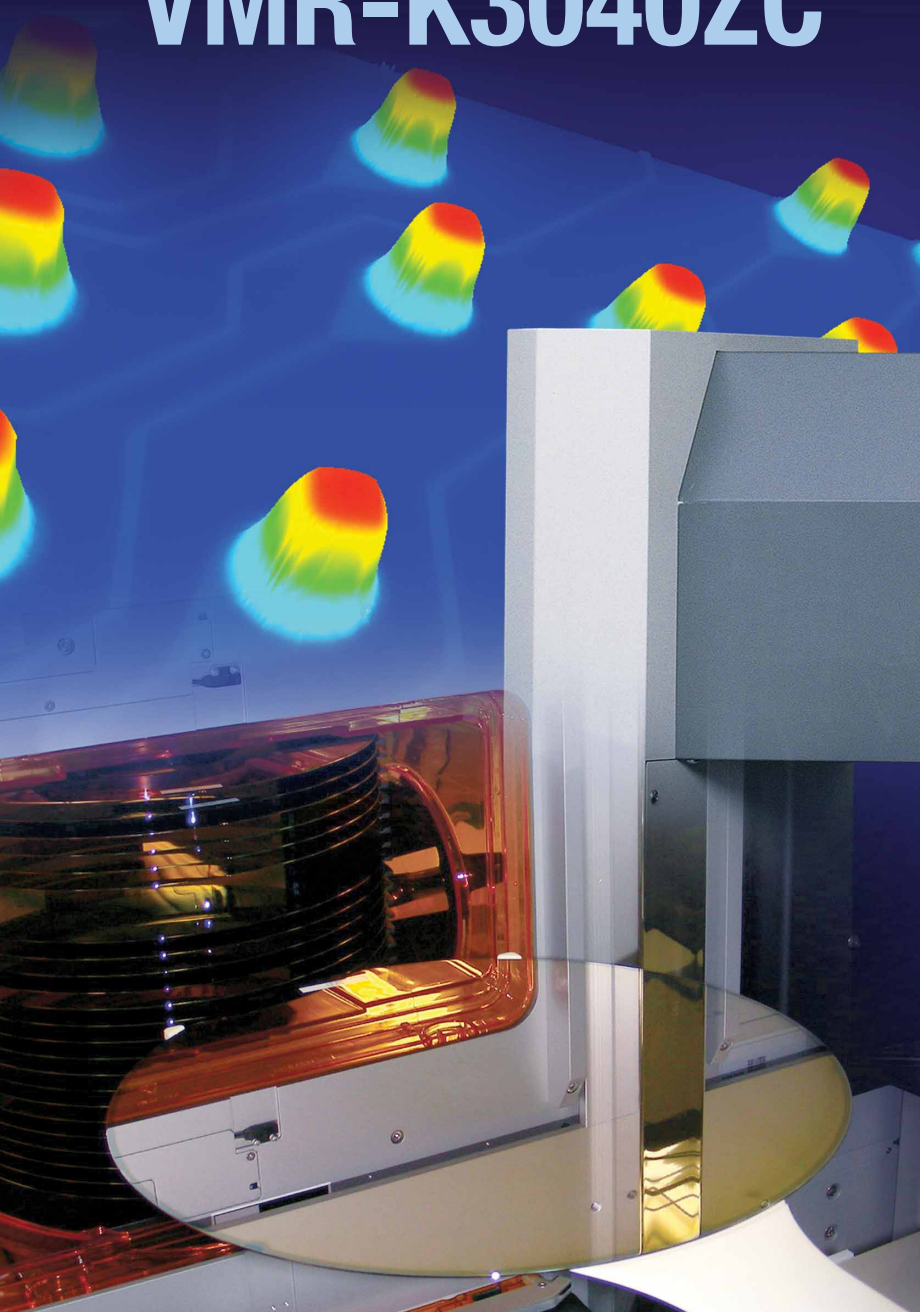




CNC Video Measuring System

# CONFOCAL NEXIV VMR-K3040ZC



# Real-Time 3D FOV Measurements in Confocal Images

Confocal NEXIV VMR-K3040ZC provides totally new dimensioning abilities for your advanced parts & devices

The Confocal NEXIV, a ground-breaking multifunctional video measuring system, was developed on the strength of Nikon's leading optomechanics technologies. It incorporates confocal optics for fast and accurate evaluation of fine three-dimensional geometries, and brightfield optics with a 15x zoom. It allows both 2D and height measurements in the same field of view.

