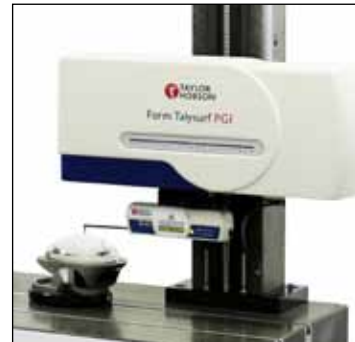


PGI Optics

The industry standard for precision optics metrology



The most versatile metrology in the industry

Talysurf PGI Optics

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 tool for optics manufactures in measuring aspheric form error. Since then, we have installed thousands across the globe becoming a true industry standard.

Our patented PGI (Phase Grating Interferometer) 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.

New software!

Easy-to-use interface increases productivity

New wide range gauge!

Measurement of large sag lenses without compromise

- ☑ Easy to program
- ☑ Easy to use
- ☑ Fast and accurate
- ☑ Packed with powerful analysis tools to improve your capacity and capability



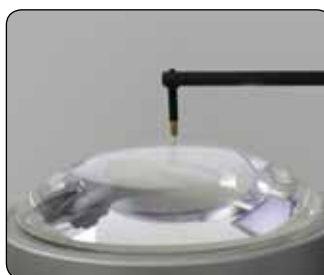
The most versatile metrology in the industry



Plastic lenses



Small components



Large diameter optics



IR glass and crystals



The benefits of Talysurf PGI Optics

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.

New gauge design with improved measurement range!

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

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.

“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**

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.

New features such as automatic spike removal, P-V/ RMS radius optimisation, flanking and sag calculators enable you to reduce subjective measurement analysis errors in a production environment.

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.



“We recently upgraded to the latest version of Taylor Hobson AAU software, and the improvements are just what we needed. We have improved reliability and reduced time to test.”

John Franks, Technical Director – IR Optics, Umicore



Easy-to-use interface increases productivity

With automation further reducing operator dependency

A dedicated user-friendly interface is supplied for the specific measurement of optical moulds and lenses. This interface provides an easy method of instrument operation, presenting clear control options to the operator – ideal for production use.

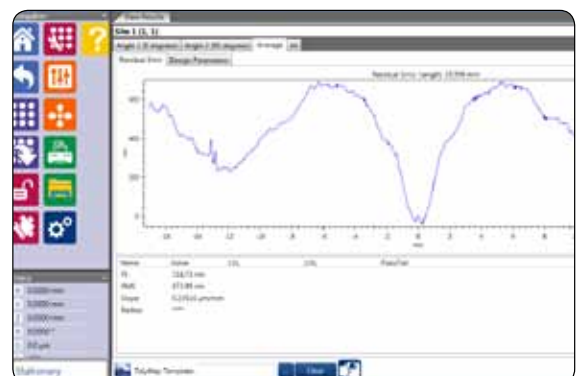
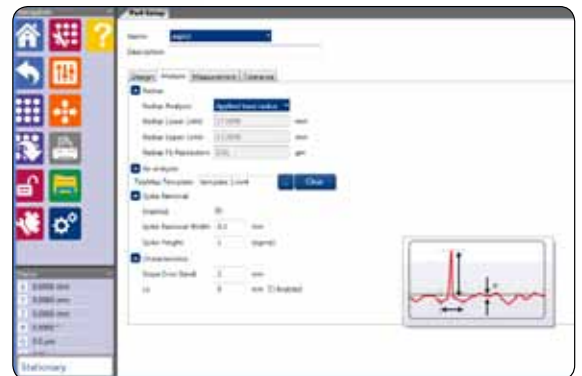
A new vacuum system makes smaller parts easier to hold and reduces errors from part movement.

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.

Typical output results include:

- Profile form-error Pt and RMS
- Slope error
- Diffractive Zone analysis
- Reverse fit aspheric and/or diffractive terms
- Optimised radius
- X-offset and tool radius for diamond turning feedback
- Vacuum system for small parts
- 2D and 3D error maps can be linked back to the manufacturing process for process improvement with MRF, Diamond Turning, CNC grinding and polishing.





Industry leading technology for the competitive edge

Measurable benefits

Reduced costs and improved manufacturing yields

The 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.

Improved utilisation

Error Compensation, X-offset and Tool Radius error analysis capabilities give automatic feedback to the manufacturing process, enabling dramatically reduced set-up times and temperature compensation for diamond turning and CNC grinding applications.

Improve your competitiveness

With the 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.

