FORM TALYSURF®
PGI OPTICS PRO

A fast, accurate and easy to use system
for high precision optics measurement

PGI OPTICS PRO

Measurement of high-precision optics
A benchmark for accuracy and versatility

A fast, accurate and easy to use system for high precision optics measurement

The Form Talysurf® PGI OPTICS PRO is equipped with a new dual bias gauge and powered by Metrology 4.0 Smart Software.

Adjustable tip force, 0.2 nm resolution and 20 mm gauge range deliver broader versatility for optics applications, with increased accuracy.

Our patented PGI (Phase Grating Interferometer) technology enables you to measure 20 mm sag using a standard 100 mm length stylus with 0.2 nm resolution.

Additionally, Taylor Hobson manufactured styli combine very high stiffness and low force, delivering much greater accuracy and repeatability than comparable products.

The new platform is flexible with a variety of options as well as future advances and developments.

Instrument shown
0.2 nm resolution, 20 mm range, dual bias guage, powered by Metrology 4.0

Unique benefits for both design and production

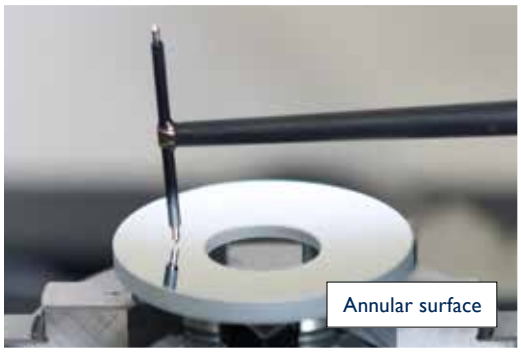
Buy with confidence

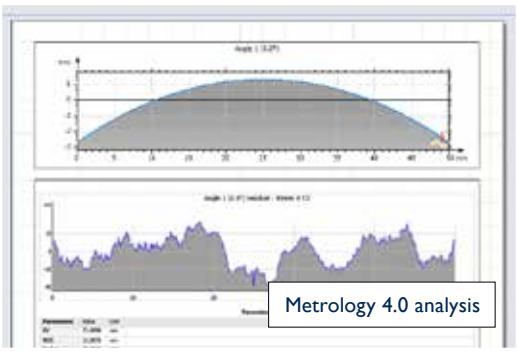
- **Stylus force -** adjustable between 30 - 220 mgf (~0.3 - 2.2 mN) to remove ringing effect and deliver better results on soft surfaces. NEW
- **Annular surface measurements -** measure aspheric mirrors with central hole and analyse using simple part description and automated routine. NEW
- **Dual surface measurements -** measure both surfaces of a lens in a single run and analyse for form, radius and center thickness. NEW
- **Automated motorised stages -** increase flexibility with the addition of motorised Y-Axis and/or Rotary stages, coupled with a precision tilt and centre stage.
- **Advanced error compensation -** calculate and correct for x-offset, radius and form errors in a single run for diamond turned parts.
- **3D astigmatism -** take multiple radial traces and analyse for astigmatism, accompanied by 3D map and Zernike coefficients.
- **Intelligent cresting -** accurately identifies the part centre regardless of surface form allowing accurate measurements to be taken automatically.
- **Measurement start memory -** allows repeat measurements to be taken without the need for re-cresting to lower cycle times and save time in production environment.

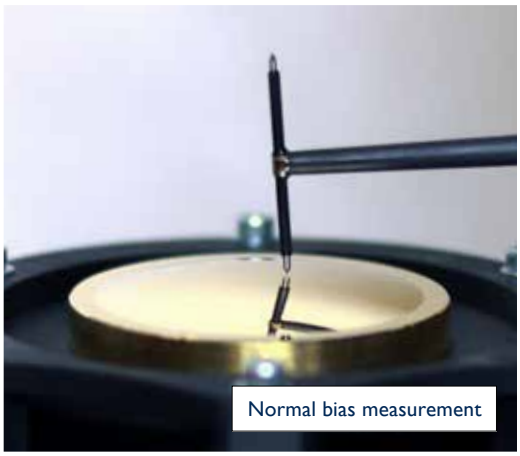
Metrology 4.0®
SMART SOFTWARE

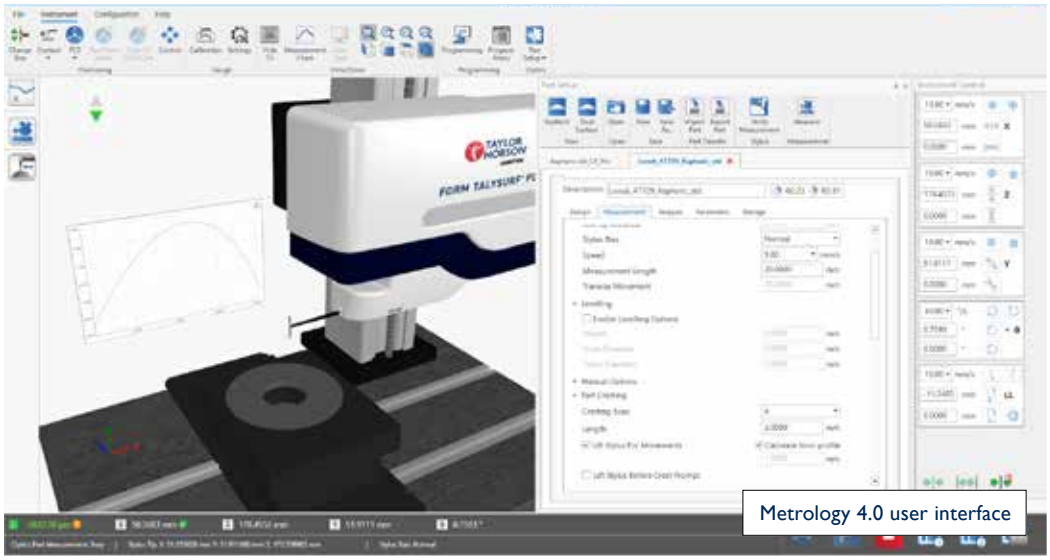
Powerful analysis software

Advanced optics metrology, made simple


Annular surface


Metrology 4.0 analysis


Normal bias measurement


Metrology 4.0 user interface


Reverse bias measurement

Metrology 4.0 - Smart Software NEW

Cutting-edge technology

The advance in metrology software design that the market has been waiting for...

Metrology 4.0 is an All-In-One software combining all functions of part description, measurement, analysis and reporting in one single platform. It is easy to use with an intuitive user-interface, virtual display and real time control.

The desktop publishing features are powerful and simple to use. Allowing customisation of result layouts, ensuring a more professional and personalised look to your brand.

Operator benefits

Virtual display - simulation of the measurement process with 'at-a-glance' status, on-screen indicators, real-time feedback and remote system control.

Part setup - easy setup of surface, measurement and analysis parameters for fully automated processing of aspheric and diffractive surfaces.

User levels - tailor your instrument to suit the operator, from basic production mode to advanced administration use with password protected modes.

Customisation - screen layouts can be completely customised or simplified for individual users and saved for future use.

