NEXIV 3rd Generation, VMZ-R Series,

Created with 3 new stage platforms (3020, 4540, and 6555) and 6 new optical heads (Type 1,2,3, and 4, Type TZ and Type A)

Optical heads – Total 6 types Select the best one for your measurements.

Type 1, 2 and 3 – Standard magnification zooming heads

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

Type 1, 2 and 3, have Nikon 15× zoom optics with a long working distance, wide FOV (Field of View) and a high N.A. (Numerical Aperture) 0.35. All standard heads equipped with LED episcopic, diascopic and inner/outer ring illuminators giving top, bottom and oblique lights with 3 different oblique angles, to make obscure edges stand out.

High density PCB
(optical magnification 1×)
Type 2 zooming head /
coaxial top light

Printed circuit board
(optical magnification 2×)
Type 2 zooming head /
8 segment LED ring light

Type 4 and TZ – High magnification zooming heads

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

Type 4 and TZ have Nikon 15× and 120× zoom optics with higher magnification and a higher N.A. 0.46. Type 4 is equipped with LED episcopic, diascopic and ring illuminators, giving top, bottom and oblique lights with 50 degrees. TZ has LED episcopic, diascopic and Dark Field illuminators for the main objective lens (16-120×) and LED episcopic and Dark Field illuminators for the auxiliary objective lens (1-7.5×).

IC chip
(optical magnification 8×)
Type 4 zooming head /
coaxial top light

High density PCB
(optical magnification 16×)
Type TZ zooming head /
dark field illumination

Type A - Wide FOV zooming head

Type A 0.35×~3.5×

Type A features Nikon 10× zoom optics with the widest FOV, the longest working distance and the highest N.A. 0.11 in this low magnification range, equipped with LED episcopic, diascopic and ring illuminators giving top, bottom and oblique lights.

Plastic molded part
(optical magnification 0.6×)
Type A zooming head /
coaxial top light

Resin parts
(optical magnification 0.35×)
Type A zooming head /
8 segment LED ring light

Stage strokes – 3 types

300mm(X) × 200mm(Y) × 200mm(Z) – Standard strokes

VMZ-R 3020

Suitable for small components used for various kinds of products such as mechanical, electric, electronic, automotive, medical devices, etc.

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.

Type A Plastic molded parts, sheet metal parts, rubber parts, mechanical parts, implant components, watch components, etc.

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

VMZ-R 4540

Newly 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.

* 150mm(X) × 150mm(Y) × 150mm(Z), 1000mm(X) × 800mm(Y) × 150mm(Z) and 1200mm(X) × 740mm(Y) × 150mm(Z) are available with VMR series.

Optical magnification			0.35	0.5	0.6	1	1.8	2	3.5	4	7.5	8	15	16	30	32	60	64	120
Magnification type	Standard zooming heads	Type 1																	
		Type 2																	
		Type 3																	
	High magnification zooming heads	Type 4																	
		Type TZ																	
	Wide FOV zooming head	Type A																	
FOV size on stage	Horizontal (mm) × Vertical (mm)		13.3 10.0	9.33 7.01	7.8 5.8	4.7 3.5	2.6 1.9	2.33 1.75	1.33 1.00	1.165 0.875	0.622 0.467	0.582 0.437	0.311 0.233	0.291 0.218	0.155 0.117	0.146 0.109	0.078 0.058	0.073 0.055	0.039 0.029
Total magnification on PC monitor			12.6	18	21.6	36	64.8	72	126	144	270	288	540	576	1080	1152	2160	2304	4320

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

New zooming heads Type 4 and A, new stage strokes 450×400mm, cover your applications with a wider range.

New zooming heads

• Type 4

Newly designed with optical magnification 4 to 60×, twice the magnification than that of type 3, where a high N.A. 0.46 and a long working distance of 30mm are combined. Ideal for high density specimen with tiny features to measure.

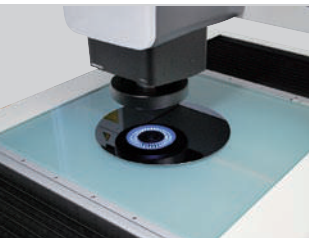**Type 4**

High density PCB
(optical magnification 16×)

• Type A

Type A optical head has gained an excellent reputation with the VMA-2520 since 2007. It has an extremely long working distance of 73.5mm, making it comfortable and safe to work with. It also has an extremely wide FOV max. 13.3×10mm. Good for many low density specimen with big steps, deep holes, tall bosses, etc..

