

KEYENCE

Multisensor Measurement System

NEW LM-X Series

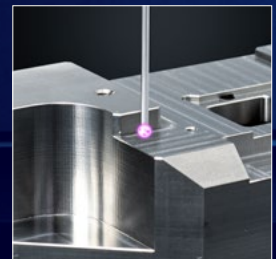
High-Precision Optical, Laser, and Probe Measurements



Three different measurement methods for fast and easy high-accuracy measurement

Touch probe 3D measurement of three-dimensional targets

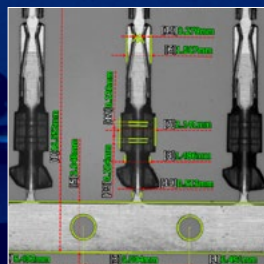
Measure optically-challenging features with the built-in low-pressure touch probe, enabling 3D inspection of three-dimensional parts.





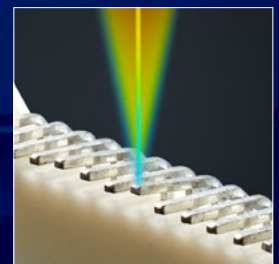
Ultra-high-resolution camera
**High-accuracy
image measurement**

The ultra-high resolution 20-megapixel CMOS sensor enables reliable edge detection and clear capturing of measurement locations down to the smallest detail with a repeatability of $\pm 0.1 \mu\text{m}$.



Multi-color laser
Instant height measurement

The system uses a white confocal laser for high-accuracy height measurement at multiple locations at speeds that are faster than with conventional models for both height and depth.



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



Multisensor
Measurement System

NEW LM-X Series

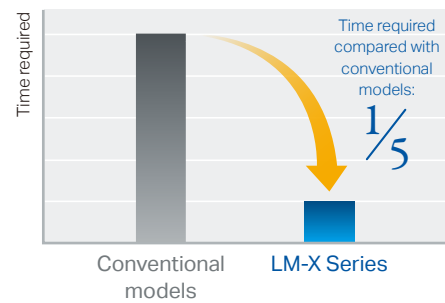
Highly-accurate measurement along the X, Y, and Z axes

- High-accuracy submicron measurement
- High-speed, high-accuracy 3D measurement



5× faster measurement than conventional models

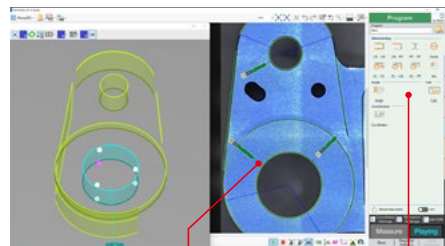
- Measure up to 5000 locations with 1000 parts
- Place-and-press measurement with no positioning required



* Based on in-house sample measurement

Easy operation with no required programming knowledge

- Intuitive measurement location configuration with a mouse
- Color images of the entire target
- 3D display for easy identification of measurement elements



STEP 2 Click to measure

STEP 1 Select tools

Solve a variety of measurement challenges with a single tool

Conventional measurement tools



Measuring microscope



Optical CMM

Prone to human error

- ▮ Focus position varies depending on the operator
- ▮ Measured points vary depending on the operator
- ▮ Values vary depending on the operator

Time-consuming

- ▮ Aligning the reference points takes time
- ▮ More measurement locations mean more time required
- ▮ More time required with more parts

Difficult to use

- ▮ Identifying measurement locations is difficult due to a narrow field of view
- ▮ Requires a highly-trained operator
- ▮ Complex menus make training time-consuming and difficult



Accurate results regardless of operator

- Autofocus eliminates variations between operators
- Touch probe and multi-color laser for greater measurement reliability
- Reproducible illumination settings for accurate measurement between operators

Fast

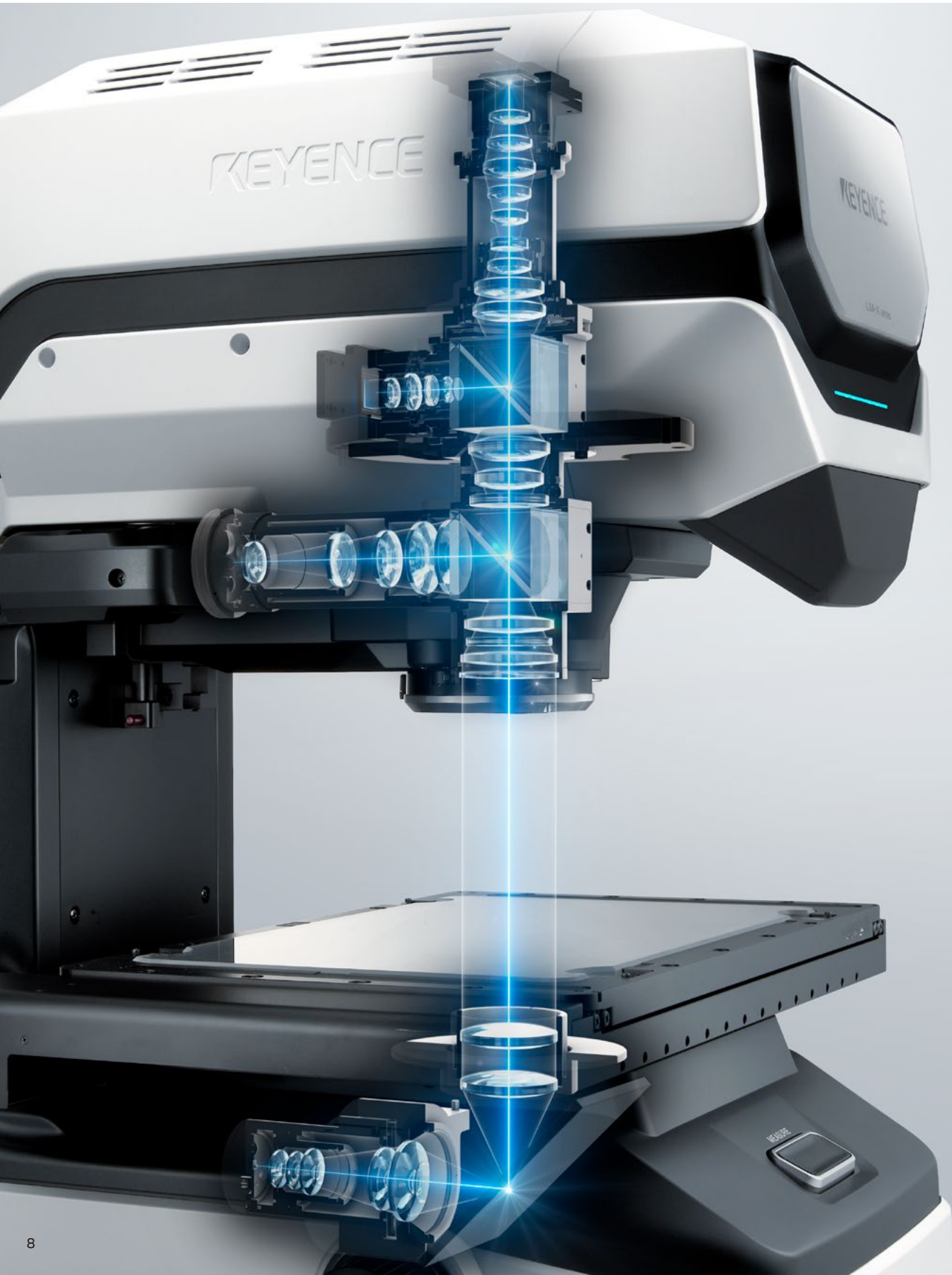
- Measurement anywhere within the field of view
- Simultaneous measurement of up to 5000 locations
- Batch measurement of up to 1000 identical parts

Easy setup

- Overall view for intuitive configuration of settings
- Intuitive mouse-based operation
- Built-in tutorial function for first-time users

High
accuracy

High-accuracy submicron measurement technology



Optical system reliably captures edges for measurement

The high-resolution double telecentric lens makes it possible to clearly see edges that previously could only be seen through magnification for easier high-accuracy measurement.