The Confocal NEXIV can be optimally used for the inspection of highly complex structures such as bump heights on advanced semiconductor packages, probe cards and laser marks on wafers and so on. Moreover, online communication software and an automatic 300mm wafer loading system for use in cleanrooms at semiconductor manufacturing fabs are also available to realize the fully automated confocal-based metrology system.

## MAIN FEATURES

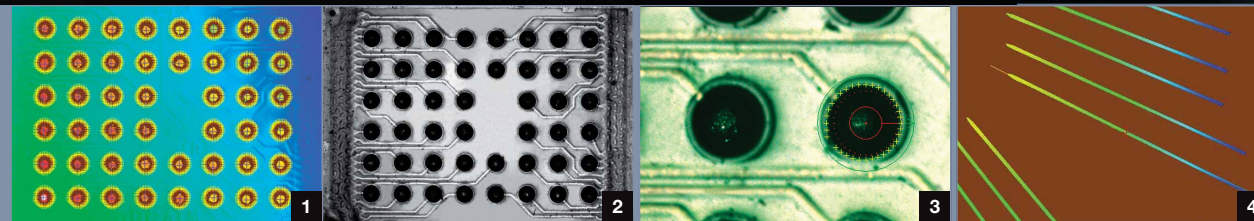
- Simultaneous wide-area height measurements with Nikon proprietary confocal optics
- 2D measurement with 15x brightfield zoom optics
- Fully compatible with 300mm wafer measurement at semiconductor fabs

## MAIN APPLICATIONS

- Bumps on advanced IC packages
- Probe cards
- Precise glass components (Micro lens, Contact lens)
- Laser marks on semiconductor wafers
- MEMS
- Wire bonding

