



2D and 3D Contact Metrology Solutions for the Measurement of Micro Lens Arrays

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Nov 2109

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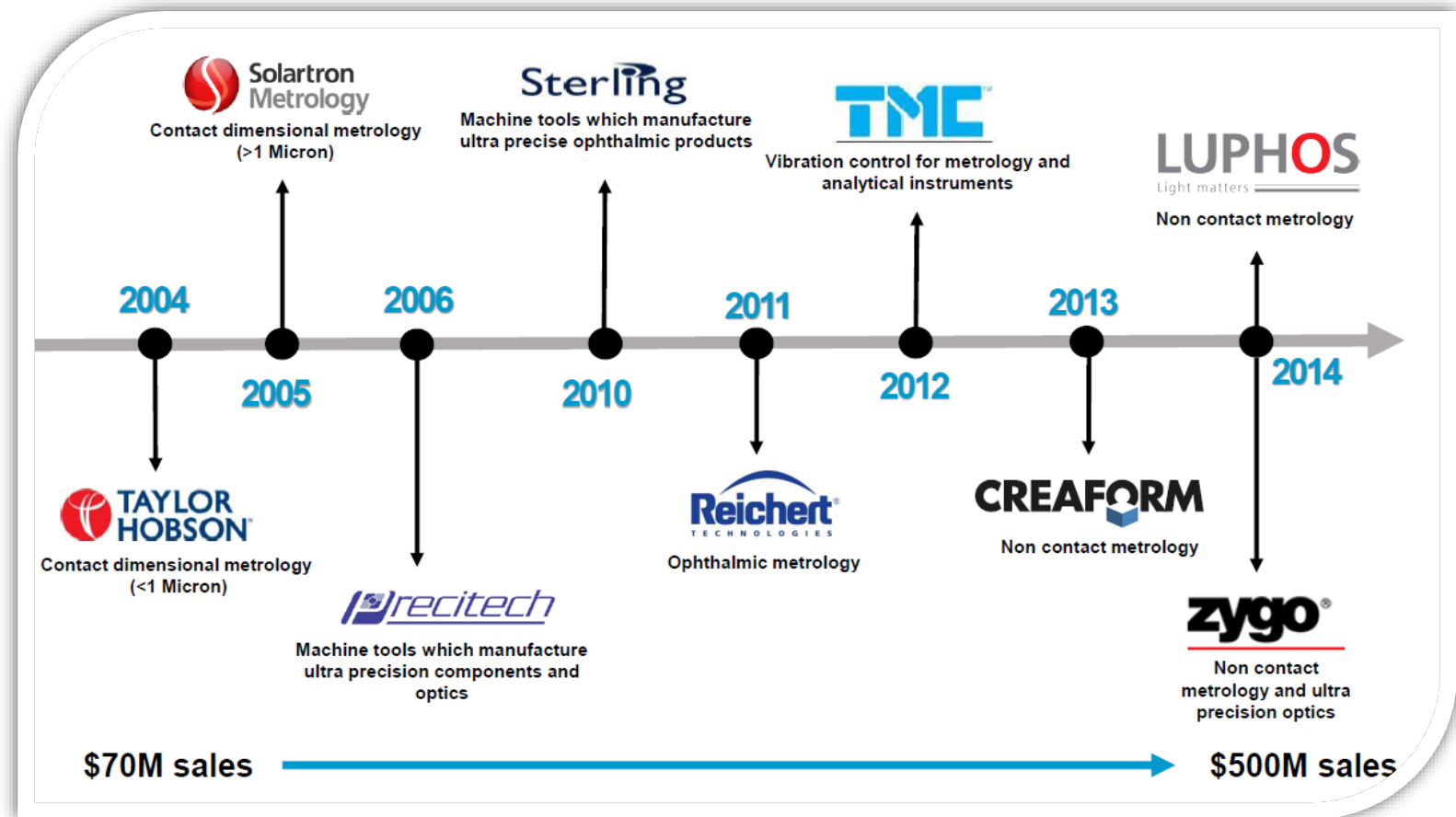
