Optical Interferometric Microscope System
BW-S500/BW-D500 Series

BW-S500
Optical Interferometric Microscope System

BW-D500
Series
Nikon’s proprietary scanning-type optical interference measurement technology achieves 1 pm* height resolution.

* Height resolution specified by algorithm

Quickly and accurately measures surface profile from sub-nano to millimeter height ranges, using a single measurement mode. Fully supports high-precision processing technology and advanced material development of the Materials Science field.

High-precision/high-speed image acquisition via a two beam interference objective lens

The BW-S500 / D500 series uses a two beam interference objective lens and Nikon’s proprietary algorithms to acquire height images with high speed and precision.

1 Interference created by two beam interference objective lens

By overlaying the light returning from the reference mirror inside the objective lens and the light returning from the sample, the two beams overlap at the focal position and create interference.

2 Focal position is determined with high precision from the interference waveform

The brightness of the interference is highest at the focal position (0-order interference position). The two beam interference objective lens is moved gradually by a piezo mechanism, and the position of greatest brightness is detected simultaneously and with ultra precision by all of the imaging elements.

3 Height information mapping

The focal position information acquired by each imaging element is mapped, and the surface profile of the sample is depicted in pseudocolor.

Six models available to match application and cost

Both the BW-S and BW-D are available in the six types shown below.

|       | Piezo driven | Scanning
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Objective lens drive</td>
<td>Nosepiece drive</td>
</tr>
<tr>
<td>BW-S501/BW-D501</td>
<td>○</td>
<td>○</td>
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<tr>
<td>BW-S502/BW-D502</td>
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<td>BW-S503/BW-D503</td>
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<tr>
<td>BW-S505/BW-D505</td>
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<tr>
<td>BW-S506/BW-D506</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>BW-S507/BW-D507</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Both the BW-S and BW-D are available in the six types shown below.

<table>
<thead>
<tr>
<th></th>
<th>Electric Z axis</th>
<th>Electric XY axis</th>
<th>Nosepiece drive piezo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S02/S03/S04/S07</td>
<td>S03/S07</td>
<td>500/506/507</td>
</tr>
</tbody>
</table>

Enables measurement of steps in excess of 100 µm (piezo scanning range).

Enables wide-area analysis through the stitching of multiple height images.

An affordable objective lens drive piezo is also available.

BW-S501/BW-S502/BW-S503/BW-S505/BW-S506/BW-S507

General-purpose model with high-pixel resolution that measures both smooth and rough surfaces.

Delivers super high-resolution height measurement with 4.19 Mpixel high-resolution camera.

BW-D501/BW-D502/BW-D503/BW-D505/BW-D506/BW-D507

With its high-speed and high-precision, this model is suited for measurements of smooth surfaces such as glass and wafers. Delivers with a 2000 fps high-speed camera.

BW-S501/BW-S502/BW-S503/BW-S505/BW-S506/BW-S507

With its high-speed and high-precision, this model is suited for measurements of smooth surfaces such as glass and wafers. Delivers with a 2000 fps high-speed camera.

BW-D501/BW-D502/BW-D503/BW-D505/BW-D506/BW-D507

With its high-speed and high-precision, this model is suited for measurements of smooth surfaces such as glass and wafers. Delivers with a 2000 fps high-speed camera.
High Accuracy and Repeatability

The BW-S500/BW-D500 series is calibrated by an 8 nm or 8 µm VLSI Step Height Standards sample, certified by the NIST. Achieves extremely high accuracy and repeatability as a height measurement system.

Calibrated Value (NIST) : 8.9 nm ±0.6 nm
Average Value by BW-S507: 8.906 nm (10 times/0.031 nm)

1pm height resolution achieved at magnifications from 2.5× to 100×

Ultra high-precision allows for measurement of grade-0.1nm 3D roughness Sa from minimum magnification (4.4 mm) to maximum magnification (111 µm).

Wide region configuration analysis with stitching

Electric XY stage and “Digital Stylus Imager 3” software allow stitching with BW-S503/507 and BW-D503/507. Stitching can be done in both vertical and horizontal direction.

