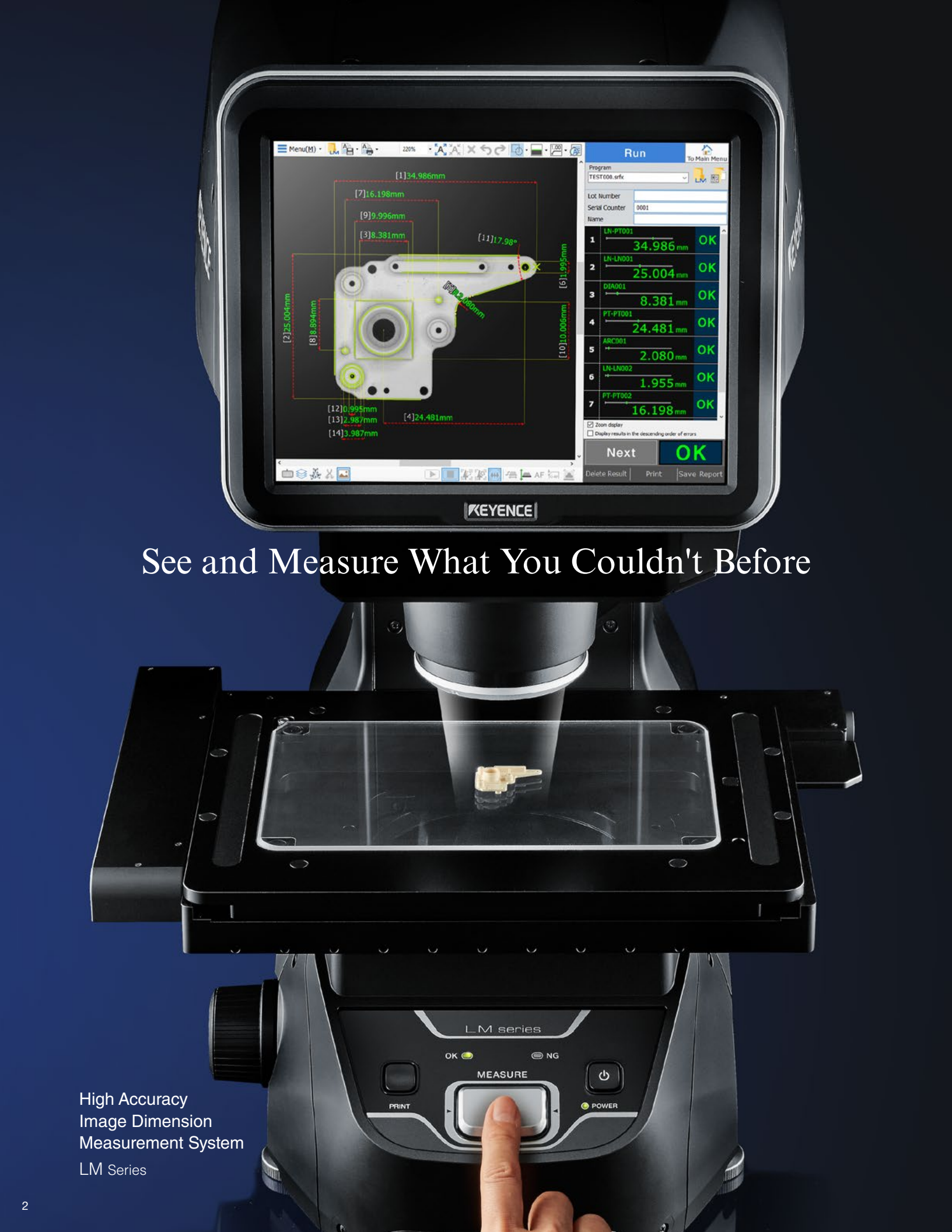
KEYENCE

High Accuracy
Image Dimension Measurement System
LM Series

±0.1 μm

World class measurements
with the touch of a button



See and Measure What You Couldn't Before

High Accuracy
Image Dimension
Measurement System

LM Series

±0.1 µm Repeatability

With conventional measurement systems, measured values would vary, as each operator's method for setting the focus and edges would differ. The LM series ensures highly accurate and repeatable measurements by automating the process of focusing and positioning the part.

High-resolution double telecentric lens

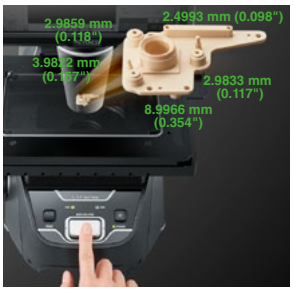
Anyone Can Use It

The map navigation function allows you to check the entire part at any time, so you can instantly see what is being measured. User-friendly menus and comprehensive help function allows anyone to use it.

Stage camera

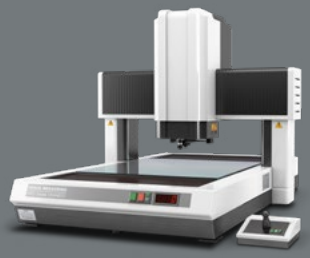
Fast Measurements

Previously time-consuming fixturing work and datum setup are no longer required when measuring. You can also instantly measure several of the same parts with just the push of a button.



Measurement at the simple push of a button

Operating conventional measuring microscopes and optical CMMs are challenging to master.



Optical CMM

Measuring microscope

Problems with conventional methods

Difficult to take accurate measurements

- Measured points vary depending on the operator
- Values vary depending on the lighting
- The focus position varies depending on the operator

Difficult to use

- The viewing area is narrow and difficult to work with
- The presence of burrs or chips causes detection errors
- You need to take a course to understand how to operate it

Measurement is time-consuming

- It takes time to align the X/Y reference points
- As the measurement area increases, it becomes more time-consuming
- You need to measure many of the same part

The LM Series solves all of these conventional problems, allowing anyone to easily and accurately operate it

Solved using the LM Series

High precision

- Accurately detects and measures edges
- Automatically reproduces lighting conditions for measurement
- Autofocus eliminates focus variations

Easy setup

- Easy to understand, as the entire part is visible
- Stable detection with no fine adjustment required
- Built-in on-screen help function to help with usage

Fast

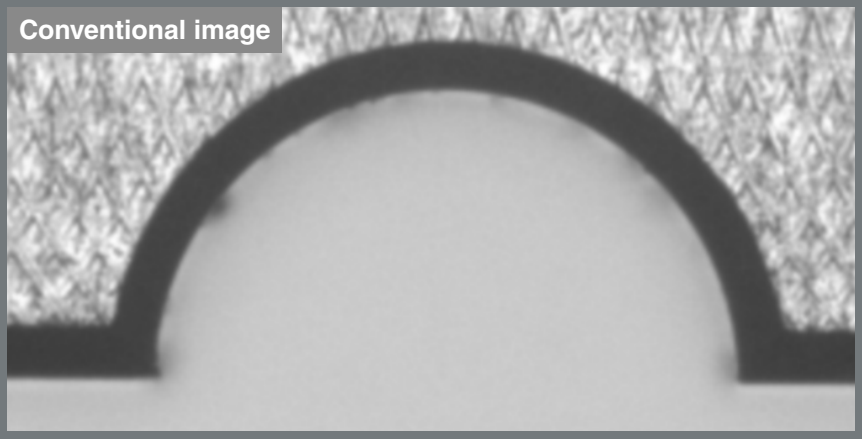
- No positioning of the part is required
- Simultaneously measure up to 600 dimensions
- Measure up to 1000 of the same parts all at once