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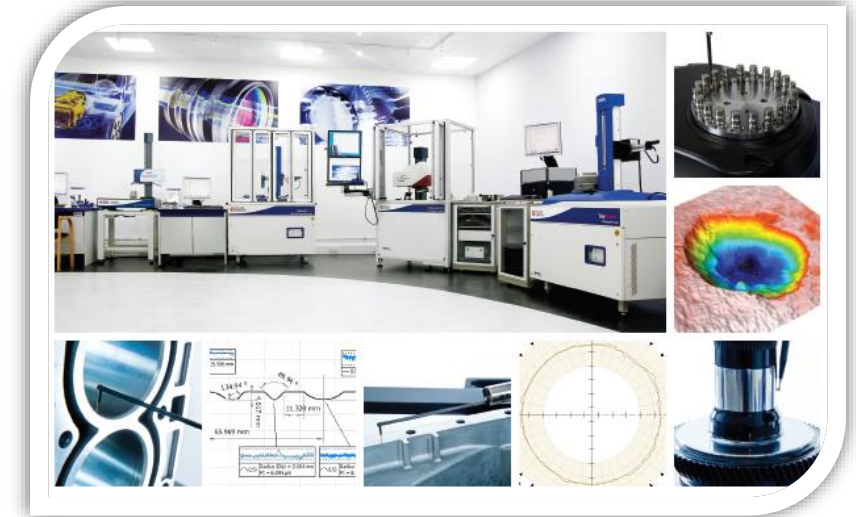
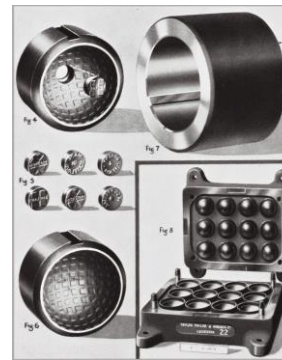
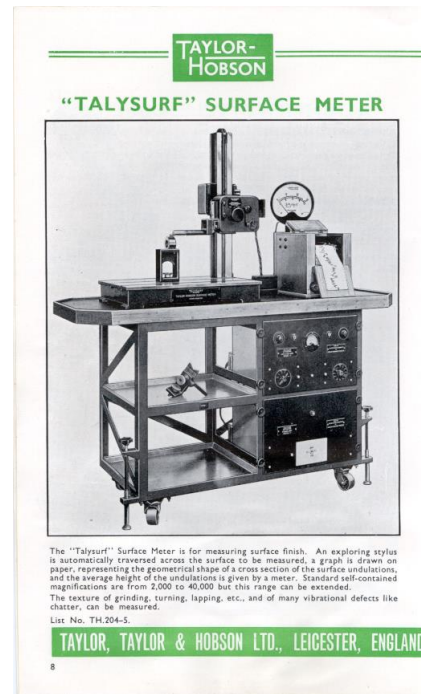
- Taylor Hobson (includes LUPHOS)
- Solartron Metrology
- Precitech (includes Sterling & TMC)
- Reichert
- Creaform
- ZYGO





