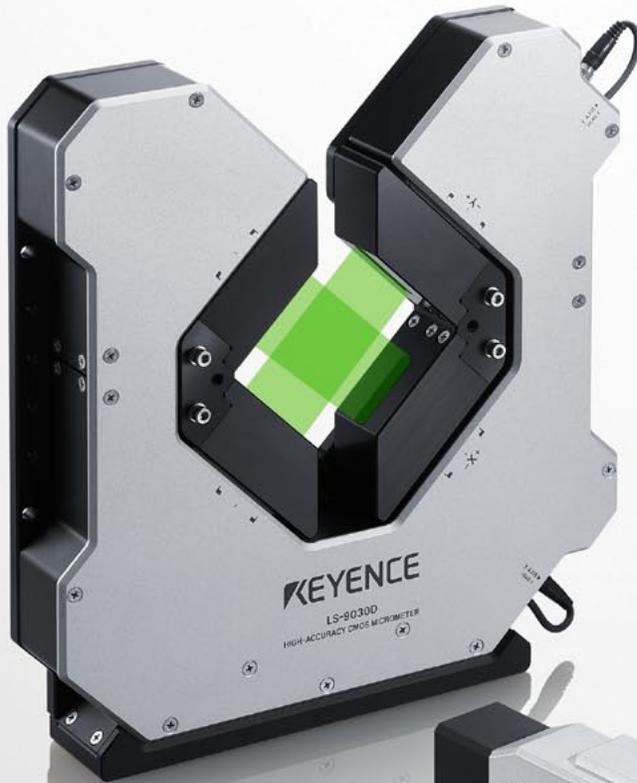


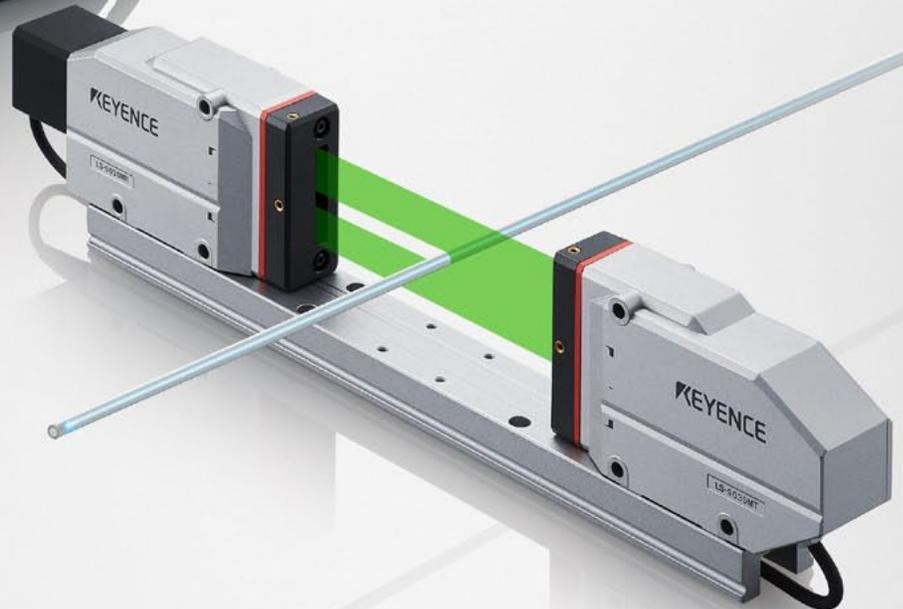
**KEYENCE**

High-speed optical micrometer  
LS-9000 Series



**Fastest in its class**

**16,000 Hz**  
sampling rate



# A NEW HIGH PRECISION MICROMETER SYSTEM

AUTOMATICALLY CORRECTS FOR TARGET MISALIGNMENT AND VIBRATION

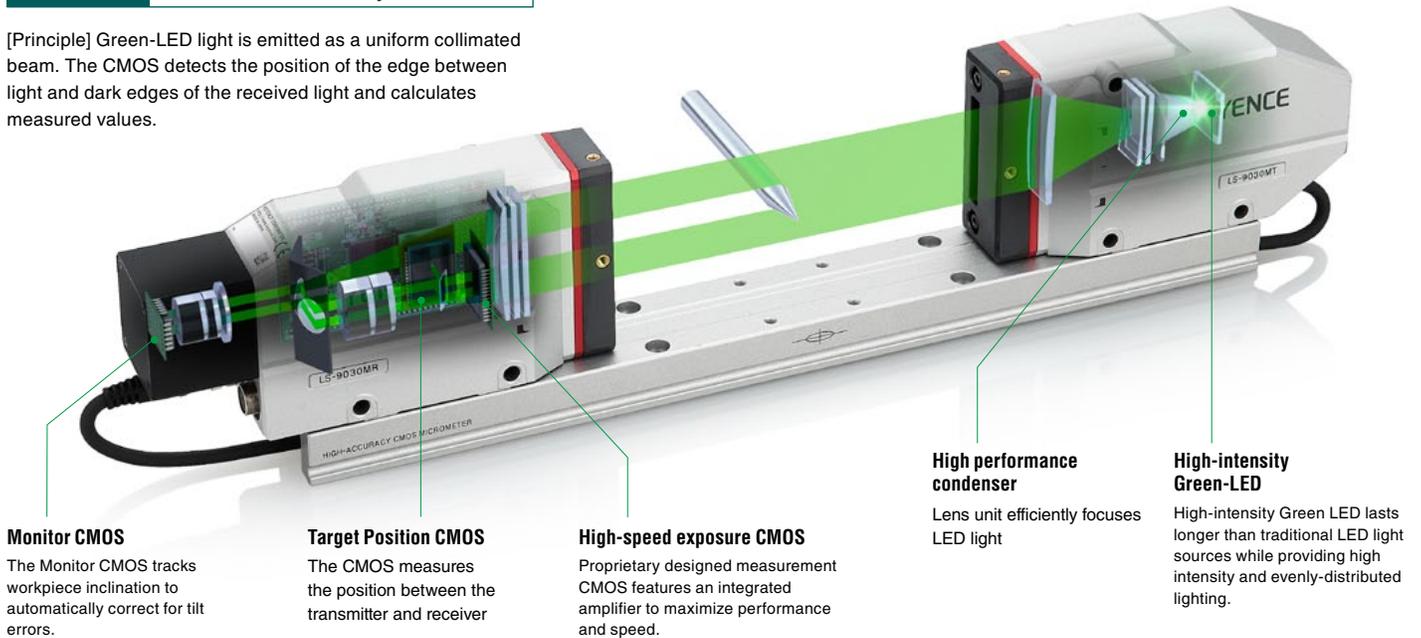
**LS-9000 Series**

# Compare against existing technology

The performance needed for 100% in-line measurement  
KEYENCE's proprietary 3-CMOS x Green-LED measurement system

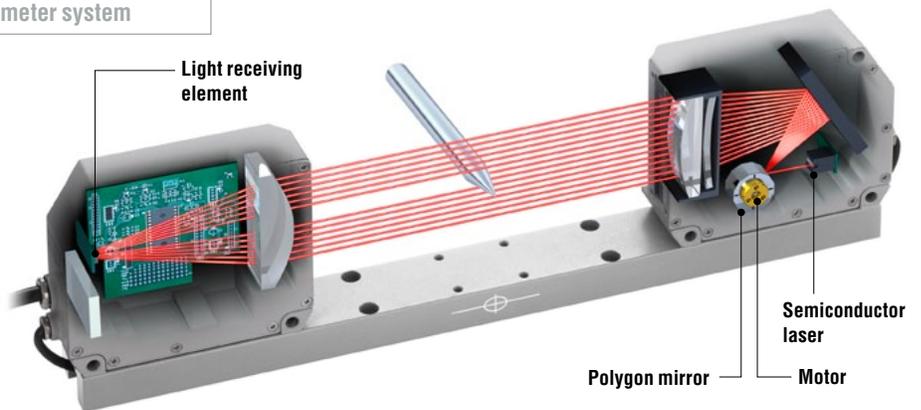
## LS-9000 3-CMOS x Green-LED system

[Principle] Green-LED light is emitted as a uniform collimated beam. The CMOS detects the position of the edge between light and dark edges of the received light and calculates measured values.

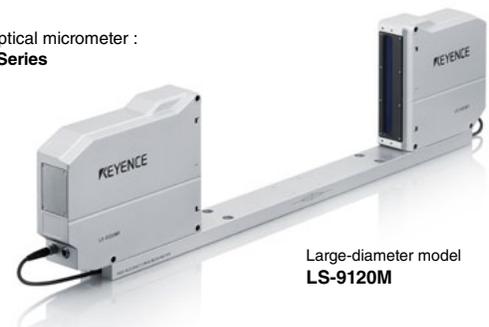


## Conventional Technology Laser scan micrometer system

[Principle] A semiconductor laser is fired at a rotating polygon mirror and scans through the measurement range. Measured values are calculated by measuring how long the laser is obstructed by the target



High-speed optical micrometer :  
the LS-9000 Series



Speed

Stability

Durability

With the LS-9000 Series

13.3 times faster than conventional systems  
Fastest in its class

### 16000 Hz sampling rate

Fitted with a high-speed exposure CMOS and high-intensity Green-LED to produce a 16000 Hz sampling rate, far outstripping previous systems. Improves production line cycle times and ensures more stable measurement.

