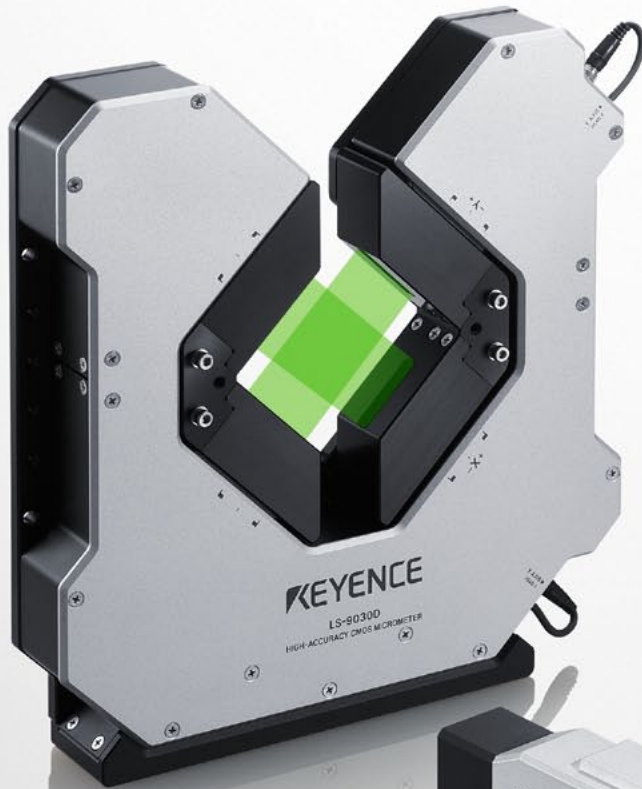


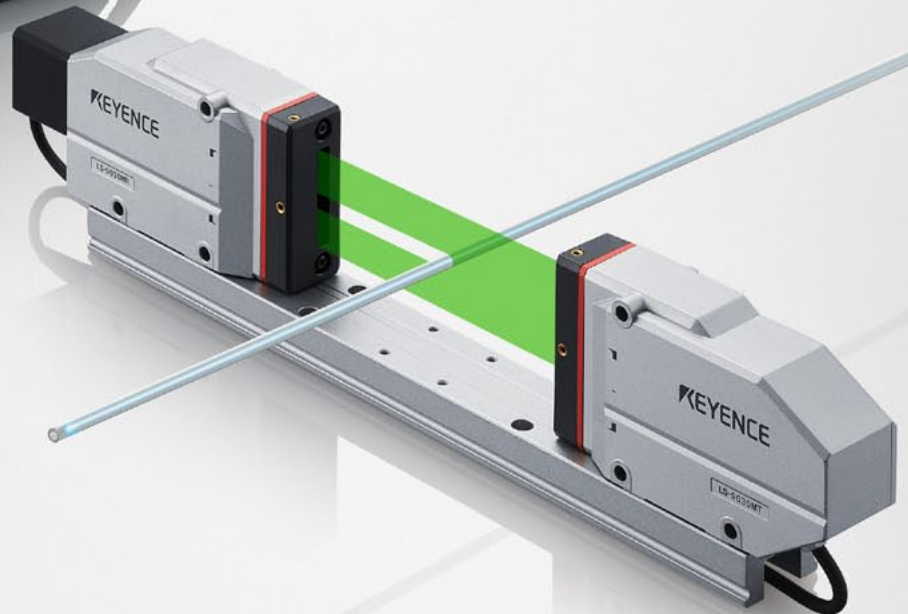
KEYENCE

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

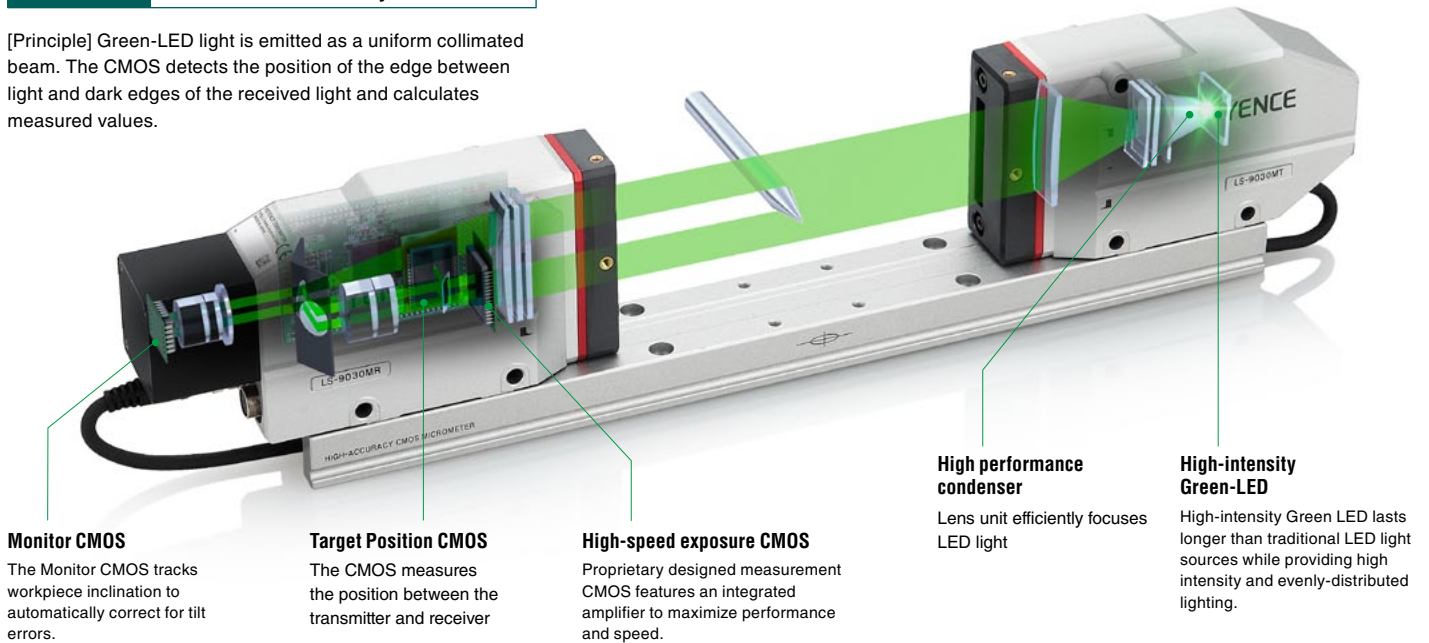
LS-9000 Series

Compare against existing technology

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

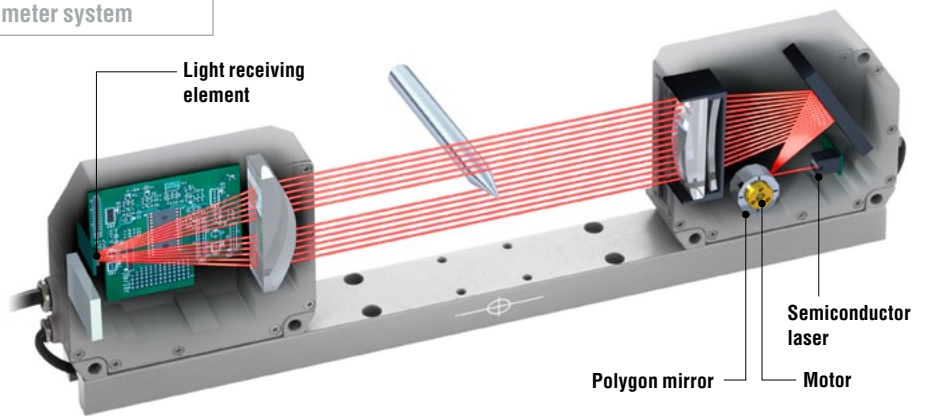
LS-9000 3-CMOS x Green-LED system

[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

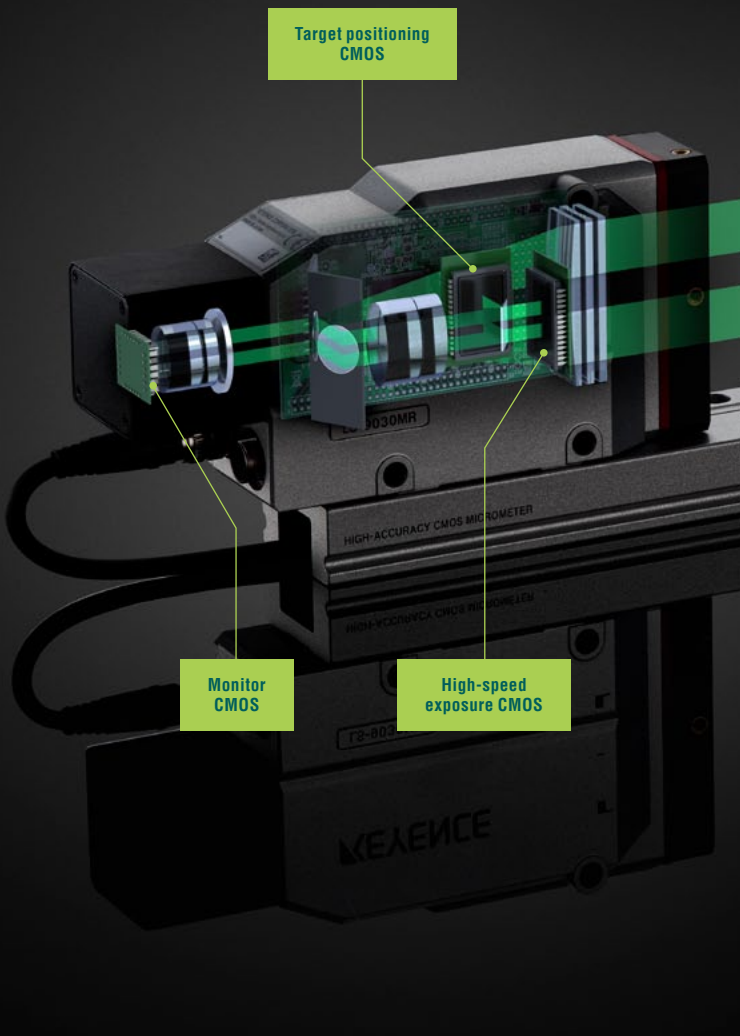


Controller
LS-9501 (P)

Enhanced speed and accuracy

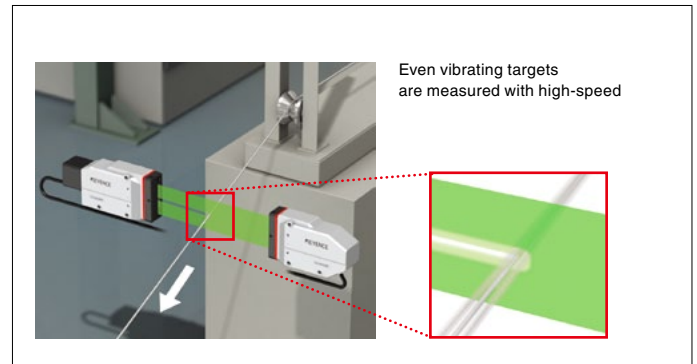
3-CMOS System

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.

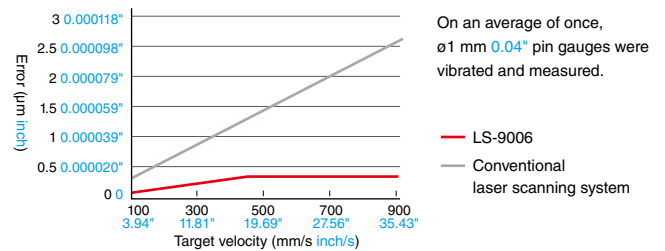


High-speed CMOS