Type A

Plastic molded part
(optical magnification 0.35×)

Middle XY stage strokes and an extended Z stroke

Type 1, 2 and 3 are equipped with 8 segment LED inner and outer ring illuminators enabling you to make the best illumination for making obscure edges stand out. You have a choice from 3 oblique angles, 37, 55 and 75 degrees, from any directions of 8 segments and combination of any segments and using any light intensity.

Measurement of a 300mm wafer
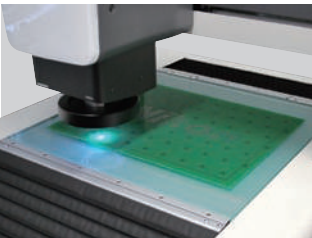
Measurement of a large PCB

New TTL Laser AF (TTL - Through the lens)
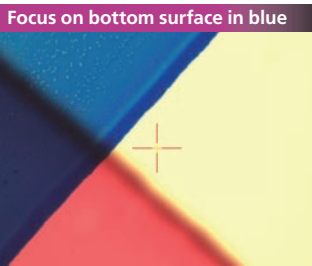
Type 1~3 / Type 4 / TZ

New TTL Laser AF can now detect 2 Laser beams reflected, one from top surface of an upper transparent layer, the other from its bottom surface or from the top surface of the second layer. Consequently, it can measure thickness of the transparent layer or depth to top surface of the second layer. Laser AF now has a new mode to make the optical head stop exactly on focus point and cease any further movement, passing or returning to focus point, for reducing measuring time.

New TTL Laser AF
It can detect 2 Laser beams reflected on 2 different surfaces.

Transparent layer
Substrate

Focus on top surface in red

Focus on bottom surface in blue
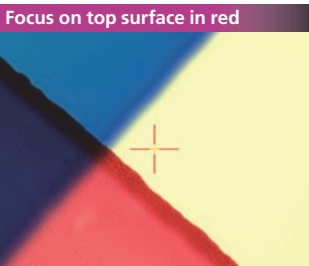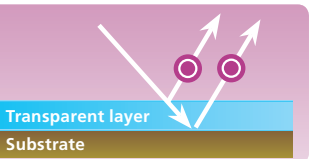
0.1mm glass plate at 8× optical magnification of Type 2 zooming head

Software with new GUI

Type 1~3 / Type 4 / TZ / Type A

NEXIV software is renewed with new GUI featuring Main Window, from which you can make or run teaching files, verify results or make various calibrations. With various wizards, you can make teaching files more easily in shorter time. It is equipped with NEXIV Profiler and NEXIV Report software. Please refer to page 11 and 12 for more details of the software.
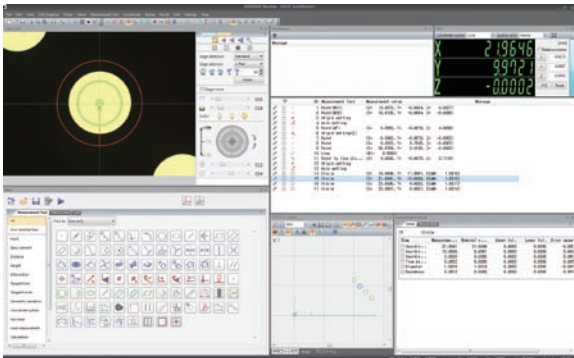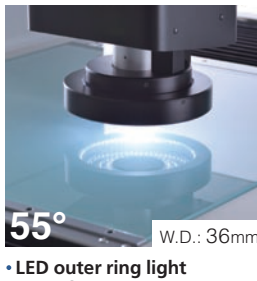
## 8 segment LED inner and outer ring illuminators

Type 1~3

Type 1, 2 and 3 are equipped with 8 segment LED inner and outer ring illuminators, achieving the best illumination possible, revealing obscure edges stand out. You have a choice from 3 oblique angles, 37, 55 and 75 degrees, from any directions of 8 segments and combination of any segments and using any light intensity.
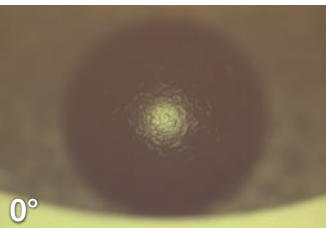
37° W.D.: 50mm
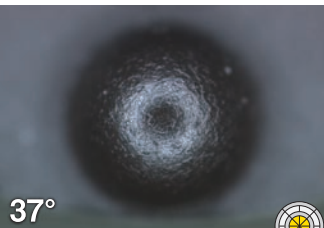**LED inner ring light**

