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Laser Confocal Displacement Meters

LT Series

Features

- Advanced “Active Confocal Measurement” system
- 2-µm 0.08 Mil beam spot
- Resolution of 0.1 µm 0.004 Mil
- Linearity of ±0.5% of F.S.

Measuring range

Standard – 5 mm ±0.3 mm (0.20" ± 0.01")

Long-range – 28 mm ±1 mm (1.10" ± 0.04")



Description

Stable measurement regardless of surface conditions

The confocal measurement system detects only peak beam reflection and ignores beam intensity, which is easily affected by surface conditions. Therefore, the color, luster, and texture of the target surface have no affect on measurement.

Smallest spot size and longest distance

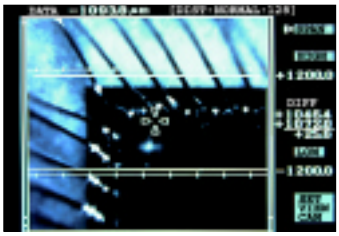
With a 2-µm 0.08 Mil or 7-µm 0.28 Mil diameter laser beam spot and a working range of 5 mm 0.20" or 28 mm 1.10" (depending on the model), the LT Series easily spans the distance required between sensor head and target in most applications.

Thickness measurement of transparent materials

A single sensor head mounted at the side of the target can be used to measure thickness. Unlike conventional displacement meters, the LT Series requires no additional sensor head on the opposite side. By detecting the peak beam reflection from the top and bottom surfaces of the target, it achieves accurate measurement with ease.

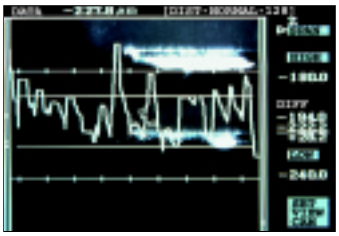
Microscope function

High-speed auto-focus lens ensures clear captured images.
The sensor head incorporates a miniature CCD camera. During measurement, a 9-inch monitor can be used to display the target image at 200x (Model LT-8010) or 90x (Model LT-8110) magnification.



Waveform monitor

Real-time display of measured values.



Resolution of 0.1 µm 0.004 Mil and linearity of ±0.5%*

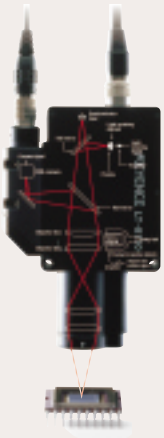
The LT achieves these specifications with almost any target.

*Resolution of 0.2 µm 0.008 Mil and linearity of ±0.3% with Model LT-8110.

The active confocal principle

KEYENCE combines the confocal principle with a tuning fork to achieve non-contact, laser measurement.

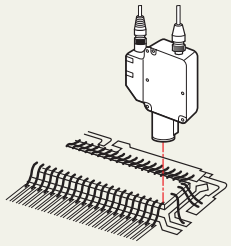
1. The laser beam emitted from the light source is focused on the target surface through an objective lens that vibrates rapidly up and down by means of a tuning fork.
2. The beam is reflected off the target surface and back into the sensor and is redirected by half-mirrors to converge on a pinhole over a light-receiving element.
3. A sensor determines the tuning fork’s exact position when the laser beam focuses on the target surface, and the distance to the target surface is calculated. This measuring technique is called the active confocal principle.



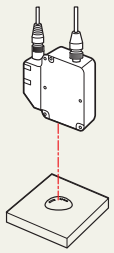
Visible beam
Model LT-8110 emits a visible beam 7 µm 0.28 Mil in diameter. Easy setup is ensured, even at a distance of 28 mm 1.10".