Future metrology savings

With high instrument accuracy and versatility you are able to measure new and emerging designs, future-proofing investment. You also have the option to upgrade packages by adding on new functionality, and therefore protect your metrology investment.

Software functionality to save time and improve error detection



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 optimisation (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.

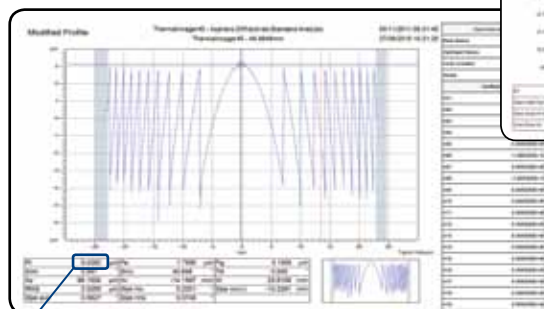
Automatic spike removal can be defined by set width and heights to save time, eliminate user subjectivity and give more repeatable results.

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.

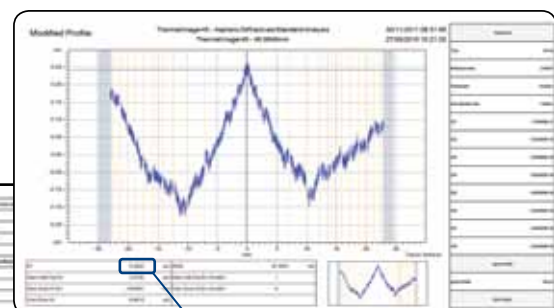
Diffractive analysis

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.



9.0282 um PV



0.4502 um PV

“Only Taylor Hobson can extract the true form.”



Patented ball calibration routine from UKAS approved laboratory

Dimensional measurement capability and gauge linearity

The Talysurf PGI systems use a patented ball calibration routine to ensure that both of these requirements are dealt with in a single, automated operation. 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.

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.

In addition to the ball calibration routine the Talysurf PGI Optics also includes a unique calibration unit and software to determine the position of the stylus to achieve the centering of the stylus for accurate rotational measurement of the lens.

Phase Grating Interferometer (PGI) gauge

This gauging technology, developed and patented by Taylor Hobson, delivers 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.

“Gauging technology developed and patented by Taylor Hobson.”





PGI Optics family

The 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.

PGI Optics 100	PGI Optics 150	PGI Optics 200	PGI Optics 300
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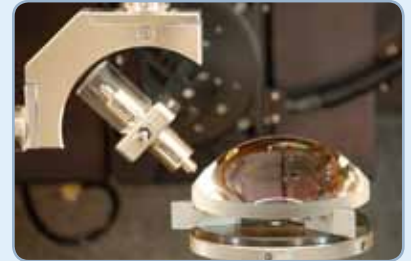
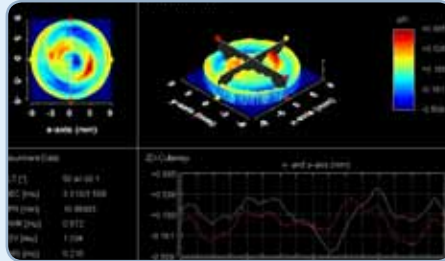
	100	150	200	300
Max diameter (mm)	100	150	200	300
14mm / 28mm gauge range (60 / 120 mm styli)	●	●	✓	✓
Auto spike removal	✓	✓	✓	✓
Stylus flanking calculator	✓	✓	✓	✓
Radius tolerancing and optimisation	✓	✓	✓	✓
X-offset (machine feedback)	●	●	●	●
Vacuum lens holding system	●	●	●	●
TalyMap 3D analysis	●	●	●	●
Asphere (AAU 1)	✓	✓	✓	✓
Derived aspheres (AAU 3)	●	●	●	●
Diffractives (AAU 2)	●	●	●	●
Derived diffractives (AAU 4)	●	●	●	●

✓ Standard ● Option

Optics metrology solutions

LuphoScan

- High accuracy, Non-contact form metrology
- Extremely fast and flexible
- Full 3D (large data density)



PGI Dimension

- High accuracy form metrology
- Fully automated
- Extremely versatile



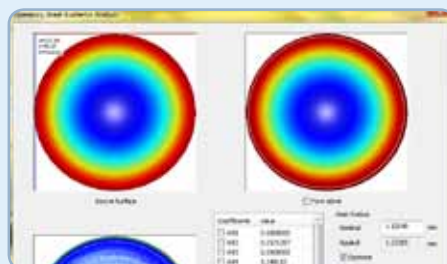
PGI Matrix

- Batch testing of multiple parts
- Extremely fast and easy to use
- Fully automated for high throughput



