

**Nikon**

CNC Video Measuring Systems

CNC Video Measuring Systems

# NEXIV

VMR Series



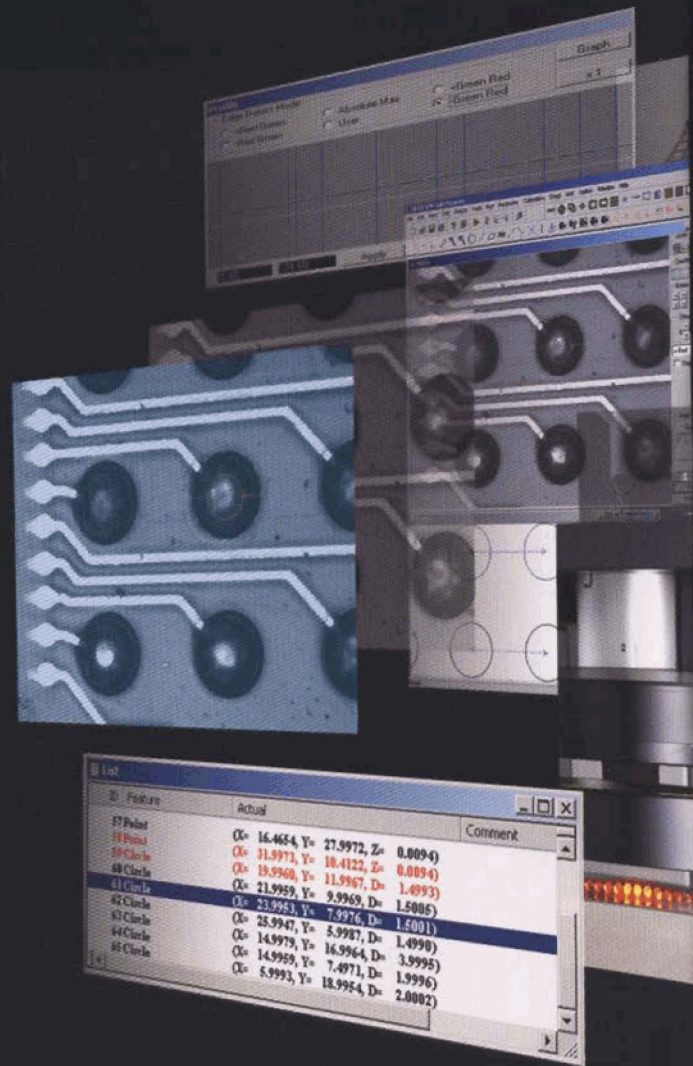
The pinnacle of precision

NEXIV



NEXIV

Nikon  
VMR-3020



Destined to become  
the de facto standard  
CNC video measurement



# NEXIV

VMR Series

## Outstanding total throughput

With increased speeds in stage movement (300mm/sec. max. with VMR-6555), sampling, image processing and system control, the VMR Series performs measurements with dramatically improved throughput.

## Enhanced U2 accuracy provided as standard

U2 accuracy has been improved and is now provided as standard on both models.

|                                   | VMR-3020         | VMR-6555           |
|-----------------------------------|------------------|--------------------|
| U <sub>1x</sub> , U <sub>1y</sub> | 1.5 + 4L/1000 μm | 1.5 + 2.5L/1000 μm |
| U <sub>2xy</sub>                  | 2.5 + 4L/1000 μm | 2.5 + 2.5L/1000 μm |

## All new optics featuring TTL Laser AF and new LED ring illuminators

- World's widest 15X zoom facilitates both observation and measurement
- TTL Laser AF usable also at low magnifications
- Versatile LED illumination makes it easy to detect various edges

## Unrivaled edge detection

- Fast gray-scale processing
- Video edge probes with auto "best-fit" function
- Enhanced edge detection with Nikon's unique algorithm

## Easy wizard-based operation

- Measurement and teaching wizards facilitate programming



VMR-3020



VMR-6555

in  
nt systems!



## All new optics for measurement with unrivaled precision

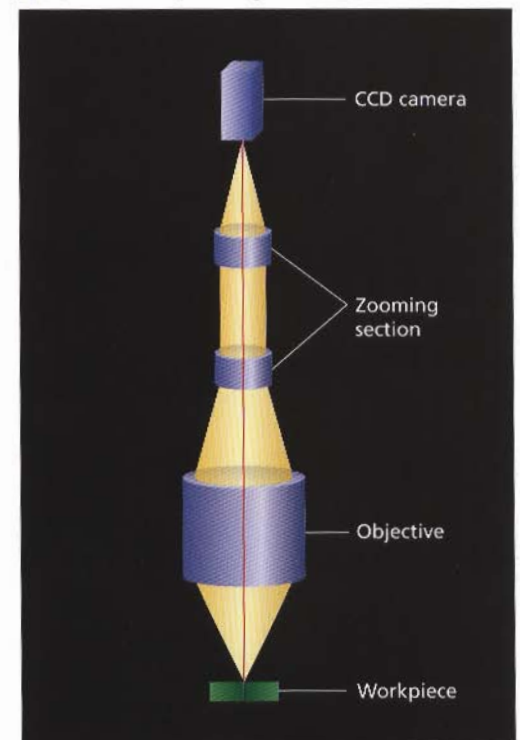
### Brand new telecentric optics

The system's telecentric optics—the heart of the system—have been completely redesigned to make them among the world's best. These new optics employ an objective lens that features an outstanding working distance of 50mm and superb numerical apertures found in top-end microscopes. The 15X-zoom ratio—the world's widest—provides both ample fields of view during low-magnification observations and excellent resolution at high magnifications.

### Objective lens with a 15X zoom ratio provides observations with wider F.O.V. and greater resolution

The new objective lens provides a 5-step, 15X-zoom ratio—the world's widest—delivering wide fields of view at low magnifications and superb resolution at high magnifications. Its auto compensation feature corrects shifts in the optical axis caused by magnification changes during zooming to ensure accurate measurements.

■ Telecentric optical system





## Both 50mm W.D. and high N.A.

The new large-diameter objective lens features high numerical apertures and low distortion, while providing a long 50mm working distance throughout all magnification ranges.

## Three choices of magnification ranges

The objective lens is available in three different magnification ranges as shown below.

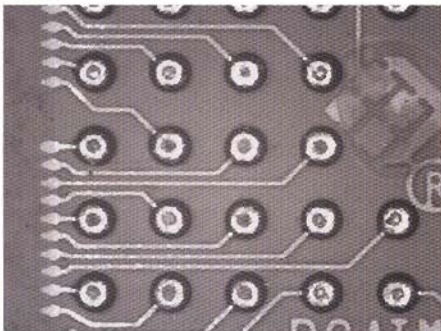
Select Type 1 when a wide field of view is required or use Type 3 when high magnifications are needed for measuring minute workpieces. However, Type 3 cannot be used with an optional color CCD-camera model.

