



CNC Video Measuring System

# NEXIV

## VMZ-K Series

Confocal Model



# NEXIV VMZ-K Series

## 3D FOV Measurements Generated with Confocal Images

A ground-breaking multifunctional video measuring system developed on the strength of Nikon's leading optomechanics technology.

- Combines confocal optics and brightfield optics, for fast and accurate evaluation of fine three-dimensional geometries

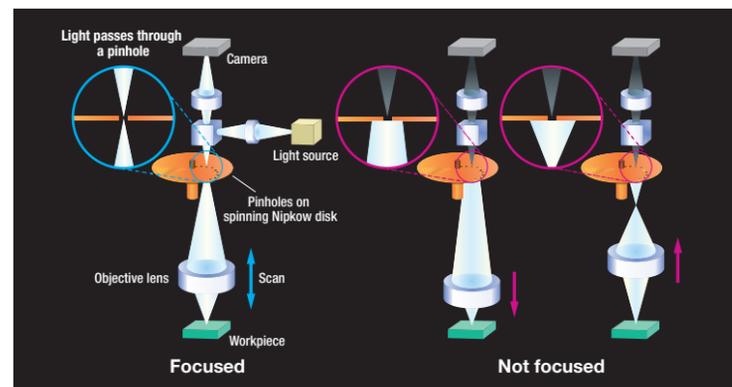
- Allows both 2D and height measurements in the same field of view

This series can be optimally used for inspecting precise 3D-shaped samples, including micro bumps, circuit patterns, and bonding wires, as well as samples with countless points, such as probe cards.

The VMZ-K series can also measure both the shallow recesses and gentle ledges on PCBs.

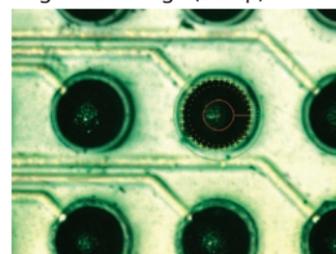
### Principle of Confocal Optics

Light passing through a pinhole on a spinning Nipkow disk is reflected by the workpiece at the focal point, back through the pinhole. This light is detected as a very narrow DOF confocal image by the camera. If there is no workpiece at the focal point, the light does not reflect back through the pinhole. By moving the focal plane in the vertical direction, the Confocal NEXIV VMZ-K series samples multiple confocal images and combines them to compose a confocal image with height information, provided by Nikon's unique interpolation technology.

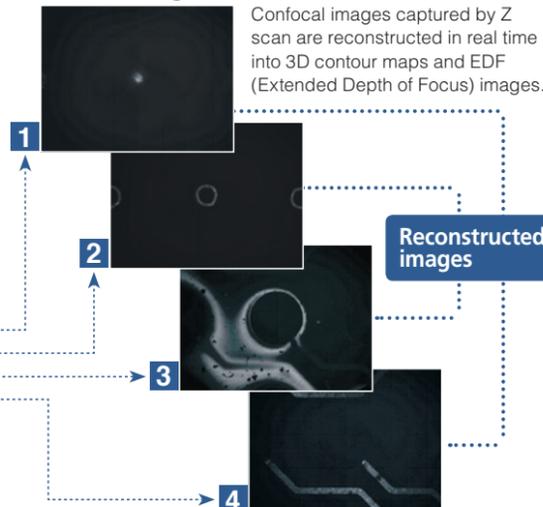


Nikon-Original Low Flare Confocal Optics

Brightfield Image (Bump)

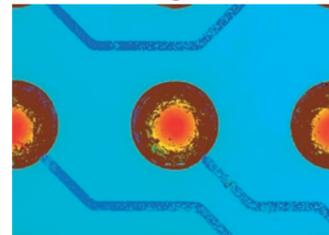


Confocal Image

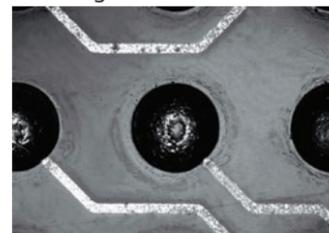


Confocal images captured by Z scan are reconstructed in real time into 3D contour maps and EDF (Extended Depth of Focus) images.

