Cat. No. SCHA-719A

Z4LB V2

Parallel Beam Linear Sensor

INSTRUCTION MANUAL

OMRON

READ AND UNDERSTAND THIS DOCUMENT

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON–INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CON-

FIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

SUITABILITY FOR USE

THE PRODUCTS CONTAINED IN THIS DOCUMENT ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amuse-

ment machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.

- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.
NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PERFORMANCE DATA

Performance data given in this document is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

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Z4LB V2
Parallel Beam Linear Sensor
Instruction Manual

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ Caution Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Visual Aids

The following headings will help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

→ Indicates pages where additional information can be found.

1 Indicates a procedure. The step numbers in the procedure correspond to the numbers in any related illustrations.

About this Manual:

This manual describes the installation and operation of the Z4LB V2 Parallel Beam Linear Sensor and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the Z4LB V2 Parallel Beam Linear Sensor.

Section 1 provides practical information on the connections, wiring, and operation of the Z4LB V2 with a typical application example. Read this section for a quick application reference.

Section 2 provides information on preparations that must be made before turning ON the Sensor, such as wiring, connecting, and installing Sensors and Amplifiers.

Section 3 provides information on basic settings, such as the threshold settings for good/improper product discriminations.

Section 4 provides information on the optional functions that can be set in addition to the basic settings.

Section 5 provides timing charts to show the operation of the hold modes.

Section 6 provides information on error messages and remedies to be taken. Refer to this section before requesting service from your OMRON representative.

Section 7 provides the Sensor specifications and dimensions.

> ⚠ **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

PRECAUTIONS

This section provides general precautions for using the Z4LB V2 Parallel Beam Linear Sensor.

The information contained in this section is important for the safe and reliable application of the Z4LB V2 Parallel Beam Linear Sensor. You must read this section and understand the information contained before attempting to set up or operate a Z4LB V2 Parallel Beam Linear Sensor.

1 Laser Safety

The Z4LB V2 Parallel Beam Linear Sensor, is a Class 1 Laser Product according to EN60825-1 (IEC825-1) and a Class II Laser Product according to FDA (21 CFR1040.10) (see note). The Z4LB V2 is meant to be built into final system equipment. Pay special attention to the following precautions for the safe use of the product:

Note: Europe: Class 1 of EN60825-1: 1994 = IEC825-1: 1993
U.S.A.: Class II of FDA (21 CFR1040.10)

1. Use this product as specified in this instruction manual. Otherwise, you may be exposed to hazardous laser radiation.
2. Be careful not to expose your eyes directly to the laser radiation or indirectly to laser radiation reflected from mirror or shiny surfaces.
3. To avoid exposure to hazardous laser radiation, do not displace nor remove the protective housing during operation, maintenance, and any other servicing.
4. The user should return the product to OMRON for all repair and servicing.
5. As for other countries, observe the regulations and standards specified by each country.

■ Requirements from Regulations and Standards

EN60825-1 "Safety of Laser Products, Equipment Classification, Requirements and User's Guide"

Summary of Manufacturer's Requirements

Requirements; Sub-clause	Classification				
	Class 1	Class 2	Class 3A	Class 3B*	Class 4
Description of hazard class	Safe under reasonably foreseeable conditions	Low power; eye protection normally afforded by aversion responses	Same as Class 2. Direct intrabeam viewing with optical aids may be hazardous	Direct intrabeam viewing may be hazardous	High power; diffused reflection may be hazardous
Protective housing	Required for each laser product; limits access necessary for performance of functions of the products				
Safety interlock in protective housing	Designed to prevent removal of the panel until accessible emission values are below the AEL (see note 2) for the class assigned				
Remote control	Not required			Permits easy addition of external interlock in laser installation	
Key control	Not required			Laser inoperative when key is removed	

Requirements; Sub-clause	Classification				
	Class 1	**Class 2**	**Class 3A**	**Class 3B***	**Class 4**
Emission warning device	Not required			Gives audible or visible warning when laser is switched on or if capacitor bank of pulsed laser is being charged	
Attenuator	Not required			Gives means beside ON/OFF switch to temporarily block beam	
Location controls	Not required		Controls so located that there is no danger of exposure to AEL above Classes 1 or 2 when adjustments are made.		
Viewing optics	Emission from all viewing systems must be below Class 1 AEL's as applicable				
Scanning	Scan failure shall not cause product to exceed its classification				
Class label	Required wording	Figures A and B and specified wording			
Aperture label	Not required			Specified wording required	
Service entry label	Required as appropriate to the class of accessible radiation				
Override interlock label	Required under certain conditions as appropriate to the class of laser used				
User information	Operation manuals must contain instructions for safe use				
Purchasing and service information	Promotion brochures must reproduce classification labels; service manuals must contain safety information				
Medical products	Special calibration instructions required			Special calibration instructions, means for measurement and target-indicator required	
Fibre optic	Cable service connections require tool to disconnect if disconnection breaks protective housing and permits access above Class 1				

* With respect to the requirements of remote interlock connector, key control, emission warning and attenuator, Class 3B laser products not exceeding five times the AEL of Class 2 in the wavelength range of 400 nm to 700 nm are to be treated as Class 3A laser products.

