

INSTALLATION GUIDE

Laser Sensor Series LAR

For further information please see the data sheet at www.waycon.biz/products/laser-sensors/

INTRODUCTION

Thank you very much for purchasing WayCon Positionsmesstechnik GmbH products. Please read this installation guide carefully and thoroughly for the correct and optimum use of this product. Kindly keep this guide in a convenient place for quick reference.

Attention!

- This product is for the sensing (determination and measurement) of objects. Do not use this product to secure safety, such as accident prevention which may affect human life and property.
- Do not stare directly into the laser beam, or through observation optical equipment, such as lenses or etc. as it is dangerous.

CONFIRMATION OF PACKED CONTENT

• Sensor	1 piece
• Laser warning label (GB Standard)	1 set (already on sensor)
• FDA certification label	1 piece
• Installation Guide	1 piece

SAFE USE OF LASER PRODUCT

For the purpose of preventing any injury which may occur to the user by the use of the laser product in advance, the following standards have been established by the IEC Standards, JIS Standards and FDA Standards.

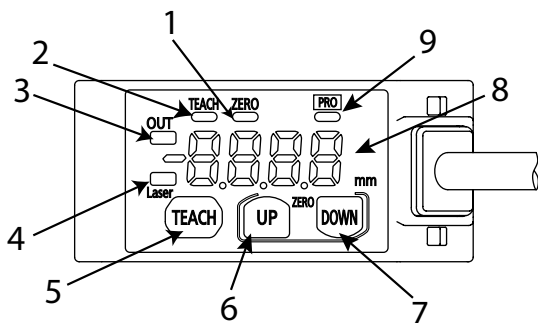
IEC: IEC 60825-1-2007 (EN 60825-1-2007)

JIS: JIS C 6802-2011

FDA: PART 1040 (Performance standards for light-emitting products)

These standards classifies laser products according to the level of hazard and provide the safety measures for respective classes.

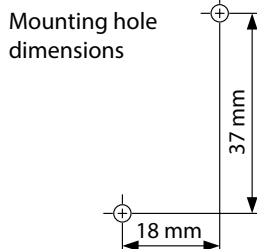
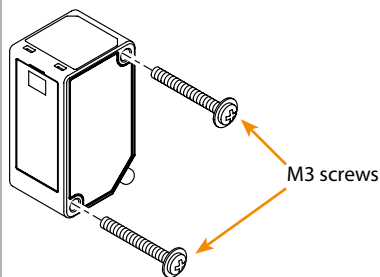
PART DESCRIPTION



No.	Description
1	Zero set indicator (Yellow)
2	Teaching indicator (Yellow)
3	Output operation indicator (Orange)
4	Laser emission indicator (Green)
5	TEACH key
6	UP key
7	DOWN key
8	Digital indicator (Red)
9	PRO indicator (Yellow)

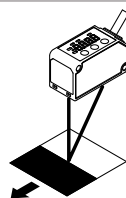
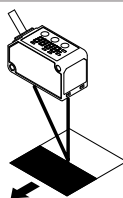
MOUNTING

When mounting this product, use M3 screws (prepare separately). Use a tightening torque of 0.5 Nm for mounting.

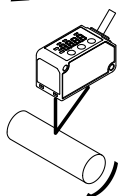
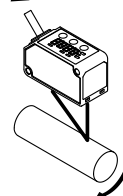


MOUNTING DIRECTION

1. When performing measurements of moving objects with excessively different materials and colours, mount the product per the following directions to minimize measurement errors.

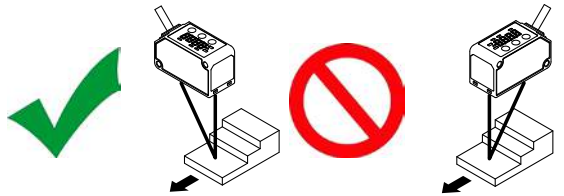


2. When measuring rotating objects, mount the product as follows. Measurement can be performed with minimized effect on the object caused by up / down deflection, position deviation and etc.