3D Contour Image



EDF Image



The VMZ-K series enables microscopic height measurements using various objective lenses, with two models to choose from, each featuring different stage strokes.

### VMZ-K3040 Type-S/Type-H

#### Main Features

General model for a wide range of needs

#### Main Applications

- Microscopic bumps in advanced IC packages
- Probe cards
- Precision optical components
- Microscopic laser marks on semiconductor wafers
- MEMS
- Wire bonding



### VMZ-K6555 Type-S/Type-H

#### Main Features

Handles printed circuit board sizes with its 650 x 550 mm stroke

#### Main Applications

- PCB with precise circuit patterns
- Probe cards
- LCD-related components



### Objectives

Nikon offers five different objective types, enabling users to choose the optimal magnification model for the application.

		Type-S			Type-H		
Magnification		1.5x	3x	7.5x	15x	30x	
Working Distance		35 mm *1	24 mm	5 mm	20 mm	5 mm	
Field of View	Confocal	8 x 6 mm	4 x 3 mm	1.6 x 1.2 mm	0.8 x 0.6 mm	0.4 x 0.3 mm	
	Brightfield	8 x 6 to 0.53 x 0.4 mm	4 x 3 to 0.27 x 0.2 mm	1.6 x 1.2 to 0.11 x 0.08 mm	1.26 x 0.95 to 0.1 x 0.074 mm	0.63 x 0.47 to 0.05 x 0.04 mm	

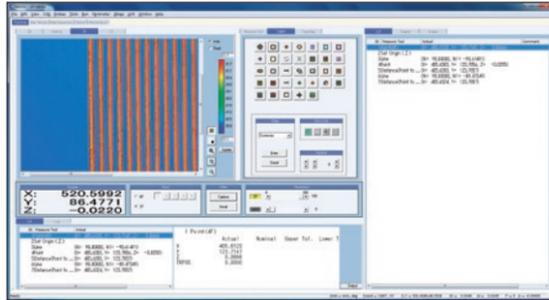
\*1: Ring illumination only has a traveling distance of 24 mm.

Field of View	W (mm) x L (mm)	8	4	2.0	1.6	1.26	1.00	0.8	0.63	0.53	0.4	0.27	0.20	0.11	0.100	0.05	Working distance
Type S	1.5 x	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	24 mm
	3 x	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	24 mm
	7.5 x	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	5 mm
Type H	15 x	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	20 mm
	30 x	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	5 mm

● Brightfield ● Confocal/Brightfield

## High performing GUI and sophisticated software functionality provides the easiest and quickest 3D metrology

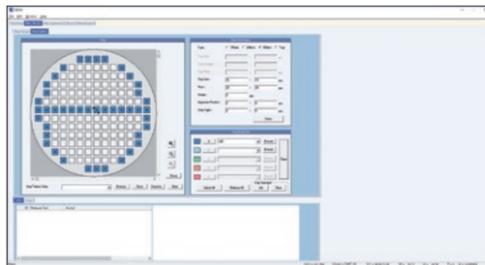
### Teaching Generation/Replay



- Both 2D measurement of brightfield images and height measurement of 3D images are possible in the same field of view, at high speeds and with high accuracy.
- In addition to the measurement tools employed by the NEXIV series, 3D feature measurement tools are available for diverse workpiece shapes, such as ball/flat bumps, bonding wires, and probe card pins. The optimized algorithms for measurement sequence enable simultaneous measurement of multiple points in the field of view.
- Measurement results are stored as CSV format ASCII data for Data Reporting/SPC Analysis.

## User-friendly operations enhance efficiency of semiconductor wafer and PCB chip measurements.

### Map Recipe Generation



Wafer



PCB Chip Map

- Any chip on the generated map can simply be measured by inputting chip size and pitch.
- Map generation can also be done on PCBs, composed of groups of chips.

