



Self-contained CMOS Laser Sensor LR-ZB□N/P Series



Instruction Manual

Read this manual before using the product in order to achieve maximum performance. Keep this manual in a safe place after reading it so that it can be used at any time.

The following symbols alert you to important messages. Be sure to read these messages carefully.

WARNING	It indicates a hazardous situation which, if not avoided, could result in death or serious injury.
NOTICE	It indicates a situation which, if not avoided, could result in product damage as well as property damage.

Safety Information for LR-ZB Series

WARNING	<ul style="list-style-type: none"> This product is only intended to detect object(s). Do not use this product for the purpose to protect a human body or part of a human body. This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere. This product uses DC power. The product may explode or burn if an AC voltage is applied.
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NOTICE	<ul style="list-style-type: none"> Do not wire the cable along with power lines or high-tension lines, as the sensor may malfunction or be damaged due to noise. When using a commercially available switching regulator, ground the frame ground terminal and ground terminal. Do not disassemble this product. Laser emission from this product is not automatically stopped when it is disassembled. Use with an over current protection device which is rated 30 V or more and not more than 1 A.
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Safety Precautions on Laser Product

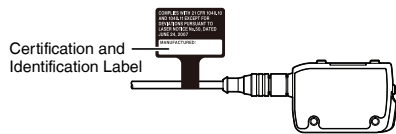
WARNING	<ul style="list-style-type: none"> This product uses a semiconductor laser for the light source. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Follow the instructions mentioned in this manual. Otherwise, injury to the human body (eyes and skin) may result. Laser emission from this product is not automatically stopped when it is disassembled. Do not disassemble this product. Do not stare into the beam.
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Wavelength/Output	660 nm/145 μW
FDA(CDRH) Part1040.10 ⁻⁷	Class 1 laser product
IEC 60825-1	Class 1 laser product

* The laser classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.

■ Certification and Identification Label

- When using this product in the U.S. affix the Certification and Identification Label included in the package of this product as shown on the right.



(Affix this label in a location that is not splashed with oils or chemicals.)

Consignes de sécurité relatives au Laser

AVERTISSEMENT	L'utilisation des commandes ou réglages ou l'exécution des procédures autres que celles spécifiées dans les présentes exigences peuvent être la cause d'une exposition à un rayonnement dangereux.
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Precautions on Regulations and Standards

■ UL Certification

- This product is an UL/C-UL Listed product.
- UL File No. E301717/Category NRKH. NRKH7/Enclosure Type 1 (UL50)

Be sure to consider the following specifications when using this product as a UL/CUL Listed Product.

- Use a power supply with Class 2 output defined in NFPA70 (NEC: National Electrical Code).
- Power supply/ Control input/ Control output shall be connected to a single Class 2 source only.
- Install the product at the ambient temperature 45°C or below when using with following optional cable. (OP-73864, OP-73865, OP-87396, OP-85499, OP-85500, OP-85497, OP-87399, OP-85584, OP-85585)

■ CE Marking

KEYENCE Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directive, based on the following specifications. Be sure to consider the following specifications when using this product in a member state of European Union.

● EMC Directive (2004/108/EC)

- Applicable standard EMU: 60947-5-2, Class A/EMS: 60947-5-2

These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive.

