TAYLOR HOBSON®

AMETEK®

LUPHOScan 50 SL

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

LUPHOScan SL

Ultra fast, non-contact, 3D form measurement

Measure cellphone lenses in <60 seconds

Based on the industry standard LUPHOScan platform

Introducing, the LUPHOScan SL with new probe technology for increased measurement flexibility and ultra fast measurement times down to < 60 seconds.

The LUPHOScan SL is ideal for high volume production of small lenses with key benefits of the system including ultra fast measurement speeds and the ability to measure geometric lens features.

Unique benefits for both design and production.

- **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**
  Such as interlocks and edge diameters in relation to each other or the optical surface
- **Thin transparent substrates**
  Down to 100 µm thickness
- **Fast measurement speeds for true 3D**
  < 120 sec. - Optical surface and geometric features*
  < 60 sec. - Optical surface only**

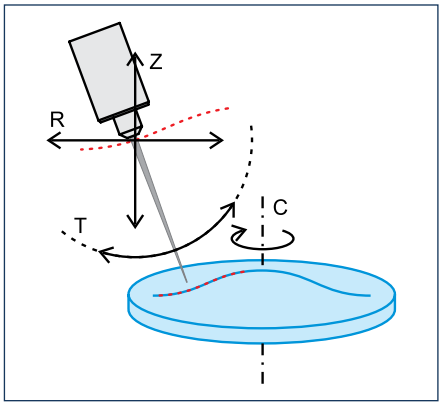
LUPHOScan 50 SL

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.

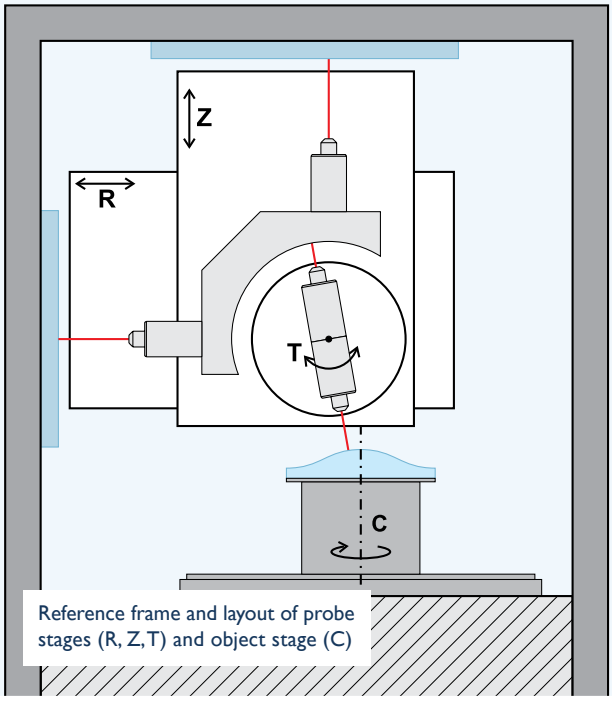


Movement of the LUPHOScan object sensor

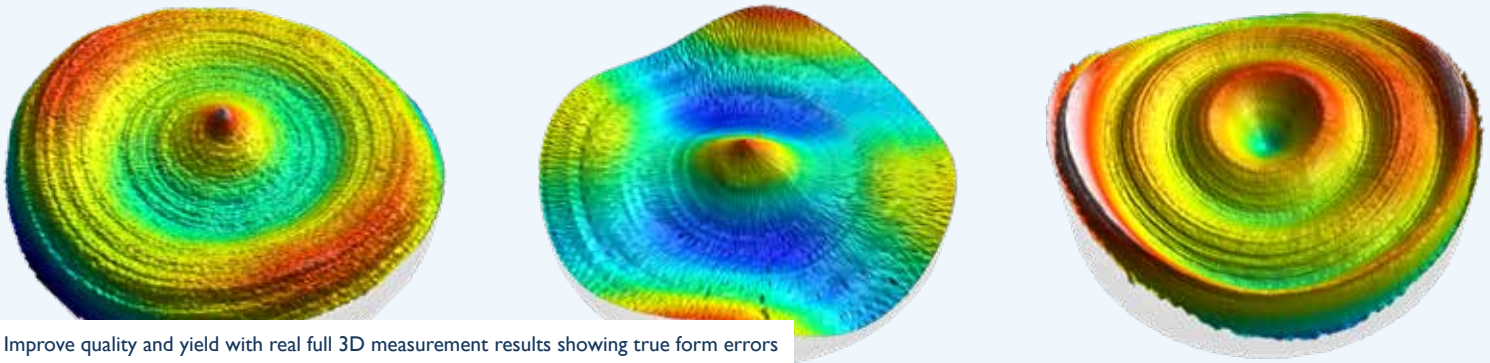
* Such as surface flats, interlocks and edge diameters.
** Geometry and lateral resolution dependant.