PGI OPTICS PRO

In so many ways, it's a first
The new industry standard

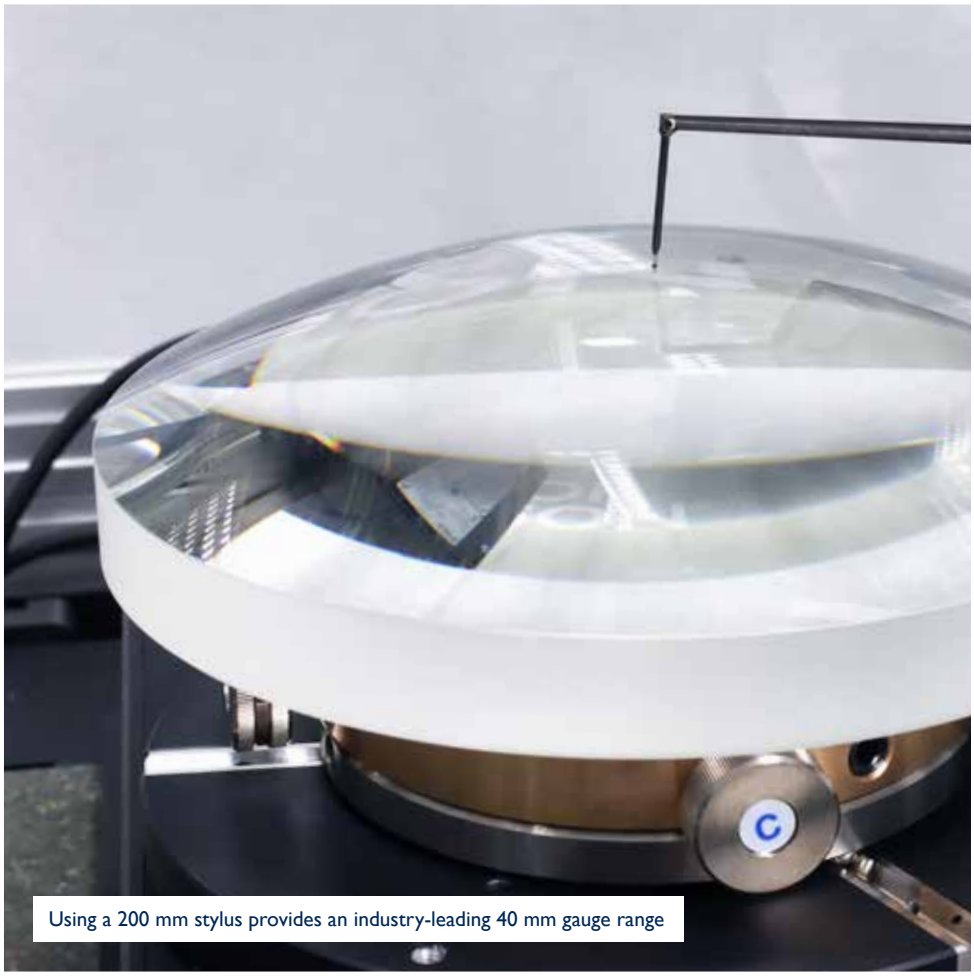
World-leading range with new PGI gauge

The Form Talysurf® PGI OPTICS PRO delivers 20 mm gauge range with a standard 100 mm stylus.

The new PGI gauge has been designed to provide the user with greater measurement flexibility. Small, medium and large spherical, aspherical and diffractive surfaces can be measured on a single system.

Using a 200 mm stylus provides an industry-leading 40 mm gauge range with high resolution and accuracy for optical surfaces with large sag.

When you purchase from Taylor Hobson, you are investing in the most accurate, stable and repeatable measurement system on the market.



Using a 200 mm stylus provides an industry-leading 40 mm gauge range

World-leading gauge resolution

Large range coupled with a high resolution gives flexibility in measuring large sag optics while also ensuring small surface details are not lost.

Gauge protection system

Protect your investment from accidental damage and reduce down time by utilising the built-in rapid collision detection system.

The system stops movement in any direction under automatic or manual mode to prevent collision.

Center thickness analysis with dual bias gauge

The optional dual bias PGI gauge combined with the new high precision column delivers unparalleled center thickness measurements to micrometer accuracy.

Verification of system measurement accuracy

Taylor Hobson is the only company that can prove radius accuracy and form capability over the **full** gauge range. This is to certify the integrity and reproducibility of the results the system produces.

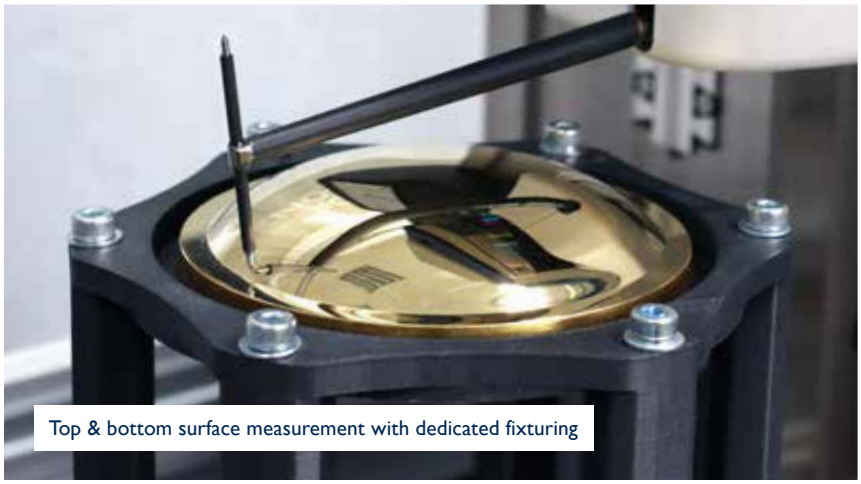
Complete trust in your measurements and results

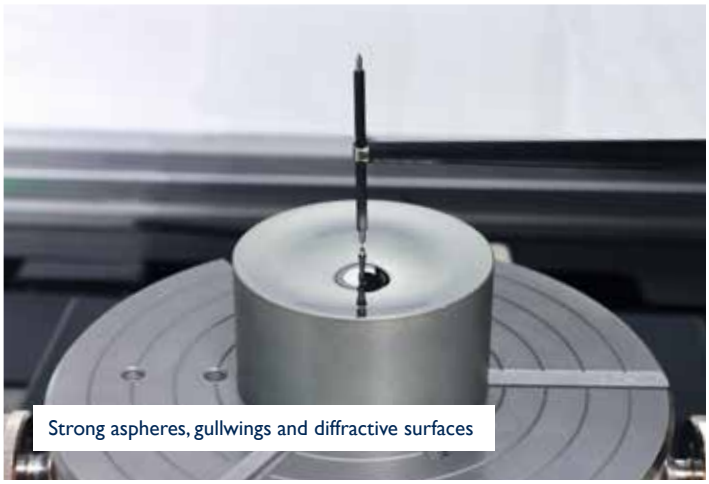
Fundamental to any metrology system is the integrity and reproducibility of the results it delivers.

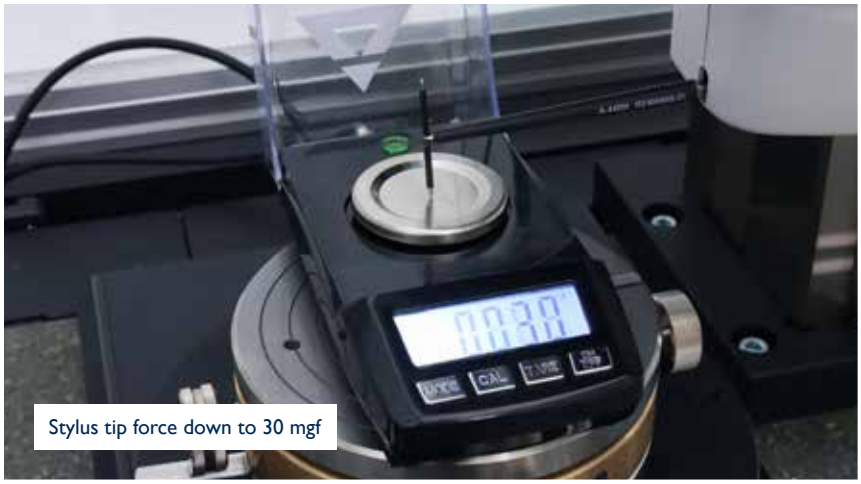
The foundation of accurate measurements is the system's noise floor capability. Taylor Hobson take great pride in boasting the worlds best noise floor.