High-resolution double telecentric lens

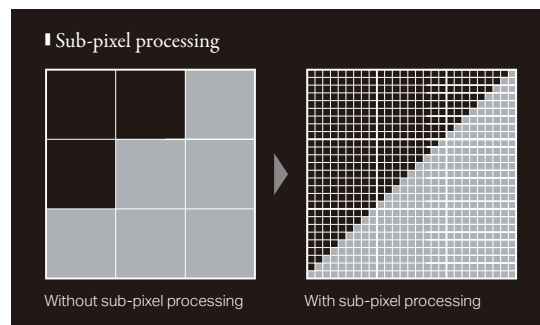
Ultra-high-definition monochrome CMOS sensor makes it possible to get the maximum resolution performance from the lens for higher-resolution images and easier checks.



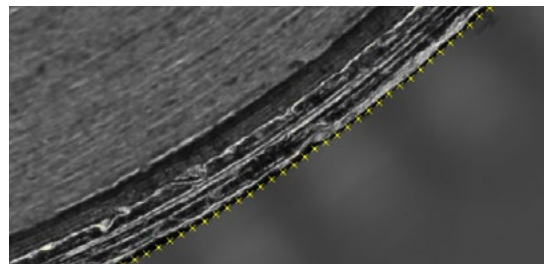
Ultra-high-definition CMOS sensor

Consistent detection results regardless of operator

Splitting each pixel into 100 or fewer sub-pixels makes it possible to maintain high-accuracy measurement capability.



Shapes are processed using the least squared method to detect lines and circles based on multiple detection points. Burrs and chips within the measurement location are also treated as anomalies and excluded.



Shape processing

Fast

Significantly reduced measurement time

STEP 1
Place

STEP 3
Obtain results

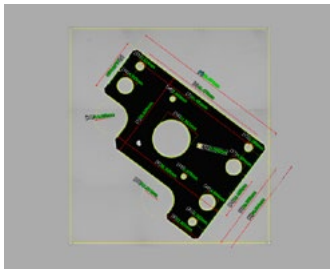


STEP 2
Press

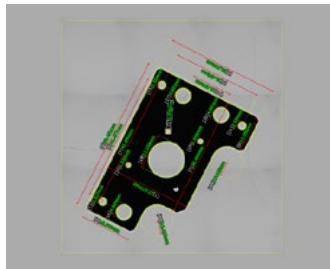
No time-consuming positioning or coordinate creation required

The location and orientation of parts placed on the stage are automatically detected.
This eliminates the need for conventional labor-intensive positioning, creating coordinates, and preparing fixing jigs.

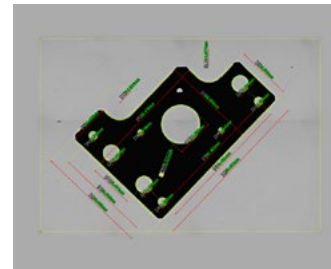
Whether on the left ...



... in the center ...

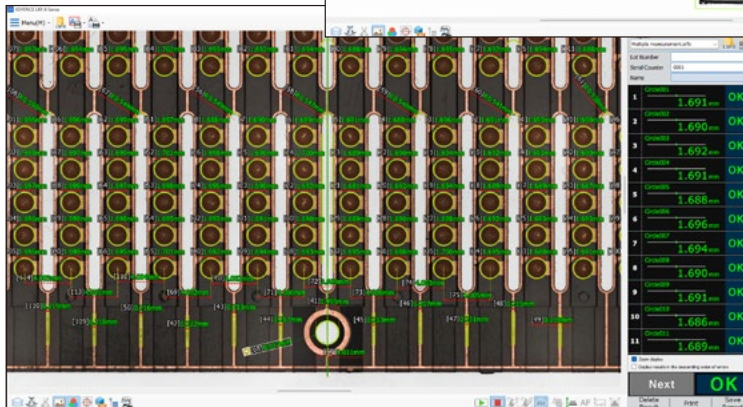
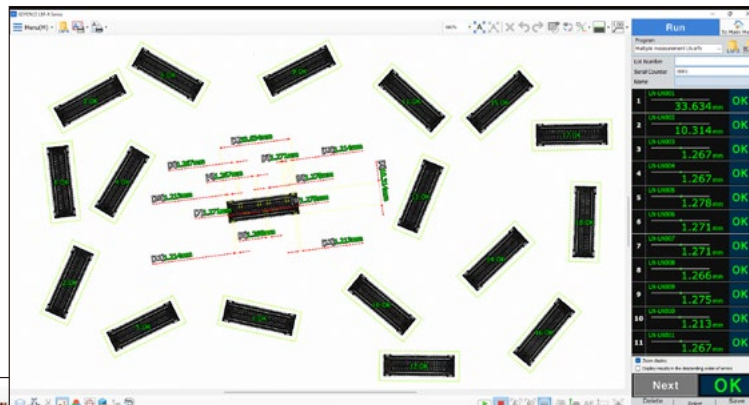


... or on the right.



Measure up to 5000 locations on up to 1000 parts

Fast, simultaneous measurement is possible even when multiple parts are placed on the stage. There is also no need to use fixing jigs.

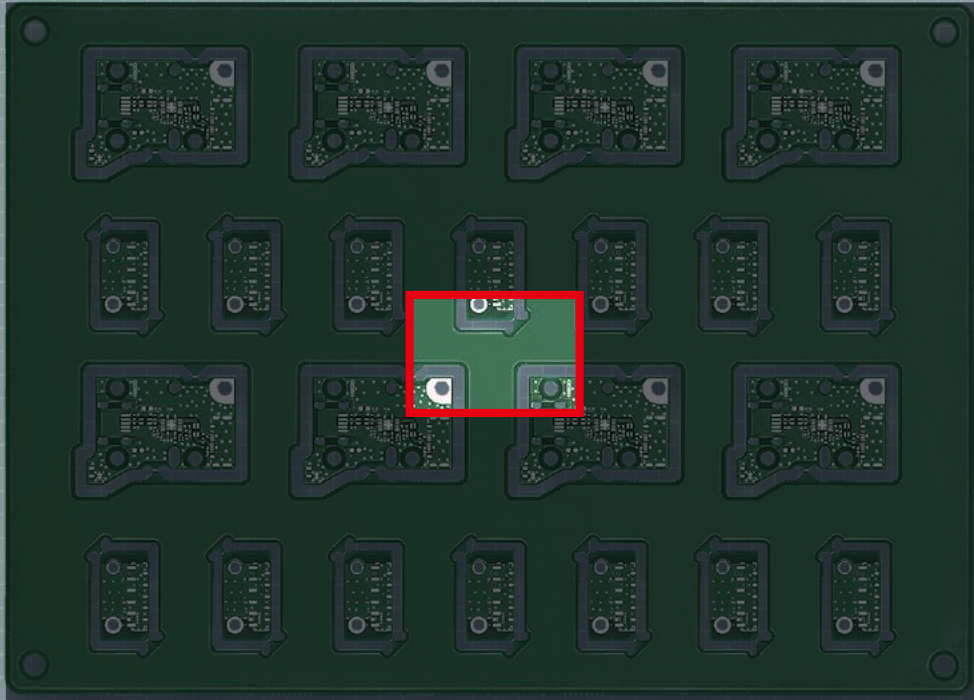


Measurement of up to 5000 locations on a single part makes it possible to reduce the time required for parts with multiple measurement locations.

