reddot winner 2025

VIDEO MEASURING SYSTEMS

NEXIV VMF-K Series

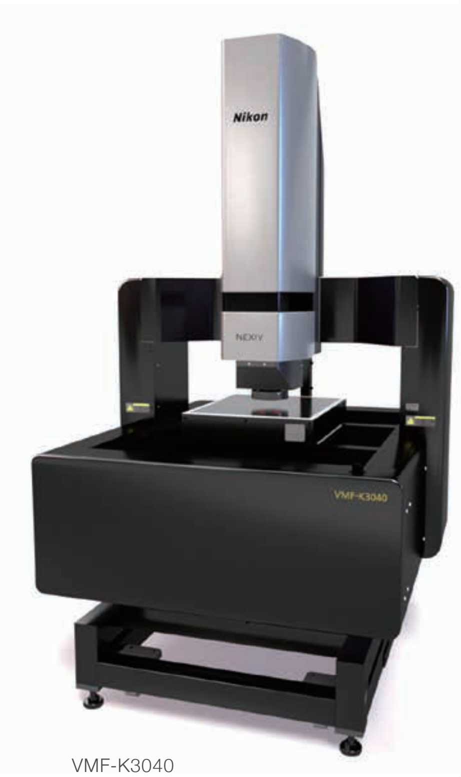
Confocal Model

A high-end video measuring system that can perform two-dimensional measurement and highly accurate height measurement simultaneously.

NEXIV VMF-K Series

The NEXIV VMF-K series can perform two-dimensional measurement using brightfield images, as well as full-field height measurement using confocal optics. Special samples that are difficult to detect with brightfield measurements can be clearly calculated with confocal measurements.
Compared to previous models, the VMF-K series has achieved faster measurements, a wider range of target applications, and superior equipment operation efficiency.

NEXIV VMF-K6561, equipped with a large stage compatible with 600 × 600 mm panel-level packages (PLP), has been added to the lineup. The NEXIV VMF-K6561 enables full-panel measurement of panel-level packages using Nikon's high-speed measurement technology.



VMF-K3040

VMF-K6555

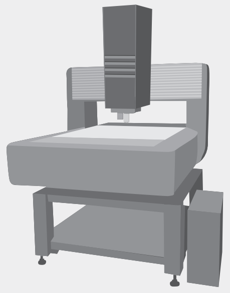
VMF-K6561

Two-in-one device for two-dimensional and height measurement

Two-dimensional and height measurement can be performed with a VMF-K series. Operators do not need to learn how to operate multiple measuring instruments, reducing the workload for measurement and equipment management.

Two-dimensional measurement

Video measuring systems



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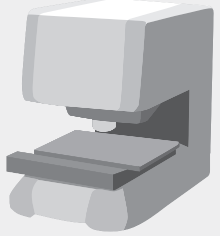
Height measurement

Laser microscope

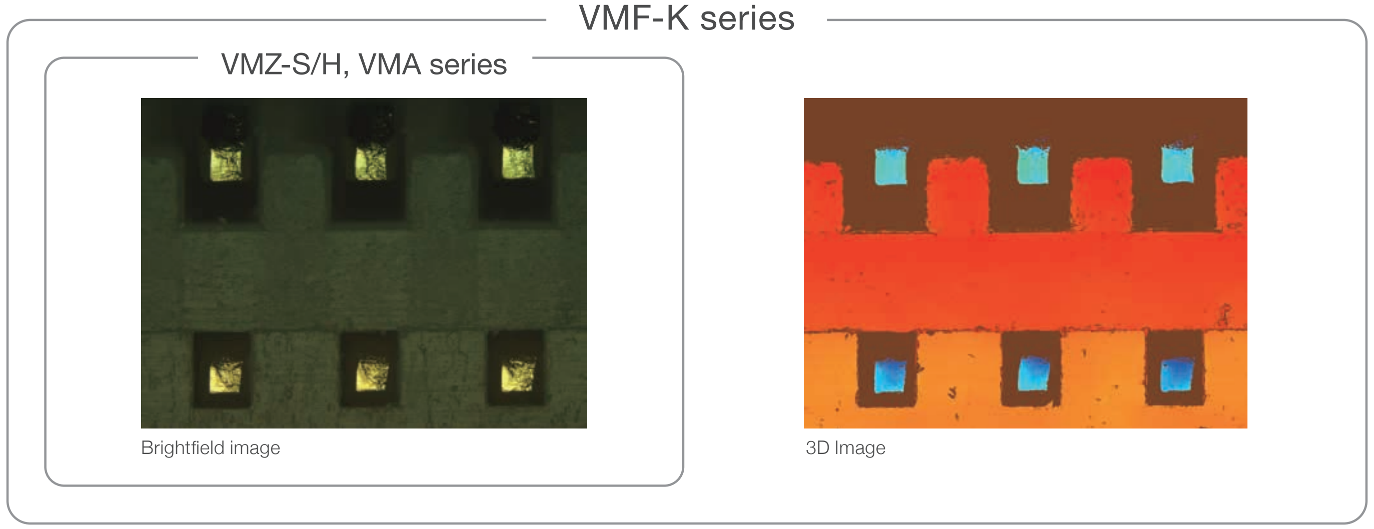


▶

Two-dimensional and height measurement

VMF-K Series

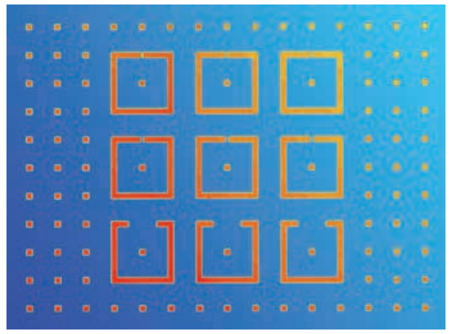
Equipped with two optical systems for two-dimensional and height measurement



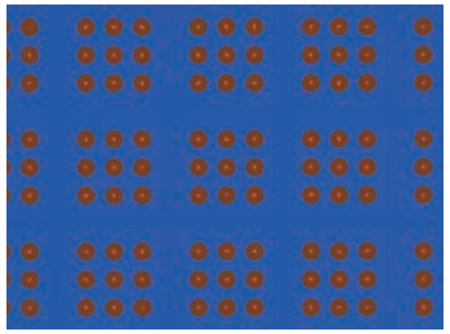
Brightfield image

3D Image

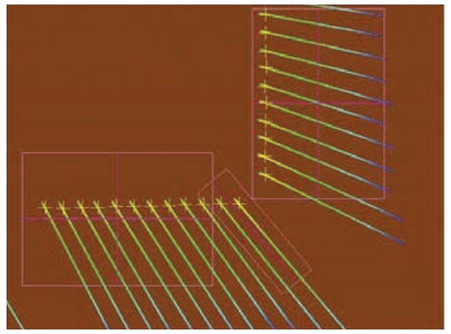
Measurement examples



Fine bump and substrate pattern



Bump board



Bonding wire

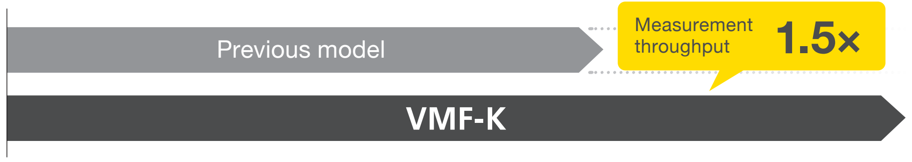
Faster and more accurate two-dimensional and height measurements

The VMZ-K series, the flagship model of NEXIV series, has evolved further while retaining highly accurate two-dimensional and height measurement.

