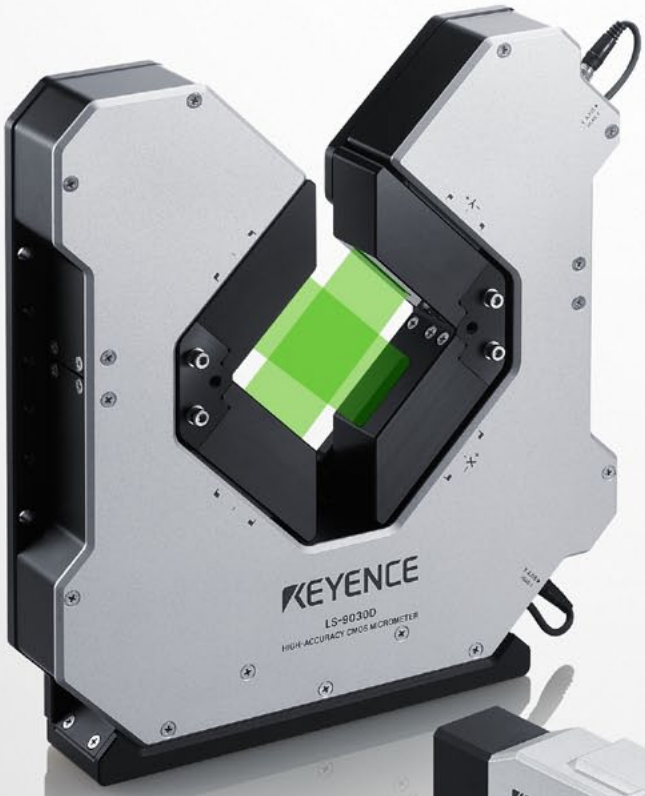
KEYENCE

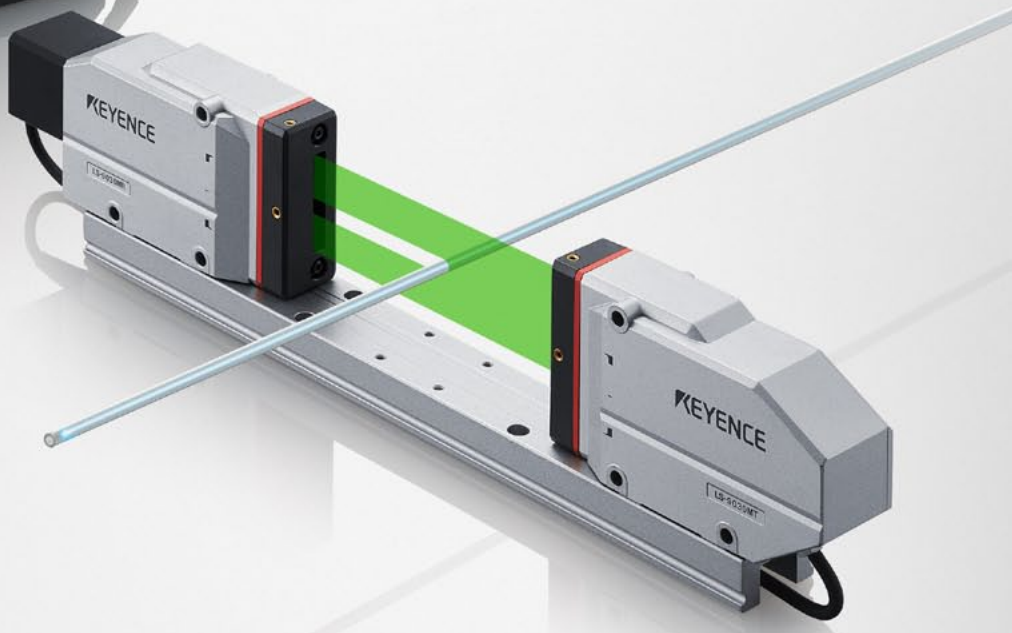
High-speed optical micrometer
LS-9000 Series

CE



Fastest in its class

16,000 Hz
sampling rate



A NEW HIGH PRECISION MICROMETER SYSTEM

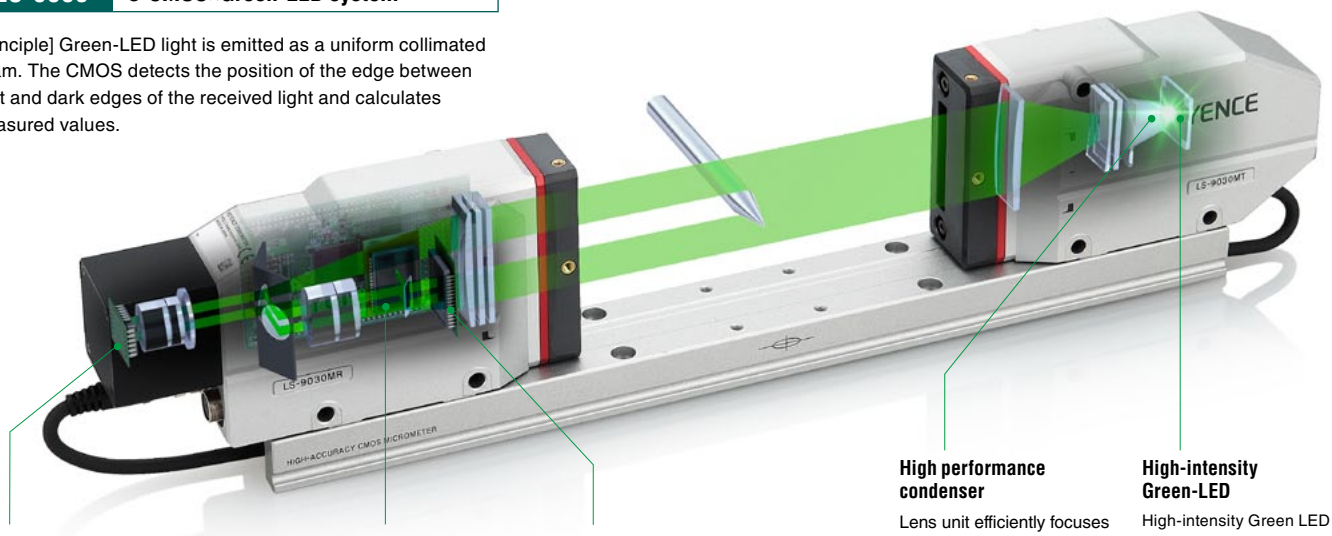
AUTOMATICALLY CORRECTS FOR TARGET MISALIGNMENT AND VIBRATION

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×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.



Monitor CMOS
The Monitor CMOS tracks workpiece inclination to automatically correct for tilt errors.

