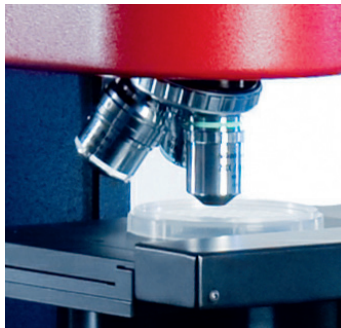
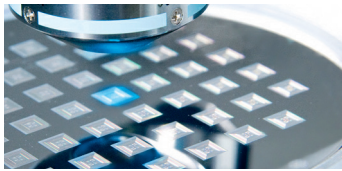




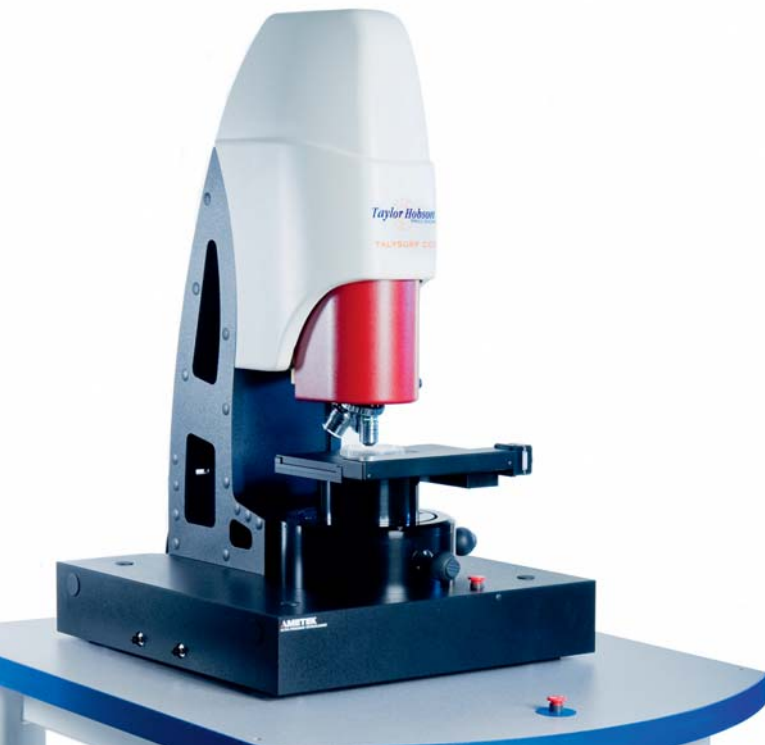
# CCI HD

HD-3D surface and film thickness optical profiler



# CCI HD

## Engineered to challenge your definition of impossible



### Optical interferometry without compromise

- 2.2 mm vertical range with closed loop piezoless Z axis scanner
- 0.1 Angstrom resolution over the entire measurement range
- 2048 x 2048 pixel array for large FOV with high resolution
- 0.3% - 100% Surface reflectivity can be accommodated

### Virtual elimination of measurement uncertainty

- <0.2 Angstrom RMS repeatability, <0.1% step height repeatability
- FEA optimised mechanical design for excellent R&R capability
- Calibration utilizing ISO standards ensures acceptance of results
- Automatic set-up features eliminate operator variability or sample

### Robust design for long term cost effectiveness

- Piezoless Z axis scanner eliminates expensive repair bills
- Automatic surface detection prevents crash damage to lens
- Built in self-diagnostic tools for quick and easy troubleshooting
- Ease of operation reduces the possibility of operator mishandling

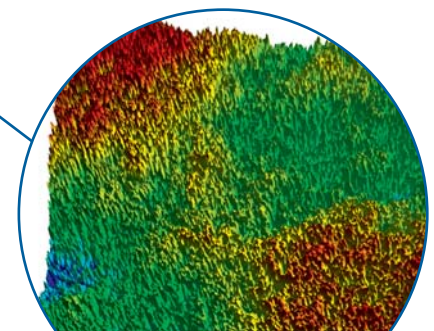
### 64-bit Control and analysis software

