TAYLOR HOBSON®
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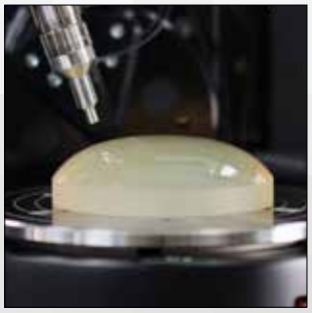
LUPHOSCAN 75 HD

The world's fastest and most accurate automated system, for non-contact 3D small lens metrology



LUPHOSCAN 75 HD

Ultra fast, automatic, 3D form measurement

Align, measure, analyse in <120 seconds

Based on the industry standard LUPHOScan platform

Introducing, the New LUPHOScan 75 HD, delivering faster complete measurement cycle times and full automation for advanced non-contact 3D measurements.

The LUPHOScan 75 HD brings laboratory level accuracy to high volume production. Consistently accurate results are achieved with a single click, enabling operators of any level to deliver fast detailed analysis.

LUPHOScan 75 HD

Unique benefits for both design and production

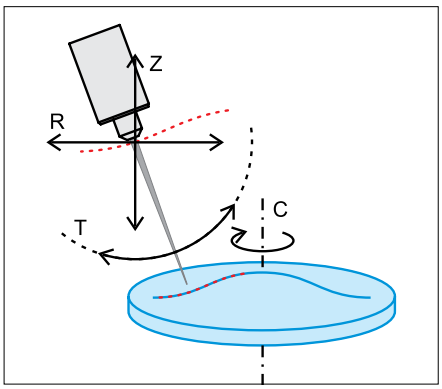
- **Automatically align optics**
  In as little as 45 seconds*
- **Faster measurement cycles with the Focal Point Pivot (FPP) technology**
  Up to 65% reduction in time*
- **Ultra high, repeatable accuracy**
  ≤ 30 nm PV (3σ)
- **Best available stability**
  Power variation < ± 15 nm (3σ)
  PV variation < ± 1.5 nm (3σ)
- **Analyse geometric features**
  Interlocks and edge diameters in relation to each other or the optical surface

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.

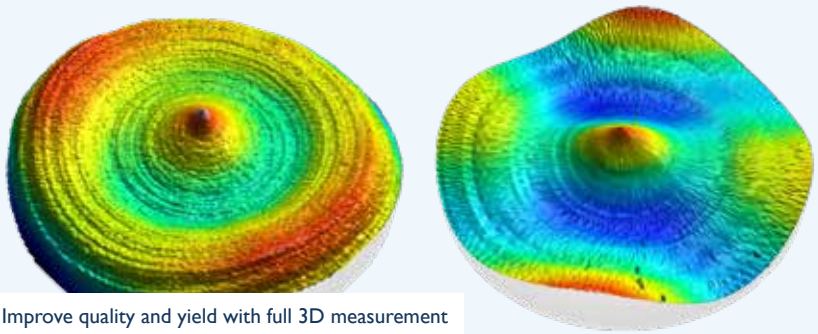


Movement of the LUPHOScan object sensor

* Data resolution, tooling and part geometry dependant.

> Achieving ultra-precise full 3D measurements on complex optics has never been easier!

Small lens metrology



Improve quality and yield with full 3D measurement results showing true form errors

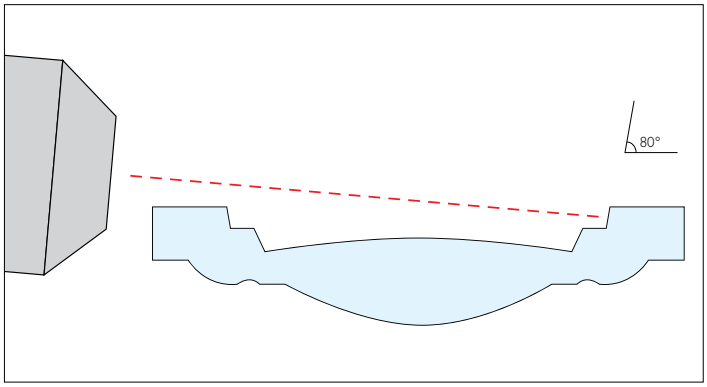
Automation and Focal Point Pivot (FPP) technology for high volume production

Optimised LUPHOScan probe

The new probe technology used on the LUPHOScan 75 HD adds additional benefits including an increased working distance of 7.5 mm.