### Magnification and field of view

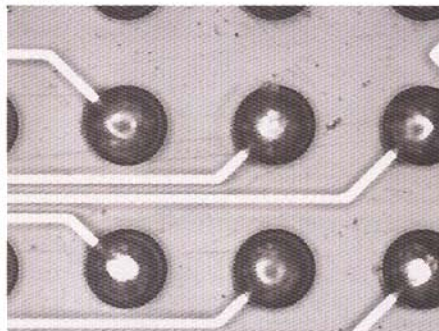
| Zoom position                       | 1           | 2             | 3             | 4             | 5             |
|-------------------------------------|-------------|---------------|---------------|---------------|---------------|
| <b>Type 1</b> Optical magnification | 0.5x        | 1x            | 2x            | 4x            | 7.5x          |
| Total magnification                 | 22x         | 44x           | 88x           | 176x          | 330x          |
| 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 |
| <b>Type 2</b> Optical magnification | 1x          | 2x            | 4x            | 8x            | 15x           |
| Total magnification                 | 44x         | 88x           | 176x          | 352x          | 660x          |
| 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 |
| <b>Type 3</b> Optical magnification | 2x          | 4x            | 8x            | 16x           | 30x           |
| Total magnification                 | 88x         | 176x          | 352x          | 704x          | 1320x         |
| 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 |

**Notes:** Total magnifications are calculated on a 21-inch monitor in SXGA mode.

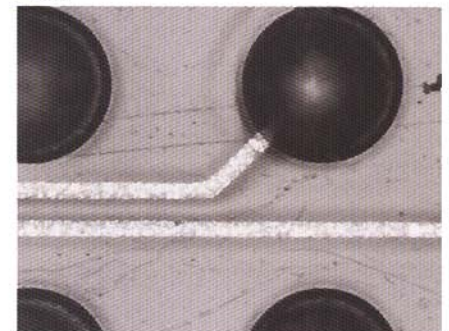
■ 1X



■ 2X



■ 4X



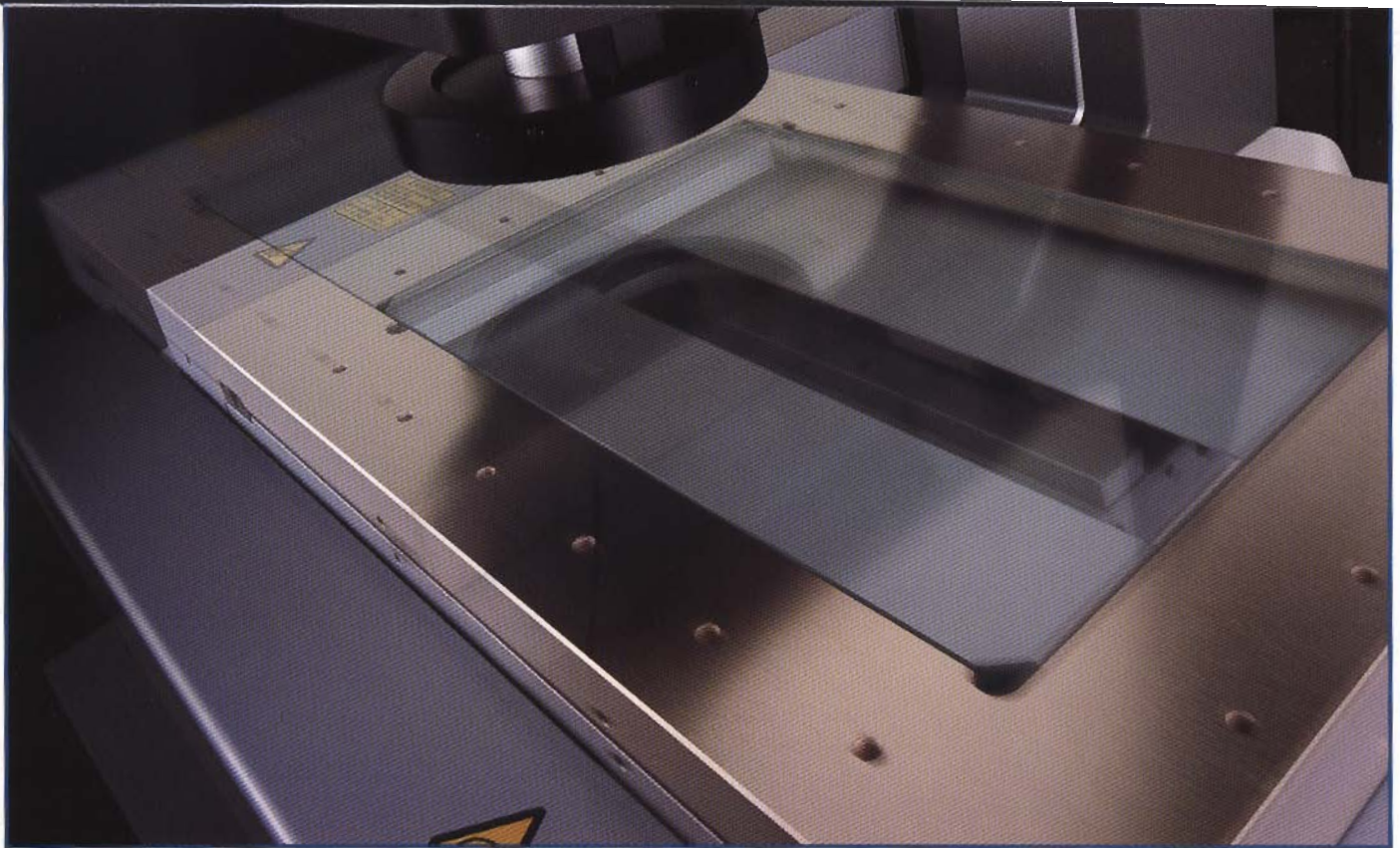
■ 8X



■ 15X







## Outstanding speeds and precision by optimizing design using latest technologies

### Fastest stage

Stage speeds of the world's highest order—150mm/sec. max. for VMR-3020 and 300mm/sec. max. for VMR-6555 or 1.5 times faster than our previous models—have been achieved by increasing the rigidity of the stage-driving unit.

### U2 accuracy improved and provided as standard

Now among the highest in the world, the XY measurement accuracy on both models has been greatly enhanced by redesigning the stage and body, including optimizing their scale position. Also, U2 accuracy is now guaranteed as standard on both models.

|                                   | VMR-3020       | VMR-6555         |
|-----------------------------------|----------------|------------------|
| U <sub>1x</sub> , U <sub>1y</sub> | 1.5+4L/1000 μm | 1.5+2.5L/1000 μm |
| U <sub>2xy</sub>                  | 2.5+4L/1000 μm | 2.5+2.5L/1000 μm |

### Rapid overall speeds

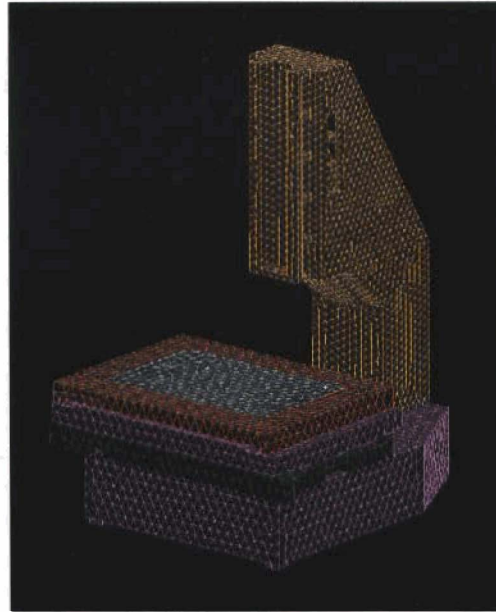
Advanced control technology and parallel data processing realized by DSP have dramatically increased the speeds of sampling, image processing, and data transmission. Combined with increased speed for stage acceleration and shortened time for stage positioning, these significantly increase throughput.