16000 Hz sampling

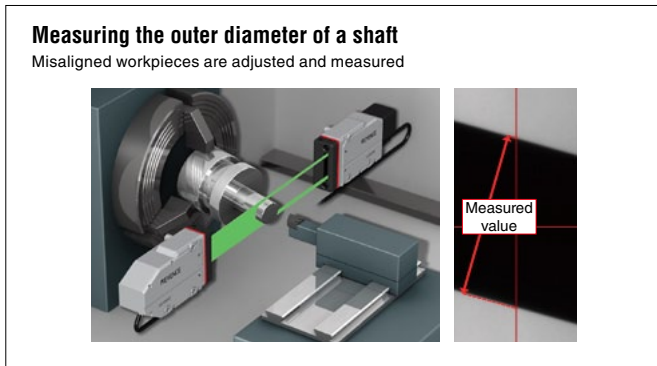
By integrating the peripheral circuits of the measurement CMOS into one chip, the S/N ratio has been dramatically improved and high-speed sampling achieved. For example, targets that move at 1000 m/min. can be measured at a pitch of around 1 mm 0.04° . Even parts that vibrate at high speeds can be measured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

Error in relation to vibrating workpieces



Even misaligned parts are measured stably

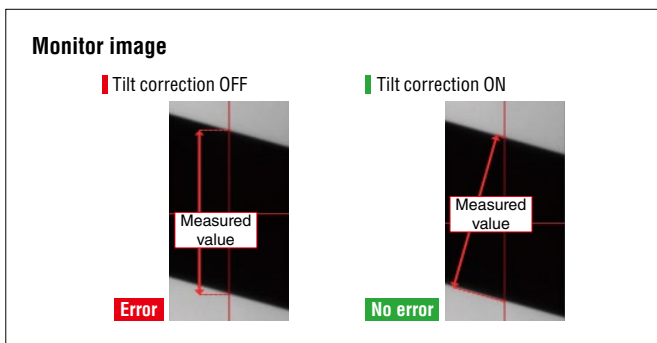
The target monitor CMOS recognizes the orientation of the part and adjusts the measured value so there are no measurement errors due to inclination.