Specifications

Type		Distance setting		
Appearance		Rectangular		
Model	NPN	2 m cable	LR-ZB100N	LR-ZB250N
		M8 connector 4-pin	LR-ZB100CN	LR-ZB250CN
	PNP	2 m cable	LR-ZB100P	LR-ZB250P
		M8 connector 4-pin	LR-ZB100CP	LR-ZB250CP
		M8 connector 3-pin	LR-ZB100C3P	LR-ZB250C3P
Detectable distance		35 to 100 mm (650 to 0) ¹	35 to 250 mm (215 to 0) ¹	
Standard detection deviation		35 to 50 mm : 1.5 mm 50 to 100 mm : 3 mm	35 to 180 mm : 9 mm 180 to 250 mm : 25 mm	
Display resolution		2 (0.2 mm)	1 to 3 (1 to 3 mm)	
Spot diameter		2 X 1 mm at 100 mm	2.4 X 1.2 mm at 250 mm	
Response time		1.5 ms / 10 ms / 50 ms selectable		
Light source	Type	Red laser (660 nm)		
	Laser class	Class 1 laser product (IEC60825-1, FDA (CDRH) Part1040.10 ⁻²)		
Function	Indicator	3-digit 7-segment display (red), output indicator (yellow), DATUM indicator (orange), 1 spot indicator (green)		
	Timer	OFF/ON delay/OFF delay/One-shot		
Specifications	Power voltage	10 to 30 VDC, including 10% ripple (P-P), Class 2 or LPS		
	Power consumption	450 mW or less (18 mA or less at 24 V, 34 mA or less at 12V)		
	Control output	LR-ZB*N: NPN Open collector LR-ZB*P: PNP Open collector Applied voltage 30 VDC or less, Control current 100 mA or less, Residual voltage 1.2 V or less at 10 mA or less, 2 V or less at 10 to 100 mA		
	Protection circuit	Protection against reverse power connection, output overcurrent, output surge, reverse output connection		
	Output operation	Light-ON / Dark-ON selectable		
	External input *3	Input time calibration: 35 ms or more ON, 35 ms or more OFF Laser emission stop: 2 ms or more ON, 20 ms or more OFF Short-circuit current NPN: 1 mA or less/PNP: 2 mA or less		
Environmental resistance	Enclosure rating	IP68 (IEC60529)/IP69K (DIN40050-9)/ 4X, 6P, 13 (NEMA250)		
	Ambient light*4	Incandescent lamp: 4000 lx or less Sunlight: 8000 lx or less	Incandescent lamp: 2000 lx or less Sunlight: 4000 lx or less	
	Ambient temperature	-10 to +50°C		
	Storage temperature	-25 to +75°C		
	Ambient humidity	35 to 85%RH		
	Shock resistance	1000 m/s ² in X, Y, Z axis directions respectively 6 times		
	Vibration resistance	10 to 55 Hz Double amplitude 1.5 mm in the X, Y, Z axis directions respectively, 2 hours		
	Insulating resistance	20 MΩ or more (500 VDC)		
Withstand voltage	1000 VAC 50/60 Hz 1 min			
Material	Case: SUS316L, Display: PES, Lens cover: PMMA with scratch-resistant coating, Packing/Connector ring: FKM			
Weight	2 m cable type: Approx. 110 g (including cable) M8 connector type: Approx. 55 g			

*1 Display reading used as a guide for the detecting distance. When the setting value is tuned, the readout shifts. When the value exceeds "-99", "-FF" is displayed.

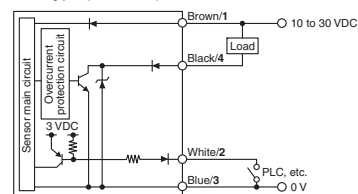
*2 The laser classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.

*3 M8 connector (3-pin) type does not include the external input function.

*4 When the response time is 10 ms

I/O Circuit Diagram

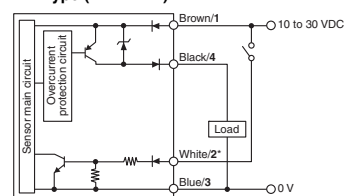
NPN type (LR-ZB*N)



M8 connector (4-pin) type



PNP type (LR-ZB*P)



M8 connector (4-pin) type



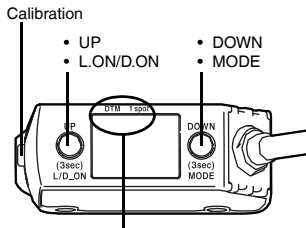
M8 connector (3-pin) type



* Cable type, M8 4-pin connector type only

Basic Operation

Part names and functions

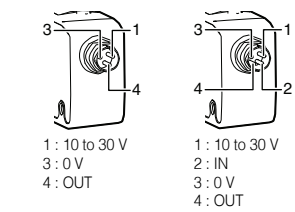
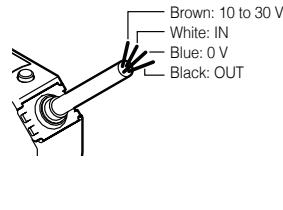


DTM: This lights up when datum calibration is performed.
 1 spot: This turns off when no light enters or multiple reflections occurs.