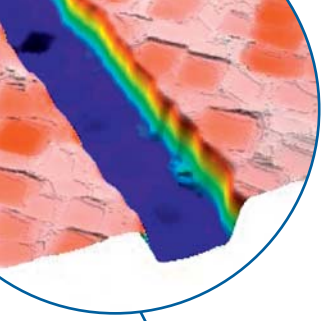
- Multi-language support to ease communication with global partners
- Compatible with most PC platforms for collaborative research projects
- New tools including 4D analysis of 3D surfaces as they evolve over time
- Automatic report generation based on batches of measurement data



### Improving ball point pen performance

CCI-HD is used to study the size, shape and volume of the pits in small bearings that control the consistent flow of ink





### Optimising PV cell efficiency

Uniform trench depth prevents conducting material flowing out of the trench reducing efficiency – CCI-HD evaluates depth, width and volume of trench-like features

*“The speed and extraordinary sensitivity makes the CCI HD an ideal tool for R&D and quality assurance.”*

*Prof. Michael Walls,  
Professor of Photovoltaics at CREST, UK*

## CCI-HD is an industry changing blend of science, experience and imagination

### Range, resolution, accuracy, reliability - our formula for your success

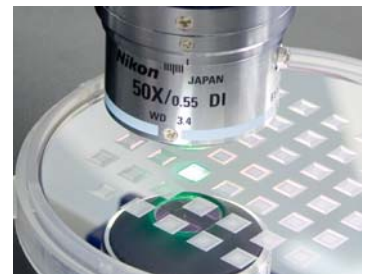
Whatever the component, however quickly you must analyse it, confidence in your 3D areal measurement result is assured with the revolutionary CCI HD non-contact optical profiler. A unique 4 MP camera combines with 1/10 angstrom vertical resolution to deliver incredibly detailed analysis of all surface types from very rough to extremely smooth.

### Designed for metrology without compromise

Streamline your analysis program by eliminating multiple inspection routines and incompatible measurement reports. Our patented Coherence Correlation algorithm provides sub-angstrom resolution regardless of scanning range so that all surfaces at any stage in your process can be measured on the same instrument using the same measuring technique, ensuring comparability of results.

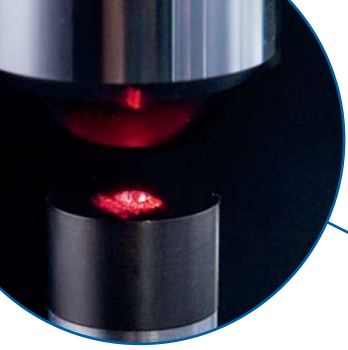
### Versatile – ready for a production run or a research project

Keeping pace with the expertise of researchers and scientists, the CCI HD is ready for your most demanding measurement requirements including dramatically changing fields such as solar energy, optics and medical devices. Combining powerful dimensional and roughness analysis software with uncompromised engineering which provides you with the ideal inspection tool for virtually any application.



### Ease of use reduces the cost of operator training

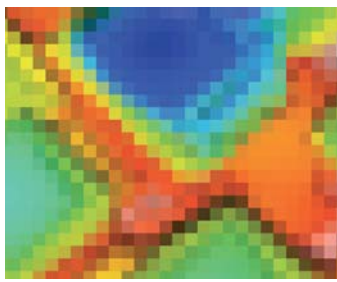
Even with infrequent use, re-training or close supervision of operators is not required. CCI HD has innovative features such as AutoRange and AutoFringeFind that simplify setting up and staging of components. All surfaces can be measured without the complication of switching between measurement modes or the extra burden of intermediate lens calibration.



## Controlling lens production

The latest projectors require precise lens arrays. Identifying defects in any on the lenses is critical to the performance of the projector

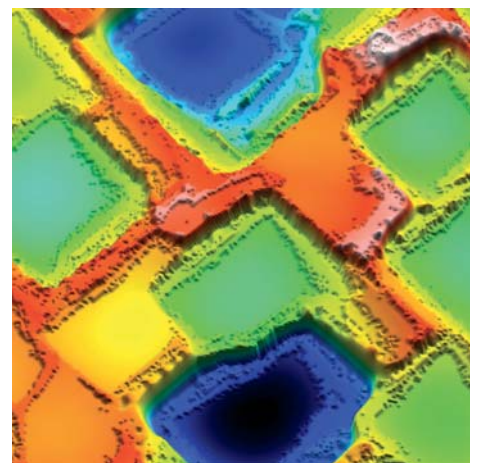
# Next generation 3D camera technology



Last century 640 x 640

## Higher resolution

CCI-HD image sensors with 2048 x 2048 pixel array are vastly superior to old VGA video camera technology where 640 x 480 pixel array grossly limited lateral resolution. Now you can measure large areas without the complexity or potential distortion caused by field of view multipliers.