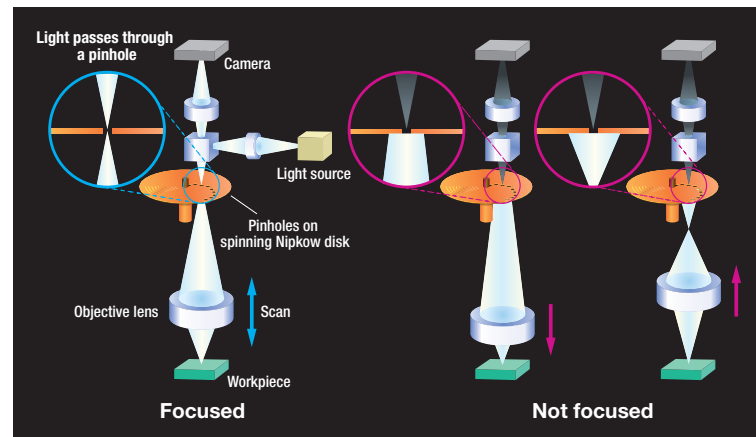


**NEXIV**  
VMR-K3040ZC

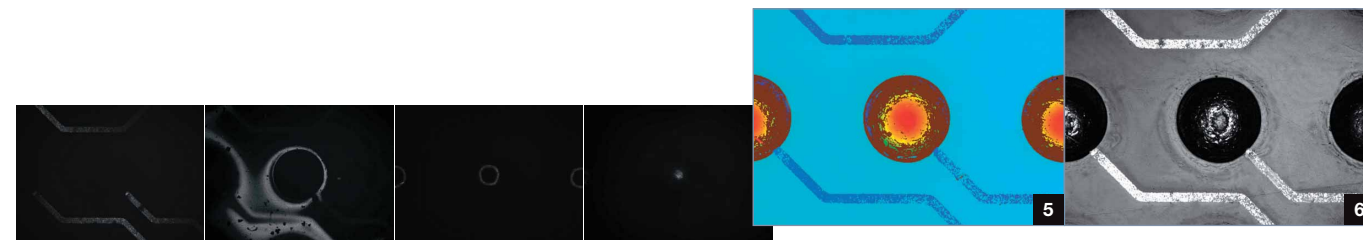


## Principle of confocal optics

Light that has passed through a pinhole on a spinning Nipkow disk is reflected by the workpiece at the focal point back through the pinhole and is detected as a very narrow DOF confocal image by the camera. However, 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 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



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

## Core technologies for the Confocal NEXIV metrology

Confocal optics allow wide-area height measurement in one go. Nikon proprietary confocal optics, in combination with ZC objective lenses newly developed for height measurement, can obtain height data for every pixel in the field of view in a single objective lens scan. This allows fast wide-area height measurement. Moreover, thanks to Nikon's precision control technologies, the system boasts extremely high gauging repeatability & reproducibility.

## Brightfield optics with 15x high-speed zoom

Five-step, 15x CNC high-speed zoom employed in the NEXIV series allows brightfield 2D measurement at optimum magnification.

## Three models with different magnifications available

To provide optimum magnification to measure a workpiece, three different models with 1.5x, 3x and 7.5x magnification are available.

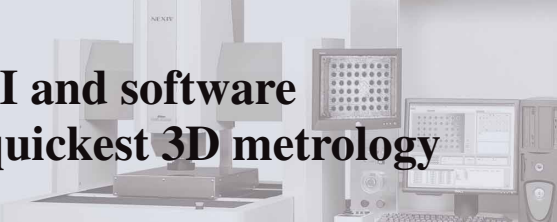
Magnification	1.5x	3x	7.5x
W.D.	24mm	24mm	5mm
Field of view	Confocal optics	8 x 6mm	4 x 3mm
	Brightfield optics	8 x 6mm to 0.53 x 0.4mm	4 x 3mm to 0.27 x 0.2mm
CF pixel size	5µm	2.5µm	1µm

## Compatible with automatic 300mm wafer handling system (NWT-3000)

The Confocal NEXIV can be configured with the automatic 300mm wafer loader at semiconductor fab cleanrooms. It is effective for the measurements of bumps and laser marks with on-line host communication in the factory. For wafer retention, both the edge clamp method and the rear side vacuum method are available depending on the characteristics of wafers. It is also compatible with OHT/RGV transfer by FOUF cassettes and online communication software. For details, please consult Nikon, an authorized dealer or distributor.

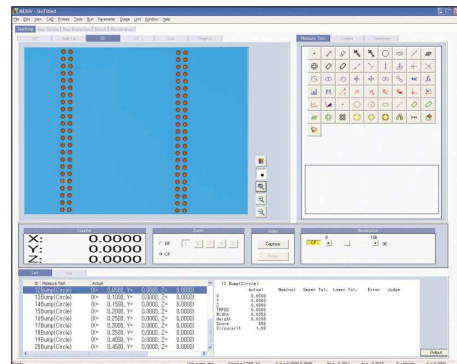
1 5 3D Contour Image (Bump) 3 Bright Field Image (Bump) 4 3D Contour Image (Bonding Wire Loop) 2 6 EDF Image (Bump)

# High-performance, sophisticated GUI and software functionality provides the easiest & quickest 3D metrology



The versatile metrology functionality in the sophisticated NEXIV VMR Advanced AutoMeasure realizes 3D FOV feature measurement in real-time confocal images.