This enables complex geometric features on lens moulds and moulded lenses to be measured, such as:

- Access to measure interlocks without collision between the probe and substrate.
- Increased access to steep concave optical surfaces



Improve measurements of interlocks without collision

All measurements displayed in the the brochure are examples of what can be achieved. Refer to the specification page for Instrument Performance specification

Automation

Consistently accurate results

Automated centre and level

The New LUPHOScan 75 HD provides complete instrument automation with the introduction of the fully automatic centring and levelling table.

- 'Single Click' align, measure and analyse
- Increase throughput with shorter setup time.
- Remove operator skill dependence
- Measurement consistency through automatic reproducible centring and levelling

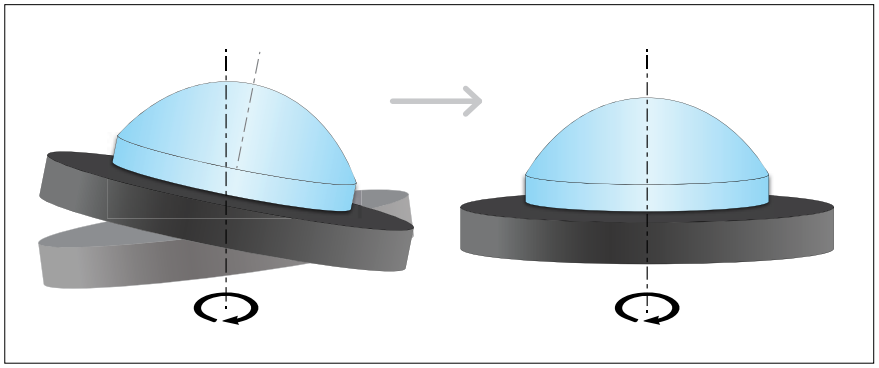
Accurate alignment for the measurement of small lenses

The curvature of an aspheric lens surface varies across the surface.

For small lenses precise alignment is critical to accurately measure and characterise their surface shape. Even slight misalignment during measurement can lead to errors in determining the asphericity.

As spheres have no axis accurate centring only is required for precise measurements. Flats, however, require precise levelling.

The automatic centre and levelling table is designed for all optics alignments necessary for the highest accuracy measurements.



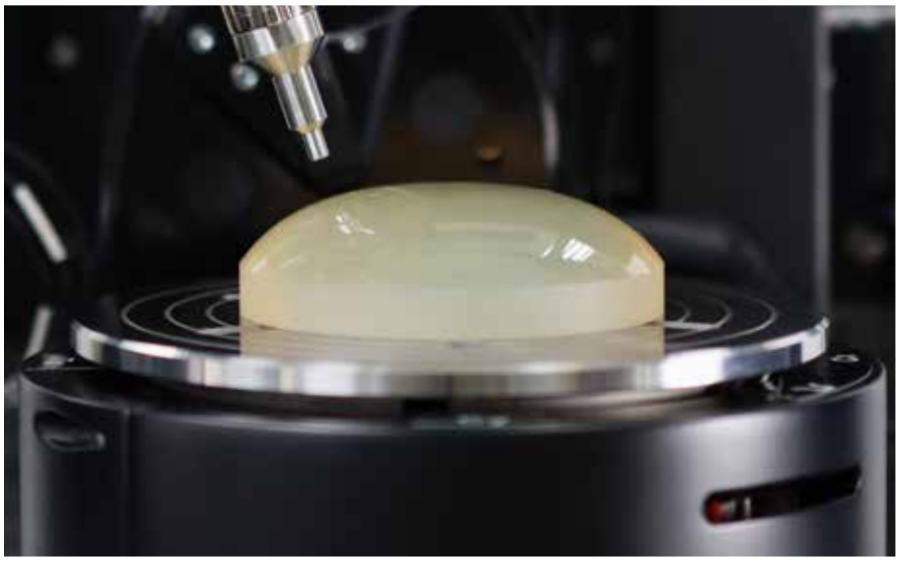
Alignment of aspheric lens to rotation axis

