ZEISS Smartproof 5
Your Integrated Widefield Confocal Microscope
for Surface Analysis in Quality Assurance and Quality Control
The versatile ZEISS Smartproof 5 widefield confocal microscope is your integrated system for surface analysis: fast, precise and repeatable.

Put it to work on a wide range of industrial applications – such as roughness and topographical characterization – that come up every day in QA/QC departments, production environments and R&D labs.

This productive and versatile confocal system is driven by powerful ZEISS Efficient Navigation (ZEN) software to bring you the added benefits of maximum user familiarity and increased productivity.

Integrated & Robust Design
Smartproof 5 gives you the benefit of a fully integrated system design: optics, electronics and camera are all enclosed in the microscope with the number of cables minimized to eliminate clutter. The entire system is built in a compact manner and its sturdy construction withstands vibration so effectively that there is no need for extra anti-vibration equipment.

Guided Workflows
Thanks to the easy to operate system and to workflow routines in software, Smartproof 5 is well suited to production and process monitoring. Teachable inspection jobs and the workflow-oriented graphical user interface (GUI) guide you through recurring tasks and ensure user-independent data acquisition as a basis for precise and repeatable results.

Trusted Output
Because of its patented Spinning Disc, Aperture Correlation technology, Smartproof 5 minimizes the time to result thus providing a perfect balance between high resolution and high speed. Dedicated ZEISS optics and proven components enable you to work effectively across a broad range of applications. Your Smartproof 5 comes with ConfoMap – the ZEISS version of MountainsMap – the gold standard in characterization software. You easily analyze your data according to international standards and create the respective reports. That’s why Smartproof 5 is preferred for routine topography and roughness measurements.
Your Insight into the Technology Behind It

Integrated & Robust Design for Top Performance

Smartproof 5’s robust design offers you the choice of installing and running it in many different working environments – not only in labs but also on the shop floor, even without additional anti-vibration equipment. The scanning stage has a surface area of 300 mm × 240 mm with threaded holes, enabling you to mount holders or fixtures for any parts to be measured. The travel range of 150 mm × 150 mm allows you to analyze different regions on a large part or multiple parts in one pass. Your Smartproof 5 monitors the status of its own mechanical components to ensure optimal performance and preventive detection of potential service issues. The new ZEISS lens class C Epiplan-Apochromat has been especially designed for confocal systems.

These high numerical aperture lenses are optimized for violet light (405 nm) – the wavelength used for widefield confocal imaging – but do also perform excellent in the visible light. These images form the basis for generating topography. True-to-life surface reconstructions can be generated by overlaying texture information generated by wide-field imaging.
Your Insight into the Technology Behind It

Guided Workflows for Precise Navigation
Orientation is always easy with Smartproof 5 thanks to its integrated graphical user interface based on the ZEISS Efficient Navigation (ZEN) software that supports seamless macro-to-detail workflows.

The overview image size is 4 mm × 4 mm, within which you can easily define the position to be measured. You can also set up a coordinate system for performing repeatable examinations of samples in the future. The acquired data is automatically transferred to Confomap software, allowing you to process and analyze the 3D properties of your sample. Your workflow can be saved, ready to perform the same microscopic 3D analysis again and again.
Your Insight into the Technology Behind It

Output You Can Trust, Over and Over Again
Smartproof 5 components are motorized so the software can monitor the status of each component. As a result, workflows for repetitive acquisitions can be set up easily. By using the powerful ConfoMap software, you can analyze geometrical parameters of your sample or carry out roughness analyses in 2D (profile) and 3D (area). The latter are based on ISO standards. Then create your reports with ease using the built-in reporting tools.