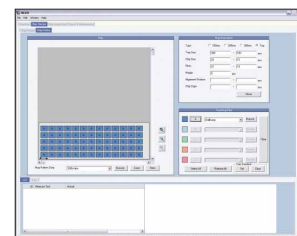
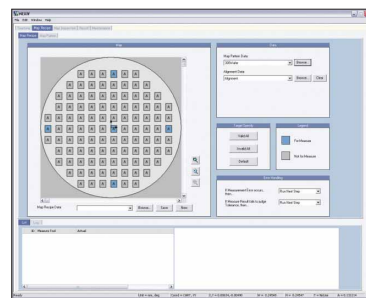
## Teaching generation/replay screen



- 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 sophisticated measurement tools employed by the NEXIV VMR series, 3D feature measurement tools are available for diverse workpiece shapes such as ball/flat bumps, bonding wires, probe card pins and so on. Thanks to optimization of algorithms for measurement sequence, multiple measurement points can be simultaneously measured in the field of view.
- Measurement results are stored as CSV format ASCII data for Data Reporting/SPC Analysis and so on.

User-friendly operation screen enhancing operation efficiency of wafer (tray) chip measurement allows map measurement of semiconductor wafers.

## Map recipe generation screen



Chips in-tray

- Allows wafer and chips in-tray measurement. A map can be generated and any chip on the map measured simply by inputting chip size and pitch.

## Map measurement execution screen

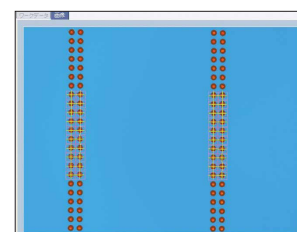
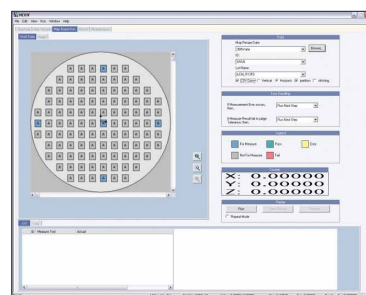
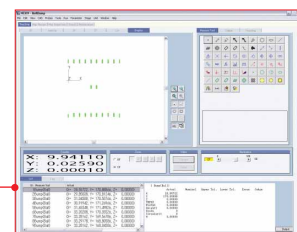
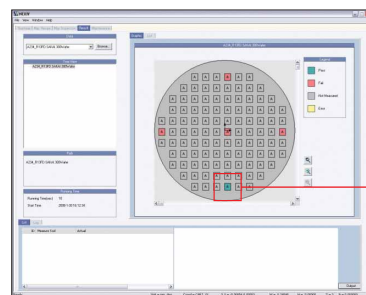


Image tab screen

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

## Measurement result review screen



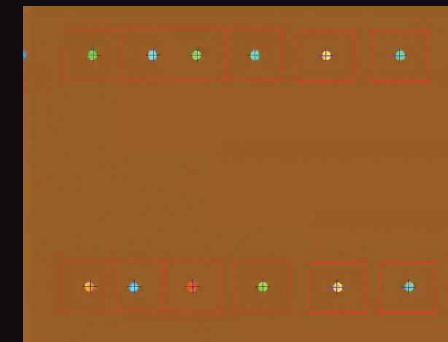
Measurement result screen

- 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.

## Applications

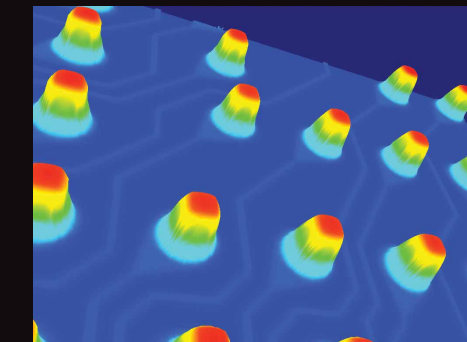
### Probe cards

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



3D image

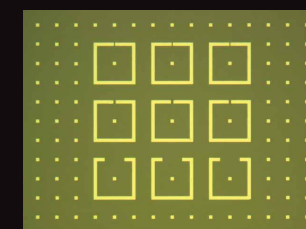
### Wafer level package



Bird's-eye view image by 3D viewer software (option)

### Fine bump & substrate pattern

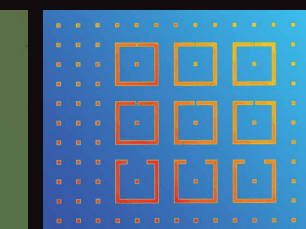
A combination of 2D measurement with 15x zoom brightfield image and 3D height measurement in the same field of view enables diverse measurements.