Image Dimension Measurement System with a New Degree of High Accuracy

Conventional visual performance

Metal cutting parts

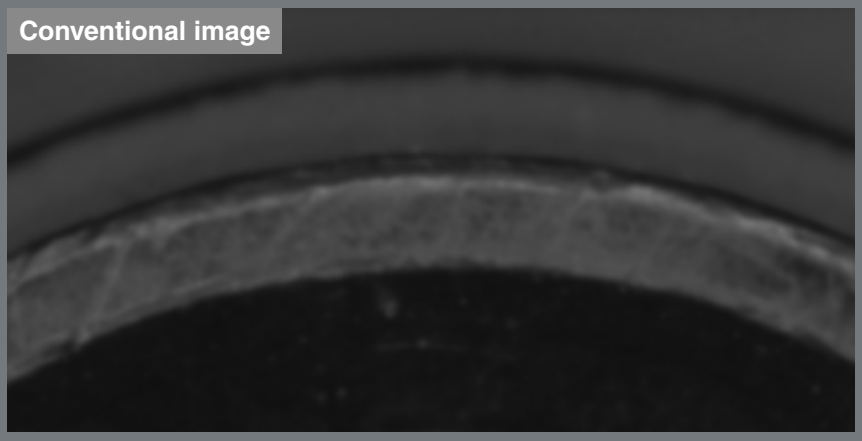
Conventional image



30× magnification

Resin-molded part

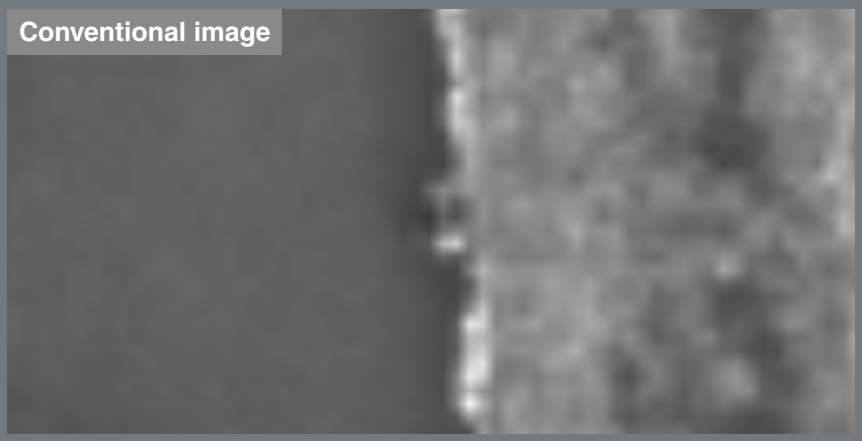
Conventional image



30× magnification

Chip capacitor electrode

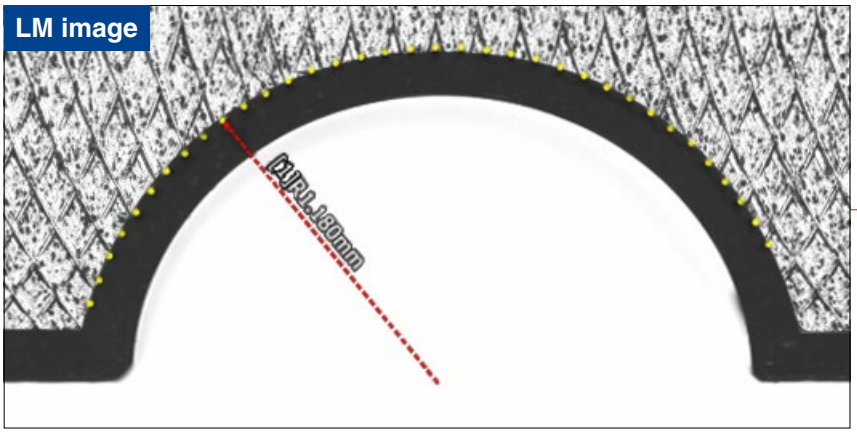
Conventional image



100× magnification

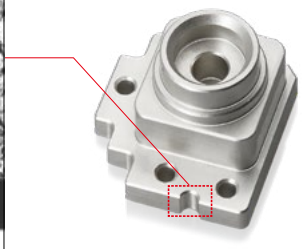
Solved using the LM Series

LM image

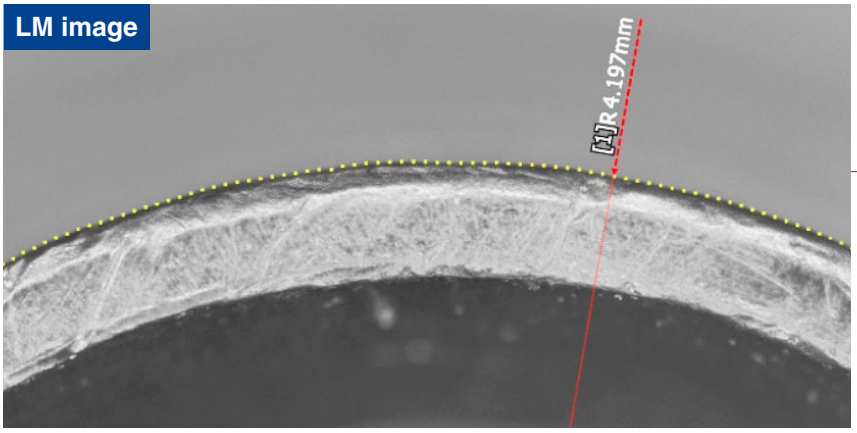


High-magnification camera. Field of view 1.5 × 3 mm 0.06" × 0.12"

Allows clear checks of surface edge cuts.



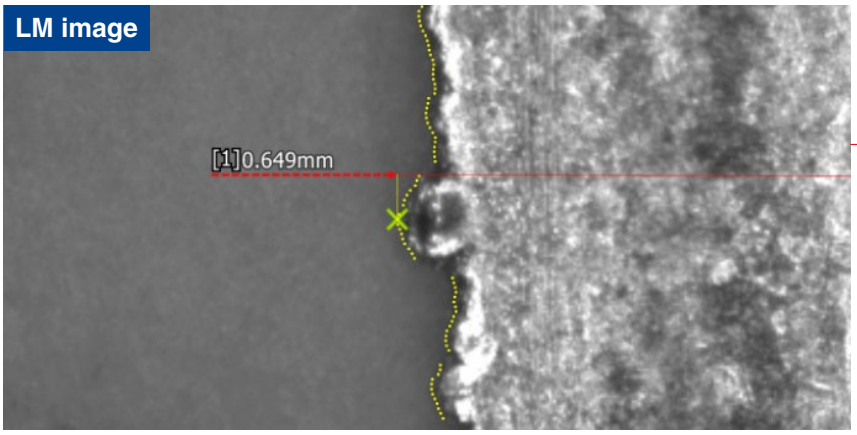
LM image



High-magnification camera. Field of view 1.5 × 3 mm 0.06" × 0.12"

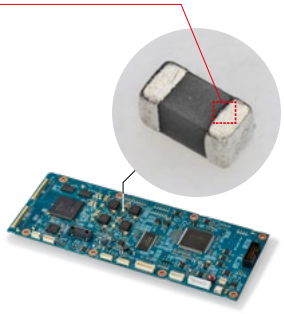
Reliable edge detection and focus allow for stable measurement of resin-molded parts.

LM image



High-magnification camera. Field of view 0.5 × 0.9 mm 0.02" × 0.04"

Allows you to clearly check capacitor electrode parts on PCBs.