A world-first

### Active Tilt and Vibration Correction

The high-speed exposure CMOS clearly recognizes measurement targets that suddenly move due to target vibration and corrects measurement errors. The monitor CMOS determines the alignment of the target to enable accurate measured values.

Low maintenance

### No moving parts

Thanks to KEYENCE's proprietary optic design there are no moving parts. The use of a LED light source means no errors due to external sources. This combination of no moving parts with a LED light source means it can be used on-site for extended periods without requiring regular maintenance.

Problems with conventional systems

### 1200 Hz sampling

Motor speed must be increased to raise the sampling rate. However, it was hard to achieve both durability and stability, and the speed could not be dramatically increased.

### Target alignment and vibration cause errors

Could not recognize tilting of the target due to only having one source of measurement data. Vibration in the target could also cause errors in the scan that lead to incorrect values.

### Moving parts deteriorate

Regular calibration of the polygon mirror and laser was required due to the wear-related deterioration of moving parts.

\* LS-5000 Series



2-axis standard model  
LS-9030D



2-axis small-diameter model  
LS-9006D



Standard model  
LS-9030 (M)

Small diameter model  
LS-9006 (M)



Display and settings panel  
LS-D1000

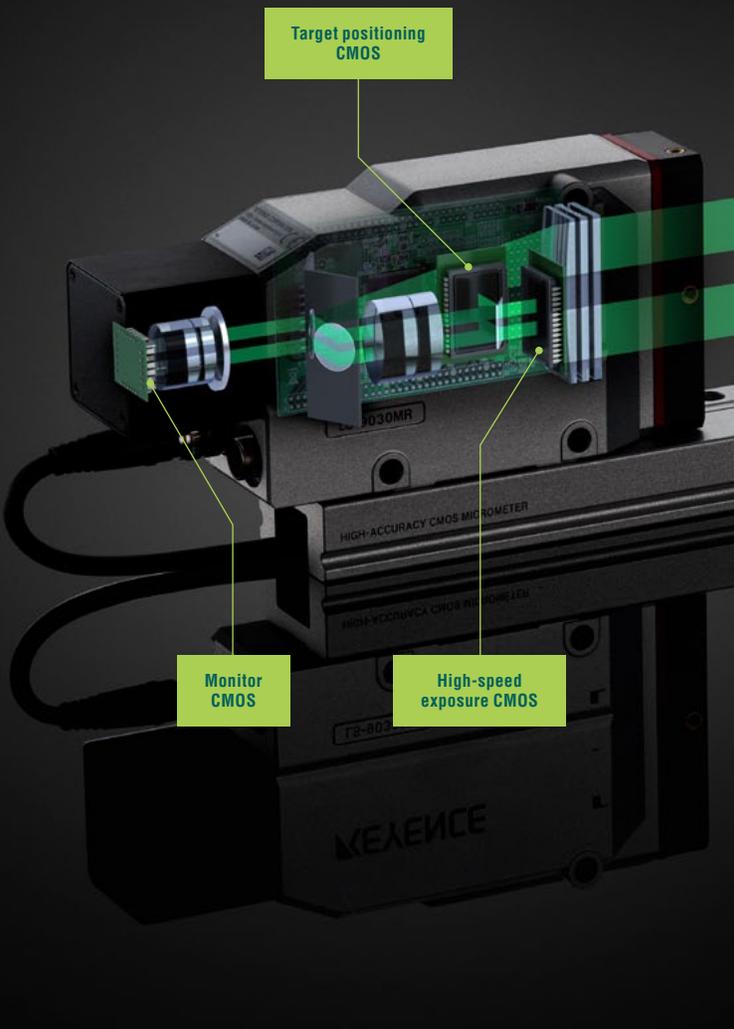


Controller  
LS-9501 (P)

# Enhanced speed and accuracy

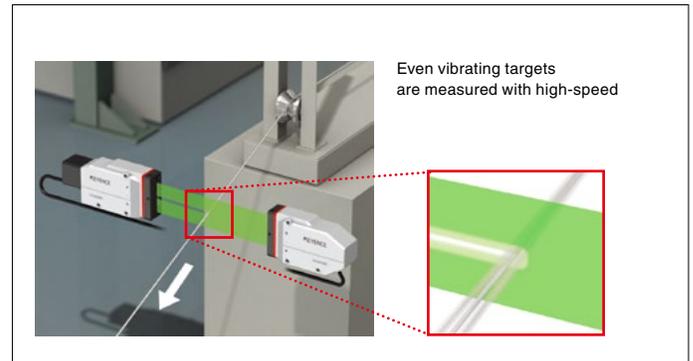
## 3-CMOS System

Three separate CMOS sensors provide advanced inspection capabilities



## Even vibrating targets are measured stably

High-speed exposure is used so that a precise inspection of the target can be performed even if the target is vibrating, making accurate measurement possible.

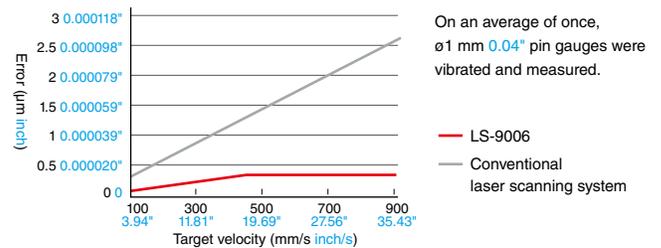


## High-speed CMOS

### 16000 Hz sampling

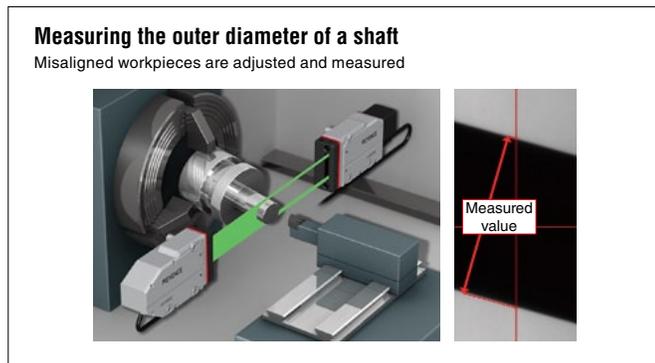
By integrating the peripheral circuits of the measurement CMOS into one chip, the S/N ratio has been dramatically improved and high-speed sampling achieved. For example, targets that move at 1000 m/min. can be measured at a pitch of around 1 mm  $0.04^\circ$ . Even parts that vibrate at high speeds can be measured stably.

### Error in relation to vibrating workpieces



## Even misaligned parts are measured stably

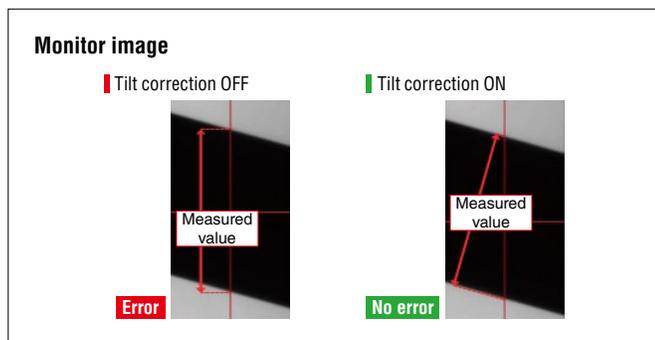
The target monitor CMOS recognizes the orientation of the part and adjusts the measured value so there are no measurement errors due to inclination.



### Monitor CMOS

#### Alignment adjustment\*1

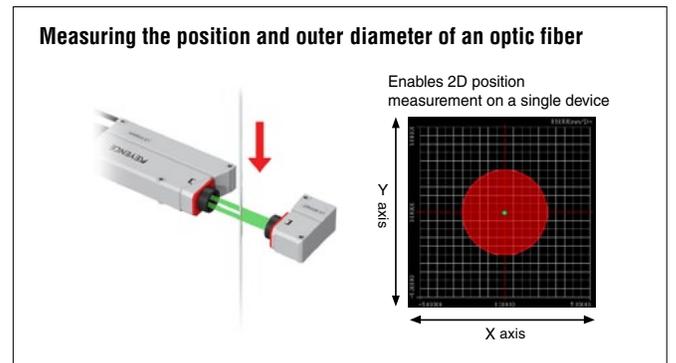
Recognizes the misalignment of a workpiece from the image taken by the monitor CMOS. Inclination error is removed automatically and does not affect the measurement result. The captured image can also be checked with computer software so even novices will have no problem taking measurements.



\*1 Functions of the LS-9006M and LS-9030M heads only.

## Two axis target position indicator

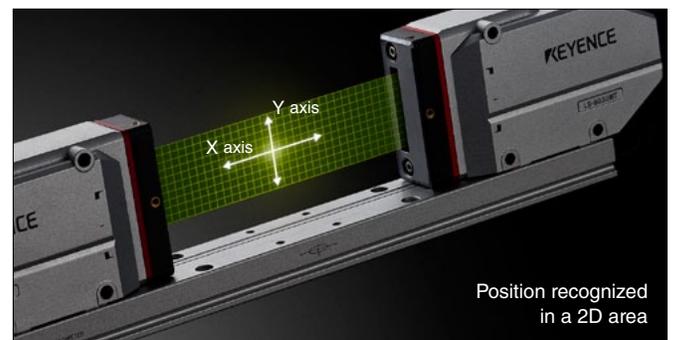
The LS-9000 can use the target positioning CMOS receiver to determine the location of the measurement target in two axes. This makes installation and part position feedback simple, even with a single axis system.