CCI Optics

- Extremely high resolution (0.1 ångström)
- Extremely fast and flexible
- Full 3D (large data density)

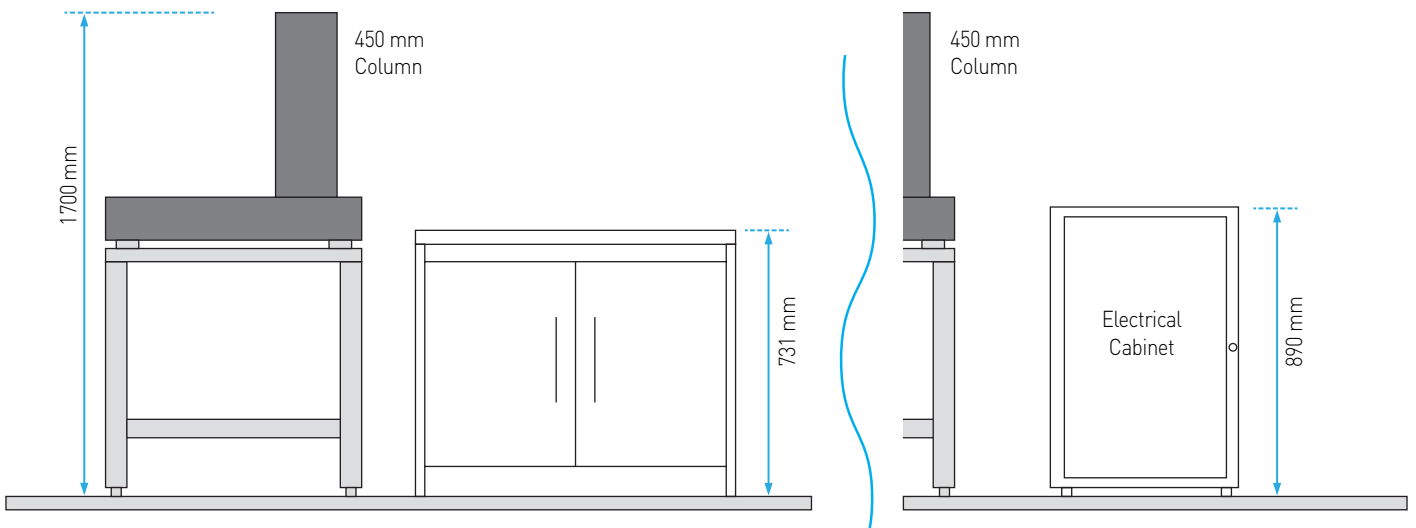
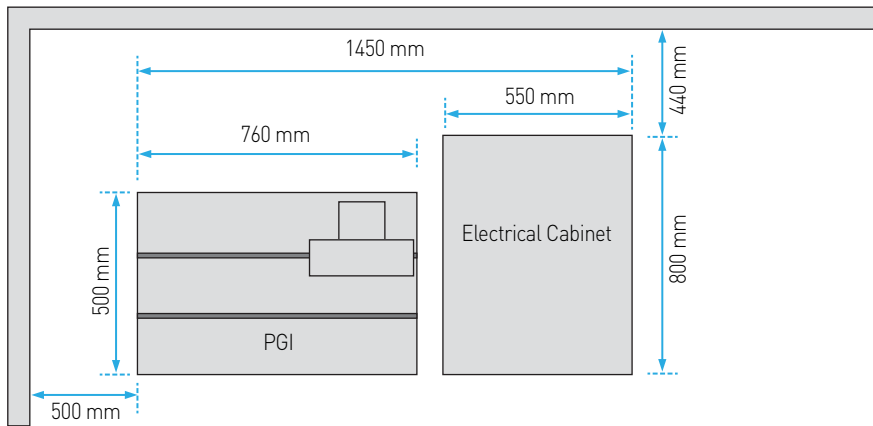
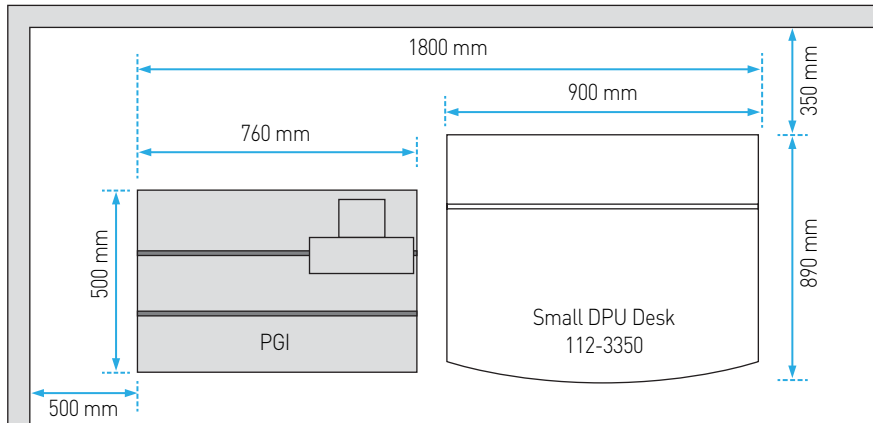