Easy

Color visualization of the entire part for easy setup

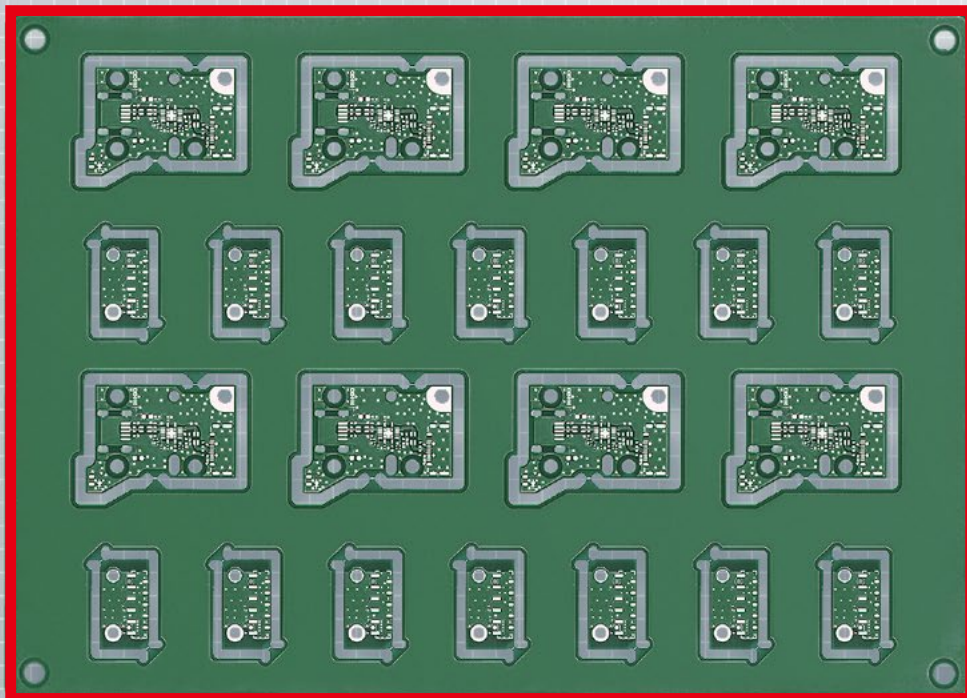
Field of view with conventional models



Only a section of the part is visible.

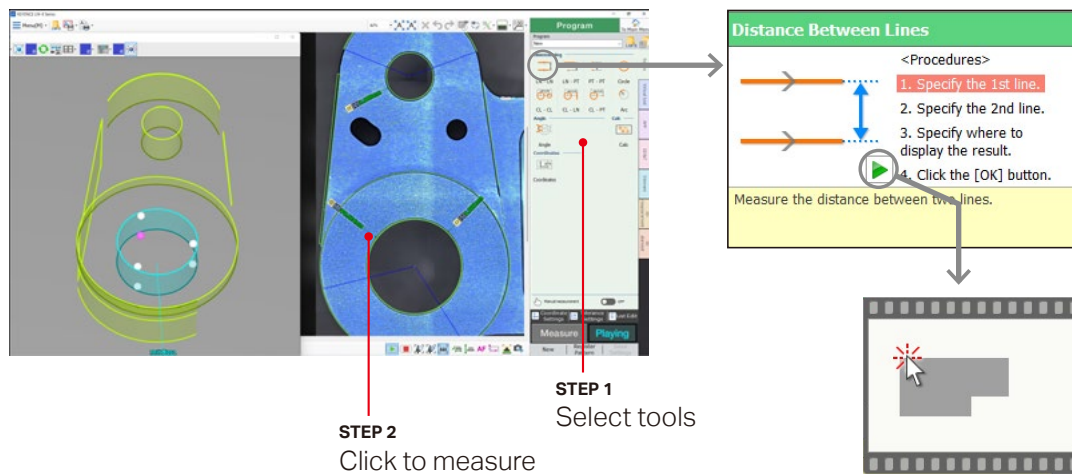
Field of view with the LM-X

The entire part is visible for easier programming.



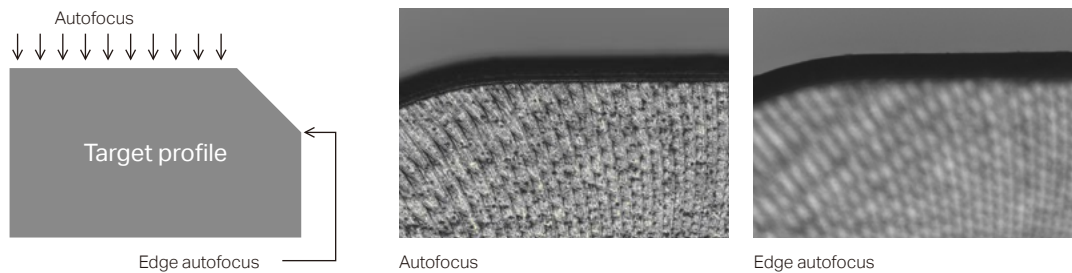
Easy setup and measurement

The menu screen ensures intuitive operation procedures in addition to allowing users to check the procedure manual and animations on-screen for easy, stress-free setup regardless of skill level.



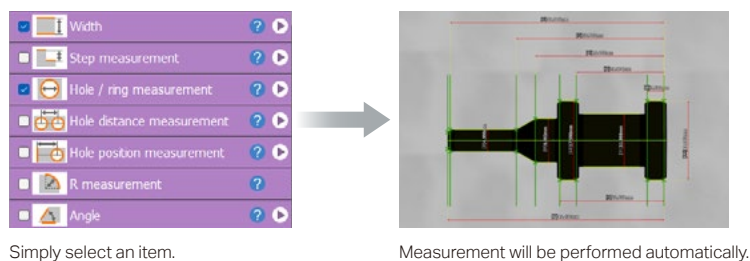
Accurate focusing regardless of operator

The built-in autofocus function focuses on the surface area of the part, and the edge auto-focus function identifies the lowest point of focus on chamfered surfaces. This eliminates variations caused by focus positions being set using the naked eye, enabling accurate focusing for any operator.



Automatic measurement program creation

The system can automatically recognize lines, circles, and arcs on targets within the measurement area simply by selecting the desired measurement items. This makes setup easy not only for single parts but also small quantities of mixed parts.



Easy

Two cameras for simplified setup



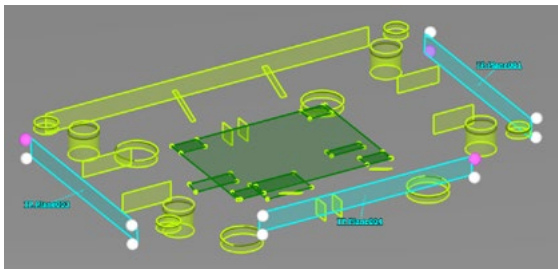
Front camera

Stage camera

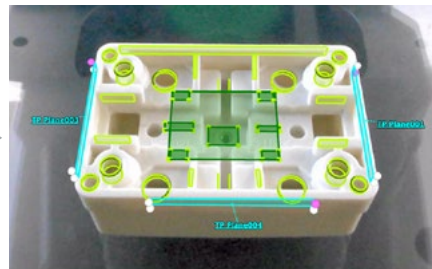
Front camera

Easy visualization of measurement locations

Images captured by the front camera can be superimposed with measurement elements to create a 3D display. This makes it easy to see measured areas, and the display can also be used as report images.



3D display



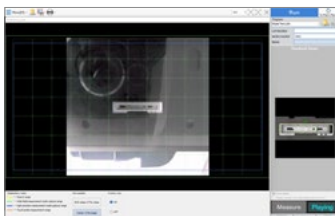
Composite front camera image + 3D display

Stage camera

On-screen visualization of the part on the stage

During continuous measurement, the part's position is displayed as a preview image on the screen*, eliminating the need to use a fixing jig or carry out positioning. Once the part's position is set, additional parts can be placed in the same position. This reduces the time spent on positioning for faster measurement.

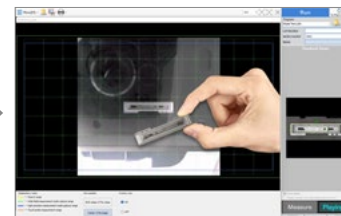
* The preview image display is a function that shows the part's position as a translucent image during setup.