## Real-time image capture using a progressive scan camera

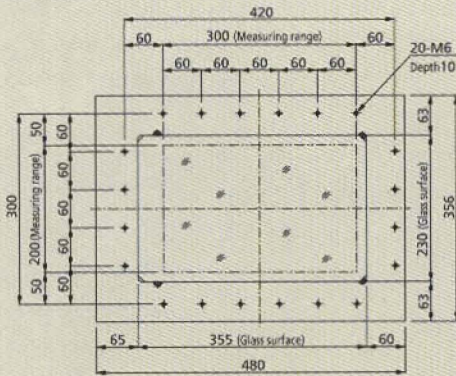
A progressive scan type of camera (monochrome) that features rapid image capture has been employed. This enables the system to run the stage and process the image simultaneously, resulting in a substantial reduction in measurement time. This design also prevents the system from being affected by vibration during image capture.

1 3 0 illustration: VMR-3020 stage and body

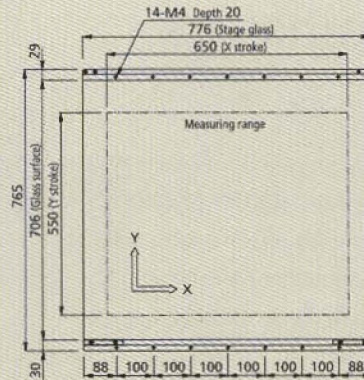


### Position of tapped holes for fixing jigs

VMR-3020



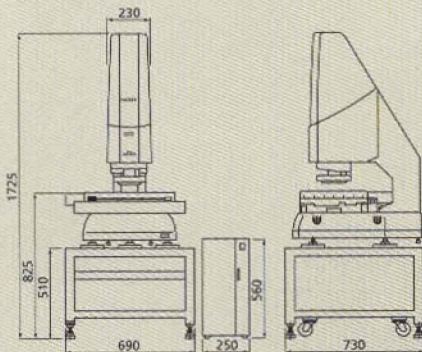
VMR-6555



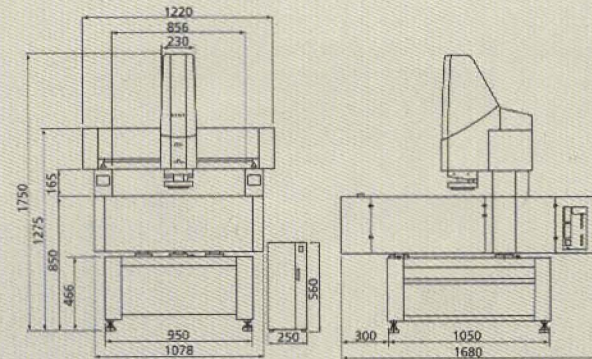
Unit: mm

### Dimensional diagrams

VMR-3020

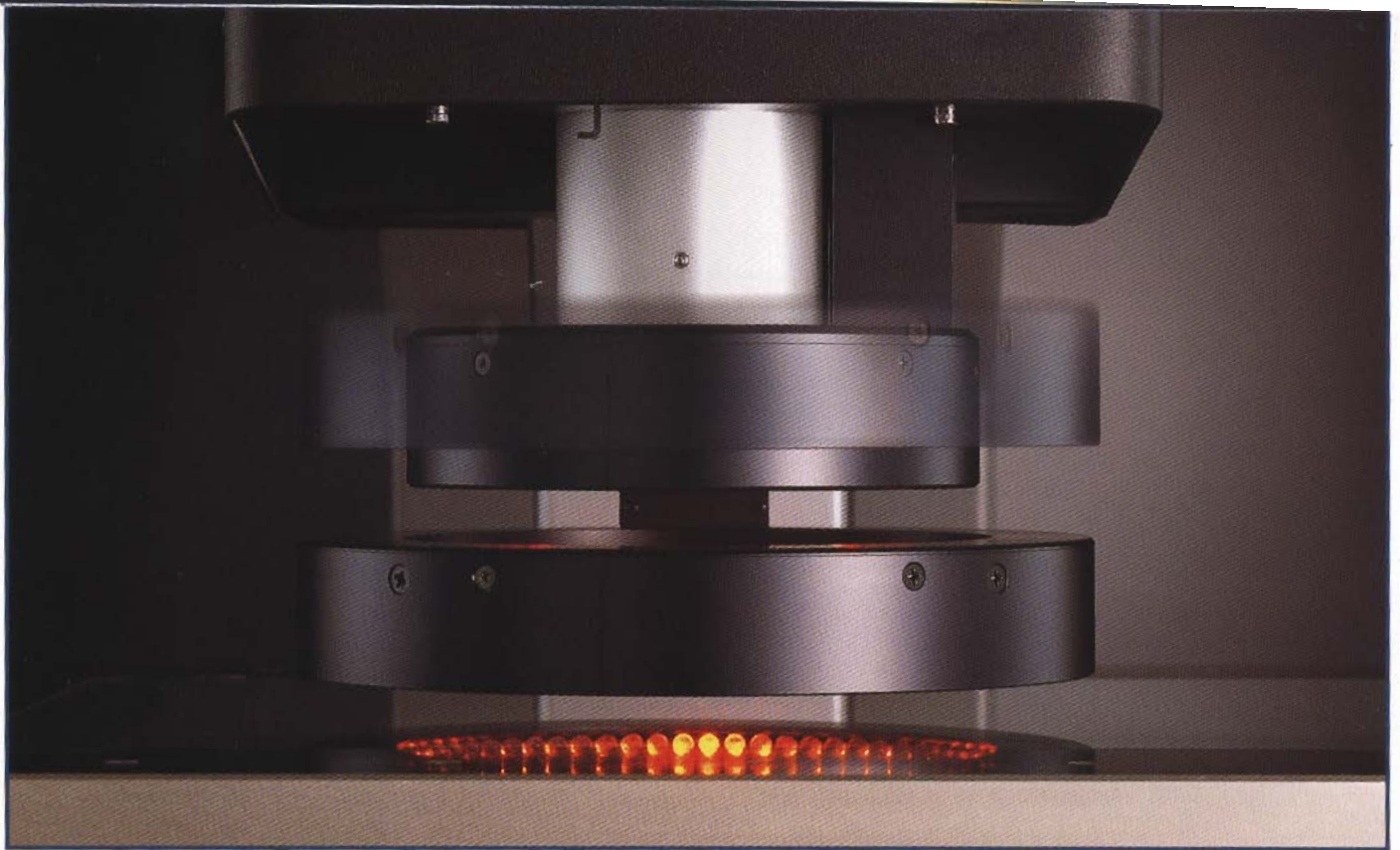


VMR-6555



Unit: mm





## Versatile illumination including two new 8-segment LED ring illuminators

### Wide illumination choices

The VMR Series offers a wide variety of illumination choices as standard for optimum illumination, depending on the workpiece selected.

