KEYENCE

High-speed, High-accuracy
Digital Micrometer
LS-7000 Series

CE

The Original Green LED Incorporated Digital Micrometer

[New Larger Diameter Head – LS-7070(M)]
[New Advance Controller – LS-7601]
[New PC Based Software – LS-H1W]

Green LED

Optical System Achieving High-speed, High-accuracy, and High-durability

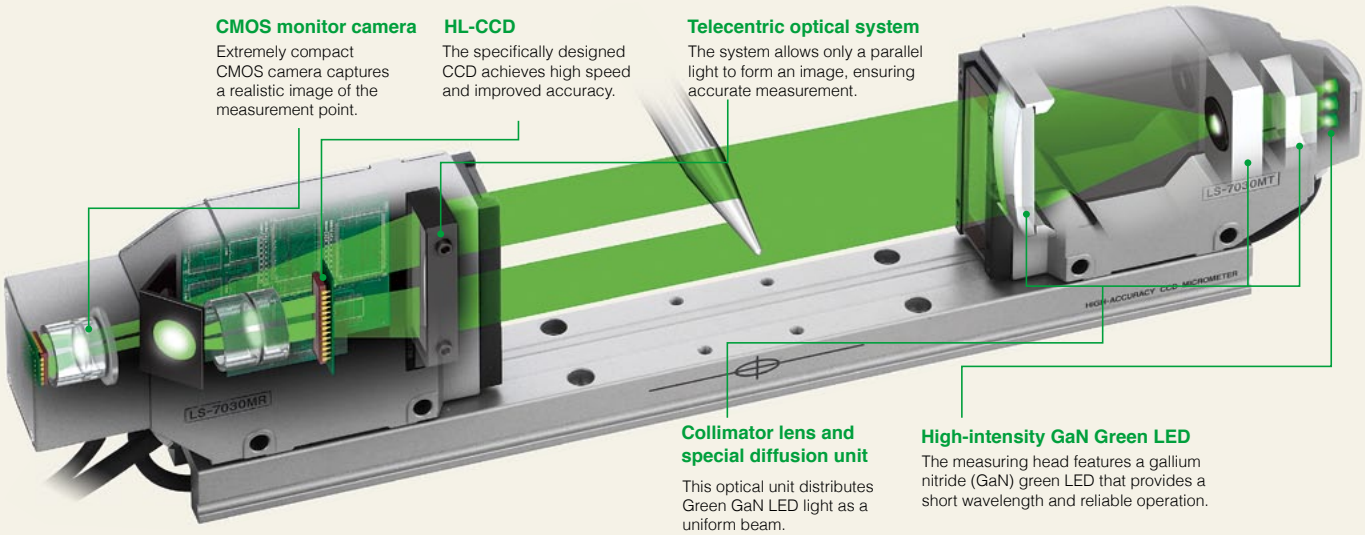
Speed, accuracy, and durability have been improved by advanced optical technology, using high-intensity Green LED, a telecentric lens, and the HL-CCD in the receiver.

LS-7000 Series

CMOS monitor camera
Extremely compact CMOS camera captures a realistic image of the measurement point.

HL-CCD
The specifically designed CCD achieves high speed and improved accuracy.

Telecentric optical system
The system allows only a parallel light to form an image, ensuring accurate measurement.

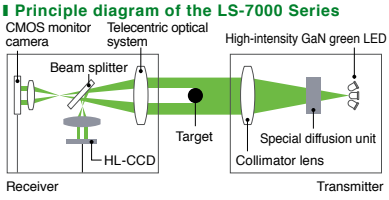


Collimator lens and special diffusion unit
This optical unit distributes Green GaN LED light as a uniform beam.

High-intensity GaN Green LED
The measuring head features a gallium nitride (GaN) green LED that provides a short wavelength and reliable operation.

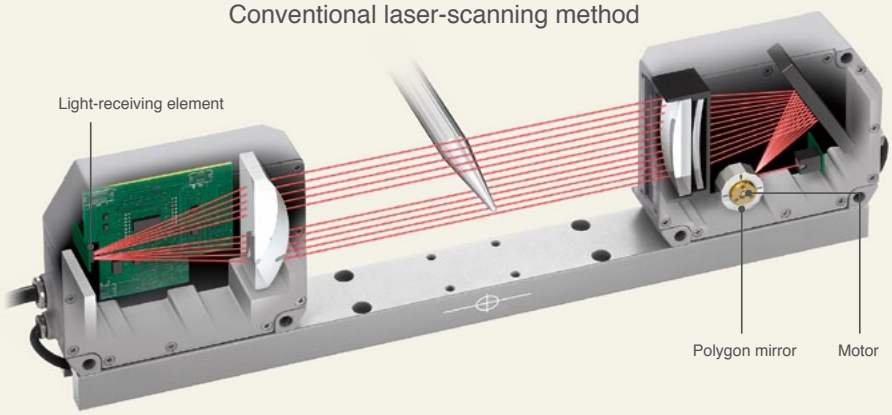
The LS-7000 Series features an optical system with a green LED a telecentric lens a HL-CCD. Helping achieve double speed and accuracy compared to conventional micrometers. The motor-less structure and longer-life light source ensure excellent durability that retains reliable operation for a long time.

Principle diagram of the LS-7000 Series



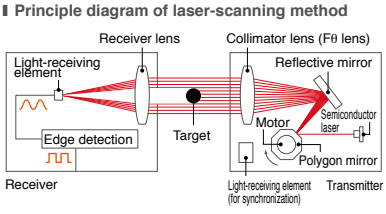
The green LED light is distributed as a uniform, parallel light and is applied to a target. The edge between the bright and dark area on the CCD is detected as a measured value, such as an outer diameter.

Conventional laser-scanning method



The laser beam is projected onto a rotating polygon mirror, the reflected light scans the measurement range, then reaches the receiving element. To improve speed and accuracy the motor would need to rotate at a faster rate at the cost of durability and reliability.

Principle diagram of laser-scanning method



A measured value such as an outer diameter is determined by measuring the difference in the timing between bright and dark areas created by the scanned laser beam.