On-screen preview display



Place the part on the stage



Displays the real object superimposed over the preview display

High-accuracy measurement technology



Multi-color laser

Instant height measurement of any shape or material

Low-pressure measurement touch probe

Accurate measurement of three-dimensional parts

Large high-precision stage

Accurate measurement of large parts

Variable color illumination

Versatile color illumination for stable measurement



Instant height measurement of any shape or material



White confocal imaging for stable height measurement

Fast

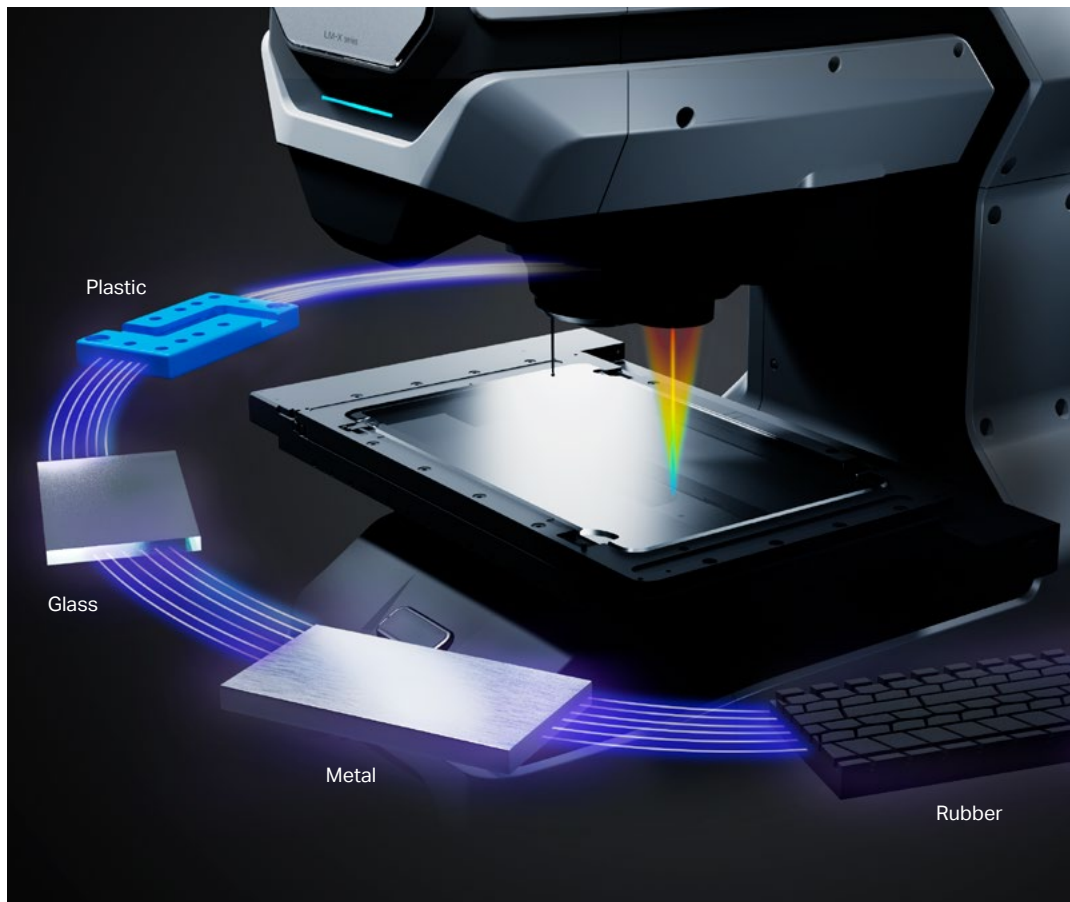
While conventional automatic focusing methods require longer scanning times, the white confocal laser enables instantaneous measurement.

High accuracy

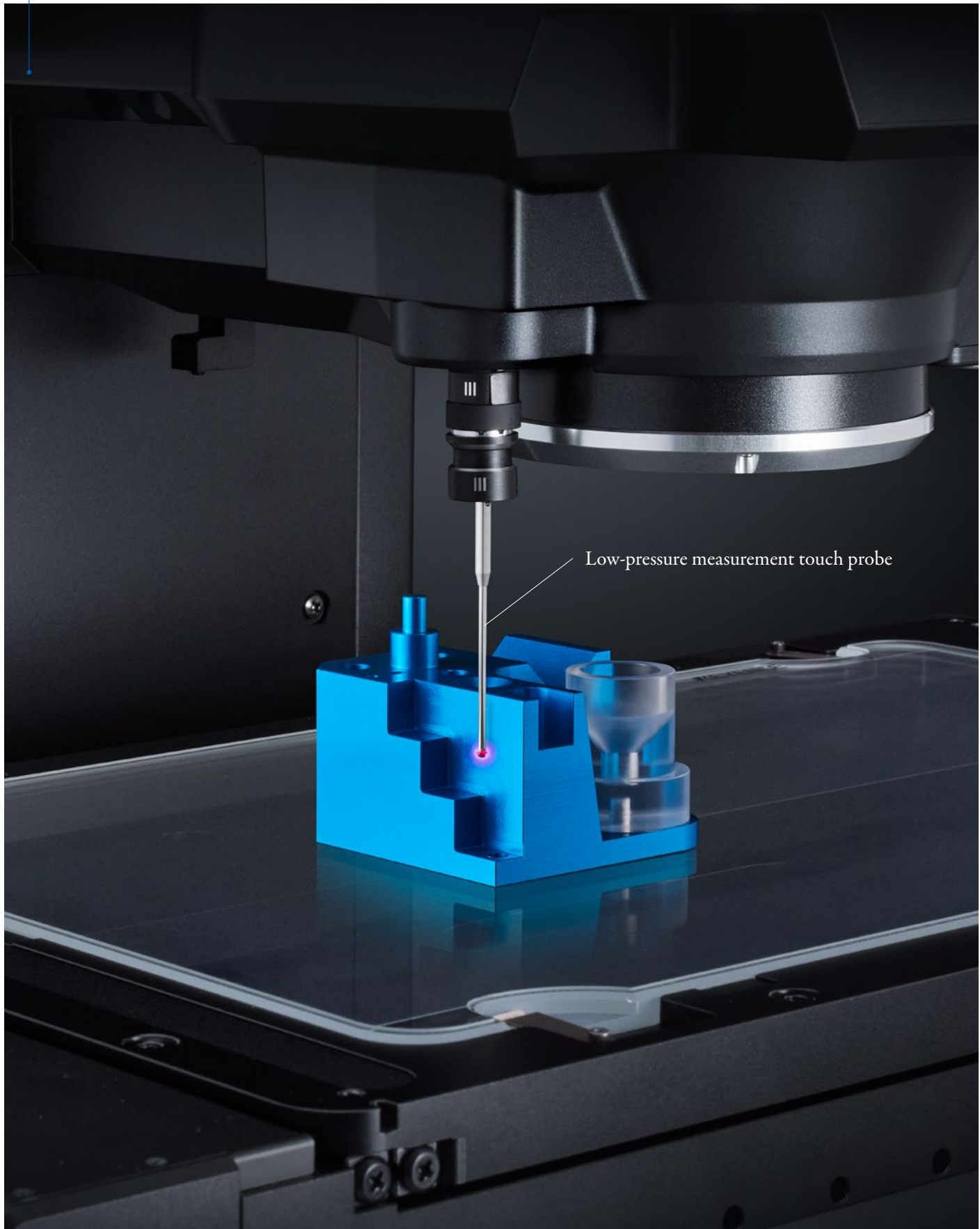
Combining the light source and other parts in the optical unit while leaving only the lens in the head enables high-accuracy measurement that is unaffected by heat or electrical noise.

Usable with any material

Measurement is possible for any material, including metal, plastic, glass, rubber, and ceramic. Accurate measurement is even possible for parts that are too detailed or soft for contact-type systems.



Accurate measurement of three-dimensional parts



Accurate measurement of top, side, and angled surfaces

The low-pressure measurement touch probe makes measuring three-dimensional machined parts easy, including perpendicularity between top and side surfaces as well as slope angles, which are difficult to detect with conventional measurement systems. The probe can also be used with commercially available styluses for accurate measurement of deep holes and narrow grooves.



Accurate measurement for small, light targets even without fixing jigs

Conventional contact-type measurement systems use a strong measuring force that can cause misalignment with small, light parts. The low-pressure measurement touch probe uses an extremely low measuring force of 0.015 N for accurate measurement without the hassle or cost of fixing jigs. There is also no need to worry about deforming soft parts.