Metrology solutions for surface, form and roundness measurement.

- Over 130 years of innovation
- A pioneer of metrology products
- Contact and non-contact solutions
- Global support network
- A long history of Optics
- 250 employees, globally.
- Golf ball dimples.....



One of the earliest tests of the superb quality of 'Cooke' lenses was their successful use on the Shackleton expedition to the Antarctic in 1901. Besides surviving the rigours of a lengthy sea voyage, they took photographs of superb quality in sub zero temperatures. The 'Cooke Casket', (pictured) was an early example of how Taylor, Taylor and Hobson would market and present their product.





UK
Leicester



Germany
Weiterstadt



France
Elancourt



Italy
Milan



China
Shanghai
Beijing, Chengdu
Guangzhou



Japan
Tokyo
Osaka
Nagoya



India
Bangalore
Chennai
Delhi, Pune



Taiwan
Hsinchu



USA
Chicago



Brazil
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Mexico
Queretaro



Thailand
Bangna



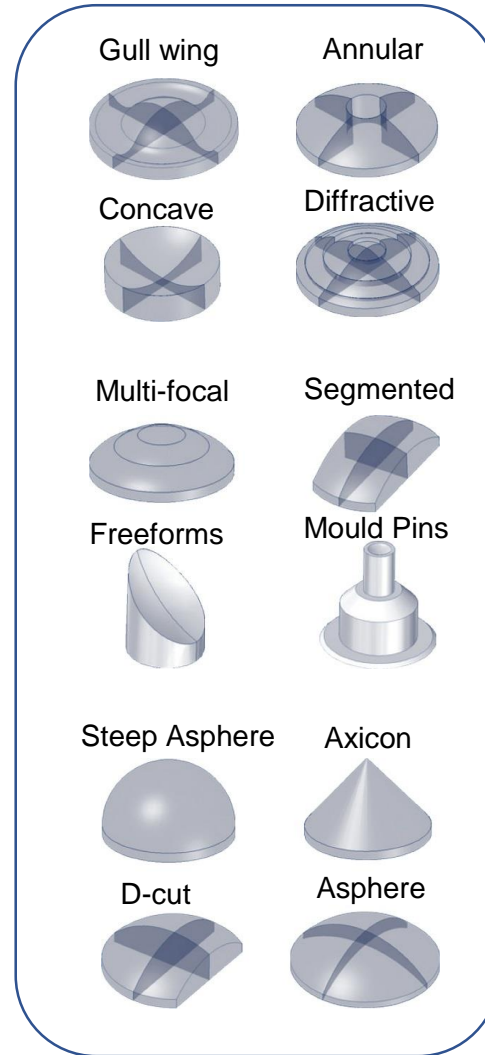
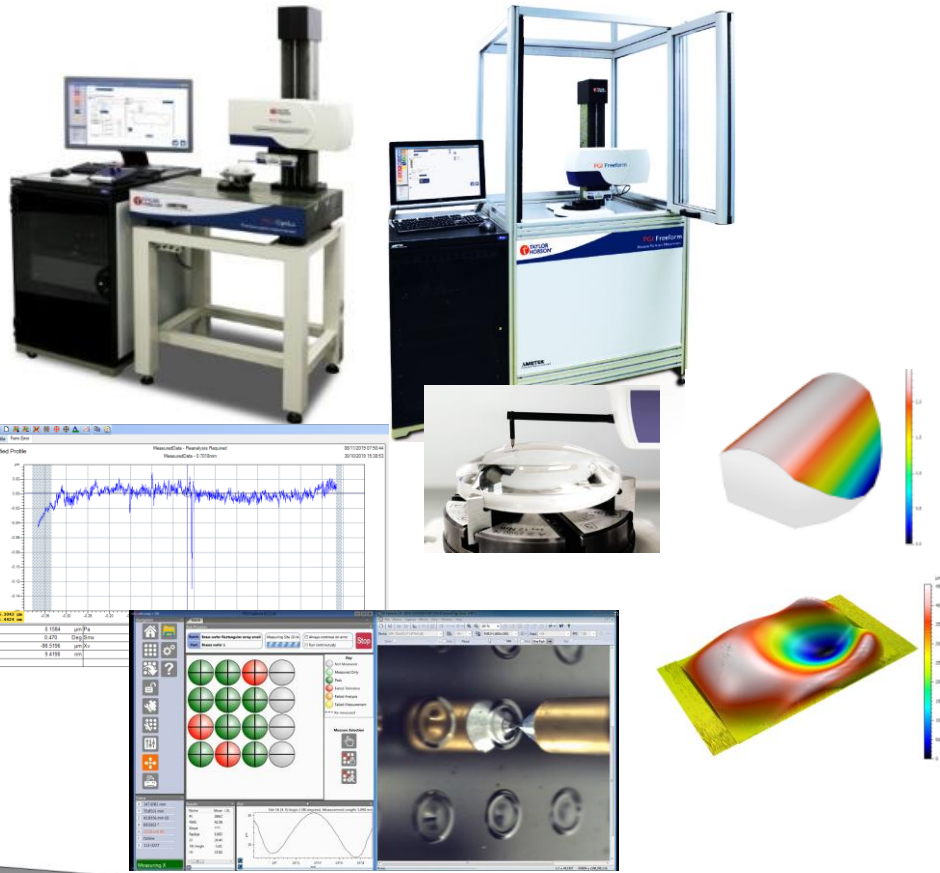
Singapore



