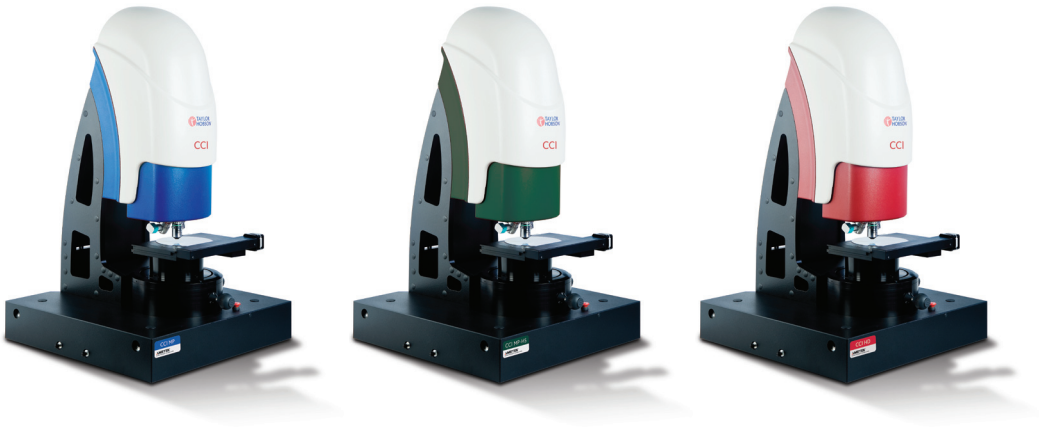
AMETEK®
ULTRA PRECISION TECHNOLOGIES

TAYLOR HOBSON®

# CCI system specifications



| System | CCI MP | CCI MP-HS | CCI HD |
|---|---|---|---|
| Measurement type | 3D non-contact | | |
| Measurement mode | Coherence Correlation Interferometry (CCI) | | |
| Z scanner | Ultra high precision closed loop piezoless scanner | | |
| Objective mount | 3 position turret | | |
| X/Y Stage | Automatic | | |
| Z stage | Automatic | | |

| Performance | CCI MP | CCI MP-HS | CCI HD |
|---|---|---|---|
| Single scan range (Z) | 2.2 mm as standard (closed loop) | | |
| Z-stitching range | Up to the working distance of the lens (current maximum is 40 mm) | | |
| Z-resolution (max) | 0.01 nm | | |
| Noise floor (Z) [1] | <0.08 nm [0.8 Å] | <0.05 nm [0.5 Å] | <0.02 nm [0.2 Å] |
| Repeatability of surface RMS [2] | <0.01 nm [0.1 Å] | <0.01 nm [0.1 Å] | <0.01 nm [0.1 Å] |
| Number of measurement points | 1024 x 1024 | 1024 x 1024 | 2048 x 2048 |
| Step height repeatability [3] | <0.02% | <0.02% | <0.02% |
| Surface reflectivity | <0.3[4] % - 100% | <0.3[4] % - 100% | <0.3[4] % - 100% |

[1] As demonstrated by multiple measurements on SiC flat
[2] Standard deviation of 20 Sq (RMS) measurements on SiC flat
[3] Standard deviation of 20 measurements on a 5 µm step height standard
[4] Based on certified standard. Actual value is much lower

Other configurations are available upon request – please contact your local Taylor Hobson representative.

**Specifications subject to change without prior notice.**

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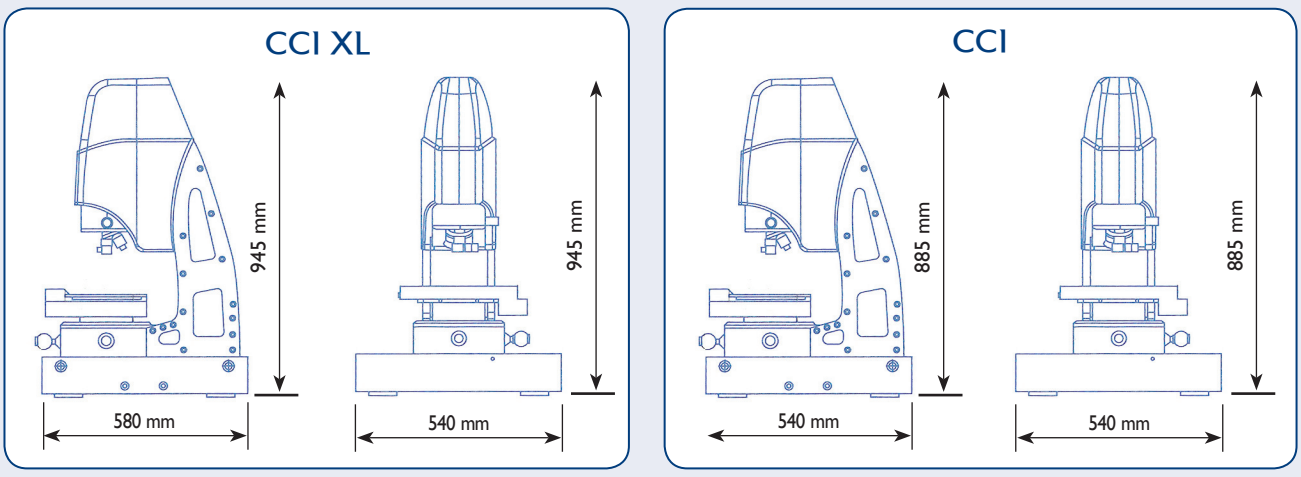
| Software | CCI MP | CCI MP-HS | CCI HD |
|---|---|---|---|
| Roughness | Yes | Yes | Yes |
| Step height analysis | Yes | Yes | Yes |
| Super smooth surface analysis | Yes | Yes | Yes |
| Thick film analysis ( >1.5 microns) | Optional | Optional | Yes |
| Films and materials ( >50 nm) | No | No | Optional |
| Stitching | Yes | Yes | Yes |
| Multi-site | Yes | Yes | Yes |
| Aspheric analysis | Optional | Optional | Optional |
| Asphero-diffractive analysis | Optional | Optional | Optional |