55° W.D.: 36mm
• **LED outer ring light at 55 degree position**
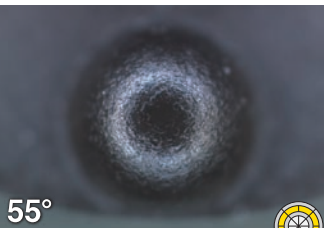
78° W.D.: 10mm
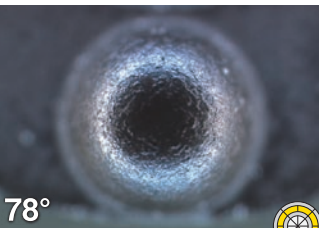• **LED outer ring light at 78 degree position**
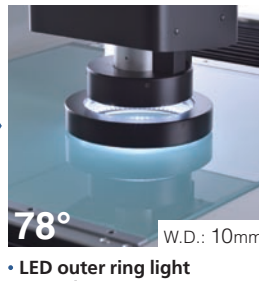
0°
Plastic molded part (optical magnification 4×)
Coaxial top light

37°
LED inner ring light

55°
LED outer ring light at 55 degree position

78°
LED outer ring light at 78 degree position

Other new features

Type 1~3 / Type 4 / TZ / Type A

Improvement of uncertainty

Nikon's new linear encoder "ModuRay" featuring a non-contact reading head that contributes to greater certainty.

XGA camera option

You now have a choice of XGA camera with 1024 × 768 pixels in addition to conventional VGA camera with 640 × 480 pixels. XGA camera is for getting high resolution images for visual inspection, documentation, etc.. Uncertainties of systems specified in this brochure are guaranteed with both VGA and XGA cameras.

Higher throughput

Higher data transferring speed and adoption of LED light source, that can change its intensity in a moment, compared with halogen lamp, resulting in higher throughput.

New joystick box

Z axis fine movement buttons are newly added on top of the joystick lever for XY axis movement and rotating knob for Z axis movement as wells as 3 buttons to which your favorite 3 functions can be assign.

LED light source for all illuminators

LED light source is newly adopted for episcopic and diascopic illuminators giving top and bottom lights. LED light source features a short time for changing its intensity, a stable high color temperature regardless of its intensity, a long life and a low consumption of electric power in comparison with halogen lamp. Thus, LED light source brings you shorter measurement time and lower cost of ownership.

Standard magnification zooming heads equipped with excellent Nikon optics.

The zooming heads are equipped with Nikon-designed 15x zoom optics and made exclusively for the NEXIV VMZ-R series, featuring a long working distance 50mm, a high N.A. 0.35, a low distortion, and low magnification error.

Optical magnification		0.5	1	2	4	7.5	8	15	16	30
Magnification Type	Type 1 (0.5 to 7.5×)	0.5x	1x	2x	4x	7.5x				
	Type 2 (1 to 15×)		1x	2x	4x		8x	15x		
	Type 3 (2 to 30×)			2x	4x		8x		16x	30x
FOV size on stage	Horizontal × Vertical (mm)	9.33 7.01	4.7 3.5	2.33 1.75	1.165 0.875	0.622 0.467	0.582 0.437	0.311 0.233	0.291 0.218	0.155 0.117
1/3" CCD size	Horizontal × Vertical (mm)	4.8×3.6								
Video magnification		36								
Total magnification on Video Window (640 × 480 pixels)		18	36	72	144	270	288	540	576	1080
Size of 1 pixel (micrometer)		14.7	7.36	3.68	1.84	0.98	0.82	0.48	0.46	0.24
Size of objects on Video Window (640 × 480 pixels)	0.01× (mm) 0.1× (mm) 1× (mm)	0.18 1.8 18	0.36 3.6 36	0.72 7.2 72	1.44 14.4 144	2.7 27 270	2.88 28.8 288	5.4 54 540	5.76 57.6 576	10.8 108 1080
Optical magnification		0.5	1	2	4	7.5	8	15	16	30

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

New 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 be used also for scanning surface by detecting a maximum of 1000 points per second. It now can also detect 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.