Note: 1. This table is intended to provide a convenient summary of requirements. See text of this standard for complete requirements.

2. AEL: Accessible Emission Limit
The maximum accessible emission level permitted within a particular class. For your reference, see ANSI Z136.1-1993, Section 2.

Symbol and border: black
Background: yellow

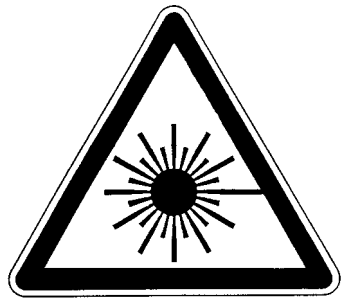


Figure A Warning label – Hazard symbol

Legend and border: black
Background: yellow

Figure B Explanatory label

FDA (Compliance Guide for Laser Products, 1985, according to 21 CFR1040.10)

Requirements	Class (see note 1)					
	I	IIa	II	IIIa	IIIb	IV
Performance (all laser products)						
Protective housing	R (see note 2)	R (see note 2)	R (see note 2)	R (see note 2)	R (see note 2)	R (see note 2)
Safety interlock	R (see notes 3, 4)	R (see notes 3, 4)	R (see notes 3, 4)	R (see notes 3, 4)	R (see notes 3, 4)	R (see notes 3, 4)
Location of controls	N/A	R	R		R	R
Viewing optics	R	R	R	R	R	R
Scanning safeguard	R	R	R	R	R	R
Performance (laser systems)						
Remote control connector	N/A	N/A	N/A	N/A	R	R
Key control	N/A	N/A	N/A	N/A	R	R
Emission indicator	N/A	N/A	R	R	R (see note 10)	R (see note 10)
Beam attenuator	N/A	N/A	R	R	R	R
Reset	N/A	N/A	N/A	N/A	N/A	R (see note 13)
Performance (specific purpose products)						
Medical	S	S	S	S (see note 8)	S (see note 8)	S (see note 8)
Surveying, leveling, alignment	S	S	S	S	NP	NP
Demonstration	S	S	S	S	S (see note 11)	(see note 11)
Labeling (all laser products)						
Certification & identification	R	R	R	R	R	R
Protective housing	D (see note 5)	D (see note 5)	D (see note 5)	D (see note 5)	D (see note 5)	D (see note 5)
Aperture	N/A	N/A	R	R	R	R
Class warning	N/A	R (see note 6)	R (see note 7)	R (see note 9)	R (see note 12)	R (see note 12)
Information (all laser products)						
User information	R	R	R	R	R	R
Product literature	N/A	R	R	R	R	R
Service information	R	R	R	R	R	R

Abbreviations:

R: Required.
N/A: Not applicable.
S: Requirements: Same as for other products of that Class. Also see footnotes.
NP: Not permitted.
D: Depends on level of interior radiation.

Footnotes:

1. Based on highest level accessible during operation.
2. Required wherever & whenever human access to laser radiation above Class I limits is not needed for product to perform its function.
3. Required for protective housings opened during operation or maintenance, if human access thus gained is not always necessary when housing is open.
4. Interlock requirements vary according to Class of internal radiation.
5. Wording depends on level & wavelength of laser radiation within protective housing.
6. Warning statement label.
7. CAUTION logotype.
8. Requires means to measure level of laser radiation intended to irradiate the body.
9. CAUTION if 2.5 mW cm^2 or less, DANGER if greater than 2.5 mW cm^{-2}.
10. Delay required between indication & emission.
11. Variance required for Class IIb or iV demonstration laser products and light shows.
12. DANGER logotype.
13. Required after August 20, 1986.

Use Precautions

EN60825-1

Requirements; Sub-clause	Classification				
	Class 1	**Class 2**	**Class 3A**	**Class 3B***	**Class 4**
Remote interlock	Not required			Connect to room or door circuits	
Key control	Not required			Remove key when not in use	
Beam attenuator	Not required			When in use prevents inadvertent exposure	
Emission indicator device	Not required			Indicates laser is energized	
Warning signs	Not required			Follow precautions on warning signs	
Beam path	Not required	Terminate beam at end of useful length			
Specular reflection	No requirements			Prevent unintentional reflections	
Eye protection	No requirements		Required if engineering and administrative procedures not practicable and MPE exceeded		
Protective clothing	No requirements			Sometimes required	Specific requirements
Training	No requirements		Required for all operator and maintenance personnel		

* With respect to the requirements of remote interlock connector, key control, beam attenuator, and emission indicator, Class 3B laser products not exceeding five times the AEL of Class 2 in the wavelength range of 400 nm to 700 nm are to be treated as Class 3A laser products.