> Advanced capability delivers world's fastest measurement of 3D surface and interlocks
>
> < 120 sec. cycle time

New 7.5 mm working distance prevents collision



Reference frame and layout of probe stages (R, Z, T) and object stage (C)



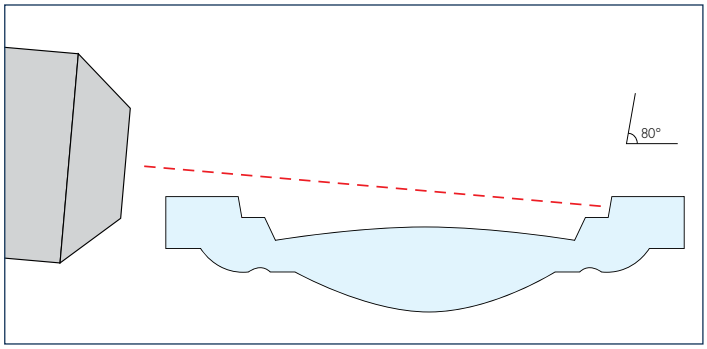
Improve quality and yield with real full 3D measurement results showing true form errors

Optimised LUPHOScan probe.

The new probe technology used on the LUPHOScan SL 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

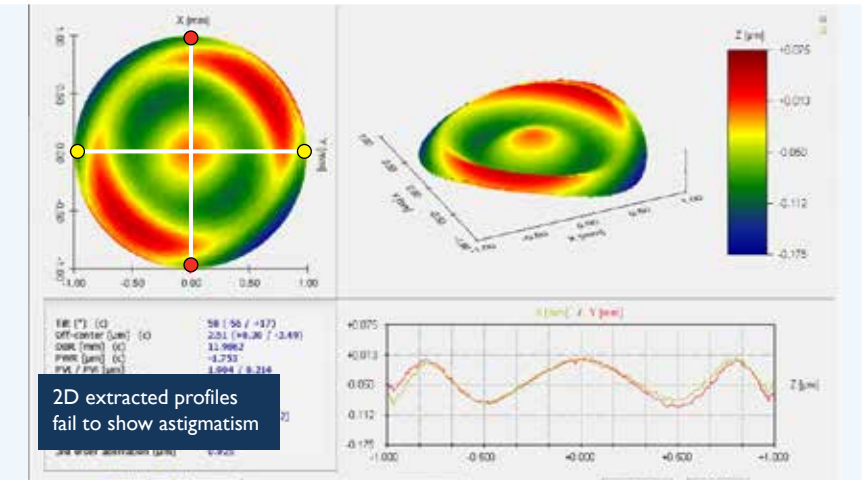


Improve measurements of interlocks without collision