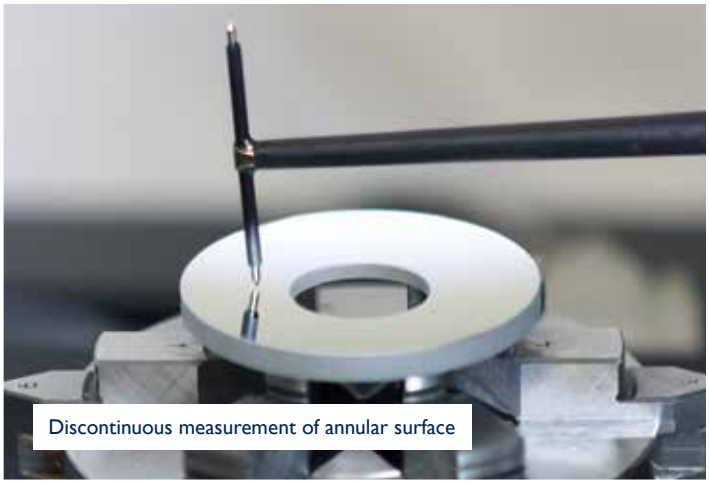
Our product design is underpinned by decades of measurement experience, ultra-precision manufacturing. These attributes provide low noise and near flawless mechanical execution of the measuring axes.

Traverse Unit	Resolution	Bias	Software
Traverse range, up to **300 mm**	Gauge resolution **0.2 nm**	Bias options **Dual or single**	Powered by **Metrology 4.0**


Top & bottom surface measurement with dedicated fixturing


Strong aspheres, gullwings and diffractive surfaces


Stylus tip force down to 30 mgf


Discontinuous measurement of annular surface

Adjustable force control

Stylus tip force can be adjusted from 30 mgf (~0.3 mN) to 220 mgf (~22 mN) within Metrology 4.0 software, even for 200 mm length styli with 40 mm gauge range*. Low stylus tip force is combined with a selection of tip materials and geometries to deliver best performance on soft and coated surfaces. Low stylus tip force also reduces ringing effect, bringing total confidence in stylus calibration and part measurement with standard 2 µm diamond tips as well as ruby and silicon nitride ball tips.

Automatic lift-lower

The precise lift-lower function minimizes gauge movement and reduces the measurement time while also providing safe and automatic clearance from part. Coupled with closed loop feedback, the lift-lower excels in discontinuous/ interrupted surfaces such as annular optical parts.

Dual bias gauge capability

The new PGI OPTICS PRO gauge comes with optional dual bias capability, granting the stylus the option to work upwards with exactly same accuracy, resolution and noise levels.

Both surfaces of the lens under inspection can be setup by inputting design, measurement and analysis parameters just like single surface measurements.

Measurement parameters and analysis options are all available for the second surface, and can be selected independently for either surface.

Analysis for both surfaces can be completed with a single click. Analyses include aspheric, aspheric-diffractive, astigmatism, in addition to interrelated parameters such as center thickness.

* Special styli

PGI OPTICS PRO

Measurement of freeform optics
Dedicated platform module

Fully automated, fast and accurate freeform optics measurement

Freeform module provides 3D raster measurement and analysis of freeform optics.

Reduced cycle time with fully automated measurement routines and analysis of freeform surfaces. Freeform module can work with standard equations for common surfaces such as:

- Toric
- Bi-conic
- Ellipsoid
- A-Cylinder
- Anamorphic asphere

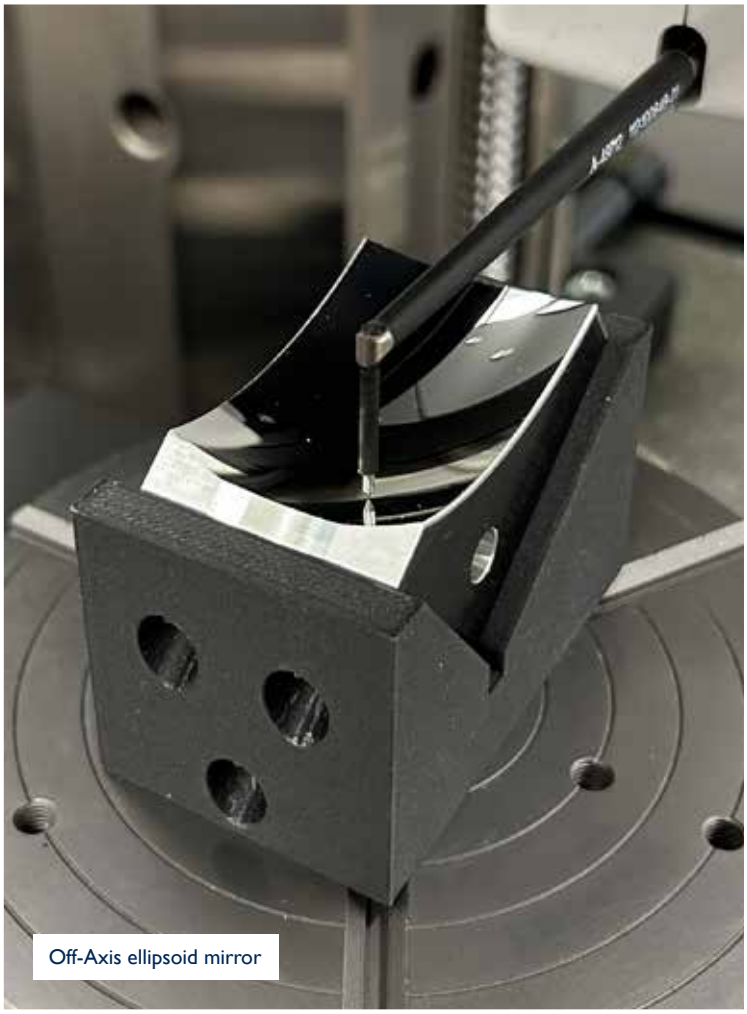
Complex surfaces can be imported as:

- Point clouds
- CAD files

Surfaces without any description can be measured by defining boundaries and processed for later manual analysis.

High flexibility and accuracy

- Gauge range up to 40 mm*
- Slope angle up to 50°
- Lateral angle up to 35°



Off-Axis ellipsoid mirror

Results you can trust

Measurement integrity and reproducibility

Taylor Hobson's Form Talysurf® PGI Optics PRO 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.

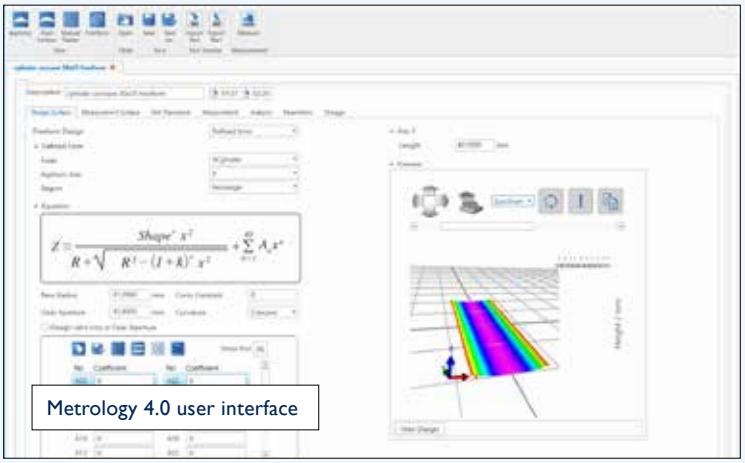
With the new Metrology 4.0 software, accurate freeform measurements are easy to set-up and analyze. The versatility of the Form Talysurf® PGI Optics PRO with Freeform Module makes it the complete optics metrology solution.