### Target positioning CMOS

#### Transmitter/receiver direction and position measurement\*2

With the additional data obtained from the target positioning CMOS, the LS-9000 can determine the position of the target in both the X and Y axes.

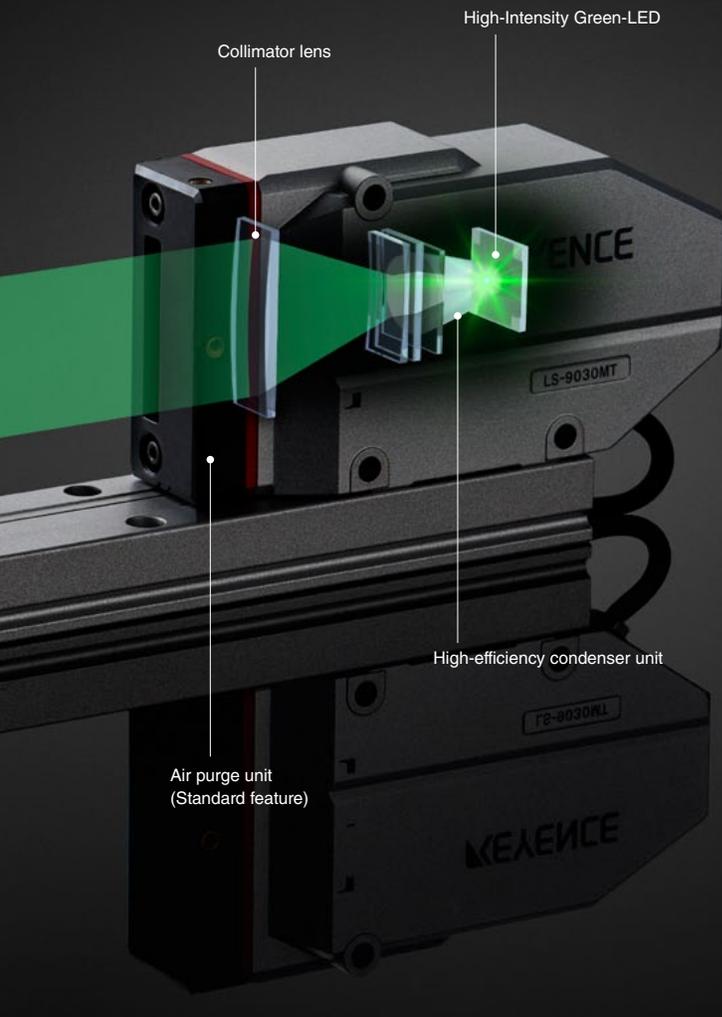


\*2 Functions of the LS-9006 (M) and LS-9030 (M) heads only.

# Enhanced durability and reliability

## High durability design

Constructed with no moving parts, a design that offers enhanced service life.



## Huge reduction of maintenance time

With no motor to introduce wear and a long lifespan LED, minimal maintenance is required.

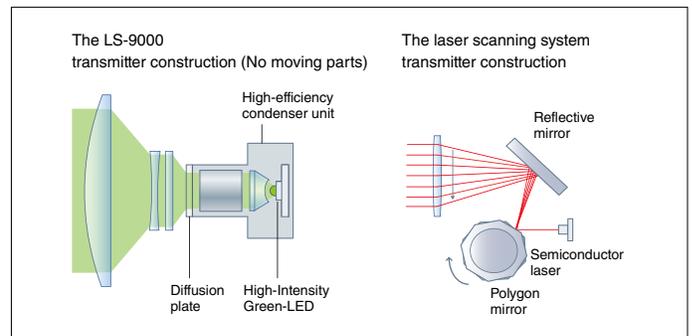
	LS-9000 Series	Existing systems
Motor durability	✓	×
Light source durability	✓	×



## High-intensity Green-LED + high-efficiency condenser unit

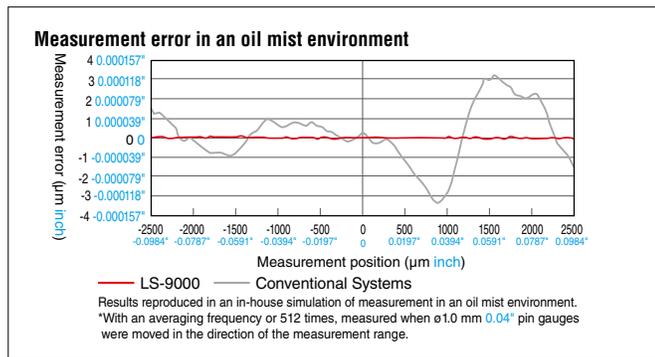
### Our proprietary wear-free construction

As a high intensity Green LED is used to generate the measurement beam, laser degradation typical with traditional systems is completely avoided. In addition, as the entire beam is generated with no moving parts, there is no motor or mirror system to wear out or replace.



## Stable measurements in harsh environments

The effects of water, dust, and oil mist on the measurement value are eliminated.



### IP67 construction + air purge unit

#### Best in class environmental resistance design\*

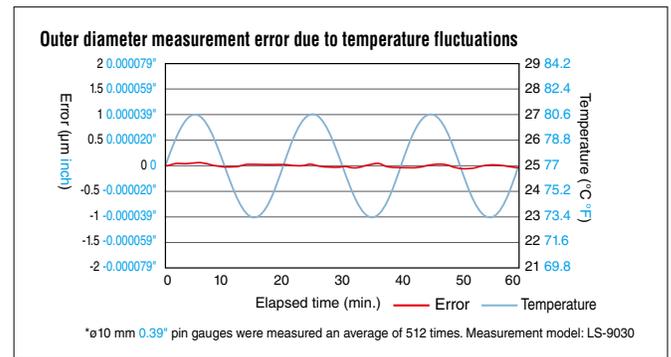
The system enclosure maintains an IP67 rated protection for all internal components. In addition, the LS-9000 series heads come standard with a built in air purge mechanism to further enhance the system's resistance to environmental influence.



\* The air purge unit is sold as an optional accessory only for the LS-9120M head.

## Extreme resistance to shock and temperature drift

Revolutionary design eliminates the influence of shock and temperature fluctuations on the measurement value.



### Die-cast housing + optical unit protection design

#### Hardened housing protects internal construction

The outer die-cast body has been mechanically isolated from the internal optical unit so that the outer body absorbs shocks and temperature variations, protecting the internal optics. Meets the IEC 68-2-29 standard (15 g/6 ms) for shock resistance.



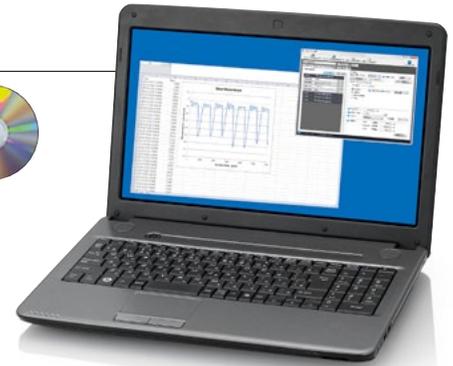
# Easy setup and analysis via a computer.

## Computer software solves those "difficulties" in setting and measuring

### Conventional measurement system

- Setting each device separately is time-consuming
- Original settings are easily lost
- Controller setup is complicated and hard to understand
- Difficult to verify measurement setup
- Needs a separate recorder to save data

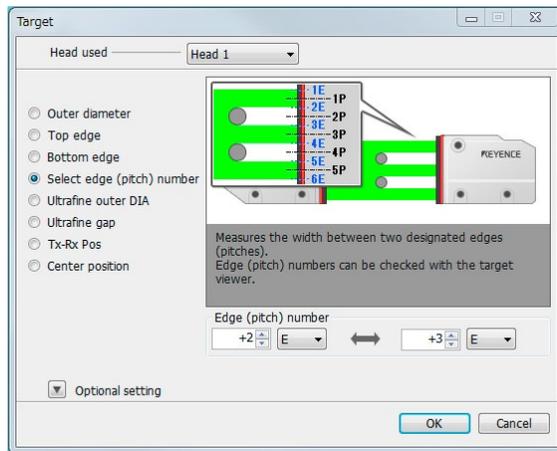
The LS-Navigator2 setup and diagnostics software simplifies and streamlines setup. (OPTIONAL)



## Easy setting and backup

### Easy visual setting

Measurement details can be selected from a picture, so settings are simple, even for a novice. Setting details are stored on the computer as backup files.



## Customize your display

### Multifunction measurement display

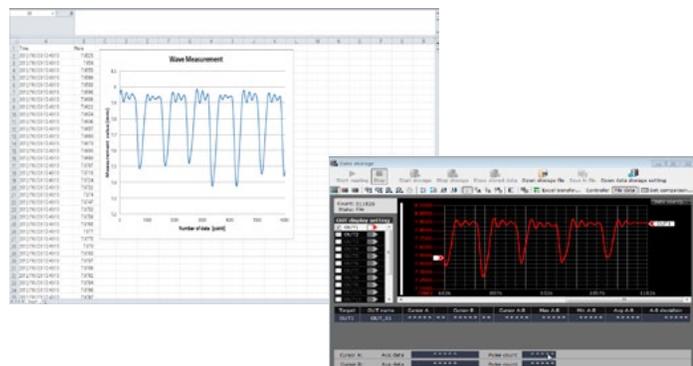
Support software features 12 independent display tools that let you customize your display. View any and all the information you need on a single screen to maximize efficiency.