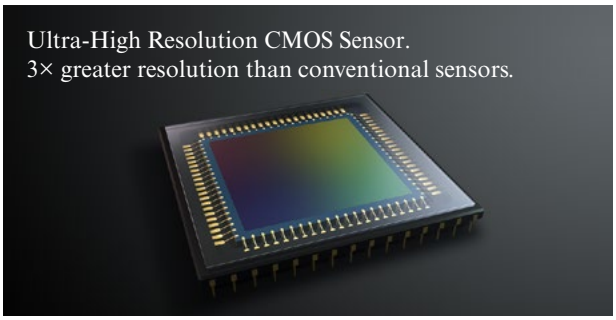
High Precision

Accurately capture and detect part edges

Optical System Reliably Captures Edges for Measurement

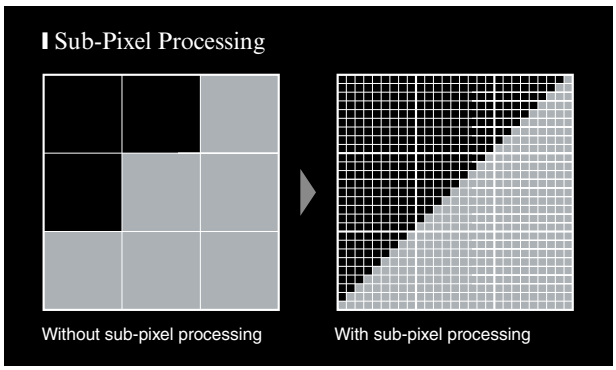
The newly developed high-resolution double telecentric lens enables you to clearly see edges which previously could only be seen through magnification. This makes it easy to perform high accuracy measurements.

Equipped with a 20-megapixel monochrome CMOS sensor to get the maximum resolution performance from the lens. These higher-resolution images allow for easier checks.

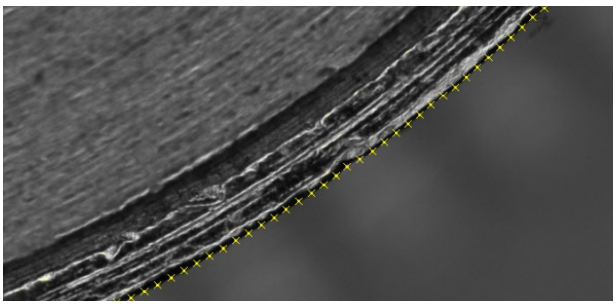


Consistent Detection Results Regardless of Operator

By splitting each pixel into 100 or less sub-pixels, the LM Series is able to maintain its high-precision measurement capability.



Processes shapes using least squared method to detect lines or circles based on 100 or more detection points. Furthermore, if burrs or chips are within the measurement location, they are treated as anomalies and are removed.



Shape processing

Easy Setup

Capture an image of the entire part to easily find all measurable areas

Intuitive Operation Allows Anyone to Use It

Includes a map navigation function that uses the stage camera to capture an overall image of the part and then increase the magnification to specify the measurement points.

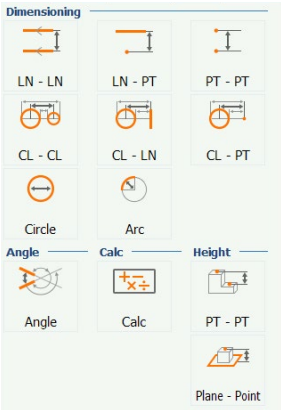
Conventional Measurement Methods	
1	Place the part on the stage
2	Set the focus
3	Align the X/Y reference points
4	Adjust lens or lighting to make it easier to see the desired edge
5	Calculate measurement results from stage movement
6	Calculate and measure complex virtual points and virtual lines

LM Measurement Method	
1	**After placing, capture a high-angle shot of the entire part**
2	**Select the measurement points**

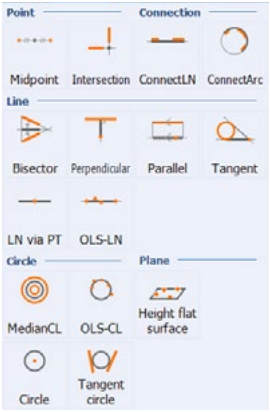
The measurement process is shortened by 1/3

User-Friendly Menu Display for Easy Setup

The menu display shows dimensional measurements such as lines, circles, points and virtual lines/points in an intuitive manner. Difficult-to-measure GD&T can also be measured with just one click.



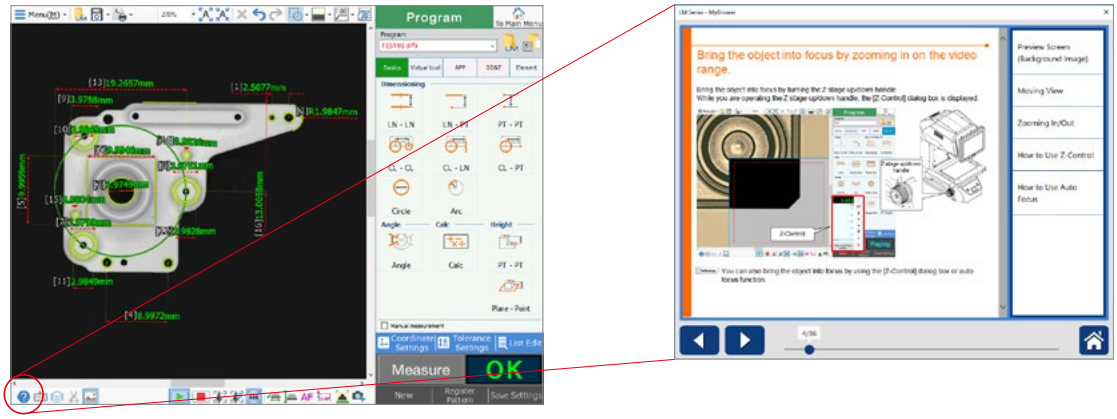
Basic measurement



Virtual tools

Features an On-Screen Tutorial for First-Time Users

There is a built-in on-screen tutorial with easy-to-understand illustrations. You can check the tutorial on the same screen while working.

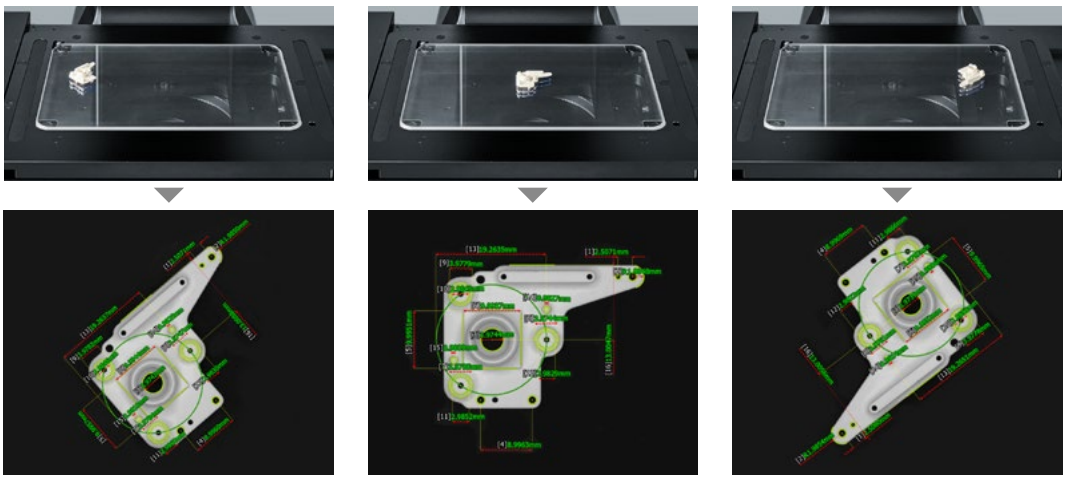


Fast

Stage speed 2x faster than conventional models

Parts Can Be Measured Regardless of Orientation

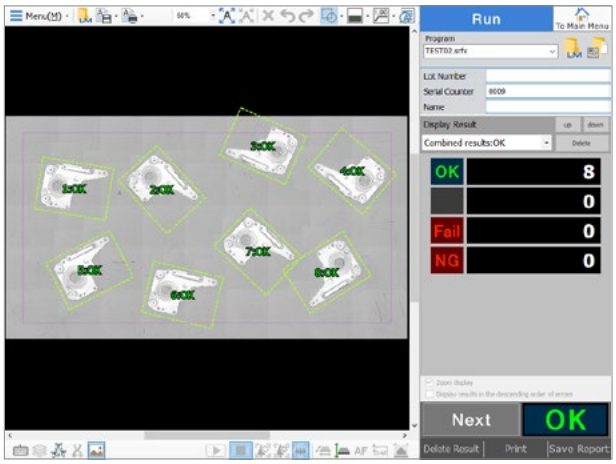
The location and orientation of the part placed on the measurement stage is automatically detected.
No need for precise fixturing of the part.