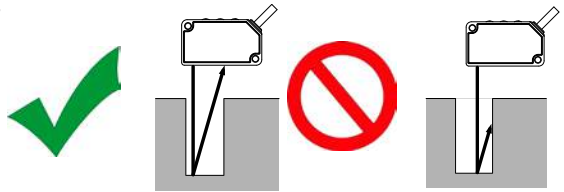


MOUNTING DIRECTION

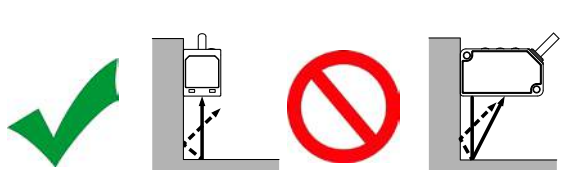
3. When there is a step in the moving object, mount the product as follows. Measurement can be performed with minimized effect from the edges of the steps.



4. When measuring in narrow locations or inside holes, mount the product so that optical path from the light emitting part to light-receiving part is not interrupted.

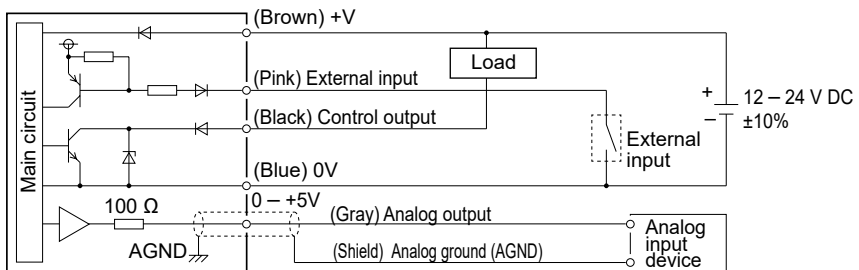


5. Mount the product as follows, so that the multiple light reflections on the wall do not emit to the light-receiving part. When the reflection factor on a wall is high, it is effective to use a dull black colour.

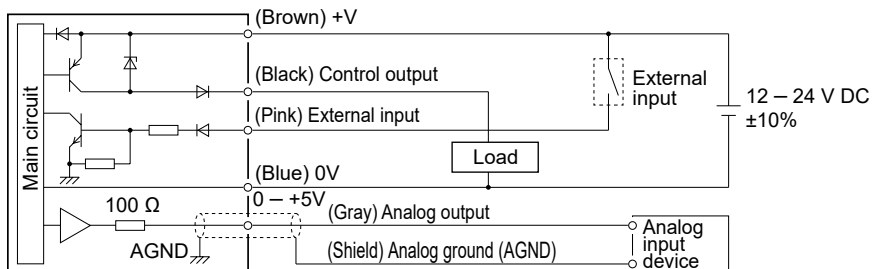


I/O CIRCUIT DIAGRAMS

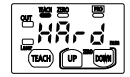
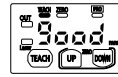
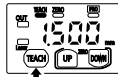
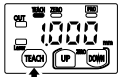
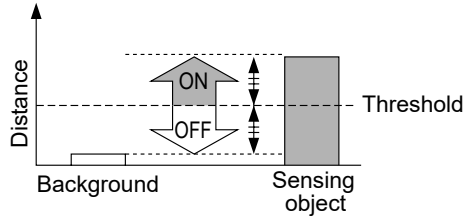
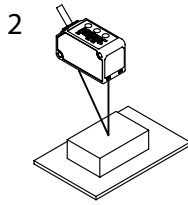
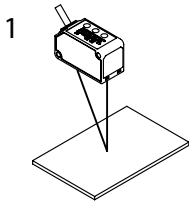
NPN Output Type



PNP Output Type



2-point teaching (basic teaching method)



1. Press the TEACH key in the background present condition.

2. Press the TEACH key in the sensing object present condition.

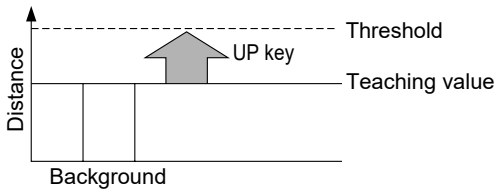
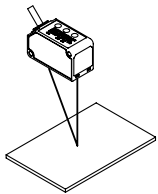
Stable sensing is possible.