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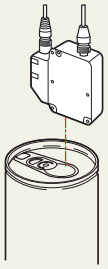
Applications



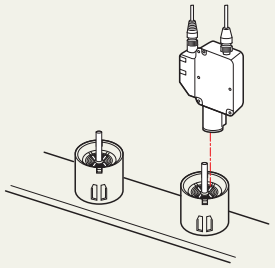
Confirming height of bonding wire



Checking thickness/profile of contact lens



Confirming scaring depth of pull-tab can



Confirming component height inside an electric motor

Specifications

Type			Standard			
Model		Sensor head	LT-8010			
		Camera unit	LT-V201			
		Controller	LT-8101	LT-8102	LT-8105	LT-8106
Measuring range			±0.3 mm 0.01"			
Operating distance			5 mm 0.20"			
Light source			Red semiconductor laser			
	Wavelength		670 nm			
	Class	FDA	Class II			
		IEC	Class 1			
Camera light source			Infrared LED (wavelength: 830 nm)			
Spot diameter			Approx. 2 µm 0.08 Mil			
Resolution[1]		NORMAL mode	0.3 µm 0.01 Mil		0.1 µm 0.004 Mil	
		THICK mode	0.7 µm 0.03 Mil		0.2 µm 0.008 Mil	
Linearity			±0.5% of F.S.			
Sampling frequency			1.4 kHz min.			
Response time			2.2 ms max. (number of averaging measurements: 2)			
Number of averaging measurements			2/16/128 (selectable)			
Terminal block I/O		Analog displacement output	±6 V (10 mV/µm, thickness measurement: 5 mV/µm) Output impedance: 140 Ω			
		LASER REMOTE input	Non-voltage input (contacts/solid state)			
		Print start output	NPN: 30 mA max. (30 V max.)			
9-pin connector I/O		Output	Upper/lower limit, ALARM, Low light quantity,			
			NPN: 30 mA max. (30 V max.)			
		Input	HOLD, Auto-zero set, P-P reset			
			Non-voltage input (contacts/solid state)			
Interface		RS-232C	Displacement data output and control input			
Temperature characteristics (ambient temperature: +20 to +30°C)			±0.5% of F.S.			
Power supply			100/120 VAC ±10% 50/60 Hz	220/240 VAC ±10% 50/60 Hz	100/120 VAC ±10% 50/60 Hz	220/240 VAC ±10% 50/60 Hz
Power consumption			40 VA max.			
Ambient light			Incandescent/fluorescent lamp: 2,000 lux max.			
Weight		Sensor head	400 g			
		Camera unit	1.8 kg			
		Controller	3.3 kg	3.3 kg	3.3 kg	3.3 kg

1. A mirror-surfaced target was measured with the number of averaging measurement set to 128.

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LT Laser Confocal Displacement Meters

Type			Long-range			
Model		Sensor head	LT-8110			
		Camera unit	LT-V201			
		Controller	LT-8101	LT-8102	LT-8105	LT-8106
Measuring range			±1 mm 0.04"			
Operating distance			28 mm 1.10"			
Light source			Red semiconductor laser			
	Wavelength		670 nm			
	Class	FDA	Class II			
		IEC	Class 1			
Camera light source			Infrared LED (wavelength: 830 nm)			
Spot diameter			Approx. 7 µm 0.28 Mil			
Resolution[1]		NORMAL mode	0.4 µm 0.02 Mil		0.2 µm 0.08 Mil	
		THICK mode	0.8 µm 0.03 Mil		0.4 µm 0.02 Mil	
Linearity			±0.3% of F.S.			
Sampling frequency			1.4 kHz min.			
Response time			2.2 ms max. (number of averaging measurements: 2)			
Number of averaging measurements			2/16/128 (selectable)			
Terminal block I/O		Analog displacement output	±8 V (4 mV/µm, thickness measurement: 2 mV/µm) Output impedance: 140 Ω			
		LASER REMOTE input	Non-voltage input (contacts/solid state)			
		Print start output	NPN: 30 mA max. (30 V max.)			
9-pin connector I/O		Output	**Upper/lower limit, ALARM, Low light quantity**			
			NPN: 30 mA max. (30 V max.)			
		Input	**HOLD, Auto-zero set, P-P reset**			
			Non-voltage input (contacts/solid state)			
Interface		RS-232C	Displacement data output and control input			
Temperature characteristics (ambient temperature: +20 to +30°C)			±0.25% of F.S.			
Power supply			100/120 VAC ±10% 50/60 Hz	220/240 VAC ±10% 50/60 Hz	100/120 VAC ±10% 50/60 Hz	220/240 VAC ±10% 50/60 Hz
Power consumption			40 VA max.			
Ambient light			Incandescent/fluorescent lamp: 2,000 lux max.			
Weight		Sensor head	430 g			
		Camera unit	1.8 kg			
		Controller	3.3 kg	3.3 kg	3.3 kg	3.3 kg