Zoom optics
Mirror
Objective lens
LED ring illuminator
TTL Laser AF device
Specimen
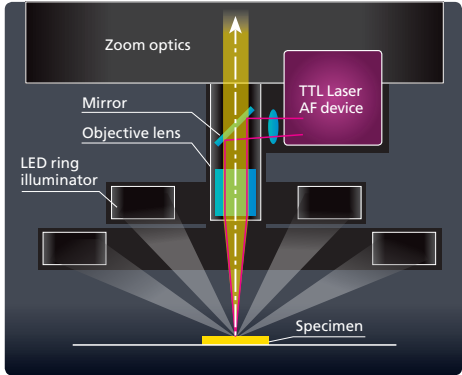
TTL Laser AF schematic

Image Auto focus (AF)

The AF image of the VMZ-R has improved speed and repeatability with respect to the VMR series. The VMZ-R AF produces improved average height of a rough surface, depth detection of small, deep holes or steep surfaces as opposed to that obtained by a laser.

Two peak detection
☑ Double peak detection
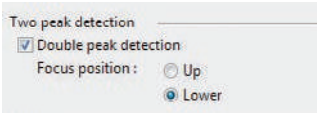Focus position: ○ Up
● Lower
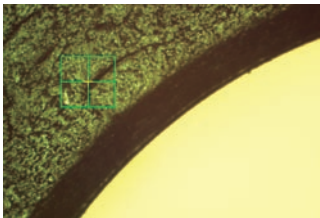
• **Surface mode**
For focusing on surface of objects
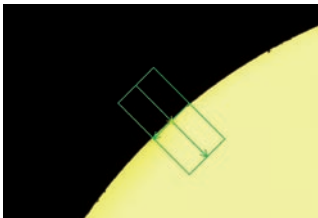
• **Contrast mode**
For focusing on edges contoured by bottom light
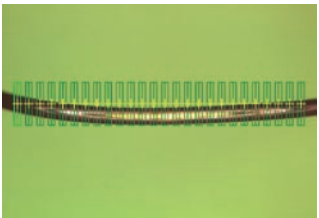
• **Multi mode**
For getting height of multiple points in FOV

• **2 peak detection**
For getting higher or lower focus point

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.

❶ Diascopic and episcopic light control
❷ Automatic adjustment of diascopic and episcopic light intensity
❸ Ring light control – angle and direction
❹ Rotation of ring light direction
❺ Ring light intensity control
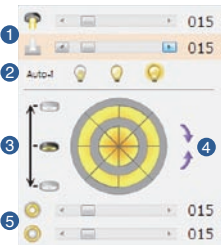
The inner 8 segment LED ring illuminator has 37 degree oblique angle to optical axis and the outer 8 segment LED ring illuminator has 55 and 78 degrees, that can easily define edges which are almost invisible to coxial top light.
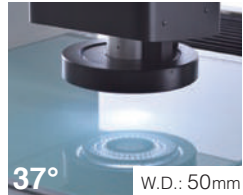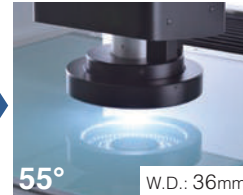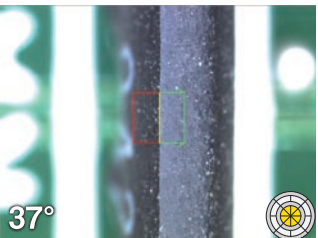
37° W.D.: 50mm
• LED inner ring light

55° W.D.: 36mm
• LED outer ring light at 55 degree position

78° W.D.: 10mm
• LED outer ring light at 78 degree position
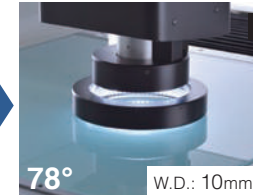
0° (Coaxial top light) **37°**
0° (Coaxial top light) **78°**

• Coaxial top light / 37 degree oblique light (Connector at optical magnification 5×)
Obscure edges under coaxial top light are visible with LED ring lights.

