CNC Video Measuring System

NEXIV

VMZ-R Series

Standard Model
**Optical Heads**

**Type 1, 2 and 3** – Standard magnification zooming heads

- **Type 1**: 0.5×~7.5×
- **Type 2**: 1×~15×
- **Type 3**: 2×~30×

**Type 4 and TZ** – High magnification zooming heads

- **Type 4**: 4×~60×
- **Type TZ**: 1×~7.5×/16×~120×

**Type A** – Wide FOV zooming head

- **Type A**: 0.35×~3.5×

**Stage Sizes**

**300mm(X) × 200mm(Y) × 200mm(Z)** – Standard stroke

**VMZ-R 3020**

Suitable for small components used for products such as mechanical, electric/electronic, automotive, and medical devices.

- **Type 1–3**: Connectors, semiconductor packages, small PCB’s, small stamped sheet metal parts, lead frames, watch components, etc.
- **Type 4–TZ**: High density PCB’s, lead frames, semiconductor packages, MEMS, probe cards, etc.

**450mm(X) × 400mm(Y) × 200mm(Z)** – Middle stroke

**VMZ-R 4540**

Designed for middle size components and/or series measurements of multiple pieces on the stage.

- **Type 1–3**: Middle size PCB’s, stamped sheet metal parts, etc.
- **Type 4–TZ**: 300mm wafers, 300mm probe cards, etc.
- **Type A**: Middle size mechanical parts, plastic molded parts, etc.

**650mm(X) × 550mm(Y) × 200mm(Z)** – Large stroke

**VMZ-R 6555**

Suitable for large size components and/or ‘step-and-repeat’ measurements of multiple pieces on the stage.

- **Type 1–3**: Large PCB’s, large plastic molded parts, etc.
- **Type 4–TZ**: High density large PCB’s, etc.
- **Type A**: Large stamped sheet metal parts, large plastic molded parts, etc.

<table>
<thead>
<tr>
<th>Optical magnification</th>
<th>0.35</th>
<th>0.5</th>
<th>0.6</th>
<th>1</th>
<th>1.8</th>
<th>2</th>
<th>3.5</th>
<th>4</th>
<th>7.5</th>
<th>8</th>
<th>15</th>
<th>16</th>
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<th>32</th>
<th>60</th>
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<td>Type 4</td>
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<tr>
<td>Wide FOV zooming head</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>FOV size on stage</th>
<th>Horizontal (mm) × Vertical (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>12.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total magnification on PC monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.6</td>
</tr>
</tbody>
</table>

*Total magnification is that of video window with 640 × 480 pixels on 24 inch WXGA monitor (1920 × 1200 pixels) recommended for VMZ-R series.
**Type 1, 2 and 3 – Standard magnification zooming heads**

Equipment with excellent Nikon optics

Zooming heads are equipped with 15x zoom optics made exclusively for the NEXIV VMZ-R series. These Nikon optics feature a long working distance, a high NA of 0.35, low distortion, and low magnification error.

<table>
<thead>
<tr>
<th>Optical magnification</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>5x</th>
<th>8</th>
<th>16</th>
<th>16</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1 (0.5 to 7.5x)</td>
<td>0.5x</td>
<td>1x</td>
<td>2x</td>
<td>4x</td>
<td>7.5x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 2 (1 to 15x)</td>
<td>0.5x</td>
<td>1x</td>
<td>2x</td>
<td>4x</td>
<td>8x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 3 (2 to 30x)</td>
<td>0.5x</td>
<td>1x</td>
<td>2x</td>
<td>4x</td>
<td>8x</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>FDV size on stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal × Vertical (mm)</td>
</tr>
<tr>
<td>9.33 x 7.01</td>
</tr>
<tr>
<td>18 x 36</td>
</tr>
<tr>
<td>27 x 144</td>
</tr>
<tr>
<td>288 x 144</td>
</tr>
<tr>
<td>540 x 576</td>
</tr>
<tr>
<td>576 x 1080</td>
</tr>
</tbody>
</table>

**Measurement support provided by Vision AF**

Used for samples difficult to detect with TTL Laser AF, Vision AF is suitable to measure the height of rough surfaces and depth of small/ deep holes.

- **Surface mode**
  - Focus on surface of objects
- **Contrast mode**
  - Focus on edges contoured by the bottom light
- **Multi mode**
  - Measure height of multiple points in the FOV
- **2 peak detection**
  - Obtain higher or lower focus points

**Versatile illumination designed for highlighting obscure edges**

LED light sources have now replaced all the halogen light sources used on previous models. LEDs have a stable high color temperature, which does not change with intensity. This gives more natural images and shorter measurement times.