1. A mirror-surfaced target was measured with the number of averaging measurement set to 128.

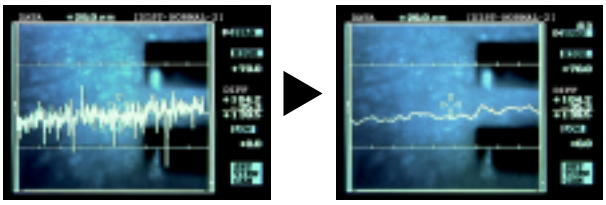
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Functions

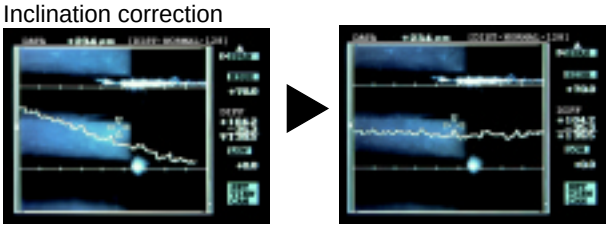
Smoothing and inclination correction

The LT's smoothing feature cancels extraneous fluctuations in the measured data. In addition, an inclination correction feature corrects waveform inclinations to clearly reveal height differences.

Smoothing (Low-pass filter)

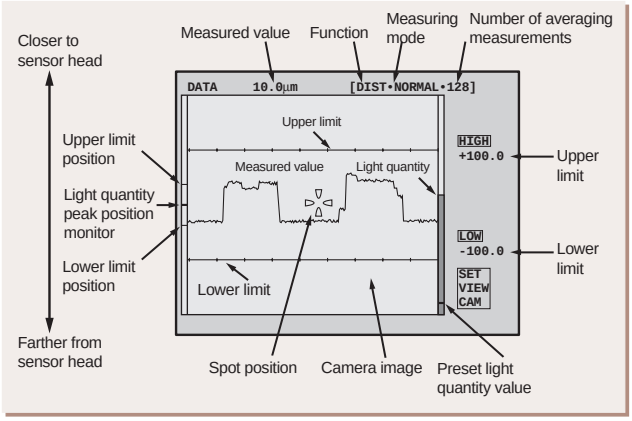


Inclination correction

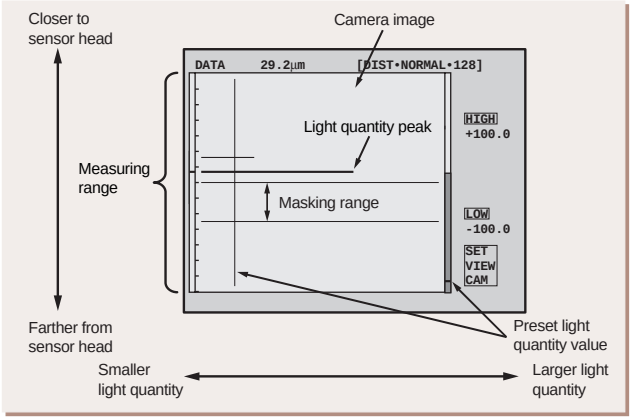


Screen displays

Scrolling screen



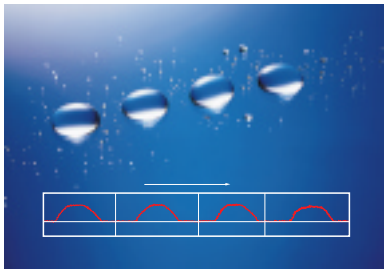
Light quantity distribution screen



* Processing of displayed data as waveforms

Accurately measures wet surfaces

Unlike conventional sensors, the LT can measure the thickness of wet coatings, eliminating the need to dry the target. As shown in the photo, even dewdrops can be measured accurately.