Accuracy through automation

The LUPHOScan 75 HD delivers automatic alignment of the optical axis of an asphere and the rotary axis of the instrument.

This is critical in ensuring accurate measurements on steep parts, and ensures that the measurement is in line with the optical axis of the part.

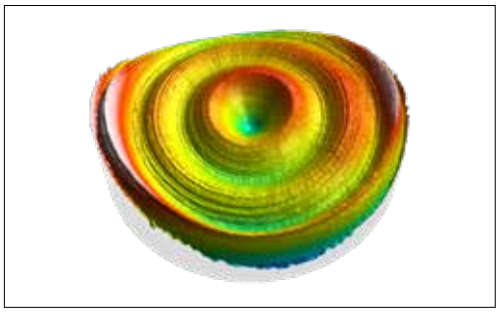
> Automatically align aspheres in as little as 45 seconds*



Quick and easy part set-up

With a single-click the automatic centre and levelling table provides:

- Evaluate the component for de-centre and level
- Align the component to < 5''
- Centre the component down to 1 µm eccentricity



Prepare for the future

The LUPHOScan 75 HD is future proofed for full automation integration.

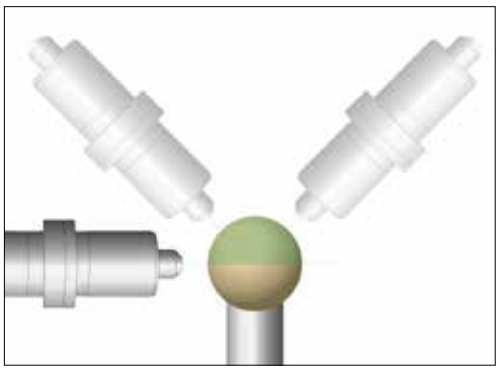
- Scripting function for easy interfacing
- OP-UA compatibility
- Optimise processes to improve your efficiency and reduce costs!

Smart features, perfect results

LUPHOScan platforms offer many features to ease the operation and guarantee best results, including semi- or fully-automated alignment with live sensor feedback, or edge detection.

In addition, over-centre measurement scans compensate for remaining alignment errors, as well as sophisticated online-calibrations.

After the measurement, during post-processing, clever algorithms enable flexible best-fit, analysis, and correlation studies – tailored to your needs.