Target Position CMOS
The CMOS measures the position between the transmitter and receiver

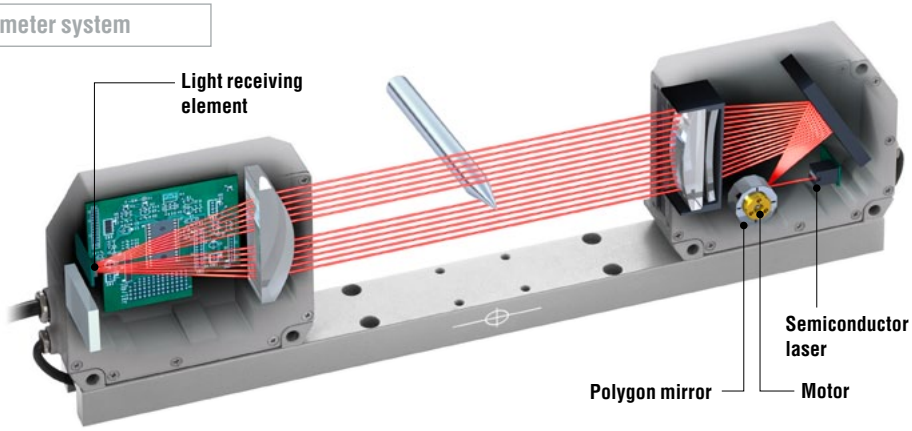
High-speed exposure CMOS
Proprietary designed measurement CMOS features an integrated amplifier to maximize performance and speed.

High performance condenser
Lens unit efficiently focuses LED light

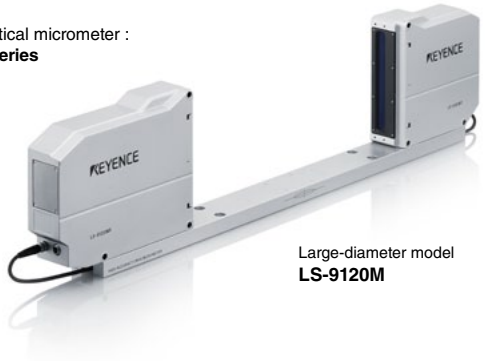
High-intensity Green-LED
High-intensity Green LED lasts longer than traditional LED light sources while providing high intensity and evenly-distributed lighting.

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**



Large-diameter model
LS-9120M

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.

* LS-5000 Series

Target alignment and vibration cause errors

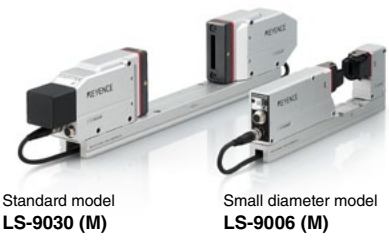
Could not recognize tilting of the target due to only having one source of measurement data. Vibration in the target could also cause errors in the scan that lead to incorrect values.

Moving parts deteriorate

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

2-axis standard model
LS-9030D

2-axis small-diameter model
LS-9006D



Standard model
LS-9030 (M)

Small diameter model
LS-9006 (M)

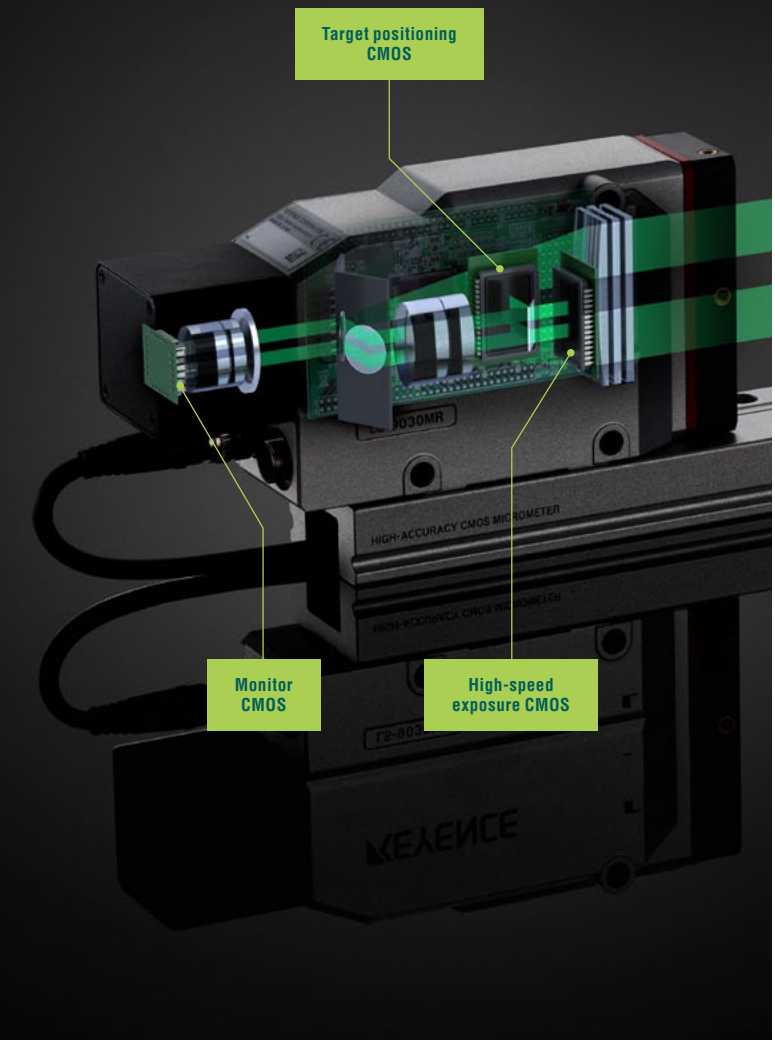
Display and settings panel
LS-D1000

Controller
LS-9501 (P)

Enhanced speed and accuracy

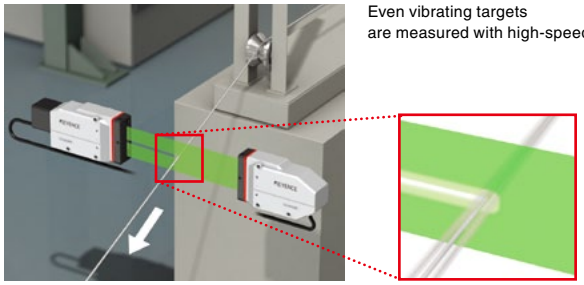
3-CMOS System

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.

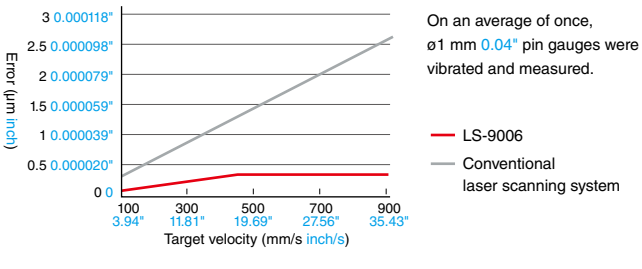


High-speed CMOS

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". Even parts that vibrate at high speeds can be measured stably.

Error in relation to vibrating workpieces

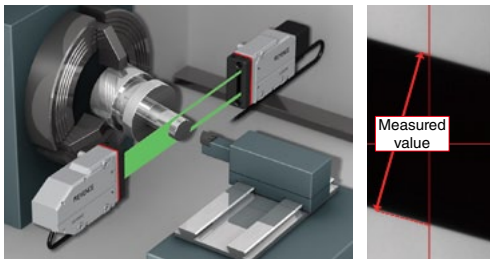


Even misaligned parts are measured stably

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

Measuring the outer diameter of a shaft

Misaligned workpieces are adjusted and measured

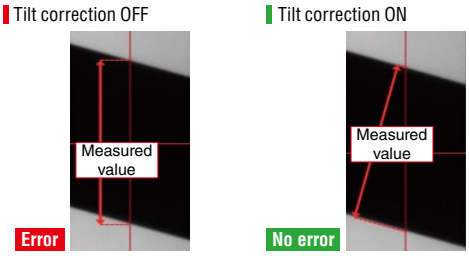


Monitor CMOS

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.