Monitor CMOS

Alignment adjustment*1

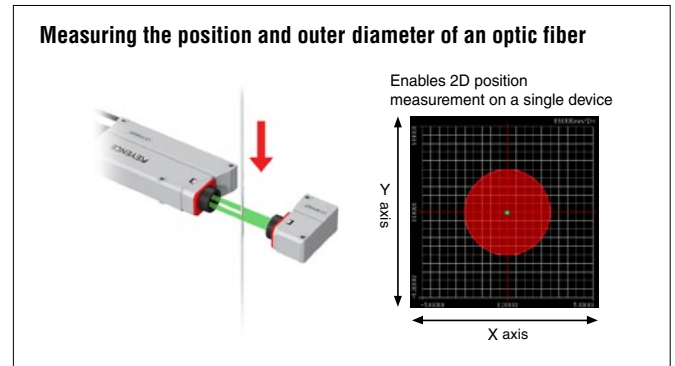
Recognizes the misalignment of a workpiece from the image taken by the monitor CMOS. Inclination error is removed automatically and does not affect the measurement result. The captured image can also be checked with computer software so even novices will have no problem taking measurements.



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

Two axis target position indicator

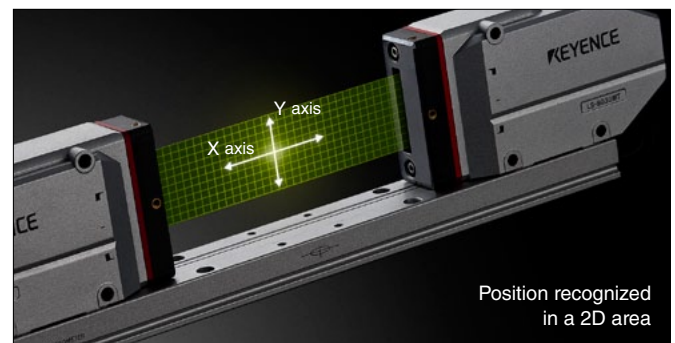
The LS-9000 can use the target positioning CMOS receiver to determine the location of the measurement target in two axes. This makes installation and part position feedback simple, even with a single axis system.



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.

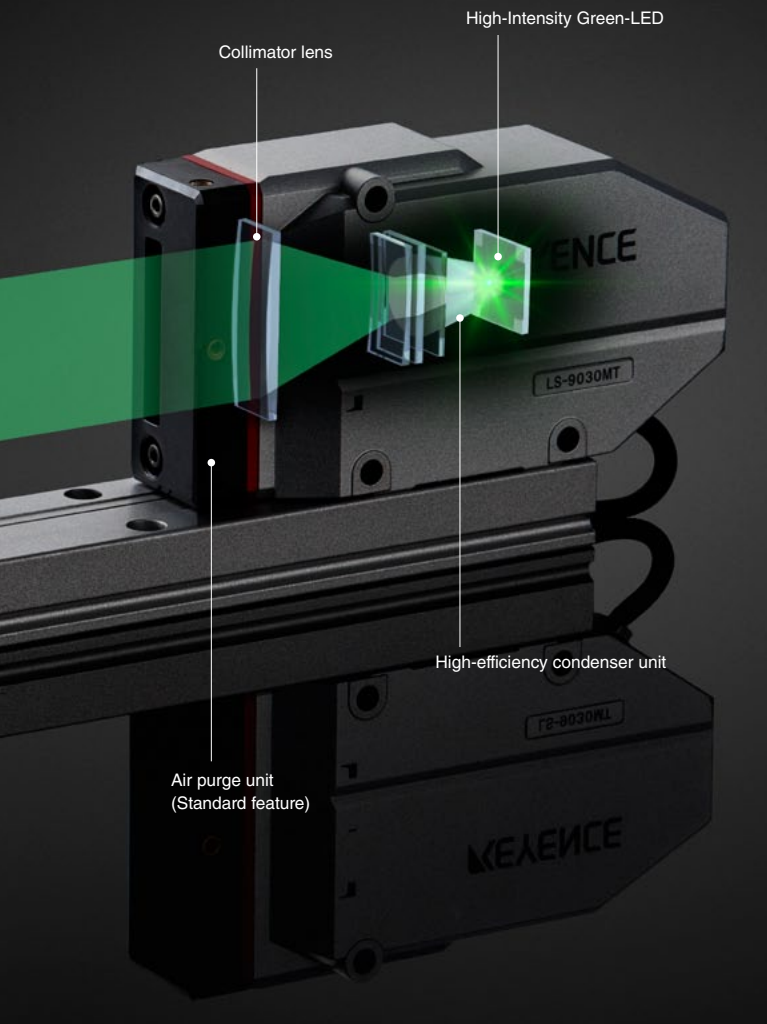


*2 Functions of the LS-9006 (M) and LS-9030 (M) heads only.

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.

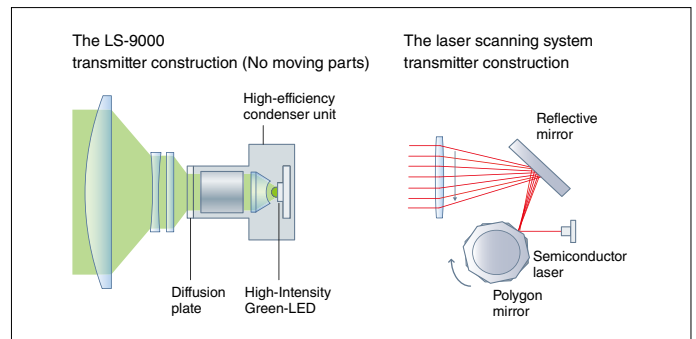
| | LS-9000 Series | Existing systems |
|-------------------------|----------------|------------------|
| Motor durability | ✓ | × |
| Light source durability | ✓ | × |



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

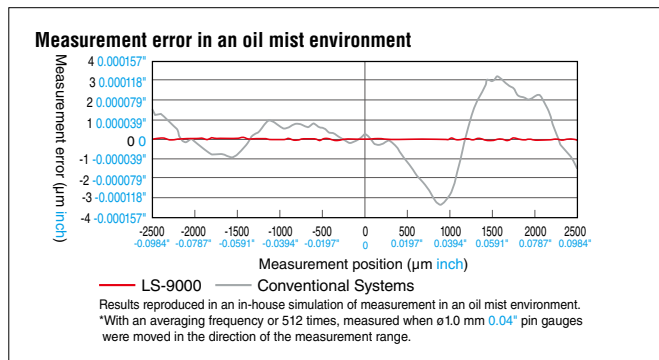
Our proprietary wear-free construction

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

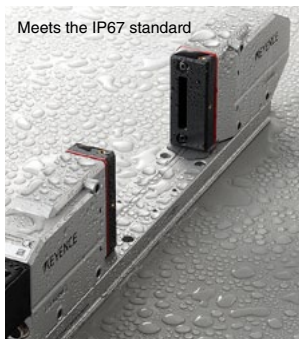
The effects of water, dust, and oil mist on the measurement value are eliminated.