Full 3D measurements

Accurate surface analysis

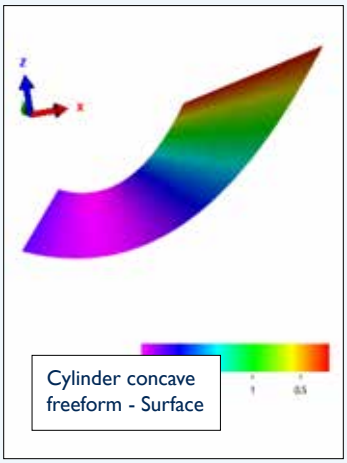
- Measurement & analysis on single platform
- Easy to define measurement set-up
- 3D point cloud for raw and error surfaces
- Dedicated freeform analysis module allows raw surface comparison to design
- Residual surface shows form error
- Output residual surface for correction to manufacturing process

* Using 20 mm gauge and 200 mm stylus

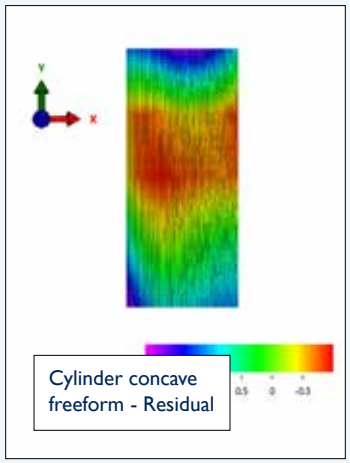


Metrology 4.0 user interface

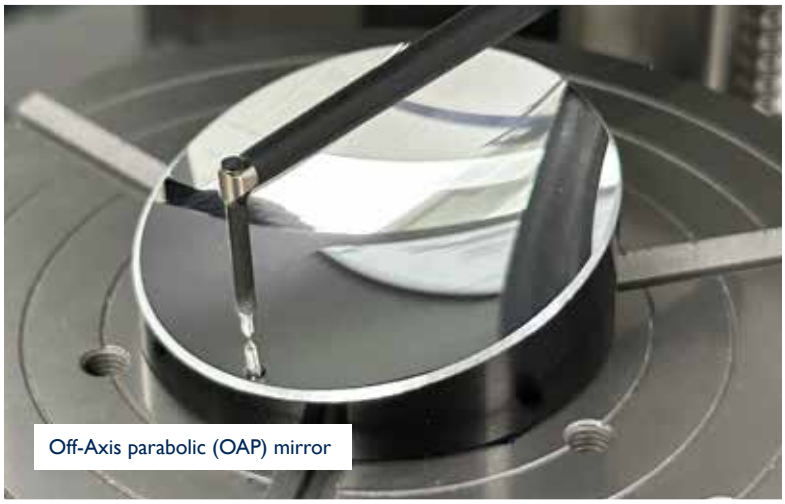
A-Cylindric lens



Cylinder concave freeform - Surface



Cylinder concave freeform - Residual



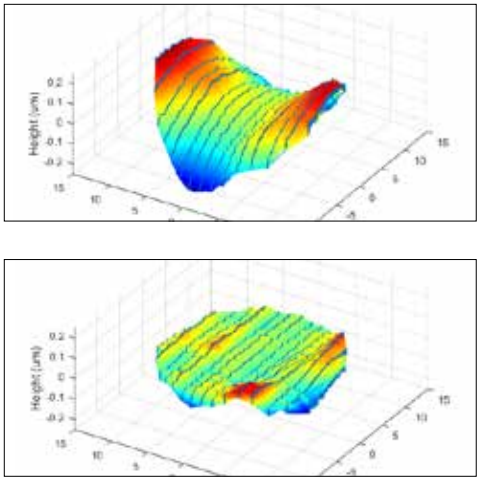
Off-Axis parabolic (OAP) mirror

3D calibration capability

Delivering unparalleled measurement accuracy

3D Calibration routine - Accurate 3D measurements to optical levels of accuracy cannot be achieved by simply adding a Y-stage.

- Unique, new true 3D calibration
- Corrects for alignment errors beyond those mechanically possible
  - Datum correction
  - Gain correction
  - Twist correction
- Critical for accurate 3D measurements
- Typical form errors: ~350 nm with 3D calibration



Form error before (top) and after (bottom)
Taylor Hobson's 3D calibration routine

Metrology 4.0®
SMART SOFTWARE

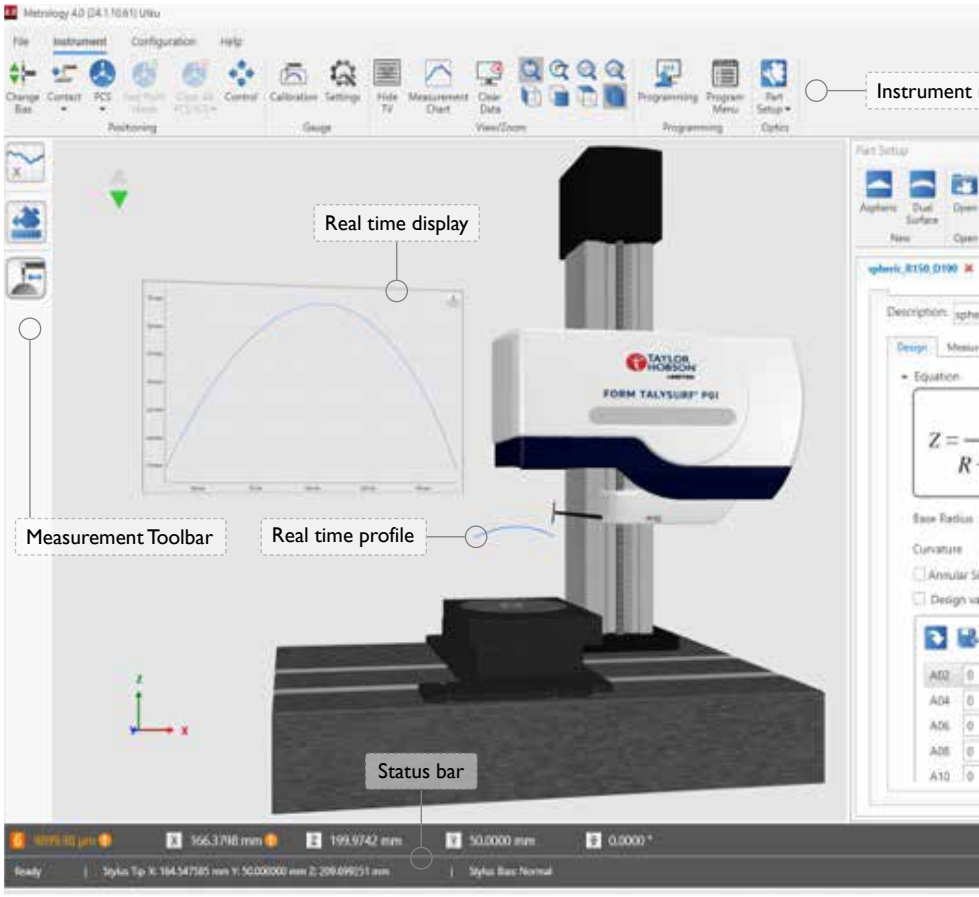
In so many ways, it's a first
Optics metrology, made simple

Designed with the operator in mind

Powerful, intuitive and easy-to-use.

The user interface provides at a glance monitoring of the measurement process.

Real time simulation and true part co-ordinates enable monitoring and control to a level unprecedented in the industry.



Real time display

The TV view allows the user to track the measurement in real time through the on-screen profile.

This is most beneficial if any dirt, marks or obscurities are seen, as the measurement can be stopped at any point, without any loss of data.

Part setup

Easy setup of spheric, aspheric, diffractive and fresnel optics for full, annular and dual surfaces.

This helps recording part design, measurement parameters and analysis type so the process is repeatable in time and among different users or instruments.

Media messages

Include text, images and videos as operator prompts during programs.

Customisation

Separate windows like control, part setup, measurement chart, etc are dockable and hidable.

Every user can create and save multiple customized screen layouts and recall them later.