- **LED inner ring light**
- **LED outer ring light at 55 degree position**
- **LED outer ring light at 78 degree position**

The inner 8 segment LED ring illuminator has 37 degree oblique angle to optical axis and the outer 8 segment LED ring illuminator has 55 and 78 degrees, that can easily define edges which are almost invisible to coaxial top light.

**TTL Laser AF with 50mm working distance (TTL - Through the lens)**

Type 1, 2 and 3 zooming heads are equipped with TTL Laser AF with a long working distance 50mm. TTL Laser AF can work and show a high repeatability, independent from magnification used. It can also be used for scanning the surface by detecting a maximum of 1000 points per second. TTL Laser AF can detect both top and bottom surfaces of a transparent layer for measuring thickness of the transparent layer or the depth to surface of the layer under the transparent layer.

- **Focusing mode**
  - Zooming head moves to focus point, passes it and returns to it.
- **Trigger mode**
  - Zooming head moves to focus point and passes it and does not return to it (for reduction of measuring time).
- **Tracking mode**
  - Zooming head moves to focus point and stops there and does not pass it (for further reduction of measuring time).
- **Searching mode**
  - Zooming head detects 2 surfaces reflecting laser beam and you can choose a surface to detect.
Type 4 – High magnification zooming head

Ideal for measuring high density samples with tiny features

Type 4 has a 4 to 60× optical magnification, twice that of Type 3. The objective lens is designed with a high NA of 0.46 and a long working distance of 30mm.

8-segment LED ring illuminator suited for various samples

Type 4 is equipped with an 8-segment LED ring illuminator, as well as episcopic and diascopic illuminators, that make obscure edges stand out.

Subtle edges can be detected by utilizing the 50 degree oblique angle of the 8-segment ring illuminator.

2 types of AF available as standard

TTL Laser AF

TTL Laser AF, with a working distance of 30mm, can detect both the top and bottom layers of thin samples, such as transparent samples of 0.1mm thickness. By scanning 1000 points per second, the TTL Laser AF not only offers high accuracy, but also speed.

Vision AF

Vision AF can detect surfaces that cannot be reached with the Laser AF. The bottom surface of deep holes and the height of steep surfaces can be detected and measured with Vision AF.

Type TZ – High magnification zooming head

Type TZ high magnification zooming head is equipped with two objective lenses that can be easily switched, offering a total of 1 to 120× optical magnifications. From low magnification to high magnification to measure tiny features, such as 1 micrometer line width, Type Z covers a wide range of measurement area.

CNC controlled illuminations

Offers coaxial, episcopic, and darkfield illuminations to detect edges of tiny features.

Optical magnification

<table>
<thead>
<tr>
<th>Type 4</th>
<th>4x</th>
<th>8x</th>
<th>32x</th>
<th>60x</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOV size on stage (micrometer)</td>
<td>1.165</td>
<td>0.875</td>
<td>0.582</td>
<td>0.437</td>
</tr>
<tr>
<td>Horizontal × Vertical (mm)</td>
<td>0.291</td>
<td>0.216</td>
<td>0.146</td>
<td>0.078</td>
</tr>
<tr>
<td>1/3&quot; CCD size (micrometer)</td>
<td>4.8×3.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal × Vertical (mm)</td>
<td>1152</td>
<td>2160</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type TZ</th>
<th>1x</th>
<th>2x</th>
<th>4x</th>
<th>7.5x</th>
<th>10x</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOV size on stage (micrometer)</td>
<td>4.7</td>
<td>2.33</td>
<td>1.65</td>
<td>0.622</td>
<td>0.291</td>
</tr>
<tr>
<td>Horizontal × Vertical (mm)</td>
<td>3.5</td>
<td>1.75</td>
<td>0.875</td>
<td>0.467</td>
<td>0.218</td>
</tr>
<tr>
<td>1/3&quot; CCD size (micrometer)</td>
<td>4.8×3.6</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Optical magnification

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<th>4x</th>
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<td>0.467</td>
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</tbody>
</table>

* Total magnification is that of video window with 640×480 pixels on 24 inch WUXGA monitor (1920×1200 pixels) recommended for VMZ-R series.

Optical magnification

<table>
<thead>
<tr>
<th>Type TZ</th>
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<th>2x</th>
<th>4x</th>
<th>7.5x</th>
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<td>0.622</td>
<td>0.291</td>
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<td>Horizontal × Vertical (mm)</td>
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<td>1.75</td>
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<td>0.467</td>
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<tr>
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<td>2160</td>
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</tbody>
</table>

* Total magnification is that of video window with 640×480 pixels on 24 inch WUXGA monitor (1920×1200 pixels) recommended for VMZ-R series.
Features a wide FOV and long working distance

With a maximum of 13.3 × 10 mm FOV at 0.35x, the wide FOV is available for samples with large features.