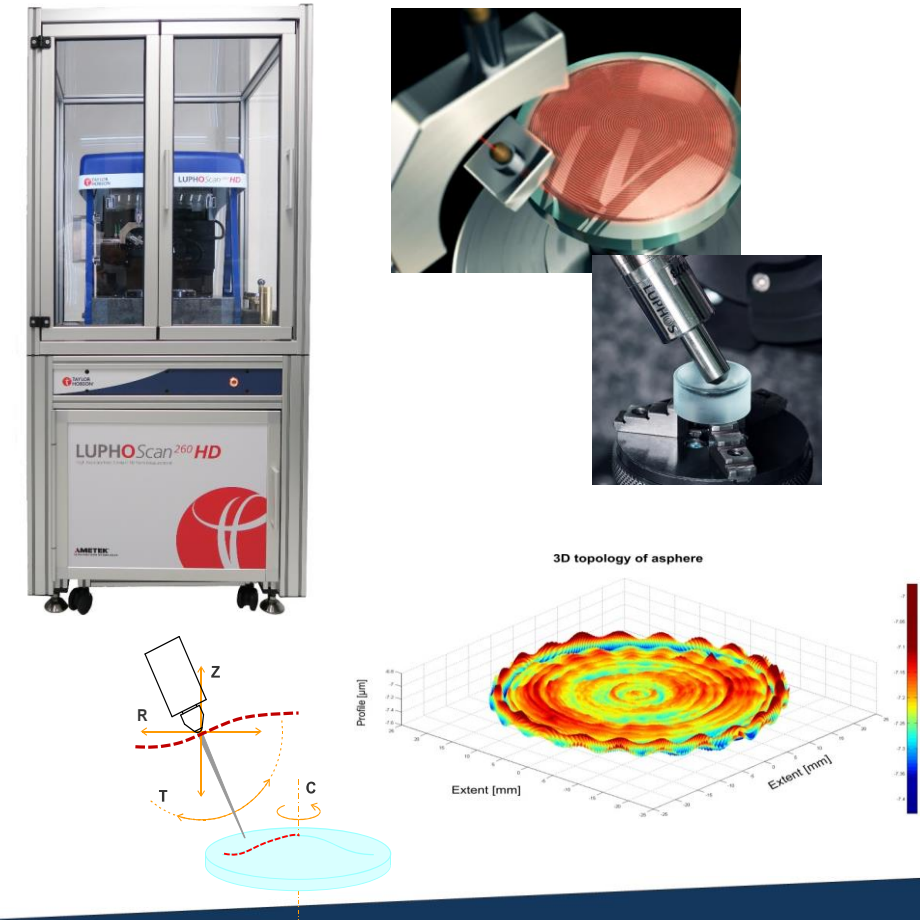
Korea
Suwon

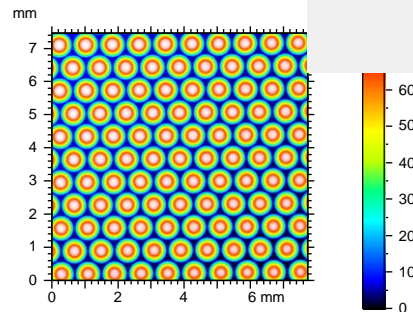
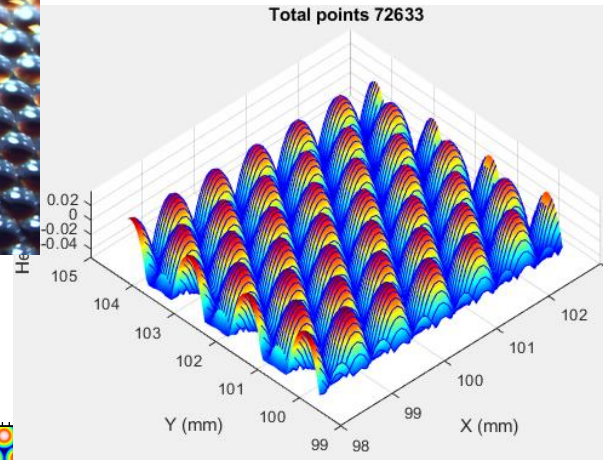
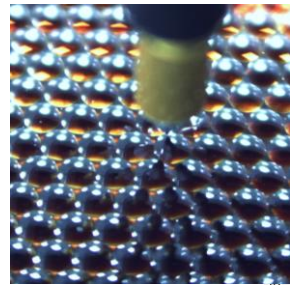


2D and 3D contact measurement solutions PGI Form Talysurf technology

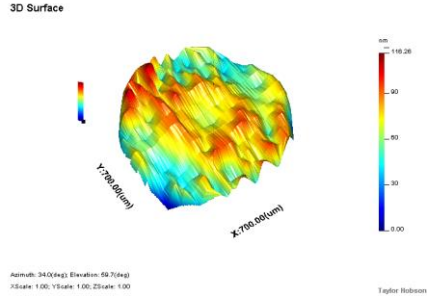
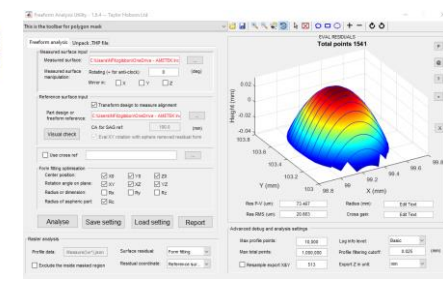
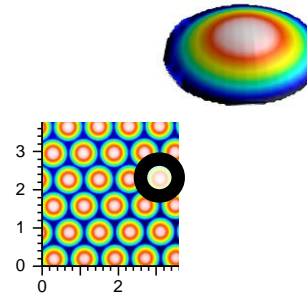