Package contents

- Sensor
 - Certification and Identification Label
 - Instruction Manual
- A connector cap is supplied with connector type sensors.

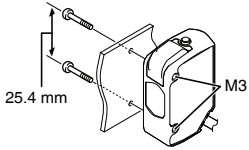
Wiring



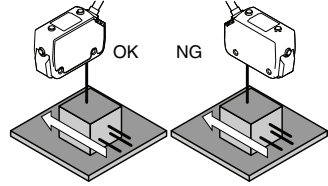
M8 Connector Tightening Torque: 0.6 Nm
 * Tighten the connector by a hand, and then retighten it by using tools and so on. Insufficient tightening will degrade water-resistant performance.

Installation

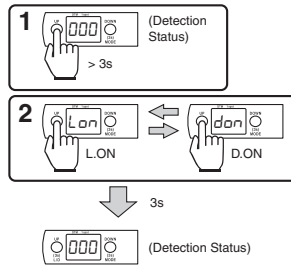
Tightening Torque: 0.6 Nm or less



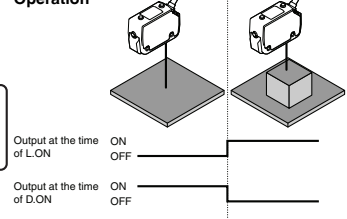
Direction of installation



Output configuration (L.ON ↔ D.ON)

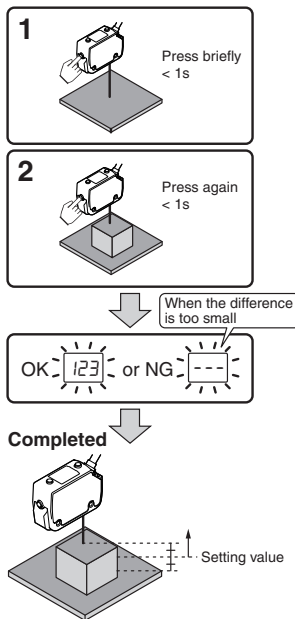


Operation

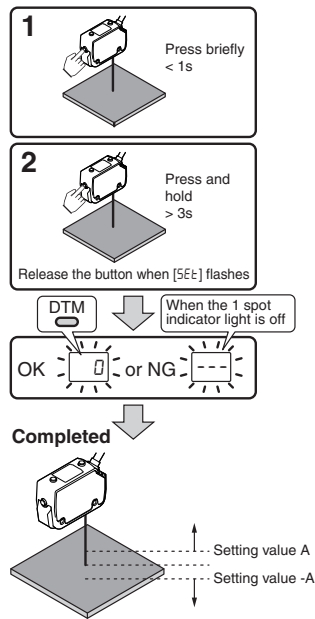


Sensitivity adjustment

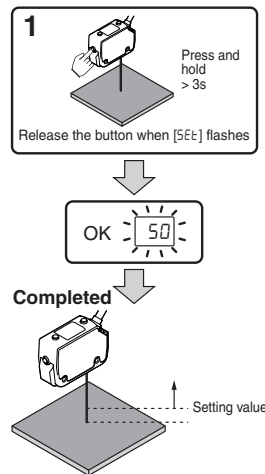
• Basic setting (high accuracy) (2-point calibration, background suppression - BGS)