Vision AF and Laser AF

The search probe can detect misaligned parts, and rotate the program to suit, allowing for successful measurement with the Vision AF. With a 63 mm working distance, the Laser AF option for Type A offers high accuracy, independent of magnification and its depth of focus.

Illumination lineup for various needs

Equipped with episcopic, diascopic and 8-segment ring illuminators. Obscure edges can be visualized by using the 8-segment ring illuminator with an oblique angle of 18 degrees.

Optical magnification

<table>
<thead>
<tr>
<th>Magnification</th>
<th>0.35x</th>
<th>0.6x</th>
<th>1x</th>
<th>2x</th>
<th>2.6x</th>
<th>3.5x</th>
<th>5x</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOV size on stage</td>
<td>Horizontal</td>
<td>Vertical</td>
<td>Horizontal</td>
<td>Vertical</td>
<td>Horizontal</td>
<td>Vertical</td>
<td>Horizontal</td>
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<tr>
<td>10.0</td>
<td>7.8</td>
<td>5.8</td>
<td>3.5</td>
<td>2.6</td>
<td>1.9</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>13.3</td>
<td>10.0</td>
<td>8.0</td>
<td>5.8</td>
<td>4.7</td>
<td>3.5</td>
<td>2.6</td>
<td>1.9</td>
</tr>
</tbody>
</table>

At all magnifications, a working distance of 73.5 mm can be realized. Type A is suitable for measuring low density samples with wide steps and/or deep holes.

Errors can be visualized by overlaying nominal and measured shapes. Can be used for both geometrical shapes and free-form shapes.

Evaluation of shapes

- Calculation of errors can be made in normal or axis direction
- Nominal shapes can be made from CAD data or XYZ coordinate values
- Measured shapes can be output as CSV or DXF files
- Evaluation reports can be made in PDF files

Other functions

Import of CAD data
Export of DXF data
Features measured can be exported as DXF data.

Off-line teaching
Teaching files can be made on CAD data.

Reporting measured data
Easily made by choosing graphics and layouts.

Calculations based on ISO and JIS standards
Circle (roundness), plane (flatness), line (straightness) are available.

Digital Operation Guide

NEXIV Note Ver.1.0
Offers slides and movies with NEXIV contents, such as basic operations and functions. Simple measurement programs can be created by referring to this application.

Content Example

- Search: search by related words
- Favorite: list only selected contents
- Memo: share information by creating memos
- Pack List: sort by related contents
- Stay on top: display in the foreground on screen

Software

Edge and point selection

Preset rules for selecting the correct edge with multiple edge candidates and a filter to avoid abnormal points to minimize errors.

Intelligent search function

Measures by searching preset shapes/patterns. Misaligned samples can be found and measured without failure.

“Rotate search” detects the misaligned samples and automatically rotates the program to suit for measurement.

Working distance 73.5 mm

Assembled components

Under coaxial top light at 0.35x optical magnification

Working distance

63 mm (Laser AF)

Episcopic illumination

8-segment LED ring light

Plastic molded part

Under coaxial top light at 0.35x optical magnification

Focusing on a surface

(Vision AF Surface model)

Focusing on an edge

(Vision AF Contrast model)
MountainsMap X

Sample surfaces can be analyzed, based on ISO, with the data exported from VMZ-R.

Manufactured by Digital Surf (France)

Optional Software

EDF/Stitching Express

Images taken with the VMZ-R can be stitched to get a larger image, while images at different heights can result in an image with Extended Depth of Focus (EDF). Stitching and EDF can produce 3D graphics.

ImageFit QC

Creates inspection reports according to any designated format. Measurement results can be automatically reflected with pass/fail results and statistical results*. Line graphs and histograms can also be created as needed.

*standard deviation, process capability index (Cp, Cpk)

Codeveloped by Aria Co., Ltd. (Japan)

Custom Fit QC

Measurement results are read into 10 different templates and pass/fail results and calculation results are automatically exported. Graphs, including X-R control charts and scatter diagrams, can be automatically generated to visualize measurement results.

*1: Average, maximum value, minimum value, range, standard deviation, and process capability index (Cp, Cpk)

*2: Line graphs, histograms, X-R control charts, scatter diagrams

Codeveloped by Aria Co., Ltd. (Japan)

MapMeasure Pro

MapMeasure Pro creates wafer maps and is capable of automatically measuring any die on the wafer map. Tray maps can also be created.