Enhanced measurement throughput

By increasing the scanning speed in the height direction, the measurement throughput has been improved by approximately 1.5 times compared to previous model.

Comparison of measurement throughput (example)*



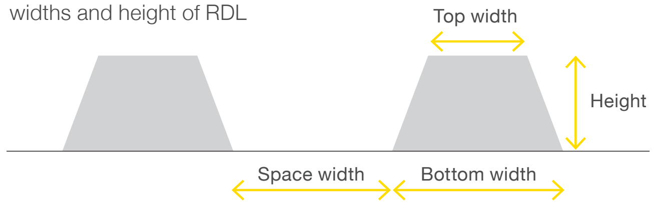
*This is a comparison of measurement throughput based on our specified measurement conditions. The improvement of measurement throughput varies depending on the measurement content.

Additional 45x model to support fine processing

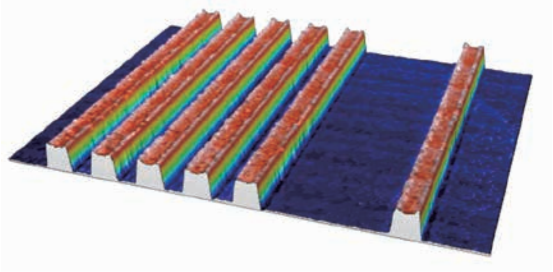
To meet the demands of measuring the fine dimensions of cutting-edge semiconductor devices that are becoming increasingly miniaturized and highly integrated, the 45x high-magnification model has been added to the standard lineup. Multi-dimensional details less than 2 µm can be measured quickly and with high accuracy. Thereby, meeting the needs for measuring precision semiconductor packaging.

Measurement items of Redistribution Layer (RDL)

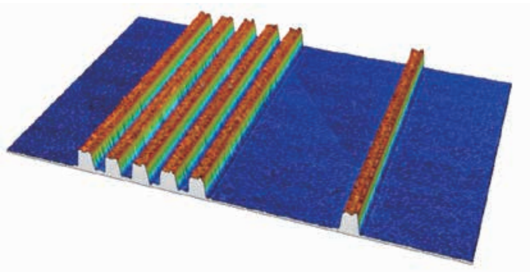
Measuring the top and bottom widths and height of RDL



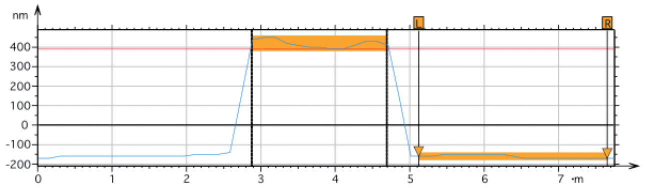
2.0 µm L/S height image (bird's-eye view)



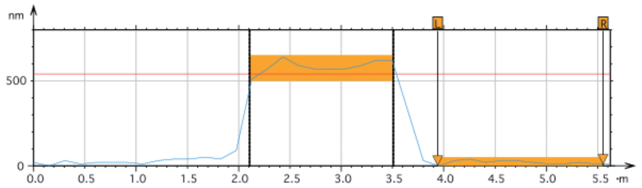
1.5 µm L/S height image (bird's-eye view)



*Obtained using MountainsMap® X (optional)



Profile picture



Profile picture

Superior equipment operation efficiency

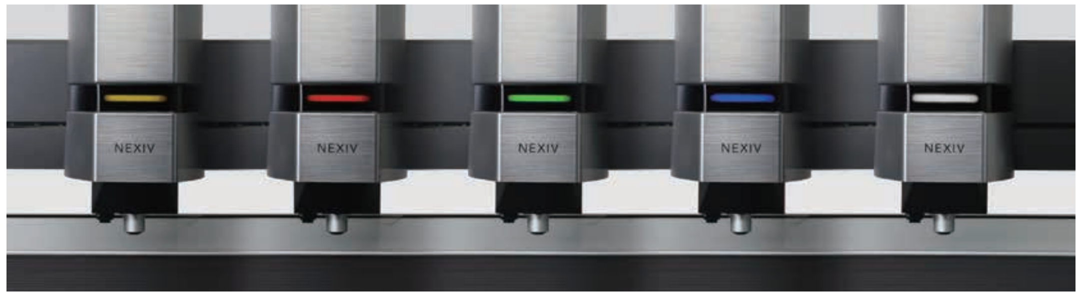
- Confocal light source LED

The confocal light source used in previous models was Xenon, but has been upgraded to LED. The light source lifespan has increased by approximately 10 times, improving the equipment's operating rate and reducing the burden of lamp replacement and disposal.

- LED indicator to show device status

Each measuring head is equipped with a colored LED indicator to display device status. The light sequence can be set from the dimensional measurement software NEXIV AdvancedMeasure.

*Signal tower option is also available.

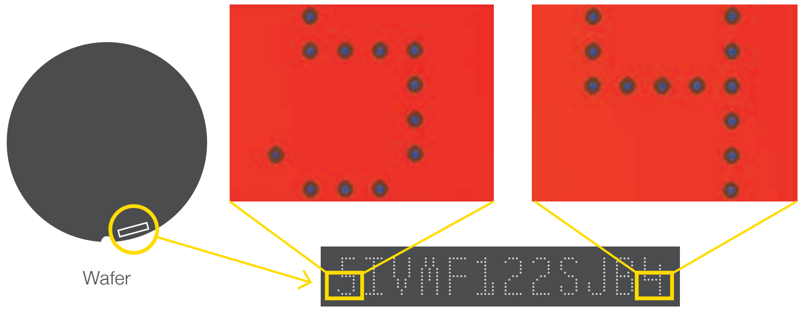


- Improved maintenance

In addition to a completely new exterior design, the measurement head cover is easier to attach and remove. General operation and maintenance will be easier as interior access is improved and the number of parts that require maintenance is reduced.

Supports highly accurate, high-speed coordinate system measurement

Another major feature of video measuring systems is the ability to measure coordinate systems over long dimensions that exceed the field of view. Nikon's NEXIV series reflects the technology and knowledge it has accumulated over many years as a manufacturer of video measuring systems in its system design, enabling highly accurate and stable measurements, even over long dimensions.



Laser mark (example)

- Hardware structure that achieves highly accurate measurements

The effects of environmental temperature changes are minimized as the main body guide rails and measurement stage are made from similar thermal expansion coefficient materials. This reduces the risk of deformity and inaccurate measurements.

- In-house linear encoder boasts highest resolution levels

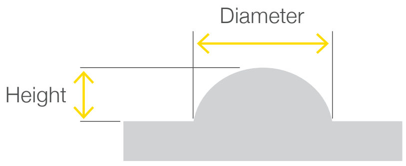
Nikon's in-house developed linear encoder has a resolution of 0.01 µm – the highest level for video measuring systems. Included on XY axes as standard, this precisely detects linear position to provide highly accurate and stable measurement results.