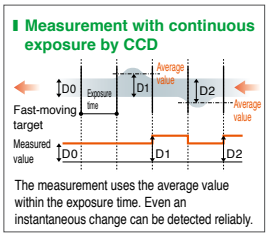
High performance achieved by Green LED

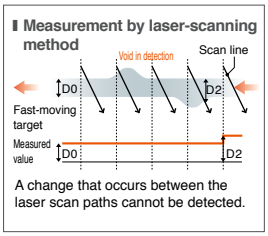
The original Green LED technology achieves both quick and accurate measurement reliably and durably. Moreover, the built-in CMOS monitor camera enhances usability.

Double the conventional ability High-speed & High-accuracy

2400 samples/second, 0.002 Mil (±0.06 μm) repeatability

The continuous exposure measurement using HL-CCD enables high-speed sampling, which doubles the conventional speed and accuracy. Unlike the laser scanning method, there is no void in detection. This allows for wider applications that require more precision due to finer product designs, or faster line speed due to shorter manufacturing times.





Best in its class High-durability CCD without moving parts & Long-life LED

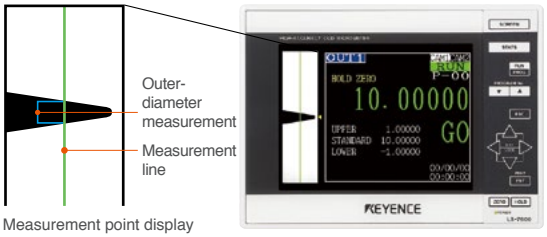
The laser scan method was reviewed thoroughly. Resulting in the combination of Green LED and HL-CCD that solved the problem of motor durability, which had been the weak point of the laser-scanning method. Furthermore, the long-life LED achieved continued reliability over the long term.


HL-CCD


Green LED

First in industry Visible measurement point Controller with Target Viewer

The CMOS monitor camera built into the measuring head captures the image of a target, which is displayed on the LCD monitor. Since the measurement condition is visible, target positioning and measurement condition check become easier. The measurement area of the current measurement mode is indicated in real time.



Measurement point display function

High-Accuracy CCD Micrometers

LS-7000 Series

LS-7070(M)
Large-diameter type

LS-7030(M)
Standard type

LS-7010(M)
Small-diameter type

LS-7601
High-performance controller

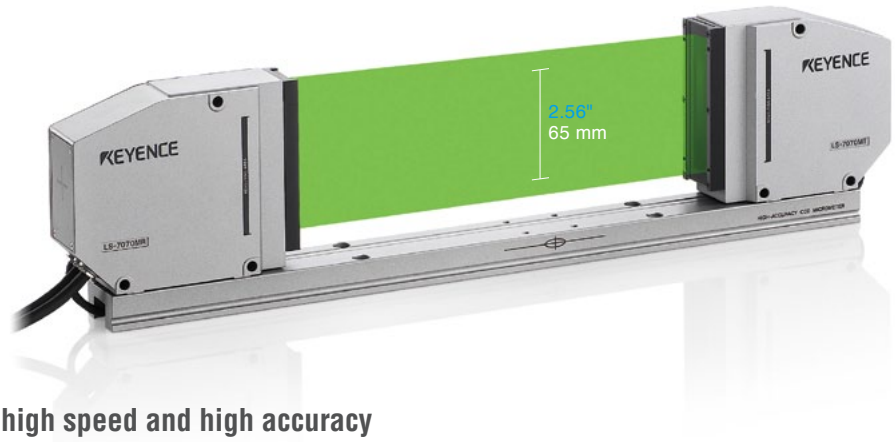
Different head variations selectable for a wide variety of applications

Wide measuring range while maintaining high accuracy

Large-diameter type Fully compatible

LS-7070M (with monitor function)
LS-7070 (without monitor function)

Measuring range	0.02" to 2.56" 0.5 to 65 mm
Smallest detectable object	0.02" 0.5 mm
Measurement accuracy	±0.12 Mil ±3 μm
Repeatability	±0.008 Mil ±0.2 μm

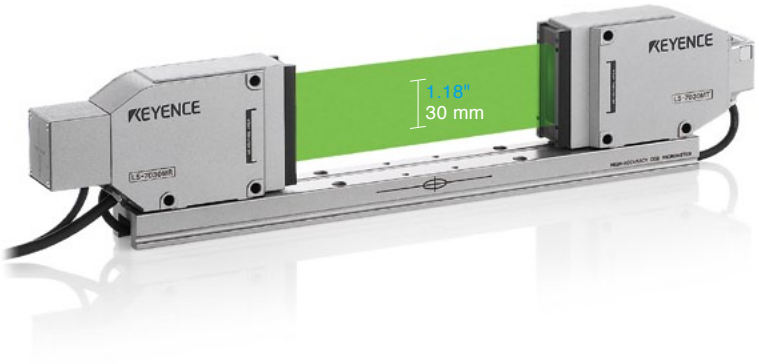


Standard model achieving high speed and high accuracy

Standard type Fully compatible

LS-7030M (with monitor function)
LS-7030 (without monitor function)

Measuring range	0.01" to 1.18" 0.3 to 30 mm
Smallest detectable object	0.01" 0.3 mm
Measurement accuracy	±0.08 Mil ±2 μm
Repeatability	±0.006 Mil ±0.15 μm



More precise measurement for minute targets

Small-diameter type Fully compatible

LS-7010M (with monitor function)
LS-7010 (without monitor function)

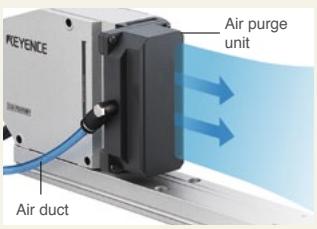
Measuring range	0.002" to 0.24" 0.04 to 6 mm
Smallest detectable object	0.002" 0.04 mm
Measurement accuracy	±0.02 Mil ±0.5 μm
Repeatability	±0.002 Mil ±0.06 μm

Fully compatible

The measuring head and controller can be connected even when they have a different measuring range or serial Nos. This allows easy maintenance and ensures reliability for an abrupt change in specifications.

For harsh environments

Air purge unit (Optional) & IP64 Rating



Air purge unit (Optional)

OP-79428 [for LS-7030(M)]
OP-79429 [for LS-7070 (M)]

Attaching the air purge unit in front of the measuring head and feeding an air flow prevents dirt or dust from accumulating on the head surface.