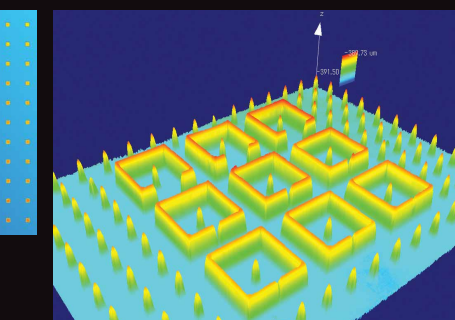
Brightfield image (minimum magnification)



Brightfield image (maximum magnification)

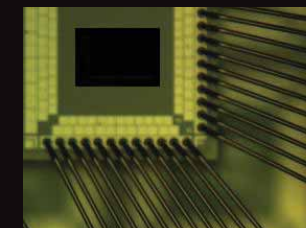


3D image

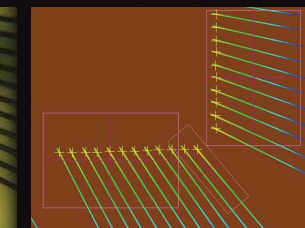


Bird's-eye view image by 3D viewer software (option)

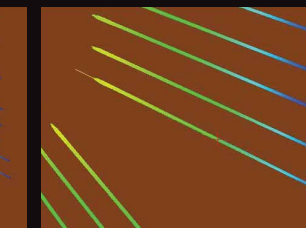
### Bonding wire loop height



Brightfield image



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

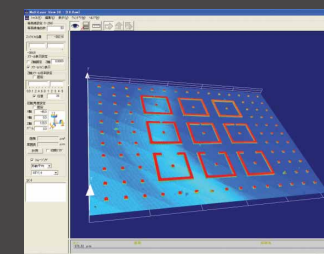


3D image: display of wire height profile

## Options

### 3D viewer software

Bird's-eye view and contour map images can be generated for visual evaluation of 3D workpiece by using confocal images acquired during the replay.