STRENGTHS

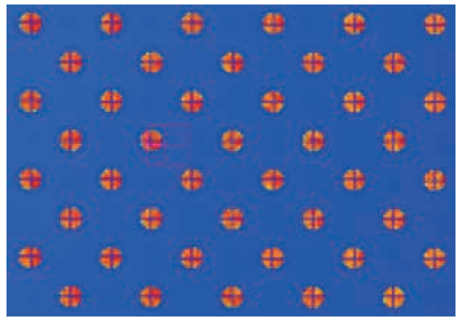
3D imaging for full-field measurement

As it is possible to perform 2D/height measurement all within the field of view, the NEXIV VMF-K series achieves overwhelming measurement throughput compared to using brightfield images.

Measurement contents



Sample: Bump



3D image

Measuring all points within the field of view at once

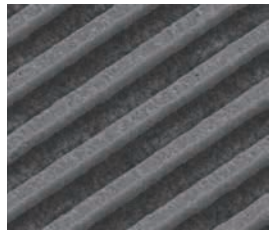
Since each pixel has XYZ information, 2D and height measurements can be performed simultaneously within the field of view.

Supports samples with high contrast and unstable light reflection

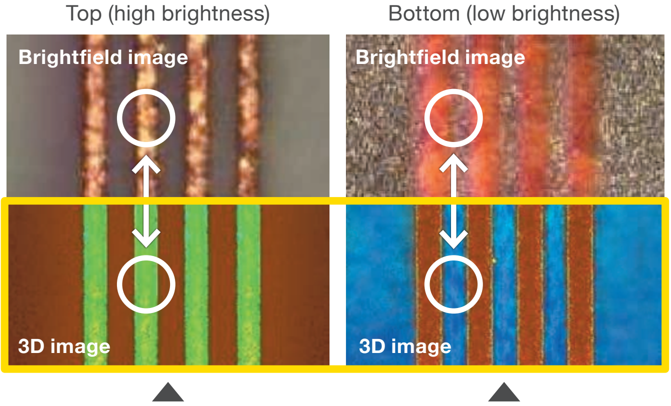
Accurate measurement of high contrast samples tends to be difficult with brightfield illumination because their edges appear unclear. Confocal optics provide a clear display, and facilitate accurate detection of sample edges.

- High contrast sample
  (copper wire on print board etc.)

Confocal observation accurately captures the shape, even for samples that are difficult to measure accurately in brightfield, due to effects such as halation.



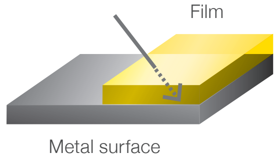
Actual shape (SEM image)



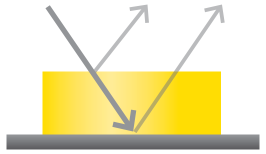
Both top and bottom can be measured

- Highly transparent and thin samples (metal surface films, semiconductor resists, etc.)

For transparent samples with unstable light reflection, confocal observation can accurately detect two points: the transparent surface and the metal surface.

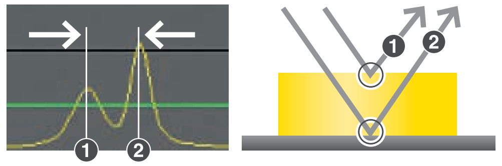


Brightfield



Unstable reflection makes it difficult to detect the exact location

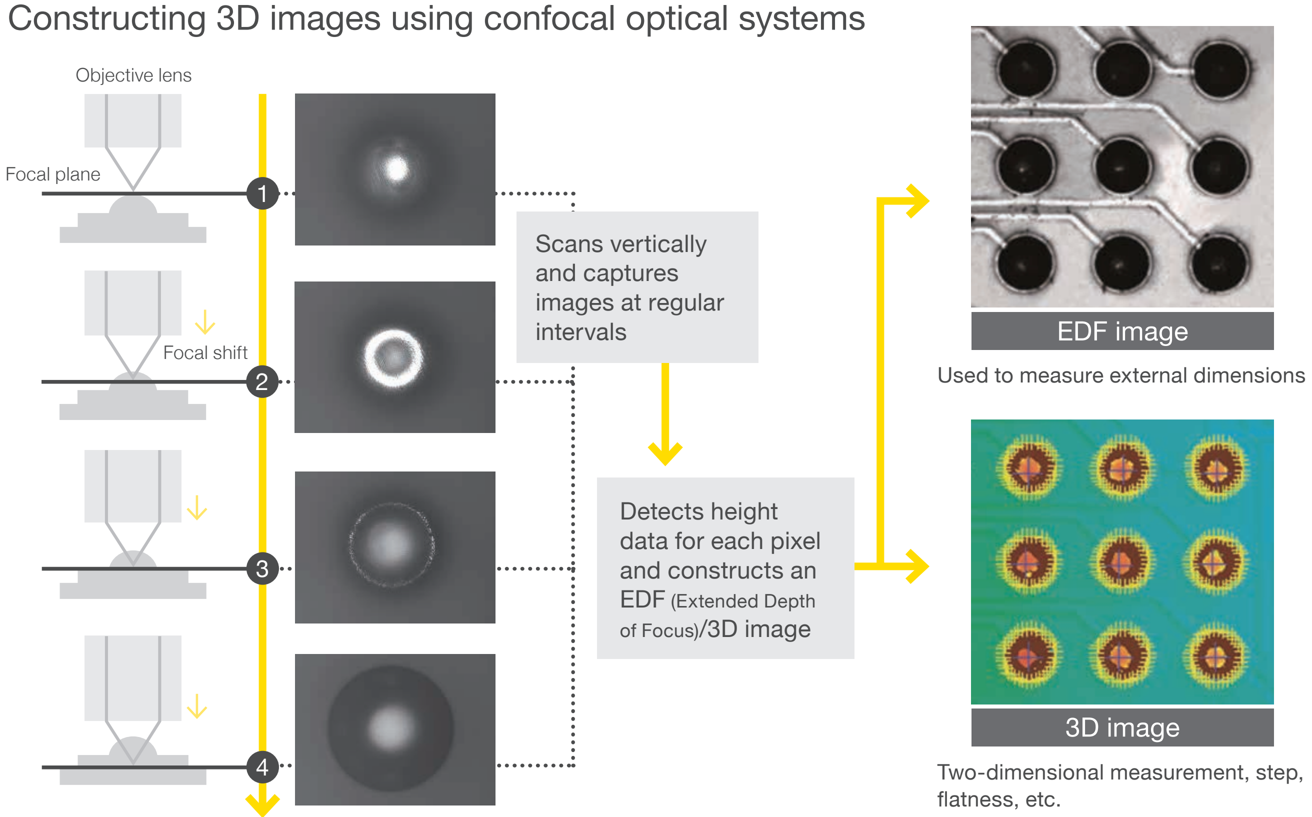
Confocal



Both the top and bottom heights can be detected accurately.