## Automatically record data

### High-capacity data storage

With a storage capacity of 400,000 points, it is easy to record output data without external units. This data can then easily be exported to Excel.



# New measurement functions that make previously unobtainable measurements easy

## Ultra-thin outer diameter and ultra-thin gap measurement\*

Specialized ultra-fine diameter / gap tool now allows measurement of gaps and diameters previously undetectable.

**Measuring the outer diameter of an ultra-thin wire**



**Smallest detectable object**

	Standard mode	Ultra-thin mode
6 mm 0.24" type	40 μm 0.0016"	10 μm 0.0004"
30 mm 1.18" type	300 μm 0.0118"	80 μm 0.0031"

\* Functions of the LS-9006 (M) and LS-9030 (M) heads only.

## 16-channel simultaneous measurement

With up to 16 simultaneous outputs, it is possible to measure any combination of diameters, position, gaps, etc. to meet your needs.

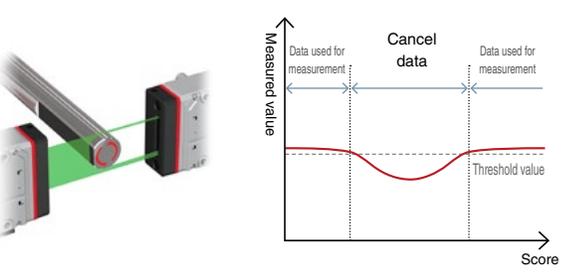
**Measuring the outer diameter and runout of a photocopier roller**



## Irregular surface cancellation

Irregular surface cancellation allows for proper outer diameter inspection of parts with complex profiles such as key slots or D-cuts.

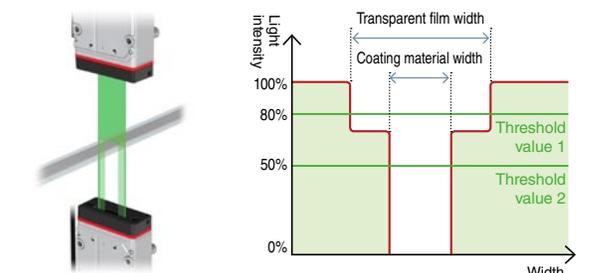
**Measuring the outer diameter of a motor shaft**



## Transparent object/ two-level edge detection threshold value setting

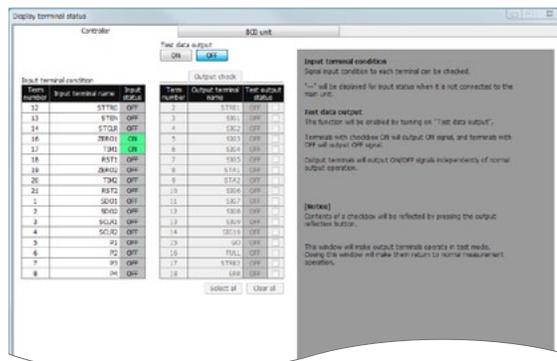
Using two-level threshold settings, it is possible to simultaneously measure two targets of differing transparency.

**Taking dimensional measurements of transparent film and coating material**



## Terminal operation monitoring

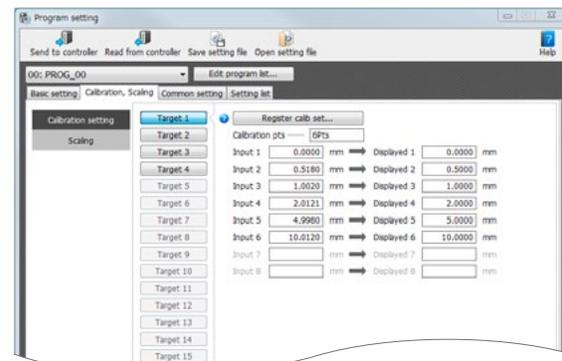
Ability to monitor live terminal I/O status with manual test data output greatly simplifies setup and troubleshooting.



Term. number	Input terminal name	Input type	Time	Output terminal name	Test output status
11	ST16	OFF	0	---	---
12	ST17	OFF	1	---	---
13	ST18	OFF	2	---	---
14	ST19	OFF	3	---	---
15	ST20	OFF	4	---	---
16	ST21	OFF	5	---	---
17	ST22	OFF	6	---	---
18	ST23	OFF	7	---	---
19	ST24	OFF	8	---	---
20	ST25	OFF	9	---	---
21	ST26	OFF	10	---	---
22	ST27	OFF	11	---	---
23	ST28	OFF	12	---	---
24	ST29	OFF	13	---	---
25	ST30	OFF	14	---	---
26	ST31	OFF	15	---	---
27	ST32	OFF	16	---	---
28	ST33	OFF	17	---	---
29	ST34	OFF	18	---	---
30	ST35	OFF	19	---	---
31	ST36	OFF	20	---	---
32	ST37	OFF	21	---	---
33	ST38	OFF	22	---	---
34	ST39	OFF	23	---	---
35	ST40	OFF	24	---	---
36	ST41	OFF	25	---	---
37	ST42	OFF	26	---	---
38	ST43	OFF	27	---	---
39	ST44	OFF	28	---	---
40	ST45	OFF	29	---	---
41	ST46	OFF	30	---	---

## Multi-point calibration

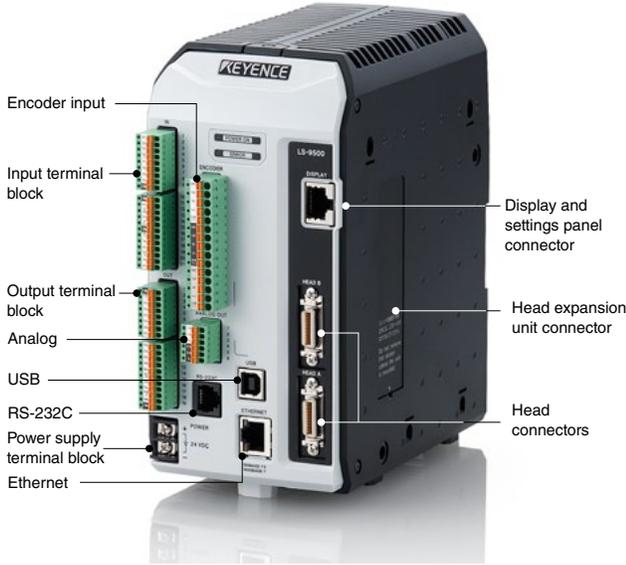
Up to 8 points can be adjusted and scaled. Multiple targets of differing diameters can be measured more precisely.



Target	Input	Output
Target 1	0.0000 mm	0.0000 mm
Target 2	0.5180 mm	0.5000 mm
Target 3	1.0020 mm	1.0000 mm
Target 4	2.0121 mm	2.0000 mm
Target 5	4.9980 mm	5.0000 mm
Target 6	10.0120 mm	10.0000 mm
Target 7		
Target 8		
Target 9		
Target 10		
Target 11		
Target 12		
Target 13		
Target 14		
Target 15		

Controller

A wide variety of interfaces to ensure easy integration



Controller **LS-9501 (P)**

A variety of I/O to suit on-site needs is a standard feature.

Controller line-up

NPN output type	<b>LS-9501</b>
PNP output type	<b>LS-9501P</b>



Setting and support software **LS-H2**



USB cable **OP-66844**

**Max. of 4 heads can be connected**

When an LS-HA100 head expansion unit is connected, a maximum of 4 heads can be connected.

**Head cable Maximum extension 40 m 131.2'**

**Encoder input**

Can capture data whose signals have been synchronized with encoder pulses.

HMI / Display



Display and settings panel **LS-D1000**

Measured values, judgment values and positions can be seen at a glance on the display panel. A maximum of 4 displays can be connected.



Display panel stand **OP-87610**



Stand switch **OP-87611**

Expansion units



Head expansion unit **LS-HA100**  
Used when 3 or 4 heads are being used.