CCI SunStar 2048 x 2048

## Faster measurements

Larger FOV (field of view) means fewer set-ups, faster inspection speed and better utilization of equipment and operators. Cost effectiveness is much improved now that you can inspect more parts more thoroughly and in greater detail without additional expense.

## Good results

With 4 million data points the measured surface is defined as never before. You can identify surface flaws or potential areas of concern anywhere in the wide FOV and "zoom in" for detailed analysis without having to waste time re-measuring the component.

## NEW camera technology

High resolution visual analysis provides an essential tool for monitoring and improving your manufacturing process. Stunning 3D images with sub-micron detail can also be used to educate, inform or simply impress potential customers with your engineering expertise.

*Save valuable time, reduce errors and quickly get the results you need*

## 21st century optical profiling

### Automatic surface detection

AutoFringeFind will increase inspection throughput by eliminating manual set-up and the need to re-take measurements caused by false identification of the sample surface. Unlike common auto focus routines which require a flat and smooth surface, this innovative coupling of software and optical expertise can detect ALL types of surfaces quickly and automatically.

### Automatic range setting

Significant reductions in measurement time are achieved with our exclusive AutoRange feature which automatically sets the optimum scan range based on the sample surface. Manual setting of the scan range is typically a guessing game that often results in over scanning, longer measurement times and frustration for even the most skillful operators.

### Universal measuring technique

Streamline your inspection program by eliminating multiple inspection routines and incompatible measurement reports. Our patented Coherence Correlation algorithm provides sub-angstrom resolution regardless of scanning range so that all surfaces at any stage in production can be measured on the same instrument using the same measuring technique.



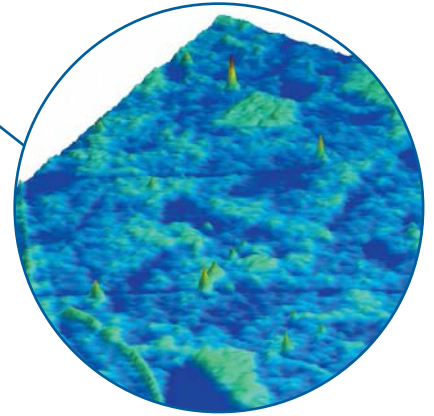
### Hard drive performance

Flatness of hard drive disks is critical to performance – with wide FOV and 4 million pixels, CCI-HD evaluates flatness, waviness and surface texture



## Increasing semiconductor device yield

The CCI HD is used for any surface defects that could reduce the yield of devices from a wafer



## Helping to improve the efficiency of solar cells

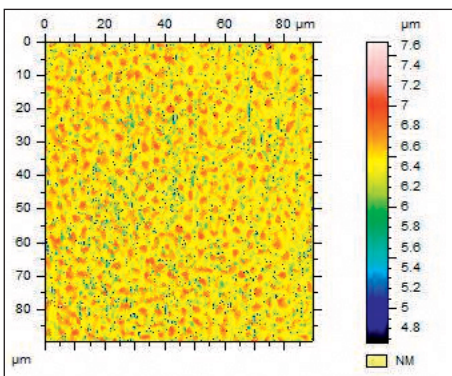


Figure 1. Film thickness of polymer film on metal substrate

### Thick films (>1.5 microns)

- Single and multilayer coatings can be measured.
- 3D thickness, thickness uniformity, delamination and interfacial roughness, all studied in a single measurement.
- Automation allows the measurement of multiple sites on one sample and measurement of multiple samples.