MECHANISM

Constructing 3D images using confocal optical systems

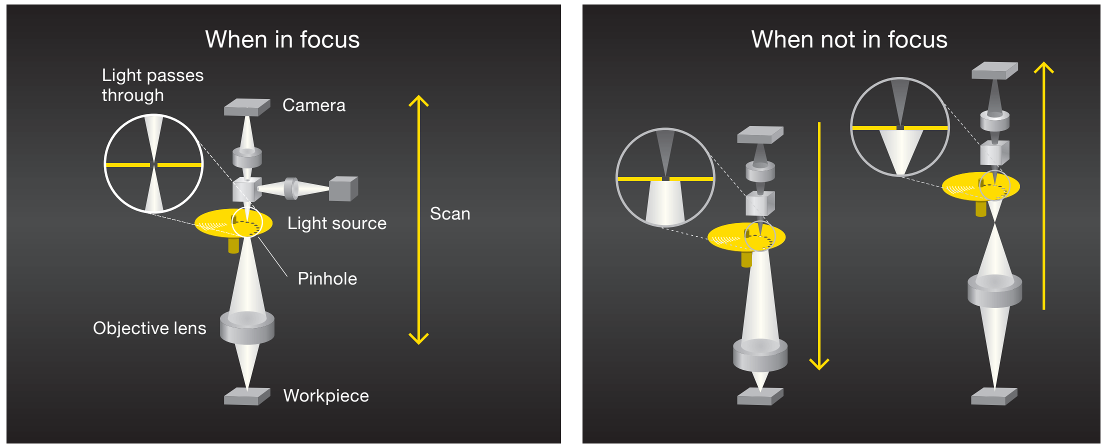


Nikon's Confocal model NEXIV uses the Nipkow disk method

Confocal optics is an optical technology that uses pinholes to block light outside the focal plane, achieving high resolution and high contrast. The confocal optics of the VMF-K series uses the Nipkow disk method. The Nipkow disk has pinholes arranged in a spiral shape. By shining light on the disk while rotating it, a confocal image of the entire focal plane is obtained. Multiple confocal images are created by moving the optical system alongside to construct an image with height information.

The Nipkow disk enables extremely high-speed imaging, but requires advanced design and manufacturing technologies to precisely control the high-speed rotating disk.

Nikon developed video measuring systems equipped with a Nipkow disk type confocal optical system in the early 2000s, and has continued innovating ever since, helping customers around the world.

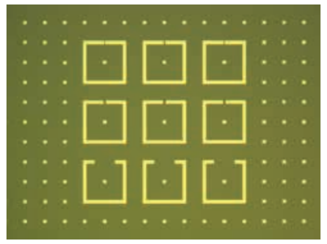


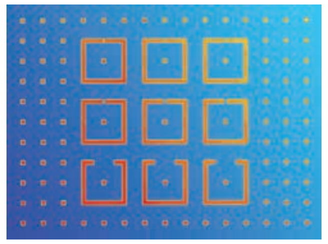
Confocal optical system (Nipkow disk method)

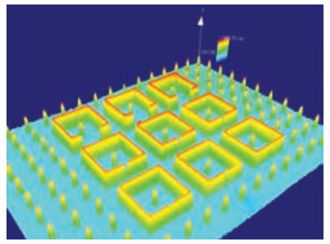
APPLICATIONS

Fine bump and substrate pattern

A combination of 2D measurement with 15x zoom brightfield image and height measurement with 3D image enables diverse measurements.


Brightfield image
(minimum magnification)


3D image


Bird's-eye view image by EDF/
Stitching Express (optional)

Probe cards

The XY coordinates (centre of gravity/centre of square) and Z coordinates (average/highest point) of the microscopic contact parts of the probe card are measured simultaneously within the field of view.

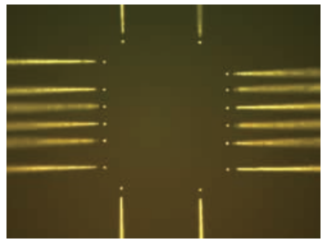
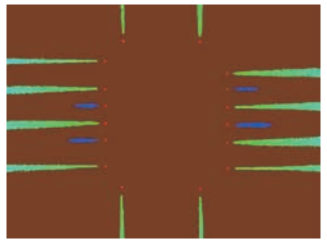
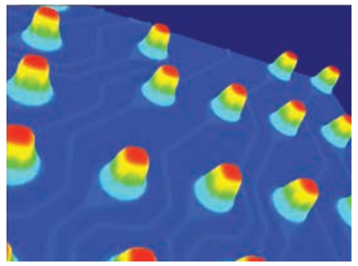

Brightfield image


Image taken with confocal optics,
with the tip in focus


3D image

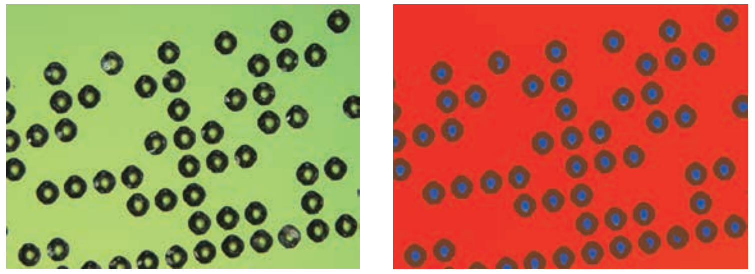
Wafer level packages

The positions and diameters of bumps, vias, chips, etc. can be inspected at high speed by full-field height measurement.


Bird's-eye view image
by EDF/Stitching
Express (optional)

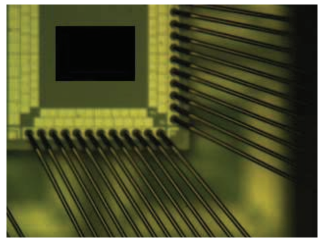
Laser mark

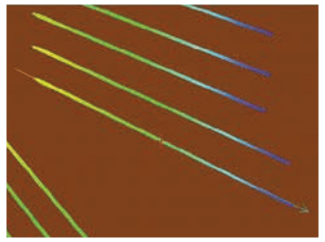
In addition to the full length of the text beyond the field of view, the depth of the engraved laser mark can be controlled with 3D images.

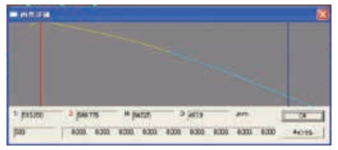


Bonding wire loop height

The 3D image detects the highest points of all wires within the field of view at once. The wire shape can also be confirmed from the height profile information.


Brightfield image

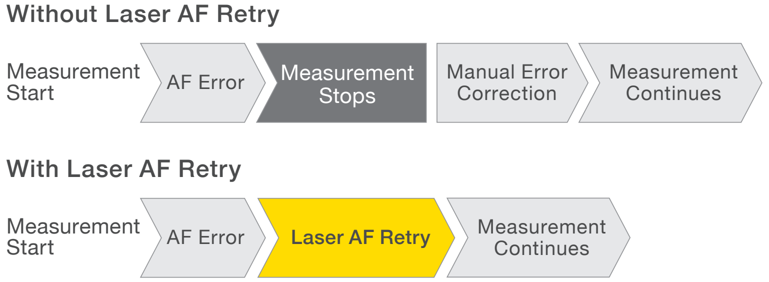

3D image


Display of wire height profile

SOFTWARE

A sophisticated GUI builds on the expertise gained from the NEXIV series and ensures efficient measurement and evaluation of three-dimensional shapes. The newest version of NEXIV software "Advanced Measure" further speeds up the measurement process.

Laser Auto Focus (AF) Retry 《 NEW


Without Laser AF Retry

Measurement Start
AF Error
Measurement Stops
Manual Error Correction
Measurement Continues

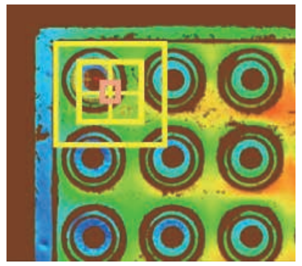
With Laser AF Retry

Measurement Start
AF Error
Laser AF Retry
Measurement Continues

Prevents measurement interruption by automatically retrying AF until it is successful.