Monitor image

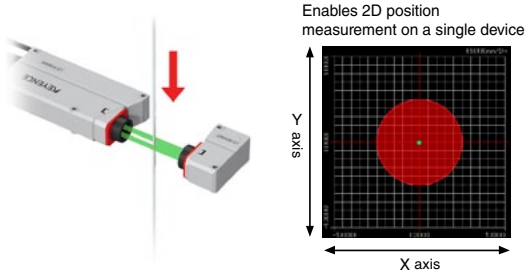


*1 Functions of the LS-9006M and LS-9030M heads only.

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.

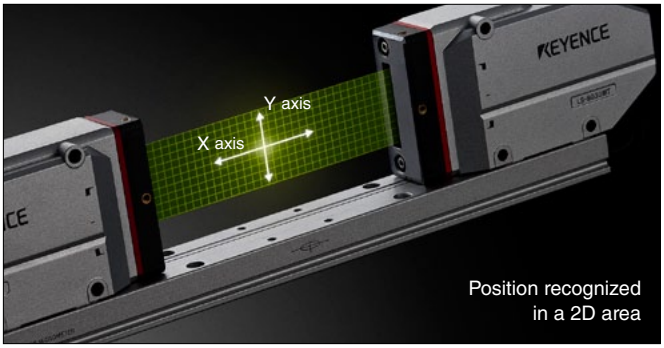
Measuring the position and outer diameter of an optic fiber



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.

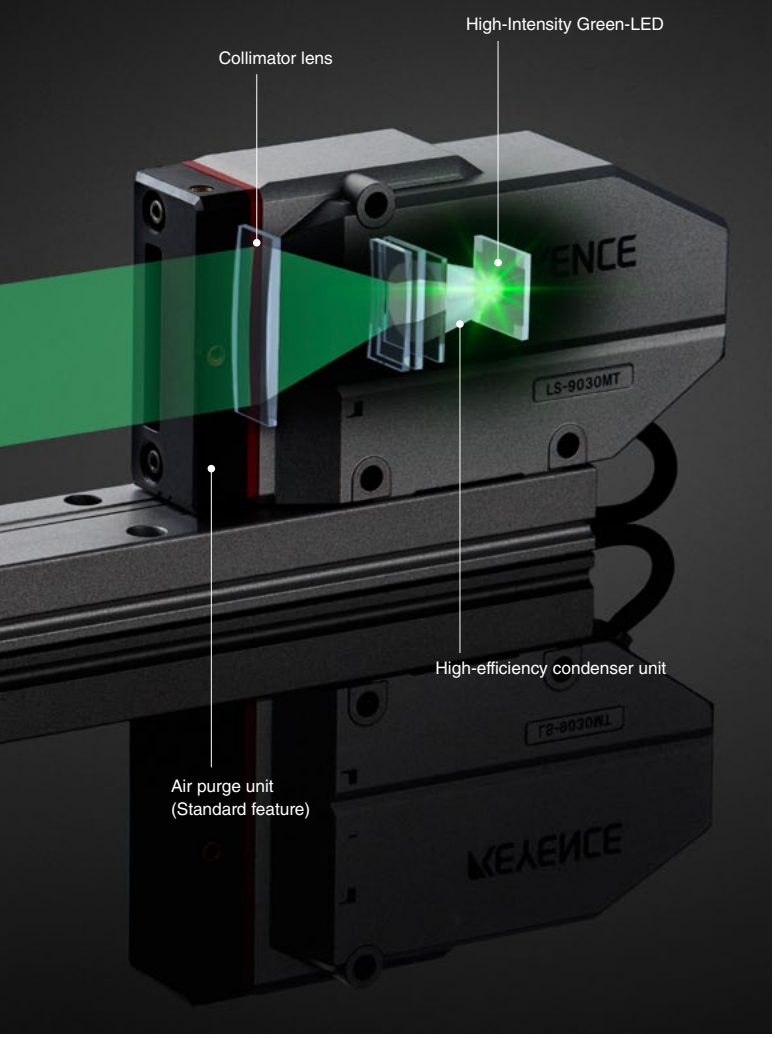


*2 Functions of the LS-9006 (M) and LS-9030 (M) heads only.

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.

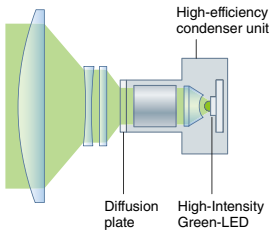
	LS-9000 Series	Existing systems
Motor durability	✓	×
Light source durability	✓	×

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

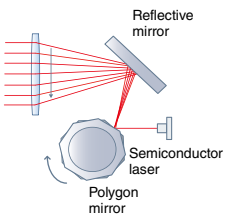
Our proprietary wear-free construction

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.

The LS-9000 transmitter construction (No moving parts)

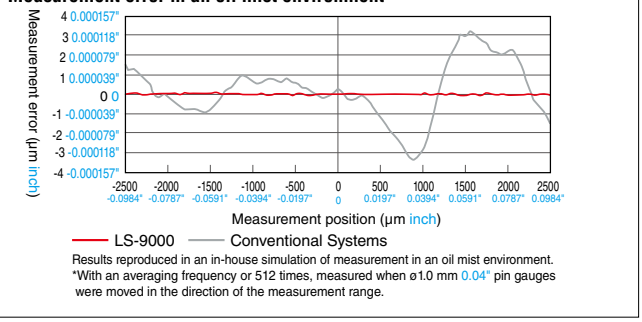


The laser scanning system transmitter construction



Stable measurements in harsh environments

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



Results reproduced in an in-house simulation of measurement in an oil mist environment.
*With an averaging frequency or 512 times, measured when ø1.0 mm 0.04" pin gauges were moved in the direction of the measurement range.

IP67 construction + air purge unit

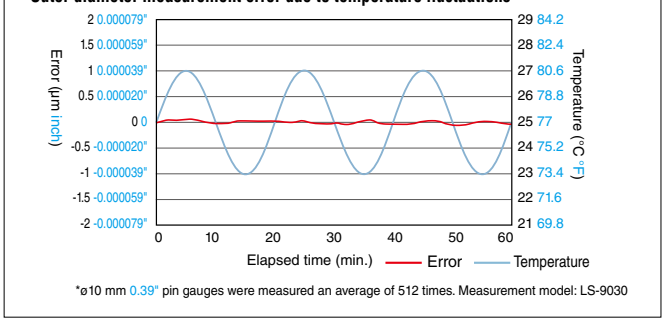
Best in class environmental resistance design*

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.