Stable sensing is not possible

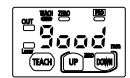
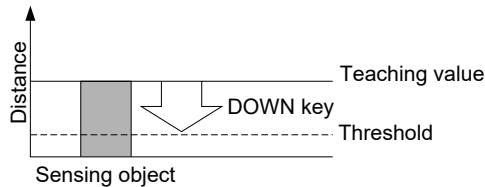
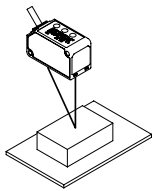
Limit-teaching

This is teaching method in case small object or object in background are existing.

When an object in background is used as reference:



When a sensing object is used as reference:



1. Press the TEACH key in the background present condition or the sensing object present condition.

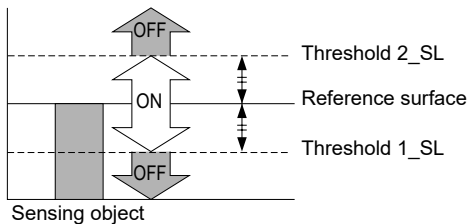
2. When an object in the background is used as a reference, press the UP key to set the threshold on the sensor side.
When a sensing object is used as a reference, press the DOWN key to set the threshold on the sensing object side.

3. Teaching is completed.

1-point teaching (Window comparator mode)

This mode is used for setting the threshold range for the distance from the reference value of the sensing object, by performing 1-point teaching. This mode is used for sensing within the threshold range.

When performing 1-point teaching (window comparator mode), preset "Window comparator mode 1" in the sensing output setting of the PRO mode. For the setting method, refer to section "PRO MODE SETTING."



1. Press the TEACH key twice in the sensing object present condition.

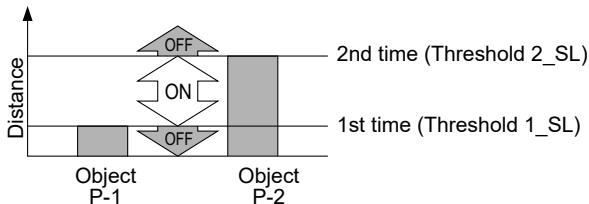


2. Teaching is completed.

2-point teaching (Window comparator mode)

This is method to set the threshold range by conducting the 2-point teaching. When performing 2-point teaching (window comparator mode), preset "Window comparator mode 2" in the sensing output setting of the PRO mode. For the setting, refer to section "PRO MODE SETTING."

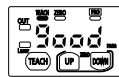
When conducting teaching, use sensing objects (P-1 and P-2) whose distance are different from each other.



1. Press the TEACH key in the sensing object P-1 present condition. (1st time)



2. Press the TEACH key in the sensing object P-2 present condition. (2nd time)



Stable sensing is possible.



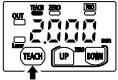
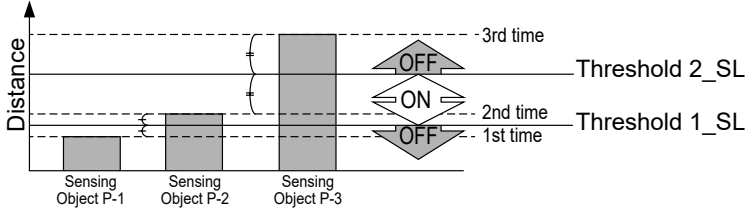
Stable sensing is not possible.

3-point teaching (Window comparator mode)

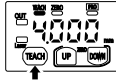
This is the method to perform 3-point teaching (P-1, P-2, P-3) and to set the threshold range by setting threshold 1_SL in the mid-point between the 1st time and 2nd time, and threshold 2_SL in the mid-point between the 2nd time and 3rd time as shown in the following figure.

