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# The perfect answer to all your measurement needs

# The NEXIV VMR series.

With an expanded lineup that includes small to ultra-wide measurement platforms as well as versatility in optical head selection, the NEXIV VMR series provides complete support for all your measurement needs.

## NEXIV VMR EZ Solution Finder

| Appropriate Object Size<br>(for FOV measurement at highest magnification) | Optical Head                                 | Model   |  |   |   |              |                   | Optional Parts |
|---|--|---|--|---|---|--------------|-------------------|----------------|
|   |  | VMR-1515/1515 Performa  | VMR-3020   | VMR-6555  | VMR-10080   | VMR-12072    | VMR-H3030         |                |
| 1*-5 µm   | VMR Maximum Magnification Module Model Z120X | High Density & Miniature Machined Parts<br>MEMS   | Probe Cards  | LCD-Array Process   | Ultimate Precision<br>Advanced Packaging Technology:<br>Water Level CSP, Flipchip | Color Camera | Yes (Limited Use) |                |
| 4*-20 µm  | Type 3                                       | Semiconductor Packaging/Final Assembly Process<br>Medical Devices<br>Electronic Devices:<br>SMD/Connector/Ferrule<br>Dies & Molds | Super Zoom & High Accuracy Non-Contact Height Measurement      | Flat Panel Display Devices<br>OLED/LCD-Cell Process<br>Module Process<br>Printed Circuit Boards, Mask Pattern | Metrology Laboratory Master Machine   | Yes          |                   |                |
| 8*-40 µm  | Type 2                                       | Versatile Measurement Tasks   | Higher Magnification<br>Large Size, Multiple Parts Measurement | Larger Measurement Envelope   | High Precision Dies & Molds   | Yes          |                   |                |
| 16*-80 µm   | Type 1                                       | Machined, Cast, Stamped, Etched, & Molded Parts   |  |   |   | Yes          |                   |                |
|   | Model LU                                     | Appropriate Wafer Size<br>150mm (6 inch) wafers   | Appropriate Display Panel Size<br>200mm (8 inch) wafers        | 22 in.  | 37 in.  | 47 in.       |                   |                |

\*For clear edges such as metallized line patterns on a transparent glass.

|                |  |     |     |     |    |    |     |
|----------------|--|-----|-----|-----|----|----|-----|
| Optional Parts | Rotary Indexer RI-3600L<br>(for Type 1 to 3) | Yes | Yes | Yes | No | No | Yes |
|----------------|--|-----|-----|-----|----|----|-----|

|                            |                           |   |
|----------------------------|---------------------------|---|
| Standard Provided Software | Online CAD Interface      | VMR AutoMeasure / VMR CAD Reader  |
|                            | Offline CAD Interface     | VMR Virtual AutoMeasure   |
|                            | 2D Profile Analysis       | VMR Profiler  |
|                            | Hard / Software Control   | VMR Control Program   |
|                            | Multiple Language Support | English/Japanese / Mandarin Chinese / Traditional Chinese / German / French, etc. |
|                            | Data File Management      | VMR Data Manager  |

|                   |                                  |                           |
|-------------------|----------------------------------|---------------------------|
| Optional Software | Quick Data Reporting             | VMR Report Generator      |
|                   | Statistical Process Control      | SPC-PC IV / SPC-IV Excel  |
|                   | 3D Surface Analysis              | NEXIV Bird's Eye View     |
|                   | 3D Surface & Roughness Analysis  | D-Surf                    |
|                   | Gear Evaluation according to ISO | Gear Measurement Software |

## Ultrahigh-Precision Measurement Platform

### NEXIV VMR-H3030

With ultra-high precision and versatility, this model can serve as the master instrument in your laboratory. NEXIV VMR-H3030 achieves sub-micrometer level uncertainty ( $U_{1xy} 0.6 \text{ mm} + 2L/1000 \mu\text{m}$ ,  $U_{2xy} 0.9 + 3L/1000 \mu\text{m}$ ) thanks to optimum layout of the ultra-precise low-thermal expansion glass scales and robust hardware designs.

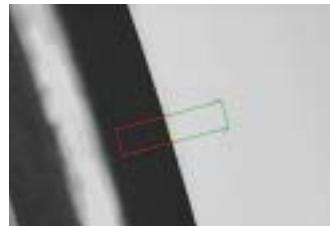
Travel (X, Y, Z) 300 x 300 x 150 mm. Ideal for high precision molds.

#### Type 1, 2, 3 Models

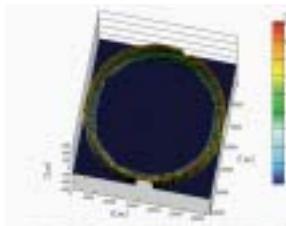
- Ultrahigh precision appropriate for the Master Instrument
- 3 models (type: 1, 2, 3) with 5-step zoom magnification to cover different fields of view and resolution requirements
- Wide illumination choices ensure accurate detection of edges in dies and molds
- Long working distance (50mm) permits measurement of parts with large height variance
- 15X zoom provides wide field of view for rapid search and high magnification for accurate measurement. Accurate calibration at all magnifications allows rapid field of view measurements of multiple parameters.

#### Applications

Master calibration instrument for laboratory, Dies and molds, Finely machined parts



Finely Machined Part and its 3D Graphic



Flip Chip Bump and its 3D Graphic showing height distributions

#### Z120X Model (with Maximum Magnification Module)

With an ultra-precision stage and maximum magnification module, it measures critical workpieces with superior accuracy (e.g., critical dimensions on patterned masks and bump heights).

- 120X optical magnification enables measurements of rerouted patterns on wafer level CSP
- High precision stage facilitates accurate measurements even for wider dimensions
- Enables measurements of top and bottom widths of etched lines
- Laser AF enables measurements of micron-sized bump heights
- Allows evaluation of cross-sectional shapes of bumps and solder balls

#### Applications

Wafer level CSP, Wafer level bump height, Wafer level SIP, Rerouted masks, Masks for MEMS



## Small Part Measurement Platform

### NEXIV VMR-1515 and VMR-1515 Performa

The VMR-1515 series has a smaller travel (X, Y, Z) 150 x 150 x 150. An affordable entry model called the Performa (without Laser AF and Outer LED Ring Illuminator) is also available for video measurement applications.

#### Type 1, 2, 3 Models

- 3 models (type: 1, 2, 3) with 5 step zoom magnification to cover different fields of view and resolution requirements
- A long 50mm working distance sufficiently supports measurements of 3D workpieces
- 15X zoom provides wide field of view for rapid search and high magnification for accurate measurement. Accurate calibration at all magnifications allows rapid field of view measurements of multiple parameters.
- High-speed TTL Laser AF ensures high-precision AF independent of surface shape. (Performa models have only Vision AF, no Laser AF)

#### Applications

Semiconductor packages, Substrates, Stamped parts, Connectors and small parts, Clock parts



Connector - Housing Inside



PGA - Insertion Pin



Plastic Gear Teeth with Smaller Module



Black Injection Molding Parts - Connector

#### Z120X Model (with Maximum Magnification Module)

- 120X optical magnification enables measurements of fine line widths
- High-precision TTL Laser AF features high N.A. and enables measurements of small height gaps
- Perfect for measurements of high-density, finely-machined workpieces
- Optional Bird's-Eye View software plots MEMS parts in 3D format

#### Applications

Small high-density PCBs, Small precision dies and molds, Packages (2D + height), MEMS parts

#### LU Model (universal epi-illuminator/motorized nosepiece)

- Full range of Nikon CFI60 LU microscope objectives from 5x to 150x
- Supports brightfield, darkfield, DIC, simple polarizing applications
- Motorized quintuple universal nosepiece
- Easy to use software controls all functions of the system

#### Applications

Small-size LCDs, Organic EL panels, wafers up to 150mm

## Versatile Part Measurement Platform NEXIV VMR-3020

The standard model of the NEXIV series with 300 x 200 mm stage stroke. It handles a variety of measurement tasks including those for mechanical parts, molded parts, stamped parts and various other workpieces.