### Map Measurement Execution

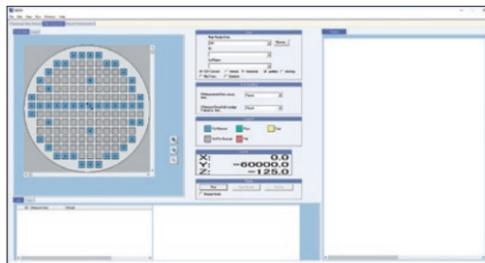
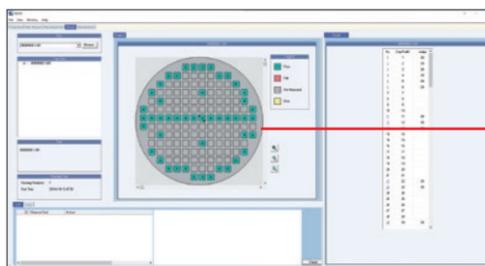


Image Tab

- A specified die can be easily measured by inputting map recipe file, ID, and lot number.
- The workpiece being measured can be viewed by changing to the image tab.

### Measurement Result Review

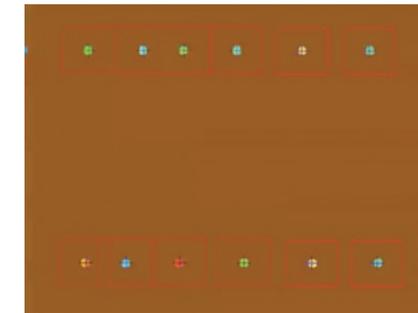


Measurement Result

- The accept/reject status of every die can be graphically reviewed on the map.
- A result screen is shown when a die is selected, making it easy to verify each die's measurement results.

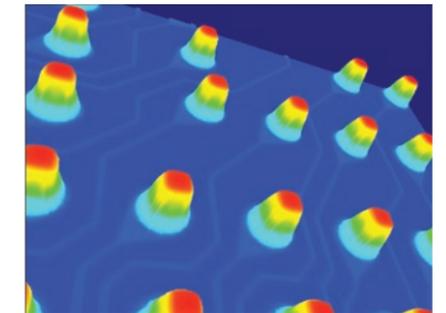
### Probe Cards

Programming can be made from location data in one click. XYZ coordinates and coplanarity contact probe pins on probe cards be automatically measured with unique image processing tools.



3D Image

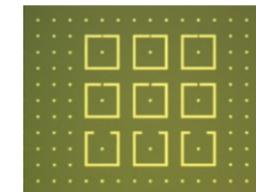
### Wafer Level Packages



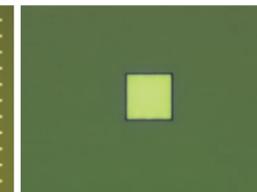
Bird's-eye View Image with 3D Viewer Software (option)

### Fine Bump and Substrate Pattern

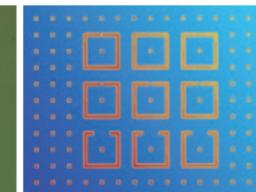
A combination of 2D measurement with 15x zoom brightfield image and 3D height measurement in the same field of view enables diverse measurements.



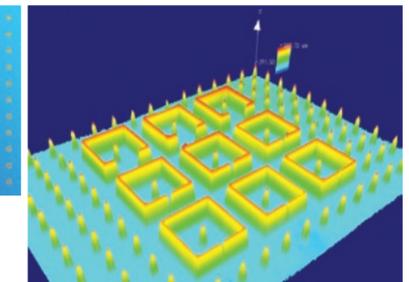
Brightfield Image (minimum magnification)



Brightfield Image (maximum magnification)

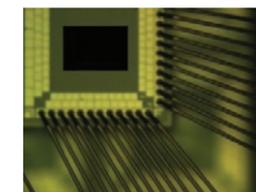


3D Image

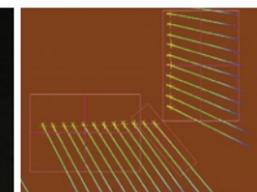


Bird's-eye View Image by 3D Viewer Software (option)