EtherNet/IP™ unit **CB-EP100**  
PROFINET unit **CB-PN100**



BCD output unit **CB-BD100**

Cables



Head cable **CB-B3** (3 m 9.8')  
**CB-B10** (10 m 32.8')



Head extension cable **CB-B5E** (5 m 16.4')  
**CB-B10E** (10 m 32.8')  
**CB-B20E** (20 m 65.6')



Transmitter-receiver cable **OP-87686** (1 m 3.3')  
**OP-87687** (3 m 9.8')



Display panel cable **OP-87602** (2 m 6.6')  
**OP-87603** (5 m 16.4')  
**OP-87604** (10 m 32.8')  
**OP-87605** (20 m 65.6')



RS-232C cable **OP-96368** (2.5 m 8.2')



D-sub 9-pin connector **OP-26401**



Ethernet cable **OP-66843**



Extension I/O cable (3 m 9.8')  
For the BCD output unit **OP-51657**

Options



Target positioning jig **OP-87609** (For the LS-9030)  
**OP-87684** (For the LS-9006)  
**OP-87749** (For the LS-9030D)  
**OP-87750** (For the LS-9006D)

Replacement glass **OP-87697** (For the LS-9030)  
**OP-87698** (For the LS-9006 transmitter head)  
**OP-87699** (For the LS-9006 receiver head)  
**OP-87756** (For the LS-9120M)

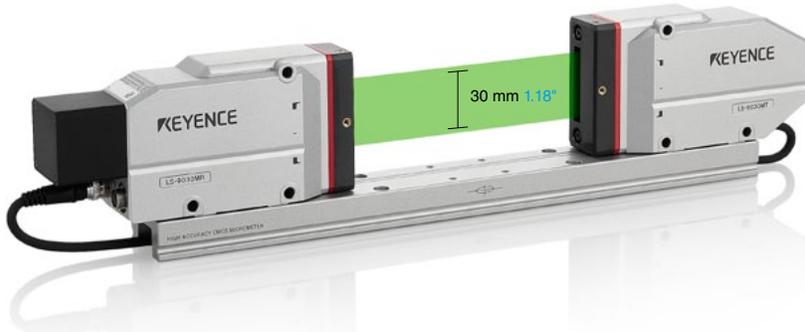
40 m 131.2' extension connection unit **CB-BR01**

Replacement air purge unit **OP-87695** (For the LS-9030)  
**OP-87696** (For the LS-9006)  
**OP-87751** (For the LS-9030D)  
**OP-87752** (For the LS-9006D)  
**OP-87755** (For the LS-9120M)

Display panel protection sheet (Set of 5 sheets) **OP-87729**

Display panel stay **OP-87757**

## Standard type offers both high speed and high precision



### Standard model

LS-9030M (with monitor camera)

LS-9030 (without monitor camera)

Measurement range	0.08 to 30 mm 0.003" to 1.18"
Smallest detectable object	0.08 mm 0.003"
Measurement accuracy	±2 μm ±0.000079"
Repeatability	±0.1 μm ±0.000004"

## Precise measurement of small diameter workpieces



### Small-diameter model

LS-9006M (with monitor camera)

LS-9006 (without monitor camera)

Measurement range	0.01 to 6 mm 0.0004" to 0.24"
Smallest detectable object	0.01 mm 0.0004"
Measurement accuracy	±0.5 μm 0.000020"
Repeatability	±0.03 μm

## Measures large-diameter workpieces of up to 120 mm 4.72" in size



### Large-diameter model

LS-9120M

Measurement range	0.8 to 120 mm 0.03" to 4.72"
Smallest detectable object	0.8 mm 0.03"
Measurement accuracy	±8 μm 0.000315"
Repeatability	±0.3 μm 0.000012"

## Achieves high-speed and high-accuracy with two axes



### 2-axis standard model

LS-9030D (without monitor camera)

Measurement range	0.3 to 30 mm 0.01" to 1.18"
Smallest detectable object	0.3 mm 0.01"
Measurement accuracy	±2 μm 0.000079"
Repeatability	±0.1 μm 0.000004"

## Uses two axes to perform highly accurate measurements of small-diameter workpieces



### 2-axis small-diameter model

LS-9006D (without monitor camera)

Measurement range	0.04 to 6 mm 0.002" to 0.24"
Smallest detectable object	0.04 mm 0.002"
Measurement accuracy	±0.5 μm 0.000020"
Repeatability	±0.03 μm



■ Head (Standard model/small-diameter model)

Model		LS-9006M (with monitor camera)	LS-9006 (without monitor camera)	LS-9030M (with monitor camera)	LS-9030 (without monitor camera)
Measurement range		0.04 mm (0.01 mm) to 6 mm 0.001" (0.0004") to 0.24"		0.3 mm (0.08 mm) to 30 mm 0.01" (0.003") to 1.18"	
Smallest detectable object		0.04 mm (0.01 mm) 0.001" (0.0004")		0.3 mm (0.08 mm) 0.01" (0.003")	
Transmitter/receiver distance		60 ±5 mm 2.36" ±0.2"		160 ±40 mm 6.3" ±1.57"	
Repeatability		±0.03 μm*1		±0.1 μm 0.000004"*2	
Measurement accuracy		±0.5 μm 0.000020"*3		±2 μm 0.000079"*4	
Sampling cycle*7		16000 samples/sec.			
Transmitter/receiver direction and position detection	Detection area	4 x 5 mm 0.16" x 0.2"		20 x 24 mm 0.79" x 0.94"	
	Smallest detectable object	0.04 mm 0.001"		0.3 mm 0.01"	
	Repeatability	±0.02 mm 0.0008"*5		±0.2 mm 0.01"*6	
	Sampling cycle	4000 samples/sec.			
Light source		InGaN green LED			
Monitor camera		Provided	Not provided	Provided	Not provided
Environmental resistance	Ambient temperature	0 to +50°C 32 to 122°F			
	Relative humidity	20 to 85% RH (no condensation)			
	Ambient light	Incandescent lamp/fluorescent lamp 3000 lux or lower			
	Vibration resistance	10 to 55 Hz, double amplitude 1.5 mm 0.06", 2 hours in each direction (X,Y, and Z)			
	Shock resistance	15 G/6 ms			
Enclosure rating		IP67 (including connector)			
Material		Aluminum			
Weight		Transmitter: Approx. 130 g Receiver: Approx. 300 g Base: Approx. 180 g	Transmitter: Approx. 130 g Receiver: Approx. 280 g Base: Approx. 180 g	Transmitter: Approx. 440 g Receiver: Approx. 500 g Base: Approx. 430 g	Transmitter: Approx. 440 g Receiver: Approx. 440 g Base: Approx. 430 g

The values in brackets are measured in ultra-thin mode. For details on the accuracy of ultra-thin mode, contact the nearest KEYENCE office.

- \*1 A ±2σ margin of error when measuring a ø1.0 mm ø0.04" rod in the center of the measurement area using outer diameter mode with the average measurement number set as 2048 times.
- \*2 A ±2σ margin of error when measuring a ø10 mm ø0.39" rod in the center of the measurement area using outer diameter mode with the average measurement number set as 2048 times.
- \*3 Margin of error when a moving ø1.0 mm ø0.04" rod is measured in the 2 mm x 4 mm 0.08" x 0.16" measurement area using outer diameter mode.
- \*4 Margin of error when a moving ø10 mm ø0.39" rod is measured in the 10 mm x 20 mm 0.39" x 0.79" measurement area using outer diameter mode.
- \*5 A ±2σ margin of error when measuring the position of a ø1.0 mm ø0.04" rod in the center of the measurement area with the average measurement number set as 512 times.
- \*6 A ±2σ margin of error when measuring the position of a ø10 mm ø0.39" rod in the center of the measurement area with the average measurement number set as 512 times.
- \*7 The sampling cycle is changed by the number of OUT set, and by the use of the mutual interference prevention function.

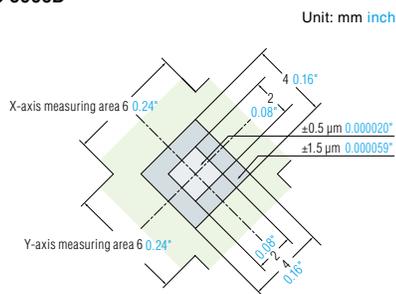
■ Head (2-axis standard model/2-axis small-diameter model)

Model		LS-9006D	LS-9030D
Measurement range		ø0.04 mm to ø6 mm ø0.001" to ø0.24"	ø0.3 mm to ø30 mm ø0.01" to ø1.18"
Smallest detectable object		0.04 mm 0.001"	0.3 mm 0.01"
Repeatability		±0.03 μm*1	±0.1 μm 0.000004"*2
Measurement accuracy		±0.5 μm 0.000020"*3	±2 μm 0.000079"*4
Sampling cycle*5		16000 samples/sec.	
Light source		InGaN green LED	
Monitor camera		Not provided	
Environmental resistance	Ambient temperature	0 to +50°C 32 to 122°F	
	Relative humidity	20 to 85% RH (no condensation)	
	Ambient light	Incandescent lamp/fluorescent lamp 3000 lux or lower	
	Vibration resistance	10 to 55 Hz, double amplitude 1.5 mm 0.06", 2 hours in each direction (X,Y, and Z)	
	Shock resistance	15 G/6 ms	
Measuring head enclosure rating		IP67 (including connector)	
Material		Aluminum	
Weight		Approx. 4.8 kg	Approx. 9 kg

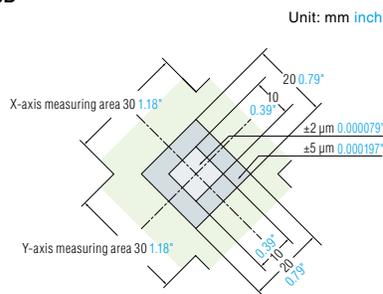
- \*1 A ±2σ margin of error when measuring a ø1.0 mm ø0.04" rod in the center of the measurement area using outer diameter mode with the average measurement number set as 2048 times.
- \*2 A ±2σ margin of error when measuring a ø10 mm ø0.39" rod in the center of the measurement area using outer diameter mode with the average measurement number set as 2048 times.
- \*3 Margin of error when a moving ø1.0 mm ø0.04" rod is measured in the 2 mm x 2 mm 0.08" x 0.08" measurement area.
- \*4 Margin of error when a moving ø10 mm ø0.39" rod is measured in the 10 mm x 10 mm 0.39" x 0.39" measurement area.
- \*5 The sampling cycle is changed by the number of OUT set, and by the use of the mutual interference prevention function.