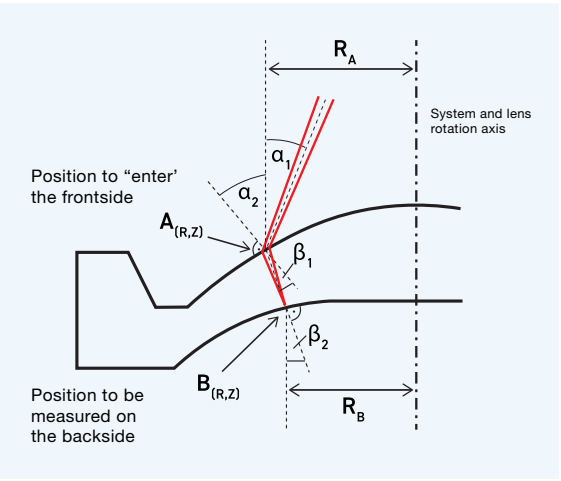
Movement of the LUPHOScan object sensor

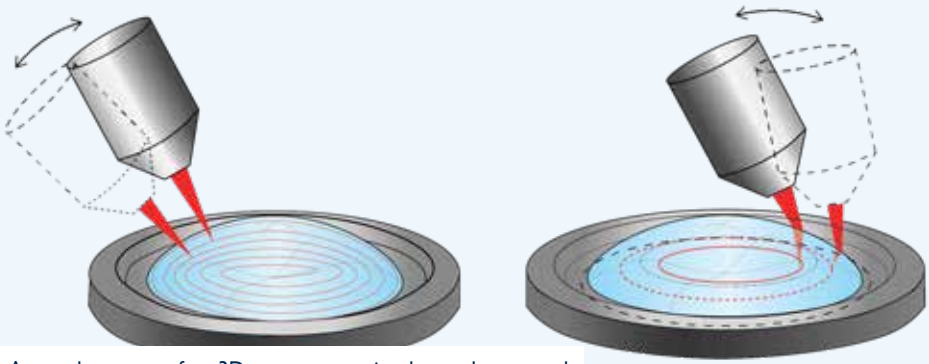
*Tooling and part geometry dependent.

Technology

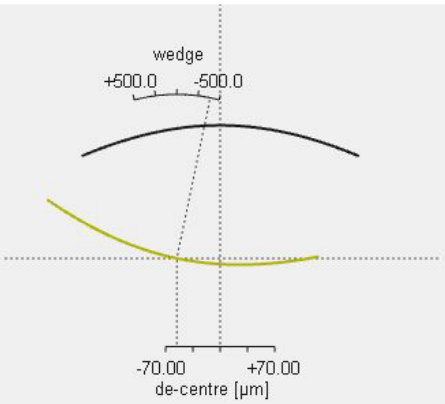
Inner centration and wedge

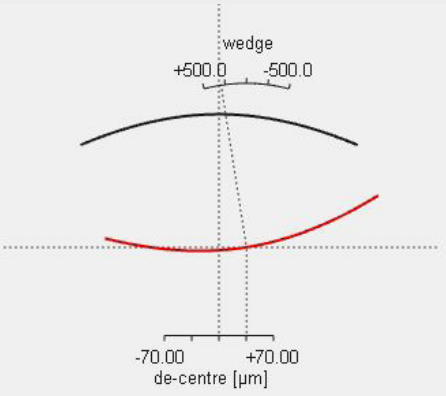
‘Through the Lens’ measurement





A complete top surface 3D measurement is taken and compared to several concentric measurements of the rear face





Visual representation allows for an intuitive evaluation of wedge and inner centration

Determining decentre and wedge of an asphere

Ray-tracing is used to adjust the sensor perpendicular and in focus on the back surface.

Refractive index, local thickness and surface slope are used to calculate the correct position. For optimised acquisition of inner centration and wedge, form errors of the front surface are taken into account automatically.

Measurement procedure

- Standard spiral scan of front side for form error measurement
- Several circular scans through the lens

Key features

- Inner centration (de-centre between front and back surface) and wedge error (tilt between front and back surface)
- Accuracy of wedge error < 5” and de-centre < 3 µm*
- Short acquisition time of < 15 seconds
- Measure in one go in the same setup: Surface form error, inner centration, and wedge
- Lenses up to a thickness of 3 mm can be measured (dependant on material and surface geometry)**
- Can be combined with acquisition of mechanical references like flanges or outer diameter, or any other software module