3D non-contact measurement solutions LUPHOScan MWLI non-contact technology

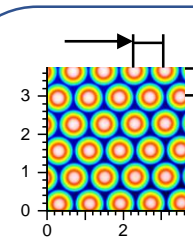




- Using the PGI Form Talysurf
- A Raster scan technique is employed to scan the complete surface, generating the 3D surface.
- Data spacing down to
 - 0.125um in X, 2um in Y
 - In this example 1um – X, 50um - Y
- Slope capability
 - 55° - X, 35° - Y
- Measurement envelope 200x200x14 (mm)
- Example measurement cycle time 3.5hrs
 - Full array

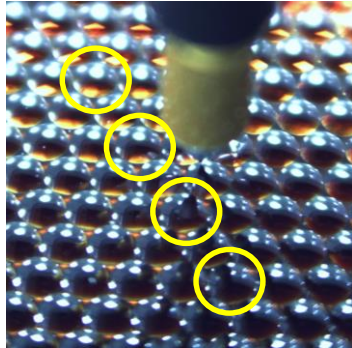


Extraction and analysis of a single lens from the array.

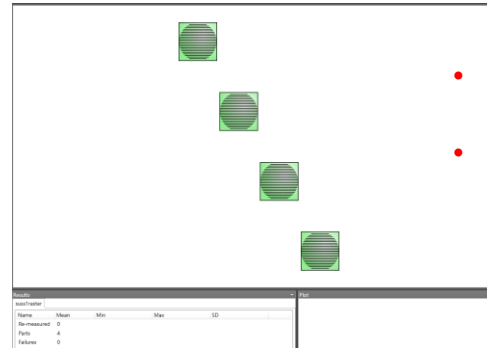


Lens position identification from 3D surface.

Name	Type	X / mm	Y / mm	Radius / mm	On Part	Crest	Align	Cre
C1	Calculated	97.584	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C2	Calculated	98.389	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C3	Calculated	99.194	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C4	Calculated	99.982	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C5	Calculated	100.788	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C6	Calculated	101.576	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C7	Calculated	102.381	95.599		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C8	Calculated	96.393	96.252		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C9	Calculated	97.181	96.252		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C10	Calculated	97.986	96.286		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C11	Calculated	98.792	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C12	Calculated	99.580	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C13	Calculated	100.385	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C14	Calculated	101.173	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C15	Calculated	101.978	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C16	Calculated	102.766	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C17	Calculated	103.571	96.304		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

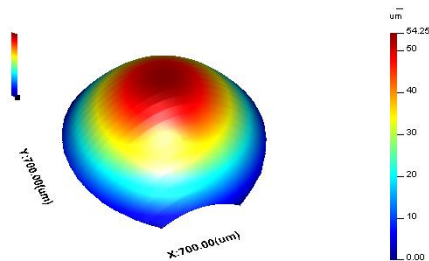


Identify locations to be measured



- Individually raster scan each selected location
- Measurement cycle time for example ~ 15 minutes

3D Surface

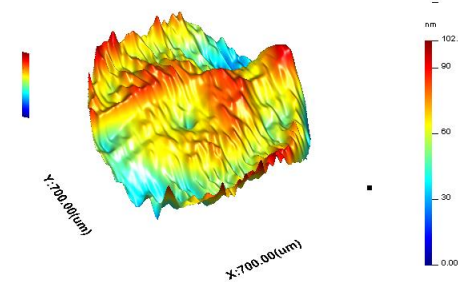


Surface Generation

Azimuth: 21.7(deg); Elevation: 50.0(deg)
XScale: 1.00; YScale: 1.00; ZScale: 1.00