Language

Support for 16 languages: English, Chinese (simplified & traditional), German, Korean, Japanese, French, Italian, Turkish, Romanian, Spanish, Portuguese, Russian, Polish, Czech and Swedish.

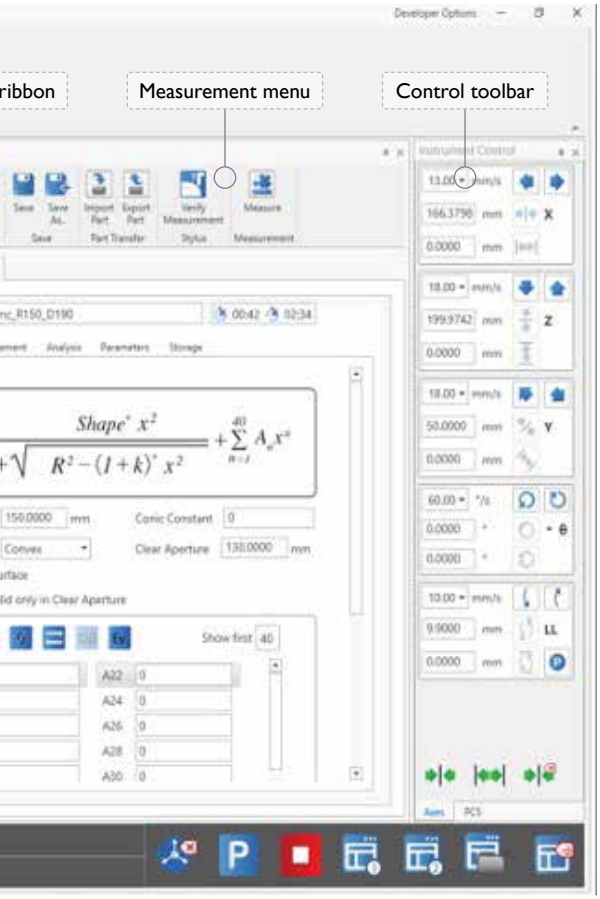
Calibration

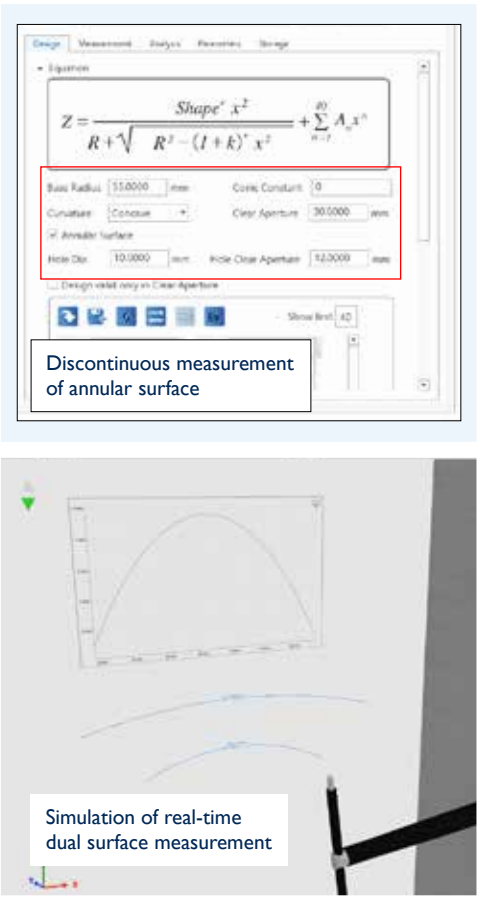
One hit patented calibration routines provide accurate and precise measurements in both single and dual bias mode.

These routines are fast and do not require operator intervention ensuring maximum performance.

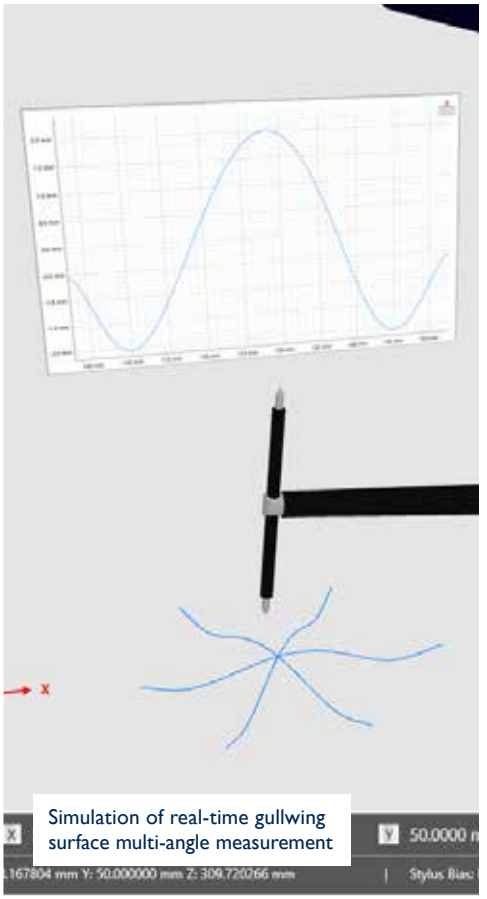
User levels

Tailor your instrument to suit the operator, from basic production mode to advanced administration use with password protected modes.




Discontinuous measurement of annular surface

Simulation of real-time dual surface measurement


Simulation of real-time gullwing surface multi-angle measurement

Programming

Measurement and analysis of asymmetric shapes like D-cut parts can be standardized by recording or programming a series of actions.

A range of different modes that offer basic elements such as recordable part programming and an advanced toolbox of programmable features including variables.

Part measure

One click part measurement for repeated measurements. Choose between options for auto-cresting and auto-analysis for speeding up the process. Select options for reporting on single/multiple files or applying templates.

Icon-driven interface

Metrology 4.0 enables simulation of the measurement process with 'at-a-glance' status, on-screen indicators, real-time feedback and remote system control.

A range of different measurement modes are available via intuitive icons on the measurement tool bar. Tool tips give a detailed overview of the measurement.

Metrology 4.0 measurement types:

Aspheres, Asphero-Diffractives, Fresnels, Annular surfaces, Dual surfaces, Multi-angle measurements and Unknown surfaces.

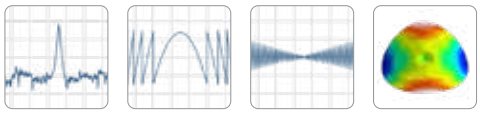
Metrology 4.0®
SMART SOFTWARE

In so many ways, it's a first
Optics metrology, made simple

Analysis dedicated to optical surfaces

One software platform does all.

Metrology 4.0 includes desktop publishing, surface form, 3D astigmatism, derived coefficients, error compensation and surface roughness.



Surface form

Basic tool for form removal of spheric, aspheric, diffractive and fresnel surfaces to analyze for form error.

Save time and increase productivity with automated features.

3D astigmatism

Use multiple radial traces to create 3D analysis of optical surfaces to better investigate non-symmetric errors like astigmatism and trifoil.