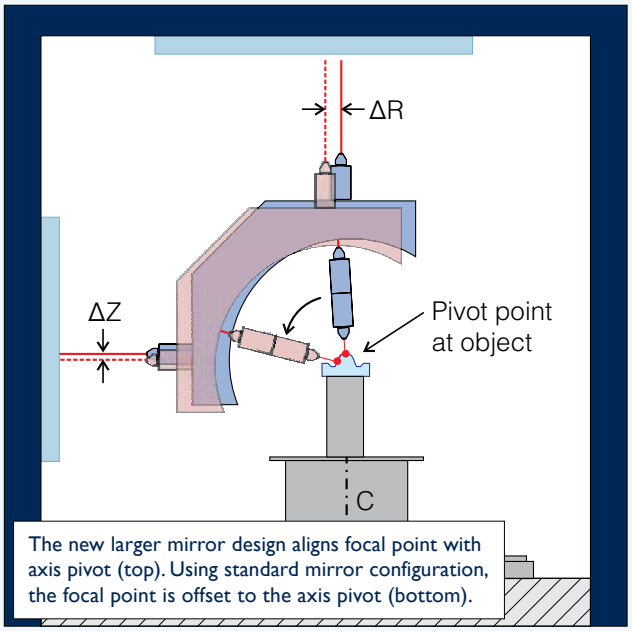
* Depends on asphericity.

** With long-coherent multi-wavelength interferometry this can be increased to approx. 10 mm for typical lens designs.

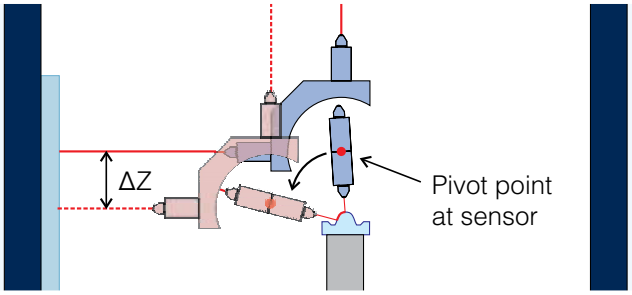
Increased speed with no loss in accuracy

Delivered through Focal Point Pivot (FPP) technology

Large radial mirror design helps reduce measurement cycle times



The new larger mirror design aligns focal point with axis pivot (top). Using standard mirror configuration, the focal point is offset to the axis pivot (bottom).



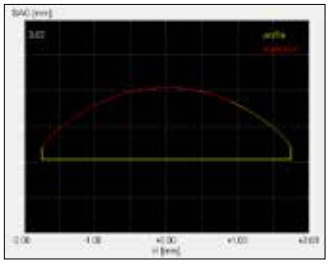
Significant reduction in measurement cycle time*** with no loss in accuracy

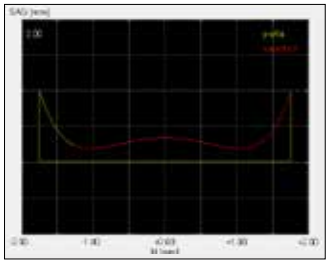
New mirror configuration with Focal Point Pivot (FPP) technology

- Probe Focal point is aligned with Pivot point
- Small ΔZ and ΔR large probe rotation
- Small ΔZ and ΔR → faster measurement

Standard mirror configuration

- Pivot point offset from the probe focal point
- Large ΔZ and ΔR for small probe rotation
- Large ΔZ and ΔR → longer measurement time





Instrument / Type	Optimised pitch			Manual pitch (0.01 x 0.1)		
	50 SL	75 HD	Time saving	50 SL	75 HD	Time saving
Convex Asphere	01:41	01:26	15%	01:16	00:31	59%
Gull wing	06:30	01:42	74%	02:12	00:36	73%