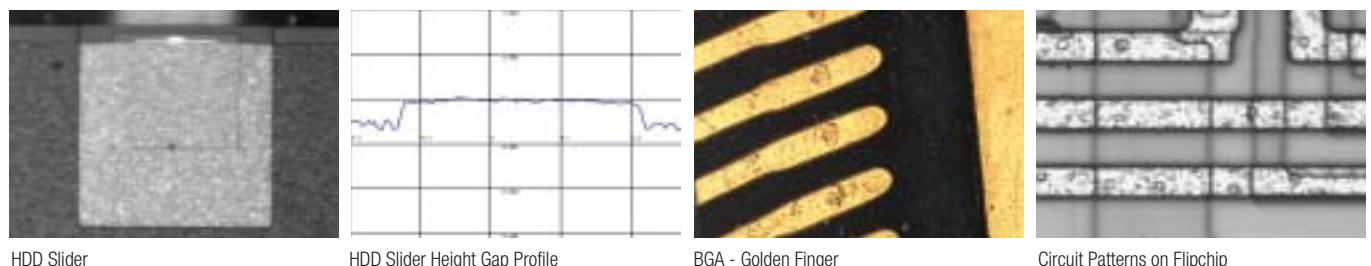


### Type 1, 2, 3 Models

- Variety of illumination choices facilitates accurate detection of edges in molded parts
- 3 models (type: 1, 2, 3) with 5-step zoom magnification to cover different fields of view and resolution requirements
- Long working distance (50mm) permits measurement of parts with large height variances
- 15X zoom provides wide field of view for rapid search and high magnification for accurate measurement. Accurate calibration at all magnifications allows rapid field of view measurements of multiple parameters
- Laser AF enables cross-sectional shape and flatness evaluation as well as 3D profiling

### Applications

Semiconductor packages, Substrates, Stamped parts, Connectors, Injection molded parts



## Z120X Model (with Maximum Magnification Module)

Its maximum magnification module achieves measurements of finely machined workpieces. Perfect for measurements of topical MEMS parts, high-density PCBs and semiconductor packages.

- The combination of the maximum magnification module and high-precision stage enables accurate measurements of large geometry workpieces as well as minute structures
- Laser AF uses small spot size to provide accurate measurements of finer cross-sectional shapes and heights
- Optional surface analysis software displays 3D shapes of MEMS parts

### Applications

High-density PCBs, Exposure masks for substrates, Packages (2D + height), MEMS parts

## LU Model (universal epi-illuminator/motorized nosepiece)

- Full range of Nikon CFI60 LU microscope objectives from 5x to 150x
- Supports brightfield, darkfield, DIC, simple polarizing applications
- Motorized quintuple universal nosepiece
- Easy to use software controls all functions of the system

### Applications

Small-size LCDs, Organic EL panels, 8" (200mm) wafers

## Wide Stage Envelopment Platform NEXIV VMR-6555

High-speed measurements with large 650 x 550 mm stroke stage. Optimal for measurements of PCB patterns and external dimensions of a display panel. You can save inspection costs by measuring a number of small parts at one time after placing them together on the stage.

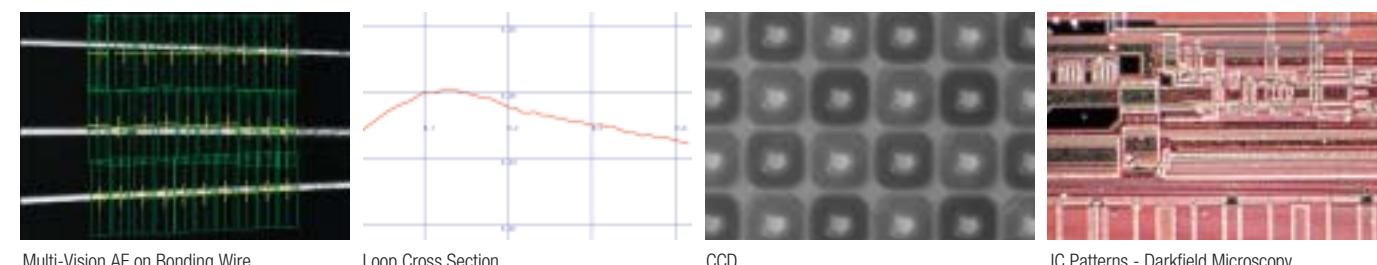


### Type 1, 2, 3 Models

- 650 x 550 mm stage stroke perfect for PCBs
- Automatic measurement of batches of parts by placing multiple pieces together on the stage
- Laser AF achieves high-accuracy measurements of bump heights
- Laser AF also enables measurements of height variance and warping in workpieces
- Search function enables measurements of lands and holes of PCBs
- Search function provides accurate measurements even when workpieces are not properly located on the stage
- Variety of illumination choices facilitate accurate edge detection even for vague geometries
- High-speed stage and image processing provide higher throughput

### Applications

Semiconductor packages (multiple pieces), Substrates, Printing masks for substrates, Stamped parts (multiple pieces), Connectors (multiple pieces), Injection molded parts (multiple pieces)



## Z120X Model (with Maximum Magnification Module)

Amazing 120X zoom combined with a big stage enables ultrahigh magnification measurements on big workpieces. Ideal for measuring high-density PCBs and their masks.

- Amazing 120X zoom
- Measurements of 1µm line widths are possible at the maximum magnification
- Laser AF perfect for measuring small, complicated geometries
- High-speed stage and image processing provide higher throughput

### Applications

High-density PCBs, Exposure masks for substrate, Semiconductor packages (multiple pieces); 2D + height), Photo plotter machines for masks, Probe cards

## LU Model (universal epi-illuminator/motorized nosepiece)

- Full range of Nikon CFI60 LU microscope objectives from 5x to 150x
- Supports brightfield, darkfield, DIC, simple polarizing applications
- Motorized quintuple universal nosepiece
- Easy to use software controls all functions of the system

### Applications

FPD panels (up to 22")

## Ultrawide Measurement Platform

### NEXIV VMR-10080

Long 1000 x 800 mm stage stroke performs brilliantly in the measurement of large-size workpieces.

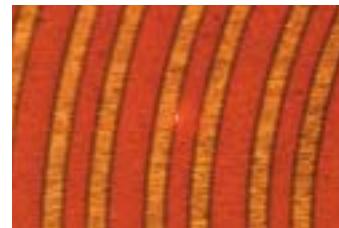


#### Type 1, 2, 3 Models

- Long stage stroke enables measurements of LCD substrates/modules and large-size PCBs
- 3 models (type: 1, 2, 3) with 5 step zoom magnification to cover different fields of view and resolution requirements
- Laser AF also enables measurements of height variance and warping in workpieces
- Search function facilitates measurements of lands and holes of PCBs
- Variety of illumination choices facilitate accurate edge detection even for vague geometries
- High-speed stage and high-speed image processing provide high throughput

#### Applications

Printing masks for substrates, Mother substrates for PCBs, Shadow masks, FPD devices



Laser Scan on FPC and its Cross Section

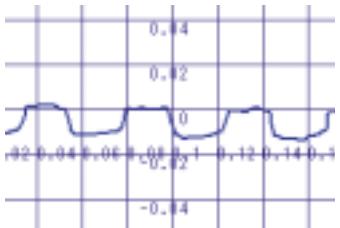


Photo Mask Pattern



Metallized Patterns of FPC

## 47-inch Display Device Measurement Platform

### NEXIV VMR-12072

Ultralong 1200 x 720 mm stage stroke allows the measurement of large workpieces such as FPD devices.

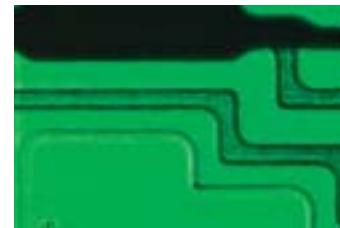


#### Type 1, 2, 3 Models

- Ultralong stage stroke enables measurements of large LCD substrates/modules and PCBs
- 3 models (type: 1, 2, 3) with 5 step zoom magnification to cover different fields of view and resolution requirements
- Laser AF enables the measurement of height gaps and warping in workpieces
- Search function enables measurements of lands and holes of PCBs
- Variety of illumination choices facilitate accurate edge detection, even for vague geometries
- High-speed stage and high-speed image processing provide high throughput

#### Applications

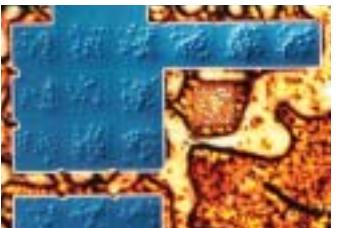
Large FPD panels and related devices



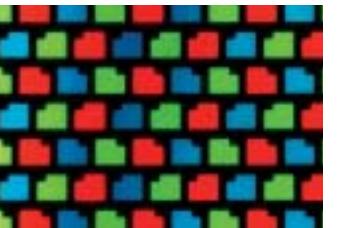
FPD-Cell Process



LCD-TFT



LCM-ACF under DIC Microscopy



Color Filter

## Z120X Model (with Maximum Magnification Module)

The model achieves ultrahigh magnification measurements with a long 1000 x 800 mm stage stroke. Ideal for measuring minute line widths of large-size display panels.