Pressure moves the part



Detection without affecting the part

Extremely low
measuring
pressure
0.015 N

Large high-precision stage

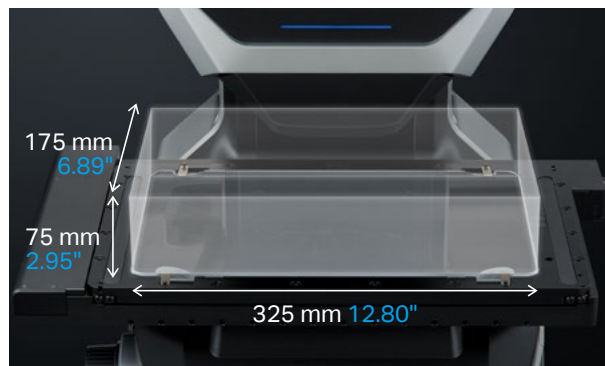
Accurate measurement of large parts



High-accuracy,
low-vibration stage

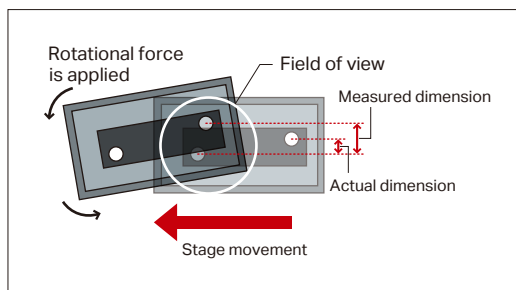
Large low-vibration stage for high-speed measurement

The large stage has a maximum measuring area of 175 × 325 mm ϕ 6.89" × 12.80" and a working height of 75 mm 2.95". The new design reduces the friction between the motor and feed screws as much as possible, allowing for quick and stable measurement without fixing the part in place.

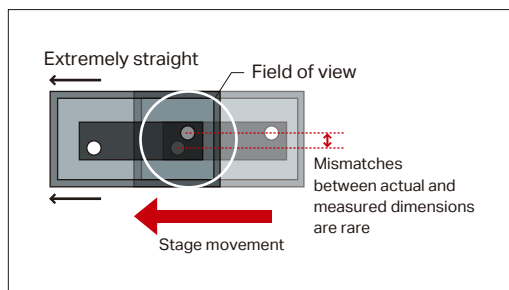


High-precision stage with excellent linearity

The movement of cross-roller bearings can be adjusted in micrometer increments for excellent linearity. This eliminates measurement errors caused by stage movement.



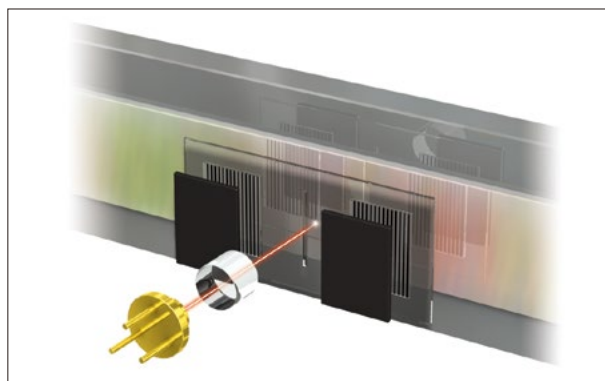
Without adjustment



LM-X Series

Custom high-precision linear scale

A specially designed high-precision linear scale allows the stage movement to be tracked in sub-micron increments. Accurately recognizing the amount of stage movement enables highly precise measurements.



Versatile color illumination for stable measurement



Multi-color illumination unit

The programmable ring-illumination unit integrates multiple ring illumination functions into a single unit. This allows for accurate and stable measurement by selecting the appropriate illumination for the measurement location and part.

Variable Illumination

Coaxial Illumination	Multi-angle illumination (high)	Multi-angle illumination (low)	Slit ring illumination

Telecentric transparent illumination	Programmable ring-illumination unit mechanism	
	<p>Multi-angle illumination (Cross-sectional image)</p> <p>Light is applied over a wide area. Illuminating the part from a higher position results in even illumination, while a lower position ensures greater contrast due to height differences.</p>	<p>Slit ring illumination (Cross-sectional image)</p> <p>Narrow bands of light are projected horizontally. Illuminating the part at the height of detected edges makes it possible to create a clear contrast at the desired location.</p>

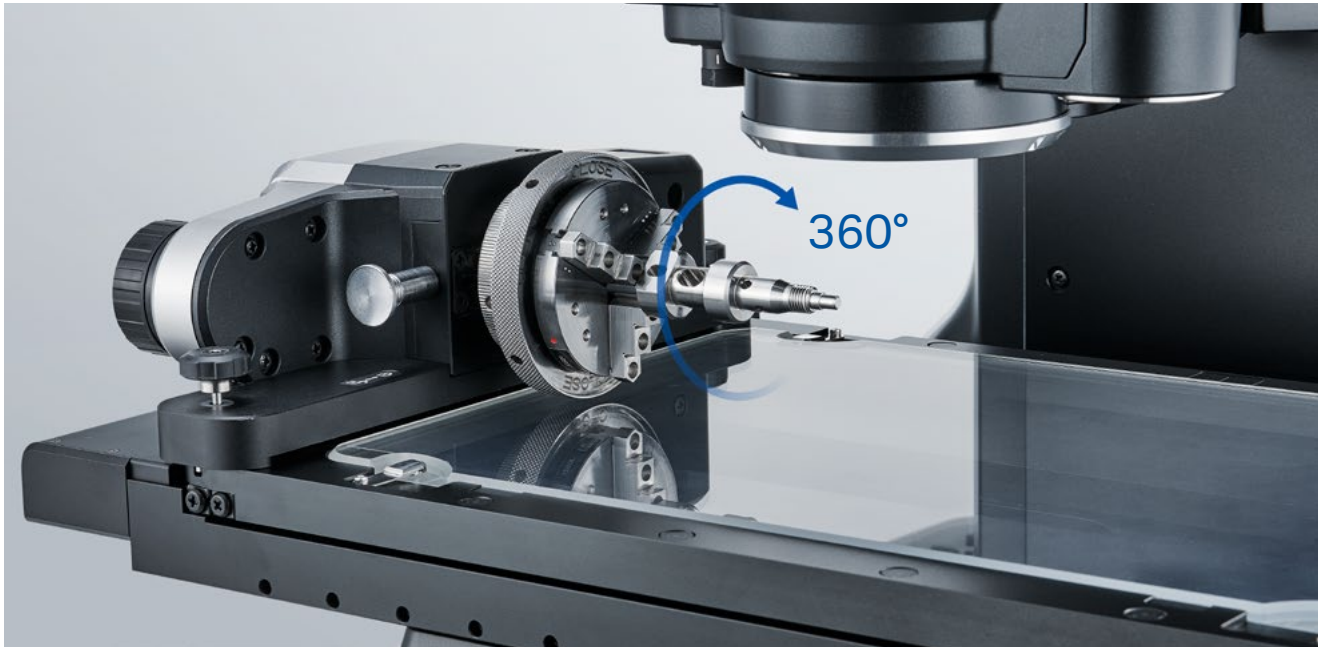
Color illumination

Blue illumination	Red illumination	Green illumination	White illumination

Blue illumination example	Edges of copper patterns and plating are clearly visible for accurate measurement of difficult-to-measure areas.	
<p>Natural lighting</p>	<p>White illumination</p> <p>Copper patterns are difficult to see</p>	<p>Blue illumination</p> <p>Copper patterns are clearly visible</p>

360° rotary unit

IM-RU1 Option



* Requires the separate OP-88848 (L-shaped cable) for connecting to the LM-X Series head.

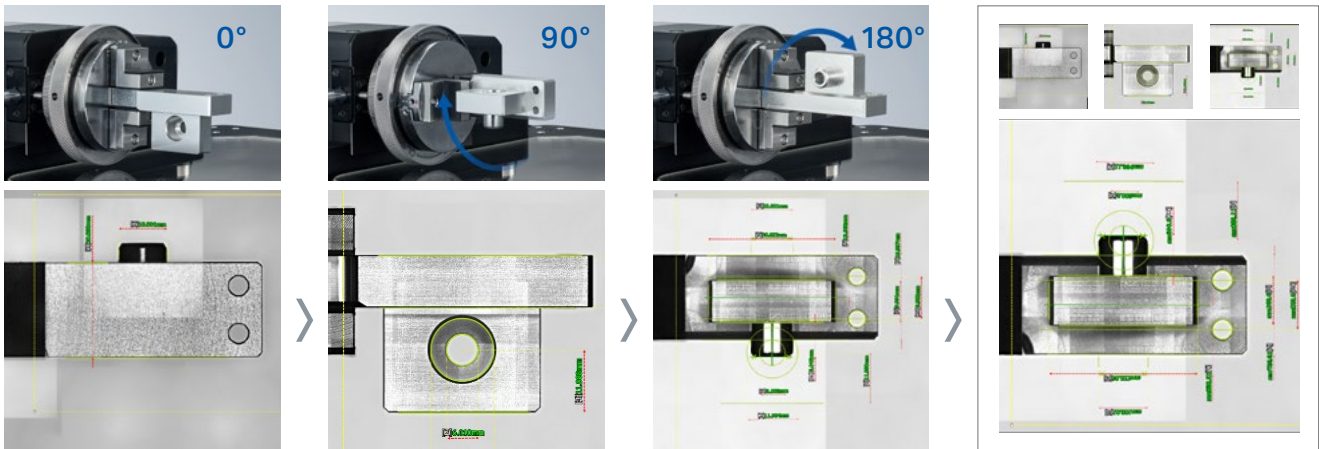
Easy part attachment

Installation is easy even for small-diameter shafts, multi-level shapes, and three-dimensional products, eliminating the need for preparing jigs for holding products horizontally.