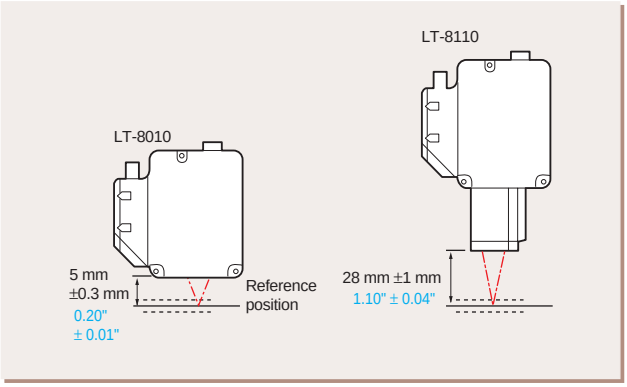


Ideal for measuring mirror-surfaced targets

Conventional methods cannot reliably measure mirror-surfaced targets such as metallic objects and compact discs, because no light is reflected at some angles or because the light-receiving element is saturated by excessive specular reflections from the target. The active confocal method, which detects the peak quantity of received light, ensures stable measurement even when the optical axis is inclined up to ±17°(Model LT-8010) or ±7° (Model LT-8110) toward the target.

Two types of sensor heads available

Two models with different beam aperture angles offer the ideal characteristics for a variety of applications. The high-accuracy Model LT-8010 excels at tracing the profiles of titled and curved surfaces, while the long-distance Model LT-8110 provides greater flexibility for mounting the sensor head.