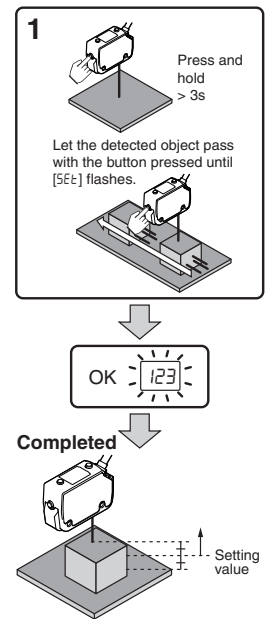
• When an object other than the background is to be detected (Datum calibration, foreground suppression - FGS)



• When an object located nearer than the background is to be detected (Maximum sensitivity calibration, background suppression - BGS)

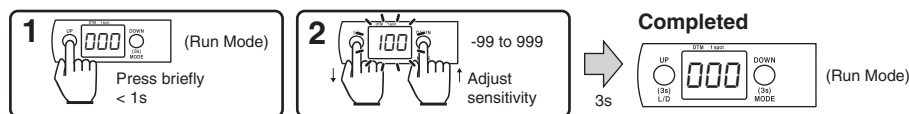


• Moving target calibration (Full auto calibration, background suppression - BGS)

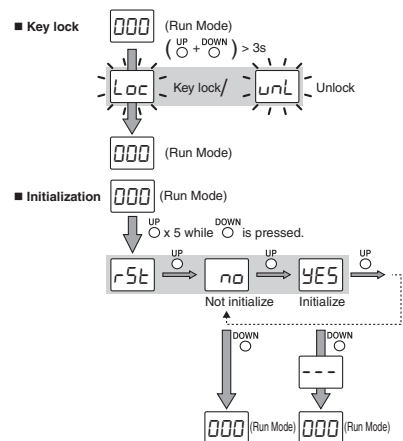
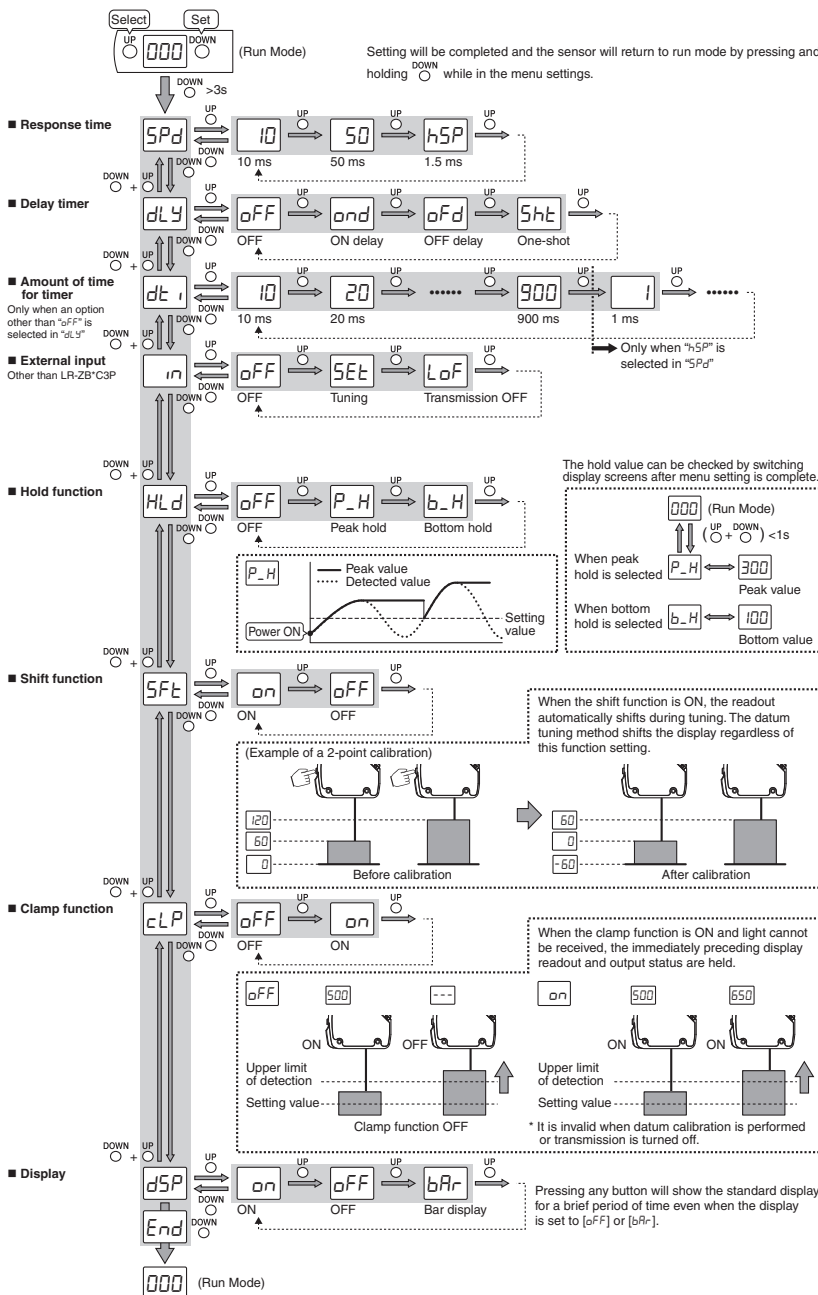


