Dynamic Surface Roughness Profiler

**Portable, Precise Roughness Metrology**

The NanoCam™ HD dynamic profiler measures surface roughness on small to meter scale coated and uncoated optics, precision metals, plastics, and other polished specular surfaces with sub-angstrom level repeatability and precision.

Providing unmatched flexibility, the light weight NanoCam HD can be easily positioned on large parts by hand, or mounted on a gantry or robotic arm to measure

- anywhere on large, complex objects
- inside production stations and polishing equipment
- multiple parts arrayed on a table
- directly on large optics

Portability and on-machine capability significantly reduce the handling and transportation of large optics, increases throughput and dramatically reduces the risk of damage to expensive, critical optics.

**Simple Operation**

New autofocus capability allows for faster, more consistent measurements requiring fewer manual adjustments. Measure parts with reflectivity from 0.5% to 100% without changing reference optics. Single cable, power over ethernet operation can be combined with high speed innovative software for data acquisition and analysis in a laptop environment for added portability.

Utilizing a Linnik configuration, NanoCam HD interference objectives provide superior lateral resolution over a larger field of view with greater working distance and surface measurement fidelity than comparable Mirau objectives.

**Optional Robot Package**

This dynamic surface roughness profiler quickly integrates to popular collaborative robots from Fanuc™ for rapid data acquisition and automatic data logging along programmed measurement paths. On a robot, the profiler can measure inside a large volume, across a large plane or sphere, on large, complex shapes—even upside down.

**Vibration Insensitive Performance**

The NanoCam HD’s Dynamic Interferometry® uses a high resolution camera and patented instantaneous phase sensor. A typical acquisition can be thousands of times faster than a conventional optical profiler enabling measurement without vibration isolation. Ideally suited for mounting in polishing equipment, on robots, or placed directly on optics.

**Industry Leading Analysis, Standard**

New 4Sight Focus™ analysis software features a user-friendly interface for rapid data acquisition and analysis of ISO 25178 S (surface roughness) parameters. Intuitive masking and filtering make it easy to investigate and quantify surface structure and roughness features.

**Accessories**

Select from 0.9X through 20X LWD objectives. Glass-compensated objectives make measurements through cover glass. 50X objectives may be custom ordered. Accessorize with a motorized, joystick controlled tripod, mobile workstation, or interfaces for polishing equipment, gantries or robots.

**FEATURES**

- Vibration insensitive dynamic operation
- 5 Megapixel, 12-bit, low-noise camera
- High speed auto-focus
- 460 nm pulsed LED source
- Motorized, joystick controlled tip/tilt/Z tripod
- Workstation, gantry, robot mountable Interfaces

**APPLICATIONS**

- Portable ISO 25178 roughness measurement for optics
- 3D, sub-angstrom measurements on optics of any size
- On-machine polishing measurements, or inside automated metrology cells
Specifications

Configuration | NanoCam HD
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Description | Vibration insensitive dynamic surface profiler
Acquisition Mode | Pixelated phase sensor
Light Source | Pulsed LED at 460 nm
Sample Reflectivity | 0.5%–100%
Camera | 5 Mpix, 3.45 µm pixels, 12-bit
Fine Focus | Motorized autofocus
Computer System | High performance PC with 22 in LCD monitor / Laptop optional
System Software | 4Sight™ Focus Analysis Software

| ISO 25178, ASME B46.1-2019 surface roughness parameters, PV, Ra 2D profiles and 3D surface maps Reference generation, subtraction, data averaging 4D data format standard, others supported including: .hs, .opd, .dat, .csv and .txt

| Instantaneous phase shifting data acquisition in robotic environment, database automatically logs data

| Upgrades free during warranty period

| Physical Envelope | <25 x 25 x 9 cm (9.6 x 9.6 x 3.3 in)

| Weight | < 5.3 kg (11.5 lbs)
| Power Consumption | < 12 Watts instrument

| Temperature Range | Operational: 16–27° C (60–80° F), non-condensing Storage: −1–38° C (30–100° F), non-condensing

| Options | Objectives Long working distance, interferometric objectives
| Configurations | Optional joystick-controlled tripod with ± 7° tip/tilt, ± 19 mm (0.75 in) z travel; mobile workstation; dovetail or Schunk mount for robots, gantries, or on-machine interfaces
| Calibration Mirror | <1 Å super-smooth mirror
| Extended Cables | 5 m standard, 10 m optional

| System Performance | Minimum Exposure | < 28 μsec
| Vertical Range | 115 nm step max
| RMS Repeatability ¹ | < 0.005 nm
| RMS Precision ² | < 0.1 nm

Warranty One-year, limited, extendable; on-site system installation and operator training

| Long Working Distance Interference Objectives ³ |
| Magnification | 0.9X | 2.0X | 5X | 10X | 20X |
| Configuration | Michelson | Michelson | Linnik | Linnik | Linnik |
| Numerical Aperture | 0.026 | 0.055 | 0.15 | 0.30 | 0.45 |
| Working Distance (mm) | 15.0 | 23.0 | 23.0 | 17.0 | 4.5 |
| Optical Resolution at 460 nm (µm) ⁴ | 8.8 | 4.2 | 1.5 | 0.77 | 0.51 |
| Spatial Sampling (µm) ⁵ | 3.8 | 1.7 | 0.7 | 0.35 | 0.17 |
| Field of View (mm) (long dimension) | 9.4 | 4.2 | 1.7 | 0.8 | 0.42 |
| Depth of Field at 460 nm (µm) | 1059 | 190.1 | 22.5 | 5.4 | 2.3 |
| Max. Spatial Wavelength (µm) ⁶ | 9445 | 4250 | 1800 | 850 | 425 |
| Min. Spatial Wavelength (µm) ⁶ | 19 | 9 | 3.5 | 1.7 | 0.9 |

1. One sigma for RMS of 10 data sets of calibration mirror, each data set being an average of 32 measurements.
2. Average RMS of the difference of 10 data sets between measured surface and the calibrated surface. Each data set is an average of 32 measurements. Calibrated surface is the pixel by pixel average of 10 measurements of calibration mirror.
3. Specifications based on 2056 x 2464 array size.
4. Optical resolution is based on Sparrow criteria = 0.5λ/NA
5. Spatial Sampling is the camera pixel size divided by objective magnification
6. (Number of pixels * pixel size) / magnification (IAW ASME B46.1)
7. (5 * pixel size) / magnification (IAW ASME B46.1)

Specifications subject to change without prior notice.

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