- Automatic measurements of batches of small parts
- Laser AF achieves high-accuracy measurements of bump heights
- Laser AF enables measurements of height variance and warping in workpieces
- Search function enables measurements of lands and holes of PCBs
- Search function also provides accurate measurements even when workpieces are not located properly on the stage
- Variety of illumination choices facilitate accurate edge detection even for weak edges
- High-speed stage and image processing provide higher throughput

#### Applications

LCD glass substrates (pattern measurements),

Organic EL glass substrates (pattern measurements)

## LU Model (universal epi-illuminator/motorized nosepiece)

- Full range of Nikon CFI60 LU microscope objectives from 5x to 150x
- Supports brightfield, darkfield, DIC, simple polarizing applications
- Motorized quintuple universal nosepiece
- Easy to use software controls all functions of the system

#### Applications

Large FPD panels (up to 37")

## Z120X Model (with Maximum Magnification Module)

The model achieves ultrahigh magnification measurements with an ultralong 1200 x 720 mm stage stroke, making it ideal for the measurement of large workpieces such as FPD devices.

- Automatic measurement of batches of small parts
- Laser AF achieves highly accurate measurements of bump heights
- Laser AF also enables the measurements of height gaps and warping in workpieces
- Search function enables measurements of lands and holes of PCBs
- Search function also provides accurate measurements even when workpieces are not properly located on the stage
- High-speed stage and image processing provide higher throughput

#### Applications

LCD glass substrates (pattern measurements),

Organic EL glass substrates (pattern measurements)

## LU Model (universal epi-illuminator/motorized nosepiece)

- Full range of Nikon CFI60 LU microscope objectives from 5x to 150x
- Supports brightfield, darkfield, DIC, simple polarizing applications
- Motorized quintuple universal nosepiece
- Easy to use software controls all functions of the system

#### Applications

Large FPD panels and related devices (up to 47") \* Including module parts.

Ensure measurements with high accuracy and at high speeds.

## Optical Head for Type 1, 2, 3

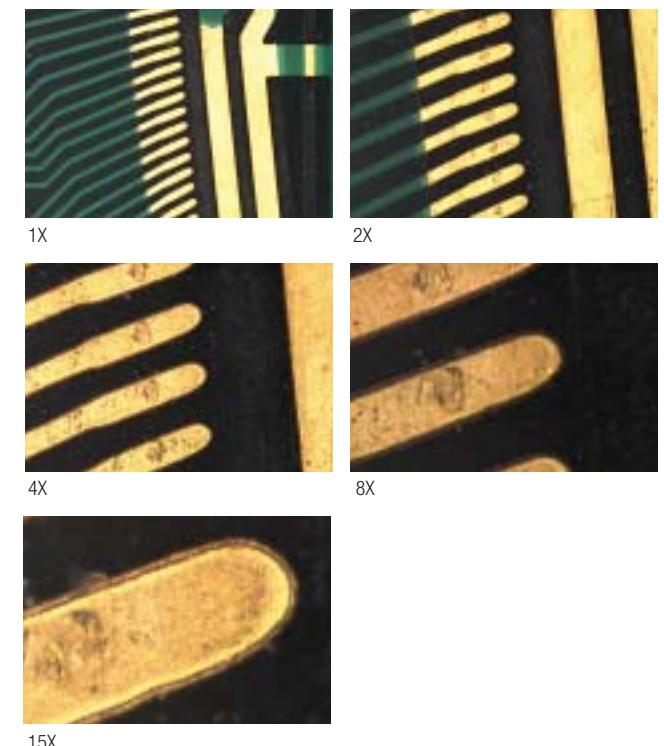
### Standard head with 15X high-speed zoom

The standard head features 5-step, 15X high-speed zoom, providing greater flexibility in choosing magnifications according to the size of the measuring area.

#### Magnification vs field of view (mm)

| Zoom position                | 1           | 2             | 3             | 4             | 5             |
|------------------------------|-------------|---------------|---------------|---------------|---------------|
| Type 1 Optical magnification | 0.5x        | 1x            | 2x            | 4x            | 7.5x          |
| Total magnification          | 18x         | 36x           | 72x           | 144x          | 270x          |
| Field of view (mm)           | 9.33 x 7    | 4.67 x 3.5    | 2.33 x 1.75   | 1.165 x 0.875 | 0.622 x 0.467 |
| Type 2 Optical magnification | 1x          | 2x            | 4x            | 8x            | 15x           |
| Total magnification          | 36x         | 72x           | 144x          | 288x          | 540x          |
| Field of view (mm)           | 4.67 x 3.5  | 2.33 x 1.75   | 1.165 x 0.875 | 0.582 x 0.437 | 0.311 x 0.233 |
| Type 3 Optical magnification | 2x          | 4x            | 8x            | 16x           | 30x           |
| Total magnification          | 72x         | 144x          | 288x          | 576x          | 1080x         |
| Field of view (mm)           | 2.33 x 1.75 | 1.165 x 0.875 | 0.582 x 0.437 | 0.291 x 0.218 | 0.155 x 0.117 |

Total magnifications listed above represent those on the monitor screen when a 17" TFT monitor is set to the SXGA (1280 x 1024 pixels) mode.



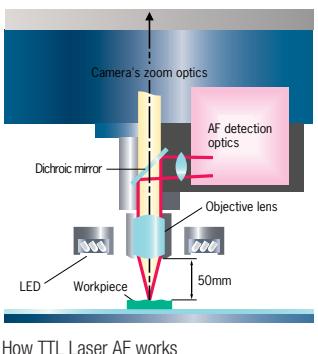
Color cameras can be used (optional).

### Widefield, high N.A. objective lens

The highly corrected objective lens is equivalent to those found in Nikon's top-end microscopes. They have a high N.A. of 0.35 with a long 50mm working distance at all magnifications.

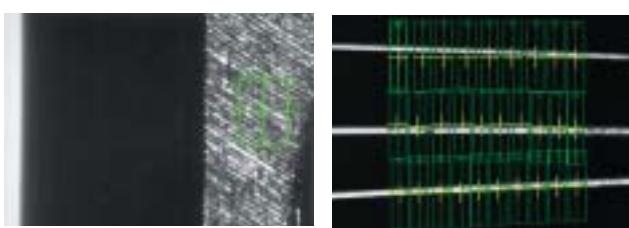
#### Upgraded TTL Laser AF

TTL Laser AF provides high resolution, long working distances, and fast operating speed for perfect focusing on narrow spaces at low magnifications. High-speed scanning measurement is possible at a rate of 1000 points per second max., enabling ultra-precise Z-axis measurements in a variety of applications.



#### High-speed, high-precision Vision AF

Thanks to the adoption of a new algorithm and a progressive scan CCD camera, Vision AF now provides greater speeds and accuracy closer to TTL Laser AF. Vision AF is convenient for applications where TTL Laser AF cannot be used, for example, when focusing on chamfered or round edges. The Multiple-Vision AF enables the simultaneous measurement of multiple points with different heights within the field of view.



Surface focus

Multi-Vision AF

### Wide choice of illumination

The VMR series comes with four illumination choices to provide illumination perfect for the workpiece to be measured. These include:

- Two LED ring illuminators—Inner (37 degrees oblique angle against Optical Axis), Outer (75 degrees oblique angle)
- Episcopic illumination (top light)
- Diascopic illumination (bottom light)

Edges previously difficult to capture can be detected with high resolution.

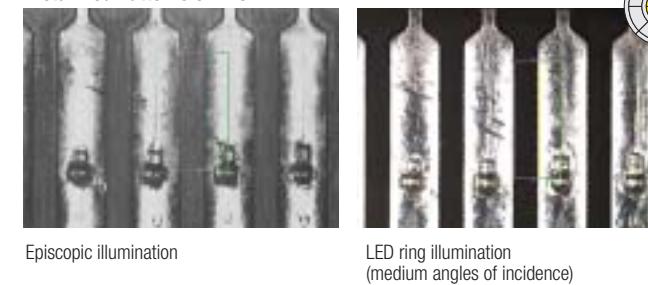
In addition, the VMR series features automatic light intensity control to provide the same brightness to multiple NEXIV systems without the need to edit the teaching program.



#### Connector

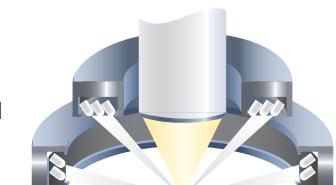


#### Metalized Patterns of FPC



### 8-sector LED ring illumination

An illumination system consisting of inner and outer ring illuminators has been specially developed for the VMR series. The system makes possible observations of extremely low-contrast edges which are usually invisible under episcopic illumination by arbitrarily combining illuminations from eight directions. Best for edge enhancement of the contours of bosses, pins, ceramic packages, and similar workpieces.