Note: This table is intended to provide a convenient summary of requirements. See text of this standard for complete precautions.

ANSI Z136.1:1993 "American National Standard for the Safe Use of Lasers"
Control Measures for the Four Laser Classes

Control measures	Classification					
Engineering Controls	1	2a	2	3a	3b	4
Protective Housing (4.3.1)	X	X	X	X	X	X
Without Protective Housing (4.3.1.1)	LSO (see note 2) shall establish Alternate Controls					
Interlocks on Protective Housing (4.3.2)	☆	☆	☆	☆	X	X
Service Access Panel (4.3.3)	☆	☆	☆	☆	X	X
Key Control (4.3.4)	---	---	---	---	•	X
Viewing Portals (4.3.5.1)	---	---	MPE	MPE	MPE	MPE
Collecting Optics (4.3.5.2)	MPE	MPE	MPE	MPE	MPE	MPE
Totally Open Beam Path (4.3.6.1)	---	---	---	---	X NHZ	X NHZ
Limited Open Beam Path (4.3.6.2)	---	---	---	---	X NHZ	X NHZ
Enclosed Beam Path (4.3.6.3)	None is required if 4.3.1 and 4.3.2 fulfilled					
Remote Interlock Connector (4.3.7)	---	---	---	---	•	X
Beam Stop or Attenuator (4.3.8)	---	---	---	---	•	X
Activation Warning Systems (4.3.9)	---	---	---	---	•	X
Emission Delay (4.3.9.1)	---	---	---	---	---	X
Indoor Laser Controlled Area (4.3.10)	---	---	---	---	X NHZ	X NHZ
Class 3b Laser Controlled Area (4.3.10.1)	---	---	---	---	X	---
Class 4 Laser Controlled Area (4.3.10.2)	---	---	---	---	---	X
Laser Outdoor Controls (4.3.11)	---	---	---	---	X NHZ	X NHZ
Laser in Navigable Airspace (4.3.11.2)	---	---	---	•	•	•
Temporary Laser Controlled Area (4.3.12)	☆ MPE	☆ MPE	☆ MPE	☆ MPE	---	---
Remote Firing & Monitoring (4.3.13)	---	---	---	---	---	•
Labels (4.3.14 and 4.7)	X	X	X	X	X	X
Area Posting (4.3.15)	---	---	---	•	X NHZ	X NHZ

Control measures	Classification					
Administrative & Procedural Controls	1	2a	2	3a	3b	4
Standard Operating Procedures (4.4.1)	---	---	---	---	•	X
Output Emission Limitations (4.4.2)	---	---	---	LSO Determination		
Education and Training (4.4.3)	---	---	•	•	X	X
Authorized Personnel (4.4.4)	---	---	---	---	X	X
Alignment Procedures (4.4.5)	---	---	X	X	X	X
Protective Equipment (4.4.6)	---	---	---	---	•	X
Spectator (4.4.7)	---	---	---	---	•	X
Service Personnel (4.4.8)	☆ MPE	☆ MPE	☆ MPE	☆ MPE	X	X
Demonstration with General Public (4.5.1)	MPE †	---	X	X	X	X
Laser Optical Fiber Systems (4.5.2)	MPE	MPE	MPE	MPE	X	X
Laser Robotic Installations (4.5.3)	---	---	---	---	X NHZ	X NHZ
Eye Protection (4.6.2)	---	---	---	---	• MPE	X MPE
Protective Windows (4.6.3)	---	---	---	---	X NHZ	X NHZ
Protective Barriers and Curtains (4.6.4)	---	---	---	---	•	•
Skin Protection (4.6.5)	---	---	---	---	X MPE	X MPE
Other Protective Equipment (4.6.5)	Use may be required					
Warning Signs and Labels (4.7) (Design Requirements)	---	---	•	•	X NHZ	X NHZ
Service and Repairs (4.8)	LSO Determination					
Modification of Laser Systems (4.9)	LSO Determination					

Note: 1. LEGEND
- X: Shall
- •: Should
- ---: No requirement
- ☆: Shall if enclosed Class 3b or Class 4
- MPE: Shall if MPE is exceeded
- NHZ: Nominal Hazard Zone analysis required
- †: Applicable only to UV and IR Lasers (4.5.1.2)

2. LSO: Laser Safety Officer
An individual shall be designated the Laser Safety Officer with the authority and responsibility to monitor and enforce the control of laser hazards, and to effect the knowledgeable evaluation and control of laser hazards.
For your reference, see ANSI Z136.1-1993, Section 1.3.