No need to change target orientation for run-out measurement

Even for parts manufactured from multiple directions, all surfaces in the rotation direction can be measured with a single operation. This means GD&T measurements are possible without specialized machines previously required for measuring circularity and runout.



0° position

Rotated by 90° and measured

Rotated by 180° and measured

Measurement of multiple surfaces with a single setting

High accuracy with easy-to-use functions

LM-1000/1100

Base Model

LM Series

$\pm 0.1 \mu\text{m}$

Highly accurate measurements
for all users



Features of the LM Series

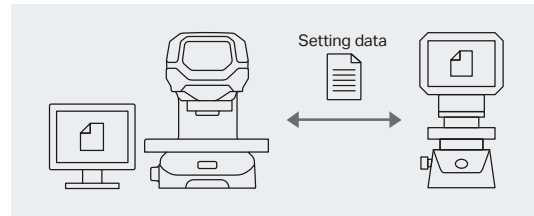
High-accuracy measurement

The high-resolution double telecentric lens enable high-accuracy measurement.



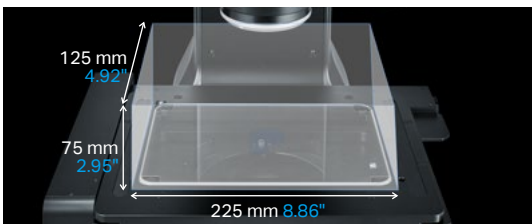
Similar settings as the LM-X Series

Settings files created with the LM can be used with the LM-X, and vice versa.



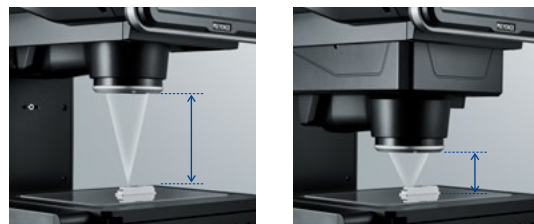
High-accuracy, low-vibration stage

Targets up to 125 × 225 mm **4.92" × 8.86"** and 75 mm **2.95"** high can be measured.



Non-contact height and depth measurement

The Auto-Focus function makes it possible to measure both height and depth. Measurement is possible even for extremely small areas (as small as 20 μm).



Optional accessories

PC software



LM-H1EE
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

Adjustment chart

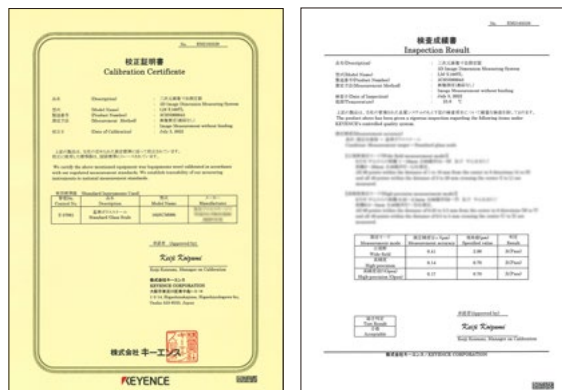
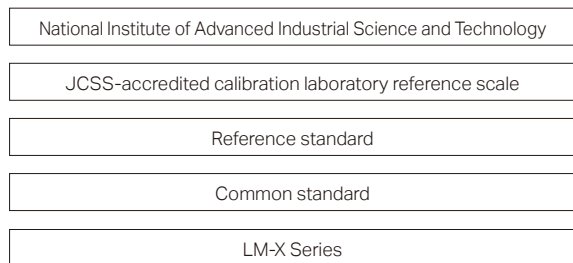


OP-88367
Stage adjustment
chart

On-site reliability

Calibration certificate and 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.



Calibration certificates, traceability system diagrams, and inspection reports issued

No need for a regulated environment

The case features a built-in temperature sensor that allows for installation in any location outside of a specialized inspection room. The system uses temperature compensation to nullify the effects of the surrounding environment, eliminating the need for a regulated environment.



Stage adjustment chart * Option: OP-88367

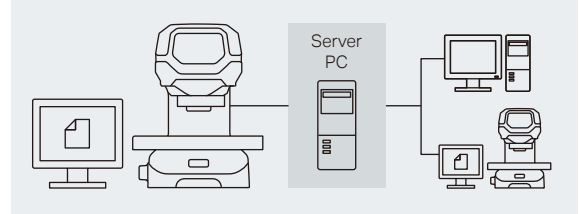
The stage adjustment chart is useful when changing installation location for customers who have installed a dedicated scale, as they can use it to adjust the scale themselves. The dedicated scale can be used to produce a calibration certificate, making measurement management easy.



Networking and software

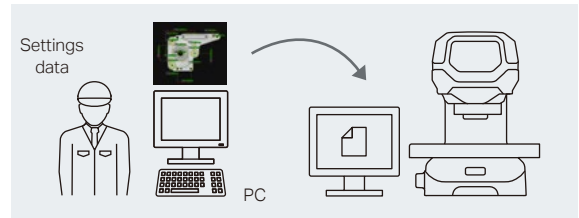
Network compatibility

Network connectivity makes it easy to share settings files on a server and to check measurement results from a different PC.



Measurement setup editor * Option: LM-H1XEE

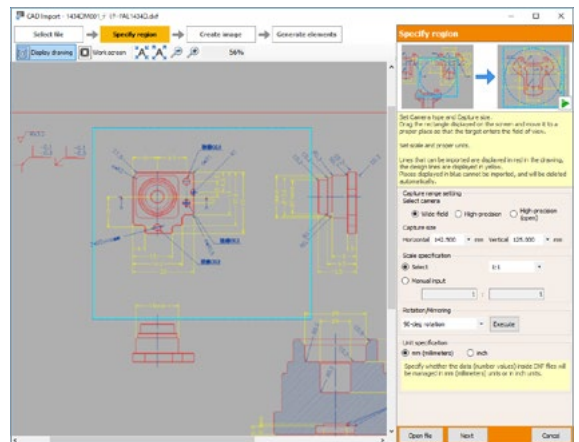
Measurement locations can be added or changed in setting data created with the LM-X Series or the CAD import module even if the main measurement unit is unavailable.



CAD import module * Option: LM-H1XC

The data required for measurements can be acquired from CAD drawing data in DXF format. Even when a part is unavailable, it is still possible to create measurement setting files.

* The LM-X measurement setup editor (LM-H1XEE) is also required when using the CAD import module.

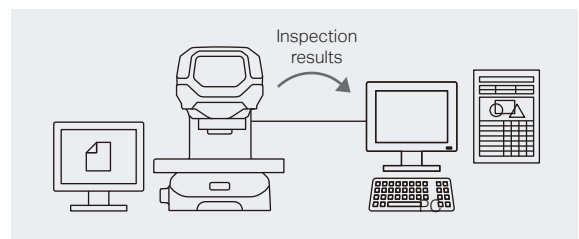


Data transfer software * Option: IM-H1T

The results of measurements performed with the LM-X Series can be automatically sent to specified cells in a spreadsheet program on a PC for easy creation of designated inspection reports.