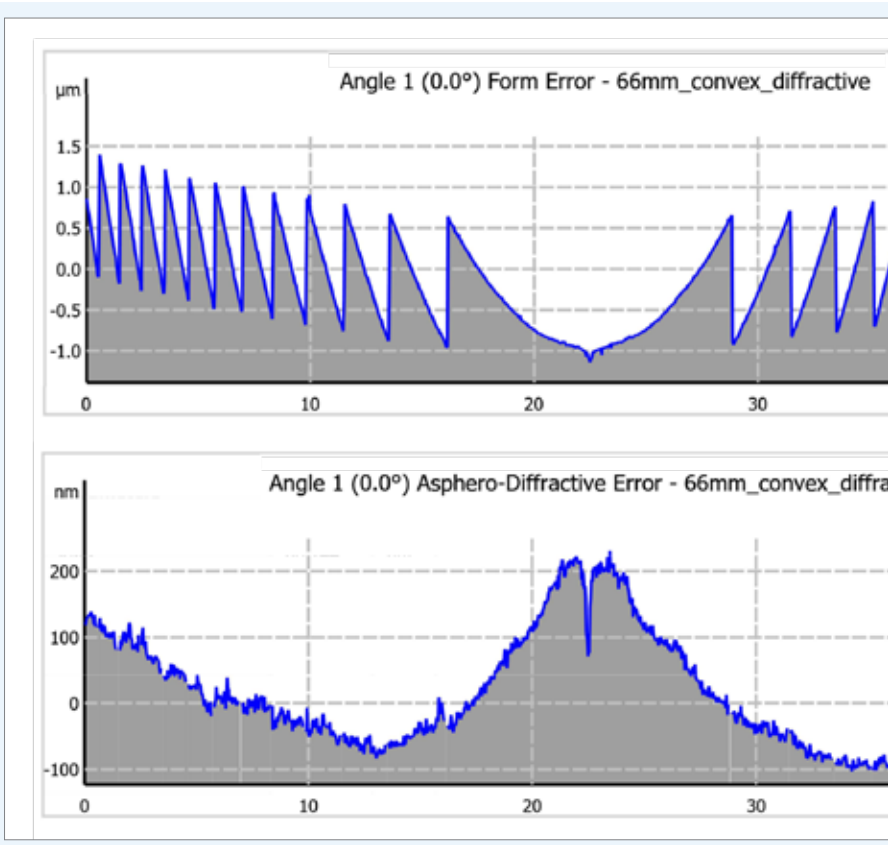
Derived coefficients

Reverse engineer unknown aspheric and diffractive surfaces for best fit to derive aspheric and diffractive coefficients.

Error compensation

Analyze for X-offset, radius deviation and form error of tool at setup stage of diamond turning machine.

All corrections to be done in single step to save machine time and tool life.



Critical analysis types

Surface form
- Spheric
- Aspheric
- Asphero-Diffractive
- Fresnel

Surface roughness
- Low noise floor capability
- Ground surfaces
- Finished InfraRed surfaces

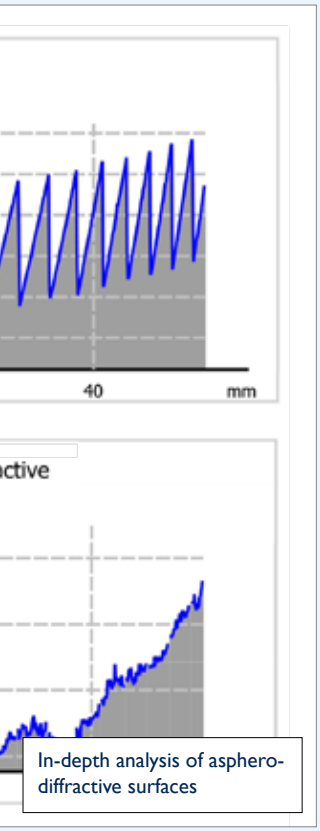
Derived coefficients
- Spheric
- Aspheric
- Asphero-Diffractive

Error compensation
- Tool X-offset
- Tool radius compensation
- Form error correction for tool tip waviness

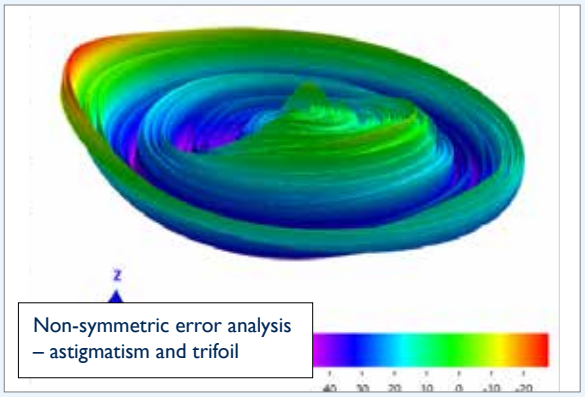
Dual surface
- Form error
- Center thicknes

3D astigmatism
- Spheric
- Aspheric

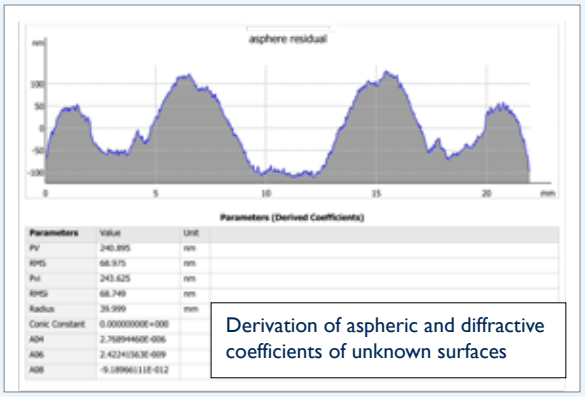
Exclusions
- Form fit/scale
- Raw/residual profile



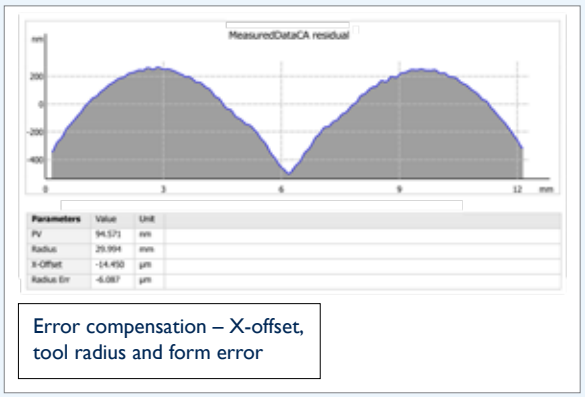
In-depth analysis of asphero-diffractive surfaces



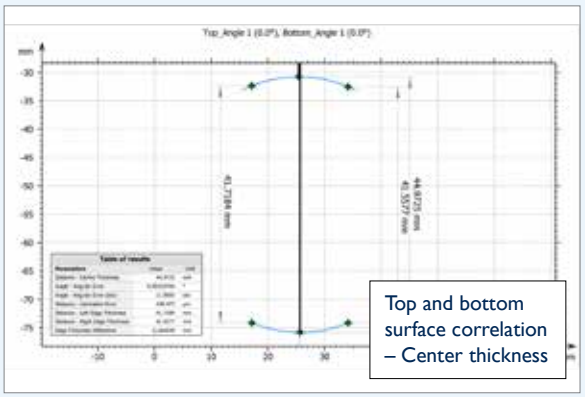
Non-symmetric error analysis – astigmatism and trifoil



Derivation of aspheric and diffractive coefficients of unknown surfaces



Error compensation – X-offset, tool radius and form error



Top and bottom surface correlation – Center thickness

Desktop publishing

The software allows users to create templates and use them in the analysis process, which vastly simplifies the measurement process.

The desktop publishing features are powerful and simple to use allowing customisation of result layouts and ensuring a more professional and personalised look to your brand.

Benefits

- Generate interactive reports.
- Compose multi-page documents.
- Multiple documents can be displayed on screen, which enables visual comparison of multiple results at once.
- Build a professional report in a matter of minutes.

Customised analysis

Our strategy for success is simple, instead of just selling products, we provide solutions. If our standard software analysis packages do not satisfy your needs, we can customise a solution to match your requirement as an advanced module.