• Coaxial top light / 78 degree oblique light (Drill at optical magnification 5×)
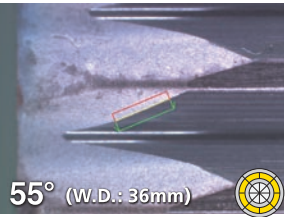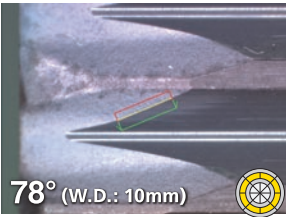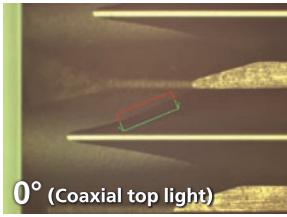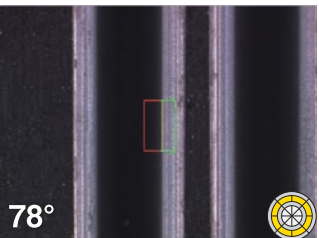
• Coaxial top light / 78 degree oblique light / 55 degree oblique light (Drill at optical magnification 5×)
An obscure edge under coaxial top light is visible with oblique lights.
55 degree oblique light with 36mm working distance has an effect similar to 78 degree one with 10mm working distance.

0° (Coaxial top light) **78° (W.D.: 10mm)** **55° (W.D.: 36mm)**

For measuring tiny features

4x 8x 16x 32x 60x
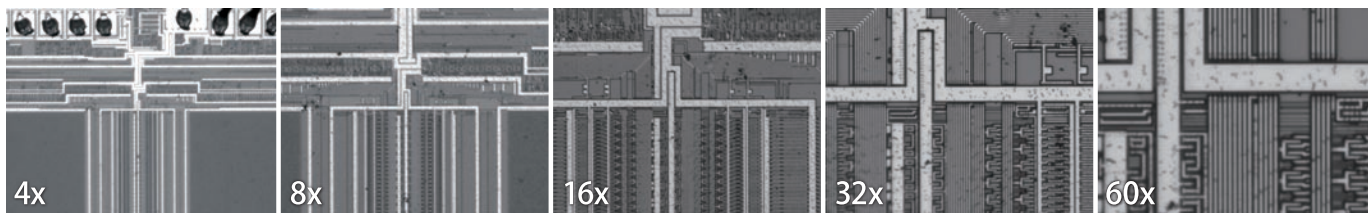
Type 4, having a 4 to 60× optical magnification, twice the magnification of the Type 3, is designed for tiny features in high density specimen. Its objective lens is newly designed with a high N.A. 0.46 and a long working distance 30mm.
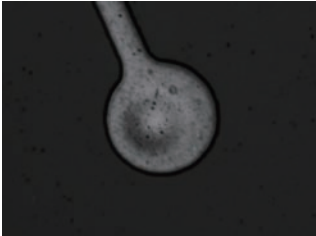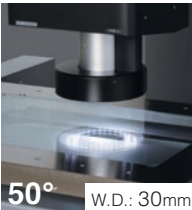
Optical magnification		4	8	16	32	60
FOV size on stage	Horizontal × Vertical (mm)	1.165 0.875	0.582 0.437	0.291 0.218	0.146 0.109	0.078 0.058
1/3" CCD size	Horizontal × Vertical (mm)	4.8×3.6				
Video magnification		36				
Total magnification on Video Window (640 × 480 pixels)		144	288	576	1152	2160
Size of 1 pixel (micrometer)		1.84	0.82	0.46	0.23	0.12
Size of objects on Video Window (640 × 480 pixels)	0.01× (mm)	1.44	2.88	5.76	11.52	21.6
	0.1× (mm)	14.4	28.8	57.6	115.2	216
	1× (mm)	144	288	576	1152	2160

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

High magnification head equipped with 8 segment LED ring illuminator

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

• 8 segment LED ring illuminator
8 segment LED ring illuminator has 50 degree oblique angle against optical axis and 30mm working distance.

50° W.D.: 30mm

High density PCB
Under coaxial top light
at optical magnification 4×
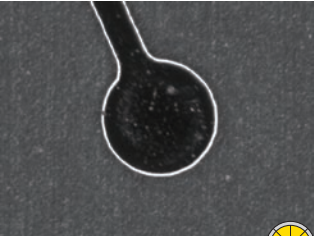
Under 8 segment LED ring light