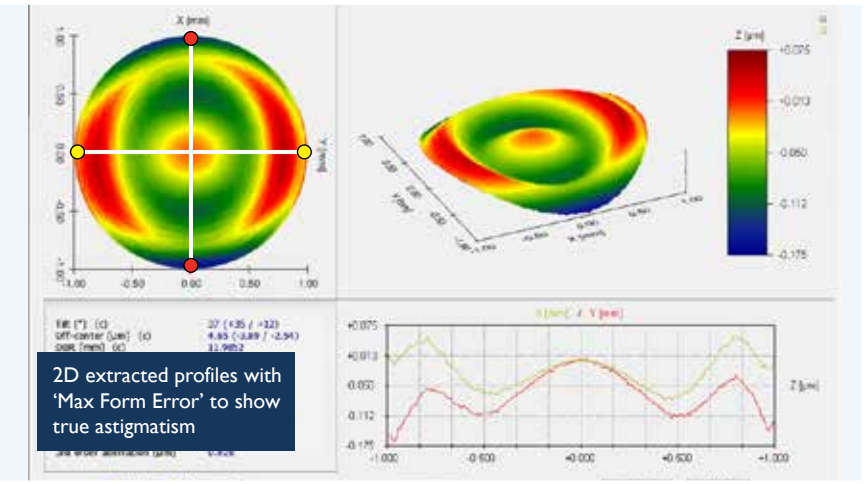
Lens form metrology

Increased yield and quality with true 3D accuracy

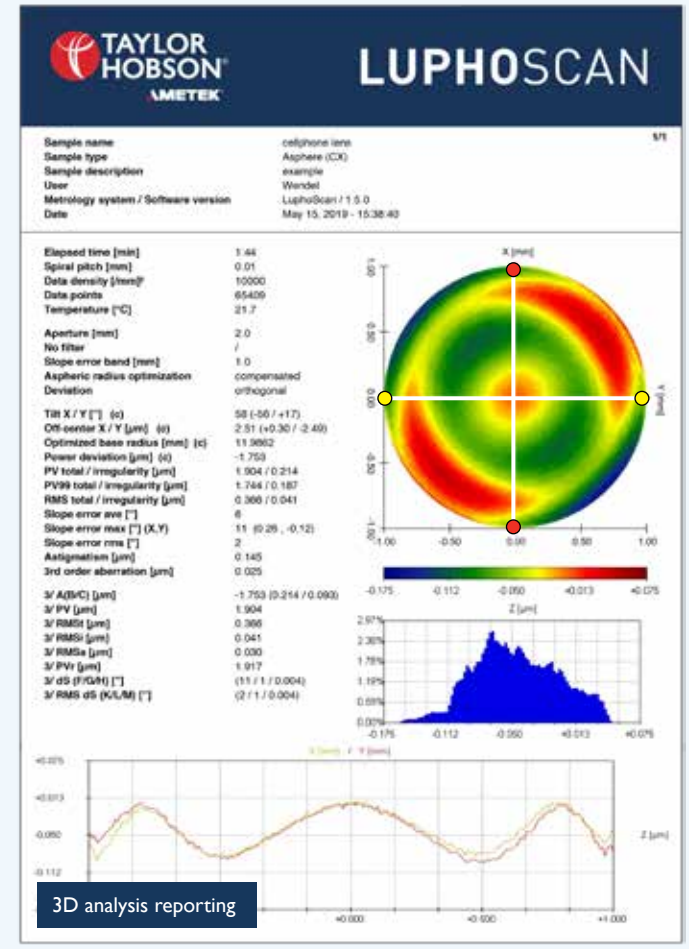
3D measurement & analysis in < 60 seconds



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 shown identifies that the same 3D form error can yield two completely different 2D form errors.

3D measurement with 3D surfaces for in-depth reporting.

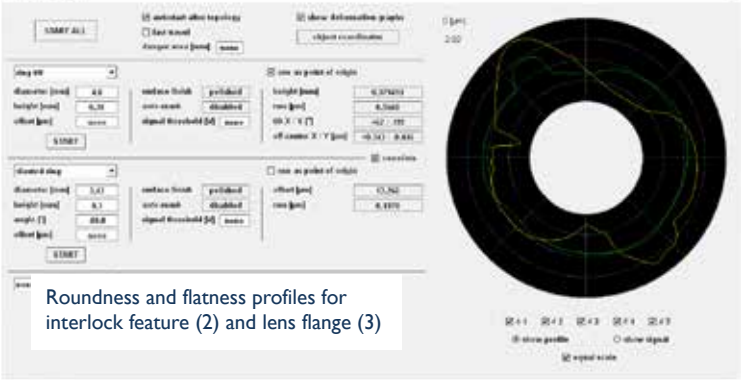
Measurement results can be output showing the complete surface form error with the 3D option, including extracted 2D profiles.

- 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.