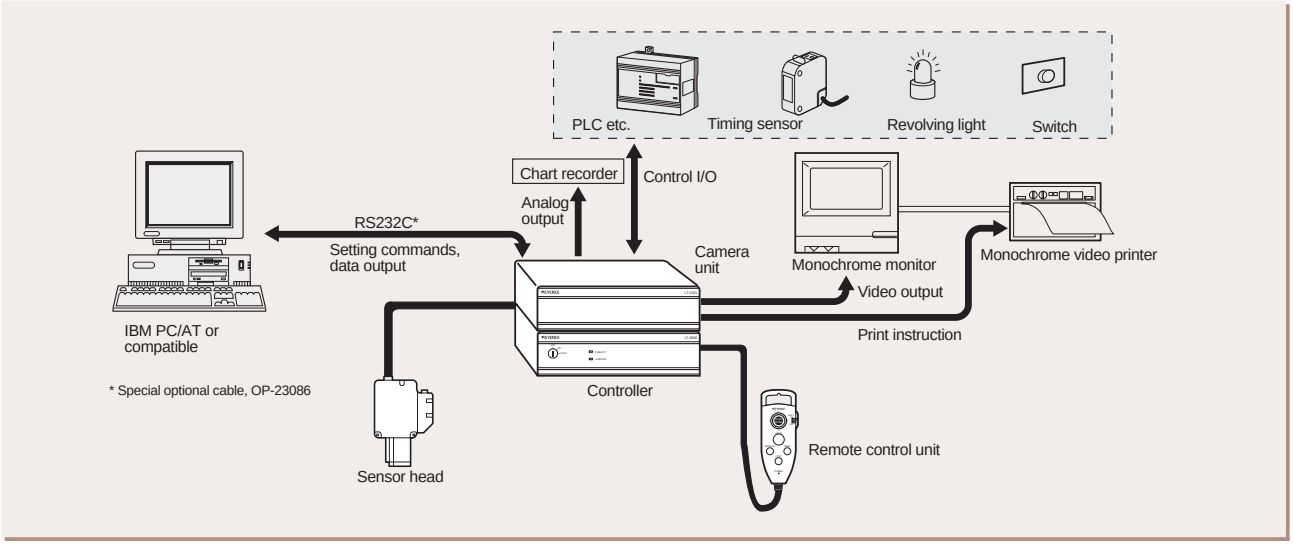


Printout function

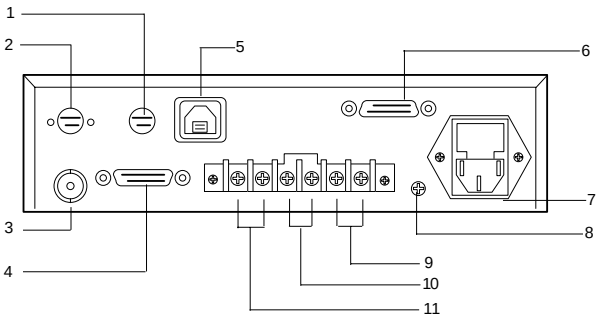
A printer can be activated with a button on the remote control unit, allowing you to print the measured waveform remotely while monitoring the screen.

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System Configuration



Rear panel of the controller



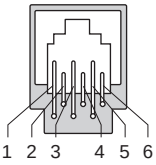
1. Sensor head connector port
2. Remote control unit
3. Video output connector port
4. Camera unit connector port
5. RS-232C connector port
6. Control I/O port
7. Power connector port
8. Frame ground terminal
9. Print-start output terminals
10. Laser emission remote control terminals
11. Analog voltage output terminals

RS-232C communication parameters

Same as a modem which conforms to EIA RS-232C.

Duplex	Full
Synchronization	Start-Stop
Data format	ASCII
Data length	8 bits
Stop bit length	1 bit
Parity check	None
Baud rate	9,600 bps

RS-232C pin assignment

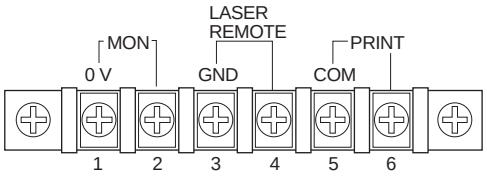


Pin No.	Signal	Description	I/O
1	—	Unused	—
2	—	Unused	—
3	SD (TXD)	Inputs data from external device.	Input
4	SG (GND)	Signal ground	—
5	RD (RXD)	Outputs data to external device.	Output
6	—	Unused	—

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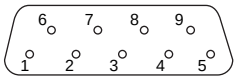
Control I/O terminal

Assignment



No.	I/O	Signal	Description
1	—	0 V	Ground for analog voltage
2	Output	Analog voltage output	Outputs analog voltage proportional to measured value.
3	—	GND	Ground for LASER REMOTE
4	Input	LASER REMOTE input	Emits laser when short-circuited with GND. Stops laser when opened.
5	—	COM	COMMON for print start
6	Output	Print start output	Outputs print start signal to video printer.

Control I/O (9-pin connector)



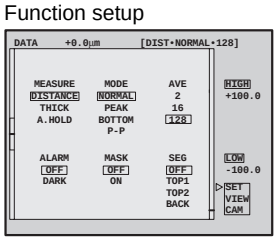
Pin No.	I/O	Signal	Description
1	Output	Low light quantity output	Outputs ON signal when light quantity is lower than lower limit of dark-cut level.
2	Output	High output	Outputs ON signal when measured value is higher than HIGH setting.
3	—	COM (for output)	COMMON for output
4	Input	Auto-zero input	Sets auto-zero when short-circuited with GND.
5	—	GND(for input)	GND for input
6	Output	Alarm output	Outputs OFF signal when measurement is impossible due to abnormal head condition.
7	Output	LOW output	Outputs ON signal when measured value is lower than LOW setting.
8	Input	HOLD input	Sets HOLD when short-circuited with GND. Cancels HOLD when opened.
9	Input	RESET input	Resets settings of PEAK, BOTTOM, and P-P mode when short-circuited with GND.