- Prevents interruptions during the measurement process, enabling continuous measurement of multiple samples and long-duration measurements.
- Operators are needed only at the start of measurement, greatly reducing on-site workload.

Search - Height Measurement 《 NEW



Two probes operate simultaneously.
Search and height measurement are performed at once with a single probe.

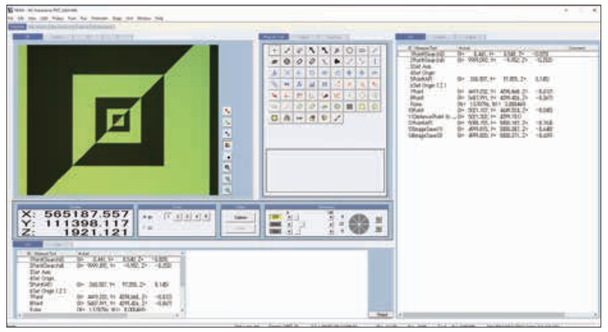
- Search and height measurements are completed in a single operation, making program creation simpler and faster.
- Measurement execution time is reduced, greatly improving work efficiency and productivity.

Expansion of the Limit on the Number of Measurement Codes 《 NEW

The maximum number of codes that can be handled in a measurement program has been increased. A single program can now accommodate large-scale measurements such as probe cards with many measurement points.

- Due to the increased number of codes, there is no need to combine results from multiple measurement programs after measurement. This significantly improves work efficiency especially for customers measuring hundreds of thousands to millions of points on probe cards.

Measurement program creation and replay


X: 565187.557
Y: 111398.117
Z: 1921.121

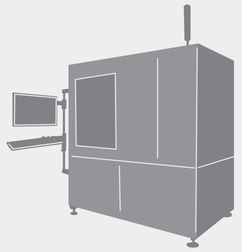
User-friendly operations enhance the efficiency of semiconductor wafer and PCB chip measurements.

- 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.

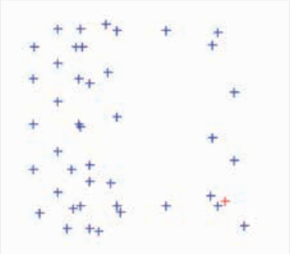
USAGE TIPS

Use as a high-precision review measurement device

By using the coordinates of abnormal points acquired by other measuring instruments, the NEXIV VMF-K series can easily deliver highly accurate review measurements.



Rough measurement using other measuring equipment



Read the coordinates of the abnormal points using a CSV file, etc.

```
-211. 1. 5, 170
-211. 5, 135
-211. 5, 85
-211. 5, 35
-205, -13
-175, -30
-150, -30
-160, -5
-185, 10
-170, 35
```

Coordinate information image

VMF-K high-precision measurement review

```
(X=-211.10000, Y= 170.00000, Z=   0.00000)
(X=-211.50000, Y= 135.00000, Z=   0.00000)
(X=-211.50000, Y=  85.00000, Z=   0.00000)
(X=-211.50000, Y=  35.00000, Z=   0.00000)
(X=-205.00000, Y= -13.00000, Z=   0.00000)
(X=-175.00000, Y= -30.00000, Z=   0.00000)
(X=-150.00000, Y= -30.00000, Z=   0.00000)
(X=-160.00000, Y=  -5.00000, Z=   0.00000)
(X=-185.00000, Y=  10.00000, Z=   0.00000)
(X=-170.00000, Y=  35.00000, Z=   0.00000)
```

Easy measurement program creation using CAD information

Measurement conditions can be set for shapes (circles/lines/arcs) on CAD graphics, and measurement data can be generated automatically. Once you have entered the conditions on the screen and completed the setup, data will be created in the measurement program.

CAD information loading

When CAD defined information is loaded, it is displayed in the graphics window.

Measurement target selection

Select the shape to measure from the graphic.

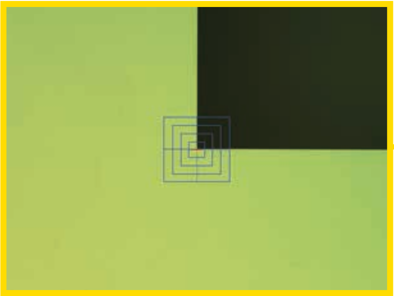
Batch application of measurement conditions

The program creation is completed by applying all the measurement contents to the selected shape at once.

USABILITY

Search function: automatically detects and corrects misalignment

By automatically detecting and correcting misalignments created (for example, in how samples are placed or variations in manufacture), continuous automatic measurement is possible.

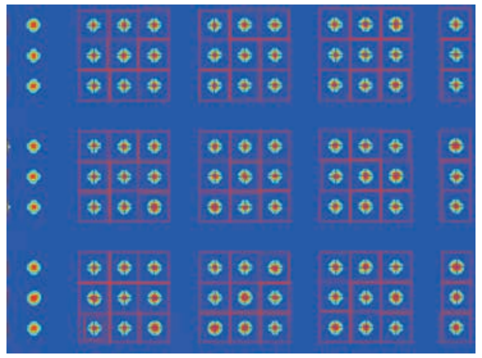


Registering the shape of a sample using a train caliper

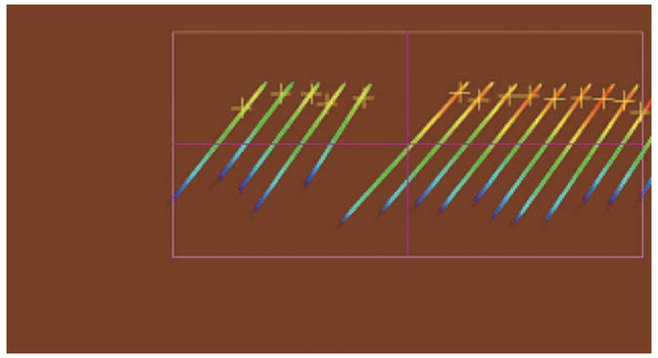
Misalignment

Automatically detects the shape of the sample and corrects measurement position

Using 3D images, it is also possible to automatically detect and measure bumps and bonding wires that are misaligned from their designed positions.



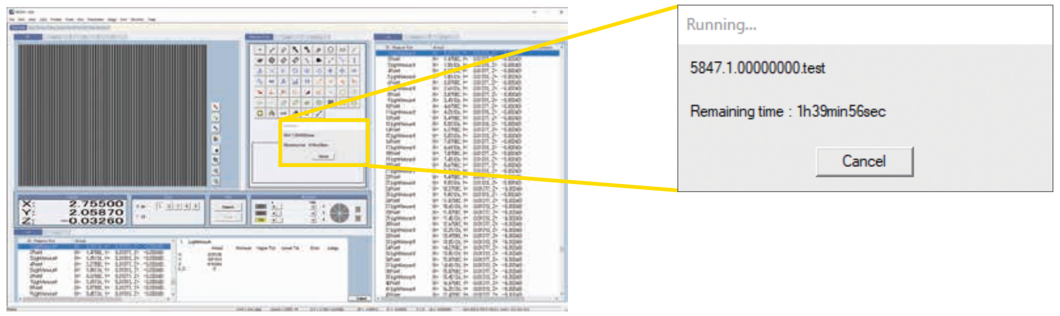
This is an example of searching for bump positions within the field of view individually. Multiple position corrections can be performed simultaneously with one detection.