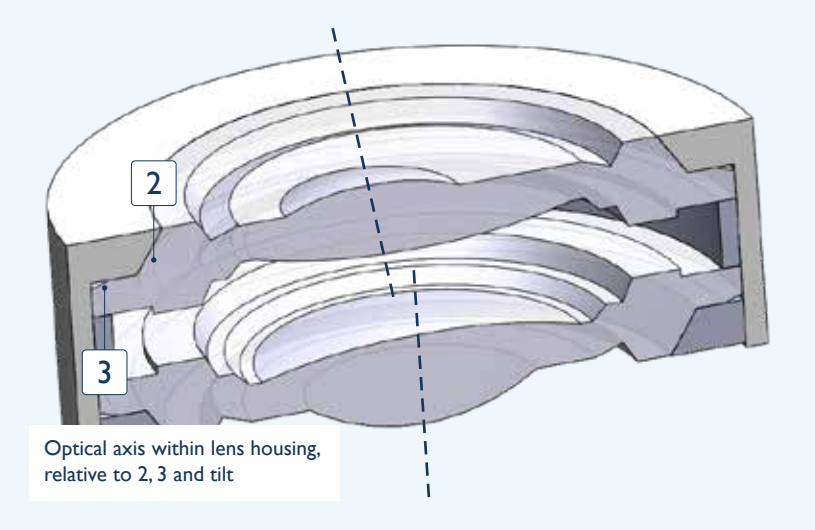
Advanced lens metrology

Increased productivity with world's fastest measurement

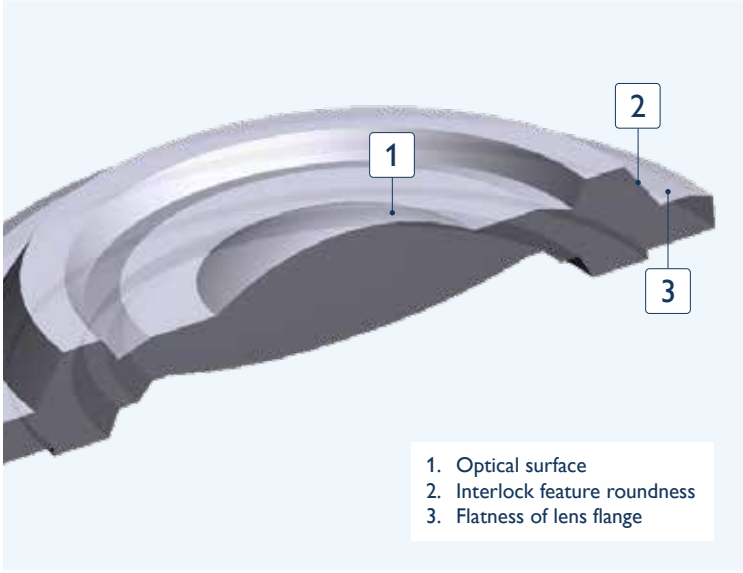
3D optical surface & interlocks in < 120 seconds



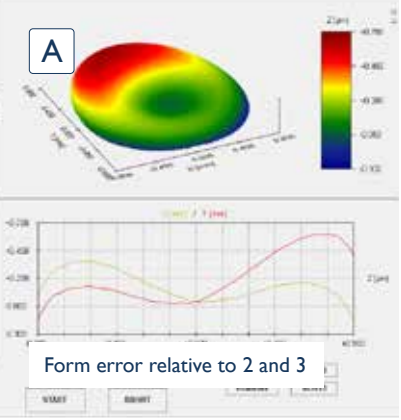
Roundness and flatness profiles for interlock feature (2) and lens flange (3)



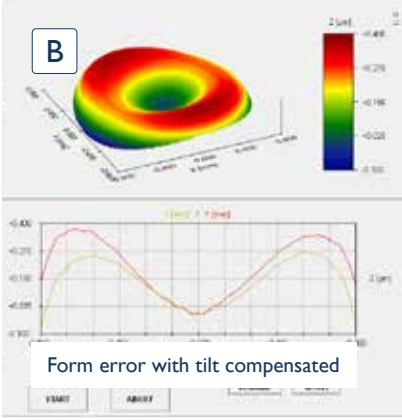
Optical axis within lens housing, relative to 2, 3 and tilt



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



Form error relative to 2 and 3



Form error with tilt compensated

Fast measurement and analysis of the optical surface and geometrical features.

Measure the optical surface and geometrical features such as interlock surface roundness, flatness of the flat lens surface and location of the optical surface relative to these features.

Optical surface is off centre and tilted relative to the interlock feature position and lens flange.