Left Center Right

Simultaneously Measure up to 1000 Parts

The dimensions of all parts on the stage are measured simultaneously, so there is no need to measure each part individually. There is also no need for a fixture.



Programs Are Quickly Found Using QR Codes

Even with an increasing number of programs, you can access a program by simply holding a QR code over the stage. This also eliminates measurement errors due to using the wrong file, reducing the operators' workload.


KEYENCE
Run
Next
OK
KEYENCE
MEASURE
Print

High-Resolution, High-Accuracy Measurement Technology

High-Resolution/High-Magnification Lens and Ultra-High Resolution CMOS Sensor

Easier to operate and with a higher degree of accuracy

Stage Camera

Instant imaging of the whole part on the stage

Multi-Lighting System

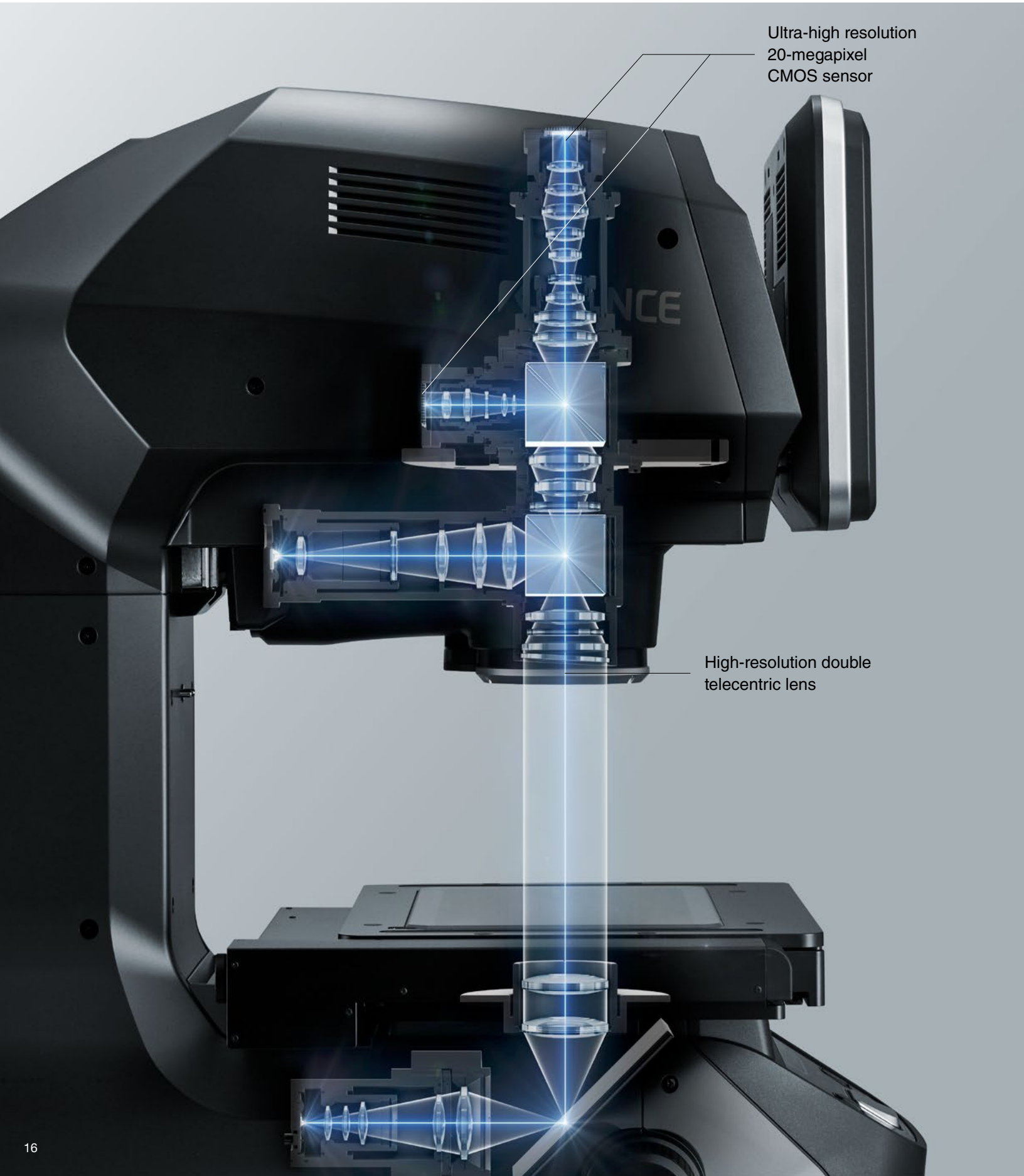
A variety of lighting options for stable edge detection

High-Accuracy Low-Vibration Stage

Stage system enables highly accurate measurements

High-Resolution Double Telecentric Lens/Ultra-High Resolution CMOS Sensor

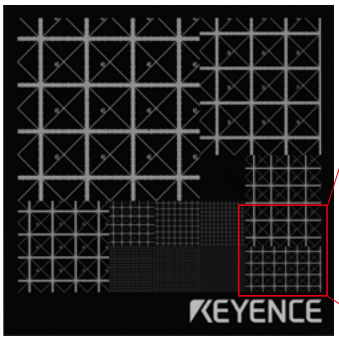
Easier to operate and with a higher degree of accuracy



Clearly See Sections of a Part in Detail

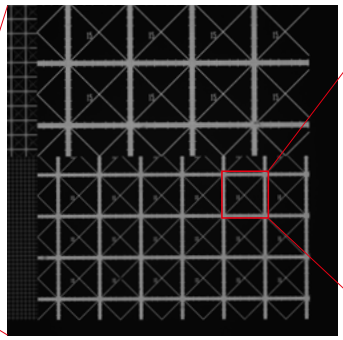
Designed with a 25 × 25-mm 0.98" × 0.98" wide field of view and a 6 × 6-mm 0.24" × 0.24" high-accuracy lens. The high-accuracy lens with built-in electronic aperture and optics with resolution equivalent to 50× (objective lens 5×, eyepiece lens 10×) allows you to clearly see more detail.

Wide-field image



Field of view: 25 × 25 mm 0.98" × 0.98"

High-accuracy image



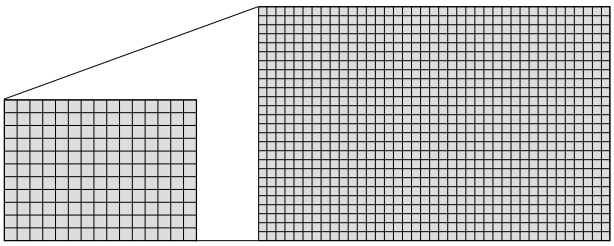
Field of view: 6 × 6 mm 0.24" × 0.24"

Open high-accuracy aperture image

Part of 6 × 6-mm 0.24" × 0.24" field of view enlarged to 0.7×0.7 mm 0.03" × 0.03"

Wide Field of View for Easy Operation and Fast Measurement

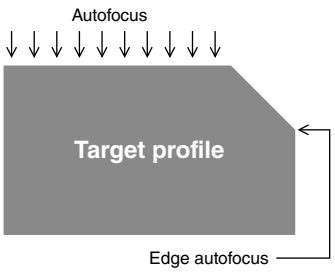
The built-in ultra-high resolution 20-megapixel CMOS sensor allows for a wider field of view to be displayed in high resolution.