When performing 3-point teaching (window comparator mode), preset "Window comparator mode 3" in the sensing output setting of the PRO mode. For the setting, refer to section "PRO MODE SETTING."

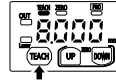
When performing teaching, use sensing objects (P-1, P-2, P-3) with different distance. After teaching, P-1, P-2 and P-3 will be automatically rearranged from the smaller value.



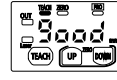
1. Press the TEACH key in the sensing object P-1 present condition (1st time).



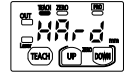
2. Press the TEACH key in the sensing object P-2 present condition (2nd time).



3. Press the TEACH key in the sensing object P-3 present condition (3rd time).



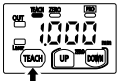
Stable sensing is possible.



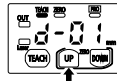
Stable sensing is not possible.

Span adjustment in rising differential mode or trailing differential mode

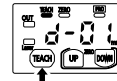
This mode is used to cancel the gradual changes in the measured value, and to only detect sudden changes. When performing rising differential mode or trailing differential mode, preset "Rising differential mode" or "Trailing differential mode" in the sensing output setting of the PRO mode. For the setting method, refer to section "PRO MODE SETTING."



1. Press the TEACH key.



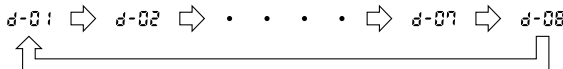
2. Press the UP key or DOWN key to select the span.



3. Press the TEACH key to set.

Short span

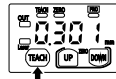
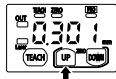
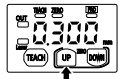
Long span



THRESHOLD VALUE FINE ADJUSTMENT FUNCTION

- Fine adjustment of the threshold can be performed in the measurement display.
- Fine adjustment of the threshold can be performed even after teaching.

Normal sensing mode, rising differential mode or trailing differential mode



Confirmed
(Automatically
set after 3 s)

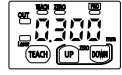
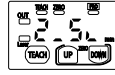
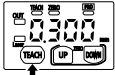
Press the UP/
DOWN key

Press the UP/
DOWN key

Press the
TEACH key

Window comparator mode

When the sensing output is set to window comparator mode, the display of 1-5L and 2-5L can be changed by pressing the TEACH key for 1 second.



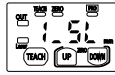
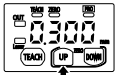
Press the TEACH
key for 1 s.

Change the threshold value.

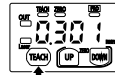
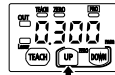
Automatic

Measurement
display

When performing a fine adjustment of the threshold of 1-5L or 2-5L, press the UP key or DOWN key. After 1-5L or 2-5L is displayed, the fine adjustment of the threshold can be performed.



Automatic



Confirmed
(Automatically
set after 3 s)

Press the
UP/DOWN key

or

Press the
UP/DOWN key

Press the
TEACH key

PEAK / BOTTOM HOLD FUNCTION

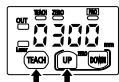
The peak / bottom hold function, is for displaying the peak value and bottom value.

When the zero set function is executed while the peak / bottom hold function is set to "Peak hold" or "Bottom hold", the held measured value will be reset.

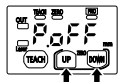
Digital Display	Description	Function
P _{OFF}	Hold function release	Releases the hold status, and outputs the current measured value
P-H	Peak hold	Holds maximum measured value
b-H	Bottom hold	Holds minimum measured value

PEAK / BOTTOM HOLD FUNCTION

Press the TEACH key and UP key simultaneously for 3 s.