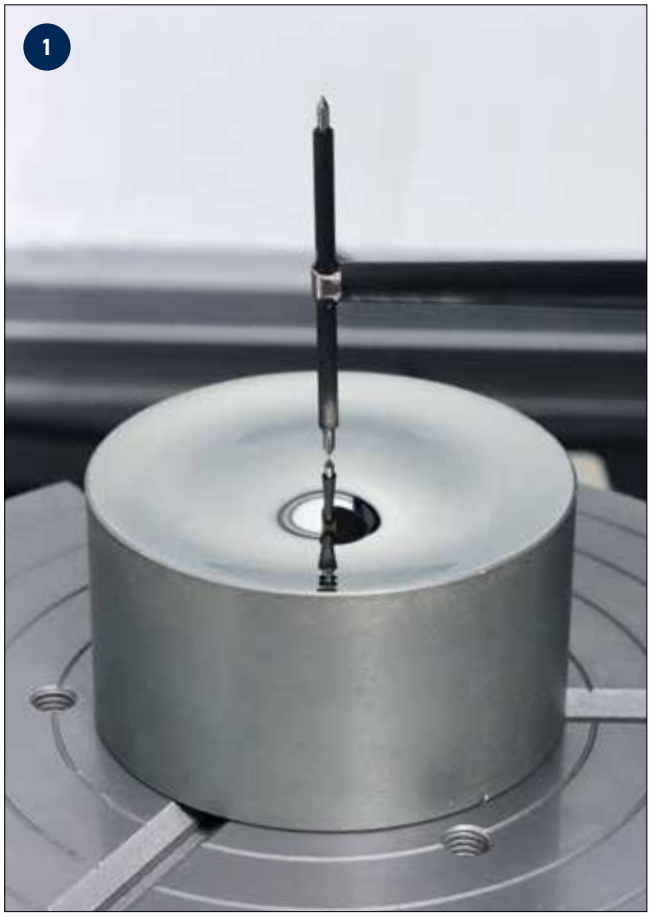
Alternatively Metrology 4.0 has built-in access to execute MATLAB™ files. This enables the user to writing their own scripts and execute them by loading an 'm' file.

Design and program your own...

- Custom filters.
- Custom analyses.
- Custom parameters.

MATLAB™ software purchased separately from external source.

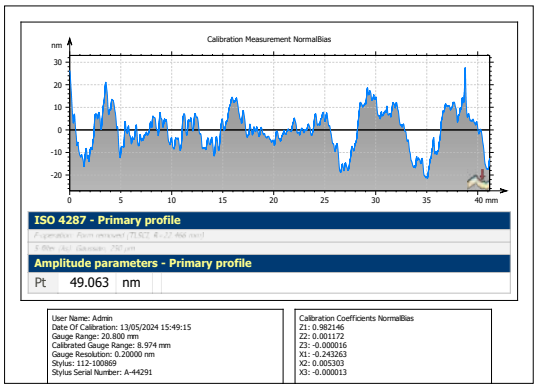
FEATURES



1 High accuracy

Typical gauge calibration result ~70-80 nm PV

Using 100 mm length conisphere diamond tip stylus on 80 mm radius artifact over 100 mm length and 18 mm gauge range.

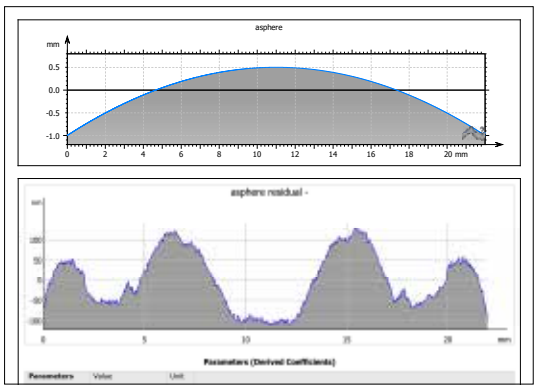


2 High flexibility

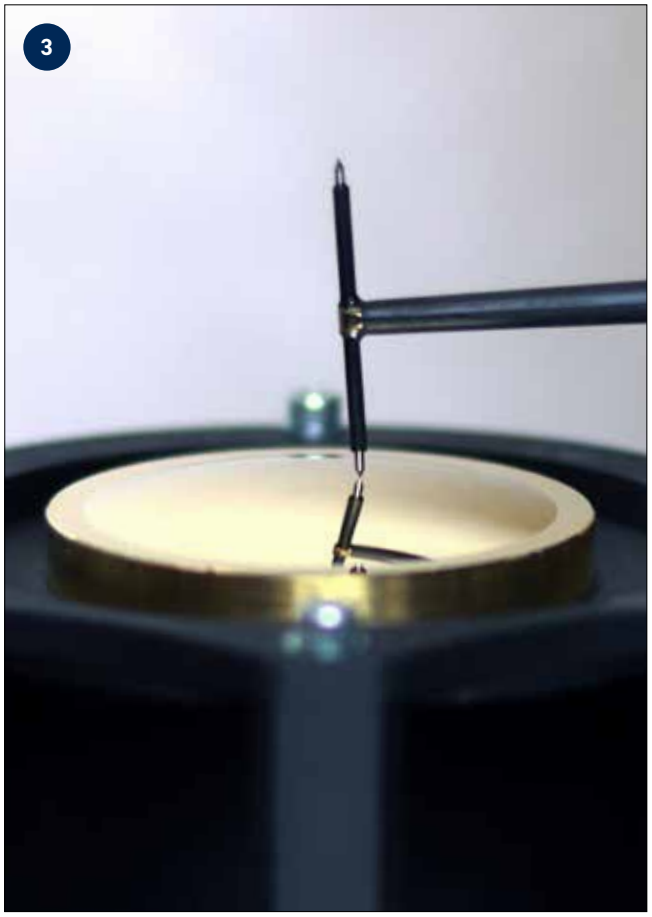
Measure any surface within measurement volume

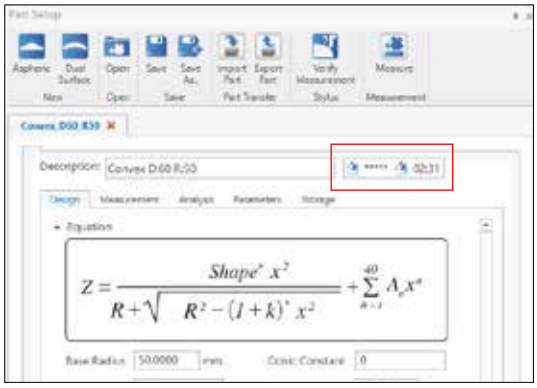
High aspheric departure, diffractive.

- 300 mm diameter *
- 40 mm sagittal height
- 55° slope angle **



* Subject to configuration. ** Subject to shape.

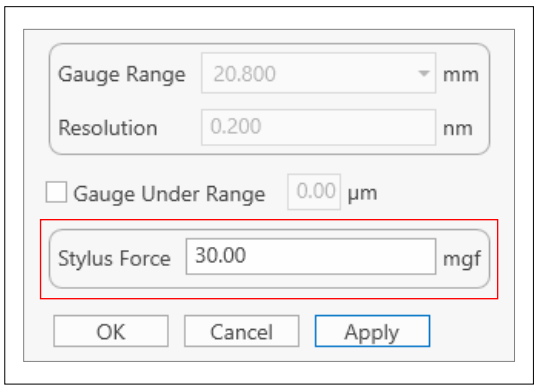




3 Short process times

Complete measurement in 3 minutes, including cresting and analysis

- 60 mm diameter part
- Convex / concave
- Spheric / aspheric / diffractive
- Single trace

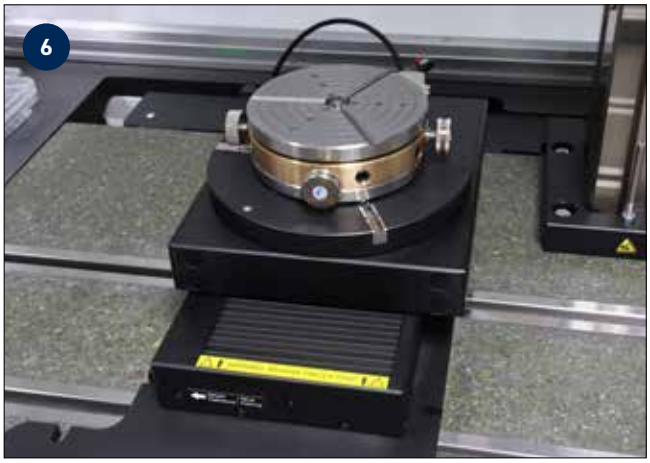


4 Soft surfaces

Stylus force down to 30 mgf for outstanding performance on soft surfaces

Selection of tip materials and geometries for best results for different applications.