Lead frame
Under bottom light
at optical magnification 4×

TTL Laser AF and image AF

▌TTL Laser AF with 30mm working distance

TTL Laser AF can detect surfaces accurately and is repeatable, it is independent of magnification. It can scan surfaces with a maximum of 1000 points per second to analyze surfaces. It can also detect not only the top surface of a top layer but also its bottom surface or the top surface of the second layer.
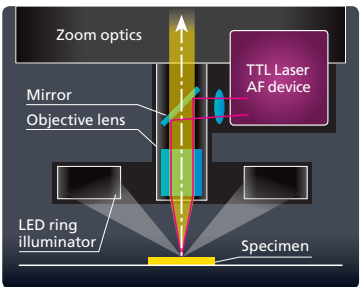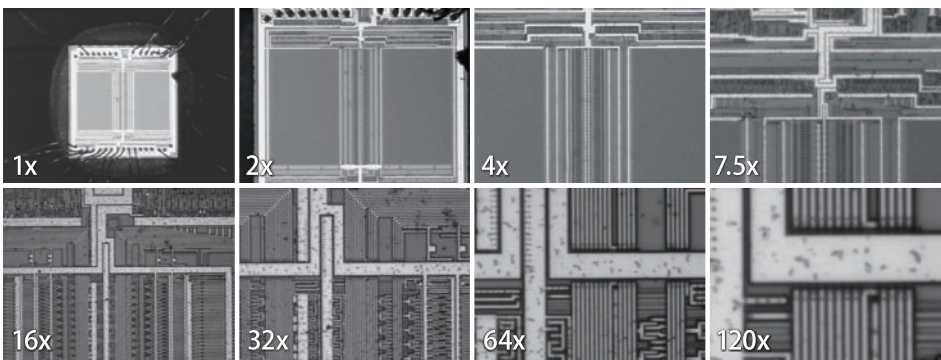
▌Image AF

Image AF can detect a surface which Laser AF cannot reach, such as the bottom of a deep hole. It can also be used to get an average height of a rough surface, height of a steep surface, etc..

Zoom optics
Mirror
Objective lens
TTL Laser AF device
LED ring illuminator
Specimen

TTL Laser AF schematic

Type TZ zooming head range 1× to 120×

Type TZ high magnification zooming head is equipped with 2 objective lenses, the left one covering 1 to 7.5× mainly for finding features to measure and the main one at the right covering 16 to 120× for measuring tiny features such as 1 micrometer line width. Both of the objective lenses, have a calibrated 50mm X offset, and the machine can be switched easily between the two lenses.


1x 2x 4x 7.5x
16x 32x 64x 120x

| Optical magnification		1	2	4	7.5	16	32	64	120
FOV size on stage	Horizontal × Vertical (mm)	4.7 3.5	2.33 1.75	1.165 0.875	0.622 0.467	0.291 0.218	0.146 0.109	0.073 0.055	0.039 0.029
1/3" CCD size	Horizontal × Vertical (mm)	4.8×3.6							
Video magnification		36							
Total magnification on Video Window (640 × 480 pixels)		36	72	144	270	576	1152	2304	4320
Size of 1 pixel (micrometer)		7.36	3.68	1.84	0.98	0.46	0.23	0.11	0.06
Size of objects on Video Window (640 × 480 pixels)	0.01× (mm)	0.36	0.72	1.44	2.7	5.76	11.52	23.04	43.2
	0.1× (mm)	3.6	7.2	14.4	27	57.6	115.2	230.4	432
	1× (mm)	36	72	144	270	576	1152	2304	4320

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

High performance TTL Laser AF

Type TZ main objective lens has TTL Laser AF built-in. High NA (0.55) lens has the highest performance in terms of detecting and scanning.


Zoom optics
Left objective
TTL Laser AF device
Mirror
Right objective
Specimen
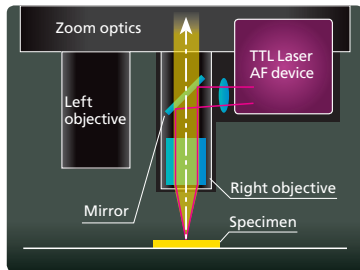
TTL Laser AF schematic
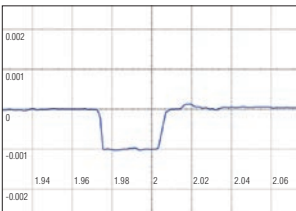
Cross section of a small groove