When measuring bonding wires, it can automatically detect wires within a specified range and output the highest point for each.

Remaining measurement time display

This function displays the remaining measurement time in a dialog box on the screen while a measurement is in progress. When performing another task during a long measurement, there is no need to return to the device repeatedly to check the measurement progress, improving work efficiency.



Running...

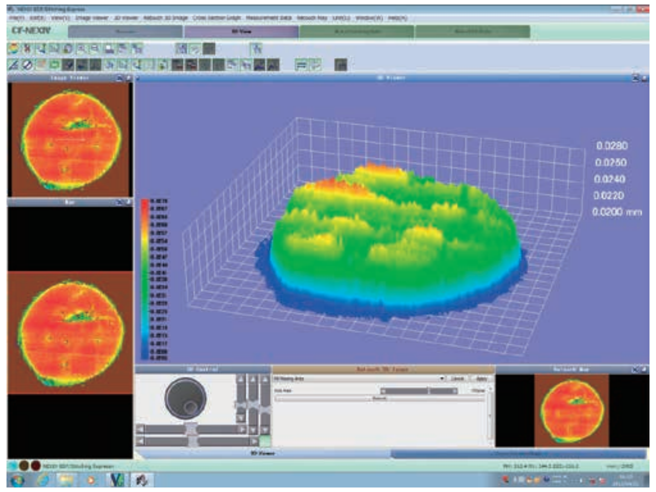
5847.1.00000000.test

Remaining time : 1h39min56sec

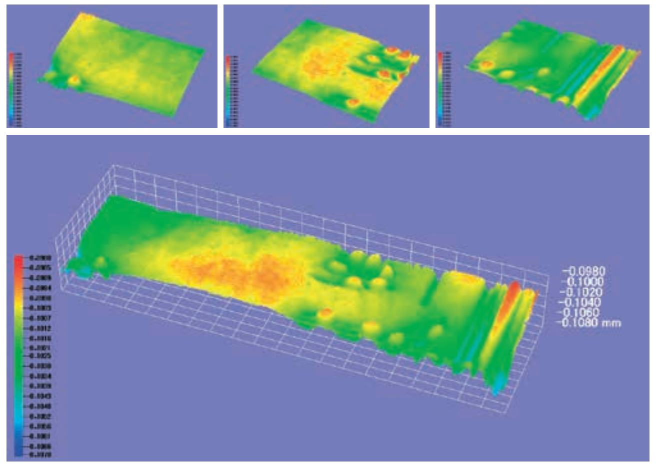
OPTIONAL SOFTWARE

Image synthesis and analysis software EDF/Stitching Express

3D images acquired by the NEXIV series can be displayed as bird's-eye views or cross-sectional shapes. In addition, multiple adjacent 3D images can be stitched together to obtain a wide-field 3D image.



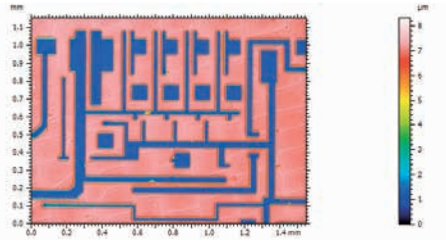
Stitching



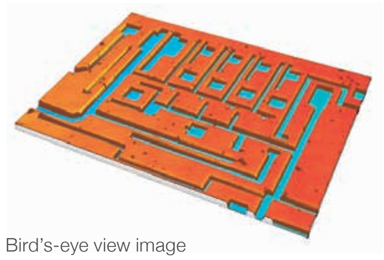
Surface shape evaluation software MountainsMap® X

This software has a wide range of functions for 3D images, such as displaying cross-sectional shapes and calculating 2D and 3D roughness based on ISO standards.

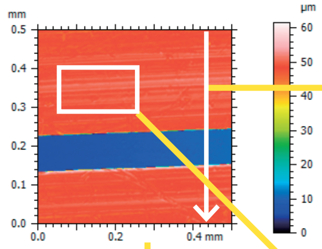
Provided for Nikon by Digital Surf (France)



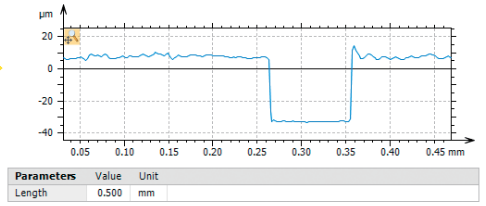
Contour image



Bird's-eye view image

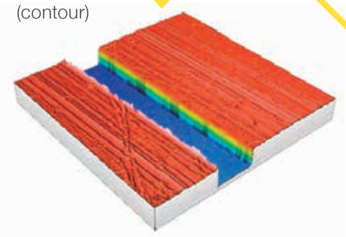


Step sample (contour)

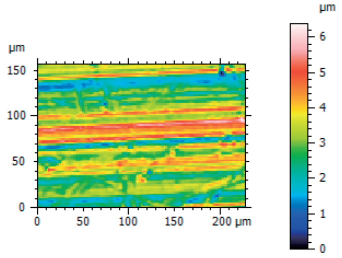


Parameters	Value	Unit
Length	0.500	mm

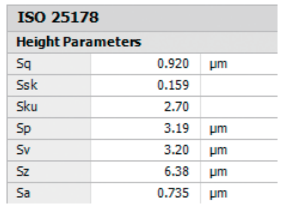
Profile



Bird's-eye view image



Partial image



ISO 25178		
Height Parameters		
Sq	0.920	µm
Ssk	0.159	
Sku	2.70	
Sp	3.19	µm
Sv	3.20	µm
Sz	6.38	µm
Sa	0.735	µm

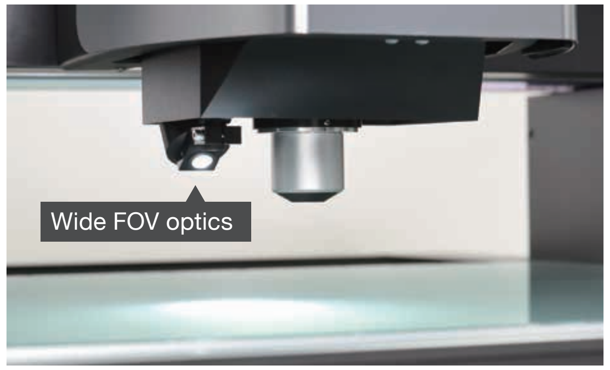
Roughness data

OPTIONAL HARDWARE

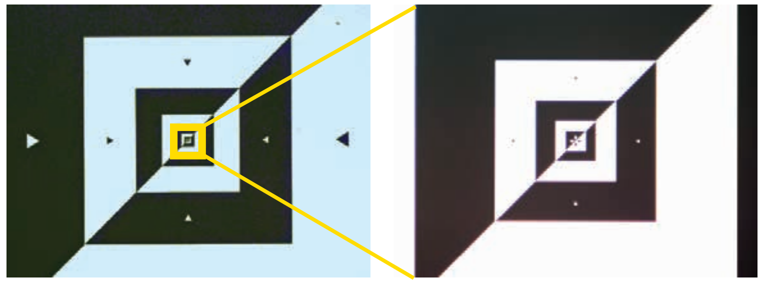
Wide field of view (FOV) optics for high-magnification optical heads

In addition to making it easier to find the measurement target location, the expanded search range enables stable measurement even when the sample is significantly misaligned.