| Stages | CCI MP | CCI MP-HS | CCI HD |
|---|---|---|---|
| Component weight (max) | 10 Kg | | |
| Automated X-Y stage (medium) | 125 mm x 75 mm | | |
| Automated X-Y stage (large) | 150 mm x 150 mm | | |
| Automated X-Y stage (extra large) | 225 mm x 157 mm | | |
| Manual tip/tilt | 4 degrees | | |

| System dimensions | CCI MP | CCI MP-HS | CCI HD |
|---|---|---|---|
| Temperature (storage) | 10°C - 50°C | | |
| Temperature (operating) | 10°C - 30°C | | |
| Temperature gradient | < 1°C/hour ( best performance) | | |
| Humidity | < 70% non-condensing | | |
| Internal anti-vibration | Advanced pneumatic anti vibration mounts supplied as standard | | |
| External active anti-vibration | Optional | Optional | Optional |

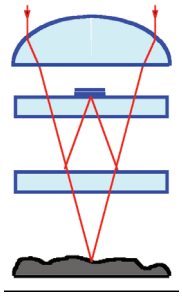
## System dimensions



A range of objective lenses are available, the choice of lens will depend on the application. The key parameters are:

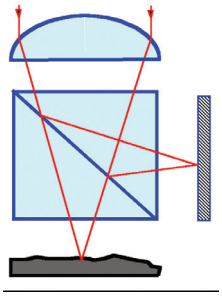
All objective lenses are supplied with protective storage.

**Mirau Interferometer**



Magnification
10 X, 20 X, 50 X,
100 X, 111 X lens

**Michelson Interferometer**

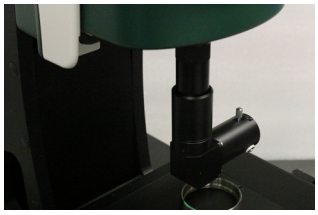


Magnification
5 X, 2.5 X
all LWD lenses

| | |
|---|---|
| Lens | The names of the lens are traditionally given as a magnification. This can be misleading as the interferometer design will dictate the system performance including features such as field of view and maximum angle. A 5x lens on one system may have a similar field of view as a 10x lens on another. |
| Field of view | Area of the sample measured by a given objective |
| Optical resolution | The ability to distinguish adjacent features |
| Pixel size | Sample resolution, pixel pitch (spatial sampling interval) |
| Slope | Maximum specular slope is restricted by pixel size and numerical aperture. The fact that maximum measurable slope can be dictated by pixel size means that it needs to be considered when comparing specifications.<br>Steeper slopes can be measured on non-specular surfaces due to scattering of the light. The actual slope maximum and amount of missing data depends on the type of surface finish. Because of the complex nature of the relationship between surface finish and data quality it is best to test the sample experimentally. |
| Working distance | Distance between sample and lens |
| NA | Numerical aperture, expresses the angular aperture of the lens |
| Design | Type of interferometer used, Michelson or Mirau |

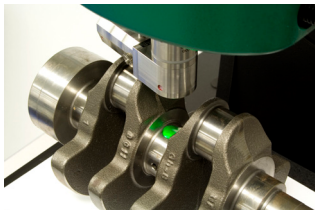
## Special lenses

### 1.5x LWD lens



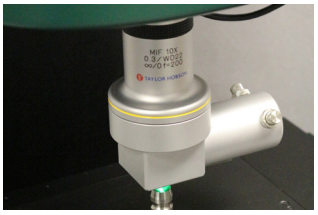
The 1.5x lens offers a 10.5 mm x 10.5 mm FOV with a 0.045 NA and working distance of 23 mm. The lens is ideal for measuring large sealing surfaces either as a single measurement or combined with AutoStitch. It is only suitable for use with the XL systems

### 5x ULWD lens



The 5X ULWD(40 mm) lens is ideal for measuring down steep trenches or pits. It is also ideal for measuring the roundness and cone angle of suitable diesel injector cones. The lens has the same FOV as other 5x lenses and an NA of 0.12.