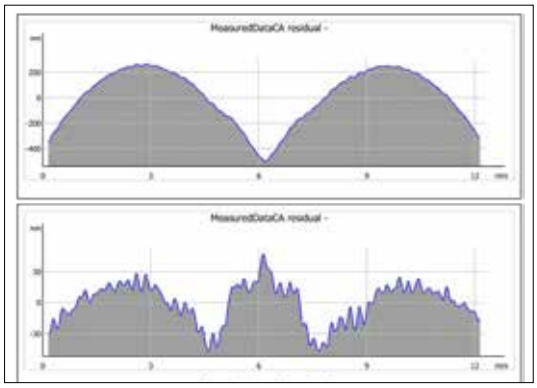
APPLICATIONS



5 Unique solution for rapid diamond tool setup

X-offset, radius compensation and form error can be corrected from a single analysis

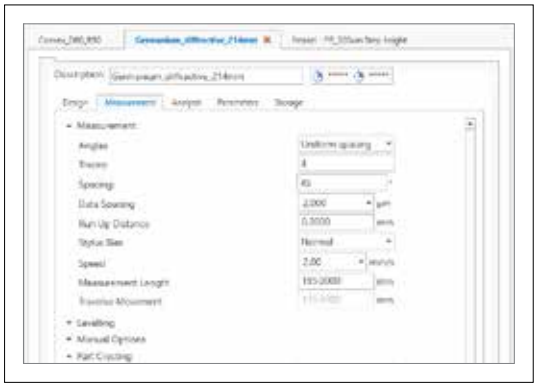
- Significantly reduce SPDT setup time
- Improve throughput with time saving



6 Fully automated routines

Semi or full automation with simple part setup including annular and dual surfaces

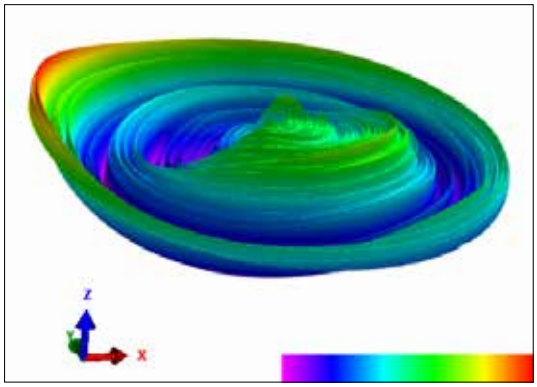
- Part cresting: Fully automated with motorized Y-stage
- Multi-angle measurements for astigmatism analysis: Fully automated with motorized Rotary-stage

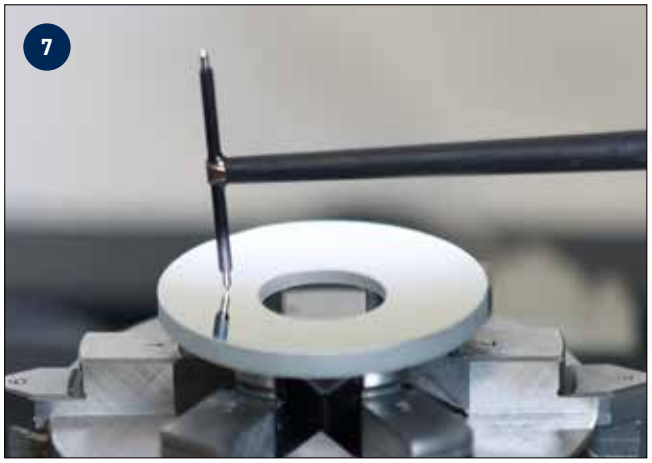


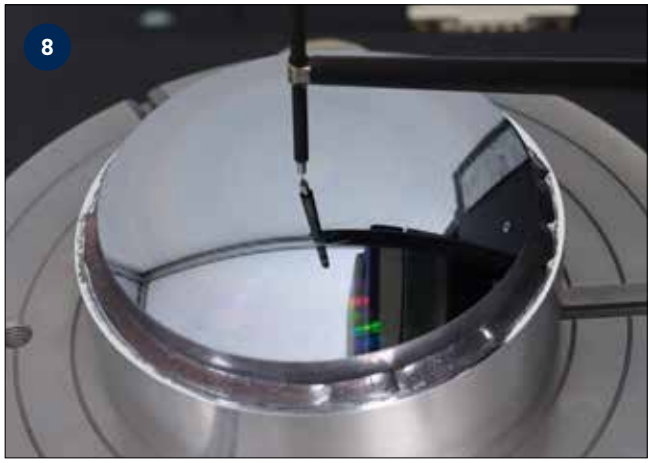
7 3D astigmatic analysis

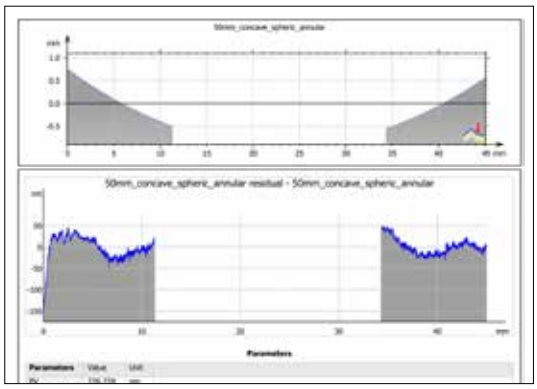
Easy to program and use routines to determine if non-symmetric errors are present in parts

- Astigmatism and trifoil
- Output average profile for toolpath correction
- 3D residual surface generation for advanced corrections





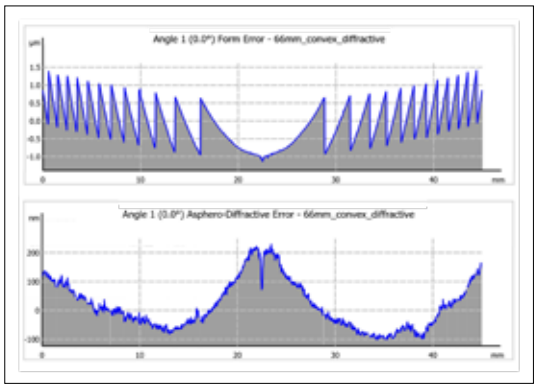




8 Annular surfaces

Easily define and measure parts with a hole in the center

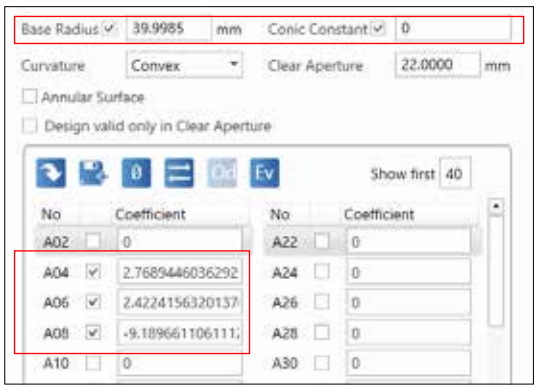
- Automated cresting and hole position identification
- No need for a filling part



9 In depth asphero-diffractive analysis

Easily analyse complex diffractives beyond 500 zones

- Identify zone diameters with direct comparison to design
- Output diffractive form error for toolpath correction



10 Reverse engineering – Derived coefficients

Single click for deriving aspheric and diffractive coefficients from raw profile

- Easy selection/deselection of parameters with lowest deviation to achieve best fit

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