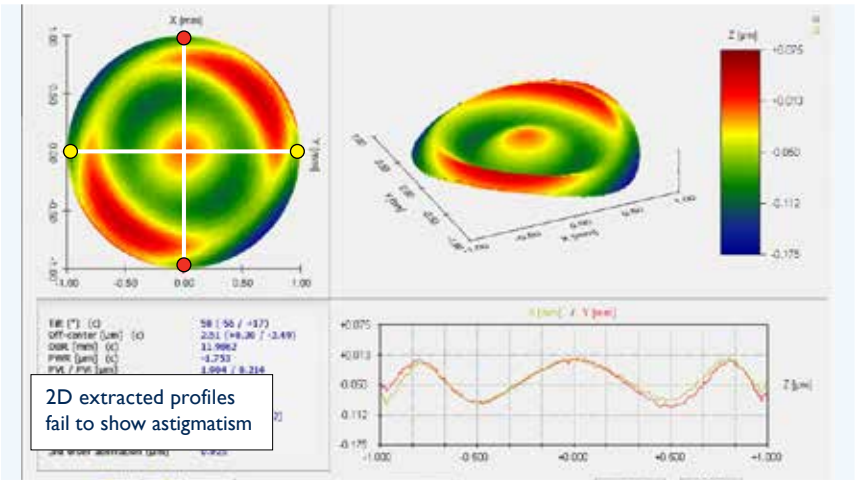
Example measurement time reduction****

*** Data resolution and part geometry dependant.
**** Actual cycles times may vary.

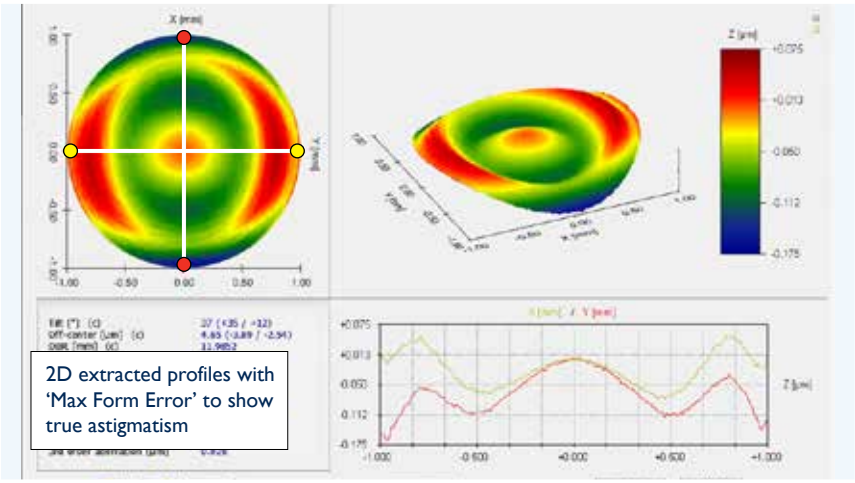
Lens form metrology

Increased manufacturing yield and quality

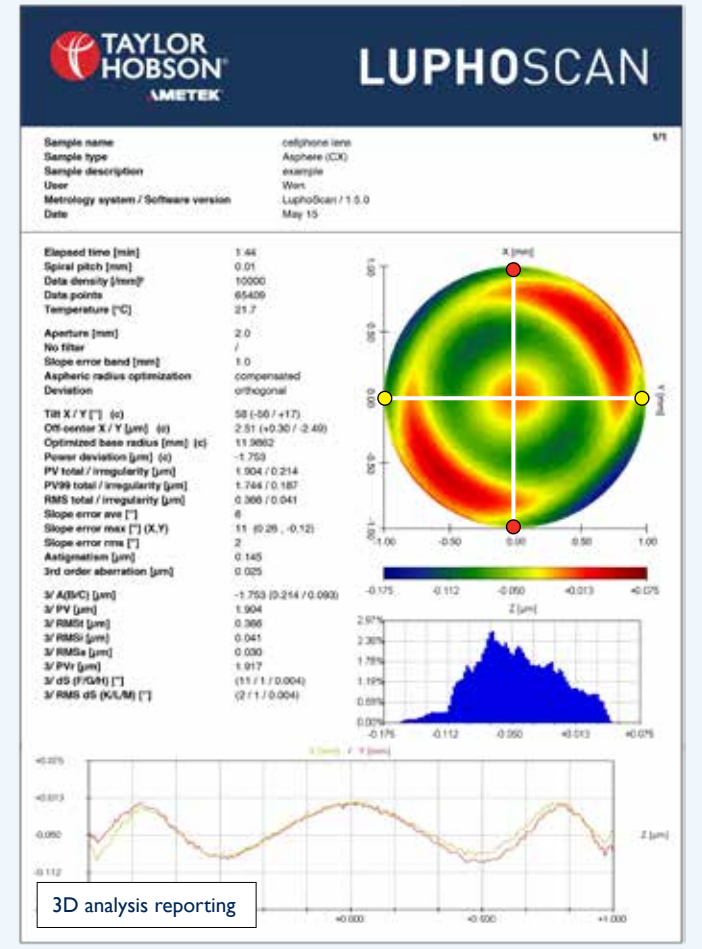
3D measurement & analysis in < 60 seconds