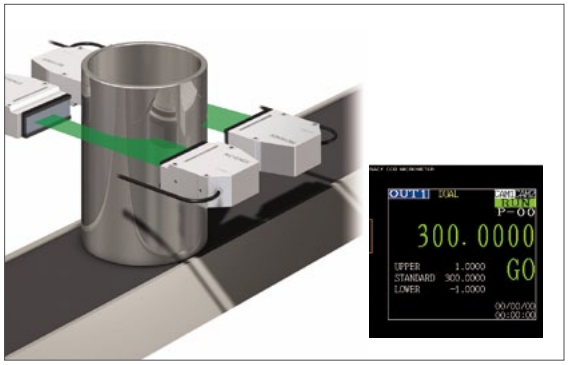
The measuring head conforms to the IP64 environmental resistance standard. Water or dust intrusion into the measuring head can be reliably prevented.

Variety of measuring functions which support numerous inspections

Dual-head mode

[Measuring the outer diameter of a metal pipe]

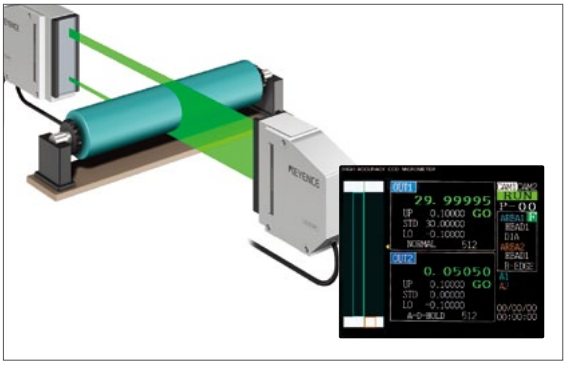
This simple, special mode measures large diameter targets or wide sheet materials. Complicated calculations or other settings are unnecessary.



One-head simultaneous measurement

[Measuring both the outer diameter and eccentricity of a copy roller simultaneously]

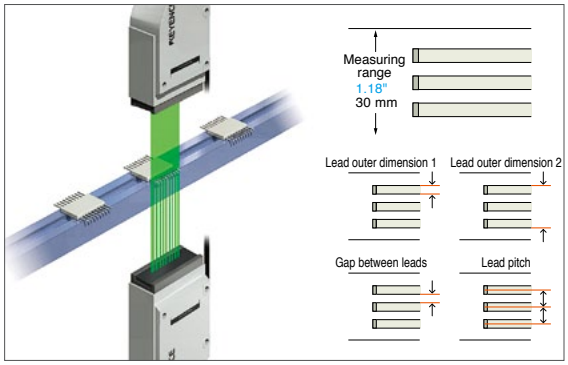
One measuring head allows simultaneous measurement using two measurement modes, such as measuring the outer diameter and eccentricity.



Measuring area designation

[Measuring IC lead pitch]

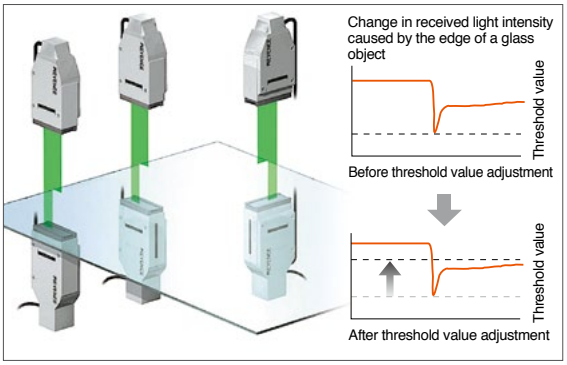
The measuring area can be designated according to the inspection purpose, such as measurement of the IC lead gap or pitch.



Transparent object measurement

[Checking the width or edge position of a glass plate]

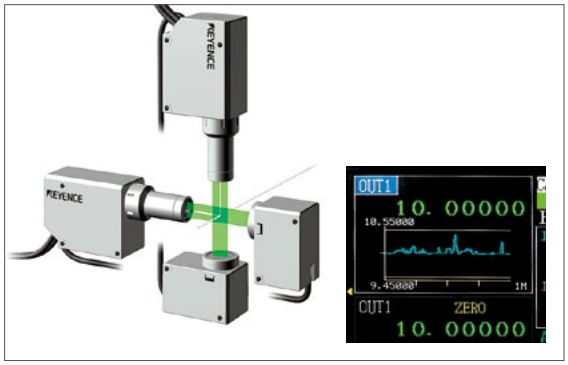
Even transparent objects that were difficult to detect with conventional micrometers can be measured. The edge detection level can be easily changed via the controller.



Trend display

[Measuring the outer diameter of a fiber]

The LS-7000 Series measures the outer diameter of a fiber continuously and displays not only numeral values but also a trend graph that represents the measured values in a waveform.



Data logging

The history of unacceptable values, such as date/time, measured value, and comparison result, can be recorded in the internal memory of the controller.

High-performance controller for ultimate usability

LS-7601

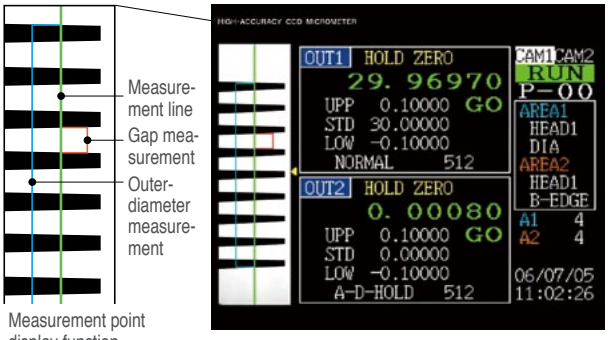
High-performance controller

LCD monitor makes viewing and aligning targets easy

By offering advance functions the controller improves efficiency and meets demanding measurement needs.