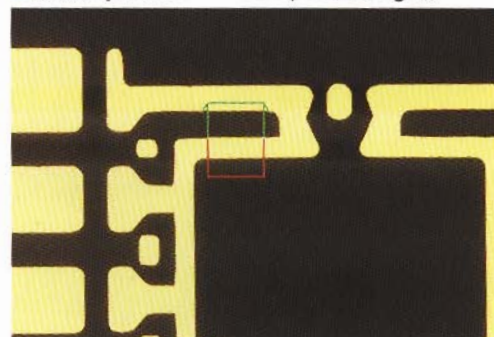
These include:

- Episcopic illumination (Top light)
- Diascopic illumination (Bottom light)
- Two types of 8-segment LED ring illuminators

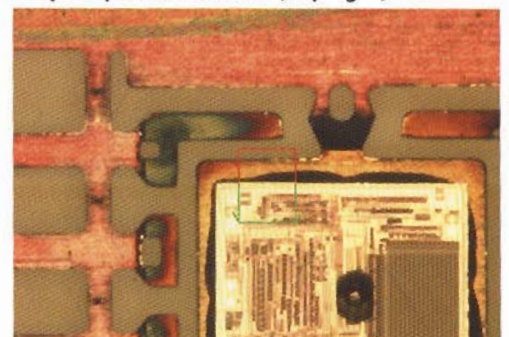


Illumination window

#### ■ Diascopic illumination (Bottom light)



#### ■ Episcopic illumination (Top light)



**Note:** Color CCD camera model is an option.



## Nikon's unique 8-segment LED ring illumination

An illumination system specially developed for the VMR Series, this makes possible observations of extremely low-contrast edges, usually impossible 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. Depending on the workpiece, two types of uses are selectable.

### For medium angles of incidence

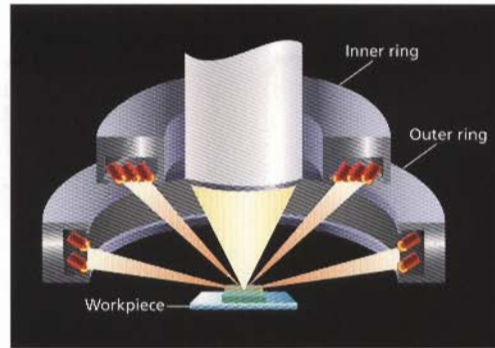
(37° from the optical axis)

This type can be universally used whenever strong illumination from various directions is needed. This illumination also provides a long 50mm working distance.

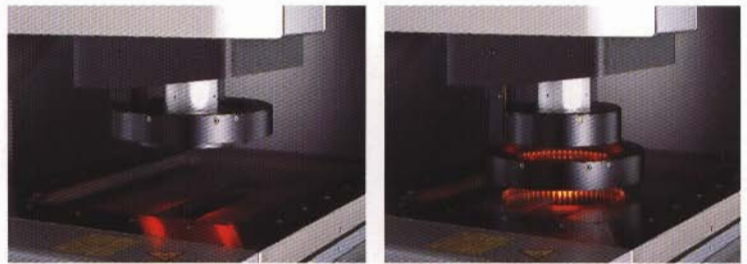
### For large angles of incidence

(75° from the optical axis)

Although the working distance suffers, this type enables the observation of workpieces that are impossible with lighting at a shallow angle. When not in use, the illuminator automatically retracts, creating more space above the workpiece.

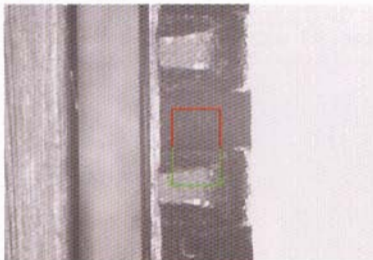


How 8-segment LED ring illuminator works

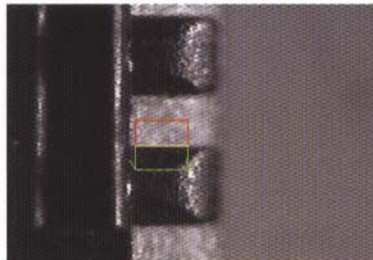


LED ring illumination

#### Episcopic illumination



#### Outer ring illumination

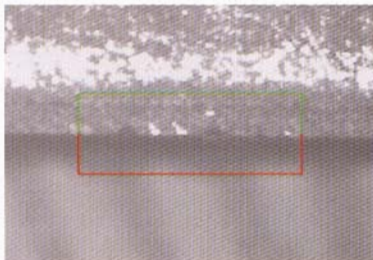


Connector (black plastic)