PC software operating environment

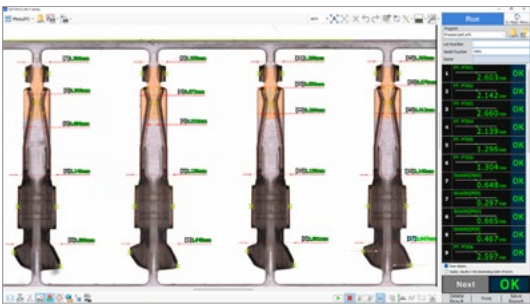
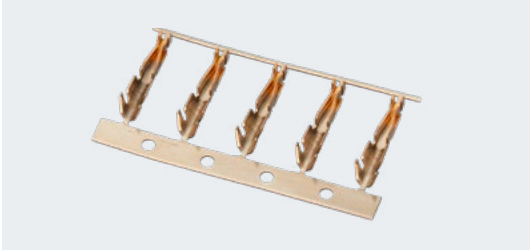
Supported OS
Windows 10 Home/Pro/Enterprise Windows 11 Home/Pro/Enterprise
Required free space on hard disk
30 GB or more



- Windows® is a trademark or registered trademark of Microsoft Corporation in the United States and other countries.
- The formal name of Windows is Microsoft Windows® operating system.

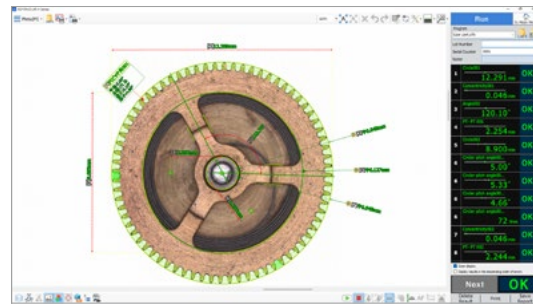
Progressive stamped parts

Allows accurate measurement with no human errors even for complex pressed products by changing the illumination conditions for each measurement location.



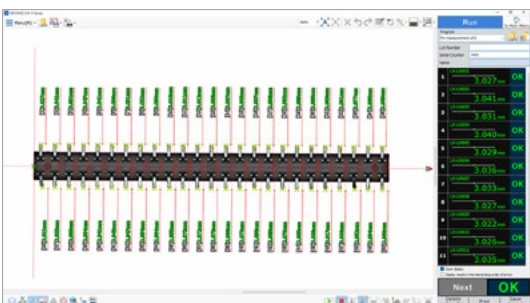
Precision metal parts

Makes it easy for anyone to accurately measure the dimensions and pitch even with detailed gear shapes.



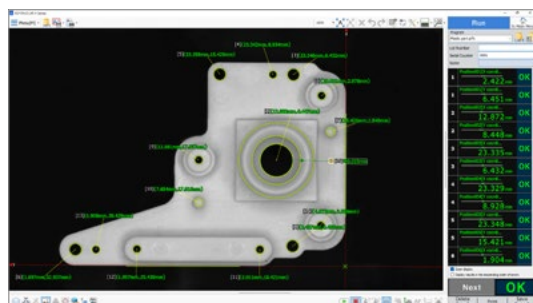
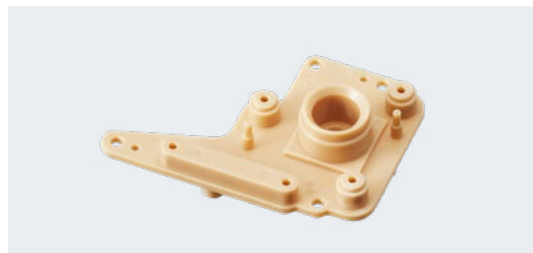
Connectors

Makes simultaneous measurement of fine terminal pitches and checking for improper terminal seating in addition to measurement of external dimensions easy.



Injection-molded parts

Allows accurate measurement even for injection-molded products with difficult-to-capture edges by varying the magnification for each measurement location.



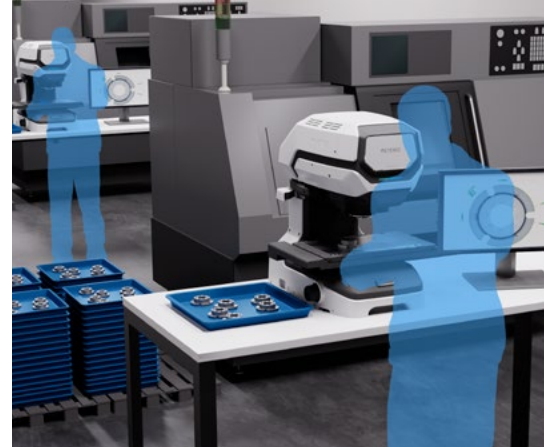
Inspections of prototypes and first off-tool parts

- Improved productivity through reductions in launch periods
- Measurements are possible regardless of the inspector's experience level
- Measurement based on national standards of traceability



In-process inspections of samples and parts

- Improved equipment availability through reductions in setup time
- Improved 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

- Management of acceptance inspections for multiple types with constant standards
- Reduced risk of defects even when the quantity of inspections is increased
- Improved quality through measurement of previously uninspected points



LM-X Series Head Unit



Three models to meet a variety of needs

Multi-color laser model

LM-X100L



Multi-color laser

Touch probe model

LM-X100T



Touch probe

Multi-color laser +
Touch probe model

LM-X100TL



Multi-color laser
Touch probe



Control PC



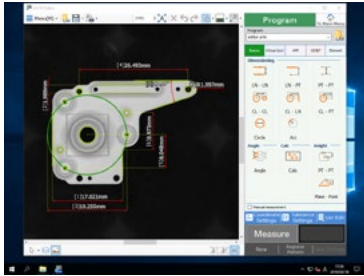
972359
Monitor



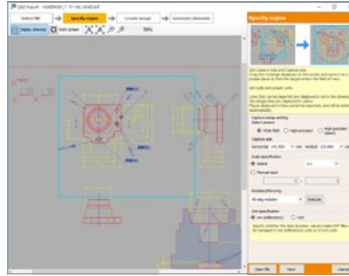
LM-H1X
Standard software

Optional accessories

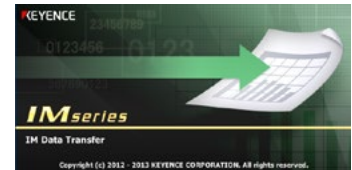
PC software



LM-H1XEE
LM-X measurement setup editor



LM-H1XC
CAD import module



IM-H1T
IM data transfer software

Adjustment chart



OP-88367
Stage adjustment chart

Stylus



OP-88750
Stylus adapter



OP-88751
Standard stylus
($\varnothing 2 \text{ mm } \varnothing 0.08''$)



OP-88752
Small-diameter stylus
($\varnothing 1 \text{ mm } \varnothing 0.04''$)