Operations

Easy setup with simple menus

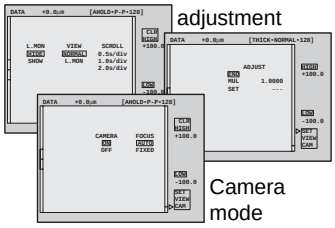
A simple menu structure — one main menu and three submenus — quickly leads you to the appropriate setup screen. For easiest setup, use the convenient remote control unit while viewing the screen.

Function setup



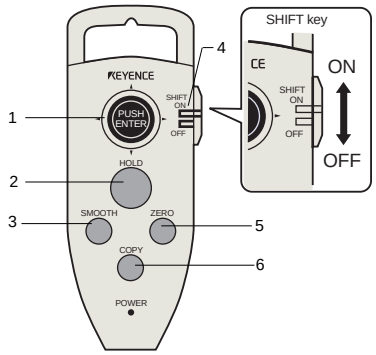
Screen mode

Thickness adjustment



Camera mode

Using the remote control unit



1 Cursor (PUSH ENTER) pad
Pressing the upper, lower, right, or left area of(▲,▼,▶or◀)this pad moves the cursor, mark, light quantity setting bar, or range-specifying bar. Pressing the center of the pad selects the desired item and determines its position.

2 HOLD button
Pressing this button with the NORMAL (scroll) screen displayed retains the current data and screen display.

3 SMOOTH (LPF) button
Pressing this button activates the smoothing feature.

4 SHIFT key
The slide-lock SHIFT key can be set for one-hand operation, which allows you to select various settings with only a few keys.

5 ZERO button
Pressing this button resets the desired displacement value to zero.

6 COPY button
Pressing this button prints the current screen data to the video printer.

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Hints on Correct Use

Ensuring high accuracy

- Maintain a stable ambient temperature. Fluctuations in ambient temperature may cause measurement errors.
- Keep the laser-emitting/-receiving surfaces free from water, oil, and dust. Any substance adhering to these surfaces will refract or decrease light and may cause measurement errors.
- Clean the LT with a soft cloth moistened with alcohol.

Controller/sensor head compatibility

The controller and sensor head are calibrated as a pair; therefore, use the controller only with a sensor head of the same serial number. Combining units of different serial numbers may result in poor performance.

Noise interference

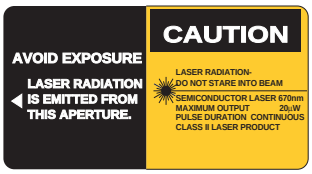
- Isolate all connecting cables from high-tension lines and power lines to avoid malfunctions due to noise interference.
- Be sure to earth-ground the frame-grounding terminal. For best performance, provide insulation between the mounting surface and sensor head.

Warning

The LT Series conforms to FDA and IEC standards as follows:

Model		LT-8010	LT-8110
Class	FDA	Class II	
	IEC	Class 1	

FDA Class II

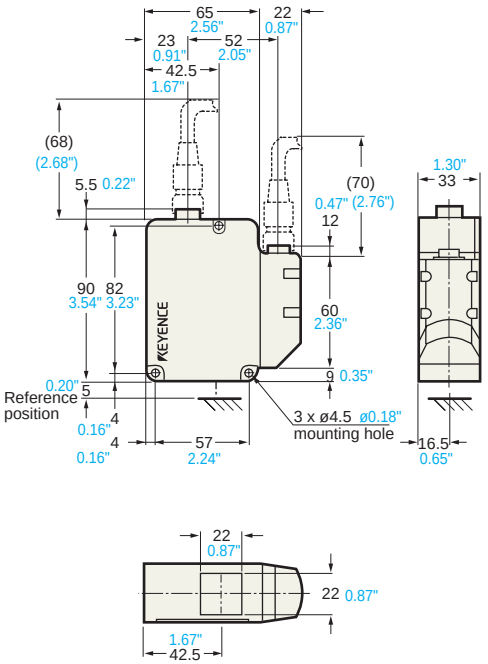


Dimensions

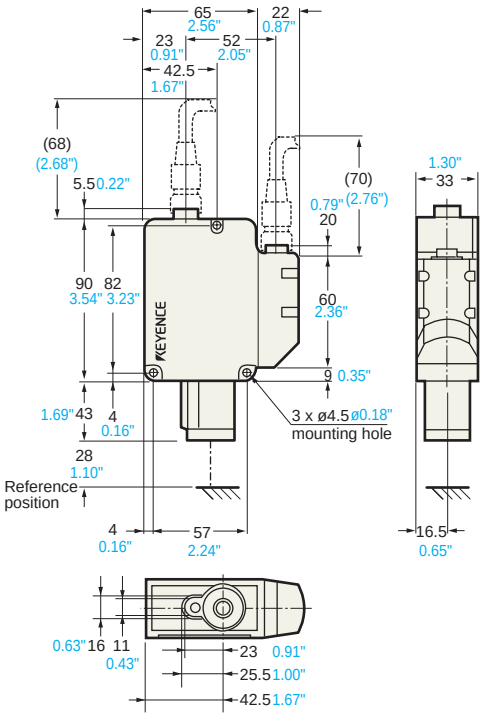
Unit: mm Inch

Sensor head

LT-8010



LT-8110

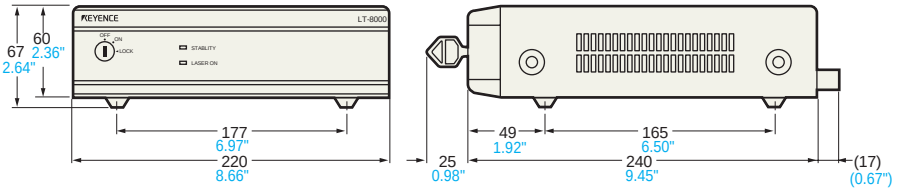


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Unit: mm Inch

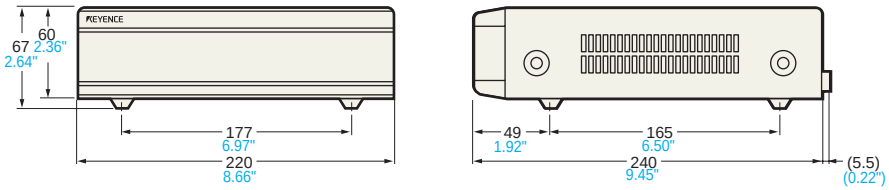
Controller

LT-8101/8102/8105/8106

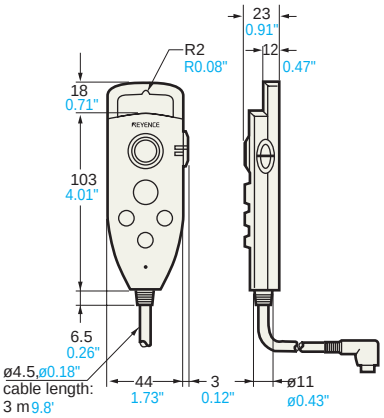


Camera unit

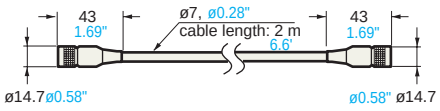
LT-V201



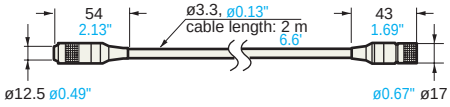
Remote control unit



Connecting cable



Camera cable



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