#### Inner ring illuminator

(37° from the optical axis)  
This type can be universally used whenever strong illumination from various directions is needed. This illumination also provides a full 50mm working distance.



#### Outer ring illuminator

(75° from the optical axis)  
This type enables the observation of workpieces that are impossible with lighting at a shallow angle. When not in use, the illuminator retracts, creating more space over the workpiece. When in use, the working distance will be 10mm.



With variable magnifications up to 120x,  
these models address applications that demand higher precision and density.

## Maximum Magnification Module VMR-Z120X

### Newly developed maximum magnification module VMR-Z120X

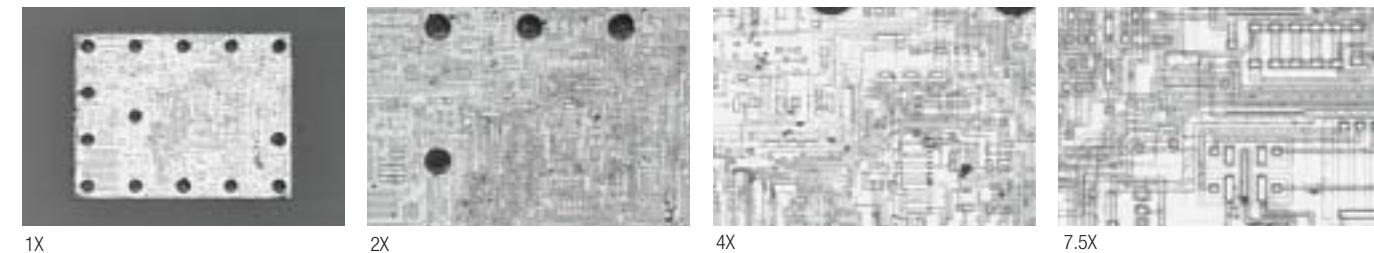
The new module achieves a 1x to 120X magnification range by using two objectives and changing the optical path. An 8-step zoom gives this system the capability to do rapid field of view measurements of hundreds of parameters and do critical measurements of line widths down to 1 $\mu$ m.

Magnification vs field of view (mm)

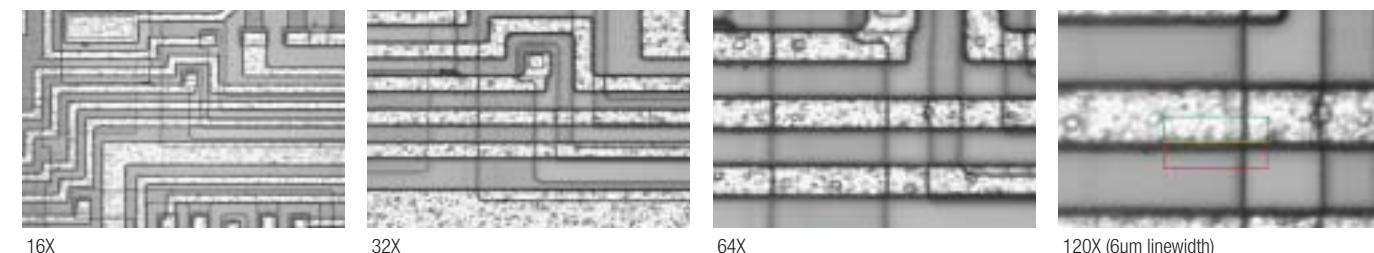
|                       |             |             |             |             |
|-----------------------|-------------|-------------|-------------|-------------|
| Optical magnification | 1X          | 2X          | 4X          | 7.5X        |
| Total magnification   | 36X         | 72X         | 144X        | 270X        |
| Field of view (mm)    | 4.67x3.5    | 2.33x1.75   | 1.165x0.875 | 0.622x0.467 |
| Optical magnification | 16X         | 32X         | 64X         | 120X        |
| Total magnification   | 576X        | 1146X       | 2292X       | 4320X       |
| Field of view (mm)    | 0.291x0.218 | 0.146x0.109 | 0.073x0.055 | 0.039x0.029 |

Total magnifications listed above represent those on the monitor screen when a 17" TFT monitor is set to the SXGA (1280 x 1024 pixels) mode.

### Low magnifications



### High magnifications

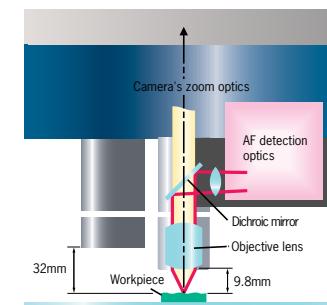


### Two objective lenses—wide field and high power (N.A. 0.55)

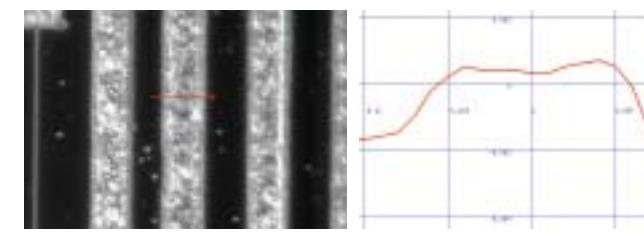
The combination of these two objective lenses enables a broad array of applications ranging from wide-field observations at low magnifications to accurate measurements at high magnifications.

### High-resolution TTL Laser AF with ultra tiny laser spot

The module comes with a high-resolution TTL Laser AF that incorporates high N.A. objectives and achieves ultra tiny laser spots. It significantly improves performance in focusing on and scanning over thin, transparent/semitransparent (e.g. resists) surfaces or irregular reflection surfaces. High-speed scanning measurement is possible at a rate of 1000 points per second max., enabling ultra-precise Z-axis measurements in a variety of applications.



How TTL Laser AF works

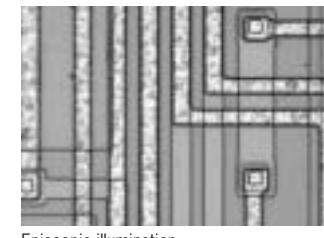


Minute steps measured

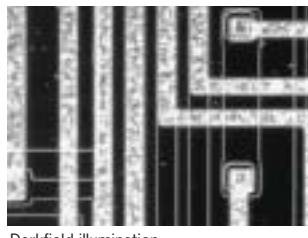
### Three illumination types

The module delivers the best illumination to any workpieces by providing three types of CNC controllable illuminations—episodic, diascopic (high magnification head), and darkfield illuminations. This enables edges to be detected with high accuracy.

#### High magnifications darkfield illumination



Episodic illumination



Darkfield illumination

#### Low magnifications darkfield illumination





Nikon's industry-acclaimed CFI60 optics supports high-precision, strain-free measurements.

## LU Head (LU Model) Universal epi-illuminator/motorized nosepiece type

### CFI60 optical system

CFI60 optics, the culmination of Nikon's optical technologies, achieves brilliant, high-contrast images, making the system most suitable for the observation of large LCD substrates and color filters. This system can perform both dimensional measurements of a workpiece via image processing and observation in a single unit. By using a high-contrast DIC slider, enhanced DIC imaging is also possible.



### Motorized universal nosepiece

The CNC-based motorized nosepiece enables changes in magnification during the execution of a teaching program. This enables microscopy at the best magnification and with the optimum objective lens.

### Automatic control from measurement to data processing

Easy to use software controls all functions of the system. From multi-source light control to image processing and stage movement, the process of measurement is automated for consistent, accurate results.

The following operations are manually controlled on the LU model:

Brightfield/darkfield illumination changeover

Field and aperture diaphragm settings

Polarizer\*, analyzer\*, Nomarski prism settings \* Option to motorize.

### Motorized rotating polarizer/analyzer (option)

An optional motorized rotating polarizer/analyzer allows the operator to optimize contrast according to the workpiece. During DIC imaging, phase differences with greater sharpness can be visualized.

Motorized rotating analyzer



Motorized rotating polarizer

### Wide variety of CFI60 objective lenses

The CFI60 optical system creates bright, high-contrast images by minimizing flare, while offering higher numerical apertures (N.A.) and longer working distances (W.D.). The VMR series can use a wide array of CFI60 universal objective lenses, including the CFI LU Plan BD.