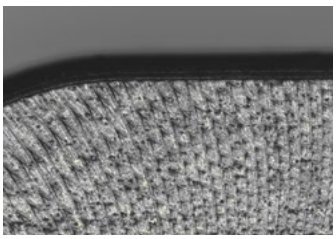


6.6 megapixels, 3000 × 2200 20 megapixels, 5472 × 3648

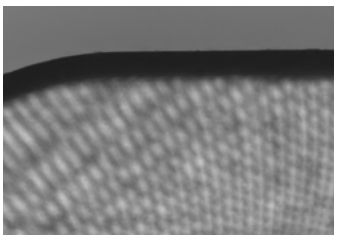
Accurate Focusing Regardless of Operator

With a built-in autofocus function that focuses on the surface area of the part, and an edge auto-focus function that identifies the lowest point of focus on a curved or rounded surface. This eliminates variations caused by focus positions being set using the naked eye. Any operator can now perform accurate focusing.





Autofocus



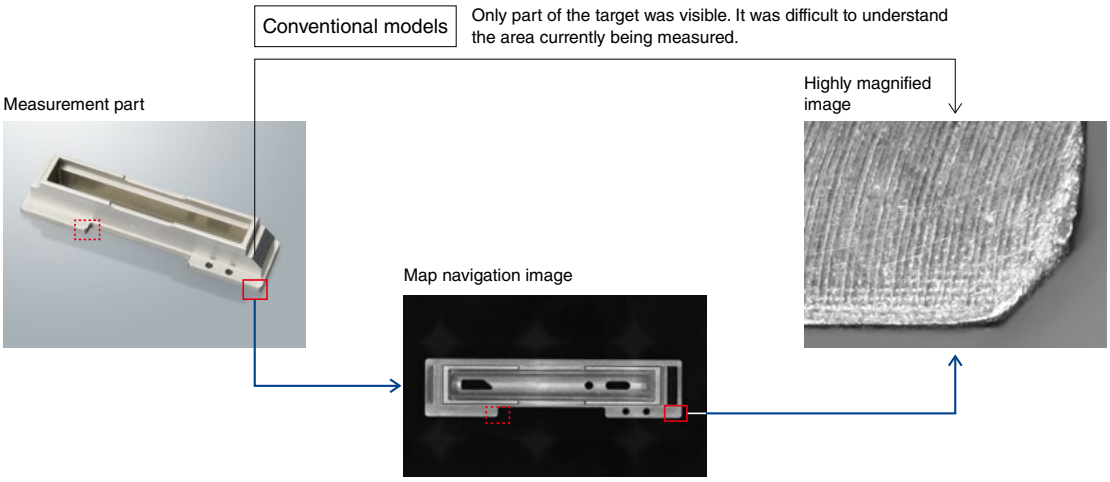
Edge autofocus

Stage Camera

Instant imaging of the whole part on the stage

Easy to Identify your Measurement Locations

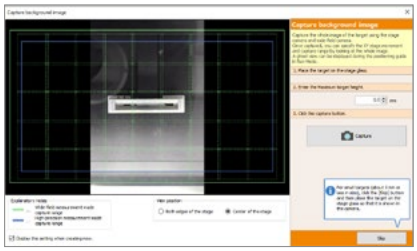
The stage camera displays the whole part, so it is easy to understand where you are measuring even when magnified. This also eliminates mistakes since it is easy to see measurement areas you have missed, placement errors, etc.



View the Part's Position on the Stage

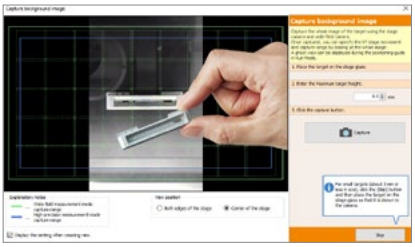
During run mode, the part's position on the stage is displayed as a preview image*, eliminating the need to use a fixture or carry out positioning. Once the part's position is set, additional parts can be placed in the same position. This time reducer allows for faster measurement.

* The preview image display is a function which shows the parts position during setting creation as a translucent image



On-screen preview display

Place the part on the stage



Displays the real object superimposed over the preview display

Multi-Lighting System

A variety of light settings for stable edge detection

Multiple Illumination Units All in One

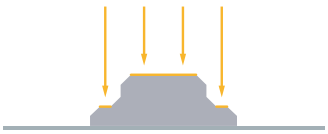
The programmable ring-illumination unit integrates multiple ring illumination functions into a single unit. This maximizes work efficiency, as there is no need to use different lighting systems to match the point being measured.

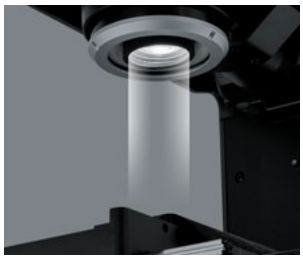
Telecentric Transparent Illumination

The transmitted light is parallel, allowing the profile of the part to be stably measured.

Coaxial Illumination

Better contrast allows even tapered parts and transparent parts to be measured.





Four Division, Multi-Angle Illumination, Above

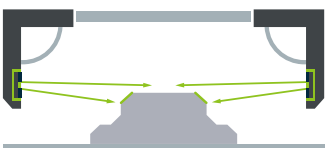
Switches between different lighting directions to allow even low-contrast parts to be stably measured.

Four Division, Multi-Angle Illumination, Below

Makes it possible to achieve high contrast for parts that have parts with height differences.

Slit Ring Illumination

Makes it possible to achieve high contrast by illuminating only on the outer edge profiles.

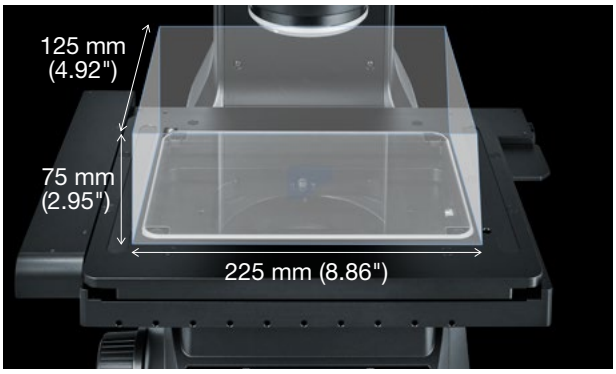


High-Accuracy Low-Vibration Stage

Stage system enables highly accurate measurements

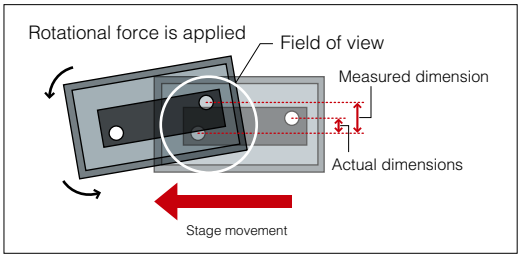
Large Low-Vibration Stage for High-Speed Measurement

The large stage has a maximum measuring area of 125 × 225 mm 4.92" × 8.86" and a working height of 75 mm 2.95". Uses a new design that reduces the friction between the motor and feed screws as much as possible, allowing for quick and stable measurement without fixturing the part in place.

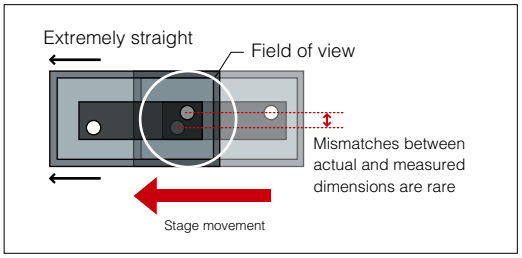


High-Precision Stage with Excellent Linearity

Excellent linearity, as the movement of cross-roller bearings can be adjusted in micrometer increments. This eliminates measurement errors due to stage movement.