Coin (5×5 Stitching)
**Analytical software** spanning basic measurement to advanced analysis

**Image Transformer**
- Performs automatic measurement of distance, height and angle between two points specified by the cursor, as well as two-dimensional roughness (Ra, Rq, Rs) / three-dimensional roughness (Sa, Sq, Ss)
- Display of cross-section profile and measurement results at position specified on the height image

**Zernike Polynomial Analyzer**
- From the height image of a spherical sample, the ideal spherical surface curve (geometric shape) for the sample’s form is calculated, allowing analysis of the sample’s surface roughness.
- Display of the volume and area of specified indentations and protrusions

**Optical Ray Tracer**
- From a simulation of light rays when light is shone on the backside of a sample with transparent layers, other data can be analyzed for the specified cross section.
- Display of cross-section profile and measurement results at position specified by the cursor, as well as two-dimensional roughness (Ra, Rq, Rs) / three-dimensional roughness (Sa, Sq, Sz)

**Geometric Parameter Measurement**
- Through area and volume measurement of an irregular portion, as well as simultaneous analysis of the shapes of multiple irregular portions, uniformity and unevenness can be ascertained.
- The acquired height image is displayed in 3D.

**Surface Texture Analyzer**
- The low frequency / high frequency components of the height image can be ascertained.
- As simultaneous analysis of the shapes of multiple irregular portions, uniformity and unevenness can be ascertained.
- Display of the volume and area of specified indentations and protrusions

**Layer Thickness Analyzer**
- Analysis of transparent films can be performed to ascertain the surface shape of each layer and investigate the film thickness distribution. Measurement of multiple layers is possible.

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**Specifications**

<table>
<thead>
<tr>
<th>BW-LV150N</th>
<th>BW-FMA</th>
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</thead>
<tbody>
<tr>
<td>Dimensions (W×D×H)</td>
<td>500×560×700 mm / 23 kg</td>
</tr>
<tr>
<td>Travel Range</td>
<td>1022×1022×1022 mm</td>
</tr>
<tr>
<td>Power Source</td>
<td>230 V±10%/50 Hz</td>
</tr>
<tr>
<td>Resolution</td>
<td>8 nm</td>
</tr>
<tr>
<td>Step Measurement Reproducibility</td>
<td>15 pm (0.015 nm)</td>
</tr>
<tr>
<td>Height Measurement Time</td>
<td>2 seconds</td>
</tr>
<tr>
<td>Height Measurement Range (Two Beam Interference Objective Lens 1 Field of View)</td>
<td>90 µm lens working</td>
</tr>
<tr>
<td>Optical Source</td>
<td>White light interferometry</td>
</tr>
<tr>
<td>Measurement Optical System</td>
<td>White light interferometry</td>
</tr>
<tr>
<td>Height Resolution</td>
<td>1 pm (0.001 mm)</td>
</tr>
<tr>
<td>Effective Field of View</td>
<td>1022×1022 mm</td>
</tr>
<tr>
<td>Optical Microscope Unit</td>
<td>Two beam interference objective lenses (1 Field of View)</td>
</tr>
<tr>
<td>Digital Enlargement</td>
<td>2046×2046, 1022×1022 (selectable via software)</td>
</tr>
<tr>
<td>CMOS USB 3.0 camera</td>
<td></td>
</tr>
</tbody>
</table>

**Zernike Polynomial Analyzer**
- The acquired height image is displayed in 3D.
- The height image and the calculated geometric shape are compared, and surface roughness is detected.

**Optical Ray Tracer**
- Measurement of multiple layers is possible.
- The height image and the calculated geometric shape are compared, and surface roughness is detected.

**Layer Thickness Analyzer**
- Analysis of transparent films can be performed to ascertain the surface shape of each layer and investigate the film thickness distribution. Measurement of multiple layers is possible.
Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. May 2019 ©2014-2019 NIKON CORPORATION
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*Products: Hardware and its technical information (including software)

⚠️ WARNING ⚠️
TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING THE EQUIPMENT.

ISO 14001 Certified for NIKON CORPORATION
ISO 9001 Certified for NIKON CORPORATION
Industrial Metrology Business Unit