Versatile illuminations

Both of the objective lenses are equipped with episcopic and dark field illuminators giving coaxial top light and oblique light respectively. The right main objective lens has diascopic illuminator giving bottom light.
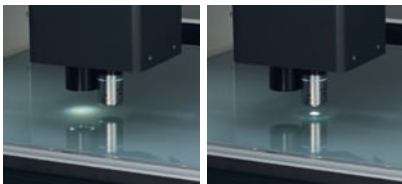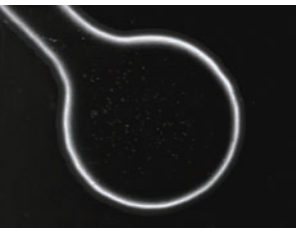

• 2 objective lenses covering 1 to 120×
The left one for 1 to 7.5×
The main one for 16 to 120×
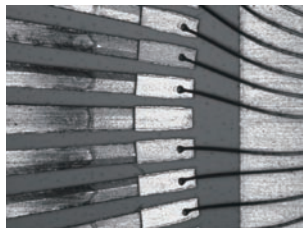
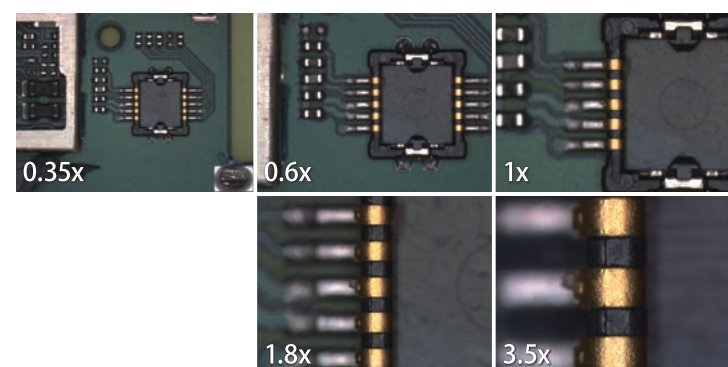Lead frame
Under coaxial top light
at optical magnification 16×
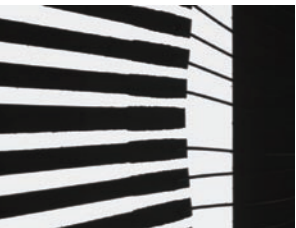
Under bottom light

High density PCB
Under dark field illumination
at optical magnification 16×

Wide FOV and long working distance

| 0.35x | 0.6x | 1x |
| 1.8x | 3.5x | |

Optical magnification		0.35	0.6	1	1.8	3.5
FOV size on stage	Horizontal × Vertical (mm)	13.3 10.0	7.8 5.8	4.7 3.5	2.6 1.9	1.33 1.00
1/3" CCD size	Horizontal × Vertical (mm)	4.8×3.6				
Video magnification		36				
Total magnification on Video Window (640 × 480 pixels)		12.6	21.6	36	64.8	126
Size of 1 pixel (micrometer)		21.8	12.6	7.36	4.25	2.15
Size of objects on Video Window (640 × 480 pixels)	0.01× (mm)	0.126	0.216	0.36	0.648	1.26
	0.1× (mm)	1.26	2.16	3.6	6.48	12.6
	1× (mm)	12.6	21.6	36	64.8	126

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

Max. 13.3 × 10mm FOV at 0.35×

Suitable for large specimen with large features to measure.

13.3mm

10 yen coin
Under coaxial top light
at 0.35× optical magnification
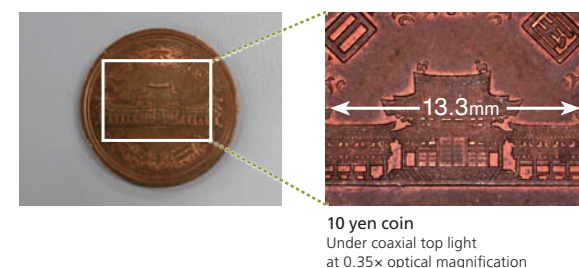
Long working distance 73.5mm

The objective lens is designed for Type A zooming head where a wide FOV, a long working distance and a high N.A. 0.11 are compatible. Suitable for low density specimen with big steps, deep holes, tall bosses, etc.

Working distance 73.5mm

Assembled components
Under coaxial top light
at 0.35× optical magnification

Image AF and Laser AF

Image AF

The search probe can detect misaligned parts, and rotate the program to suit. Allowing the machine to sucessfully measure the part.