CFI LU Plan Epi



CFI LU Plan Epi ELWD



CFI LU Plan BD



CFI LU Plan BD ELWD

| CFI60 objective lenses | Magnification | N.A. | W.D. (mm) |
|------------------------|---------------|------|-----------|
| CFI LU Plan BD         | 5X            | 0.15 | 18.00     |
|                        | 10X           | 0.30 | 15.00     |
|                        | 20X           | 0.45 | 4.50      |
|                        | 50X           | 0.80 | 1.00      |
|                        | 100X          | 0.90 | 1.00      |
| CFI LU Plan BD ELWD    | 20X           | 0.40 | 13.00     |
|                        | 50X           | 0.55 | 9.80      |
|                        | 100X          | 0.80 | 3.50      |
| CFI LU Plan Epi*       | 5X            | 0.15 | 23.50     |
|                        | 10X           | 0.30 | 17.30     |
|                        | 20X           | 0.45 | 4.50      |
|                        | 50X           | 0.80 | 1.00      |
|                        | 100X          | 0.90 | 1.00      |
| CFI LU Plan Epi ELWD*  | 20X           | 0.40 | 13.00     |
|                        | 50X           | 0.55 | 10.10     |
|                        | 100X          | 0.80 | 3.50      |
| CFI LU Plan Apo BD     | 150X          | 0.90 | 0.42      |
| CFI LU Plan Apo Epi*   | 150X          | 0.95 | 0.30      |

\*An LU objective adapter is necessary when using the EPI series of objective lenses.

### CFI Objective Lenses for LCD

|                         | N.A. | Glass Thickness Correction Range | Working Distance (t=glass thickness (mm)) |                 |                 |  |
|-------------------------|------|----------------------------------|---|-----------------|-----------------|--|
| CFI L Plan Epi 20x CR   | 0.45 | 0 to 1.2mm                       | 10.9mm at t=0                             | 10.5mm at t=0.6 | 10.0mm at t=1.2 |  |
| CFI L Plan Epi 50x CR   | 0.7  | 0 to 1.2mm                       | 3.9mm at t=0                              | 3.4mm at t=0.6  | 3.0mm at t=1.2  |  |
| CFI L Plan Epi 100x CRA | 0.85 | 0 to 0.7mm                       | 1.20mm at t=0                             | 1.05mm at t=0.3 | 0.85mm at t=0.7 |  |
| CFI L Plan Epi 100x CRB | 0.85 | 0.6 to 1.3mm                     | 1.3mm at t=0.6                            | 1.15mm at t=0.9 | 0.95mm at t=1.3 |  |

\* Working Distance varies depending on correction for glass thickness.

### Magnification and FOV Size

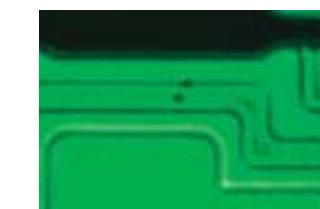
| Objective Lens                 | With 0.5x Tube Lens | Total Magnification | 5x                 | 10x   | 20x   | 50x   | 100x  | 150x  |
|--------------------------------|---------------------|---------------------|--------------------|-------|-------|-------|-------|-------|
|                                |                     |                     | Field of View (mm) | H     | V     |       |       |       |
| With 1.0x Tube Lens (standard) |                     | 90                  | 180                | 360   | 900   | 1800  | 2700  |       |
|                                |                     | 180                 | 360                | 720   | 1800  | 3600  | 5400  |       |
|                                |                     | 1.866               | 0.933              | 0.467 | 0.187 | 0.093 | 0.062 |       |
|                                |                     | 1.401               | 0.701              | 0.350 | 0.140 | 0.070 | 0.047 | 0.047 |
|                                |                     | 0.933               | 0.467              | 0.233 | 0.093 | 0.047 | 0.031 | 0.031 |
|                                |                     | 0.701               | 0.350              | 0.175 | 0.070 | 0.035 | 0.023 | 0.023 |

\* Either 0.5x Tube Lens or 1.0x Tube Lens is selectable as a factory option.

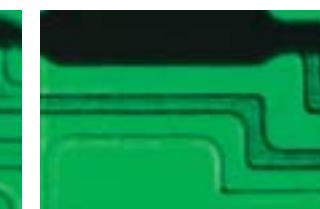
### Effect of LCD objective lens

Comparison of images observed over glass substrates.

Patterns can be clearly visualized, even when viewed through glass.



With Plan EPI objective lens



With LCD objective lens

### Nomarski DIC image

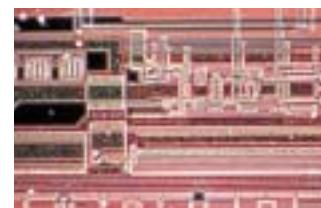
With DIC microscopy, small height gaps can be visualized as brilliant contrast images. Thus, it is possible to observe particle distributions in ACF (Anisotropic Conductive Film) bonding process.



With CFI LU Plan BD 20x objective lens

### Darkfield image

Darkfield microscopy is effective for easy detection of small particles, scratches on a surface.



CFI LU Plan BD 50x objective lens

## Edge detection with excellent precision

### Enhanced capabilities yet easier operation

#### Gray scale processing via video edge probes

The black and gray portions of a workpiece are digitally classified into 256 levels, then edges are detected and processed based on this classification. This prevents measurement data from being affected by changes in illumination.

#### Video edge probes with auto “best-fit” function

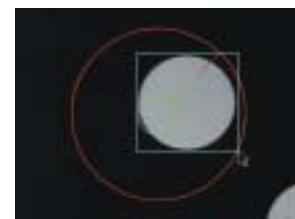
When the operator clicks the point to be measured, the system automatically rotates the probes, sets them at the optimum position, and sets the probe size, all automatically.



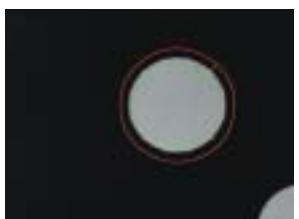
Drag to resize and fit the projection probe to the edge



After this process



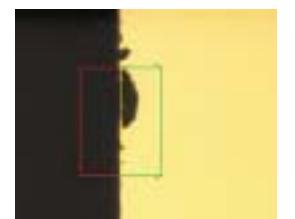
Drag to resize and fit the circle probe to the circle



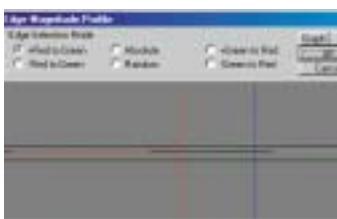
After this process

#### Easy selection of desired edges by eliminating dust and burrs

Some workpieces contain multiple edges within a given caliper, or their contrast is too low, making edge detection extremely difficult. This function graphically profiles the contrasts of the image within the caliper using a multi-gray-level scale, enabling the operator to select any one of a number of edges. Selection of the desired edge is simple: click the appropriate buttons in the edge selection menu and adjust a threshold level using the mouse.



Gray scale processing



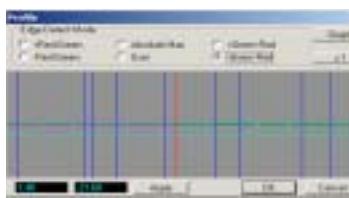
Dust clearly removed by the projection probe  
Edge selection graphic window

#### Enhanced edge detection with Nikon's unique algorithm

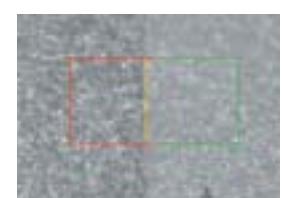
Thanks to Nikon's proprietary edge detection algorithm (patent pending), detection of edges at low magnifications is now possible with excellent precision. This enables the detection of minute, low-contrast edges, a task that is difficult to perform using gray scale processing. Image recognition capability almost equal to the human eye and a detection speed among the world's fastest allow the system to measure any workpiece with unrivaled precision.



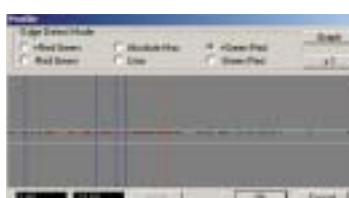
Only a main edge is extracted and enhanced



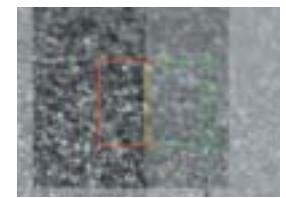
Processing window



Before edge enhancement



Processing window



Enhancement after eliminating noise factors



Processing window

## Advanced intelligent search

### Enhances accuracy for increased productivity

Skew alignment and deviations between the edge probing points within a workpiece are automatically corrected by a pattern-matching feature, eliminating possible measurement errors.

#### APS (Auto Position Search)

Thanks to this function, the operator no longer needs to manually place multiple workpieces in proper alignment; the NEXIV automatically searches workpiece position for skew alignment.