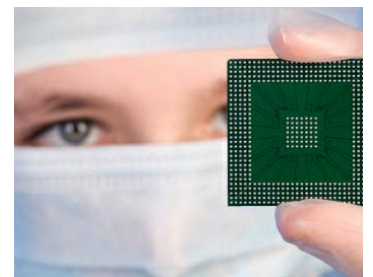
### Thin films (>300 nm)

The Helical Complex Field (HCF)<sup>1</sup> approach, patented by Taylor Hobson, now provides unique measurement capability to measure film thickness below 1.5 micron with unsurpassed vertical and spacial resolution.

Test measurement of SiO<sub>2</sub> thin film on Si  
3 samples ranging in thickness from 50nm to 1000nm

Sample	#1	#2	#3
CCI (HCF) Thickness (nm)	47.3	191.7	1053.4
NIST Calibrated Thickness (nm)	47.0	191.2	1055.7
Measurement Error (%)	0.6	0.3	0.2

Measurement of film thickness down to 25 nm has been demonstrated, dependant upon the optical properties of the film. Information on films less than 300nm is available on request



<sup>1</sup> Mansfield D, 'Thin Film Extraction from Scanning White Light Interferometry', Proc. of the Twenty First Annual ASPE Meeting, Oct 2006

<sup>2</sup> As demonstrated by multiple measurements on a levelled fused silica optical flat

<sup>3</sup> As demonstrated by 1 sigma Std Dev of 20 Sq (RMS) measurements on SiC flat

*How good must a system be to have  
1/10 angstrom resolution?  
That's what you need to consider*

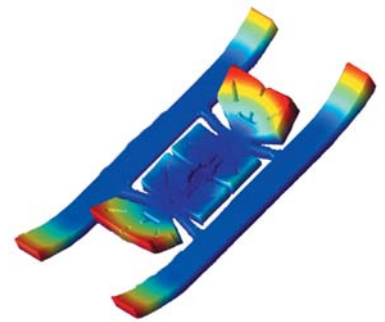


Medical implants

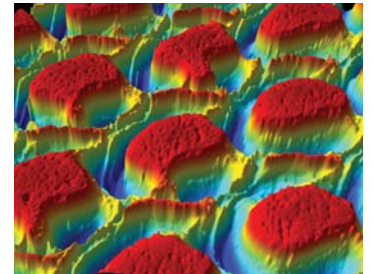
## Unlimited application possibilities

Many users look to CCI-HD for solving measurement problems that other instruments simply cannot handle. However, with outstanding range, resolution and ease of operation, it can easily become your ideal tool for R&D and quality assurance in a wide variety of applications.

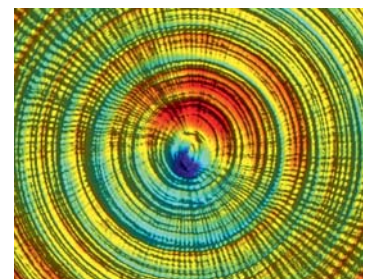
- Thin film thickness
- Thick film thickness
- 1st Gen. Solar cells
- 2nd Gen. Solar cells
- LED
- MEMS
- Wafer Roughness
- Material Research
- Data Storage
- Polished Optics
- Textured Steel
- Diamond Turning
- Medical Implants
- Automotive Injectors
- Crankshaft Finish
- Lubricant Thickness
- Bearing Roughness
- Paper / Toner



MEMS accelerometer



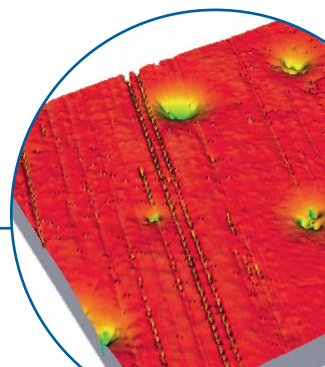
Textured Steel



Diamond Turned Optic

### Extending lifetime of orthopaedic implants

Tribological study of orthopaedic implants is critical to maximizing useful life – CCI-HD combines form, shape and texture in one evaluation