Compatible optical head	15x, 30x, 45x
Field of view	4.75 mm x 3.56 mm



FOV comparison



Wide FOV optics

30× objective 1× (0.4 mm × 0.3 mm)

INTEGRATION

Automatic wafer/panel/tray loading solution

Nikon provides many video measuring systems to the semiconductor industry, and can flexibly respond to diverse requirements for combinations with loading systems.

Why choose Nikon?

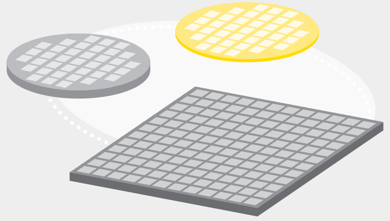
1 Consistent support

Our dedicated technical staff will support you in determining the appropriate product specifications to meet your needs. Our technical staff will also handle after-sales service, so you can use our products with peace of mind.

2 Support for a wide variety of wafers

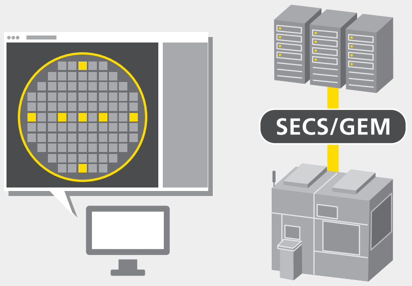
We provide a system that can safely load a wide variety of wafers, including wafers that are 100 µm or thinner, wafers warped by 10 mm or more, and wafers and panels with extremely limited contact points.

* Please contact us for information on panel sizes up to 600 mm.



3 Excellent usability

The most important factor in operability is the ease of selecting the wafer or chip to be measured and the measurement program, so we can flexibly customize the system to meet your needs. We can also automatically transfer measurement results to a SECS/GEM compatible server/network.



LINEUP

The NEXIV VMF-K series allows you to measure height with ease by selecting the objective lens. Three stage strokes are available.

VMF-K3040

Main features

A general-purpose system that meets a wide range of needs.

Main measurement targets

- Micro bumps on semiconductor packages
- Fine laser marks on semiconductor wafers
- Passive components such as MLCCs
- Bonding wire
- Probe card
- Precision optical parts
- MEMS

VMF-K6555

Main features

A large stroke type of 650 × 550 mm that can handle printed wiring boards and panel level packages.

Main measurement targets

- Micro bumps on semiconductor packages
- Fine laser marks on semiconductor wafers
- Passive components such as MLCCs
- Bonding wire
- Panel level package (PLP)
- Probe card
- Precision optical parts
- MEMS
- High precision PCB
- Interposer board

VMF-K6561 NEW!

Main features

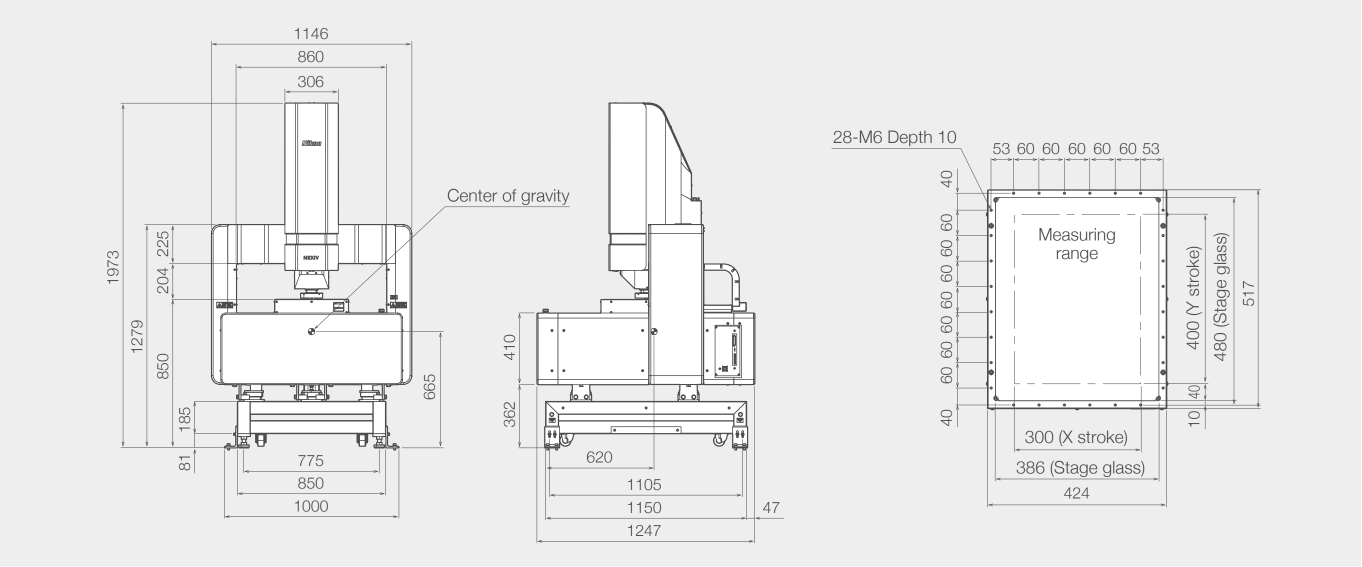
A large stage type of 650 × 610 mm capable of measuring an entire 600 × 600 mm panel-level package in a single setup.

Main measurement targets

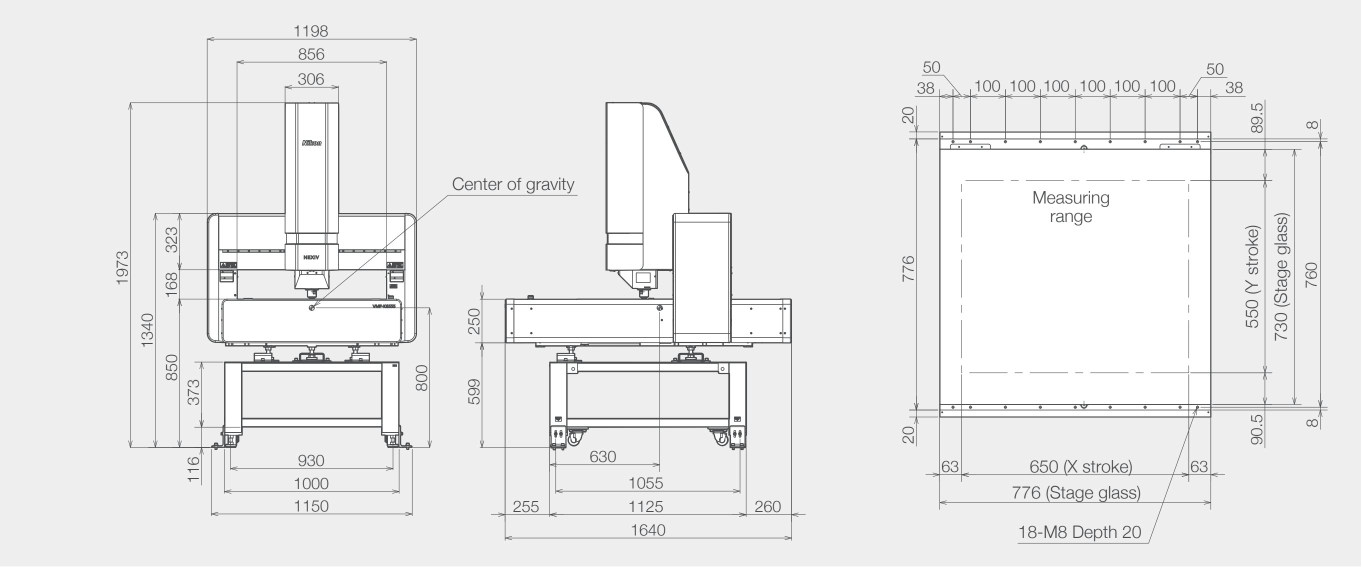
- Panel level package (PLP)