ISO 25178

<table>
<thead>
<tr>
<th>Height Parameters</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sq</td>
<td>0.4721 μm</td>
<td>Root-mean-square height</td>
</tr>
<tr>
<td>Sk</td>
<td>0.1800</td>
<td>Skewness</td>
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<tr>
<td>Sku</td>
<td>3.6852</td>
<td>Kurtosis</td>
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<tr>
<td>Sp</td>
<td>2.0156 μm</td>
<td>Maximum peak height</td>
</tr>
<tr>
<td>Sr1</td>
<td>2.2513 μm</td>
<td>Maximum pit height</td>
</tr>
<tr>
<td>Sr2</td>
<td>4.2069 μm</td>
<td>Minimum height</td>
</tr>
<tr>
<td>Sa</td>
<td>0.2677 μm</td>
<td>Arithmetic mean height</td>
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Spatial Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sa</td>
<td>30.2943 μm</td>
<td>Autocorrelation length</td>
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<tr>
<td>Str</td>
<td>0.2669</td>
<td>Texture aspect ratio</td>
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<tr>
<td>Std</td>
<td>8.9688 silent</td>
<td>Texture direction</td>
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</table>

Functional Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sfrac</td>
<td>2.3204%</td>
<td>Areal material ratio</td>
</tr>
</tbody>
</table>

Roughness Parameter according to new standard

Heightmap surface representation

Report with 3D surface and 2D profile

Advanced surface study with Core Roughness analysis
Tailored Precisely to Your Applications

<table>
<thead>
<tr>
<th>Typical Applications, Typical Samples</th>
<th>Task</th>
<th>ZEISS Smartproof 5 Offers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-manufacturing</td>
<td>Measurement of 3D geometrical features</td>
<td>The overview image allows you easy navigation to the region of interest. An extensive set of 3D roughness and measuring tools gives you the ideal means of analyzing small surface regions that are inaccessible to conventional measurement devices.</td>
</tr>
<tr>
<td>Medical Devices</td>
<td>Measurement of roughness on implants</td>
<td>The confocal method used at a very high level of precision enables non-contact roughness measurements on ceramic and metallic surfaces. 3D roughness parameters provide additional important information to guarantee optimal performance of your product.</td>
</tr>
<tr>
<td>Micro-optics</td>
<td>Quantification of form parameters</td>
<td>Confocal imaging allows geometric measurements on soft and sensitive surfaces without modifying the results. ConfloMap software offers a large number of surface characterization parameters.</td>
</tr>
<tr>
<td>Electronics</td>
<td>Qualification of traces</td>
<td>Highly reflective traces on dark substrates can be imaged all at once thanks to the powerful HDR-function. A valid qualification of the geometry can easily be performed.</td>
</tr>
<tr>
<td>Automotive &amp; Aerospace</td>
<td>Roughness, edge and wear measurements</td>
<td>The fast widefield aperture correlated confocal acquisition combined with the fast and very sensitive detector provides fast, precise and accurate measurement results. In addition to the common 2D roughness values, 3D parameters give you a much better understanding of your surface properties.</td>
</tr>
</tbody>
</table>
ZEISS Smartproof 5 at Work

- Laser structured surface, 3D view of color coded height map with texture overlay, C Epiplan-Apochromat 50×/0.95
- 8 nm step height standard, height map, C Epiplan-Apochromat 50×/0.95
- Profile measurement of a circuit board, 3D view with true color overlay, C Epiplan-Apochromat 10×/0.4
- Milled aluminum surface, 3D view with texture overlay, C Epiplan-Apochromat 20×/0.7
- Silver finger on solar cell surface, 3D view of color coded height map with texture overlay, C Epiplan-Apochromat 50×/0.95
- Diffractive optics, color coded height map, C Epiplan-Apochromat 10×/0.4
1 Microscope
Smartproof 5 consisting of:
- Scan head with fine Z-drive and 4-megapixel camera
- Stand with coarse Z-drive

2 Objectives
- EC Epiplan-Neofluar 2.5×/0.06 (always included)
- C Epiplan-Apochromat 5×/0.2
- C Epiplan-Apochromat 10×/0.4
- C Epiplan-Apochromat 20×/0.7
- C Epiplan-Apochromat 50×/0.95
- LD C Epiplan-Apochromat 50×/0.6 (long working distance)
- LD C Epiplan-Neofluar 100×/0.75 (long working distance)

3 Stages
- Scanning stage, 150 mm x 150 mm
- Fixed stage

4 Computer System
- PC system with Smartproof ZEN software
- Monitor
- 3D mouse for control of XYZ axes
## System Overview

### Optical Unit
Containing the fine Z-drive, the illumination with 405 nm, red, green and blue light, the widefield spinning disc aperture correlation module, 4 megapixel camera and 6 times objective nosepiece.