2D extracted profiles fail to show astigmatism



2D extracted profiles with 'Max Form Error' to show true astigmatism



3D analysis reporting

Fully automated analysis options for professional reporting

2D extracted profiles with 'Max Form Error' feature

Form error results can be automatically optimised to output the maximum form error present on a part.

Only true 3D measurements can provide this level of form error information.

The example illustrates that the same 3D form error can result in two completely different 2D form errors.

3D measurement of surfaces for in-depth reporting

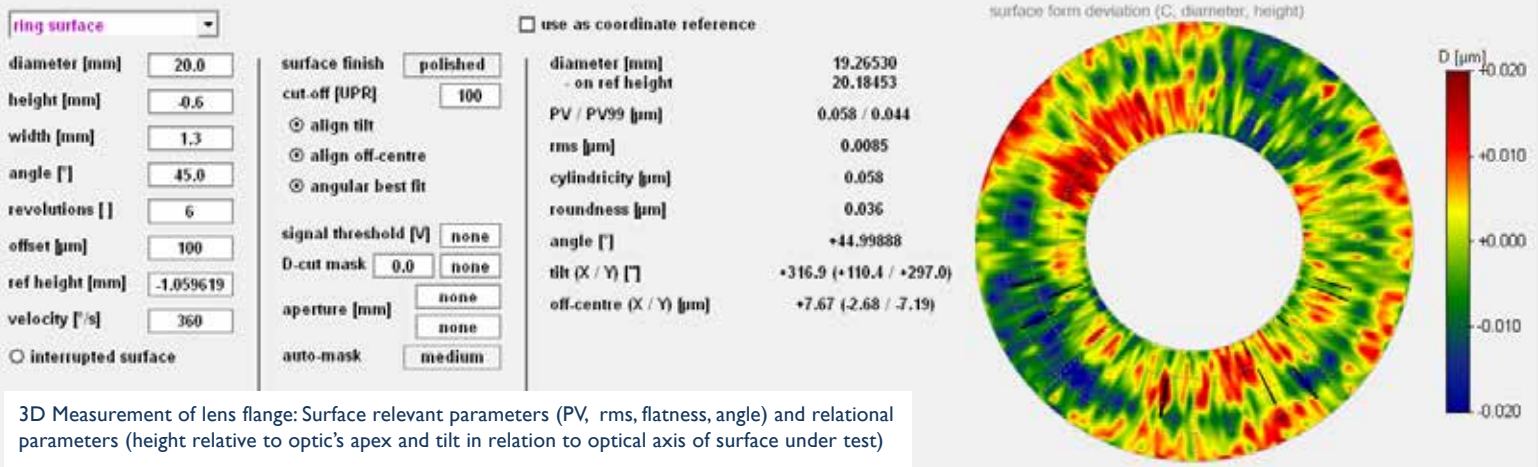
Measurement results can be output showing the complete surface form error with the 3D option, including extracted 2D profiles.

- ISO compliant analysis results (ISO 10110).
- Auto export results for quality control and traceability.
- Export 3D measured surface in common formats for process improvement.
- Set pass/fail criteria for easy process control.