Search on left-side mark



Search on right-side mark



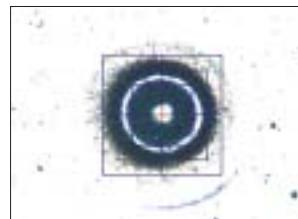
Before APS



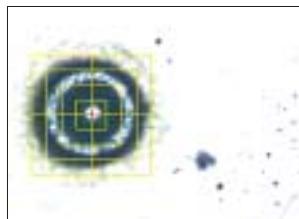
After APS

#### PMM (Pattern Matching Measurement)

Determines coordinate values for features too difficult to measure in the normal geometric measuring mode.



Trained pattern 1



Actual searched pattern 1



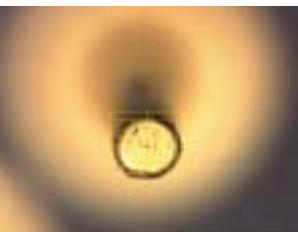
Actual searched pattern 2

#### MPS (Multi-Pattern Search)

Automatically corrects deviations between the edge probing points programmed in a teaching file as well as irregular feature positions without edge probing error.



Normal pin location



Pattern matched on abnormal pin location



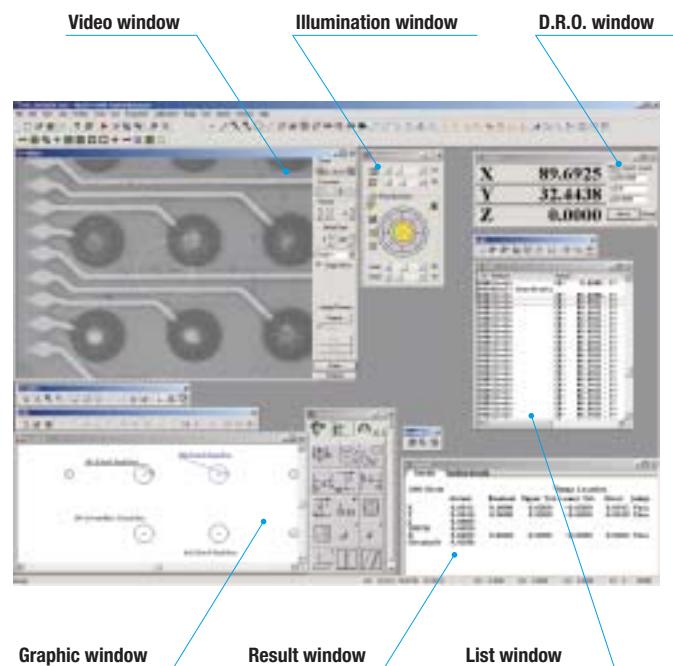
Circle probe appears on the abnormal pin location without measurement failure

## User-friendly standard software:

### VMR AutoMeasure

Interactive wizards simplify a whole range of tasks.

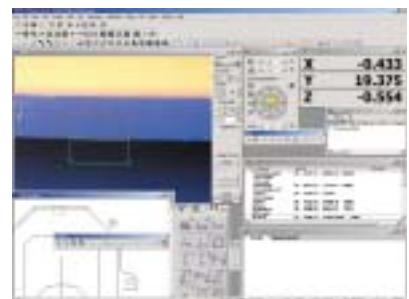
#### Main program



#### Online CAD interface program

By importing CAD data (IGES, DXF, Gerber, and Excellon) of a workpiece, the operator can display its graphics in the CAD graphic window on NEXIV VMR AutoMeasure. This facilitates efficiency in teaching and shortens working time.

- The operator can move the stage to the desired position by double-clicking the appropriate position within the input workpiece.
- This function makes it possible to create a teaching file automatically from CAD feature data on NEXIV VMR AutoMeasure.



#### CAD interface off-line teaching support program:

##### NEXIV Virtual AutoMeasure

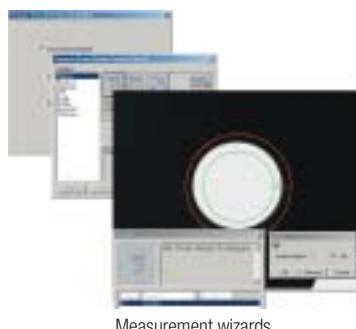
This program enables CAD data to be read into the Virtual Video Window on a separate computer, allowing the operator to use NEXIV's teaching program with the same operational procedures as on the online computer. This eliminates the necessity of using the actual workpiece during teaching sessions and lets the NEXIV system concentrate on automatic measurement for increased productivity.

- Supports IGES, DXF, DMIS, NC files, Gerber, and Excellon.
- The Virtual Video Window enables the operator to confirm the current field of view based on CAD data.
- Same operational procedures as the NEXIV AutoMeasure.
- Manual or one-click automated programming.
- Possible to combine programs with Macro steps, such as Line Width Measure and Multi Pattern Search.



#### Interactive measurement wizards

The measurement wizards guide operators, step by step, through what is required to achieve their tasks. In addition to the default wizards, operators can create customized wizards by registering frequently used procedures to streamline future operation.



#### Two-dimensional profile shape analysis program:

##### NEXIV Profiler

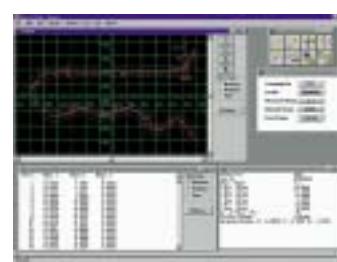
This program makes it possible to measure and judge 2-dimensional profile shapes in a workpiece that cannot be measured in the normal geometric mode. Now more accurate quantitative measurements can be taken than with the chart comparison method using profile projectors and/or conventional measuring microscopes.

##### Shape profile function

The NEXIV can now accomplish the following measurements. When the operator enters the start point, end point, and the measurement pitch, NEXIV automatically performs measurement and saves the results.

##### On XY plane:

- Constant pitch profiling—along axis
- Constant pitch profiling—along vector
- Constant pitch profiling—along angle



Constant pitch profiling on XY plane



Height constant pitch profiling on XZ plane (IC lead)

##### On XZ/YZ plane:

- Height constant pitch profiling—along axis
- Height constant pitch profiling—along angle

##### Shape evaluation function

Deviations between the measurement results and the nominal shape data are graphically displayed on the monitor or printed out for easy evaluation.

- Calculation of shape deviations: axis direction; normal direction
- Table listing of shape data
- Graph drawing of shape data
- Creation of nominal shape data: data can be created not only by keyed-in entry but also from CAD data. Data creation by exchanging the measured shape data is also possible.

##### Shape "best fit" function

This function is used to minimize the deviation between the measurement results and the nominal shape data. Deviation evaluation is easy even when the two use different coordinates.

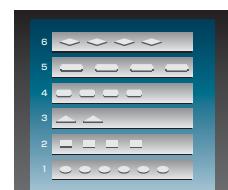
##### Creation of nominal shape data from CAD data

Nominal shape data can be created from CAD data in the DXF/IGES file format.

#### NEXIV VMR Control Program

This program enables multiple teaching files to be run sequentially according to set replay instructions.

- Simplifies the process of giving instructions to measure many different workpieces continuously, e.g., measurements of various dedicated jigs
- Allows the inspector's operating environment to be separated from that of the system administrator
- Enables the administration of inspection date, inspector, date of manufacture, lot number and other inspection data
- Automatic printing linked to inspection sheets



#### NEXIV VMR Visual Basic Control

With the newly developed Communication Package Program, users can program their own application software to remotely control the various functions of the NEXIV AutoMeasure on a Visual Basic 6.0/Net environment. By sending variables to the AutoMeasure teaching file, workpieces of different sizes can be measured on a single program. The results data then can be sent back to the VB program.



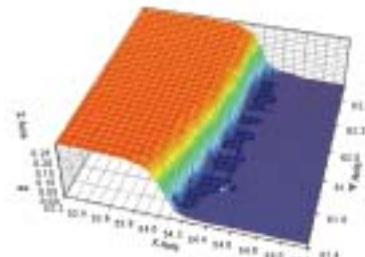
## Handy options

### Contribute to time and labor savings throughout the work process

#### 3D surface analysis program: NEXIV Bird's-Eye View

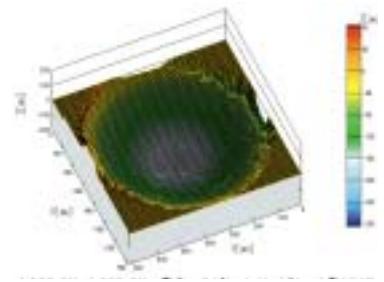
Running on Origin™, this program allows data obtained using the Scan Measure feature provided with TTL Laser AF to be plotted in a 3-dimensional format. After that, 3-dimensional shape analysis and 2-dimensional cross-section shape analysis can be performed.