### Objectives
2.5× lens for overview and navigation, 5× to 100× high numerical aperture lenses, specially designed for 405 nm as well as white light.

### Stage
Powered by a stepper motor with integrated controller, which makes it possible to move to relevant areas of the sample in a reproducible manner. Alternatively, a fixed stage is available.

### Stand
Powered by a motorized Z-drive for sample height adjustment and including controlling electronics.

### 3D Mouse
Offering intuitive operation of all XYZ axes, including coarse and fine Z-drive.

### PC
Containing the Smartproof 5 application software and connected to the camera via USB 3 and to the stand via USB 2.

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**System Components**

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### Technical Specifications

#### Image Field According to Objective Magnification

<table>
<thead>
<tr>
<th>Objective Magnification and Numerical Aperture</th>
<th>Field of View (µm × µm)</th>
<th>Working Distance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5×/0.2</td>
<td>2250 × 2250</td>
<td>21</td>
</tr>
<tr>
<td>10×/0.4</td>
<td>1125 × 1125</td>
<td>5.4</td>
</tr>
<tr>
<td>20×/0.7</td>
<td>562 × 562</td>
<td>1.3</td>
</tr>
<tr>
<td>50×/0.95</td>
<td>225 × 225</td>
<td>0.22</td>
</tr>
<tr>
<td>50×/0.6</td>
<td>225 × 225</td>
<td>7.6</td>
</tr>
<tr>
<td>100×/0.75</td>
<td>112 × 112</td>
<td>4.0</td>
</tr>
</tbody>
</table>

#### Image Pixel Resolution

2048 x 2048 pixels

#### Lateral Resolution (Line-space Pattern) Using 50×/0.95

0.13 µm

#### Lateral Measurement Uncertainty

±0.1 µm ±0.008 x L (or better)

#### Vertical Measurement Uncertainty

±0.1 µm ±0.012 x L (or better)

#### Movement Resolution of Z-Drive

1 mm

#### Illumination

405 nm LED for confocal imaging and RGB LEDs for color imaging

#### Camera Frame Rate

50 fps at 2048 x 2048 pixels using USB 3

#### Color Depth

10 bit

#### Height Scanning Range

Up to 5 mm

#### Maximum Height of Work Piece

100 mm

#### Maximum Weight of Work Piece

5 kg

#### Scanning Stage Size and Travel Range in X and Y

300 mm x 240 mm

150 mm x 150 mm

#### Image Data Processing and Measurements

- 2D: distance, height, angle, constructed elements, profile roughness based on ISO 4287
- 3D: lateral distances, 3D distance, height, angle, constructed points, area, volume, areal roughness according to ISO 25178
- Additional: Alignment, form removal, filters, noise cut, reporting.

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1) When measuring a standard sample with C-Epiplan-Apochromat 50×/0.95 under setup conditions recommended in the user manual.

2) When using the "accurate"-mode for acquisition.
By choosing Smartproof 5 from ZEISS, you’ve put reliability and availability among your top priorities for quality assurance and quality control.

**Your Performance. Our Support.**
Your Smartproof 5 is designed for a long, productive life. However, should you ever have a question about the technology or how to use it, a dedicated team of experts will be available by phone, e-mail or remote access.

**Because Your Standards Are Uncompromising: Service Agreements with Connected Assistance**
If you rely on a high level of availability, you are well served by our ZEISS Protect Service Agreements. You can be sure of priority service and shorter response times as well as rapid repairs – and with Protect premium, all of that comes for a flat fee.