IP67 construction + air purge unit

Best in class environmental resistance design*

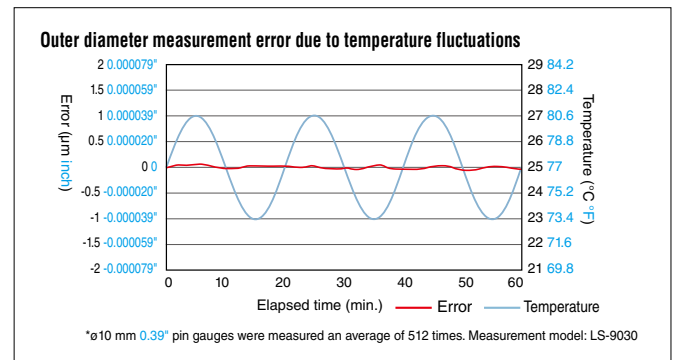
The system enclosure maintains an IP67 rated protection for all internal components. In addition, the LS-9000 series heads come standard with a built in air purge mechanism to further enhance the system's resistance to environmental influence.



* 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.



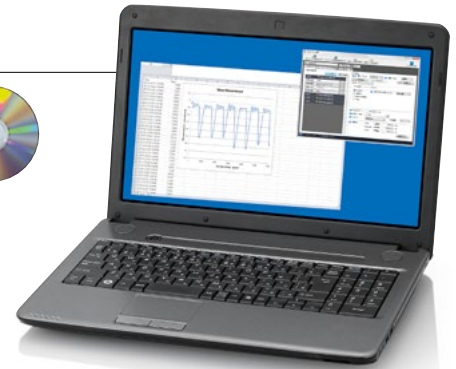
Easy setup and analysis via a computer.

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

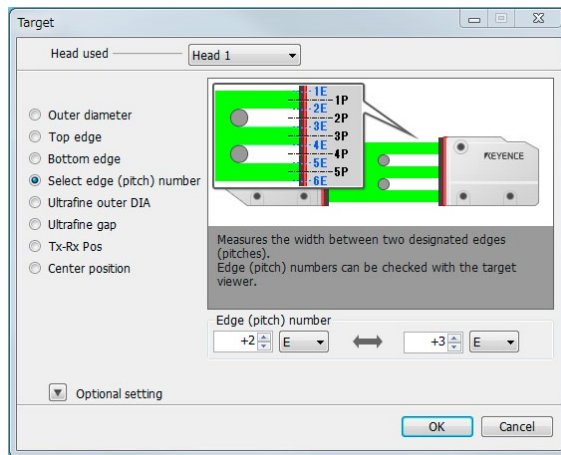
The LS-Navigator2 setup and diagnostics software simplifies and streamlines setup. (OPTIONAL)



Easy setting and backup

Easy visual setting

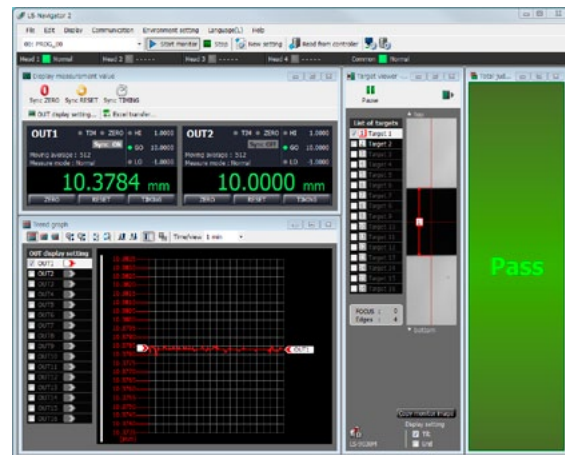
Measurement details can be selected from a picture, so settings are simple, even for a novice. Setting details are stored on the computer as backup files.



Customize your display

Multifunction measurement display

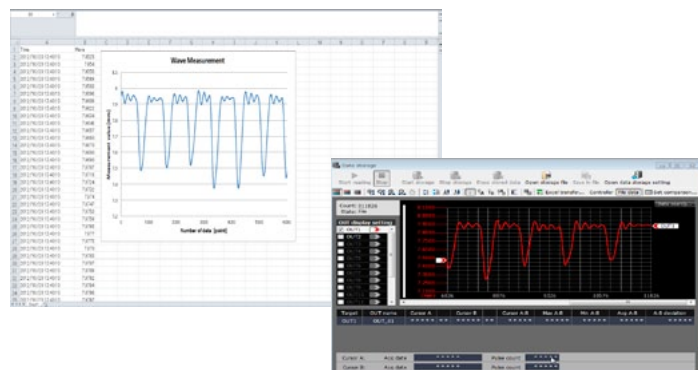
Support software features 12 independent display tools that let you customize your display. View any and all the information you need on a single screen to maximize efficiency.



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.

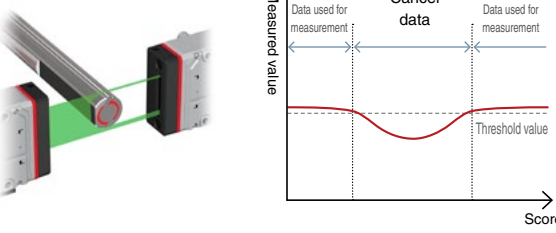
Measuring the outer diameter and runout of a photocopier roller



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

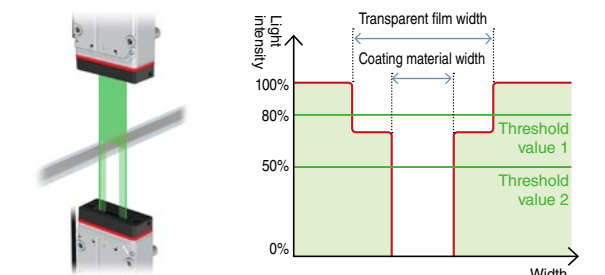


The graph shows a measured value curve that dips below a threshold value. The area where the curve is below the threshold is labeled 'Cancel data', and the areas above are 'Data used for measurement'.

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.

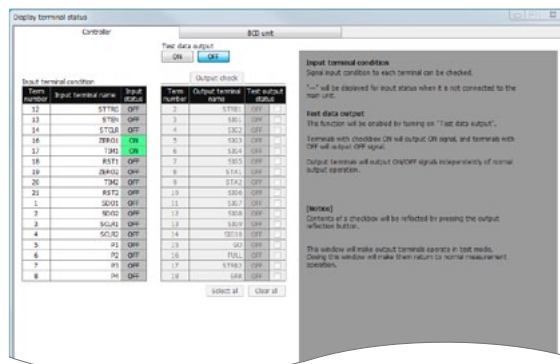
Taking dimensional measurements of transparent film and coating material



The graph shows light intensity on the y-axis (0% to 100%) and width on the x-axis. Two thresholds are shown: 'Threshold value 1' (higher) and 'Threshold value 2' (lower). The width between the two thresholds is labeled 'Coating material width', and the width between the higher threshold and the next step is labeled 'Transparent film width'.