DIMENSIONS

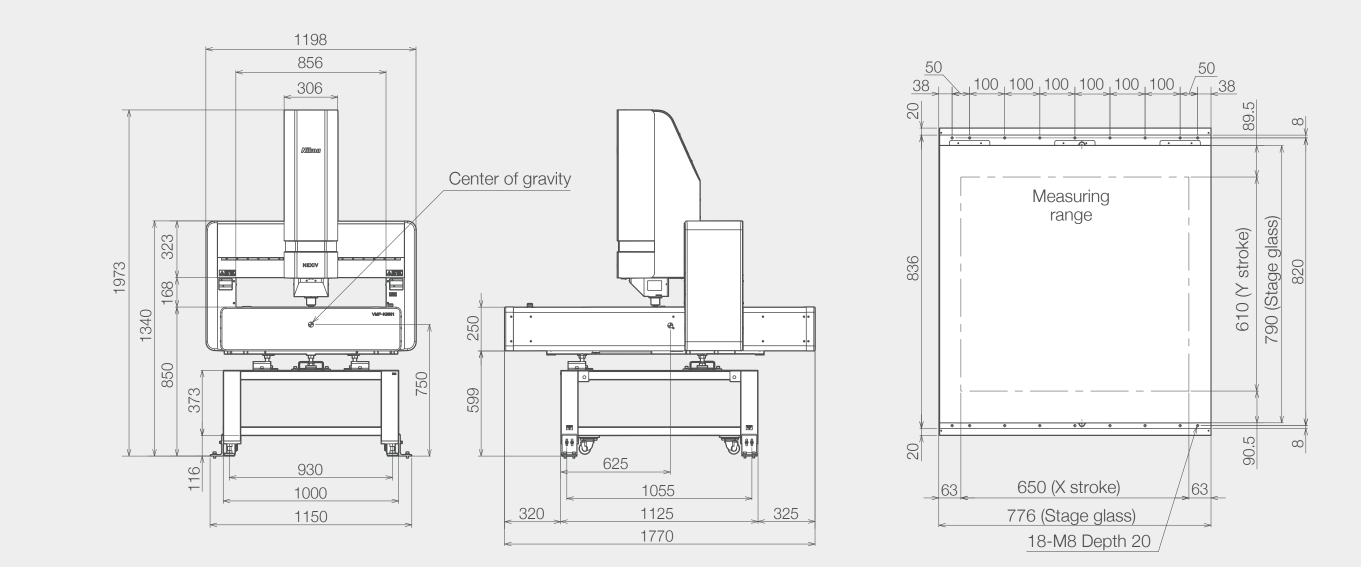
VMF-K3040



VMF-K6555



VMF-K6561



SPECIFICATIONS

VMF-K3040 / VMF-K6555 / VMF-K6561

Measuring head		Standard head (Type-S)			High-magnification head (Type-H)		45x High-magnification head
Optical magnification *1	Magnification	1.5×*2	3.0×	7.5×	15×	30×	45×
	Working distance	24 mm	24 mm	5 mm	20 mm	5 mm	5 mm
Confocal optics (height measurement)	Maximum scan height	1 mm					
	Field of view	7.80×5.82 mm	3.90×2.91 mm	1.56×1.17 mm	0.78×0.58 mm	0.39×0.29 mm	0.26×0.19 mm
	Height measurement repeatability (2σ)	0.6 μm	0.35 μm	0.25 μm	0.25 μm	0.2 μm	0.2 μm
	Height resolution	0.025 μm	0.01 μm				
	Light source	Green LED					
Bright field optics (two-dimensional measurement)	Magnification method	Motorized 5-step zoom					
	Field of view	7.81×5.86~ 0.52×0.39 mm	3.91×2.93~ 0.26×0.20 mm	1.56×1.17~ 0.10×0.078 mm	1.27×0.95~ 0.099×0.074 mm	0.63×0.47~ 0.049×0.037 mm	0.63×0.47~ 0.049×0.037 mm
	Illumination	Diascopic, coaxial episcopic and ring				Diascopic, coaxial episcopic	
	Light source	White LED					
	Autofocus	TTL Laser AF, Image AF					

Zoom Range

Field of view*	Width (mm)× Vertical (mm)	7.81 5.86	3.91 2.93	1.95 1.47	1.56 1.17	1.27 0.95	0.98 0.73	0.78 0.59	0.63 0.47	0.52 0.39	0.39 0.29	0.26 0.19	0.20 0.15	0.10 0.078	0.099 0.074	0.049 0.037	Working distance
Standard head (Type-S)	1.5×	◑	○	○			○			○							24 mm
	3×		◑	○			○			○		○					24 mm
	7.5×				◑			○			○		○	○			5 mm
High-magnification head (Type-H)	15×					○		◑			○		○		○		20 mm
	30×								○		◑		○		○	○	5 mm
45x High-mag. head	45×								○		○	●	○		○	○	5 mm

○ Brightfield optics ◑ Confocal/ Brightfield optics ● Confocal optics *The FOV of the bright field optics are indicated.

Model		VMF-K3040	VMF-K6555	VMF-K6561
Main body	XYZ strokes	300×400×150 mm	650×550×150 mm	650x610x150mm
	Accuracy guaranteed loading capacity	20 kg	30 kg	30 kg
	Maximum permissible error (L: Length in mm)	Eux, MPE Euy, MPE 1.2+4*L* /1000 μm Euxy, MPE 2.0+4*L* /1000 μm Euz, MPE 1+*L* /1000 μm		
	Minimum readout	0.01 μm		
	Power source	AC 100V-240V ±10%, 50/60 Hz		
	Power consumption	5.5A-3A		
	Safety standard	SEMI S2/S8 compliance *3		
Dimensions (WxDxH) and weight	Main body and table	1146×1247×1973 mm/800 kg	1198×1640×1973 mm/800 kg	1198×1770×1973 mm/820 kg
	Controller	190×450×440 mm / approx. 14 kg		
	Recommended installation dimensions (W×D)*4	3150×3000 mm	3200×3300 mm	3200×3430 mm
	Minimum installation dimensions (W×D)	2500×1600 mm	2500×1900 mm	2500×2030 mm

*1: The optional maginification is fixed and cannot be replaced by the customer. *2: The working distance for the LED ring lighting is 24 mm.
*3: If installed according to SEMI guidelines, VMF-K will be compliant with SEMI S2/S8. *4: Includes our recommended maintenance space.

N.B. Export of the products* in this brochure 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)

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

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