Dimensions

Controller: 190×450×440 mm / 15 kg

VMZ-R 3020

Main body with table: 720×730×1795 mm / approx. 245 kg
Footprint including a PC on table: 2100×1100 mm

VMZ-R 4540

Main body with table: 1000×1340×1820 mm / approx. 500 kg
Footprint including a PC on table: 2300×1700 mm

VMZ-R 6555

Main body with table: 1200×1640×1820 mm / approx. 665 kg
Footprint including a PC on table: 2400×2000 mm
## Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>VMZ-R 3020</th>
<th>VMZ-R 4540</th>
<th>VMZ-R 6555</th>
</tr>
</thead>
<tbody>
<tr>
<td>XYZ strokes</td>
<td>Type 1, 2, 3 and 4</td>
<td>300×200×200 mm</td>
<td>450×400×200 mm</td>
</tr>
<tr>
<td>Type TZ with high magnification lens</td>
<td>300×200×200 mm</td>
<td>450×400×200 mm</td>
<td>650×550×200 mm</td>
</tr>
<tr>
<td>Type TZ with low magnification lens</td>
<td>250×200×200 mm</td>
<td>400×400×200 mm</td>
<td>600×650×200 mm</td>
</tr>
<tr>
<td>Type A</td>
<td>300×200×200 mm</td>
<td>450×400×200 mm</td>
<td>650×550×200 mm</td>
</tr>
<tr>
<td>Minimum readout</td>
<td>0.01 micrometer</td>
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<td></td>
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<tr>
<td>Maximum sample weight</td>
<td>20 kg</td>
<td>40 kg</td>
<td>50 kg</td>
</tr>
<tr>
<td>Maximum permissible error (L: Length in mm)</td>
<td>EUX, MPE: EUY, MPE: 1.2±4/1000 µm</td>
<td>EUX, MPE: 2±4/L1000 µm</td>
<td>EUY, MPE: 1.2±5/L1000 µm</td>
</tr>
<tr>
<td>Camera</td>
<td>1/3&quot; Black and White CCD, 1/3&quot; Color CCD *Color camera option is available only with Type 1, 2 and A</td>
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<td></td>
</tr>
<tr>
<td>Working distance of objective lens</td>
<td>Type 1, 2 and 3</td>
<td>30 mm</td>
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</tr>
<tr>
<td></td>
<td>Type 4</td>
<td>30 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type TZ</td>
<td>11 mm with right objective lens, 32 mm with left objective lens</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type A</td>
<td>73.5 mm (63 mm with Laser AF)</td>
<td></td>
</tr>
<tr>
<td>Magnification and FOV</td>
<td>Type 1: 0.5~7.5× / 9.33 × 7 ~ 0.622 × 0.467 mm</td>
<td>Type 2: 1~15× / 4.67 × 3.5 ~ 0.311 × 0.233 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type 3: 2~30× / 2.33 × 1.75 ~ 0.155 × 0.117 mm</td>
<td>Type 4: 4~60× / 1.165 × 0.875 ~ 0.078 × 0.058 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type TZ: 1~120× / 4.67 × 3.5 ~ 0.039 × 0.029 mm</td>
<td>Type A: 0.35~3.5× / 13.3 × 10 ~ 1.33 × 1 mm</td>
<td></td>
</tr>
<tr>
<td>Autofocus</td>
<td>Vision AF, Laser AF (option)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illumination</td>
<td>Type 1, 2, 3, and 4</td>
<td>Episcopic, diascopic, and 8-segment ring with 3 angles *All white LED/Type 4 has only 1 angle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type TZ</td>
<td>Left objective lens: Episcopic, darkfield ; Right objective lens: Episcopic, diascopic, darkfield</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type A</td>
<td>Episcopic, diascopic, and 8-segment ring with 1 angle *All white LED</td>
<td></td>
</tr>
<tr>
<td>Power source</td>
<td>AC 100-240V±10%, 50/60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>5 A - 2.5 A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nikon Corporation Industrial Metrology Business Unit is certified as an ISO/IEC 17025 accredited calibration laboratory for CNC video measuring systems by the IA Japan (International Accreditation Japan) as Accreditation No.JCSS0241.

ISO/IEC 17025: International standard, which specifies the general requirements to ensure that a laboratory is competent to carry out specific tests and/or calibrations

<table>
<thead>
<tr>
<th>Date of initial accreditation:</th>
<th>July 1, 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope of accreditation:</td>
<td>Coordinate measuring instruments</td>
</tr>
<tr>
<td>Accredited section:</td>
<td>Industrial Metrology Business Unit</td>
</tr>
<tr>
<td>Calibration site:</td>
<td>Customer’s laboratory (field service)</td>
</tr>
<tr>
<td>Calibration and Measurement Capability (Cmc), (K=2, Level of Confidence Approximately 95%)</td>
<td>L = measurement length (mm)</td>
</tr>
<tr>
<td>≤420mm: 0.32 µm</td>
<td>420 ≤ L ≤ 1000mm : (0.29 + 0.64 x L/1000) µm</td>
</tr>
</tbody>
</table>

 Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. March 2020 ©2013-2020 NIKON CORPORATION

**WARNING**

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

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