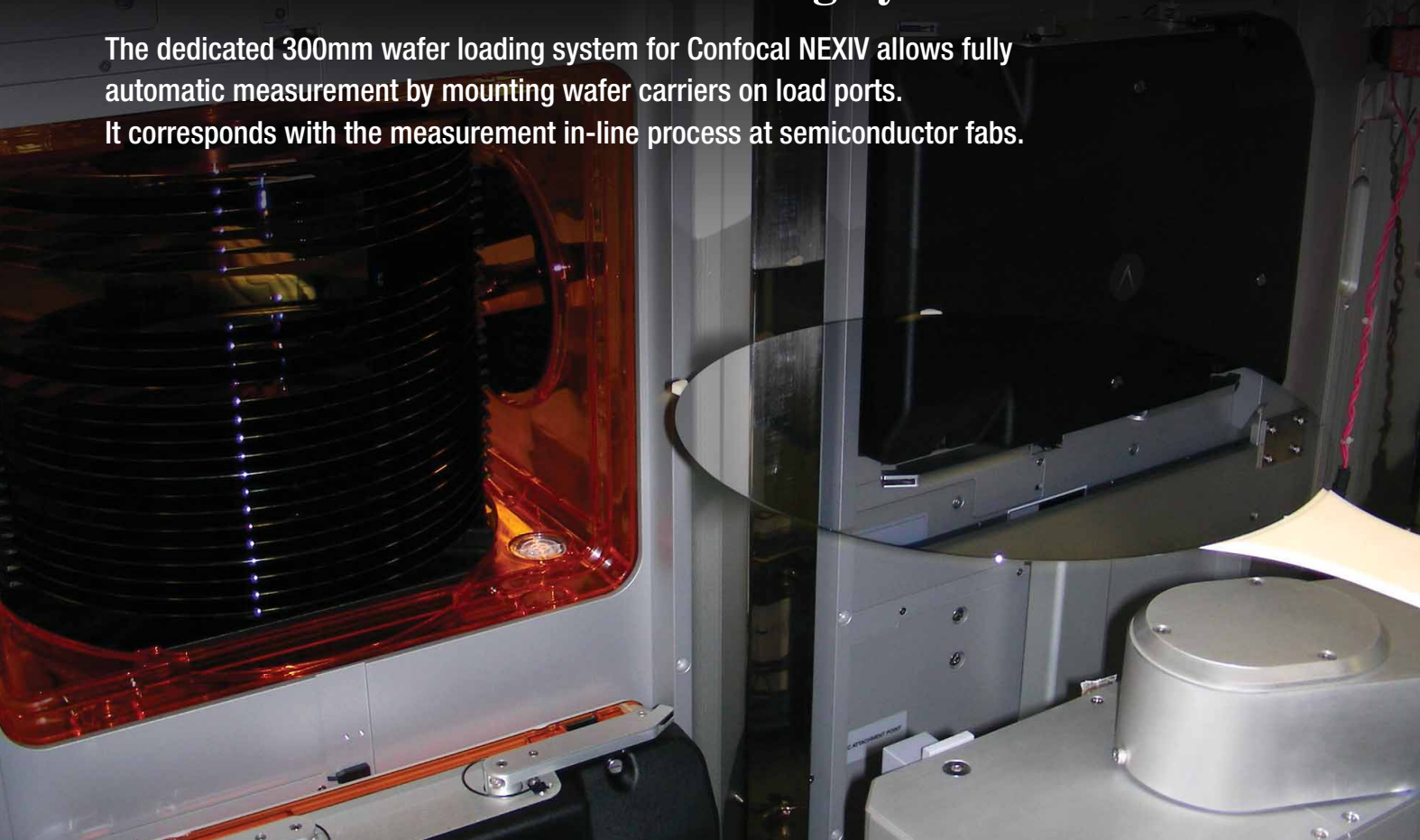
### Vacuum-chuck wafer holder

An optional vacuum-chuck wafer holder is available for supporting wafers in four different sizes: 125mm, 150mm, 200mm, and 300mm.



# Automatic 300mm Wafer Loading System NWT-3000

The dedicated 300mm wafer loading system for Confocal NEXIV allows fully automatic measurement by mounting wafer carriers on load ports. It corresponds with the measurement in-line process at semiconductor fabs.