Terminal operation monitoring

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

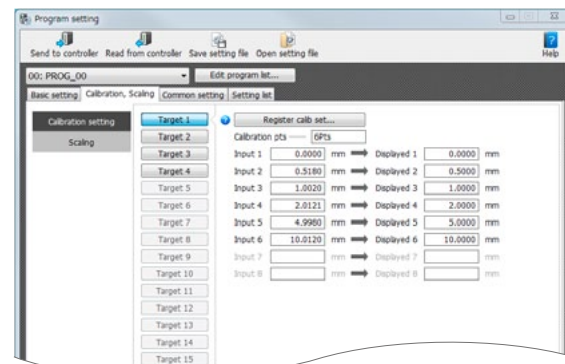


The screenshot shows a 'Display terminal status' window with a table of terminal conditions and an 'Input terminal condition' section.

| Term. number | Input terminal name | Input ON/OFF | Term. number | Output terminal name | Test output status |
|--------------|---------------------|--------------|--------------|----------------------|--------------------|
| 11 | ST16 | OFF | 1 | ST16 | OFF |
| 12 | ST17 | OFF | 2 | ST17 | OFF |
| 13 | ST18 | OFF | 3 | ST18 | OFF |
| 14 | ST19 | OFF | 4 | ST19 | OFF |
| 15 | ST20 | OFF | 5 | ST20 | OFF |
| 16 | ST21 | OFF | 6 | ST21 | OFF |
| 17 | ST22 | OFF | 7 | ST22 | OFF |
| 18 | ST23 | OFF | 8 | ST23 | OFF |
| 19 | ST24 | OFF | 9 | ST24 | OFF |
| 20 | ST25 | OFF | 10 | ST25 | OFF |
| 21 | ST26 | OFF | 11 | ST26 | OFF |
| 22 | ST27 | OFF | 12 | ST27 | OFF |
| 23 | ST28 | OFF | 13 | ST28 | OFF |
| 24 | ST29 | OFF | 14 | ST29 | OFF |
| 25 | ST30 | OFF | 15 | ST30 | OFF |
| 26 | ST31 | OFF | 16 | ST31 | OFF |
| 27 | ST32 | OFF | 17 | ST32 | OFF |
| 28 | ST33 | OFF | 18 | ST33 | OFF |
| 29 | ST34 | OFF | 19 | ST34 | OFF |
| 30 | ST35 | OFF | 20 | ST35 | OFF |

Multi-point calibration

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

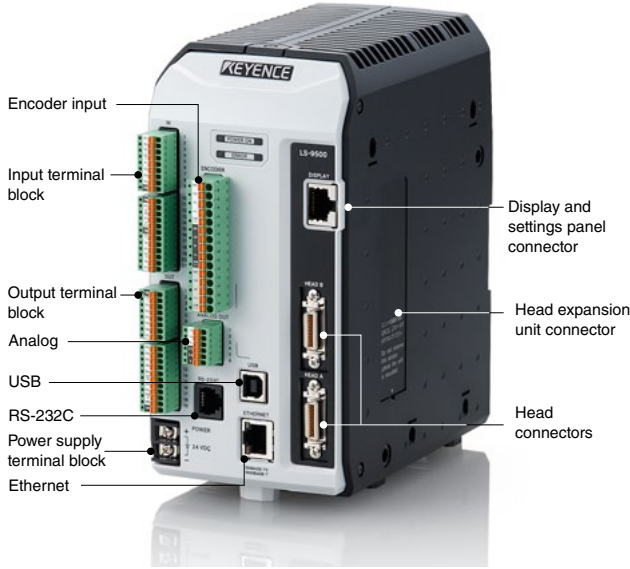


The screenshot shows a 'Program setting' window with a 'Calibration setting' section. It lists 15 targets with their corresponding input and displayed values.

| Target | Input | Displayed |
|-----------|------------|------------|
| 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 | 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)

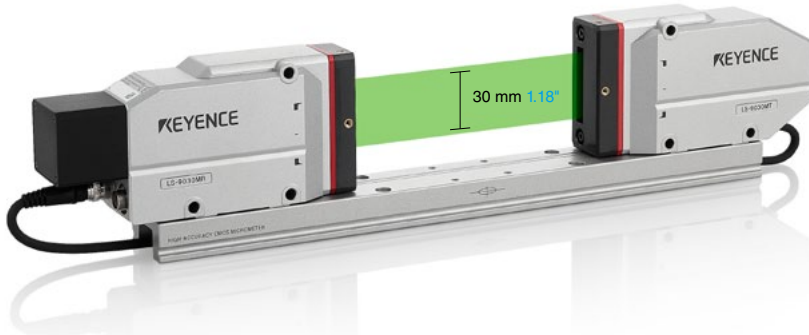
40 m 131.2' extension connection unit **CB-BR01**

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 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.

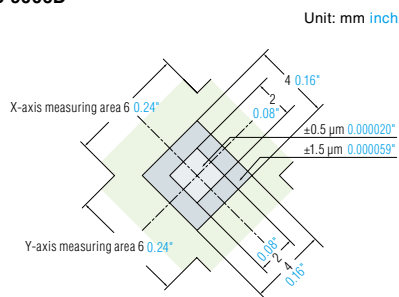
■ Head (2-axis standard model/2-axis small-diameter model)

| 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 | |

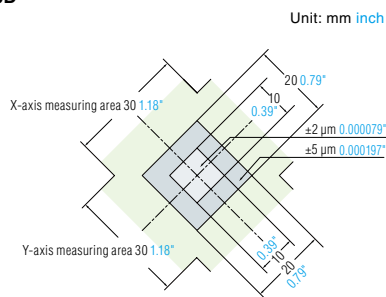
- *1 A ±2σ margin of error when measuring a ø1.0 mm **ø0.04*** rod in the center of the measurement area using outer diameter mode with the average measurement number set as 2048 times.
- *2 A ±2σ margin of error when measuring a ø10 mm **ø0.39*** rod in the center of the measurement area using outer 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 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 | 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 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 Ethernet |
| | USB 2.0 HI-SPEED supported (USB 1.1 Full-SPEED compatible) ^{*5} 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.

■ 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.

■ Display and settings panel



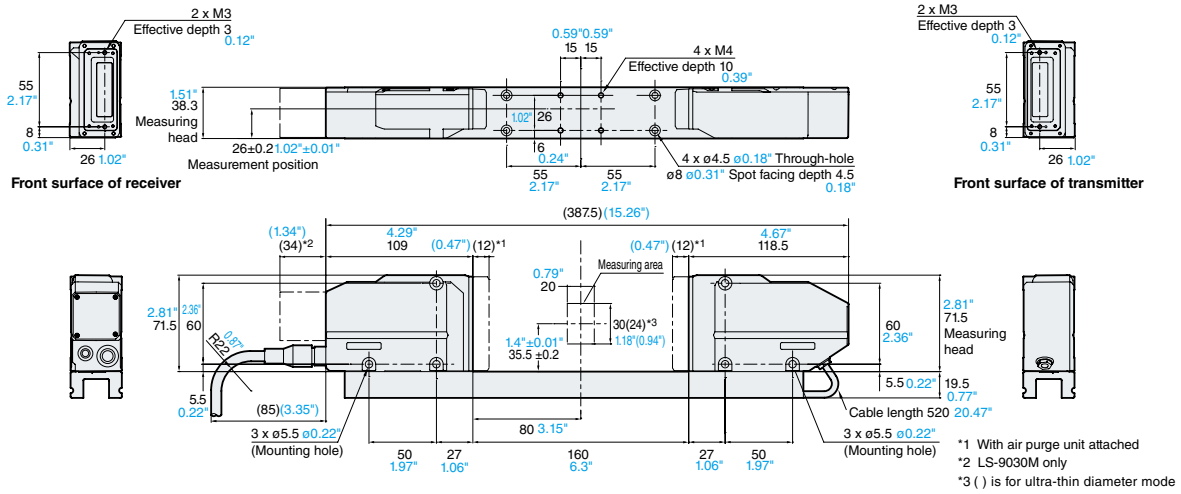
| Model | | LS-D1000 |
|--|--------------------------|--|
| Display interface | Measured value display | Measured value display: 2 colors, 8 digits, 16 segments OUT number display: Monochrome, 2 digits, 7 segments Tolerance judgment display: HH, HI, GO, LO, LL. Monochrome Control status display: TIM, 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 |