### 10x LWD lens



The 10x LWD (22 mm) has the same field of view and NA as the standard 10x lens. It is ideal for measuring surface finish inside deep trenches or pits.

## CCI MP

| Lens | Field of view (mm) | Optical resolution (um) | Pixel size (um) | Slope (max*) (deg) | Working distance (mm) | NA | Design |
|---|---|---|---|---|---|---|---|
| 2.5x | 6.92 x 6.92 | 5.4 | 6.8 | 2.2 | 10.3 | 0.075 | Michelson |
| 2.5x LWD | 6.92 x 6.92 | 5.4 | 6.8 | 2.2 | 31 | 0.075 | Michelson |
| 5x | 3.46 x 3.46 | 3.1 | 3.4 | 4.3 | 9.3 | 0.13 | Michelson |
| 5x LWD | 3.46 x 3.46 | 3.1 | 3.4 | 4.3 | 26 | 0.13 | Michelson |
| 10x | 1.73 x 1.73 | 1.3 | 1.7 | 8.5 | 7.4 | 0.3 | Mirau |
| 20x | 0.865 x 0.865 | 1.0 | 0.85 | 16.1 | 4.7 | 0.4 | Mirau |
| 50x | 0.346 x 0.346 | 0.4 - 0.6 | 0.34 | 27.8 | 3.4 | 0.55 | Mirau |
| 100x | 0.173 x 0.173 | 0.3 - 0.5 | 0.17 | 37.4 | 2 | 0.7 | Mirau |
| 111x | 0.16 x 0.16 | 0.3 - 0.5 | 0.15 | 45.2 | 0.7 | 0.8 | Mirau |

## CCI MP-HS

| Lens | Field of view (mm) | Optical resolution (um) | Pixel size (um) | Slope (max*) (deg) | Working distance (mm) | NA | Design |
|---|---|---|---|---|---|---|---|
| 2.5x | 6.4 x 6.4 | 5.4 | 6.3 | 2.8 | 10.3 | 0.075 | Michelson |
| 2.5x LWD | 6.4 x 6.4 | 5.4 | 6.3 | 2.8 | 31 | 0.075 | Michelson |
| 5x | 3.2 x 3.2 | 3.1 | 3.1 | 5.6 | 9.3 | 0.13 | Michelson |
| 5x LWD | 3.2 x 3.2 | 3.1 | 3.1 | 5.6 | 26 | 0.13 | Michelson |
| 10x | 1.6 x 1.6 | 1.3 | 1.6 | 11.1 | 7.4 | 0.3 | Mirau |
| 20x | 0.8 x 0.8 | 1.0 | 0.79 | 18.6 | 4.7 | 0.4 | Mirau |
| 50x | 0.32 x 0.32 | 0.4 - 0.6 | 0.31 | 27.8 | 3.4 | 0.55 | Mirau |
| 100x | 0.16 x 0.16 | 0.3 - 0.5 | 0.16 | 37.4 | 2 | 0.7 | Mirau |
| 111x | 0.15 x 0.15 | 0.3 - 0.5 | 0.14 | 45.2 | 0.7 | 0.8 | Mirau |

## CCI HD

| Lens | Field of view (mm) | Optical resolution (um) | Pixel size (um) | Slope (max*) (deg) | Working distance (mm) | NA | Design |
|---|---|---|---|---|---|---|---|
| 2.5x | 6.6 x 6.6 | 5.4 | 3.3 | 3.5 | 10.3 | 0.075 | Michelson |
| 2.5x LWD | 6.6 x 6.6 | 5.4 | 3.3 | 3.5 | 31 | 0.075 | Michelson |
| 5x | 3.3 x 3.3 | 3.1 | 1.65 | 6.0 | 9.3 | 0.13 | Michelson |
| 5x LWD | 3.3 x 3.3 | 3.1 | 1.65 | 6.0 | 26 | 0.13 | Michelson |
| 10x | 1.65 x 1.65 | 1.3 | 0.83 | 14.3 | 7.4 | 0.3 | Mirau |
| 20x | 0.825 x 0.825 | 1.0 | 0.415 | 19.4 | 4.7 | 0.4 | Mirau |
| 50x | 0.33 x 0.33 | 0.4 - 0.6 | 0.165 | 27.8 | 3.4 | 0.55 | Mirau |
| 100x | 0.165 x 0.165 | 0.3 - 0.5 | 0.0823 | 37.4 | 2 | 0.7 | Mirau |
| 111x | 0.15 x 0.15 | 0.3 - 0.5 | 0.074 | 45.2 | 0.7 | 0.8 | Mirau |

* Data shown is for specular surfaces. Rough surfaces with much steeper slopes (up to 89 degrees) can be measured but the nature of the roughness will affect the maximum angle and the data quality.

Other objective lenses are available upon request – please contact your local Taylor Hobson representative.

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