Side with operation unit

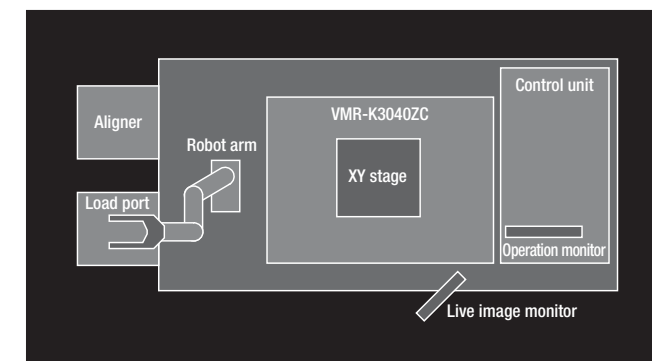


Side with load port

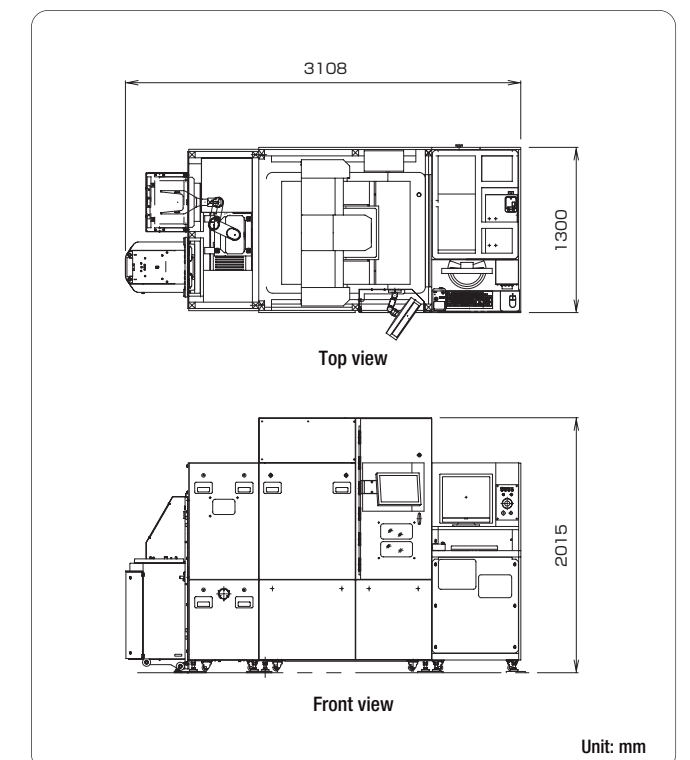
## Versatile options for wafer transfer, on-line interface, clean room compliance and others (For details, please consult Nikon, an authorized dealer or distributor.)

- FOSB compatibility
- 200mm wafer compatibility
- Two load ports compatibility
- Warped wafer compatibility
- Edge clamp transfer/measurement compatibility
- Contamination-abatement measures (suspended dust, adherent foreign particles, metal pollution, FFU attachable)
- GEM300 compliance

## Standard configuration (VMR-K3040ZC + NWT-3000)

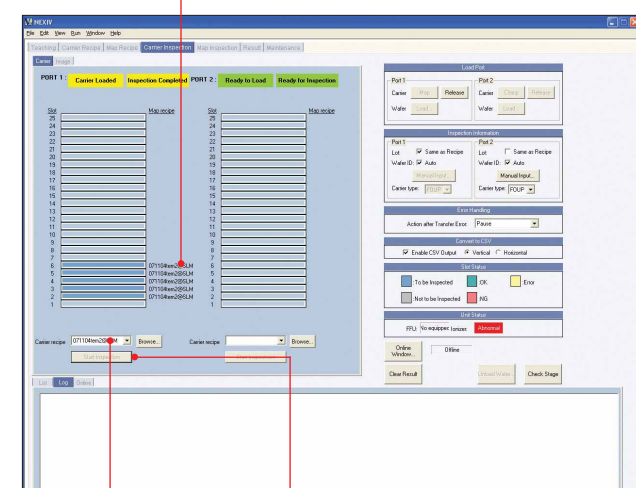


## Dimensional diagram (VMR-K3040ZC + NWT-3000)

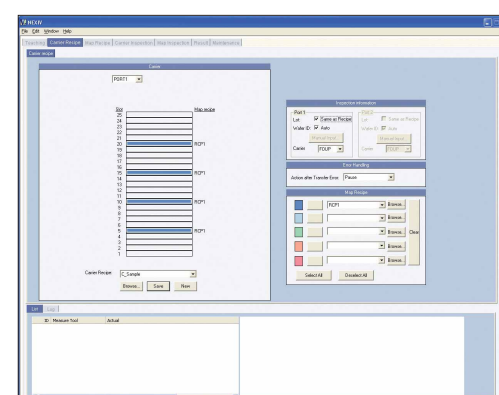


## Example of operation screen (two load ports type)

Map recipe can be selected for each wafer



Select carrier recipe Run button Carrier recipe running status screen



Carrier recipe generation screen

Automatic measurement for each carrier is possible only by selecting a carrier recipe and pushing the run button. Carrier recipe generation is also easy. During measurement in progress, wafer status is shown and the measurement screen can be viewed by switching image tabs.