■ EtherNet/IP™ unit

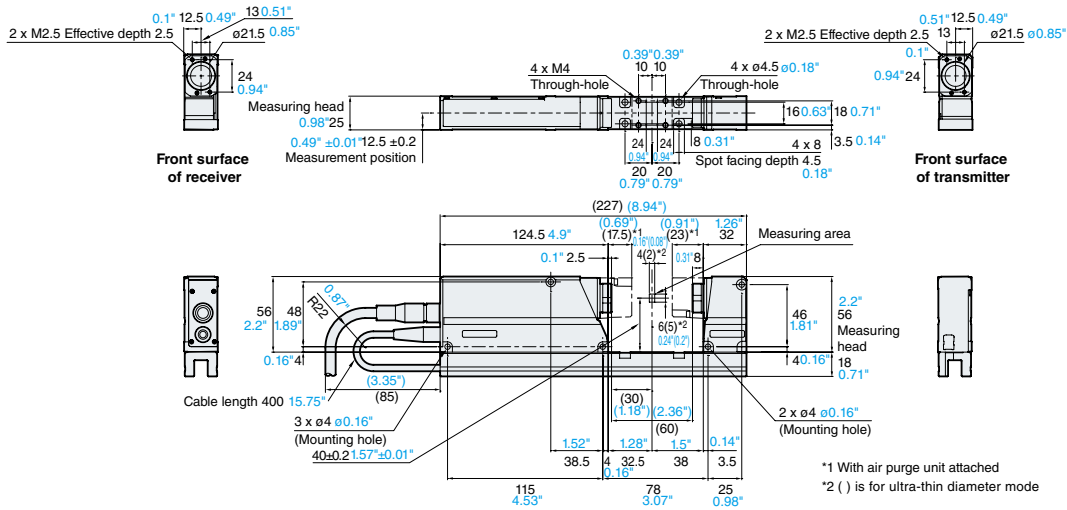
| Model | | CB-EP100 |
|--------------------------|--|---|
| Compatible network | | EtherNet/IP™ and displacement sensor-specific protocols (socket communication) |
| Ethernet | Compliant standards | IEEE 802.3 (10BASE-T), IEEE 802.3u (100BASE-TX) |
| | Transmission speed | 10 Mbps (10BASE-T), 100 Mbps (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.