*ø10 mm 0.39" pin gauges were measured an average of 512 times. Measurement model: LS-9030

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

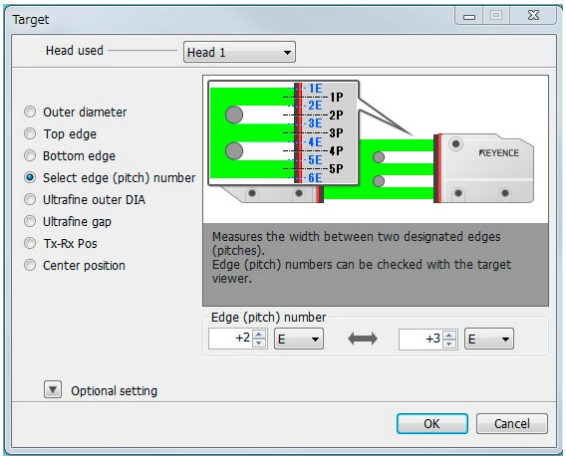
- Setting each device separately is time-consuming
- Original settings are easily lost
- Controller setup is complicated and hard to understand
- Difficult to verify measurement setup
- Needs a separate recorder to save data

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

Easy setting and backup

Easy visual setting

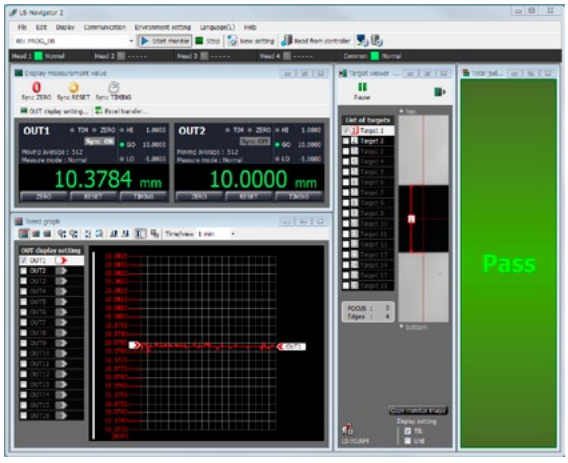
Measurement details can be selected from a picture, so settings are simple, even for a novice. Setting details are stored on the computer as backup files.



Customize your display

Multifunction measurement display

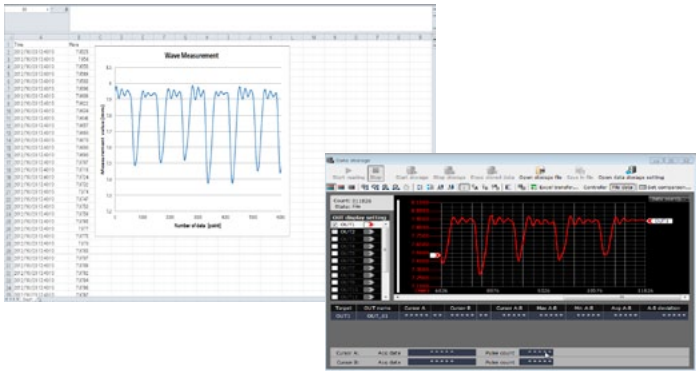
Support software features 12 independent display tools that let you customize your display. View any and all the information you need on a single screen to maximize efficiency.



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

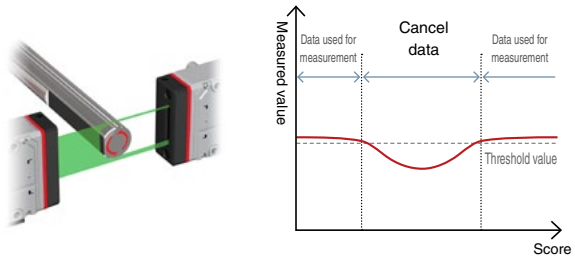
With up to 16 simultaneous outputs, it is possible to measure any combination of diameters, position, gaps, etc. to meet your needs.

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.

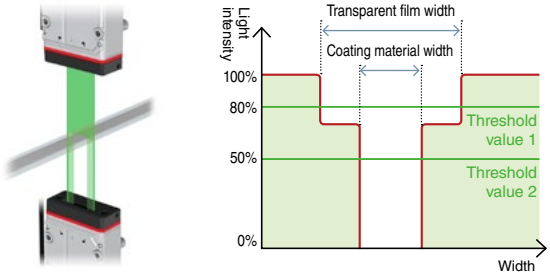
Measuring the outer diameter of a motor shaft



Transparent object/ two-level edge detection threshold value setting

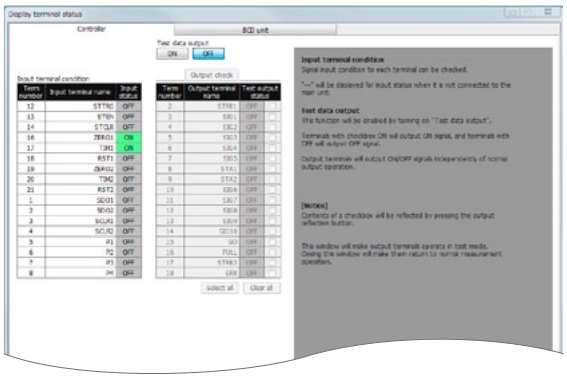
Using two-level threshold settings, it is possible to simultaneously measure two targets of differing transparency.

Taking dimensional measurements of transparent film and coating material



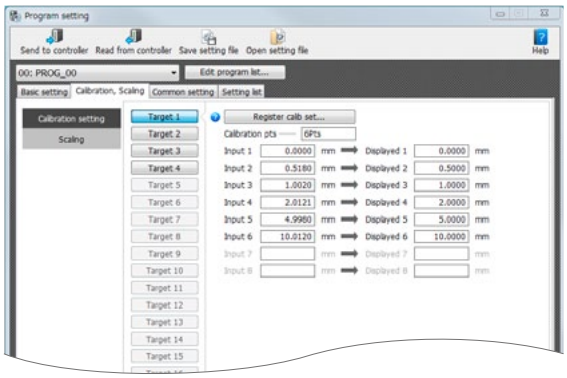
Terminal operation monitoring

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



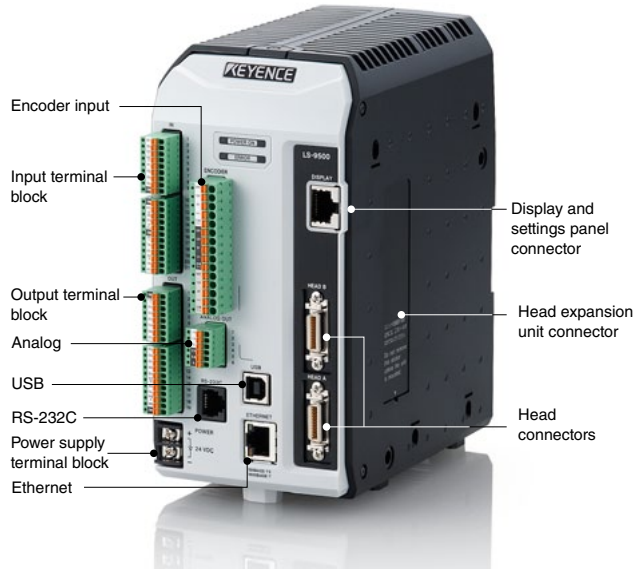
Multi-point calibration

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



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	**LS-9501**
PNP output type	**LS-9501P**

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)