Ultra Autocollimator

- Extremely high accuracy (0.2 arcsec)
- Wide measurement range (0.5 Deg)
- Laser alignment feature makes it easy to use



Floor plan



Specifications

X-axis (horizontal) performance			
Traverse length - X Max / Min	100 mm / 150 mm / 200 mm / 300 mm		
Measuring speeds ¹	0.1 mm/s to 13 mm/s		
Traverse speeds	up to 13 mm/s max		
Data sampling interval in X	0.125 µm over 300 mm length		
Z-axis (column) performance			
Usable height	190 mm		
Positioning speeds	0.25 mm/s to 10 mm/s		
Gauge			
Nominal measuring range (Z) (traverse set to 0°)	60 mm stylus arm	14 mm	
	90 mm stylus arm	21 mm	
	120 mm stylus arm	28 mm	
Resolution	0.8 nm @ 14 mm range		
Stylus arm length, tip size, force	60 mm arm, 2 µm radius conisphere diamond stylus, 1 mN force		
System performance ²			
Form error - Pt ³ (ball calibration radius)	Max 100 nm @ 22 mm Typically less than 60 nm @ 22 mm		
Radius measurement uncertainty ⁴	0.1 mm - 80 mm = 1 % - 0.005% of nominal 80 mm - 1000 mm = 0.005 % - 0.1% of nominal 1000 mm - 2000 mm = 0.1% of nominal		
Physical dimensions			
Dimensions L x D x H	See floor plan		
Weight (main instrument)	223 Kg		
Environment		Electrical supply	
Storage temperature	5 °C to 40 °C	Supply type	Alternating supply, single phase with earth (3-wire system)
Storage humidity	10% to 80% relative, non condensing	Instrument and computer voltage	90V - 130V or 200V-260V (switch selectable)
Operating temperature	18 °C to 22 °C	Frequency	47 Hz to 63 Hz
Temperature gradient	< 2 °C per hour	Supply voltage transients – width	EN 61000 - 4 - 4 : 1995
Operating humidity	45% to 75% relative, non condensing	Power consumption	500 VA
Maximum RMS floor vibration	5.0 µm/s at > 50 Hz	Safety	EN 61010 - 1 : 2001
Laser classification		EMC	EN 61000 - 6 - 4 : 2001 EN 61000 - 6 - 1 : 2001
Class 1 product to EN 60825-1 (2001) Continuous Wave (CW) output < 1 mW Max power for the laser < 50 µW Max power for the product		Measuring capacity	
		Maximum component diameter	300 mm
		Maximum component height	190 mm
		Maximum component weight	10 Kg

- For surface texture measurements, speeds of 0.5 mm/s and less are recommended.
- Using a 60 mm arm with a diamond stylus.
- From a repeat measurement on the calibration artifact over 75% of the gauge range (LS Arc analysis, primary filter $\lambda_s = 0.25$ mm).
- Assumes a calibration artifact of perfect radius.

The above technical data is for measurements taken in a metrology laboratory controlled environment: 20 °C ± 1 °C (68 °F ± 1.8 °F), draft free, and isolated from low frequency floor borne vibration. Uncertainties and maximum permissible errors (MPEs) are at 95% confidence in accordance with recommendations in the ISO Guide to the expression of uncertainty in measurement (GUM:1993). All errors are expressed as MPEs.

NOTE: Taylor Hobson pursues a policy of continual improvement due to technical developments. We therefore reserve the right to deviate from catalogue specifications.

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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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

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

Centre of Excellence department

Email: taylor-hobson.cofe@ametek.com

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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 artifacts or instruments in our laboratory or at customer's site



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