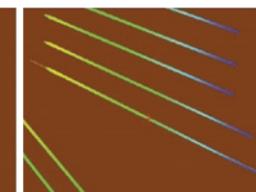
### Bonding Wire Loop Height



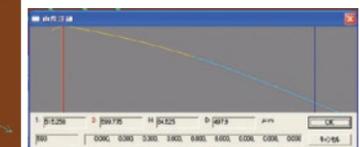
Brightfield Image



3D Image: simultaneous detection of the highest point of all wires



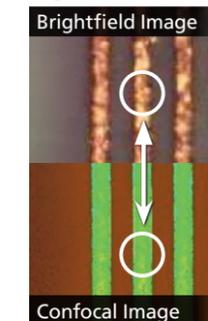
3D Image: display of wire height profile



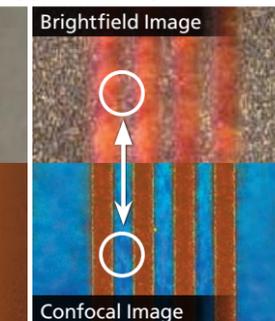
### Precise PCB Pattern

Accurate measurement of high contrast samples tends to be difficult with brightfield illumination because their edges appear unclear. Confocal optics enables a clear display, and facilitates accurate detection of sample edges.

#### High Contrast Sample (copper wire on print board)



Brightfield Image

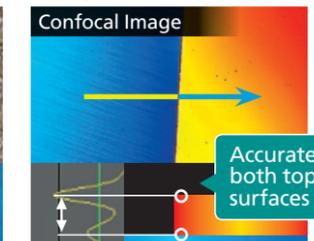


Confocal Image

Focus on Upper Area (with high contrast)

Focus on Lower Area (with low contrast)