## NWT-3000 standard specifications

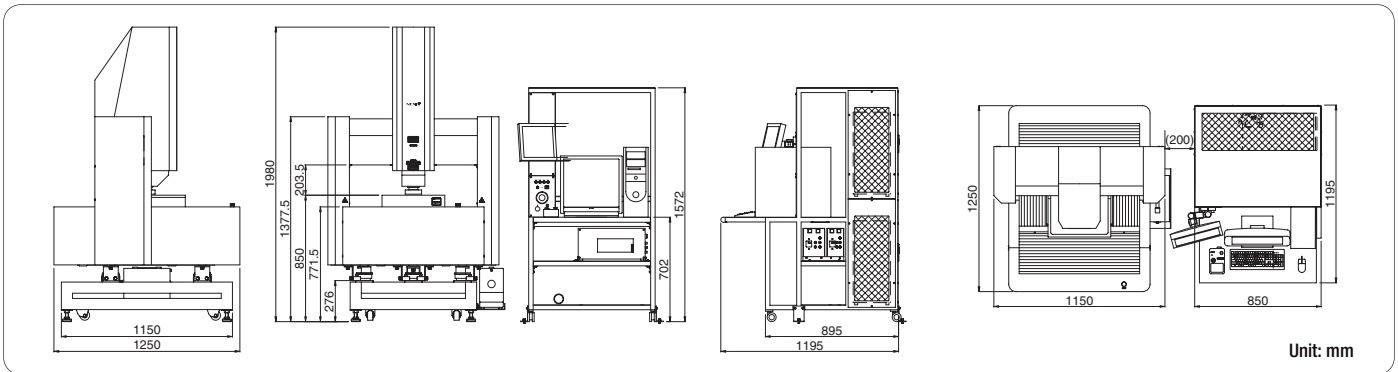
Compatible model	VMR-K3040ZC
Compatible wafer	SEMI compatible 300mm wafer
Compatible carrier	SEMI compatible FOUP
Standard functions	Automatic wafer transfer (load/unload) Prealignment 1 load port
Wafer retention during measurement	Full-back surface vacuum chuck by wafer holder
Wafer retention during transfer	Vacuum
Throughput (except measurement time)	80 sec. (transfer of one wafer) 840 sec. (consecutive transfer of 25 wafers)

## ■ Specifications

Types	1.5x	3x	7.5x
<b>Objectives</b>			
Magnification	1.5x	3x	7.5x
W.D.	24mm	24mm	5mm
<b>Confocal optics (Area height measurement)</b>			
Maximum scan height	1mm		
Field of view	8 x 6mm	4 x 3mm	1.6 x 1.2mm
Height measurement repeatability (2σ)	0.6μm	0.35μm	0.25μm
Pixel size in CF image	5μm	2.5μm	1μm
Measurement time per FOV	1.5 sec./FOV at 80μm scan range		
<b>Brightfield optics (2D measurement)</b>			
Zooming method	Motorized 5-step zoom (zoom ratio 15x)		
Field of view	8 x 6mm to 0.53 x 0.4mm	4 x 3mm to 0.27 x 0.2mm	1.6 x 1.2mm to 0.11 x 0.08mm
Illumination	Diascopic, Episcopic, White LED Ring Light		
Auto focus	TTL Laser AF		
<b>Main body</b>			
Stroke (X, Y, Z)	300 x 400 x 150mm		
Guaranteed loading capacity	20kg		
Measuring accuracy	U1XY 1.5+4L/1000μm U2XY 2.5+4L/1000μm		
Z-axis (L: Length in mm < W.D.)	1.5+L/150μm		
Main unit/operation rack weight	Approx. 900kg/250kg (standard set)		
Power source/power consumption	AC 100 to 240 V ±10% 50/60 Hz / 13A to 6.5A		
Operating condition	Temperature: 20°C±0.5K, Humidity: 70% or less		
Acquired standard	CE marking (low voltage/EMC/laser)		

Please ask Nikon for the specifications of permissible floor vibration.

## ■ Dimensional Diagram



Unit: mm

Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. March 2008 ©2008 NIKON CORPORATION

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

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