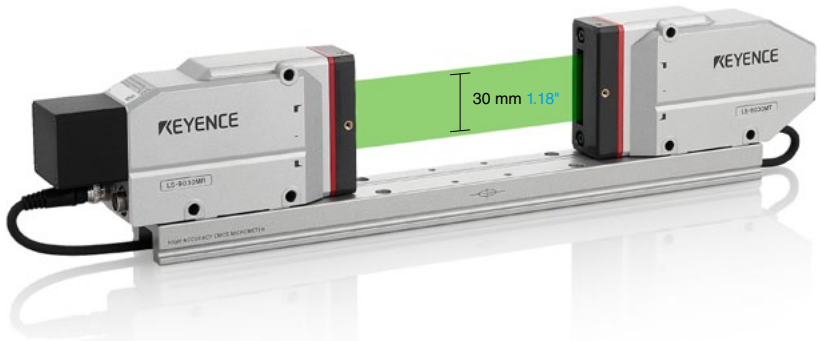
40 m 131.2' extension connection unit
CB-BR01

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"

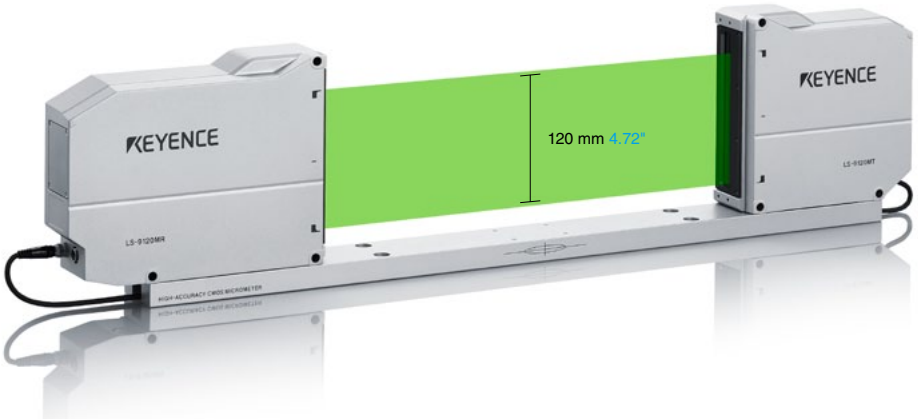
Precise measurement of small diameter workpieces

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 × 4 mm 0.08" × 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 × 20 mm 0.39" × 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)

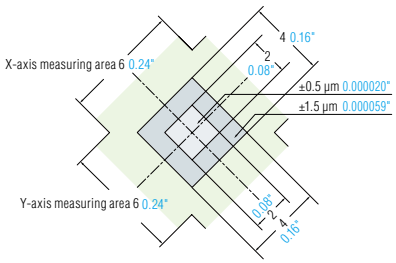
Model		LS-9006D	LS-9030D
Measurement range		ø0.04 mm to ø6 mm ø0.001" to ø0.24"	ø0.3 mm to ø30 mm ø0.01" to ø1.18"
Smallest detectable object		0.04 mm 0.001"	0.3 mm 0.01"
Repeatability		±0.03 µm*1	±0.1 µm 0.000004"*2
Measurement accuracy		±0.5 µm 0.000020"*3	±2 µm 0.000079"*4
Sampling cycle*5		16000 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 × 2 mm 0.08" × 0.08" measurement area.
*4 Margin of error when a moving ø10 mm ø0.39" rod is measured in the 10 mm × 10 mm 0.39" × 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

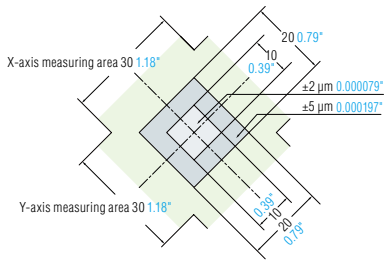
LS-9006D

Unit: mm inch



LS-9030D

Unit: mm inch



Head (Large-diameter model)

Model		LS-9120M
Measurement range		0.8 mm to 120 mm 0.03" to 4.72"
Smallest detectable object		0.8 mm 0.03"
Transmitter/receiver distance		400 ±100 mm 15.75" ±3.94"
Repeatability		±0.3 µm 0.000012"*1
Measurement accuracy		±8 µm 0.000315"*2
Sampling cycle		16000 samples/sec.
Light source		InGaN green LED
Monitor camera		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	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		
	Statistics 1, 2 input		
	Statistics clear 1, 2 input		
	Program selection input	Non-voltage input x 4 inputs	Voltage input x 4 inputs
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 32 to 122°F When LS-HA100 in use: 0 to +45°C 32 to 113°F	
	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 32 to 113°F
	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*1 Windows 7 (SP1 or later)*2 Windows Vista (SP2 or later)*3 Windows XP (SP3 or later)*4
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	USB 2.0 HI-SPEED supported (USB 1.1 Full-SPEED compatible)*5
	Ethernet	Ethernet 1000BASE-T/100BASE-TX*6

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

*1 Home, Pro, and Enterprise editions are supported.
*2 Home Premium, Professional, and Ultimate editions are supported.
*3 Ultimate, Business, Home Premium, and Home Basic editions are supported.
*4 Professional and Home editions are supported.
*5 Connection through a USB hub is not included in the guarantee.
*6 Connection to LAN and connection via a router is not included in the guarantee.

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 32 to 122°F
	Relative humidity	20 to 85% RH (no condensation)
Enclosure rating		IP65 (When panel attached, front surface only)
Weight		Approx. 400 g

BCD output unit

Model		CB-BD100
LED display		POWER-ON LED
Output terminal	BCD output *1	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 32 to 122°F
	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.
*1 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*1
	Transmission speed	100 Mbps, full duplex (100BASE-TX)
	Transmission media	STP or Category 5e or higher UTP
	Maximum cable length	100 m 328.1'
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

*1 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.

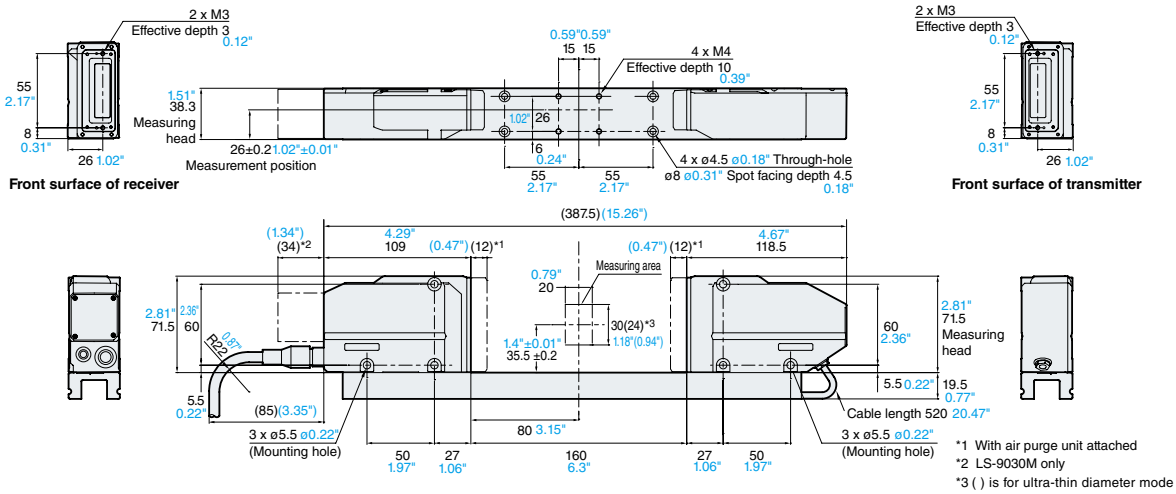
EtherNet/IP™ unit

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 328.1' (Distance between the unit and Ethernet switch)
	Maximum number of connectable hubs*1	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 32 to 122°F
	Relative humidity	20 to 85% RH (no condensation)
Weight		Approx. 470 g