#### Transparent sample (thin film)

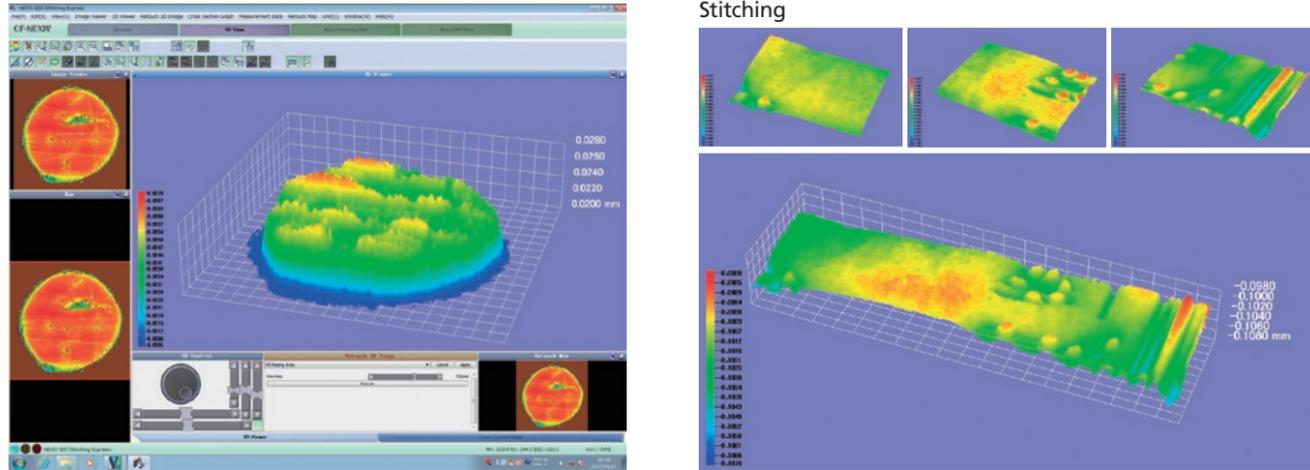


Accurately detect both top and bottom surfaces of thin film

Capable of measuring thickness of thin film

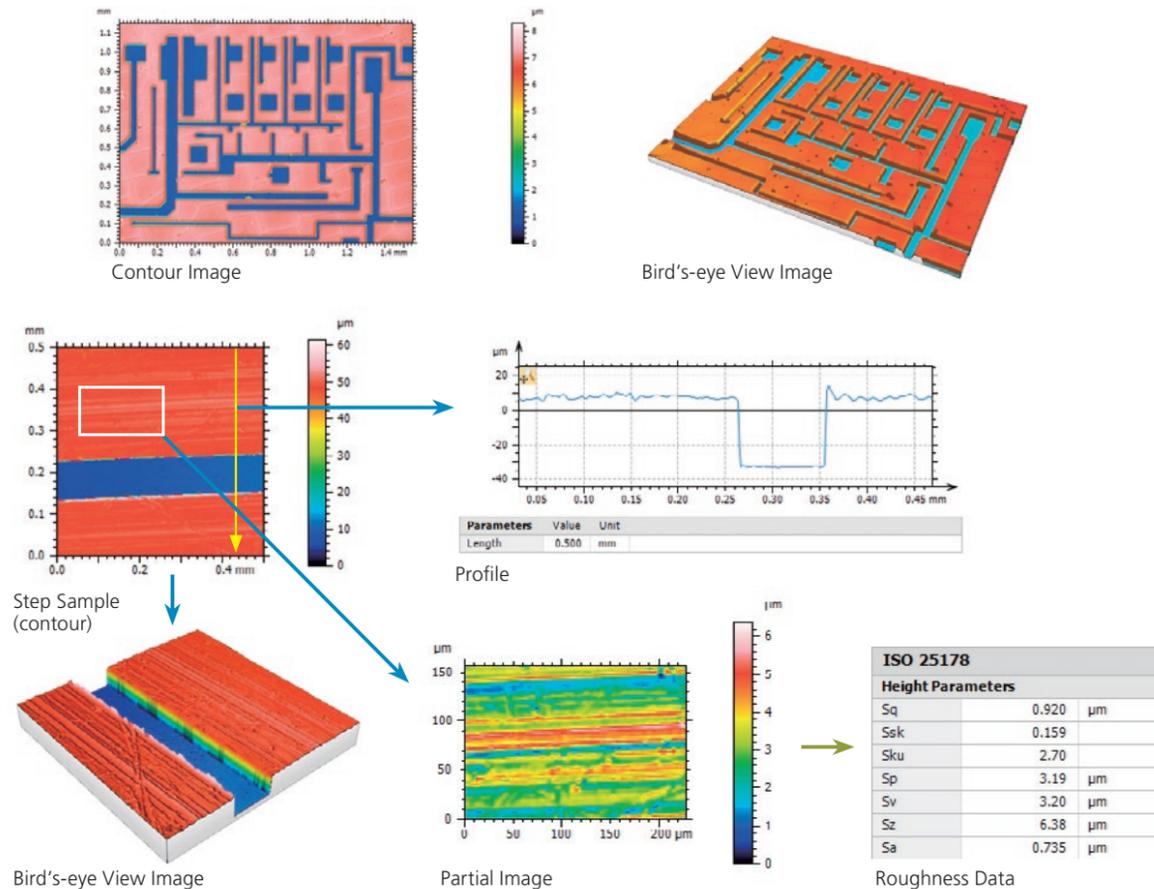
## Image Archiving and Processing Software - EDF/Stitching Express

The EDF/Stitching Express software creates an image archiving library for confocal and brightfield images, and provides post-image processing functionalities, such as EDF and large-area image stitching.