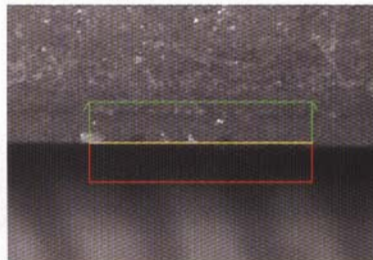


Outer ring

#### Episcopic illumination



#### Inner ring illumination

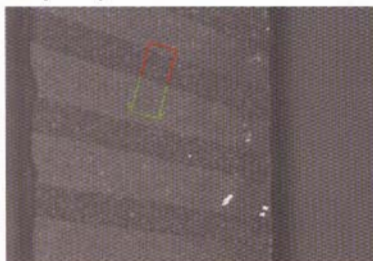


Ceramic package

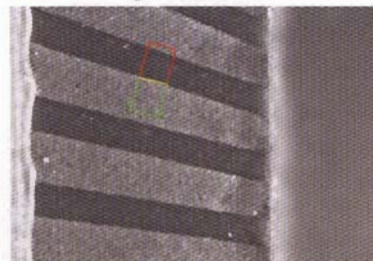


Inner ring

#### Episcopic illumination



#### Outer ring illumination

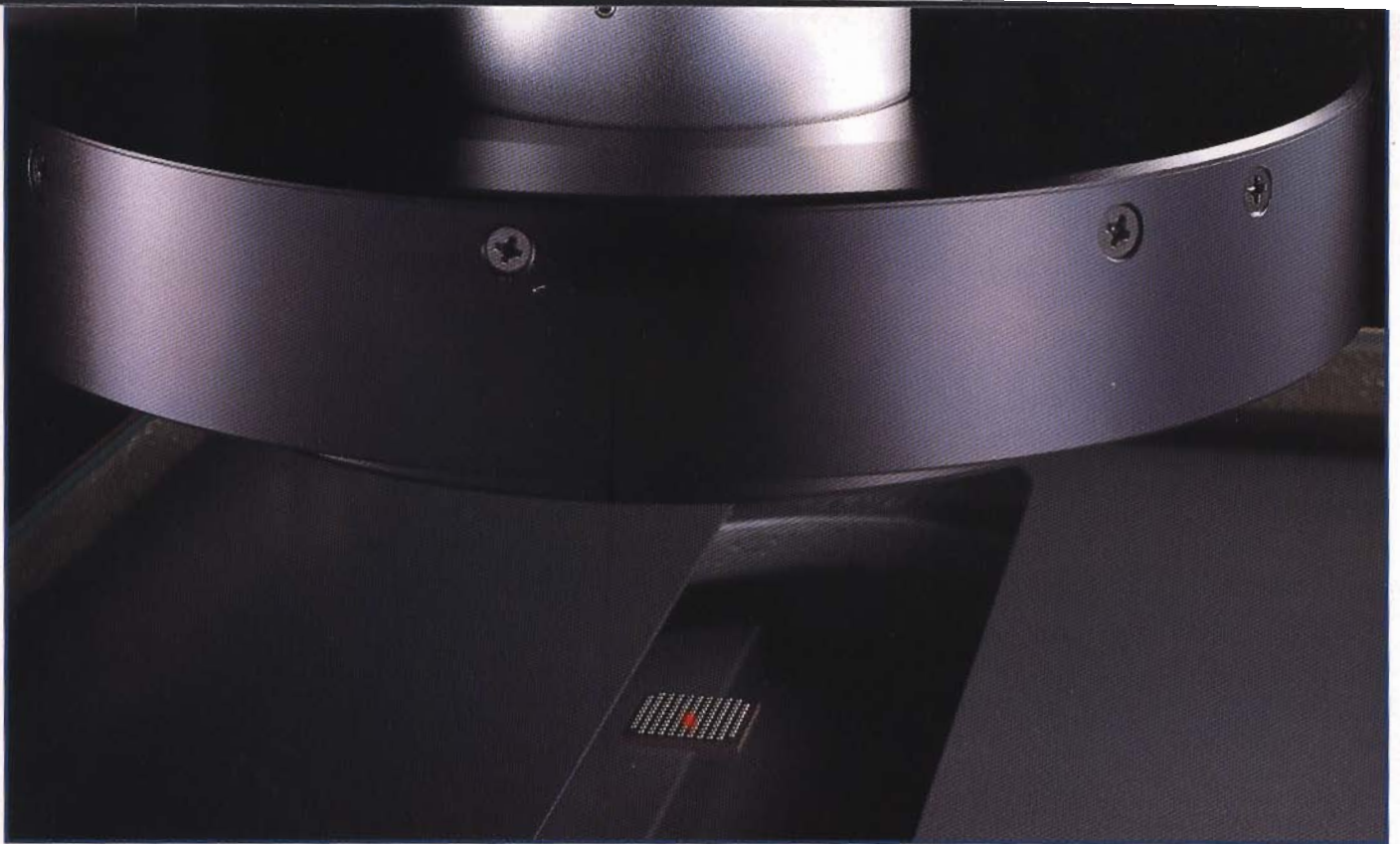


Ceramic package



Outer ring





## TTL Laser AF provided as standard

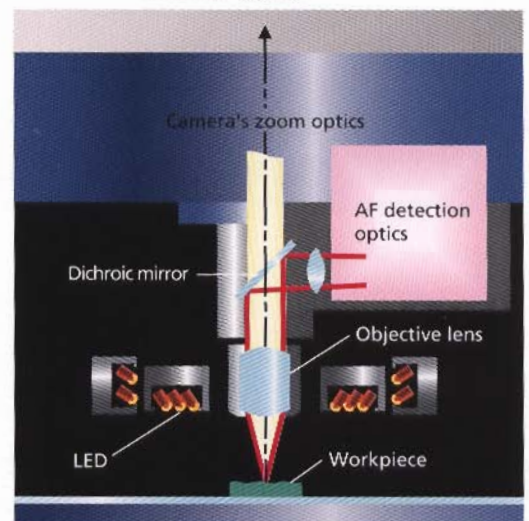
### Upgraded TTL Laser AF

TTL Laser AF now provides higher accuracy, a longer working distance of 50mm, and faster operating speed than ever before—an achievement made possible by the new objective lens. This enables perfect focusing on narrow portions with multiple steps even during low magnifications. High-speed AF is now possible, regardless of the surface conditions within a workpiece.

### High-speed multi-point contour measurement

Contour measurement is now possible at a rate of 1000 points per second max.—among the world's fastest—enabling ultra-precise Z-axis measurements to be made in a variety of applications. Workpieces can now be shown in a bird's-eye view or 2-dimensional cross-sectional format.

### How TTL Laser AF works

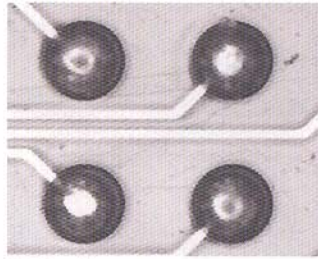




### 3D surface analysis program: NEXIV Bird's-Eye View (Option)

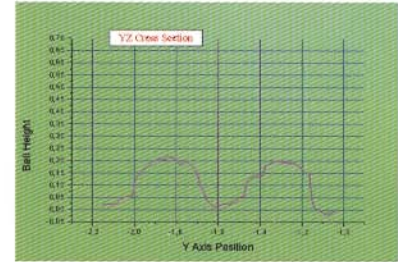
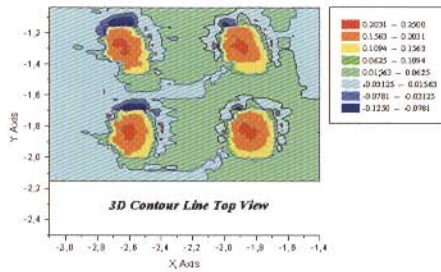
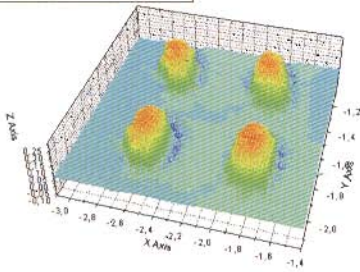
Running on Microcal Origin™, this program allows data obtained using the Scan Measure feature provided with TTL Laser AF to be plotted in a 3-dimensional format. After that, 3-dimensional shape analysis and 2-dimensional cross-section shape analysis can be performed.

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



Original image

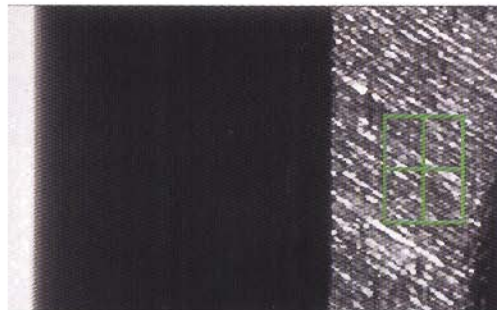
Ball 3D Surface Form - Bird's Eye View



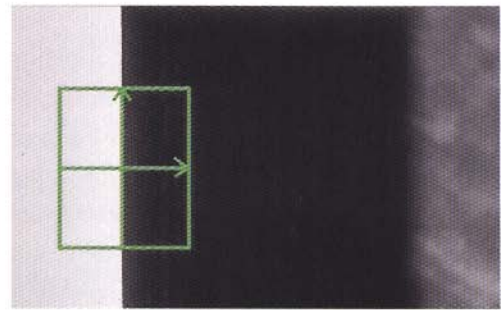
### Vision AF is now faster and more accurate

Thanks to the adoption of a new algorithm and a progressive scan type of camera, Vision AF now provides greater speeds and accuracy approaching those with 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.