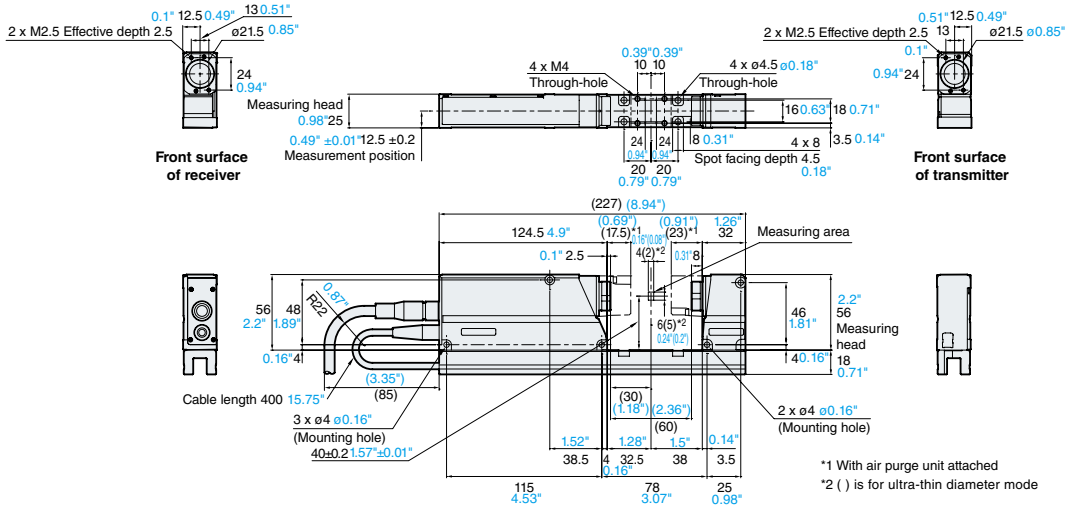
*1 The number of connectable hubs is not limited when using a switching hub.

Unit: mm inch

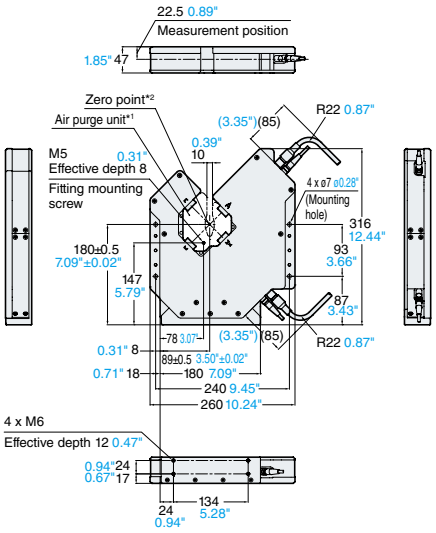
LS-9030/LS-9030M



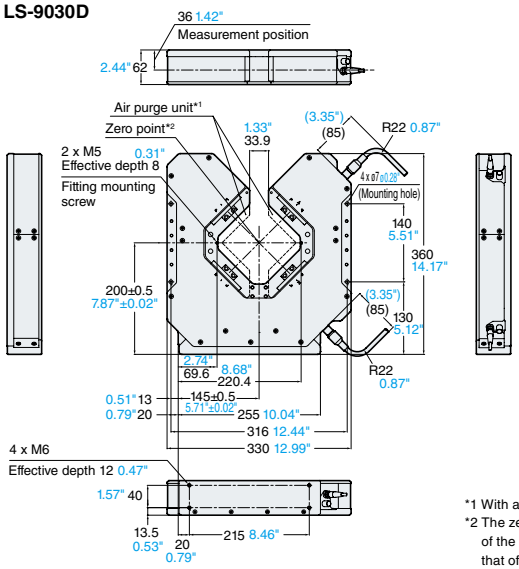
LS-9006/LS-9006M



LS-9006D

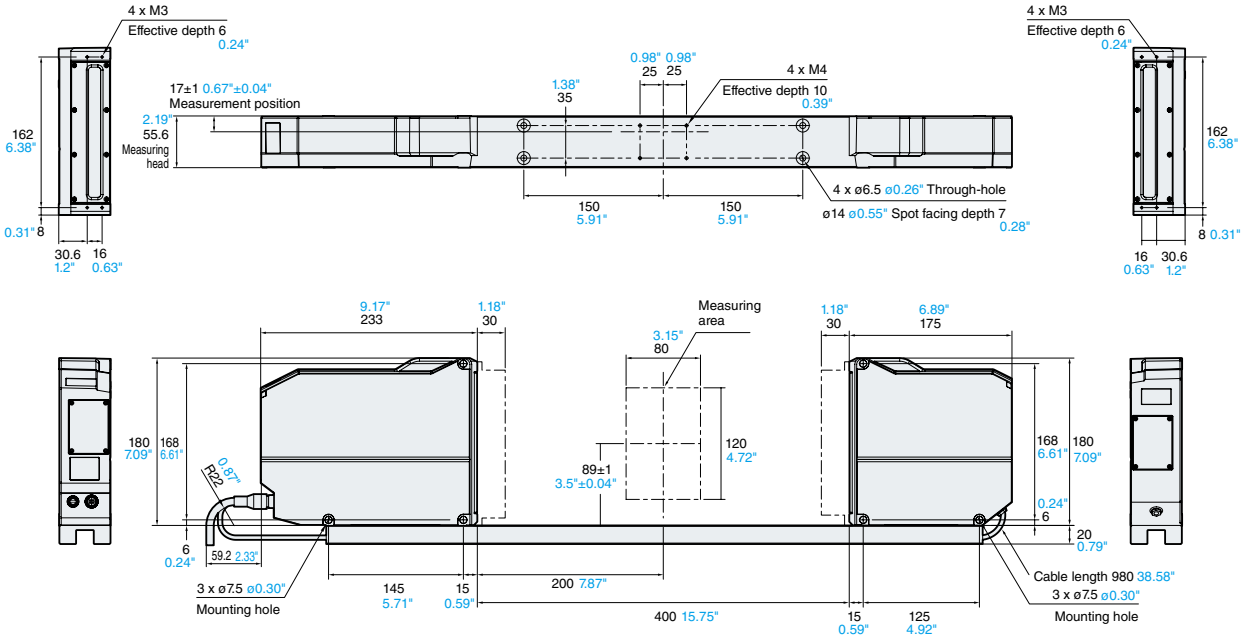


LS-9030D

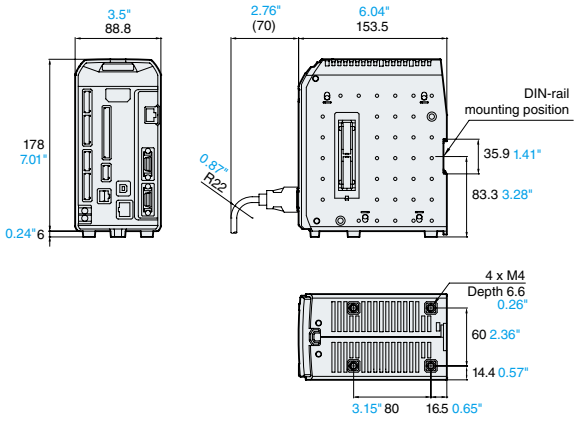


*1 With air purge unit attached
*2 The zero point represents the intersection of the optical axis center of X-axis head and that of the Y-axis head.