Taylor Hobson

3D Surface



Residual surface after automated analysis

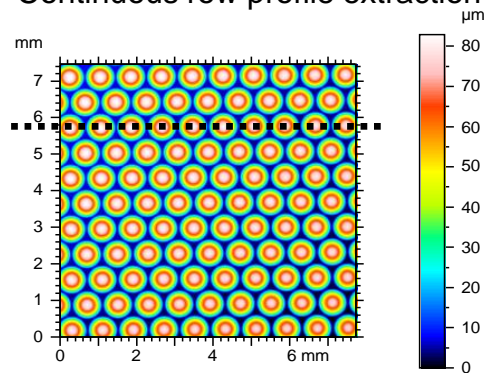
Azimuth: 210.7(deg); Elevation: 53.3(deg)
XScale: 1.11; YScale: 1.11; ZScale: 1.11

Taylor Hobson

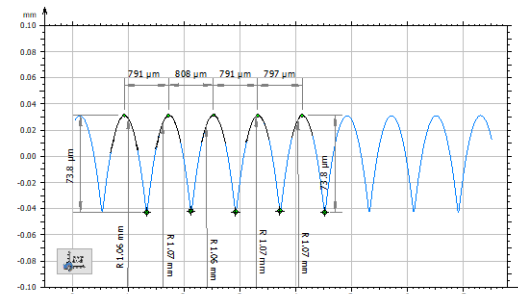
- 2D profile measurements

- For Rotationally symmetric surfaces
- Multiple radial profiles allow generation of 3D residual surface.

Continuous row profile extraction



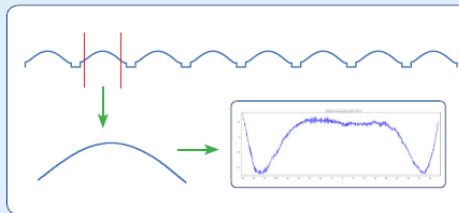
Contour analysis for feature positions



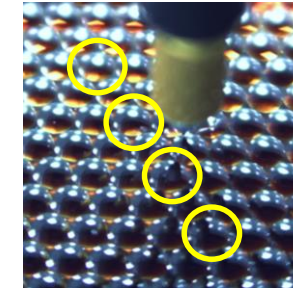
Continuous measurement

The Form Talysurf® PGI Matrix enables extraction of individual part profiles from a continuous measurement of an array of parts.

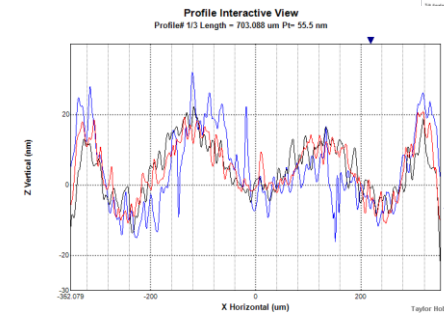
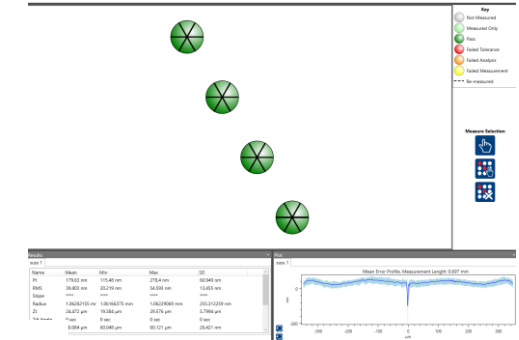
- Measure dense lens arrays quickly and accurately.
- Intelligent profile extraction ensures the correct clear aperture is always analysed.



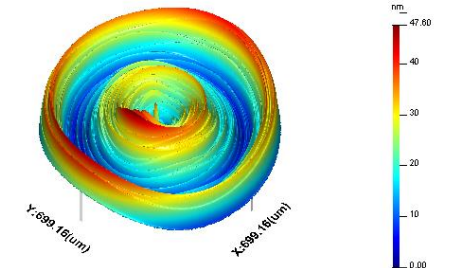
Automated extraction and analysis for individual lens locations



Individual locations are selected from the array.



For each location the 3 residual profiles are combined.



From the 3 residual profiles a 3D residual surface (form error) can be generated.

- Taylor Hobson can provide 2D and 3D measurement solutions for some lens arrays.
 - This is a relatively new area of metrology for Taylor Hobson, we're learning about the industry.
- What can we do for you ?
 - Help drive common standards ?
 - Development partners ?
- What new metrology does the industry need, that we could provide ?

This presentation was presented at EPIC Meeting on Wafer Level Optics 2019

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