# Powerful New Software Features

## Control Software

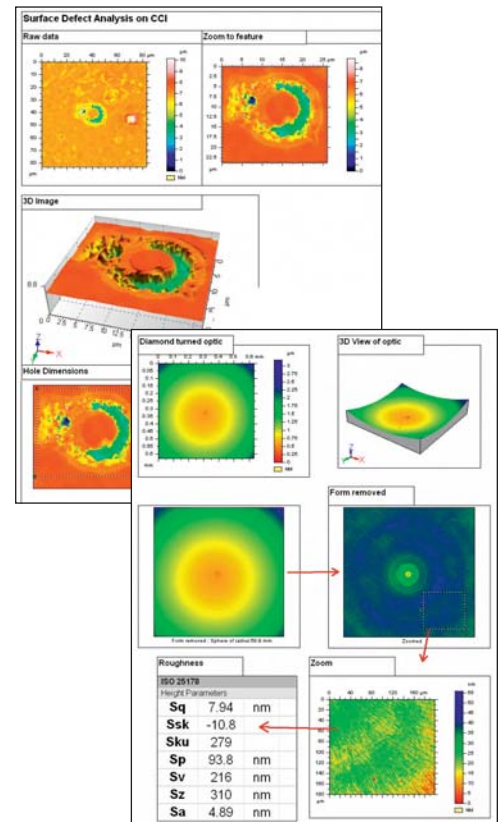
Now with **64 bit processing**, the CCI control software features more flexibility, faster operating speed and improved overall performance. Compatibility with most mainstream platforms offers the possibility of collaborative research projects and development of advanced applications.

Multi-language support is now available to keep pace with the global economy and international manufacturing partnerships.

## Talymap Analysis Software

Research facilities, factories and universities worldwide have made Talymap their preferred surface analysis software. It is used for product development, process improvement, predictive behavior analysis and routine inspection in many sectors.

TalyMap is continuously evolved by a multi-disciplinary team of specialists in metrology, software engineering and automation in order to meet present and future surface metrology needs.

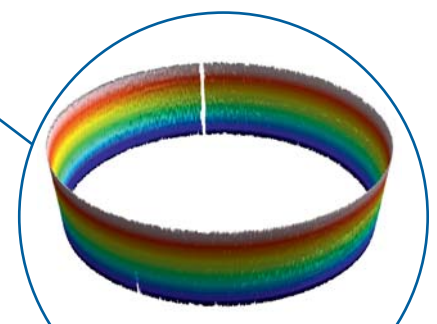


## Key features

<b>Full metrological traceability</b>	A new analysis workflow makes it easy to trace every step in an analysis document. New steps can be added and existing steps can be fine-tuned or deleted at any time.
<b>Statistics for quality control</b>	The new statistics option makes it possible to track and generate statistics on parameters across multiple measurement data sets.
<b>Multi-language support</b>	It is possible to change the software to work in one of six European languages, Japanese or Chinese.
<b>Quick results</b>	Using the Minidoc function, any sequence of analysis steps can be defined and saved into a minidoc library, significantly speeding up the preparation of new report.
<b>Customization</b>	Add company logos, measurement identity cards, screen notes and illustrations including bitmaps, text blocks, arrows.
<b>Advanced Modules</b>	Talymap Advanced Modules enhance the functionality of Talymap by providing additional analysis or presentation capabilities.

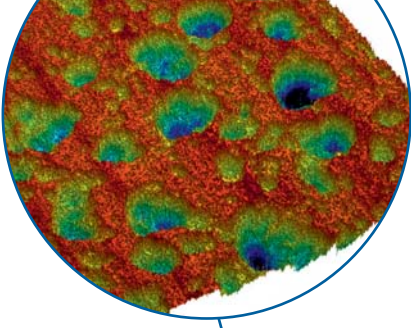
### Reduce fuel Injector leakage

CCI-HD improves performance by detecting leak paths in the fuel injector surface where the ball contacts the cone