Easy adjustment with Target Viewer

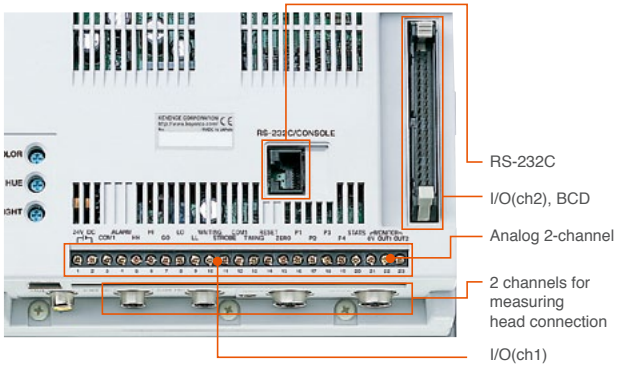
The measuring head incorporates a CMOS camera to capture an image of a target. By viewing the real-time image on the target viewer, the measurement position of a target with a complicated shape can be easily adjusted. It is also easy to check the measurement condition of a minute or transparent target.



* Screen sample for “Measuring IC lead pitch” on page 5.

2-channel connection & Multiple I/O

The compact controller measuring only one-quarter of conventional models allows connection of two sets of scanning heads. This enables simultaneous measurement and comparison. Various interfaces are also featured, including RS-232C input/output, 2 channel BCD output, 2 channel I/O, and 2 channel analog output.



Various functions

Self-timing function

The controller starts synchronization automatically and performs predefined measurement when a target enters the optical axis.

Auto-zero/offset function

The measured value can be reset to “0” by using a master target, or it can be set to a reference value for master adjustment.

Abnormal value ignore function

This function ignores abnormal values exceeding a preset value to prevent malfunctions caused by dust or other irrelevant factors.

Calibration function

This function makes it possible to calibrate measuring values using actual reference targets or to calibrate values theoretically.

24 types of computation functions

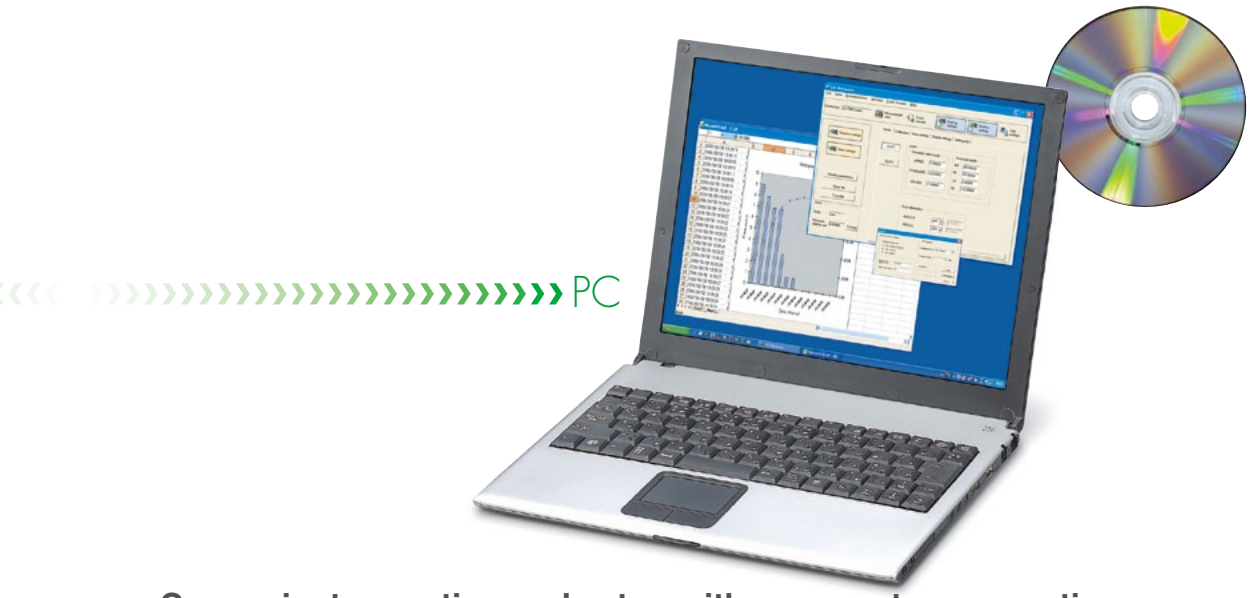
The controller is complete with 24 types of computation functions that make the most of the 2-head and 2-channel output.

16 selectable programs

Up to 16 programs including the measuring area and tolerance can be stored in the memory for each target.

A controller with digital switch-like keys is also available.

LS-7001



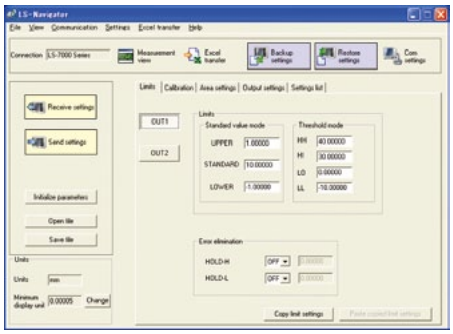
Setting support software
LS-Navigator
LS-H1W

Convenient operation and setup with a computer connection

Using the RS-232C port a PC can be connected.
You can control the LS-7000 Series from configuration to data management.

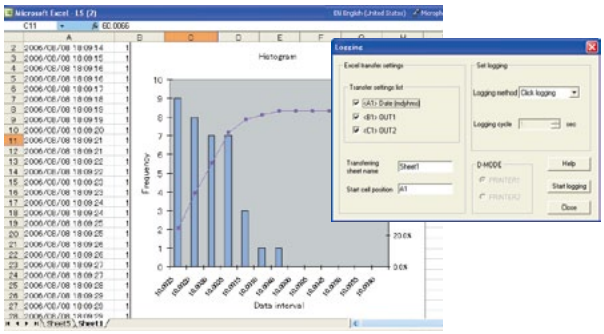
Easy setting/Setting data backup function

The controller settings can be stored and backed up in the PC. The measurement condition setting can also be configured or changed on the PC and transferred to the controller. The setting is easy by just selecting menus with the aid of illustrations and explanation.



Logging function

The setting data can be transferred directly to Excel in real time. There is also a function to display the measured values on the PC screen, enabling traceability management or the preparation of quality data reports.



Flexible installation styles according to applications

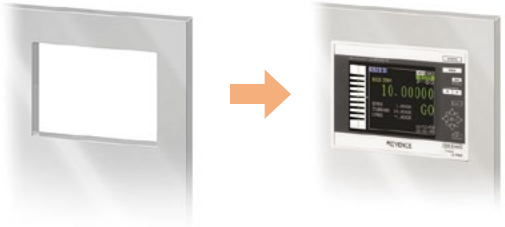
Stand-alone

The controller can be used as a stand-alone instrument. With the optional stand (sold separately).