■ Surface focus



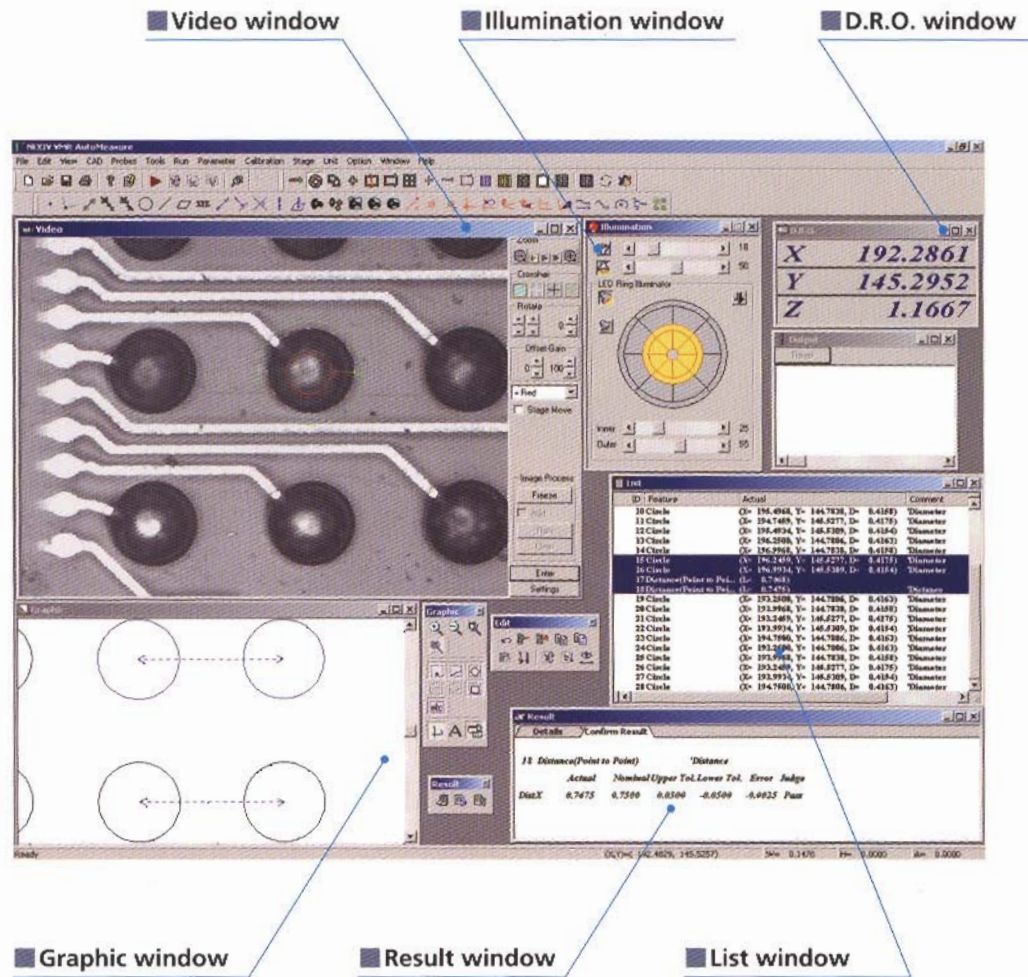
■ Contrast focus





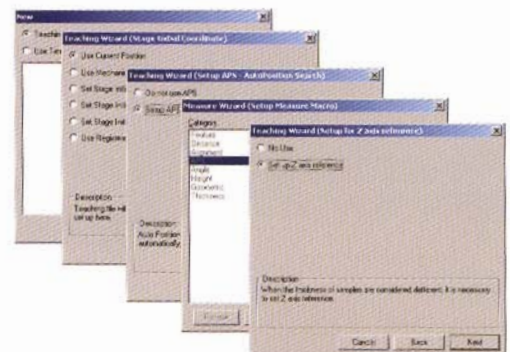
# Standard software is easier to use than ever before: NEXIV VMR AutoMeasure

## Operation windows



## Interactive teaching wizards

A set of default teaching wizards provides step-by-step guides to facilitate teaching, regardless of the knowledge or experience of the operator. Besides these, operators can customize teaching wizards by registering frequently used teaching procedures.

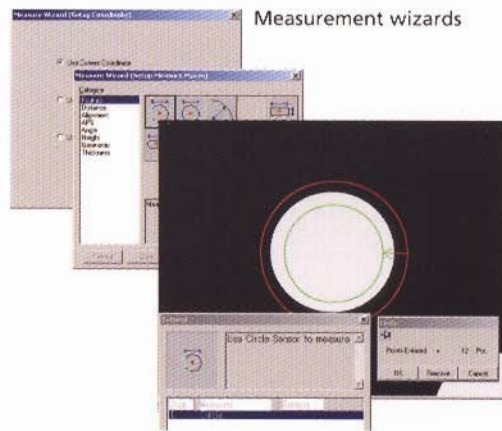


Teaching wizards



## Interactive measurement wizards

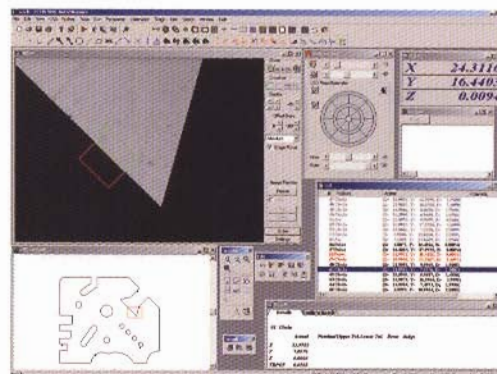
The measurement wizards guide operators, step by step, through what is required to achieve their tasks. In addition to the default wizards, operators can create customized wizards by registering frequently used procedures to streamline future operation.



## Online CAD interface program provided as standard

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.

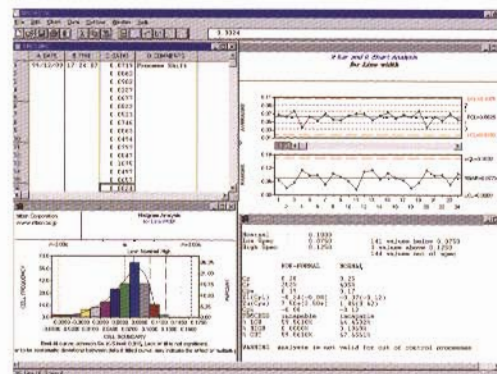
- The operator can move the stage to the desired position by double-clicking the appropriate position within the input workpiece.
- Automatic measurement makes it possible to create a teaching file automatically from CAD feature data on NEXIV VMR AutoMeasure.



CAD graphic window

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

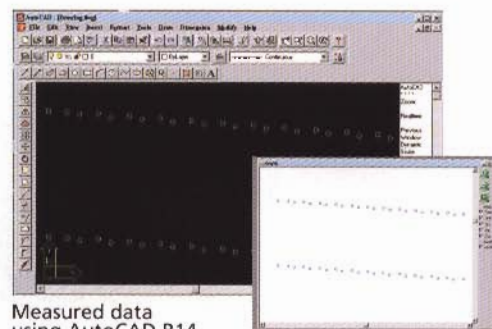
Using a DDE Link function, measured data can be immediately transferred to spreadsheets such as Microsoft Excel®, SPC-PC IV, and others, making real-time SPC analysis possible.



Note: SPC PC-IV is a product of Quality America Inc.

## Measured data can be converted into DXF files

This makes for easier reverse engineering processes.