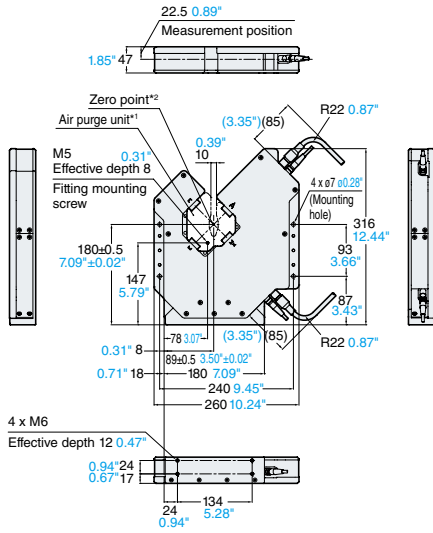
LS-9030/LS-9030M



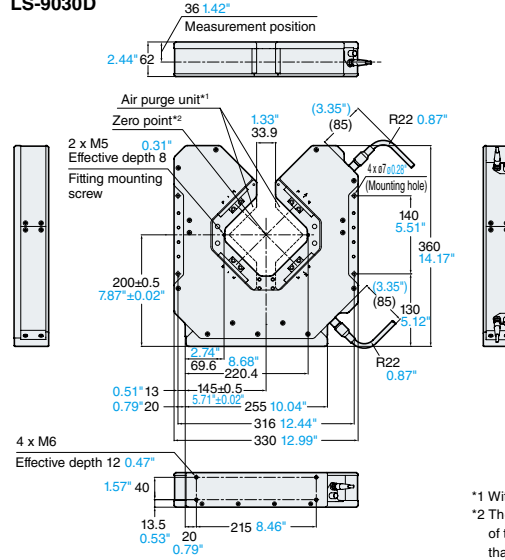
LS-9006/LS-9006M



LS-9006D

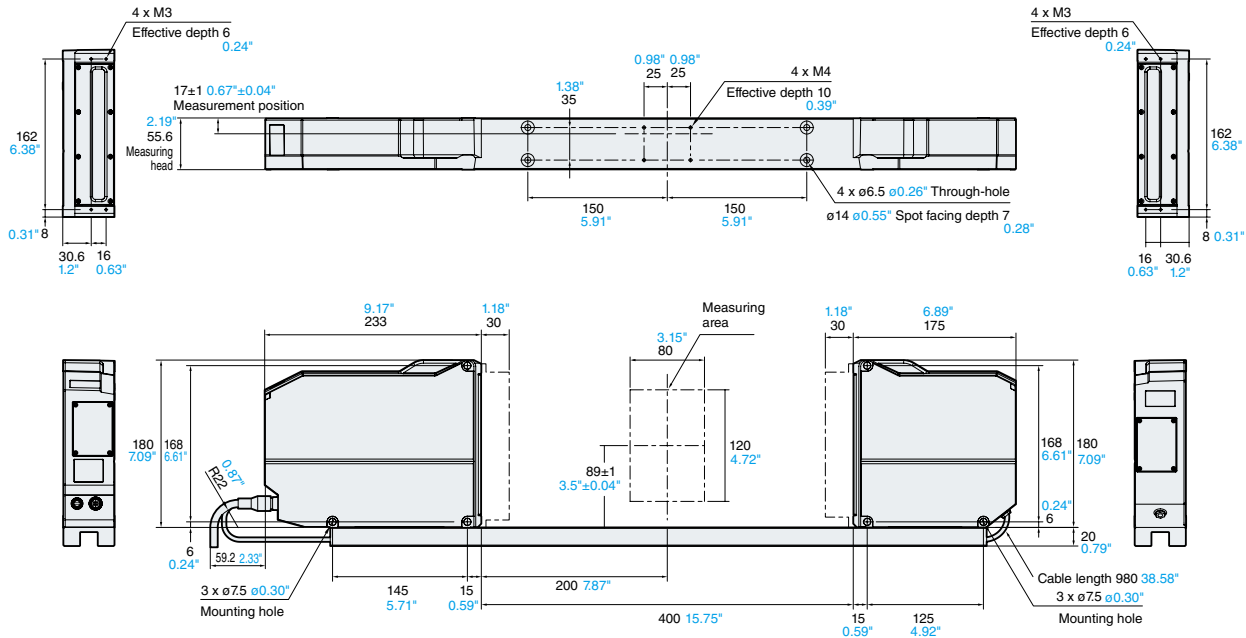


LS-9030D

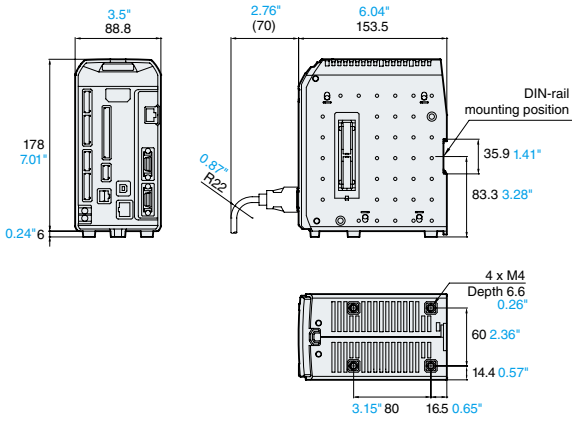


¹ With air purge unit attached
² The zero point represents the intersection of the optical axis center of X-axis head and that of the Y-axis head.