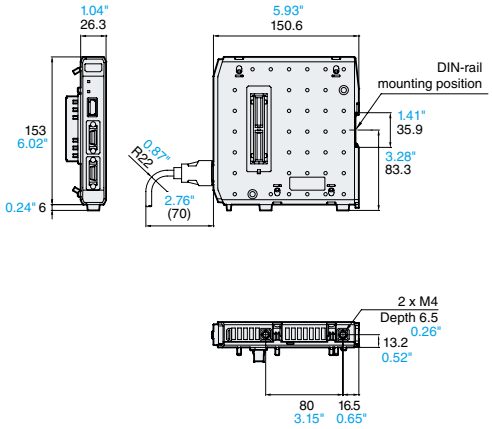
LS-9120M



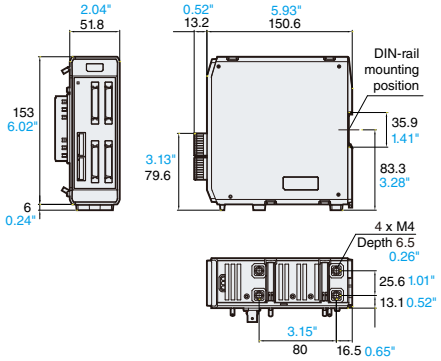
LS-9501/LS-9501P



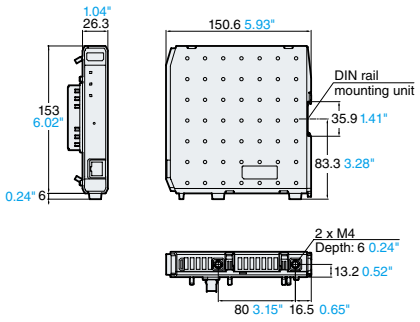
LS-HA100



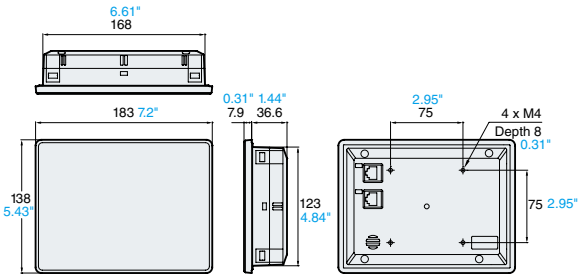
CB-BD100



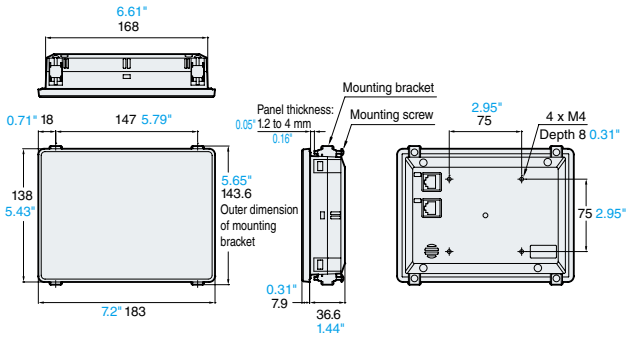
CB-EP100/CB-PN100



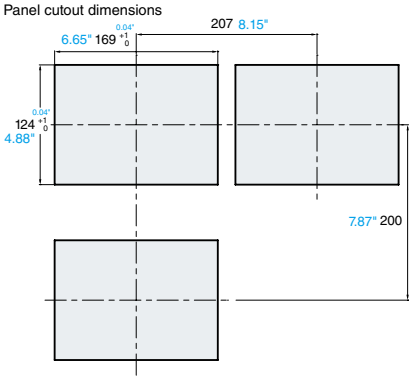
LS-D1000



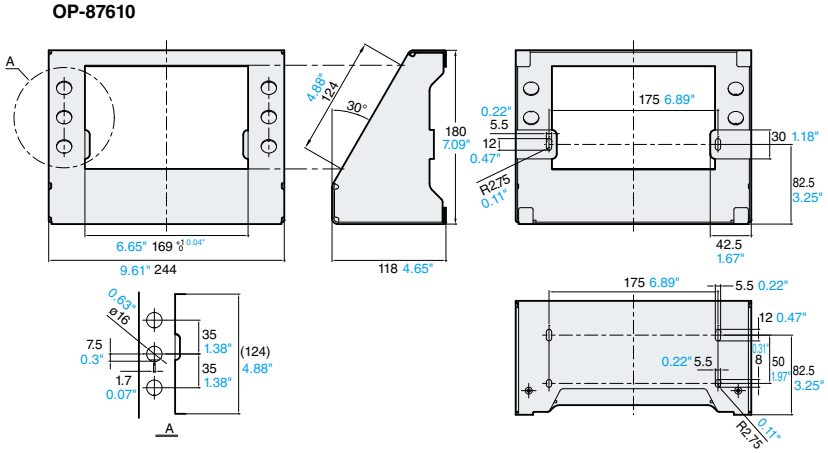
With mounting bracket attached



Panel cutout dimensions

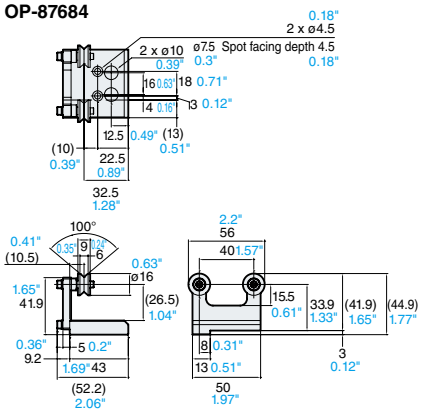


OP-87610

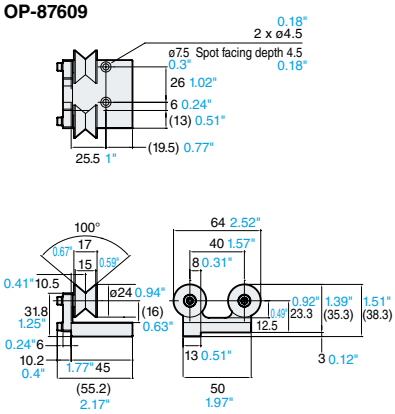


Unit: mm inch

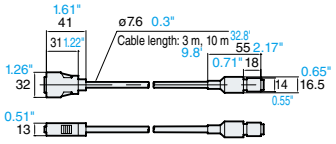
OP-87684



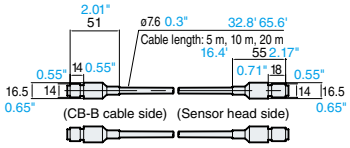
OP-87609



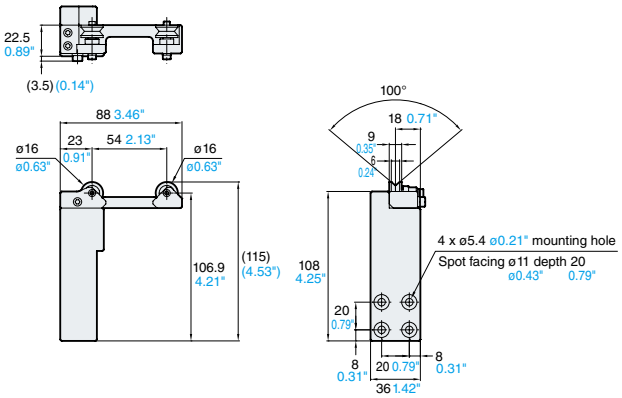
CB-B3/CB-B10