■ Measuring area and accuracy

LS-9006D



LS-9030D





## Head (Large-diameter model)

Model		LS-9120M
Measurement range		0.8 mm to 120 mm <b>0.03" to 4.72"</b>
Smallest detectable object		0.8 mm <b>0.03"</b>
Transmitter/receiver distance		400 ±100 mm <b>15.75" ±3.94"</b>
Repeatability		±0.3 μm <b>0.000012"</b> *1
Measurement accuracy		±8 μm <b>0.000315"</b> *2
Sampling cycle		16000 samples/sec.
Light source		InGaN green LED
Monitor camera		Provided
Environmental resistance	Ambient temperature	0 to +50°C <b>32 to 122°F</b>
	Relative humidity	20 to 85% RH (no condensation)
	Ambient light	Incandescent lamp/fluorescent lamp 3000 lux or lower
	Vibration resistance	10 to 55 Hz, double amplitude 1.5 mm <b>0.06"</b> , 2 hours in each direction (X, Y, and Z)
	Shock resistance	15G/6 ms
Enclosure rating		IP67 (including connector)
Material		Aluminum
Weight		Transmitter: Approx. 1800 g, Receiver: Approx. 2800 g, Base: Approx. 1600 g

\*1 A ±2σ margin of error when measuring a ø40 mm **ø1.57"** rod in the center of the measurement area using outer diameter mode with the average measurement number set as 2048 times.

\*2 Margin of error when a moving ø40 mm **ø1.57"** rod is measured in the 40 mm × 120 mm **1.57" × 4.72"** measurement area using outer diameter mode.

## Controller

Model		LS-9501	LS-9501P
No. of connectable sensor heads		2	
Head compatibility		Yes	
Display	Minimum display unit	0.01 μm	
	Display range	±99999.99 μm to ±9999.9 mm	
	LED display	POWER ON indicator, ERROR indicator	
Input terminal block	Encoder input	NPN/PNP open-collector output, voltage output (5 V / 12 V / 24 V), line-driver output	
	Synchronous 1, 2 input	Non-voltage input	Voltage input
	Auto-zero 1, 2 input		
	Reset 1, 2 input		
	Storage trigger input		
	Storage enable input		
	Storage data clear input	Non-voltage input x 4 inputs	Voltage input x 4 inputs
	Statistics 1, 2 input		
	Statistics clear 1, 2 input		
	Program selection input		
Output terminal	Analog voltage output	±10 V x 2 outputs, output impedance 100 Ω	
	Analog current output	4 to 20 mA x 2 outputs, compatible load max. 350 Ω	
	Universal output	NPN open-collector output x 10 outputs Measured value and tolerance judgment output, status output allocatable	PNP open-collector output x 10 outputs Measured value and tolerance judgment output, status output allocatable
	Status 1, 2 output	NPN open-collector output	PNP open-collector output
	Total judgment output		
	Memory FULL output		
	Strobe 1, 2 output		
Error output	NPN open-collector output (N.C.)	PNP open-collector output (N.C.)	
Ethernet interface	1000BASE-T/100BASE-TX		
USB interface	USB 2.0 HI-SPEED supported (USB 1.1 Full-SPEED compatible)		
RS-232C interface	Measured value output, control I/O, setting change, baud rate can be selected up to 115,200 bps		
Display and settings panel interface		LS-D1000 Max. four heads connectable	
Rating	Power supply voltage	24 VDC ±10%, including ripple (P-P)	
	Current consumption *1	When LS-HA100 not used: 1.0 A max. when 1 head connected; 1.4 A max. when 2 heads connected When LS-HA100 in use: 2.0 A max. when 3 heads connected; 2.3 A max. when 4 heads connected	
Environmental resistance	Ambient temperature	When LS-HA100 not used: 0 to +50°C <b>32 to 122°F</b> When LS-HA100 in use: 0 to +45°C <b>32 to 113°F</b>	
	Relative humidity	20 to 85% RH (no condensation)	
Weight		Approx. 1500 g	

-NPN open-collector output rating: 50 mA max. (40 V max.), residual voltage of 1 V max.

-PNP open-collector output rating: 50 mA max. (30 V max.), residual voltage of 1 V max.

-Non-voltage input rating: ON voltage of 1 V max., OFF current of 0.6 mA max.

-Voltage input rating: Input max. voltage 26.4 V, min. ON voltage 10.8 V, OFF current 0.6 mA max.

\*1 Add the current consumption values for all units when connecting the display settings panel and expansion units.

When the LS-9006D or LS-9030D is connected, it counts as two heads.

## Head expansion unit

Model		LS-HA100
No. of connectable sensor heads		2
Head compatibility		Yes
LED display		POWER ON indicator, head status indicator
Analog voltage output		±10 V x 2 outputs Output impedance 100 Ω
Analog current output		4 to 20 mA x 2 outputs Compatible load max. 350 Ω
Power source		Supplied from the controller
Environmental resistance	Ambient temperature	0 to +45°C <b>32 to 113°F</b>
	Relative humidity	20 to 85% RH (no condensation)
Weight		Approx. 600 g

■ OS environment for using the LS-H2 (LS-Navigator 2) Setting Support Software

Item	Required environment
Operating System	Windows 10 <sup>*1</sup> Windows 7 (SP1 or later) <sup>*2</sup> Windows Vista (SP2 or later) <sup>*3</sup> Windows XP (SP3 or later) <sup>*4</sup>
Supported languages	Japanese, English, German, Simplified Chinese, Traditional Chinese
CPU	Core 2 Duo 2 GHz or more
Memory capacity	2 GB or more
L2 cache memory	2 MB or more
Free space in hard disk	10 GB or more
Display	XGA (1024 x 768 pixels) or more, 256 colors or more
Interface	USB Ethernet
	USB 2.0 HI-SPEED supported (USB 1.1 Full-SPEED compatible) <sup>*5</sup> Ethernet 1000BASE-T/100BASE-TX <sup>*6</sup>

If you wish to use the send to Excel function, please check that one of the Excel versions listed below is installed on your computer.

Excel 2010 (32 bit/64 bit), Excel 2007, Excel 2003, Excel 2002

<sup>\*1</sup> Home, Pro, and Enterprise editions are supported.

<sup>\*2</sup> Home Premium, Professional, and Ultimate editions are supported.

<sup>\*3</sup> Ultimate, Business, Home Premium, and Home Basic editions are supported.

<sup>\*4</sup> Professional and Home editions are supported.

<sup>\*5</sup> Connection through a USB hub is not included in the guarantee.

<sup>\*6</sup> Connection to LAN and connection via a router is not included in the guarantee.

■ BCD output unit

Model		CB-BD100
LED display		POWER-ON LED
Output terminal	BCD output <sup>*1</sup>	NPN open-collector output x 4 ports
	Strobe output	NPN open-collector output x 4 outputs
	OUT selection output	NPN open-collector output x 4 outputs
Input terminal	OUT selection input	Non-voltage input x 4 inputs
Power source		Supplied from the controller
Rating	Current consumption	0.16 A max.
Environmental resistance	Ambient temperature	0 to +50°C <b>32 to 122°F</b>
	Relative humidity	20 to 85% RH (no condensation)
Weight		800 g

· Up to 1 unit can be connected to the controller.

· NPN open-collector output rating: 30 mA max. (30 V max.), residual voltage of 0.5 V max.

· Non-voltage input rating: ON voltage of 1 V max., OFF current of 0.6 mA max.

<sup>\*1</sup> Selectable from BCD output (29 bits, signed), binary output (25 bits, negative numbers are represented by the two's complement), and judgment output.

■ PROFINET unit

Model		CB-PN100
Compatible network		PROFINET IO communication
Ethernet	Compliant standards	IEEE 802.3u <sup>*1</sup>
	Transmission speed	100 Mbps, full duplex (100BASE-TX)
	Transmission media	STP or Category 5e or higher UTP
	Maximum cable length	100 m <b>328.1'</b>
PROFINET IO	Supported functions	Data I/O communication Record data communication
	Number of connectable PROFINET IO controllers	1
	Update time	2 ms to 2048 ms
	GSDML	Version 2.25
	Conformance class	Conformance Class A compliant
	Conformance test version	Based on Version 2.2.4
	Applicable protocol	LLDP, DCP
Power supply voltage		24 V ±10% (supplied from the controller unit of the laser scanner)
Current consumption		0.12 A max.
Weight		Approx. 470 g

<sup>\*1</sup> Although this unit conforms to IEEE 802.3u and can establish 100 Mbps full duplex communication using AutoNegotiation function, it does not have AutoCrossOver and AutoPolarity functions that are normally required for the PROFINET IO standard. Select a straight or cross cable according to the Ethernet port of the device to be connected.