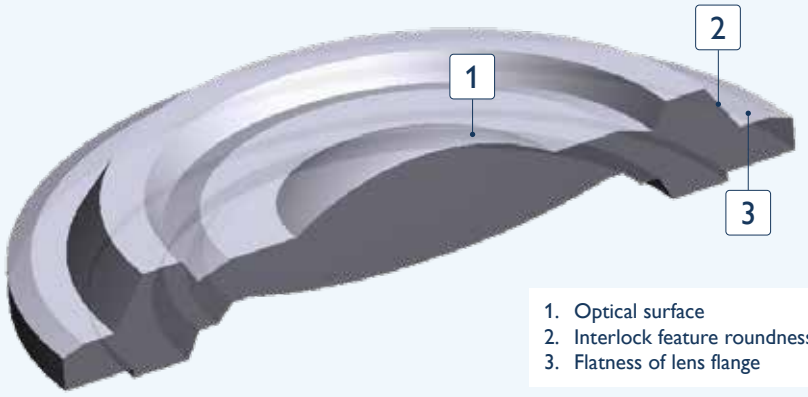
Advanced lens metrology

Complete characterisation of lenses and moulds

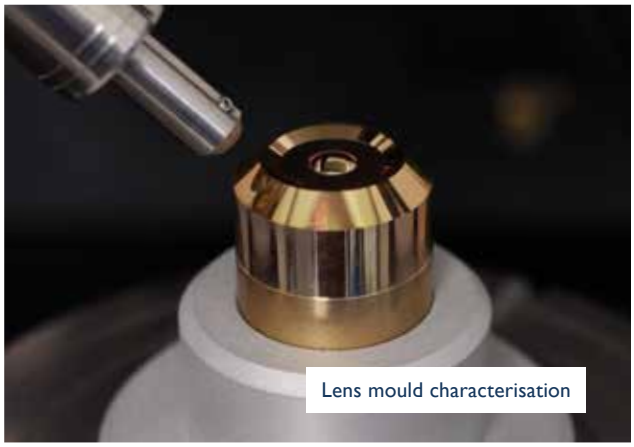
Measurement of relational datum parameters



3D Measurement of lens flange: Surface relevant parameters (PV, rms, flatness, angle) and relational parameters (height relative to optic's apex and tilt in relation to optical axis of surface under test)



1. Optical surface
2. Interlock feature roundness
3. Flatness of lens flange



Lens mould characterisation

The LUPHOScan 75 HD unites three metrology tools for moulded optics in a single device.

In addition to high accuracy form measurements, you can acquire the inner centration (and wedge error) of optical elements, as well as geometrical features like roundness, diameter, or squareness of moulding tools. All this helps to reduce cycle time and improve performance of the moulded optics at the same time.

Measurable parameters

- Roundness / Cylindricity
- Flatness and Angle
- Tilt (Off-centre between interlock and optical surface)
- Diameter / height of interlock relative to optical apex or shoulder

Key features

- 2D circular profiles (default option) or 3D spiral/helix scans (software module)
- Flexible interlock designs – outer diameter, flat flange, or conical (up to 90° convex and 85° concave*)
- Interrupted surfaces (exclude e.g. gate area from injection moulding)
- Polished and ground surfaces
- Measure in one go in the same setup: Surface form error and mechanical references
- Can be combined with all other software modules (e.g. Wedge & Decentre, Annular Lenses, …)

* Long-Working distance probe and part diameter < 6 mm.

Sales

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Tel: **+44 (0) 116 276 3771**

- **Design Engineering –** Special purpose and dedicated metrology systems for demanding applications.
- **Precision Manufacturing –** Contract machining services for high precision applications and industries.

Service

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Tel: **+44 (0) 116 246 2900**

- **Preventative Maintenance –** Protect your metrology investment with an AMECare support agreement.
- **Upgrades –** Carried out by Taylor Hobson accredited service engineers and include installation and calibration to ensure your system runs at peak performance.

Metrology Support

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- **Contract Measurement –** A cost effective option to capital expenditure, simply send in first article or production components for measurement.

  Measurement of your parts is carried out 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 & Testing –** Certification for artifacts or instruments in our laboratory or at customer's site.

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