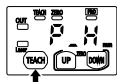


Press down UP/DOWN key

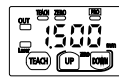


Select

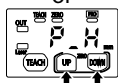
Press the TEACH key



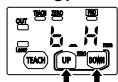
Confirmed



(Automatically set after 3 s)



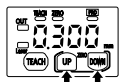
or



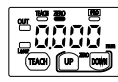
ZERO SET FUNCTION

The zero set function is the function to compulsorily set the measured value to "zero". The zero set indicator (yellow) will turn ON when the zero set is valid. When the zero set function is executed while the peak / bottom hold function is valid, the held measured value will be reset. When the display setting is set to Offset, the zero set function cannot be set.

Zero set setting

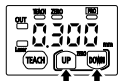


Confirmed



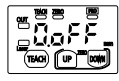
Press the UP key and DOWN key simultaneously for 3 s.

Zero set release

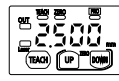


Press the UP key and DOWN key simultaneously for 6 s.

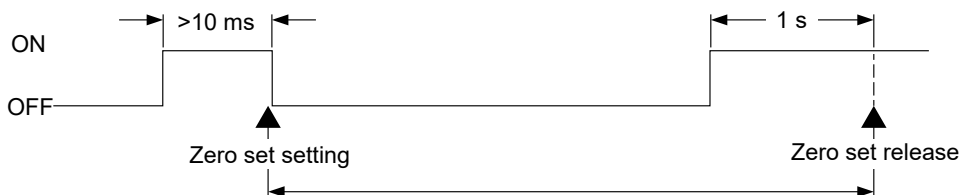
0000 will be displayed during this period.



Automatic



The setting or releasing of the zero set from an external input operates as in the following figure.



- When the power is turned ON again, zero set from external input can be released. At this time, the zero set will not be saved.
- Even when the zero set is set in the sensor, the zero set can be set or released from an external input. However, when the power is turned ON again, the zero set that is set in the sensor will be displayed.

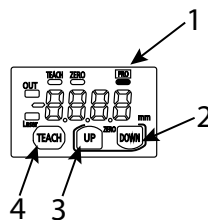
PRO MODE SETTING

To change into the PRO MODE press the DOWN key for 3 s. The PRO indicator (yellow) will turn ON when the PRO MODE is set.

When the DOWN key is pressed for 3 s or more in the middle of the PRO MODE setting, the display returns to the measurement display.