The analysed results (A) show the lens form error of the optical surface relative to the interlock and lens flange.

The results highlight the real form error which would be seen if the lens had been put into an assembly and aligned relative to these features.

The optical surface (B) shows the tilt compensated form error.

Typical cellphone lens assembly

Tooling system

Simple tooling system for increased throughput

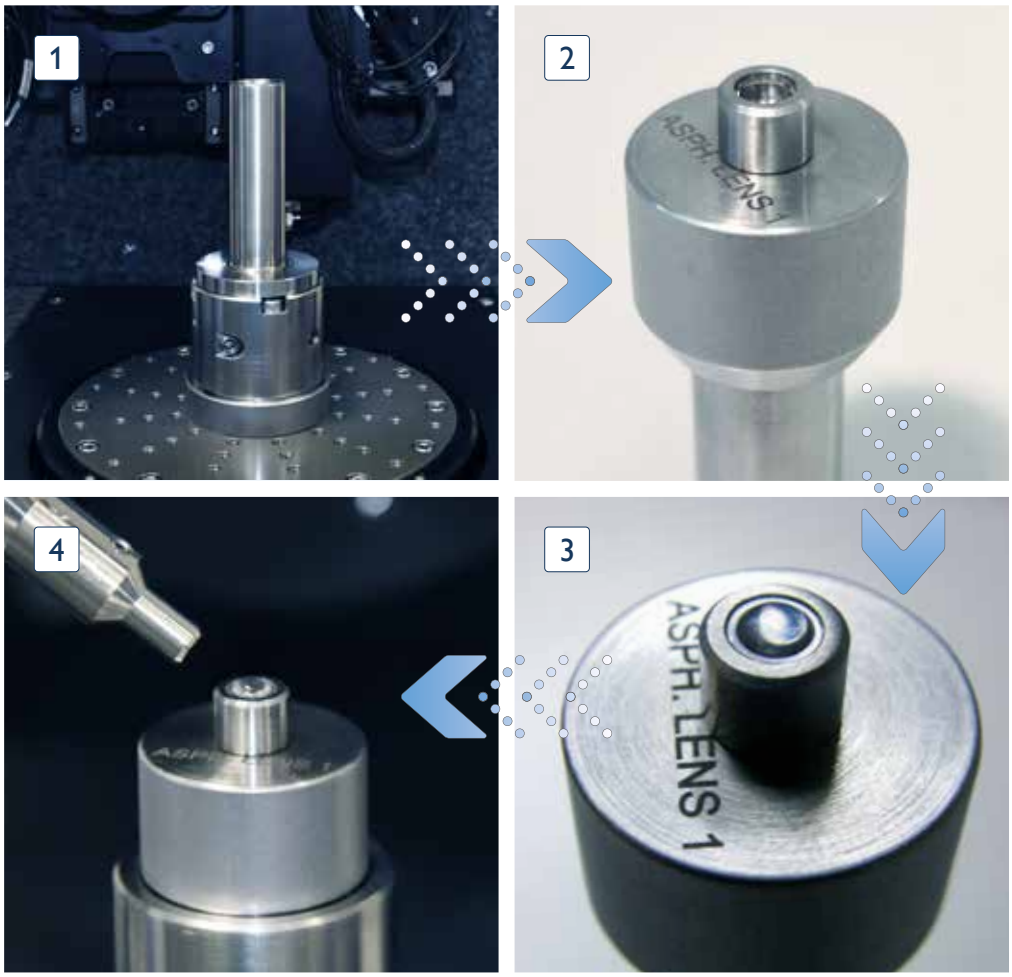
Rapid set-up with no alignment required

Save time with easy part set-up and measurement.

The easy-to-use tooling enables accurate measurements with simple set-up.

1. LUPHOScan SL system with tooling chuck
2. Dedicated lens mount.
3. Lens loaded into lens mount.
4. Lens measurement using LUPHOScan SL, lens mount and tooling chuck.