Measured data using AutoCAD R14

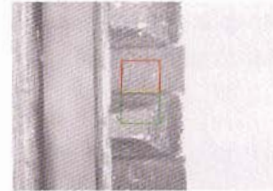
Measured data



# Unrivaled edge detection

## Gray scale processing via video edge probes

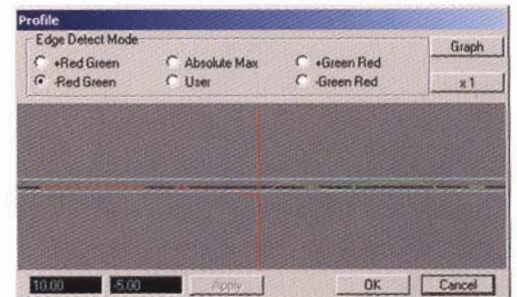
The black and gray portions of a workpiece are digitally classified into 256 gradation levels, then edges are detected and processed based on this classification. This prevents measurement data from being affected by changes in illumination.



Gray scale processing

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

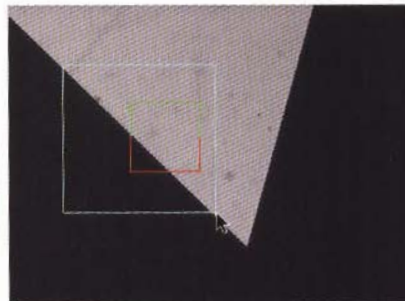
Some workpieces contain multiple edges within a given caliper, or their contrast is too low, making edge detection extremely difficult. This function graphically profiles the contrasts of the image within the caliper using a multi-gray-level scale, enabling the operator to select any one of a number 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.



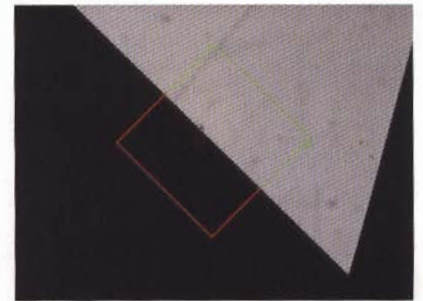
Dust clearly removed by the average caliper  
Edge selection graphic window

## Video edge probes with auto "best-fit" function

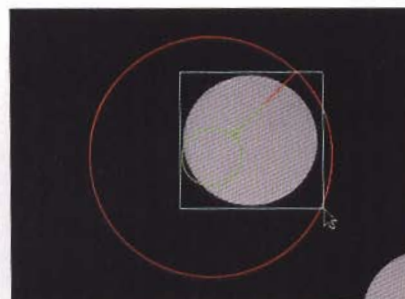
When the operator clicks the point to be measured, the system automatically rotates the probes, sets them at the optimum position, and sets the probe size, all automatically.



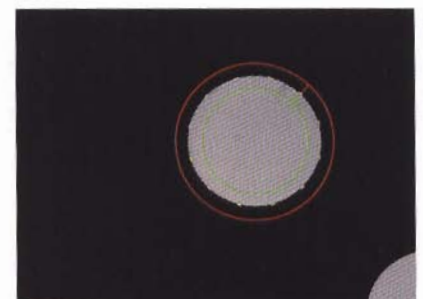
Drag to resize and fit the projection probe to the edge.



After this process.



Drag to resize and fit the circle probe to the circle.

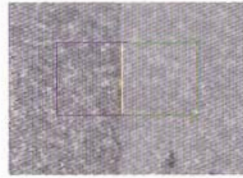


After this process.

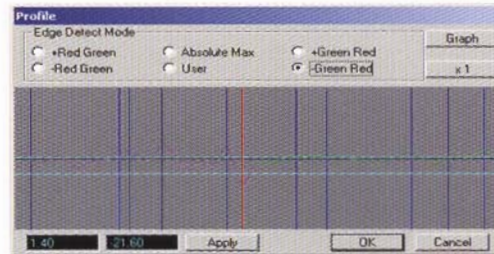


## Enhanced edge detection with Nikon's unique algorithm

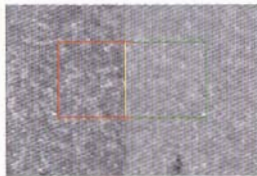
Thanks to Nikon's proprietary edge detection algorithm (patent pending), detection of edges at low magnifications is now possible with excellent precision. This enables the detection of minute, low-contrast edges, a task that is difficult to perform using gray scale processing. Image recognition capability 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.



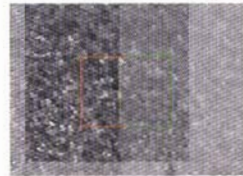
Only a main edge is extracted and enhanced



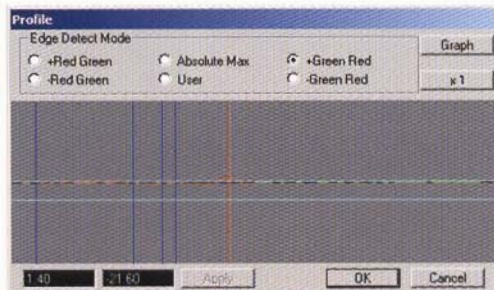
Processing window



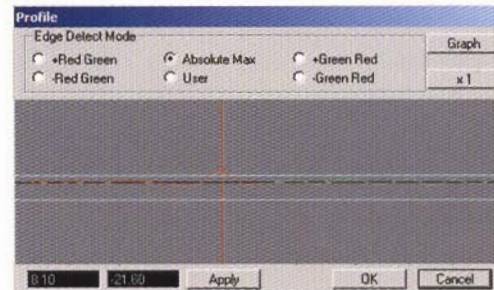
Before edge enhancement



Enhancement after eliminating noise factors



Processing window



Processing window

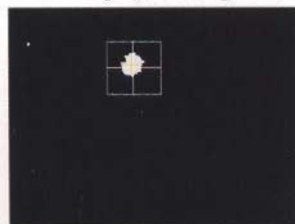
## Visual inspection tools provided as standard

In addition to a wide range of image processing procedures, various visual inspection tools are available.

Original image



After image processing



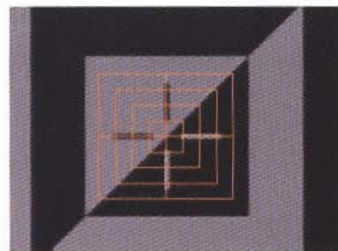
Inspection probe detects the profile of an object in a filtered image.



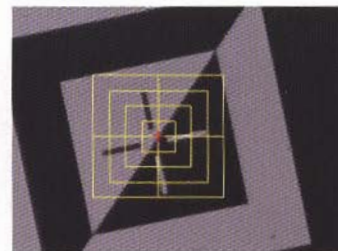
Multi-Blob probe counts the number of objects in a filtered image.

# Intelligent search

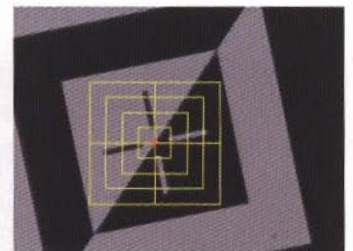
Skew alignment and deviations between the edge probing points within a workpiece are automatically corrected by a pattern-matching feature, eliminating possible measurement errors. In addition to a conventional normalized correlation algorithm, a new Geometrical (Human-Eye-Like) Pattern Recognition Mode (optional) searches features at increased speed and with greater accuracy.