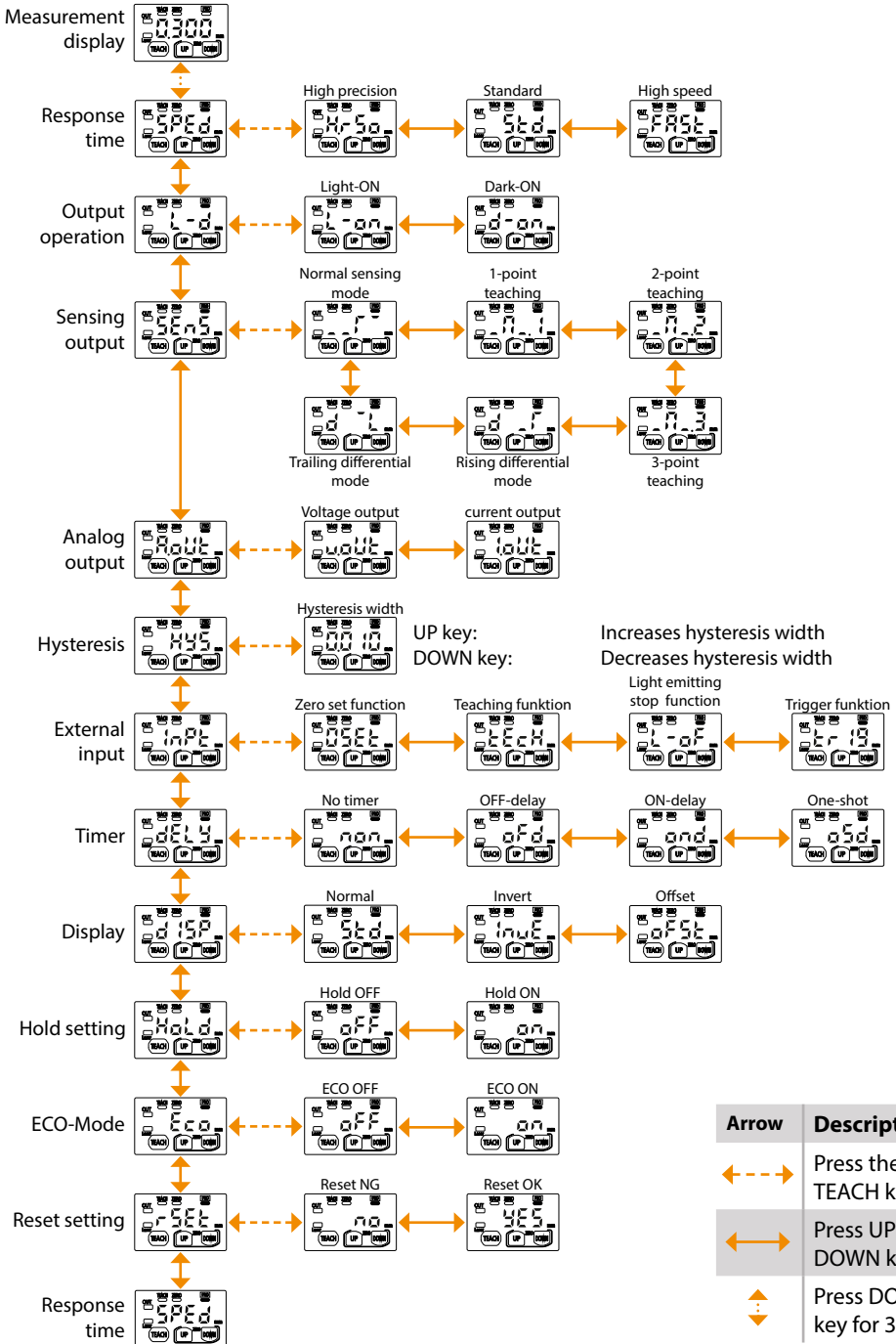
Part description

No.	Description
1	PRO indicator (Yellow)
2	DOWN key (Select)
3	UP key (Select)
4	TEACH key (Confirm)



Item	Default setting	Description
Response speed	H.r 50	Set the response time: „H.r 50“: High precision 10 ms; „50“: Standard 5 ms; „FAS“: High speed 1.5 ms
Output operation	L-on	Select the control output operation mode: „L-on“: Light-ON; „d-on“: Dark-ON
Sensing output	-- 1--	Set the sensing output: „-- 1--“: Normal sensing mode; „_1_ 1“: 1-point teaching; „_1_ 2“: 2-point teaching; „_1_ 3“: 3-point teaching; „d _ 1“: Rising differential mode; „d _ 1“: Trailing differential mode
Analog output	u.uL	Sets the output operation of analog output setting: „u.uL“: Analog voltage output (0 to 5 V); „i.uL“: Analog current output (4 to 20 mA)
Hysteresis	LAR-10: 0.0 10 LAR-30: 0.03 LAR-70: 0.07 LAR-160: 0.2 LAR-400: 0.8	Set the hysteresis width: LAR-10: 0.001 to 5 mm; LAR-30: 0.01 to 15 mm; LAR-70: 0.02 to 35 mm; LAR-160: 0.1 to 80 mm; LAR-400: 0.2 to 200 mm
External input	0SE	Set the external input: „0SE“: Zero set function; „E H“: Teaching function „L -OF“: Light emitting stop function; „E r 19“: Trigger function
Timer	on	Set the timer operation. The timer time is fixed at 5 ms: „on“: No timer; „Fd“: OFF-delay timer; „od“: ON-delay timer; „od“: One-shot timer
Display	5d	The display of the measured value can be changed: „5d“: Normal; „i uE“: Invert; „oF5“: Offset
Hold	oFF	Set the control output and the analog output operation when a measurement error occurs (insufficient light intensity, saturation of light intensity, out of measurement range): „oFF“: Hold OFF; „on“: Hold ON
ECO	oFF	The digital display can be set to go OFF when key operation is not performed for 30 seconds. Current consumption can be reduced: „oFF“: ECO OFF; „on“: ECO ON
Reset	on	Return to the default setting (factory setting): „on“: Reset NG; „SE5“: Reset OK