*This software has everything you need...yet it's still incredibly easy to use*



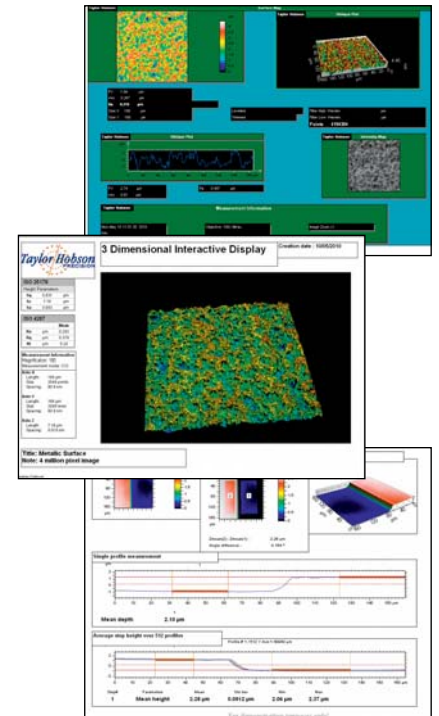
**Study of corroded surfaces**  
 The combination of 4MP camera, 100x objective and Talymap allow the fine detail of the corrosion mechanisms to be understood

## Flexible, friendly, all-inclusive software

The latest generation of TalyMap software assures conformity with the new 3D standard ISO 25178 as well as full metrological traceability. New analytical functions include 4D analysis of 3D surfaces as they evolve over time, pressure or other physical dimensions.

Along with photo-realistic full colour images, TalyMap also includes enhanced productivity tools such as templates for repetitive work and automatic report generation based on batches of measurement data.

Taylor Hobson has a well deserved reputation for industry leading data processing. Analysis parameters and software modules available include:



### 2D Parameters

<b>Primary (Unfiltered)</b> Pa, Pc, Pdc*, Pdq, PHSC*, PHtp, Pku, Plo, Plq, Pmr*, Pp, Ppc*, Pq, Prms, Psk, Psm, Pt, Ptp, Pv, Py, Pz, Pz(JIS), P3z, Pfd, Pda, Pla, PH, PD, PS, Pvo
<b>Waviness (Filtered)</b> Wa, Wc, Wdc*, Wdq, WHSC*, WHtp, Wku, Wlo, Wlq, Wmr*, Wp, Wpc*, Wq, Wrms, Wsk, Wsm, Wt, Wtm, Wtp, Wv, Wy, Wz, Wz(JIS), W3z, Wda, Wla, Wmax, WH, WD, WS, Wvo
<b>Roughness (Filtered)</b> Ra, Rc, Rdc*, Rdq, RHSC*, RHtp, Rku, Rlo, Rlq, Rmr*, Rp, Rpc*, Rq, Rrms, Rsk, Rsm, Rt, Rtm, Rtp, Ry, Rz, Rz(JIS), R3z, Rfd, Rda, Rla, Rmax, RH, RD, RS, Rvo
<b>Rk (DIN 4776, ISO 13565-2)</b> A1, A2, Mr1, Mr2, Rk, Rpk, Rvk, Rpk*, Rvk*
<b>R&amp;W (ISO 12085)</b> AR, AW, HTrc, Pt, R, Rke, Rpk, Rvke, Rx, Trc, W, Wte, Wx, Kr, Nr, SR, SAR, Kw, Nw, SW, SAW
<b>Straightness (ISO 12780)</b> STRt, STRp, STRv, STRq
* All parameters marked with an asterisk are suitable for user assigned single or multiple qualifiers; e.g., material ratio (mr) may be assessed at one or more slice levels within a single measurement.

### 3D Parameters

<b>Amplitude</b> Sa, Sq, Sp, Sv, St, Ssk, Sku, Sz
<b>Area &amp; Volume</b> Stp, SHtp, Smmr, Smvr, Smr, Sdc
<b>Functional</b> Sk, Spk, Svk, Sr1, Sr2, Sbi, Sci, Svi, Sm, Vv, Vm, Vmp, Vmc, Vvc, Vvv
<b>Flatness</b> FLt, FLTp, FLTs, FLTq, FLTv
<b>Hybrid &amp; Spatial</b> Sdq, Ssc, Sdr, Spc, Sds, Str, Sal, Std, Sfd
<b>Data analysis</b> Step height, Lateral Distance, Pitch, Angle Measurement, Peak Count, Interactive Abbott-Firestone Curve, Volume of Islands, Autocorrelation, Fractal Analysis, Motifs Analysis, Frequency Analysis, Data Patching
<b>Filters</b> Gaussian, Robust Gaussian, Spline, Wavelet, Robust Wavelet and Morphological
<b>Advanced Modules</b> Crown, Cross-crown & Twist, Laser Zone Texture, Advanced Profile PSD, Advanced Data Stitching