■ Display and settings panel



Model		LS-D1000
Display interface	Measured value display	Measured value display: 2 colors, 8 digits, 16 segments OUT number display: Monochrome, 2 digits, 7 segments Tolerance judgment display: HH, HI, GO, LO, LL. Monochrome Control status display: TIM, ZERO indicator. Monochrome
	Program number display	Monochrome, 2 digits, 7 segments
	Position monitor display	1D display: 2 colors, 32 levels 2D display: Monochrome, 7 x 7 matrix display
	Display update cycle	5 times/sec.
Operation input interface		Numeric keypad, function key, lock key timing input key, zero input key, reset input key, escape key, arrow keys (4)
Display and settings panel connection port		2
Power supply		Supplied from the controller
Rating	Current consumption	0.19 A max.
Environmental resistance	Ambient temperature	0 to +50°C <b>32 to 122°F</b>
	Relative humidity	20 to 85% RH (no condensation)
Enclosure rating		IP65 (When panel attached, front surface only)
Weight		Approx. 400 g

■ EtherNet/IP™ unit

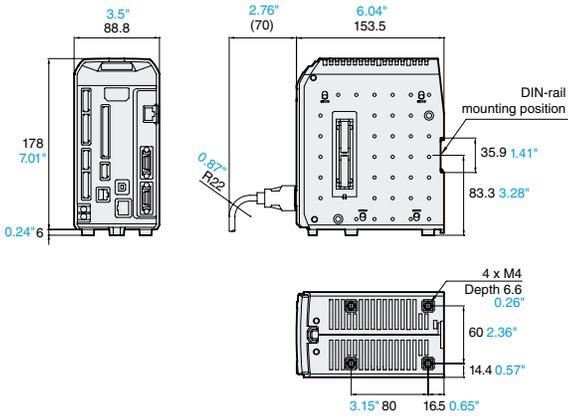
Model		CB-EP100
Compatible network		EtherNet/IP™ and displacement sensor-specific protocols (socket communication)
Ethernet	Compliant standards	IEEE 802.3 (10BASE-T), IEEE 802.3u (100BASE-TX)
	Transmission speed	10 Mbps (10BASE-T), 100 Mbps (100BASE-TX)
	Transmission media	STP or Category 3 or higher UTP (10BASE-T), STP or Category 5 or higher UTP (100BASE-TX)
	Maximum cable length	100 m <b>328.1'</b> (Distance between the unit and Ethernet switch)
	Maximum number of connectable hubs <sup>*1</sup>	4 hubs (10BASE-T), 2 hubs (100BASE-TX)
EtherNet/IP™	Supported functions	Cyclic communication (Implicit messaging), Message communication (Explicit messaging), Compatible with UCMM and Class 3
	Number of connections	64
	RPI	0.5 ms to 10000 ms (in 0.5 ms)
	Tolerable communication bandwidth for cyclic communication	6000 pps
	Message communication	UCMM, Class 3
Conformance test		Compatible with Version A9
Power supply voltage		24 VDC ±10%, including ripple (P-P) (supplied from the controller unit of the laser scanner)
Current consumption		0.12 A max.
Environmental resistance	Ambient temperature	0 to +50°C <b>32 to 122°F</b>
	Relative humidity	20 to 85% RH (no condensation)
Weight		Approx. 470 g

<sup>\*1</sup> The number of connectable hubs is not limited when using a switching hub.