AC power supply stand
LS-S11

Panel-mounting

The compact controller measures only one-quarter the size of conventional models, and can be mounted neatly in a control panel.



Specifications

Measuring head (Large-diameter type/Standard type)

Type	Large-diameter		Standard	
Category	with monitor camera	without monitor camera	with monitor camera	without monitor camera
Model	LS-7070M	LS-7070	LS-7030M	LS-7030
Measuring range	0.02" to 2.56" 0.5 to 65 mm		0.01" to 1.18" 0.3 to 30 mm	
Smallest detectable object	0.02" 0.5 mm		0.01" 0.3 mm	
Transmitter/receiver distance	9.84"±1.97" 250±50 mm		6.30"±1.57" 160±40 mm	
Light source	GaN green LED		GaN green LED	
CCD scanning range	Approx. 2.72" 69 mm		Approx. 1.30" 33 mm	
Measurement accuracy	±0.12 Mil ±3 μm [1.]		±0.08 Mil ±2 μm [3.]	
Repeatability	±0.008 Mil ±0.2 μm [2.]		±0.006 Mil ±0.15 μm [4.]	
No. of samples [7.]	2400 samples/sec.		2400 samples/sec.	
Monitor camera	Provided	Not provided	Provided	Not provided
Enclosure rating [8.]	IP64		IP64	
Ambient temperature	32 to 122°F 0 to +50°C		32 to 122°F 0 to +50°C	
Relative humidity	35 to 85% (No condensation)		35 to 85% (No condensation)	
Weight	Transmitter: Approx. 540 g Receiver : Approx. 770 g Base : Approx. 660 g	Transmitter: Approx. 540 g Receiver : Approx. 730 g Base : Approx. 660 g	Transmitter: Approx. 420 g Receiver : Approx. 570 g Base : Approx. 430 g	Transmitter: Approx. 420 g Receiver : Approx. 470 g Base : Approx. 430 g

Measuring head (Small-diameter type)

Type	Small-diameter	
Category	with monitor camera	without monitor camera
Model	LS-7010M	LS-7010
Measuring range	0.002" to 0.24" 0.04 to 6 mm	
Smallest detectable object	0.002" 0.04 mm	
Transmitter/receiver distance	2.36"±0.20" 60±5 mm	
Light source	GaN green LED	
CCD scanning range	Approx. 0.28" 7 mm	
Measurement accuracy	±0.02 Mil ±0.5 μm [5.]	
Repeatability	±0.002 Mil ±0.06 μm [6.]	
No. of samples [7.]	2400 samples/sec.	
Monitor camera	Provided	Not provided
Enclosure rating [8.]	IP64	
Ambient temperature	32 to 122°F 0 to +50°C	
Relative humidity	35 to 85% (No condensation)	
Weight	Transmitter: Approx. 140 g Receiver : Approx. 380 g Base : Approx. 220 g	Transmitter: Approx. 140 g Receiver : Approx. 340 g Base : Approx. 220 g

1. The error when a moving rod 0.79" 20 mm in diameter is measured within the measuring area of 0.79" x 1.57" 20 x 40 mm.
2. The value of ±2σ when the outer diameter of a rod 0.79" 20 mm in diameter is measured at the center of the measuring area while the number of averaging measurements is set to 512.
3. The error when a moving rod 0.39" 10 mm in diameter is measured within the measuring area of 0.39" x 0.79" 10 x 20 mm.
4. The value of ±2σ when the outer diameter of a rod 0.39" 10 mm in diameter is measured at the center of the measuring area while the number of averaging measurements is set to 512.
5. The error when a moving rod 0.04" 1 mm in diameter is measured within the measuring area of 0.08" x 0.16" 2 x 4 mm.
6. The value of ±2σ when the outer diameter of a rod 0.04" 1 mm in diameter is measured at the center of the measuring area while the number of averaging measurements is set to 512.
7. 1200 samples/sec. when the mutual interference prevention function is used.
8. The connector section is excluded.

Peripheral equipment

Air purge unit
OP-79428
[For LS-7030(M)]

Air purge unit
OP-79429
[For LS-7070(M)]

AC power supply stand
LS-S11

Model		LS-S11
Applicable controller		LS-7001/LS-7601
Rating	Power supply voltage	100 to 240 VAC ±10% 50/60 Hz
	Current consumption	110 VA max.
Environmental resistance	Ambient temperature	32 to 104°F 0 to +40°C
	Relative humidity	35 to 85% (No condensation)
Weight		Approx. 1.7 kg

Extension cables
Cable between the controller and measuring head

Model	LS-C3A	LS-C10A	LS-C30A
Cable length	9.8' 3 m	32.8' 10 m	98.4' 30 m
Weight	Approx. 250 g	Approx. 700 g	Approx. 2,000 g

* Up to two cables are connectable, provided that the total length is a maximum of 131.2' 40 m.

Cable between the receiver and transmitter

Model	OP-42182	OP-42183
Cable length	3.3' 1 m	9.8' 3 m
Weight	Approx. 50 g	Approx. 120 g

* Up to two cables are connectable, provided that the total length is a maximum of 19.7' 6 m.

Camera cable

Model	LS-C3AM	LS-C10AM	LS-C30AM
Cable length	9.8' 3 m	32.8' 10 m	98.4' 30 m
Weight	Approx. 150 g	Approx. 450 g	Approx. 1,250 g

* Up to two cables are connectable, provided that the total length is a maximum of 131.2' 40 m.