# Options

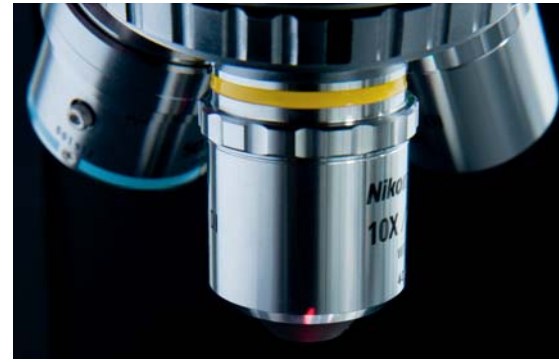
## CCI Objective Lenses

A range of objective lenses are available for the Talysurf CCI system, the choice of lens will depend on the application.

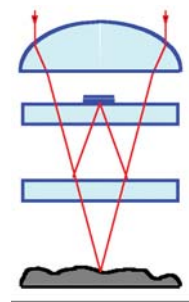
### Key parameters:

- Field of view, determines the measurement area.
- Optical resolution, defines the smallest features that can be distinguished.
- Slope, an important consideration for curved and rough samples, a rougher surface will contain steeper slopes.

All objective lenses are supplied with a protective storage

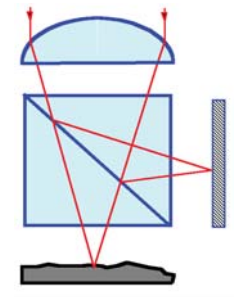


Mirau Interferometer



Magnification  
10 X, 20 X, 50 X, 100 X

Michelson Interferometer



Magnification  
5 X, 2.5 X

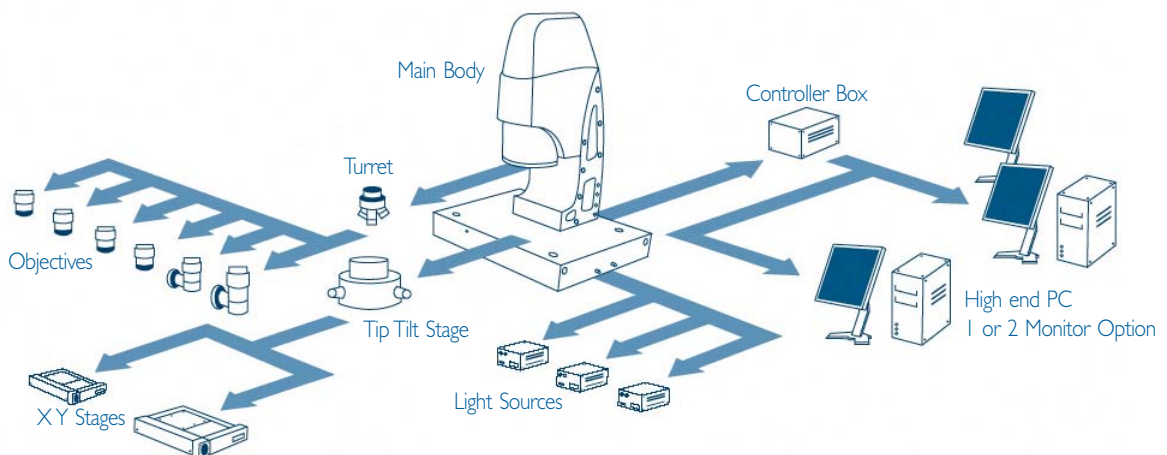
### Interferometric Objectives

With standard 2048 x 2048 pixel camera

Mag	FoV (mm)	OptRes (um)	SamRes (um)	Slope (deg)	WD (mm)	Type	Design	NA
2.5x	6.6 x 6.6	4.07	3.3	2.0 - 3.5	10.3	Std	Michelson	0.075
5.0x	3.3 x 3.3	2.35	1.65	4.0 - 6.0	9.3	Std	Michelson	0.13
10x	1.65 x 1.65	1.02	0.83	7.7 - 14.0	7.4	Std	Mirau	0.3
20x	0.825 x 0.825	0.76	0.415	14.6 - 19.0	4.7	Std	Mirau	0.4
50x	0.33 x 0.33	0.4 - 0.6	0.165	27.7	3.4	Std	Mirau	0.55
100x	0.165 x 0.165	0.3 - 0.5	0.823	33.3	2	Std	Mirau	0.7

Other objectives available, please contact your local Taylor Hobson office.