Note: Origin™ is software developed by OriginLab® Corporation.



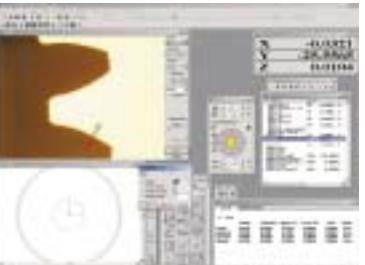
#### Surface analysis software: D-SURF

This software not only draws 3D graphics of a minuscule workpiece surface measured by the NEXIV system, but it also provides various analyses such as the calculation of various evaluation values.



#### Gear evaluation software

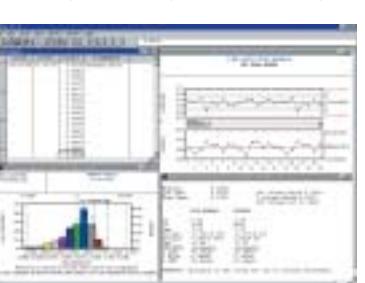
This software provides evaluations on various parameters of the measured workpiece, including pitch deviations, tooth space runout, base tangent length, and dimension overpin, based on industrial standards.



#### Real-time SPC via DDE (Dynamic Data Exchange)

Using a DDE Link function, measured data can be immediately transferred to spreadsheets such as Microsoft Excel®, SPC-PC IV, SPC-PC IV Excel, and others, making real-time SPC analysis possible.

Note: SPC-PC IV and SPC-PC IV Excel are products of Quality America Inc.



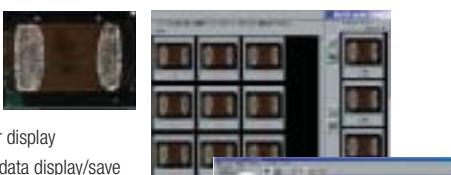
#### Focus images synthesis program: MultiLayer View

The MultiLayer View program can be used to synthesize focus portions of multiple images of the same field of view taken at different layers, creating one perfect image that is in focus throughout. Before synthesis is carried out, the images can be displayed as thumbnails on a PC monitor so that users can select the desired focus portions.

- The NEXIV's CCD camera captures multiple images on the Z-axis.
- In a configuration with the NEXIV system, users can easily attach the whole image of measured portions to an inspection result sheet.

##### Main functions

- 2-D, 3-D display
- Contour output
- Z-slice display
- Sliced area/perimeter display
- Cross section profile data display/save



##### Applications

- Attachment of synthesized images to inspection result sheet
- Filing of measured images

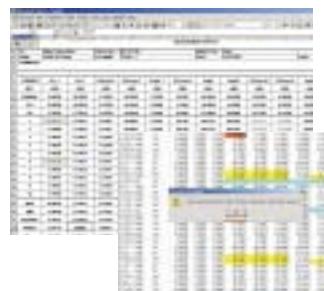


#### Report generating program: VMR Report Generator

This software is fully compatible with the NEXIV VMR AutoMeasure software and enables the quick generation of inspection results sheets in various report forms including user-designed forms. Users can even customize the program for their own easier use by making macro scripts.

Operating environment: Windows®  
Excel2000/XP  
Memory space: 64MB or more

An example of macro scripts written by users: In order to input manually the data measured by other instruments and compile them into one complete report, the macro automatically makes cell blanks and display them in sky blue and a message prompts manual inputs.



#### Rotary indexer RI-3600L

The RI-3600L can rotate the image of a workpiece and display it with a 0.01° resolution. Because it can be controlled externally, it enables automatic measurements while controlling the posture of the workpiece.

Minimum readout: 1"  
Control resolution: 0.01°  
Max. workpiece diameter: 75mm  
Operation mode: Auto or Manual  
Pre-set points: Point of origin and 3 others



#### Dedicated isolation table

This pneumatic-type isolation table effectively absorbs external vibrations preventing them from affecting measurements.

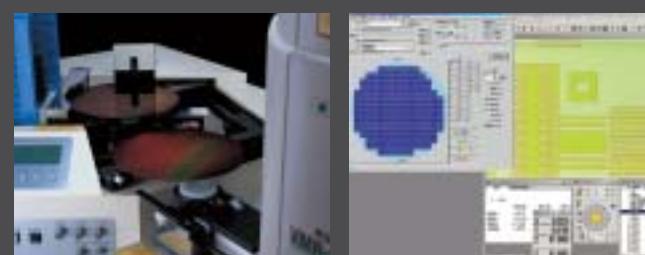


## Automated Wafer Measuring System

### NEXIV VMR-3020 with Wafer Loader NWL860T

With a wafer loading/unloading system, this system measures the whole contents of a wafer carrier automatically.

- Dedicated software provides fully automatic carrier-by-carrier measurements
- User-friendly GUI facilitates the selection of wafers to be measured
- Wafer map facilitates the selection of chips to be measured
- Industry-proven NWL860T wafer loader ensures reliable wafer transport
- In combination with the VMR-3020 Z120X, it can measure minuscule dimensions on wafers

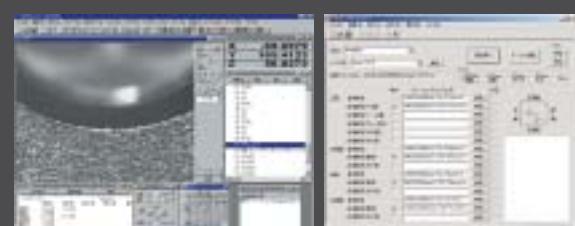


## Wafer Carrier Measuring System

### NEXIV VMR-C4540

Non-contact, fully automatic measurement provides outstanding throughput. Perfect for measuring FOUP and FOSB.

- Four side planes of the carrier are continuously measured by rotating the kinematic plate in 90° increments
- SEMI-compliant kinematic plate provides perfect XYZ coordinates
- Variety of illumination choices facilitate accurate measurements of registration pin holes and latch-key holes
- Laser AF provides fast, non-contact measurements of wafer positions
- Wide area, high-intensity LED illumination enables accurate measurements of wafer heights
- 300mm, 200mm wafer carrier and SMIF Pod base



