 543 0
taylor-hobson.germany@ametek.com



Taylor Hobson Italy

Via De Barzi, 20087 Robecco sul Naviglio,
Milan, Italy

Tel: +39 02 946 93401
taylor-hobson.italy@ametek.com



Taylor Hobson India

Divyasree NR Enclave, 4th Floor, Block A,
Plot No. 1, EPIP Industrial Area, Whitefield,
Bengaluru - 560066, India

Tel: +91 80 6782 3346
taylor-hobson.india@ametek.com



Taylor Hobson China

taylor-hobson-china.sales@ametek.com

Shanghai Office

Part A1, A4, 2nd Floor, Building No. 1, No. 526
Fute 3rd Road East, Pilot Free Trade Zone,
Shanghai, 200131, China

Tel: +86 21 5868 5111-110

Beijing Office

Western Section, 2nd Floor, Jing Dong Fang
Building (B10), No. 10, Jiu Xian Qiao Road,
Chaoyang District, Beijing, 100015, China

Tel: +86 10 8526 2111

Chengdu Office

Unit 9-10, 10th Floor 9/F, Hi-tech Incubation
Park, No.26 West Jinyue Road, Chengdu,
610041, China

Tel: +86 28 8675 8111

Guangzhou Office

Room 810 Dongbao Plaza, No.767 East
Dongfeng Road, Guangzhou, 510600, China

Tel: +86 20 8363 4768



Taylor Hobson Japan

3F Shiba NBF Tower, 1-1-30, Shiba Daimon
Minato-ku, Tokyo 105-0012, Japan

Tel: +81 34400 2400
taylor-hobson.japan@ametek.com



Taylor Hobson Korea

#309, 3rd FL, Gyeonggi R&DB Center, 105,
Gwanggyo-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea, 16229

Tel: +82 31 888 5255
taylor-hobson.korea@ametek.com



Taylor Hobson Singapore

AMETEK singapore, 10 Ang Mo Kio Street 65,
No. 05-12 Techpoint, Singapore 569059

Tel: +65 6484 2388 Ext 120
taylor-hobson.singapore@ametek.com



Taylor Hobson Thailand

89/45, Moo 15, Enterprise Park, Bangna-Trad
Road, Tambol Bangkaew, Amphur Bangplee,
Samutprakarn Province 10540, Thailand

Tel: +66 2 0127500 Ext 505
taylor-hobson.thailand@ametek.com



Taylor Hobson Taiwan

10F-5, No.120, Sec. 2, Gongdao Wu Rd.,
Hsinchu City 30072, Taiwan

Tel: +886 3 575 0099 Ext 301
taylor-hobson.taiwan@ametek.com



Taylor Hobson Mexico

Acceso III No. 16 Nave 3 Parque Ind. Benito
Juarez Queretaro, Qro. Mexico C.P. 76120

Tel: +52 442 426 4480
taylor-hobson.mexico@ametek.com



Taylor Hobson USA

27755 Diehl Road, Suite 300, Warrenville,
IL 60555, USA

Tel: +1 630 621 3099
taylor-hobson.usa@ametek.com



1100 Cassatt Road, Berwyn, PA 19312, USA
Email: info.corp@ametek.com
Web: www.ametek.com