Mag	magnification power of the objective lens	WD	working distance, distance between sample and lens
FoV	area of the sample measured by a given objective	Type	lens system, Std – Standard, Ul – Ultra low noise
OptRes	optical resolution, the ability to distinguish adjacent heights	Design	type of interferometer used, Michelson or Mirau
SamRes	sample resolution, pixel pitch (spatial sampling interval)	NA	numerical aperture, expresses the angular aperture of the lens
Slope	maximum specular slope, restricted by the numerical aperture		



Specifications are subject to change without notice.

*Results you can trust*



## Specification

### System

Measurement Type	3D non-contact (4 million data points)
Measurement Mode	Coherence Correlation Interferometry
Z Scanner	Ultra high precision closed loop piezoelectric scanner
Field of View	Up to 6.6 mm x 6.6 mm (objective dependent)
Illuminator	White light source (LED options available)
Objective Mount	Three position turret
Measurement Array	2048 x 2048
Analysis	Software
	- Talymap analysis software
	- Over 120 2D & 40 3D parameters
	- Automatic feature counting and sorting
	- Dual screen compatible

### Performance

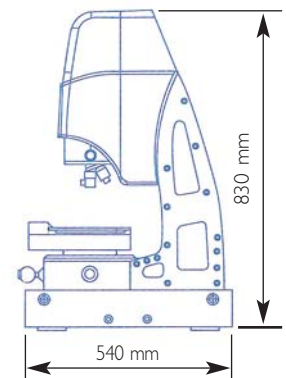
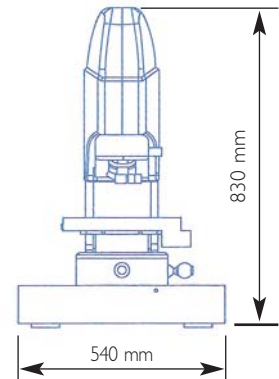
Vertical range (Z)	2.2 mm as standard (>50 mm with Z-stitching)
Vertical resolution [max]	0.01 nm [0.1 Å]
Noise floor (Z)	<0.02 nm [0.2 Å] <sup>1</sup>
Repeatability of surface RMS (Z)	<0.02 nm [0.2 Å] <sup>2</sup>
Max. Measurement area (X,Y)	6.6 mm (>100 mm with X,Y stitching)
Number of measurement points	2048 x 2048 standard
Optical resolution (X,Y)	0.3 microns (With 100x objective)
Step height repeatability	<0.1%
Surface reflectivity	<0.3% - 100%

### Stages

Component size (max)	X and Y = 150 mm; Z = 100 mm
Component weight (max)	10 kg
Automated X-Y stage (medium)	112 x 75 mm
Automated X-Y stage (large)	150 x 150 mm
Manual Tip / Tilt (Standard)	+/- 4 Degrees

### System Dimensions

Full System Dimensions (floor space)	530 mm wide x 530 mm deep x 850 mm high
Temperature (storage)	10 - 50°C
Temperature (operating)	15 - 30°C
Temperature Gradient	< 1°C / hour (for best measurement capability)
Humidity	< 70% non-condensing
Vibration	Anti-vibration supplied as standard



<sup>1</sup> As demonstrated by multiple measurements on a levelled fused silica optical flat

<sup>2</sup> As demonstrated by 1 sigma Std Dev of 20 Sq (RMS) measurements on SiC flat

## 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

- **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

### For the above services, contact our Center of Excellence:

email: [taylor-hobson.cofe@ametek.com](mailto:taylor-hobson.cofe@ametek.com)  
or call: +44 116 276 3779

- **Design engineering**  
special purpose, dedicated metrology systems for demanding applications
- **Precision manufacturing**  
contract machining services for high precision applications and industries
- **Preventative maintenance**  
protect your metrology investment with a Talycare service cover plan

### For the above services, contact our Sales Department:

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