## 3D Surface Metrology Analysis Software - MountainsMap X

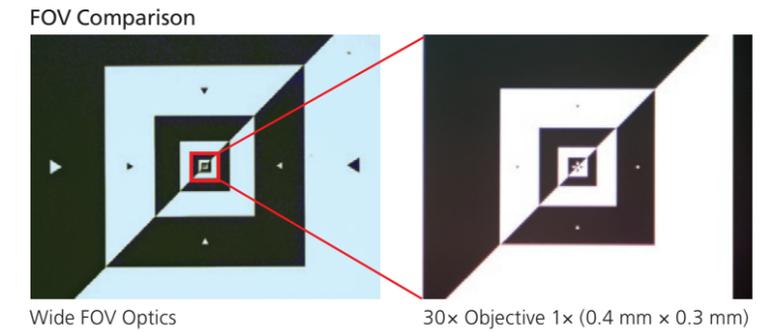
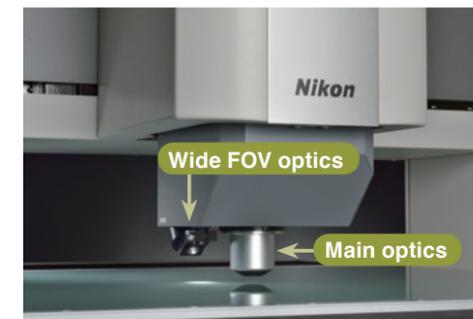
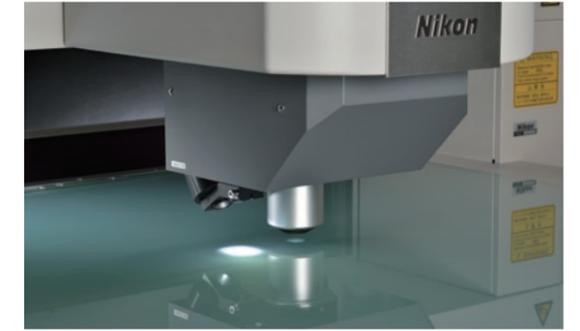
The MountainsMap X is a powerful software for surface metrology analysis. It provides the rich functionality of 3D visualization, cross-sectional view, 2D and 3D roughness, and other parameters based on the latest ISO standards.



## Wide FOV Optics (for high-magnification optical heads)

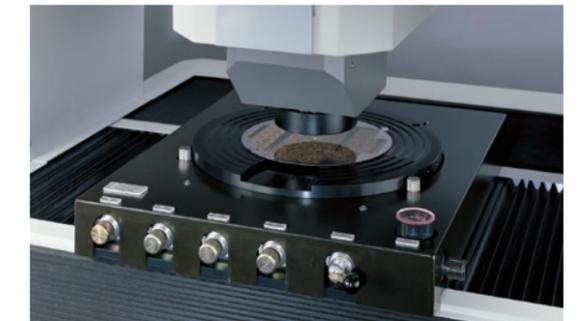
Wide field of view optics aids in the selection of the area to be measured and the creation of programs with high-magnification optical heads.

Compatible optical head	15x, 30x
Field of view	4.8 mm × 3.6 mm
Working distance	40.6 mm
Main optical head offset	64 mm
Illumination	Episcopic illumination only
Wide FOV optics effective ranges (mm)	VMZ-K3040: 236(X) × 400(Y) VMZ-K6555: 586(X) × 550(Y)



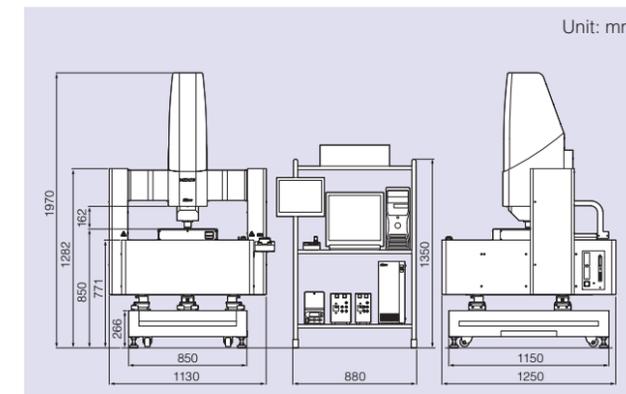
## Wafer Holder (vacuum chuck)

Firmly secures wafers to be measured with a vacuum chuck system and is compatible with 125 mm, 150 mm, 200 mm and 300 mm wafer sizes.