Focusing on a surface
(Surface mode)

Focusing on an edge
(Contrast mode)
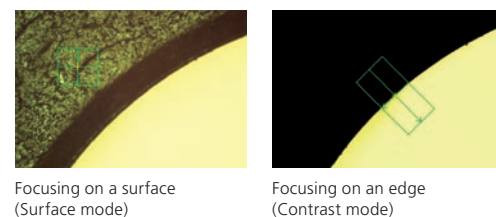
Laser AF option

Laser AF for Type A has 63mm working distance and high accuracy, it is independent of magnification and its depth of focus.
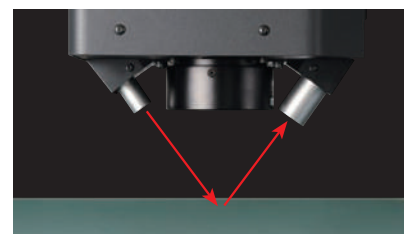

Versatile illuminations

Type A zooming head is equipped with episcopic, diascopic and 8 segment ring illuminators of all LED. The oblique angle of the 8 segment ring illuminator is 18 degrees. Combination of these illuminations with the excellent objective lens enable you to visualize obscure edges.


Plastic molded part
Under coaxial top light
at 0.35× optical magnification

Under bottom light

Under 8 segment LED ring light

## Software with new GUI for easier operations

The new graphical user interface (GUI). simplifies machine movement, creating and running teaching files, and clearly indicates status and progress of measurements.
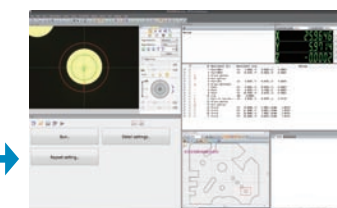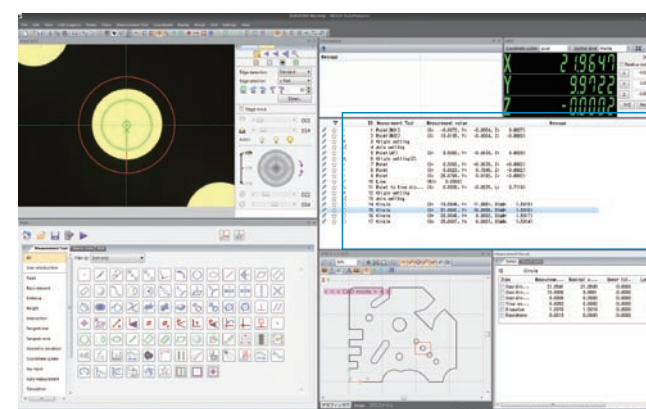
Various wizards for guiding procedures of measurements are available, providing fast, easy writing of teaching files. GUI can be customized for different tasks. You can select and hide functions for achieving your tasks.
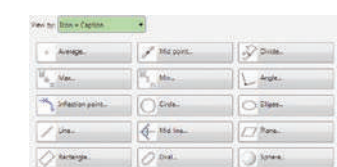
Change of indication of measure tools
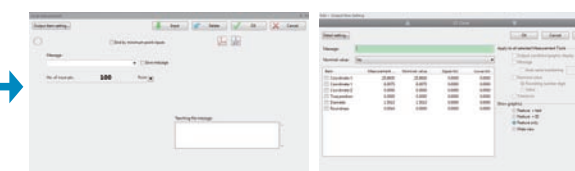
Main window changes its function according to situation.

Functions supporting automatic and accurate measurements

Edge and point selection

You can preset rules for selecting a correct edge from multiple edge candidates and a filter to avoid abnormal points to minimize errors.

Automatic adjustment of light intensity

You can have a choice from 3 distinct levels of light intensities, Low, Middle and High, for coaxial top and bottom lights by clicking one of 3 buttons.
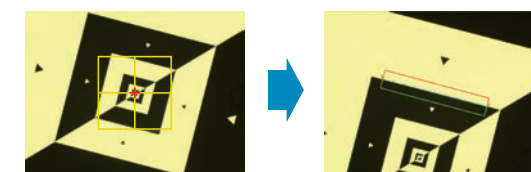

Intelligent search function

You can save images to a teach file to enable the machine to search for them. With this function a misaligned specimen can be found and measured without failure.

Save an image of the center and record the position

The search probe can detect misaligned parts, and rotate the program to suit. Allowing the machine to sucessfully measure the part.

Other useful functions for making teaching files

Import of CAD data

CAD data can be imported and shown in the graphic window.

Export of DXF data

Features measured can be exported as DXF data.

Off-line teaching

Teaching files can be made on CAD data.