Controller

Type			High-performance	Standard
Model			LS-7601	LS-7001
No. of connectable measuring heads			2 (fully compatible for all head types)	2 (fully compatible for all head types except monitor (M) models)
Display	Measurement display		TFT 5.5-inch LCD display	Main display: 7-segment red LED (Character height: 0.80" 20.3 mm) Sub-display: 7-segment red LED (Character height: 0.39" 9.9 mm) x 3
	Minimum display unit		0.0004 to 3.9 Mil 0.01 to 100 μm (7-level selectable)	
	Display range		±99.99999 to ±9999.9 mm (Linked to minimum display unit setting, mm/ μm selectable)	
	Measurement position monitor		Monitor image (When the measuring head with the monitor function is connected.)	7-level display with a red LED
	Tolerance check output display		5-level LCD indicator	Green LED (GO), Red LED x 2 (HI, LO)
Terminal block	Alarm output		NPN open-collector output (N.C.)	
	5-level comparator output		NPN open-collector output for OUT1	
	Comparator ready output			
	Strobe output			
	Synchronous input		Non-voltage input for OUT1	
	Reset input			
	Auto-zero input			
	Program selection input		Non-voltage input x 4 inputs	
	Statistical processing input		Non-voltage input for OUT1	—
	Analog output		±10 V x 2 outputs	
Connector I/O	SUB mode [1.]	5-level comparator output	NPN open-collector output for OUT2	
		Comparator ready output		
		Strobe output		
		Statistical processing output	NPN open-collector output x 2 outputs	—
		Function output	Selectable from focus, area check, and differential, NPN open-collector output x 2 outputs	
	BCD mode [1.]	BCD output	Measurement data output (Sign + 7 digits), OUT1/OUT2 selectable, NPN open-collector output	
		BCD selection output	NPN open-collector output	
		BCD selection input	Non-voltage input	
	Synchronous input		Non-voltage input for OUT2	
	Reset input			
	Auto-zero input			
	Statistical processing input		Non-voltage input for OUT2	—
RS-232C interface			Measurement data output and control I/O, printer (Baud rate can be selected up to 115200 bps.)	
Video output			Conforming to the NTSC system (PIN connector)	—
Major functions			Simultaneous measurement, Area designation, Calculation, Averaging, Calibration, 16-program memory, Measurement modes, Auto-zero, Print-out, Abnormal value elimination, Transparent object measurement, Measurement point display, Group comparison, Unacceptable value history, Trend display, Statistical processing, Mutual interference prevention, Application function, etc.	Simultaneous measurement, Area designation, Calculation, Averaging, Calibration, 16-program memory, Measurement modes, Auto-zero, Print-out, Abnormal value elimination, Transparent object measurement, Mutual interference prevention, etc.
Rating [2.]		Power supply voltage	24 VDC ±10%	
		Current consumption	1.2 A max.	0.7 A max.
Environmental resistance		Enclosure rating	IP64 (Panel surface only)	
		Ambient temperature	32 to 104°F 0 to +40°C	
		Relative humidity	35 to 85%, (No condensation)	
Weight			Approx. 1,010 g	Approx. 820 g

1. Either SUB mode or BCD mode can be selected.
2. AC power supply can be used when the LS-S1 (AC power supply stand) is connected.

The rating of the NPN open-collector inside the terminal block is: 100 mA max. (40 V max.), residual voltage of 0.5 V max.
The rating of the NPN open-collector inside the connector I/O is: 30 mA max. (30 V max.), residual voltage of 0.5 V max.
The rating of non-voltage input is: ON voltage of 1 V max., OFF current of 0.6 mA max.

System environment for using the LS-Navigator Setting Support Software

Model	LS-H1W
CPU	Pentium III 400 MHz or higher
Applicable OS	Windows 10 [1.] Windows 7 (SP1 or later) [2.] Windows Vista (SP2 or later) [3.] Windows XP (SP3 or later) [4.]
Memory capacity	64 MB or more
Display	VGA (800 x 600 pixels) or more, 256 colors or more
Free space in hard disk	10 MB or more
Interface	RS-232C(serial port) interface required
Excel	Excel 2010/2007/2003/2002/2000

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.

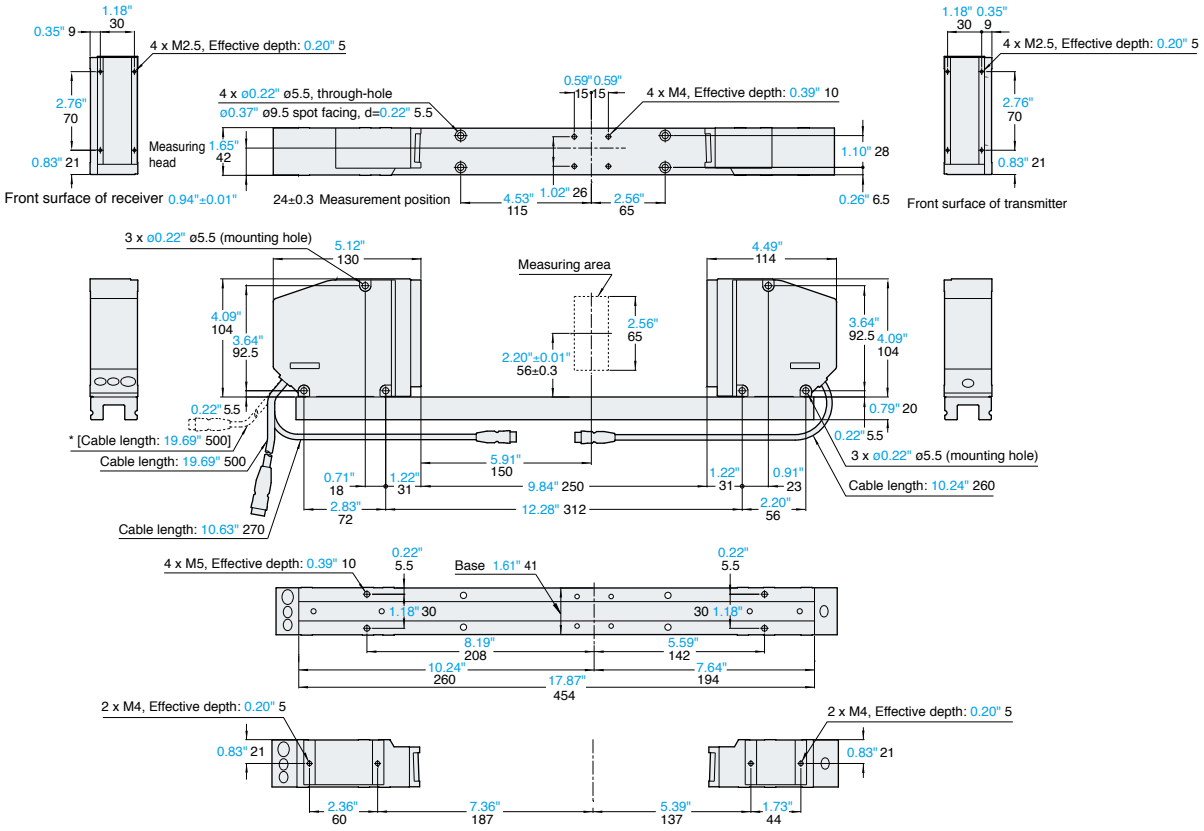
CE Marking

The LS-7000 Series complies with the following European standards:
EMC Directive: EN61326-1
Low-voltage directive: EN60825-1 (LED class 1)/EN61010-1
(Overvoltage category II, Pollution degree 2)