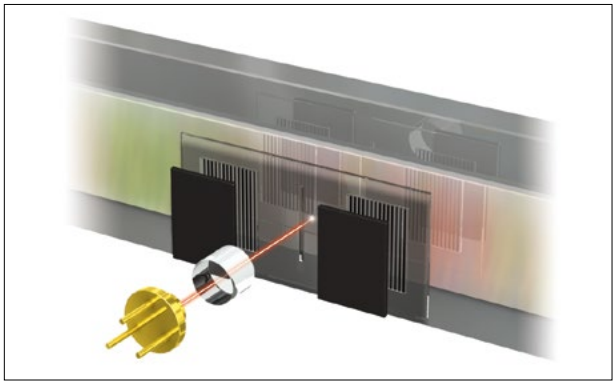
Without adjustment



LM Series

Custom High-Precision Quartz Linear Scale

Custom-designed with a glass scale with an extremely low coefficient of thermal expansion. Invar alloy is used in the base materials that support the scale, allowing for reliable measurement even if there are changes in temperature.



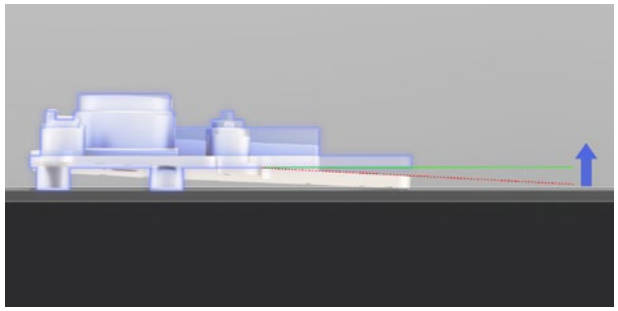
Simply Place and Press to Measure Height

Non-Contact Height and Depth Measurement

The built-in high-magnification lens with Z focus positioning enables height and depth measurement. Simply click the desired point to begin non-contact measurement for areas as small as 20 × 20 µm.

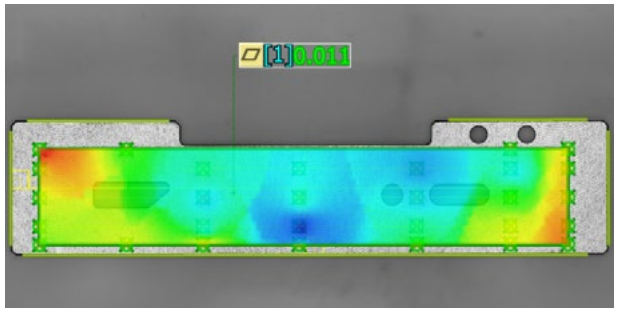
Correct Tilt by Setting a Reference Plane

The LM Series' tilt correction function ensures accurate measurement even with tilted targets.



Simple Flatness Measurement

The height measurement function enables flatness measurement. This function also makes it possible to display surface height differences in color.



On-Site Reliability

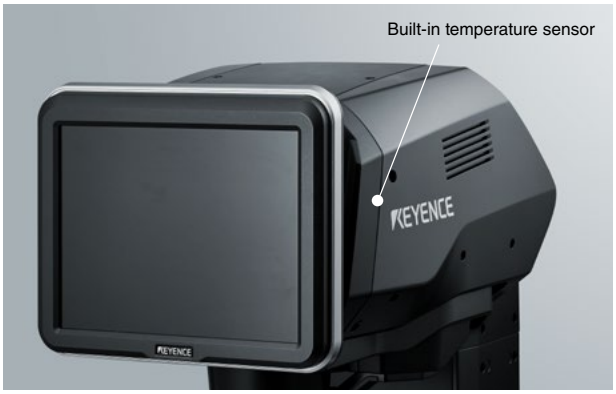
Traceability System Diagram

The reference scales used for manufacturing, inspection, and calibration conform to the reference scale of JCSS accredited calibration laboratories to establish traceability back to the national standard.

International standard	National Metrology Institute of Japan (NMIJ) of National Institute of Advanced Industrial Science and Technology
JCSS accredited calibration laboratory	Reference scale
Secondary standard	Precision coordinate measuring instrument
Common standard	Reference scale
Measuring instrument to be calibrated	LM Series image dimension measurement system

Incorporated Temperature Sensor

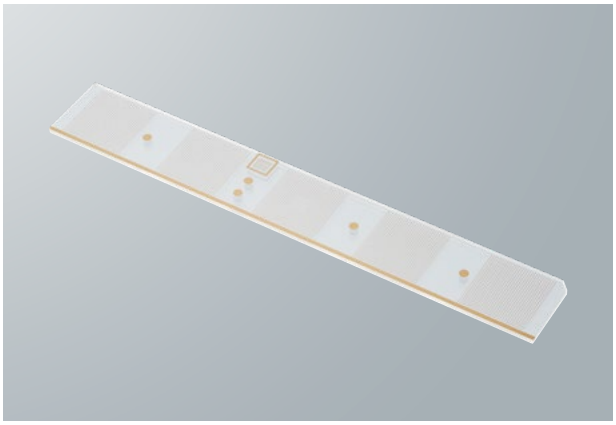
The case features a built-in temperature sensor which allows it to be installed in any location, outside of a specialized inspection room. The system uses temperature compensation in a way that nullifies the effects of the surrounding environment, eliminating the need for air conditioning management.



Stage Adjustment Chart *optional

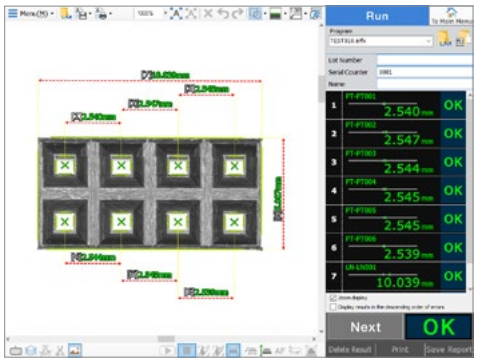
This stage adjustment chart comes with its own calibration certificate, useful for QC management.

*Optional: OP-88367



Connector Case (Resin-molded)

Allows measurement of the terminal ports' pitch distance from the center and outer dimensions in a single scan.

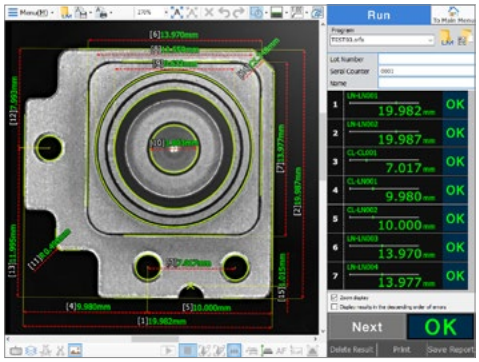


Ceramic Capacitor

Allows simultaneous measurement of the length, width and height dimensions respectively, as well as the dimensions of the electrode.

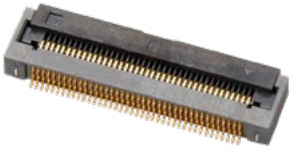
Precision Metal Parts

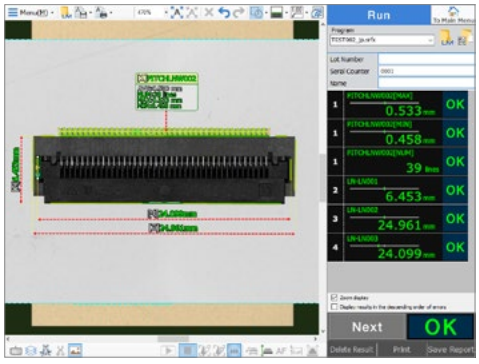
Allows simultaneous distance measurement of end faces and hole pitches, as well as dimensions of rounded and curved sections.