* This function cannot be used when the background is not within the detecting area.

• Manual adjustment



Advanced Settings



Default Settings

Item	Default	Item	Default
Response time	10 ms	Clamp function	OFF
Delay timer	OFF	Display	ON
Amount of time for timer	10 ms		
External input	OFF	Setting value	LR-ZB100*: 300 LR-ZB250*: 100
Hold function	OFF		
Shift function	ON	Output logic	L.ON

Displays other than values

Display	Description	Checks and Remedies	Control Output
ErC	Current of 100 mA or more flows through the control output	• Check power resistance. • Check the control output cable for contact with other cables.	OFF
ErS	System error	Contact the nearest sales office.	OFF
ErL	Laser diode failure		FAR
ErE	Error in the EEPROM that stores sensor settings*		Normal
uuu	Excessive reflected light	Adjust the installation angle of the sensor.	Inconsistent
---	Insufficient light	• Verify that the detecting distance is within specifications. • Adjust the installation angle of the sensor.	FAR
-FF	The detected object is too far from the display range	• Move the target closer. • Turn OFF the shift function.	Normal
Loc	The key lock function is enabled	Release the key lock function by pressing UP and DOWN at the same time (> 3s).	Normal
P_H	The peak value is displayed	Press UP and DOWN at the same time to switch screens.	Normal
b_H	The bottom value is displayed	Press UP and DOWN at the same time to switch screens.	Normal
No display or indicators	The sensor is not turned on	• Check the power voltage and power capacity. • Check the sensor power cable.	Inconsistent

* The settings can be rewritten up to 100 million times.

Warranties and Disclaimers

- KEYENCE warrants the Products to be free of defects in materials and workmanship for a period of one (1) year from the date of shipment. If any models or samples were shown to Buyer, such models or samples were used merely to illustrate the general type and quality of the Products and not to represent that the Products would necessarily conform to said models or samples. Any Products found to be defective must be shipped to KEYENCE with all shipping costs paid by Buyer or offered to KEYENCE for inspection and examination. Upon examination by KEYENCE, KEYENCE, at its sole option, will refund the purchase price of, or repair or replace at no charge any Products found to be defective. This warranty does not apply to any defects resulting from any action of Buyer, including but not limited to improper installation, improper interfacing, improper repair, unauthorized modification, misapplication and mishandling, such as exposure to excessive current, heat, coldness, moisture, vibration or outdoors air. Components which wear are not warranted.
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KEYENCE CORPORATION

1-3-14, Higashi-Nakajima, Higashi-Yodogawa-ku,
Osaka, 533-8555, Japan
PHONE: +81-6-6379-2211

www.keyence.com

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