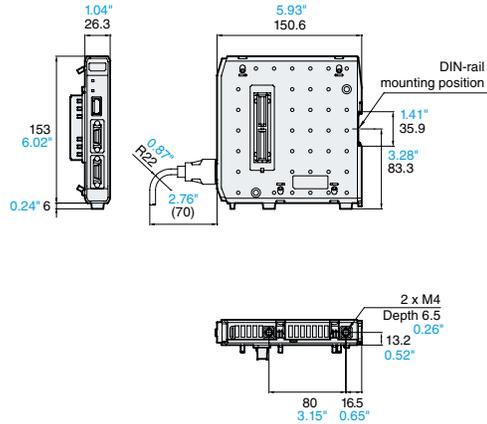




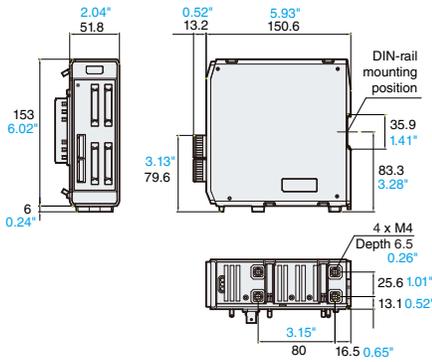
**LS-9501/LS-9501P**



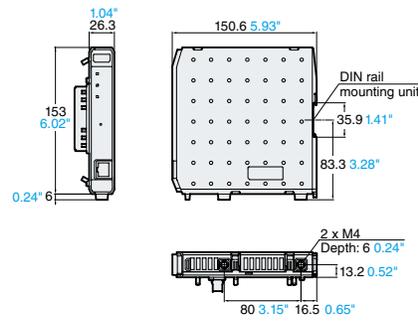
**LS-HA100**



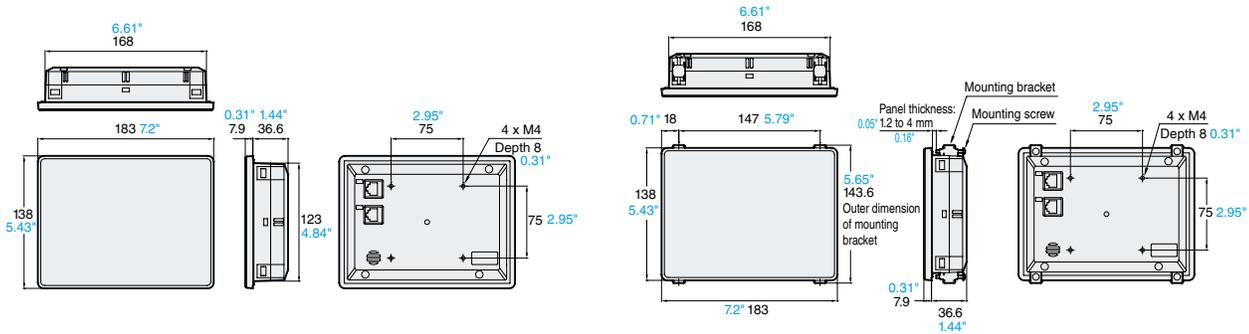
**CB-BD100**



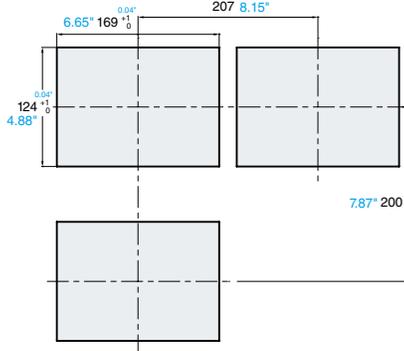
**CB-EP100/CB-PN100**



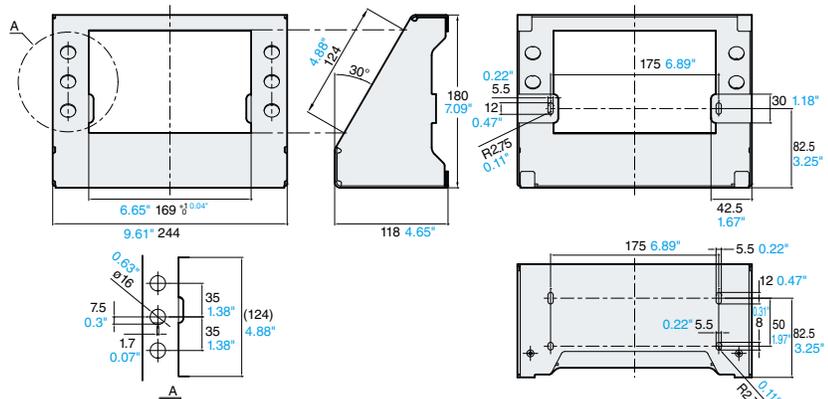
**LS-D1000**



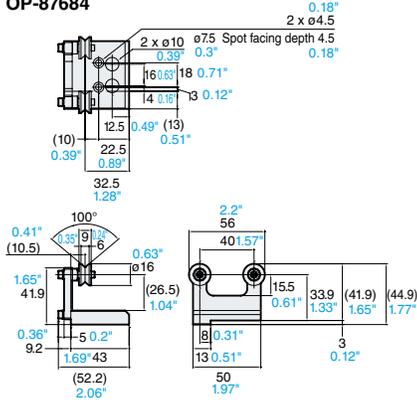
**Panel cutout dimensions**



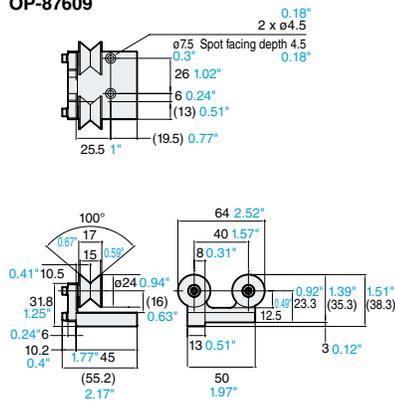
**OP-87610**



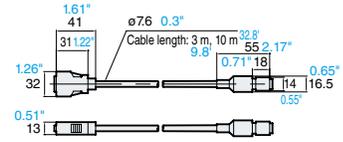
OP-87684



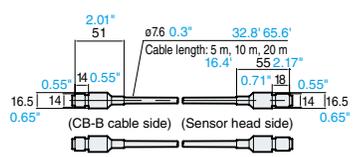
OP-87609



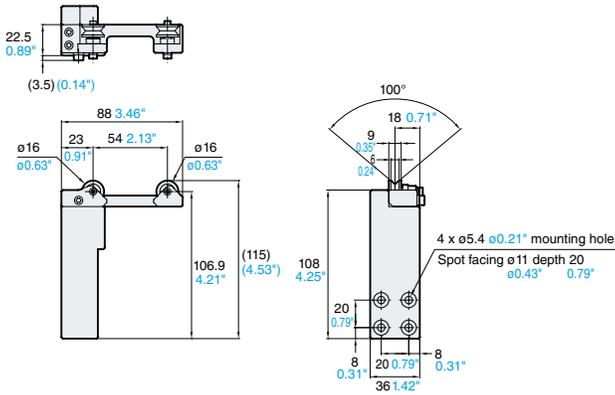
CB-B3/CB-B10



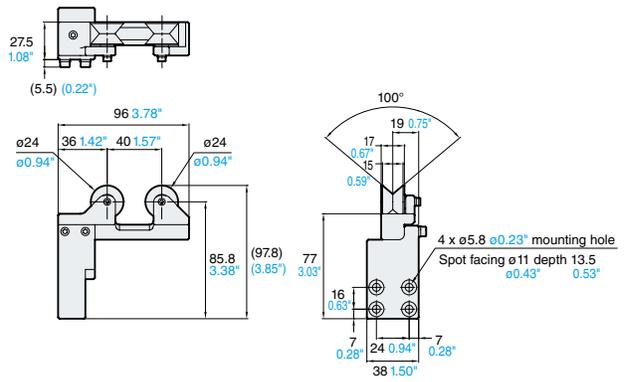
CB-B5E/CB-B10E/CB-B20E



OP-87750



OP-87749

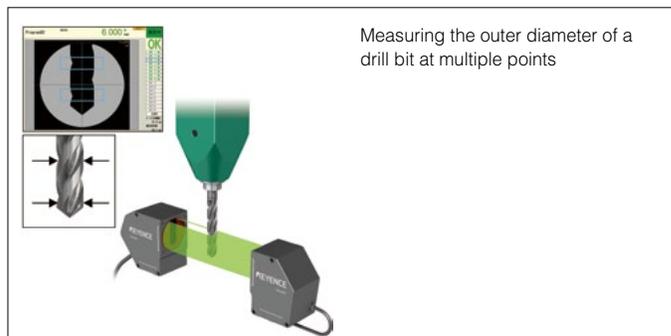
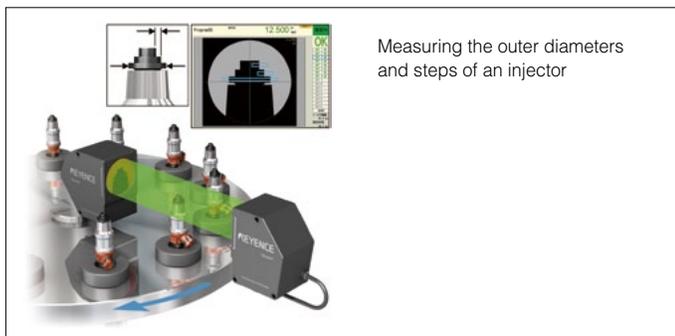
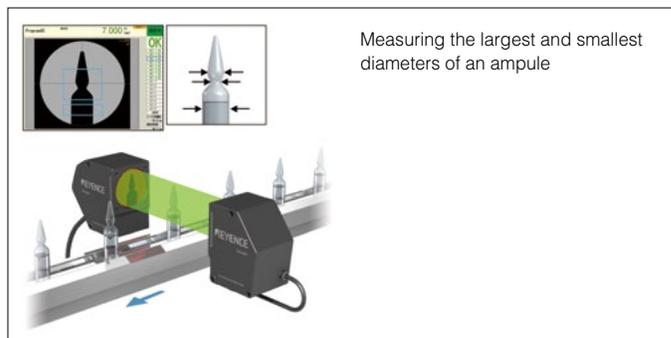
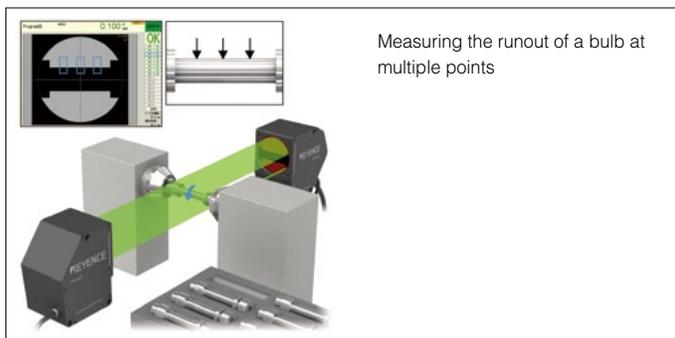


# SIMULTANEOUS MEASUREMENT OF OUTER DIAMETERS AND EDGES AT MULTIPLE POINTS



High-speed  
2D measurement sensor  
**TM-3000 Series**

## APPLICATIONS



\*Corporate names and brand names are the trademarks and registered trademarks of the companies.

# DISPLACEMENT METER/DIMENSION MEASUREMENT SYSTEM LINEUP

## Reflective-Type Measurement Instrument

### High-Speed, High-Accuracy CMOS Laser Displacement Sensor

LK-G5000 Series

HIGH-SPEED

WIDE RANGE

12 SENSOR HEADS CONNECTION



### Surface Scanning Laser Confocal Displacement Meter

LT-9000 Series

HIGH-ACCURACY

DOUBLE-SCANNING

CLEAR TARGET THICKNESS



### High-speed 2D/3D Laser Scanner

LJ-V7000 Series

2D/3D

MULTI POINT

HIGH-SPEED

PROFILES



## Thrubeam-Type Measurement Instrument

### High-speed Optical Micrometer

LS-9000 Series

GREEN LED

LONG LIFE

HIGH-ACCURACY

HIGH-SPEED



### High-speed 2D Measurement Sensor

TM Series

2D

MULTI POINT



# KEYENCE

CALL TOLL FREE TO CONTACT YOUR LOCAL OFFICE  
**1-888-KEYENCE**  
1 - 8 8 8 - 5 3 9 - 3 6 2 3

[www.keyence.com](http://www.keyence.com)



#### SAFETY INFORMATION

Please read the instruction manual carefully in order to safely operate any KEYENCE product.

#### GLOBAL NETWORK

CONTACT YOUR NEAREST OFFICE FOR RELEASE STATUS.

#### KEYENCE CORPORATION OF AMERICA

**Head Office** 500 Park Boulevard, Suite 200, Itasca, IL 60143, U.S.A. PHONE: +1-201-930-0100 FAX: +1-855-539-0123 E-mail: [keyence@keyence.com](mailto:keyence@keyence.com)

<b>AL</b> Birmingham	<b>CA</b> San Jose	<b>CO</b> Denver	<b>IL</b> Chicago	<b>MI</b> Detroit	<b>MO</b> St. Louis	<b>NC</b> Raleigh	<b>PA</b> Philadelphia	<b>TN</b> Nashville	<b>WI</b> Milwaukee
<b>AR</b> Little Rock	<b>CA</b> Cupertino	<b>FL</b> Tampa	<b>IN</b> Indianapolis	<b>MI</b> Grand Rapids	<b>NJ</b> Elmwood Park	<b>OH</b> Cincinnati	<b>PA</b> Pittsburgh	<b>TX</b> Austin	
<b>AZ</b> Phoenix	<b>CA</b> Los Angeles	<b>GA</b> Atlanta	<b>KY</b> Louisville	<b>MN</b> Minneapolis	<b>NY</b> Rochester	<b>OH</b> Cleveland	<b>SC</b> Greenville	<b>TX</b> Dallas	
<b>CA</b> San Francisco	<b>CA</b> Irvine	<b>IA</b> Iowa	<b>MA</b> Boston	<b>MO</b> Kansas City	<b>NC</b> Charlotte	<b>OR</b> Portland	<b>TN</b> Knoxville	<b>WA</b> Seattle	

#### KEYENCE CANADA INC.

**Head Office** PHONE: +1-905-366-7655 FAX: +1-905-366-1122 E-mail: [keyencecanada@keyence.com](mailto:keyencecanada@keyence.com)  
**Montreal** PHONE: +1-514-694-4740 FAX: +1-514-694-3206 Windsor PHONE: +1-905-366-7655 FAX: +1-905-366-1122

#### KEYENCE MEXICO S.A. DE C.V.

PHONE: +52-55-8850-0100 FAX: +52-81-8220-9097  
E-mail: [keyencemexico@keyence.com](mailto:keyencemexico@keyence.com)

The information in this publication is based on KEYENCE's internal research/evaluation at the time of release and is subject to change without notice. Company and product names mentioned in this catalog are either trademarks or registered trademarks of their respective companies. The specifications are expressed in metric units. The English units have been converted from the original metric units.

Copyright (c) 2014 KEYENCE CORPORATION. All rights reserved.

KA1-1116

LS9-KA-C2-US 1126-8 611847