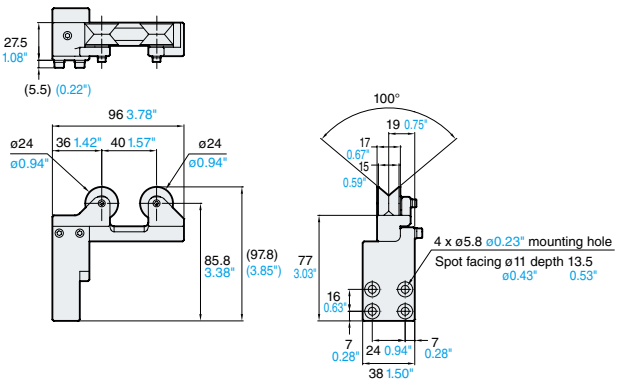
CB-B5E/CB-B10E/CB-B20E



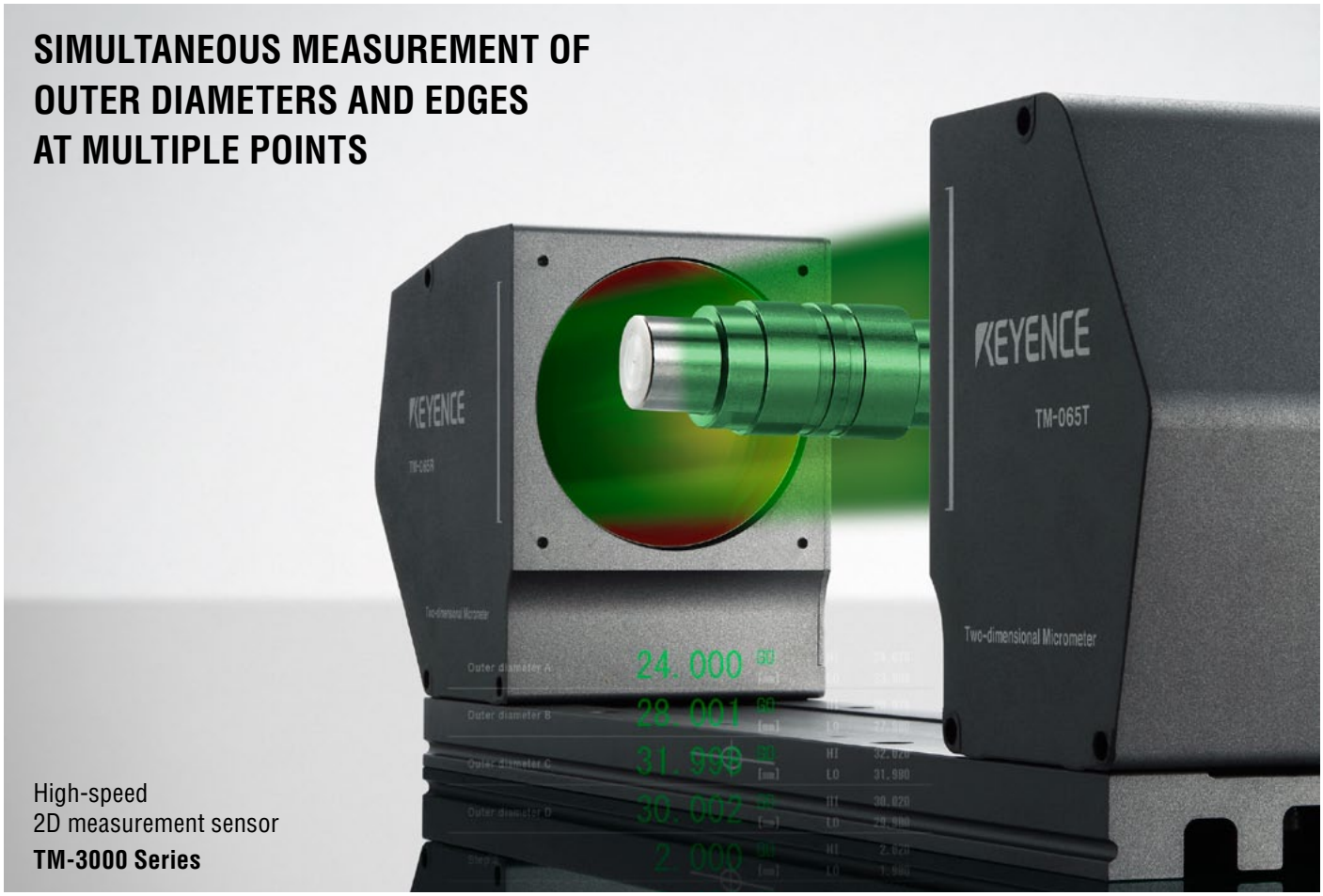
OP-87750



OP-87749



SIMULTANEOUS MEASUREMENT OF OUTER DIAMETERS AND EDGES AT MULTIPLE POINTS



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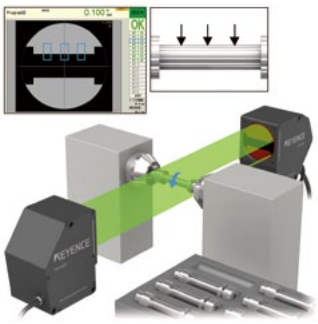
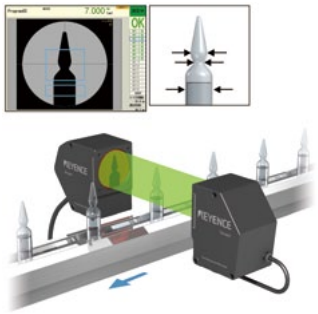
TM-3000 Series

APPLICATIONS

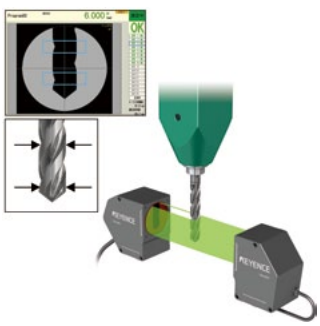


Measuring the runout of a bulb at multiple points



Measuring the largest and smallest diameters of an ampule

Measuring the outer diameters and steps of an injector



Measuring the outer diameter of a drill bit at multiple points

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