Rotary unit



IM-RU1
Rotary unit



OP-88848
L-shaped cable

Stage glass



OP-88743
Stage glass



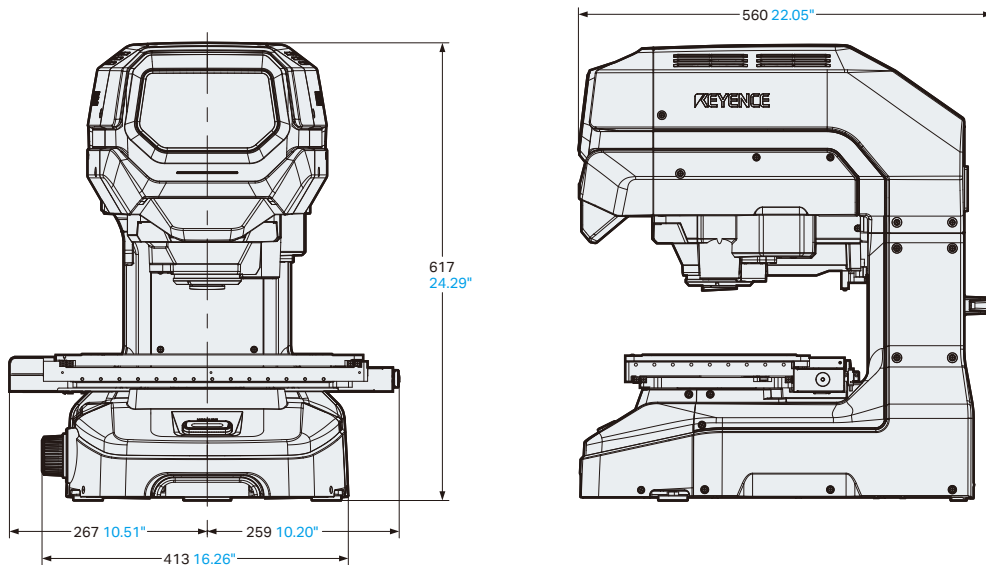
LM-XSG1
Scratch-resistant stage glass



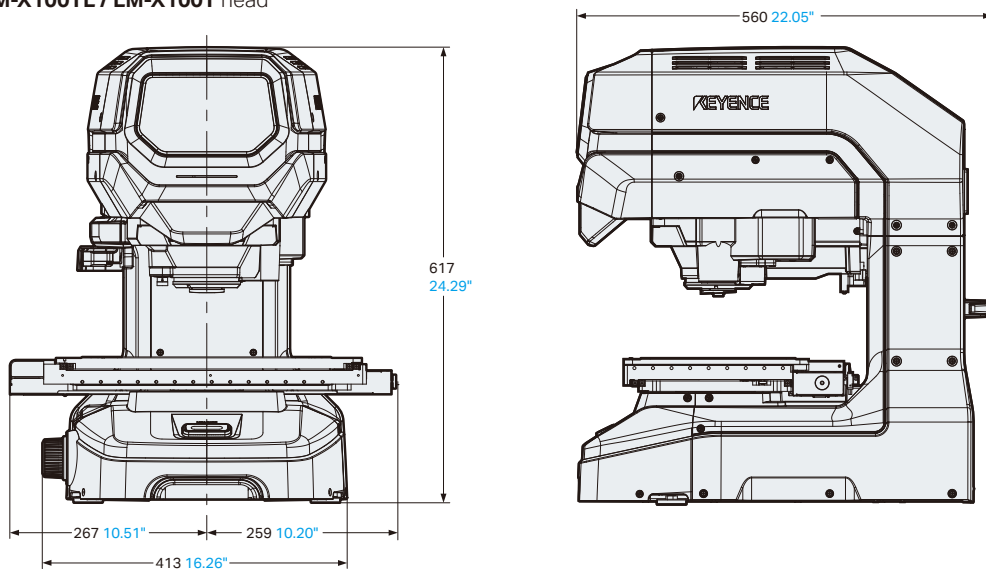
Model		Head	LM-1100	LM-X100L	LM-X100T	LM-X100TL			
		Controller	LM-1000						
Image receiving element		1", 20-megapixel monochrome CMOS							
Display		10.4" LCD monitor (XGA: 1024 × 768)							
Receiver lens		Double telecentric lens							
Image measurement	Field of view	Wide-field measurement mode		225 mm × 125 mm 8.86° × 4.92°		325 mm × 175 mm 12.80° × 6.89°			
		High-accuracy measurement mode		206 mm × 106 mm 8.11° × 4.17°		306 mm × 156 mm 12.05° × 6.14°			
	Minimum display unit		0.1 μm						
	Repeatability	Inside camera's field of view (2σ)	Wide-field measurement mode		±0.5 μm				
			High-accuracy 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-accuracy 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 _{UX,MPE} E _{UY,MPE})			±(2.8 + 0.02 L) μm ^{*3}						
AF height measurement	Repeatability	±2 μm							
	Measurement accuracy (E _{UZ,MPE})	±(4.8 + 0.04 L) μm ^{*4}							
Laser height measurement	Measurable range (X/Y)		—		239 mm × 146 mm 9.41° × 5.75°		239 mm × 146 mm 9.41° × 5.75°		
	Minimum display unit		—		0.1 μm		0.1 μm		
	Repeatability		—		±0.6 μm ^{*5}		±0.6 μm ^{*5}		
	Measurement accuracy (E _{UZ,MPE})		—		±(4.8 + 0.04 L) μm ^{*4}		±(4.8 + 0.04 L) μm ^{*4}		
	Spot diameter		—		ø50 μm		ø50 μm		
	Laser class		—		Class 1		Class 1		
Touch probe measurement	Measurable range (X/Y)		—		—		248 mm × 141 mm 9.76° × 5.55°		
	Measuring force		—		—		0.015 N ^{*6}		
	Minimum display unit		—		—		0.1 μm		
	Repeatability	X/Y axis		—		—		±1.4 μm	
		X/Y plane		—		—		±1.4 μm	
		Z-axis		—		—		±1.4 μm	
	Measurement accuracy	X/Y axis (E _{UX,MPE} E _{UY,MPE})		—		—		±(2.8 + 0.02 L) μm ^{*7}	
		X/Y plane (E _{UX,MPE} E _{UY,MPE})		—		—		±(3.8 + 0.02 L) μm ^{*7}	
Z axis (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 VDC, 0.5 A ON resistance: 50 mΩ or lower							
Environmental resistance	Operating ambient temperature		+10 to 35°C +50 to 95°F^{*8}						
	Operating ambient humidity		20 to 80% RH (no condensation)						
	Pollution degree		2						
	Overvoltage category		II						
Illumination system	Transparent		Telecentric transparent green LED illumination						
	Ring	Four division, multi-angle white LED illumination (electric)		Four division, multi-angle color LED/white LED illumination (electric)					
		Slit ring (directivity) side green LED illumination (electric)							
	Ring		Telecentric coaxial white LED illumination						
	Intensity control		PWM control, 100 kHz						
External illumination control	Output voltage		12 VDC						
	Output current		1.6 A (max.)						
	Moving range		200 mm × 100 mm 7.87° × 3.94° (motorized)		300 mm × 150 mm 11.81° × 5.91° (motorized)				
Load capacity		7 kg 15.43 lb							
Z stage	Moving range		75 mm 2.95° (electric)						
Power supply	Power voltage		100 to 240 VAC ±10% (50/60 Hz)						
	Power consumption		430 VA or less		150 VA or less				
Weight	Head		Approx. 30 kg 66.14 lb		Approx. 34 kg 74.96 lb		Approx. 34 kg 74.96 lb		
	Controller		Approx. 8 kg 17.64 lb		—		—		

*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 ISO 10360-7, 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 **4.41 lb** or less on the stage (L = amount of X/Y stage movement in mm **inch** units)
 *4 In accordance with ISO 10360-7, for plane-to-point height, within the operating ambient temperature range of +23°C ±1°C **+73.4°F ±1.8°F**, set to measurement of a target with a maximum height of 50 mm **1.97"** or less, (L = amount of Z stage movement in mm **inch** units)
 *5 In-house measurement of a standard target at an operating ambient temperature of +23°C ±1°C **+73.4°F ±1.8°F**
 *6 Typical value
 *7 In accordance with ISO 10360-7, within the operating ambient temperature range of +23°C ±1°C **+73.4°F ±1.8°F** and with a load weighing 2 kg **4.41 lb** or less on the stage (L = amount of X/Y stage movement in mm **inch** units)
 *8 With an XY-motorized stage travel speed of 80 mm/s **3.15 inch/s**; +15 to 35°C **+59°F to 95°F**

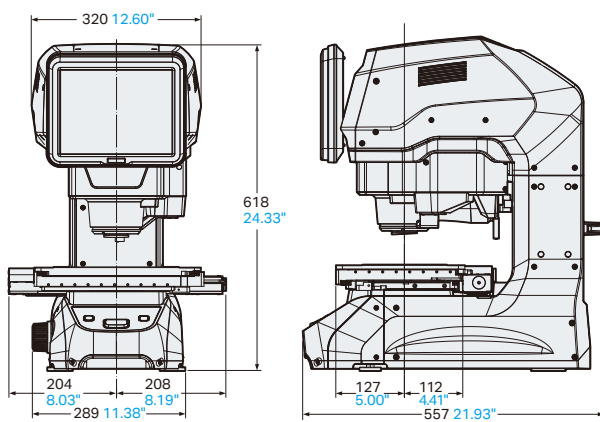
LM-X100L head



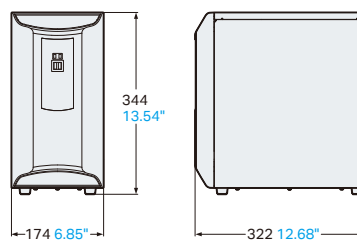
LM-X100TL / LM-X100T head



LM-1100 head



LM-1000 controller



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