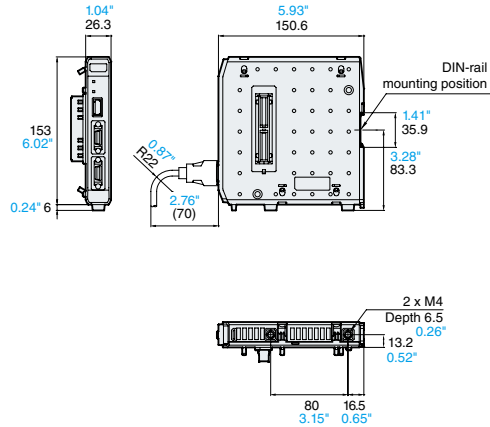
LS-9120M



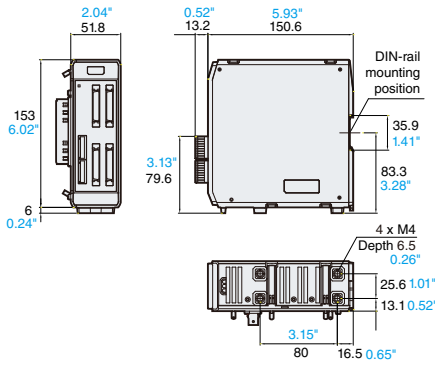
LS-9501/LS-9501P



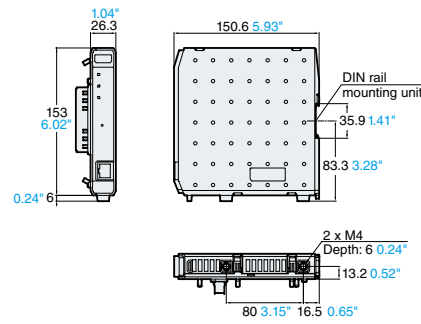
LS-HA100



CB-BD100

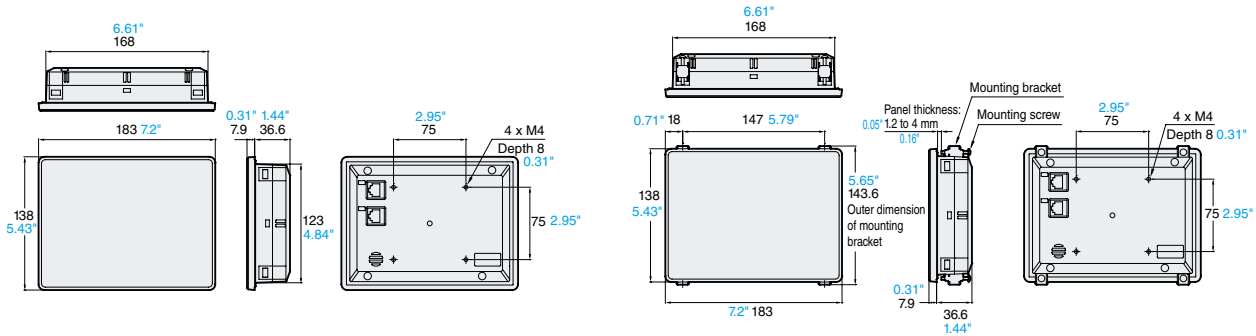


CB-EP100/CB-PN100

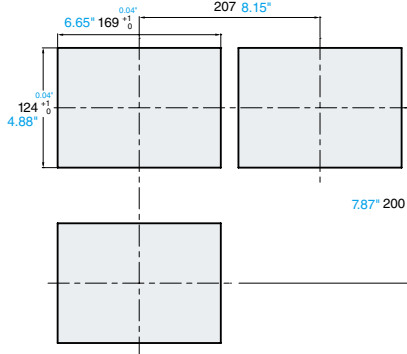


LS-D1000

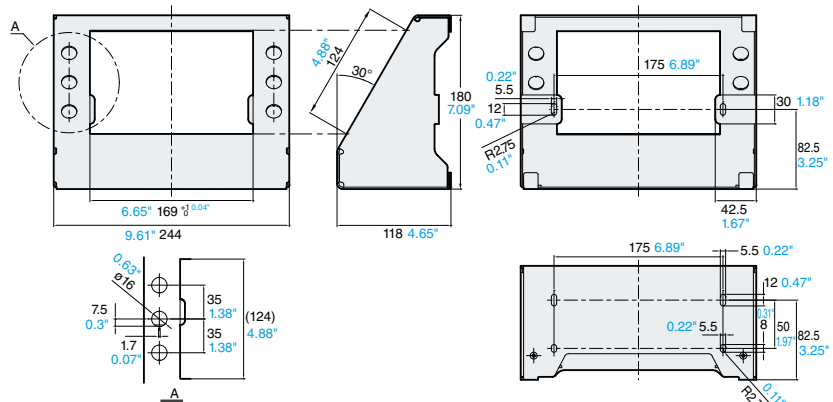
With mounting bracket attached



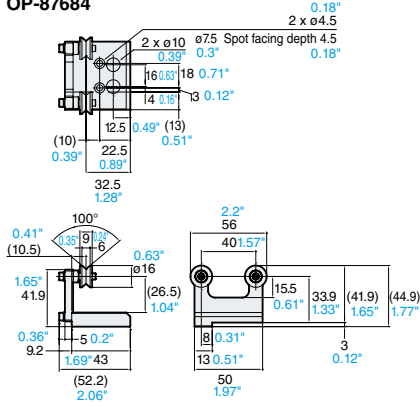
Panel cutout dimensions



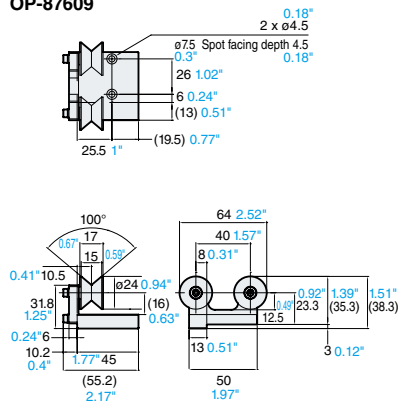
OP-87610



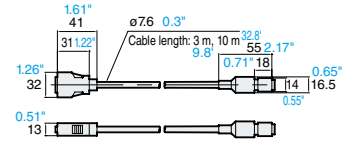
OP-87684



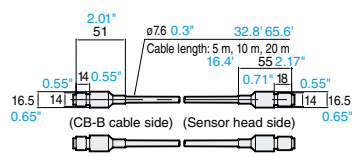
OP-87609



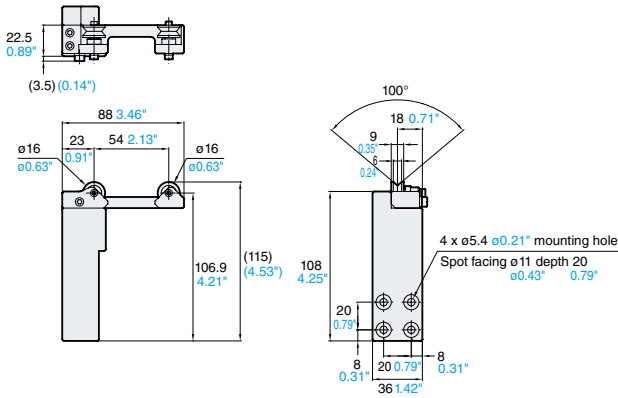
CB-B3/CB-B10



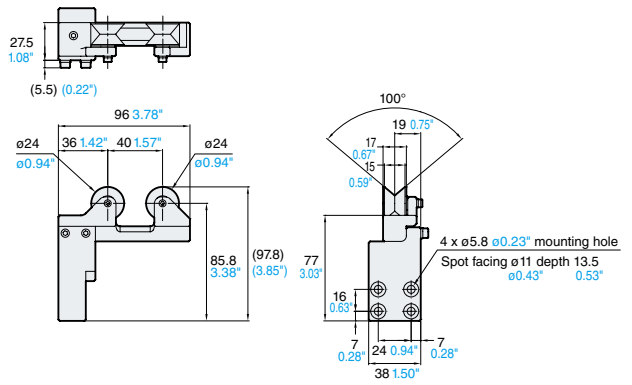
CB-B5E/CB-B10E/CB-B20E



OP-87750



OP-87749

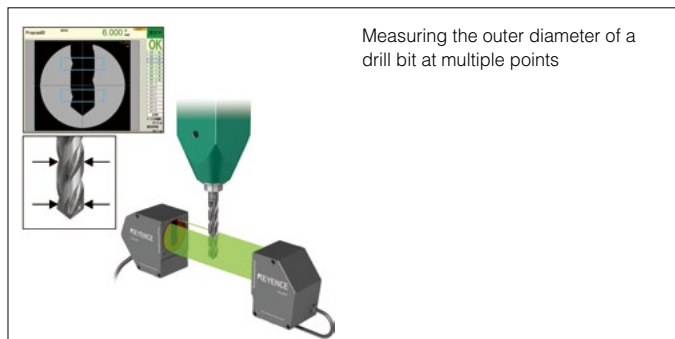
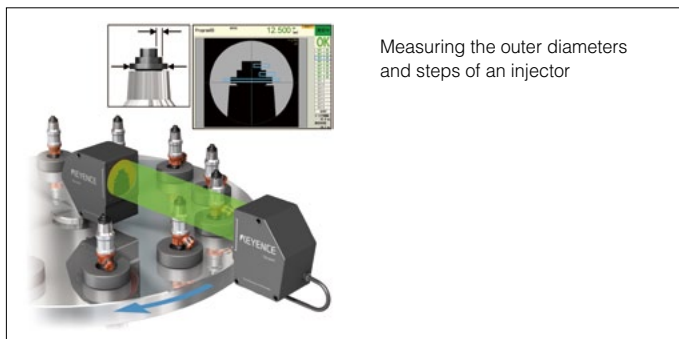
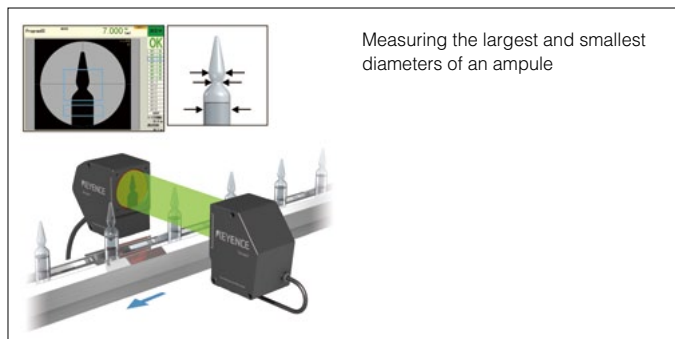
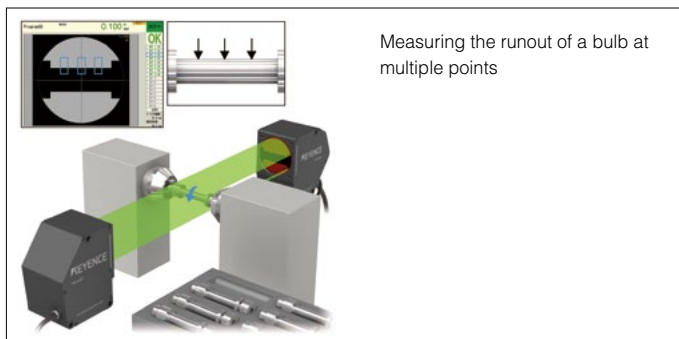


SIMULTANEOUS MEASUREMENT OF OUTER DIAMETERS AND EDGES AT MULTIPLE POINTS



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



SAFETY INFORMATION

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

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

AL Birmingham

CA San Jose

CO Denver

IL Chicago

MI Detroit

MO St. Louis

NC Raleigh

PA Philadelphia

TN Nashville

WI Milwaukee

AR Little Rock

CA Cupertino

FL Tampa

IN Indianapolis

MI Grand Rapids

NJ Elmwood Park

OH Cincinnati

PA Pittsburgh

TX Austin

AZ Phoenix

CA Los Angeles

GA Atlanta

KY Louisville

MN Minneapolis

NY Rochester

OH Cleveland

SC Greenville

TX Dallas

CA San Francisco

CA Irvine

IA Iowa

MA Boston

MO Kansas City

NC Charlotte

OR Portland

TN Knoxville

WA Seattle

KEYENCE CANADA INC.

Head Office PHONE: +1-905-366-7655 FAX: +1-905-366-1122 E-mail: 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

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.

KA1-1017

LS9-KA-C2-US 1126-8 611847