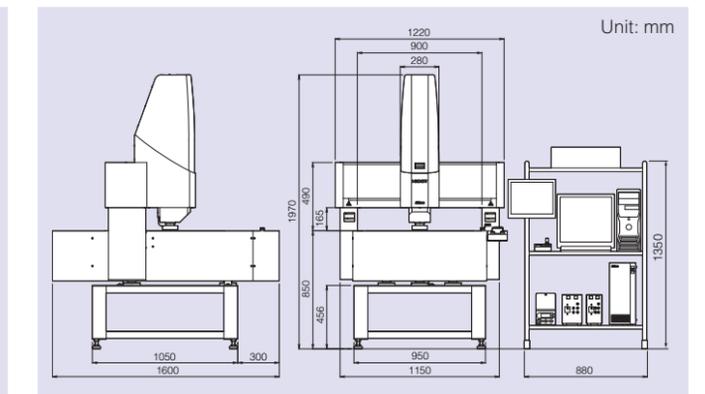


## Dimensional Diagram

### VMZ-K 3040



### VMZ-K 6555



# Specifications

Model	VMZ-K3040 Type-S			VMZ-K6555 Type-S			VMZ-K3040 Type-H		VMZ-K6555 Type-H	
	Standard head						High-magnification head			
Objectives										
Magnification	1.5x	3x	7.5x	1.5x	3x	7.5x	15x	30x	15x	30x
Working distance (*with ring illumination)	24 mm*	24 mm	5 mm	24 mm*	24 mm	5 mm	20 mm	5 mm	20 mm	5 mm
Confocal Optics (Area height measurement)										
Maximum scan height	1 mm									
Field of view	8x6 mm	4x3 mm	1.6x1.2 mm	8x6 mm	4x3 mm	1.6x1.2 mm	0.8 x0.6 mm	0.4x0.3 mm	0.8x0.6 mm	0.4x0.3 mm
Height measurement repeatability (2σ)	0.6 μm	0.35 μm	0.25 μm	0.6 μm	0.35 μm	0.25 μm	0.25 μm	0.2 μm	0.25 μm	0.2 μm
Height resolution	0.01 μm									
Field of view	8x6 to 0.53x0.4 mm	4x3 to 0.27x0.2 mm	1.6x1.2 to 0.11x0.08 mm	8x6 to 0.53x0.4 mm	4x3 to 0.27x0.2 mm	1.6x1.2 to 0.11x0.08 mm	1.26x0.95 to 0.1x0.074 mm	0.63x0.47 to 0.05x0.04 mm	1.26x0.95 to 0.1x0.074 mm	0.63x0.47 to 0.05x0.04 mm
Illumination	Diascopic, coaxial episcopic and ring						Diascopic and coaxial episcopic			
Light source	White LED									
Autofocus	Vision AF, Laser AF									
Main Body										
XYZ strokes	300 mm x 400 mm x 150 mm			650 mm x 550 mm x 150 mm			300 mm x 400 mm x 150 mm		650 mm x 550 mm x 150 mm	
Accuracy guaranteed loading capacity	20kg			30kg			20kg		30kg	
Maximum permissible error (L: Length in mm)	EUX, MPE: 1.5 + 4L/1000 μm EUY, MPE: 2.5 + 4L/1000 μm EUZ, MPE: 1 + L/1000 μm									
Power source	AC 100 - 240 V ± 10% 50/60 Hz									
Power consumption	10A - 5A									
Operating conditions	Temperature: 20°C ± 0.5 K, Humidity: 70 % or less									
Acquired standard	CE marking (low voltage/EMC/laser)									
Dimensions and weight										
Main body and table	1130 x 1250 x 1970 mm / approx. 800 kg			1220 x 1600 x 1970 mm / approx. 800 kg			1130 x 1250 x 1970 mm / approx. 800 kg		1220 x 1600 x 1970 mm / approx. 800 kg	
Controller	190 x 450 x 440 mm / 20 kg									
Installation area (WxD)	2500 x 1600 mm			2500 x 1900 mm			2500 x 1600 mm		2500 x 1900 mm	

\*Please contact Nikon for permissible floor vibration specifications.

Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. June 2020 ©2011-2020 NIKON CORPORATION  
 N.B. Export of the products\* in this catalog is controlled under the Japanese Foreign Exchange and Foreign Trade Law. Appropriate export procedures shall be required in case of export from Japan.  
 \*Products: Hardware and its technical information (including software)  
 Company names and product names appearing in this brochure are their registered trademarks or trademarks.

クラス1レーザー製品  
CLASS 1 LASER PRODUCT

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



## NIKON CORPORATION

Shinagawa Intercity Tower C, 2-15-3, Konan, Minato-ku, Tokyo 108-6290, Japan  
 phone: +81-3-6433-3701 fax: +81-3-6433-3784  
<https://www.nikon.com/products/industrial-metrology/>

ISO 14001 Certified  
for NIKON CORPORATION

ISO 9001 Certified  
for NIKON CORPORATION  
Industrial Metrology Business Unit

## NIKON METROLOGY EUROPE NV

Geldenaaksebaan 329, 3001 Leuven, Belgium  
 phone: +32-16-74-01-00 fax: +32-16-74-01-03  
 E-mail: [Sales.Europe.NM@nikon.com](mailto:Sales.Europe.NM@nikon.com)  
<http://www.nikonmetrology.com/en-gb>

## NIKON METROLOGY UK LTD.

UNITED KINGDOM phone: +44-1332-811-349 fax: +44-1332-639-881  
 E-mail: [Sales.UK.NM@nikon.com](mailto:Sales.UK.NM@nikon.com)

## NIKON METROLOGY SARL

FRANCE phone: +33-1-60-86-09-76 fax: +33-1-60-86-57-35  
 E-mail: [Sales.France.NM@nikon.com](mailto:Sales.France.NM@nikon.com)

## NIKON METROLOGY GMBH

GERMANY phone: +49-6023-91733-0 fax: +49-6023-91733-229  
 E-mail: [Sales.Germany.NM@nikon.com](mailto:Sales.Germany.NM@nikon.com)

## NIKON INSTRUMENTS S.p.A.

ITALY phone: +39-055-300-96-01 fax: +39-055-30-09-93

## NIKON METROLOGY, INC.

12701 Grand River Avenue, Brighton, MI 48116 U.S.A.  
 phone: +1-810-220-4360 fax: +1-810-220-4300  
 E-mail: [Sales.NM-US@nikon.com](mailto:Sales.NM-US@nikon.com)  
<http://www.nikonmetrology.com/en-us>

## NIKON CANADA INC.

CANADA phone: +1-905-602-9676 fax: +1-905-602-9953

## NIKON MEXICO- Metrology Showroom

MEXICO phone: +52 (442) 688 5067  
 E-mail: [Sales.NM-MX@nikon.com](mailto:Sales.NM-MX@nikon.com)

## NIKON INSTRUMENTS (SHANGHAI) CO., LTD.

CHINA (Shanghai branch) phone: +86-21-6841-2050 fax: +86-21-6841-2060  
 (Beijing branch) phone: +86-10-5831-2028 fax: +86-10-5831-2026  
 (Guangzhou branch) phone: +86-20-3882-0551 fax: +86-20-3882-0580

## NIKON INSTRUMENTS KOREA CO., LTD.

KOREA phone: +82-2-2186-8400 fax: +82-2-555-4415

## NIKON SINGAPORE PTE LTD.

SINGAPORE phone: +65-6559-3651 fax: +65-6559-3668  
 E-mail: [NSG.Industrial-sales@nikon.com](mailto:NSG.Industrial-sales@nikon.com)

## NIKON MALAYSIA SDN BHD

MALAYSIA phone: +60-3-7809-3688 fax: +60-3-7809-3633

## PT. NIKON INDONESIA

INDONESIA phone: +62-267-864-3949 fax: +62-267-864-3950  
 E-mail: [PTN.Instruments@nikon.com](mailto:PTN.Instruments@nikon.com)

## NIKON SALES (THAILAND) CO., LTD.

THAILAND phone: +66-2633-5100 fax: 66-2633-5191

## NIKON INDIA PRIVATE LIMITED

INDIA phone: +91-124-4688500 fax: +91-124-4688527