Trained pattern



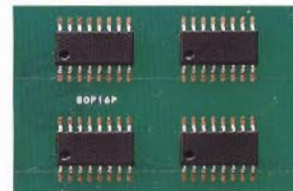
Conventional search algorithm



New Search Algorithm searches skew fiducial mark center precisely.

## 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.



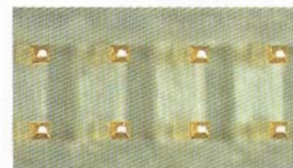
Ideal workpiece setting



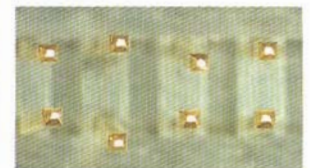
Actual workpiece setting

## 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.



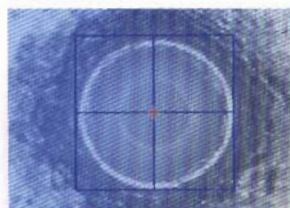
Ideal connector pin arrangement



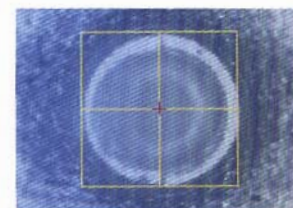
Actual connector pin arrangement

## PMM (Pattern Matching Measurement)

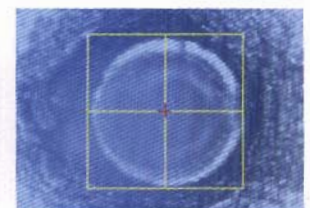
Determines coordinate values for features too difficult to measure in the normal geometric measuring mode.



Trained pattern 1



Actual searched pattern 1



Actual searched pattern 2

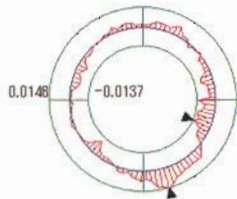


# Easy evaluation of results using graphics

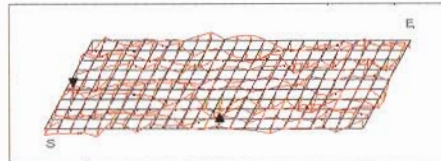
The degree of perfection in terms of roundness, flatness, and straightness of a given workpiece is graphically displayed on the monitor and easily evaluated.

Items to be evaluated include:

- Roundness: Least squares method/Minimum zone method/Maximum inscribed circle/Minimum circumscribed circle
- Flatness: Least squares method/Minimum zone method/Highest 3 points/Lowest 3 points

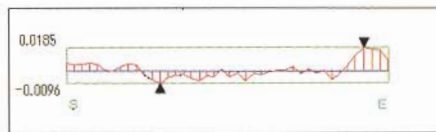


Roundness graphic



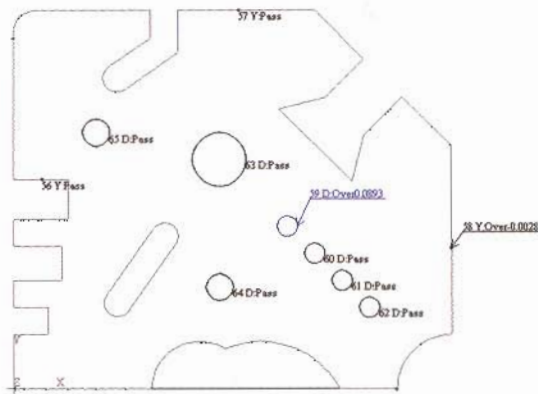
Flatness graphic

- Straightness: Least squares method/Minimum zone method



Straightness graphic

In addition, measurement results can be graphically displayed with tolerancing data. These results can be printed out when necessary—handy for re-engineering in the future.



## Specifications

| Model                             | VMR-3020  |  | VMR-6555  |
|-----------------------------------|---|--|---|
| Stroke (X x Y x Z)                | 300 x 200 x 150 mm (11.8 x 7.9 x 5.9 in.)   |  | 650 x 550 x 150 mm (25.6 x 21.7 x 5.9 in.)                                    |
| Minimum readout                   | 0.1 μm  |  |   |
| Maximum workpiece weight          | 20kg (44.0 lb.)   |  | 30kg (66.1 lb.)   |
| Measuring accuracy at 20°C ± 0.5K | $U_{1x}, U_{1y}$  | 1.5 + 4L/1000 μm (with a workpiece max. 5kg) | 1.5 + 2.5L/1000 μm (with a workpiece max. 30kg)                               |
|                                   | $U_{2zy}$   | 2.5 + 4L/1000 μm (with a workpiece max. 5kg) | 2.5 + 2.5L/1000 μm (with a workpiece max. 30kg)                               |
| Z-axis (L: Length in mm < W.D.)   | 1.5 + L/150 μm  |  | 1.5 + L/150 μm  |
| Camera                            | B&W progressive scan camera (Color CCD optional)  |  |   |
| Zoom head,                        | Type 1: 0.5 - 7.5x  | 9.33 x 7 mm - 0.622 x 0.467 mm               |   |
| Magnification &                   | Type 2: 1 - 15x   | 4.67 x 3.5 mm - 0.311 x 0.233 mm             |   |
| Field of view                     | Type 3: 2 - 30x   | 2.33 x 1.75 mm - 0.155 x 0.117 mm            |   |
| Auto focus                        | TTL Laser AF and Image AF   |  |   |
| Power source                      | AC100 to 240V ±10%, 50 or 60Hz  |  |   |
| Power consumption                 | Approx. 7A at AC100 - 120V<br>Approx. 4A at AC220 - 240V  |  | Approx. 9A at AC100 - 120V<br>Approx. 5A at AC220 - 240V                      |
| Dimensions & weight               |   |  |   |
| Main body only                    | 500 (W) x 690 (D) x 1195 (H) mm, 160kg (19.7 x 27.2 x 47.0 in., 352.7 lb.)  |  |   |
| Main body & table                 | 690 (W) x 730 (D) x 1725 (H) mm, 200kg (27.2 x 28.8 x 67.9 in., 440.9 lb.)  |  | 1220 (W) x 1680 (D) x 1750 (H) mm, 600kg (48.0 x 66.1 x 68.9 in., 1322.8 lb.) |
| Controller                        | 250 (W) x 550 (D) x 500 (H) mm, 20kg (9.8 x 21.7 x 19.7 in., 44.1 lb.)  |  |   |
| Footprint                         | 2100 (W) x 1100 (D) mm (82.7 x 43.3 in.)  |  | 2400 (W) x 2000 (D) mm (94.5 x 78.7 in.)                                      |
| <b>Host Computer</b>              |   |  |   |
| Main unit                         | IBM PC/AT (Windows® 2000)   |  |   |
| CRT                               | 19- or 21-inch color  |  |   |
| Software                          | NEXIV VMR AutoMeasure available in English, Finnish, French, German, Japanese, Mandarin Chinese, or Taiwanese, etc. |  |   |

## NEXIV VM Series

High accuracy model  
**VMH-300N**



Large envelope model  
**VM-1000N**



Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. December 2001.



**WARNING**

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



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