Connector

Allows simultaneous measurement of fine terminal pitches, its teeth and overall dimensions.

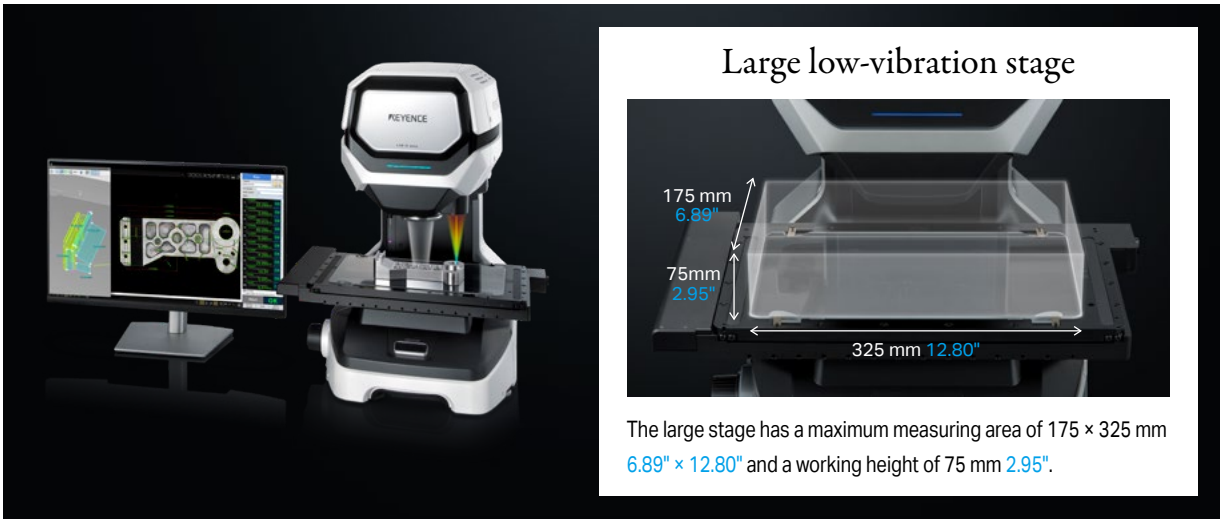




Related products

Multisensor Measurement System LM-X Series

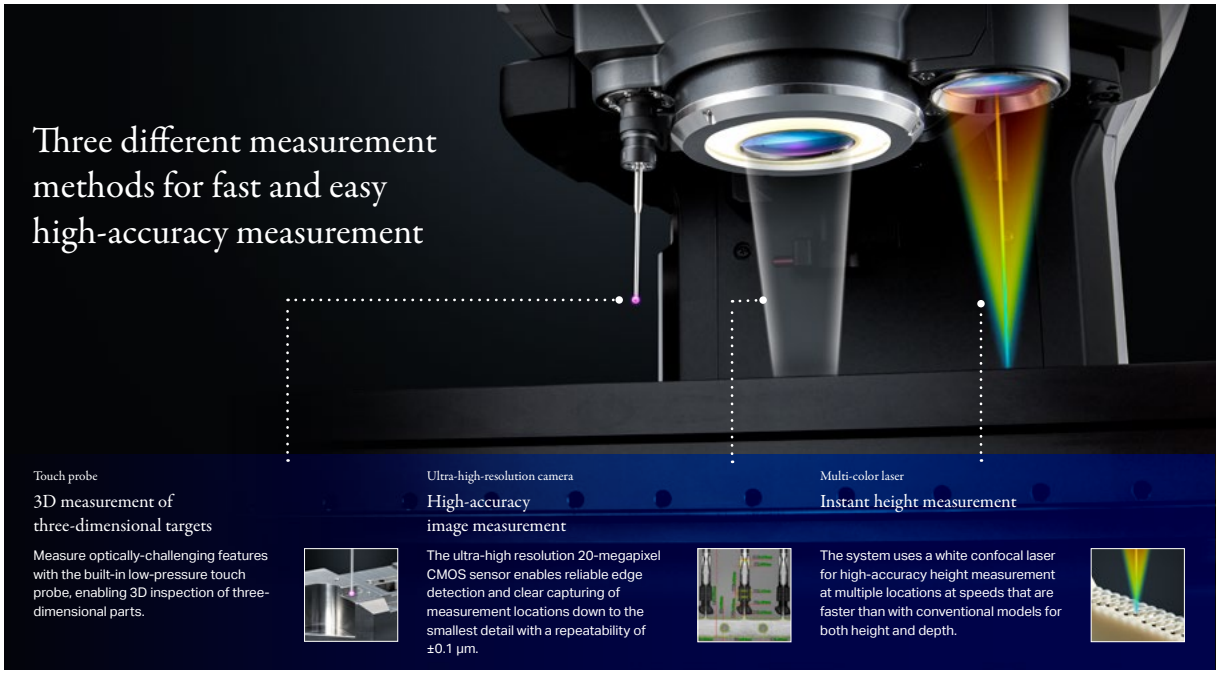
A system that takes “place-and-press measurement” to the next level



Large low-vibration stage

The large stage has a maximum measuring area of 175 × 325 mm 6.89" × 12.80" and a working height of 75 mm 2.95".

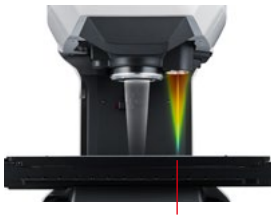
Features of the LM-X Series



Three models to meet a variety of needs

Multi-color laser model

LM-X100L

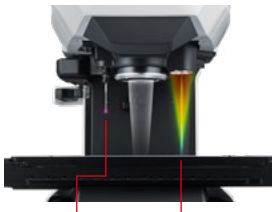


Touch probe model

LM-X100T

Multi-color laser + Touch probe model

LM-X100TL



Inspections of Prototypes and First Off-Tool Parts

- Improved productivity through reductions in launch periods
- Measurements are possible regardless of inspector experience
- Measurements based on the traceability of international standards

In-Process Inspections of Samples and Parts

- Improvement of equipment availability through reductions in setup time
- Improvement of yield rates through better accuracy in equipment adjustment
- In-process defect detection management

Pre-Shipping Inspections

- Meet tight shipping inspection deadlines
- Reduce the work required to create inspection report tables
- Reduce training time and labor costs associated with inspectors

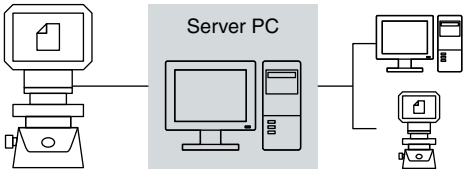
Incoming Inspections

- Can manage acceptance inspections for multiple types with constant standards
- Reduce the risk of defects even when the quantity of inspections are increased
- Improved quality through measurement of previously un-inspected points

Data transfer over a LAN connection

Communicating with PCs

Uses a LAN connection to easily transfer settings files and measurement results to a remote PC or another LM Series system.

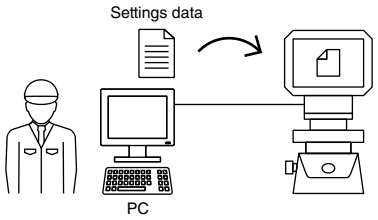


Measurement setup editor

Set Up Using a PC

Optional: LM-H1EA

A PC can be used to add or change measurement locations in a program created by the LM Series system, or in data created with the CAD import module.