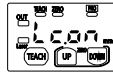
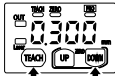
PROCEDURE OF THE PRO-MODE



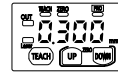
KEY LOCK FUNCTION

- The key lock function is to prevent acceptance of key operations, so that the conditions set in each setting mode are not changed accidentally.
- When key operation is performed after the key lock is set, „L o c“ will be displayed.

Key lock setting

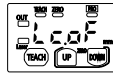
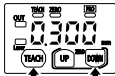


Automatic

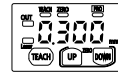


Press the TEACH key and DOWN key simultaneously for 3 s.

Key lock release



Automatic



Press the TEACH key and DOWN key simultaneously for 3 s.

ERROR INDICATION

In case of errors, attempt the following measures.

Error indication	Description	Remedy
Hold OFF --- Hold ON Measured value blinks	Insufficient amount of reflected light. The sensing object is out of the sensing range.	Confirm that the sensing distance is within the specification range. Adjust the installation angle of the sensor.
Er 0 !	Flash memory is damaged or passed its life expectancy.	Please contact our office.
Er 1 !	Load of the sensing output is short-circuited causing an over-current to flow.	Turn OFF the power and check the load.
Er 2 !	The semiconductor laser is damaged or passed its life expectancy.	Please contact our office.
Er 3 !	When zero set is set, the measurement is not performed normally. Since the display setting is set to "Offset", the zero set function can not be used.	Confirm that the sensing distance is within the specification range. Set the display to any setting except "Offset".
Er 4 !	During teaching, the measurement is not performed normally.	Confirm that the sensing distance is within the specification range.
Er 90; Er 9 1; Er 92 or Er 93	System error	Please contact our office.



WARNING NOTICES

- This product has been developed / produced for industrial use only.
- Make sure that the power supply is OFF before starting the wiring.
- If the wiring is performed incorrectly, it will cause a failure.
- Do not run the wires together with high-voltage lines or power lines, or put them in the same raceway. This can cause malfunction due to induction.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- If noise generating devices (switching regulators, inverter motors, etc.) are used around the sensor mounting area, make sure to connect the frame ground (F.G.) terminal of the device.
- Do not use this product during the transient state when the power supply is turned ON.
- The overall length of the cable can be extended to 10 m maximum with a cable size of 0.3 mm² or more.
- Make sure that stress by forcible bend or pulling is not applied to the sensor cable joint.
- Although it depends on the type, light from rapid start type or high frequency lighting type fluorescent lights, sunlight and etc. may affect the sensing, therefore make sure to prevent direct incident light.
- This product is suitable for indoor use only.
- Keep water, oil, fingerprints and etc. which reflect light, or dust, particles or etc. which interrupts the light, away from the emitting / receiving surfaces of this product. If contaminants adhere to the surface, wipe off with a dust-free soft cloth, or lens cleaning paper.
- Do not use the sensor in locations where there is excessive vapour, dust or etc. or in an atmosphere where corrosive gases, etc. is generated.
- Take care that the product does not come in contact with oil, grease, organic solvents such as thinner, etc., strong acid or alkaline.
- Make sure to turn OFF the power supply, before cleaning the light emitting / receiving windows of the sensor head.
- There is a certain deviation in the directionality of this product. Install the product using a mounting bracket or similar fitting to allow the adjustment of optical axis.
- The internal memory (non-volatile) of this product has a service life. Settings cannot be configured more than 100,000 times.