Dimensions

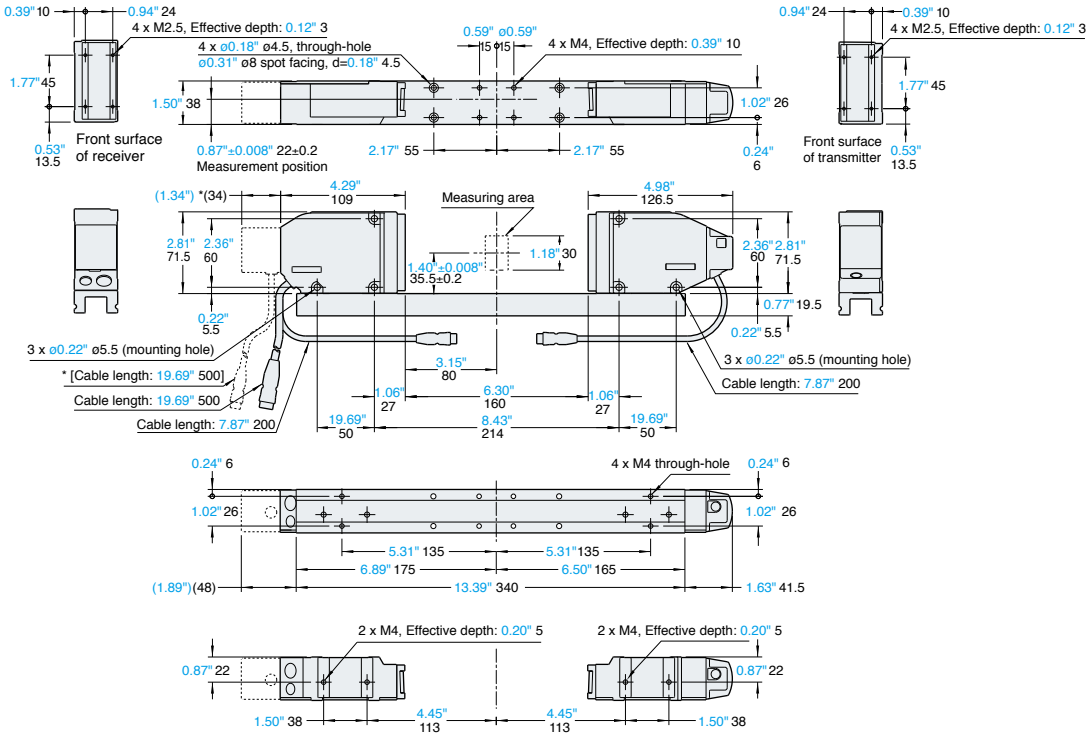
Unit : inch mm

Measuring head LS-7070 (LS-7070M)



* Figures in brackets are the values for the LS-7070M.

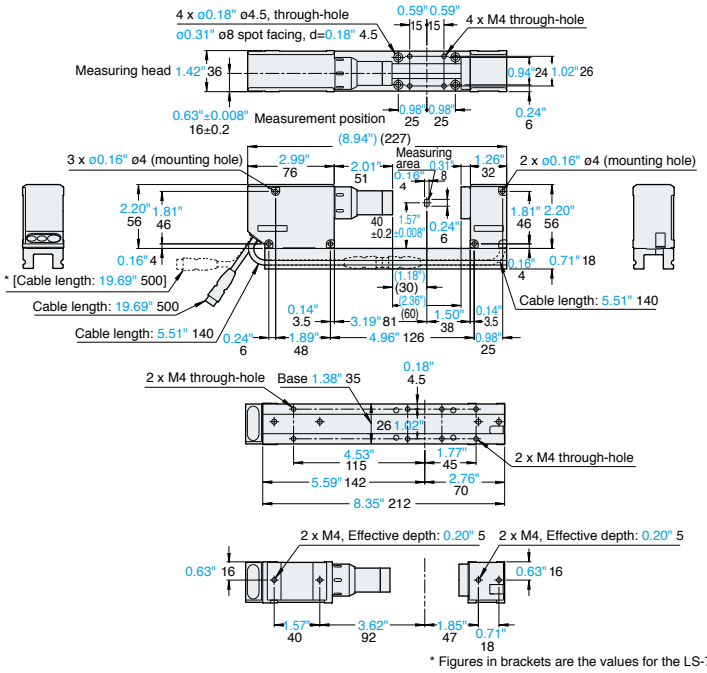
Measuring head LS-7030 (LS-7030M)



* Figures in brackets are the values for the LS-7030M.

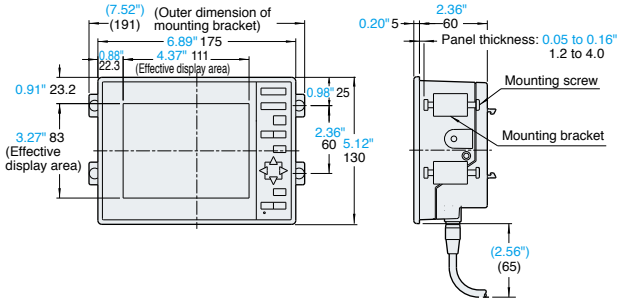
Unit : inch mm

Measuring head
LS-7010 (LS-7010M)

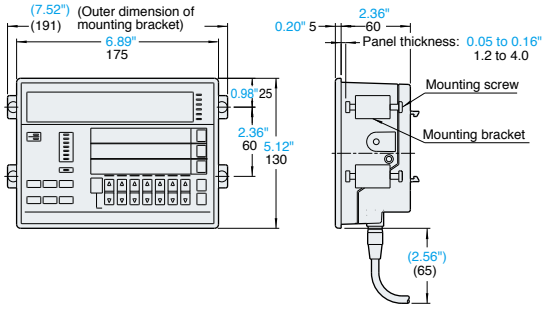


* Figures in brackets are the values for the LS-7010M.