## Specifications

| Main Unit  |   |  |   |  |  |   |
|--|---|--|---|--|--|---|
| Model  | VMR-H3030/Z120X   | VMR-1515/Z120X/LU  | VMR-3020/Z120X/LU   | VMR-6555/Z120X/LU  | VMR-10080/Z120X/LU   | VMR-12072/Z120X/LU                          |
| Stroke (XxYxZ)                                   |   |  |   |  |  |   |
| Optical Head for Type 1, 2, 3 LU model           | 300 x 300 x 150 mm (11.8 x 11.8 x 5.9 in.)  | 150 x 150 x 150 mm (5.9 x 5.9 x 5.9 in.)                               | 300 x 200 x 150mm (11.8 x 7.9 x 5.9 in.)                                  | 650 x 550 x 150mm (25.6 x 21.7 x 5.9 in.)                                  | 1000 x 800 x 150mm (39.4 x 31.5 x 5.9 in.)                                 | 1200 x 720 x 150 mm (47.2 x 28.3 x 5.9 in.) |
| With max. magnification module (high mag. lens)  | 300 x 300 x 150mm (11.8 x 11.8 x 5.9 in.)   | 150 x 150 x 150 mm (5.9 x 5.9 x 5.9 in.)                               | 300 x 200 x 150mm (11.8 x 7.9 x 5.9 in.)                                  | 650 x 550 x 150mm (25.6 x 21.7 x 5.9 in.)                                  | 1000 x 800 x 150mm (39.4 x 31.5 x 5.9 in.)                                 | 1200 x 720 x 150 mm (47.2 x 28.3 x 5.9 in.) |
| With max. magnification module (low mag. lens)   | 250 x 300 x 150mm (9.8 x 11.8 x 5.9 in.)  | 100 x 150 x 150 mm (3.9 x 5.9 x 5.9 in.)                               | 250 x 200 x 150mm (9.8 x 7.9 x 5.9 in.)                                   | 600 x 550 x 150mm (23.6 x 21.7 x 5.9 in.)                                  | 950 x 800 x 150mm (37.4 x 31.5 x 5.9 in.)                                  | 1150 x 720 x 150 mm (45.3 x 28.3 x 5.9 in.) |
| Minimum readout                                  | 0.01μm  | 0.1 μm   |   |  |  |   |
| Maximum workpiece weight                         | 30kg (66.1 lb)  | 20kg (44.0 lb)   |   | 30kg (66.1 lb)   | 40kg (88.2 lb)   |   |
| Measuring uncertainty $U_{1\sigma}, U_{2\sigma}$ | $0.6 + 2L/1000 \mu\text{m}$ (workpiece max. 10kg)   | $1.5 + 4L/1000 \mu\text{m}$ (workpiece max. 5kg)                       | $1.5 + 2.5L/1000 \mu\text{m}$ (workpiece max. 30kg)                       | $2 + 4L/1000 \mu\text{m}$ (workpiece max. 40kg)                            | $2.2 + 4L/1000 \mu\text{m}$ (workpiece max. 40kg)                          |   |
| $U_{2\sigma}$                                    | $0.9 + 3L/1000 \mu\text{m}$ (workpiece max. 10kg)   | $2.5 + 4L/1000 \mu\text{m}$ (workpiece max. 5kg)                       | $2.5 + 2.5L/1000 \mu\text{m}$ (workpiece max. 30kg)                       | $3 + 4L/1000 \mu\text{m}$ (workpiece max. 40kg)                            | $3.2 + 4L/1000 \mu\text{m}$ (workpiece max. 40kg)                          |   |
| Z-axis (L: Length in mm < W.D.)                  | $0.9 + L/150 \mu\text{m}$   | $1.5 + L/150 \mu\text{m}$  | Note: Z-axis accuracy is guaranteed by Laser AF.                          |  |  |   |
| Camera   | B&W 1/3-in. CCD (progressive scan), color 1/3-in. CCD   |  |   |  |  |   |
| Working distance                                 |   |  |   |  |  |   |
| Optical Head for Type 1, 2, 3                    | 50mm  |  |   |  |  |   |
| With max. magnification module LU model*         | High mag. objective lens: 9.8mm Low mag. objective lens: 32mm Refer to CFI Objective Lenses for LCD on page 15. |  |   |  |  |   |
| Magnification vs field of view                   |   |  |   |  |  |   |
| Optical Head for Type 1                          | 0.5 – 7.5X / 9.33 – 7 – 0.622 x 0.467 mm  |  |   |  |  |   |
| Optical Head for Type 2                          | 1 – 15X / 4.67 x 3.5 – 0.311 x 0.233 mm   |  |   |  |  |   |
| Optical Head for Type 3                          | 2 – 30X / 2.33 x 1.75 – 0.155 x 0.117 mm  |  |   |  |  |   |
| With max. magnification module LU model          | 1 – 120X / 4.67 x 3.5 – 0.039 x 0.029 mm  |  |   |  |  |   |
| Refer to Magnification and FOV Size on page 15.  |   |  |   |  |  |   |
| Auto focus                                       | TTI Laser AF and Vision AF. LU model: Vision AF only  |  |   |  |  |   |
| Illumination                                     |   |  |   |  |  |   |
| Optical Head for Type 1, 2, 3                    | Diascopic, episcopic, 8-segment LED ring illumination (inner ring / outer ring)                                 |  |   |  |  |   |
| With max. magnification module LU model          | Episcopic, diascopic (with high mag. head only), darkfield illumination   |  |   |  |  |   |
| Power source                                     | AC100-240V ±10%, 50/60Hz  |  |   |  |  |   |
| Power consumption                                | Max. 11A (Standard type), 13A (Z120X type)  |  | Max. 13A (Standard type), 15A (Z120X type)                                |  |  |   |
| Dimensions & weight                              |   |  |   |  |  |   |
| Main unit only                                   | 915 x 1060 x 1300 mm, approx. 450kg (36.0 x 41.7 x 51.2 in., 992.1 lb.)   | 512 x 703 x 1200 mm, approx. 180kg (20.2 x 27.7 x 47.2 in., 396.8lb.)  | 625 x 728 x 1195 mm, approx. 200kg (24.6 x 28.7 x 47.0 in., 441.0 lb.)    | —  | —  | —   |
| Main unit & table                                | 1000 x 1100 x 1900 mm, approx. 570kg (39.4 x 43.3 x 74.8 in., 1256.6 lb.)                                       | 512 x 703 x 1200 mm, approx. 180kg (20.2 x 27.7 x 47.2 in., 396.8 lb.) | 1220 x 1680 x 1750 mm, approx. 600kg (48.0 x 66.1 x 68.9 in., 1322.8 lb.) | 1530 x 2200 x 1750 mm, approx. 1500kg (60.2 x 86.6 x 68.9 in., 3306.9 lb.) | 1734 x 2200 x 1750 mm, approx. 1600kg (68.3 x 86.6 x 68.9 in., 3527.4 lb.) |   |
| Controller                                       | 250 x 550 x 500 mm, approx. 31kg (9.8 x 21.7 x 19.7 in., 68.3 lb.)  |  |   |  |  |   |
| Footprint  | 2400 (W) x 1400 (D) mm (94.5 x 55.1 in.)  | 2100 (W) x 1100 (D) mm (82.7 x 43.3 in.)                               | 2100 (W) x 1100 (D) mm (82.7 x 43.3 in.)                                  | 2400 (W) x 2000 (D) mm (94.5 x 78.7 in.)                                   | 2800 (W) x 2500 (D) mm (110.2 x 98.4 in.)                                  | 3000 (W) x 2500 (D) mm (118.1 x 98.4 in.)   |

## Host Computer

|           |                         |
|-----------|-------------------------|
| Main unit | IBM PC/AT (Windows® XP) |
| Monitor   | 17-in. TFT color        |

\*The "Z120X" type is equivalent to the "TZ" type in Japan.

\* LU model is not available for VMR-H3030.

| Automatic Wafer Measuring System VMR-3020 + NWL860T             |   |
|---|---|
| Compatible wafer sizes  | ø150mm/200mm (SEMI/JEIDA compliant, silicon )             |
| Standard wafer carriers   | Entegris® 150mm: PA182-60MB, 200mm: 192-80M               |
| Processing speed per carrier (Continuous transfer of 25 wafers) | 8 minutes + NEXIV's measurement time                      |
| Orientation flat/notch detection                                | Non-contact, transmitted-type sensor                      |
| Wafer transfer/chuck  | Vacuum chuck, mechanical transfer                         |
| Main unit dimensions (excluding PC rack)                        | 1700 (W) x 960 (D) x 1735 (H) mm (66.9 x 37.8 x 68.3 in.) |
| Footprint (excluding areas for operation and maintenance)       | 2750 (W) x 1100 (D) mm (108.3 x 43.3 in.)                 |
| Main unit weight  | Approx. 370kg (815.7 lb.)                                 |
| Requirements  |   |
| Electricity   | AC100-240V ±10%, 50/60Hz, 11.5A max.                      |
| Vacuum  | -800hPa (~600mmHg), 10NL/min.                             |

| Wafer Carrier Measuring System VMR-C4540 |  |
|--|--|
| Compatible carriers                      | SEMI-compliant 300mm wafer carriers<br>200mm wafer carriers (with dedicated adapter) |
| Stroke                                   | Measuring head (X x Y x Z)<br>Rotary table   |
| Minimum readout                          | 0.1 μm   |
| Head travel speed                        | XZ axis: max. 200mm/s (7.9 in.) Y axis: max. 50mm/s (2.0 in.)                        |
| Kinematic plate rotation speed           | 90°/2 sec.   |
| Camera                                   | B&W 1/2-in. CCD  |
| Optical magnification                    | 0.27X to 2.74X (5-step 10X zoom)   |
| Field of view                            | 20 x 16 mm to 2.0 x 1.6 mm   |
| Max. workpiece weight                    | 15kg (33.1 lb.)  |
| Measuring accuracy                       | (10 + 10L)/1000μm, L = measuring length in mm  |
| Repeatability (2σ)                       | 2μm  |
| Illumination                             | Episcopic, diascopic, darkfield  |
| Auto focus                               | Laser AF, Vision AF  |
| Power source                             | AC100-240V±10%, 50/60Hz  |
| Power consumption (approx.)              | AC100-120V: 1.3A (main unit), 9A (PC)<br>AC200-240V: 7A (main unit), 5A (PC)         |
| Dimensions                               | 1400 (W) x 1739 (D) x 2530 (H) mm (55.1 x 68.5 x 99.6 in.)                           |
| Weight                                   | Approx. 1400kg (3086.41 lb.)   |
| Host computer                            | IBM PC/AT (Windows® 2000)  |
| Monitor                                  | 17-in. TFT   |

## Dimensional diagrams