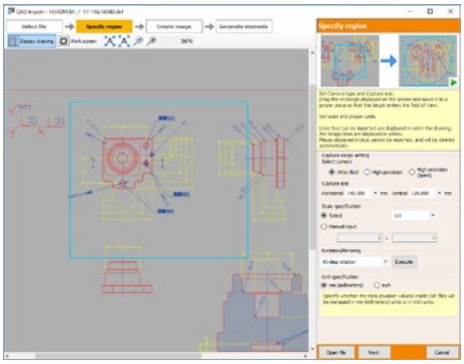
CAD import module

Using CAD Data

Optional: LM-H1C

The data required for measurements can be acquired from CAD drawing data in DXF format. Even when a part is not at hand, it is still possible to create programs.

*Measurement setup editor (LM-H1EA) is also required when using the CAD import module.

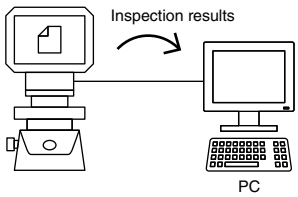


Data transfer software

Creating Inspection Reports

Optional: IM-H1T

The measurement results performed with the LM Series can be automatically sent to specified cells in a customized spreadsheet on a PC.



PC software operating environment

Supported OS	Windows 10 (64-bit version) Windows 11
Required free space on hard disk	30 GB or more

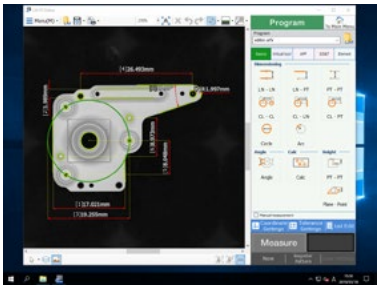
System Configuration

LM-1001
Controller

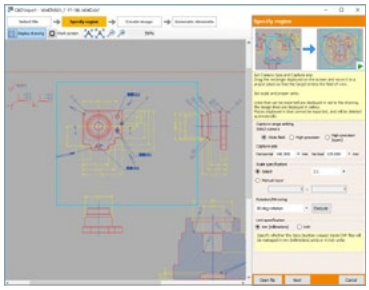
LM-1100
Head

Optional Accessories

PC Software



LM-H1EA
LM measurement setup editor

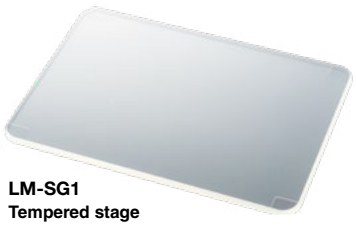


LM-H1C
CAD import module

IM-H1T
IM data transfer software

Stage Glass

OP-88368
Stage glass



LM-SG1
Tempered stage glass

Stage Adjustment Chart

OP-88367
Stage adjustment chart

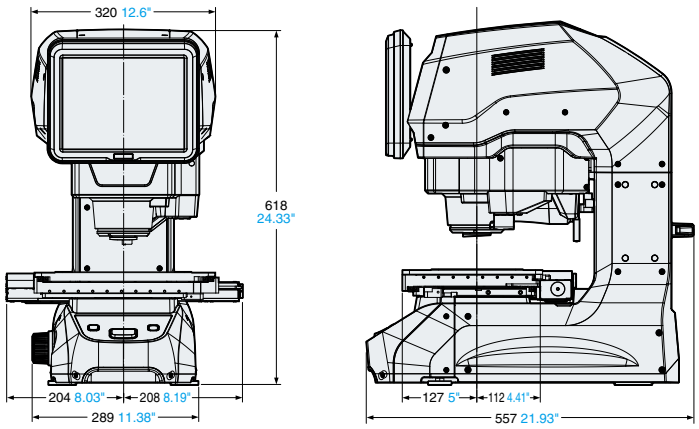
Specifications

Model		Controller		LM-1001
		Head		LM-1100
Image sensor				1", 20-mega pixel monochrome CMOS
Display				10.4" LCD monitor (XGA: 1024 × 768)
Receiver lens				Double telecentric lens
Image measurement	Field of view	Wide-field measurement mode		225 mm × 125 mm 8.86" × 4.92"
		High-precision measurement mode		206 mm × 106 mm 8.11" × 4.17"
	Minimum display unit			0.1 µm
	Repeatability	Inside camera's field of view (2σ)	Wide-field measurement mode	±0.5 µm
			High-precision measurement mode	±0.1 µm
		With stage movement	X/Y axis	±0.9 µm
			X/Y plane	±0.9 µm
	Measurement accuracy	Inside camera's field of view (2σ)	Wide-field measurement mode	±2 µm*1
			High-precision measurement mode	±0.7 µm*2
		With stage movement	X/Y axis ($E_{UX,MPE}$, $E_{UY,MPE}$)	±(1.8 + 0.02 L) µm*3
			X/Y plane ($E_{UXY,MPE}$)	±(2.8 + 0.02 L) µm*3
Height measurement	Repeatability			±2 µm
	Measurement accuracy ($E_{UZ,MPE}$)			±(4.8 + 0.04 L) µm*4
External remote input				Non-voltage input (with and without contact)
External output		OK/NG/FAIL/MEAS.		PhotoMOS output Rated load 24 V DC, 0.5 A ON resistance 50 mΩ or lower
Interface		LAN		RJ-45 (10BASE-T/100BASE-TX/1000BASE-T)
		USB 3.1		2 ports (rear: 2)
		USB 2.0 Series A		4 ports (front: 2, rear: 2)
		Monitor output		DVI-D
Record		Hard disk drive		500 GB
Environmental resistance		Operating ambient temperature		+10 to 35°C +50 to 95°F*5
		Operating ambient humidity		20–80% RH (no condensation)
		Pollution degree		2
		Overvoltage category		II
Illumination system		Transparent		Telecentric transparent illumination
		Ring		Four division, multi-angle illumination (electric)
		Ring		Slit ring (directivity) illumination (electric)
		Ring		Telecentric coaxial illumination
External illumination control		Intensity control		PWM control, 100 kHz
		Output voltage		12 V DC
		Output current		1.6 A (max.)
XY stage		Moving range		200 mm × 100 mm 7.87" × 3.94" (electric)
		Withstand load		7 kg
Z stage		Moving range		75 mm 2.95" (electric)
Power supply		Power voltage		100 to 240 V AC ±10% (50/60 Hz)
		Power consumption		430 VA or lower
Weight		Controller		Approx. 8 kg
		Head		Approx. 30 kg

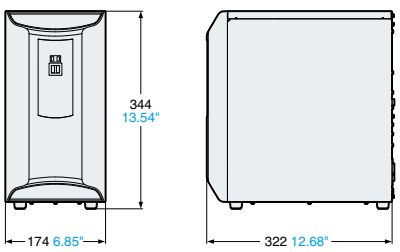
*1. In the range of 20 mm × 20 mm 0.79" × 0.79" within the operating ambient temperature range of +23°C ±1°C +73.4°F ±1.8°F at the focused focal point position.
*2. In the range of 5 mm × 5 mm 0.20" × 0.20" within the operating ambient temperature range of +23°C ±1°C +73.4°F ±1.8°F at the focused focal point position
*3. In accordance with ISO10360-7, within the operating ambient temperature range of +23°C ±1°C +73.4°F ±1.8°F at the focused focal point position, and with a load weighing 2 kg or less on the stage (L = amount of X/Y stage movement in mm units)
*4. In accordance with ISO10360-7, within the operating ambient temperature range of +23°C ±1°C +73.4°F ±1.8°F, set to a maximum measurement of 50 mm 1.97" or less, (L = amount of Z stage movement in mm units). *5 +15 to 35°C +59 to 95°F with X/Y stage travel speed of 80 mm/s.

Dimensions Unit: mm inch

LM-1100 head



LM-1001 controller



Allowing anyone to take highly accurate measurements

LM Series

Quick and easy measurement over a wide area

IM Series

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