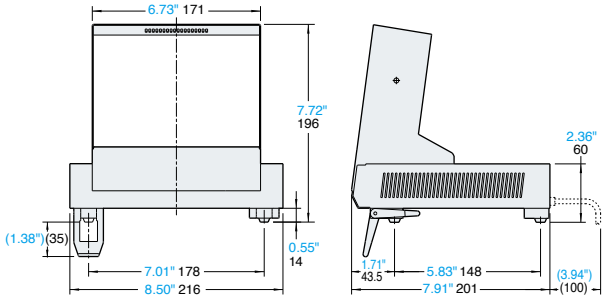
High-performance controller LS-7601



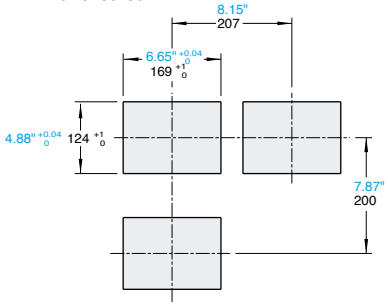
Standard controller LS-7001



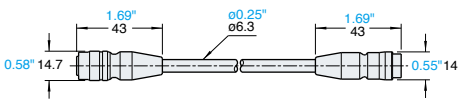
AC power supply stand LS-S11



Panel cutout



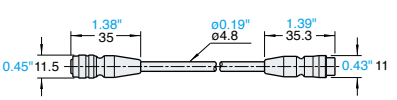
Extension cables
Cable between the controller and measuring head
LS-CxxA



Model	Cable length
LS-C3A	9.8' 3 m
LS-C10A	32.8' 10 m
LS-C30A	98.4' 30 m

* Up to two cables are connectable, provided that the total length is a maximum of 132' 40 m.

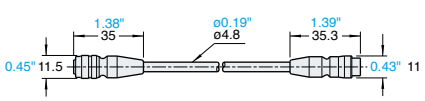
Camera cable
LS-CxxAM



Model	Cable length
LS-C3AM	9.8' 3 m
LS-C10AM	32.8' 10 m
LS-C30AM	98.4' 30 m

* Up to two cables are connectable, provided that the total length is a maximum of 132' 40 m.

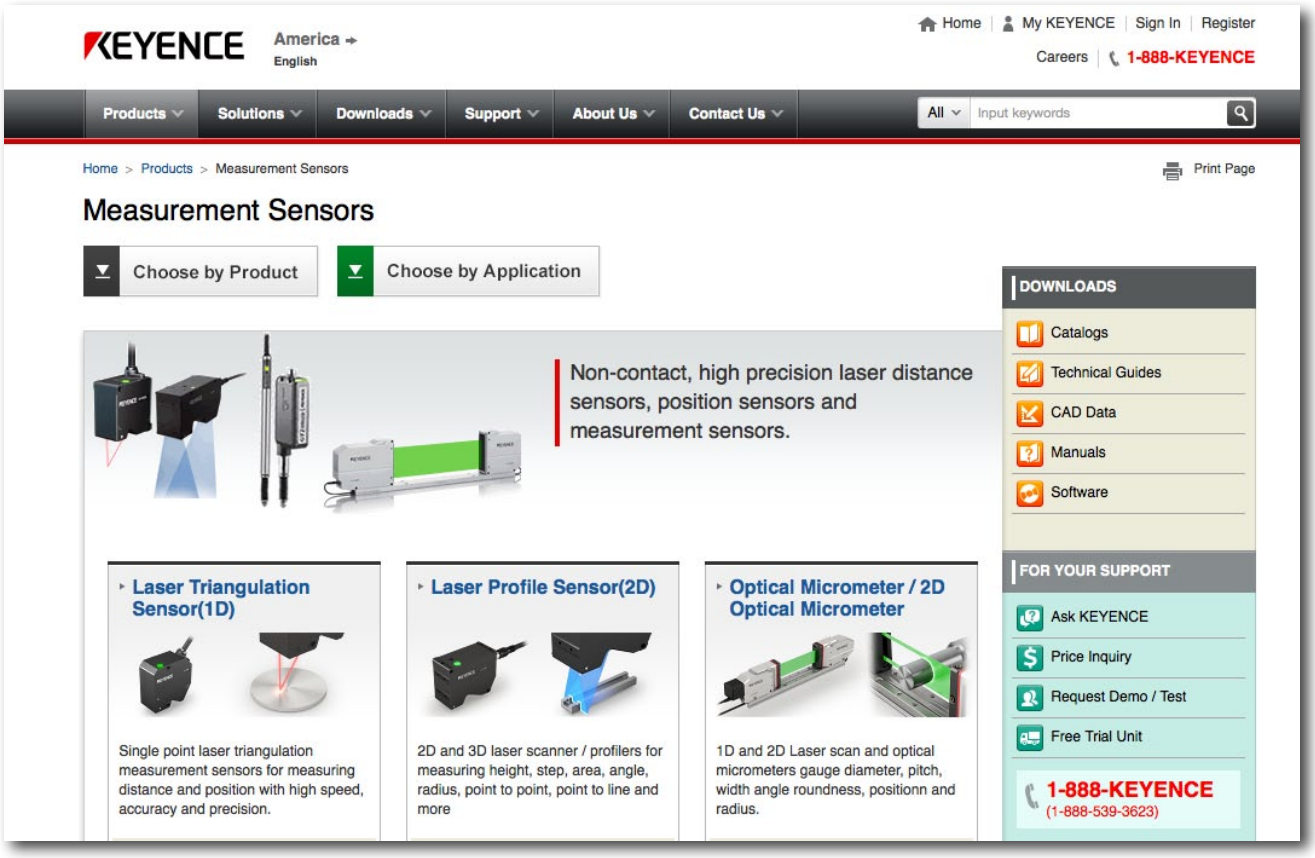
Cable between the receiver and transmitter



Model	Cable length
OP-42182	3.3' 1 m
OP-42183	9.8' 3 m

* Up to two cables are connectable, provided that the total length is a maximum of 19.80' 6 m.

Visit our website for answers to all your measurement or gauging questions.



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