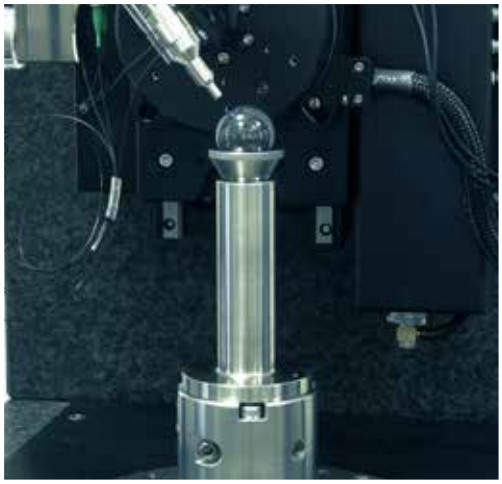
Tray of multiple lens holders, enabling fast changing



Critical results, trust Taylor Hobson.

Easy, fast & accurate calibration.

- High quality calibration with 3 artefacts (included as standard).
- Calibration artefact compatible with tooling chuck
- Easy-to-use interface with no alignment required.
- Complete calibration cycle takes only 15 minutes



Specification

Industry leading accuracy for the competitive edge

LUPHOScan^{50} **SL HD**

Measurement characteristics[1]		HD System		
Form measurement accuracy[2] (3σ)		30 nm (30°)	70 nm (70°)	100 nm (90°)
Measurement repeatability	Power (PWR)	30 nm (30°)	60 nm (70°)	90 nm (90°)
	Peak-to-Valley (PV99)	3 nm (30°)	8 nm (70°)	10 nm (90°)
Spotsize of point probe		6 µm		
Lateral resolution (points per mm²)		(adjustable) up to 2×10^5		
Measurement time (Full 3D)		Optical surface & two geometric features - < 120 sec.	Optical surface only - < 60 sec.	

Measurement system	
Machine type	4-axis (3 roller bearings, 1 air bearing)
Measurement principle	Scanning point interferometry
Sensor technology	Fibre optics based multi-wavelength interferometer (MWLI®)
Scanning mode (3D)	Spiral, equidistant, normal
Measurement volume (D x H)	50 x 75 mm
Maximum tilt	90°
Reference system	3 MWLI® sensors
	Invar frame
	Compensation of 1st order errors by R, Z, T axes (Abbe principle)

Data handling		
Parameter input		Aspheric coefficients (even, odd), AAU (.dcof /.design), DiffSys freeform (.pgm), BaSys (.asp), HMF (.hmf)
Measurement data		3D
Data export formats	3D	MetroPro (.xyz/.dat), TalyMap (.sur), X, Y, Z, dP (.ascii, binary), Satisloh (.hmf), Zeiss (.wve), OpticStudio (.dat)
	2D	Taylor Hobson (.mod, .prf), X, Z, dP (.ascii, binary)
Export methods		Manual and automatic (user definable)
Data analysis		3D surface visualisation, adjustable cross-section, 2D graphics, 2D Max form error, filtering (LPF, HPF, mean value filter), best-fit radius, aspheric fit, Power, PV, RMS, Slope errors, Zernike, ISO 10110
Measurement report		PDF (user definable)

Object parameters		
Surface shapes		Aspheric, spheric, flat, slight freeform and most other optical surface geometries
Surface finish		Polished, rough, transparent, specular, opaque
Minimum substrate thickness[3]		100 µm
Reflectivity range		0.1 % ... 100 %
Spherical departure[4]		Unrestricted
Maximal slopes	Convex	90°
	Concave[5]	-85°
Maximal diameter (90° slope)		50 mm
Diameter of largest measurable hemisphere		50 mm
Maximal SAG heights	Convex	55 mm
	Concave	25 mm
Maximum object diameter		50 mm
Maximum object weight		12 kg

Machine characteristics	
Object mount	Hydraulic expansion chuck (HD25), optional: 3-jaw chuck, centre & levelling table, optimised lens tooling
Internal data rate	2500 Hz
Wavelength range	1530 nm ... 1610 nm
Laser classification	Class 1
	Continuous wave output (CW), < 1 mW
Machine dimensions (W x D x H)	73 x 81 x 190 cm
Machine weight	325 kg
Compressed air requirement	7 ... 10 bar, 20 litre/min
Electrical power requirement	230 VAC, 50/60 Hz, < 700 W

Qualifiers

1. For polished surfaces, depending on environmental conditions.
2. PV for measurements on spherical reference standard.
3. Transparent substrate.
4. Object sensor follows ideal profile.
5. Part diameter < 6 mm.

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

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- **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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- **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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