■ Laser Product Classifications

EN

Class	Description
Class 1	Lasers which are safe under reasonably foreseeable conditions of operation.
Class 2	Lasers emitting visible radiation in the wavelength range from 400 nm to 700 nm. Eye protection is normally afforded by aversion responses including the blink reflex.
Class 3A	Lasers which are safe for viewing with the unaided eye. For laser emitting in the wavelength range from 400 nm to 700 nm, protection is afforded by aversion responses including the blink reflex. For other wavelengths the hazard to the unaided eye is no greater than for Class 1. Direct intrabeam viewing of Class 3A lasers with optical aides (e.g., binoculars, telescopes, microscopes) may be hazardous.
Class 3B	Direct intrabeam viewing of these lasers is always hazardous. Viewing diffuse reflections is normally safe (see note).
Class 4	Lasers which are also capable of producing hazardous diffuse reflections. They may cause skin injuries and could also constitute a fire hazard. Their use requires extreme caution.

Note: Conditions for safe viewing of diffuse reflections for Class 3B visible lasers are: minimum viewing distance of 13 cm between screen and cornea and a maximum viewing time of 10 s. Other viewing conditions require a comparison of the diffuse reflection exposure with the MPE.

Comparison of Classifications between FDA and ANSI

Class	FDA definition	ANSI description
Class I/1	Limits applicable to devices that have emissions in the ultraviolet, visible, and infrared spectra, and limits below which biological hazards have not been established.	A Class 1 laser is considered to be incapable of producing damaging radiation levels during operation and maintenance and is, therefore, exempt from any control measures or other forms of surveillance.
Class IIa/2a	Limits applicable to products whose visible emission does not exceed Class I limits for emission durations of 1,000 seconds or less and are not intended for viewing.	Class 2 lasers are divided into two subclasses, 2 and 2a. A Class 2 laser emits in the visible portion of the spectrum (0.4 to 0.7 μm) and eye protection is normally afforded by the aversion response including the blink reflex.
Class II/2	Limits applicable to products that have emissions in the visible spectrum (400 to 710 nm) for emission durations in excess of 0.25 second, providing that emissions for other durations and/or wavelengths do not exceed the Class I limits. Class II products are considered hazardous for direct long-term ocular exposure.	
Class IIIa/3a	Limits to products that have emissions in the visible spectrum and that have beams where the total collectable radiant power does not exceed 5 milliwatts.	Class 3 lasers are divided into two subclasses, 3a and 3b. A Class 3 laser may be hazardous under direct and specular reflection viewing conditions, but the diffuse reflection is usually not a hazard.
Class IIIb/3b	Limits applicable to devices that emit in the ultraviolet, visible, and infrared spectra. Class IIIb products include laser systems ranging from 5 to 500 milliwatts in the visible spectrum. Class IIIb emission levels are ocular hazards for direct exposure throughout the range of the Class, and skin hazards at the higher levels of the Class.	
Class IV/4	Exceeding the limits of Class IIIb and are a hazard for scattered reflection as well as for direct exposure.	A Class 4 laser is a hazard to the eye or skin from the direct beam and sometimes from a diffuse reflection and also can be fire hazard. Class 4 lasers may also produce laser-generated air contaminants and hazardous plasma radiation.

Label Indications

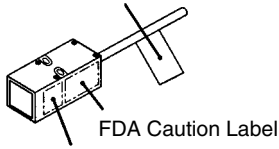
EN

Note Use of controls, adjustments, or procedures other than those specified herein may result in hazardous radiation exposure.

FDA

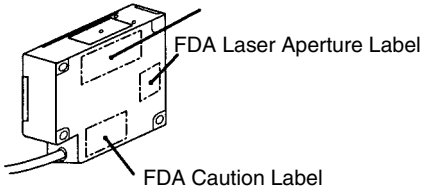
Z4LB-S10V2
Z4LB-A1040□V2

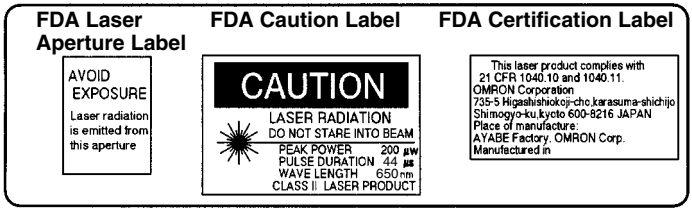
FDA Certification Label



Z4LB-S30V2
Z4LB-A3040□V2

FDA Certification Label





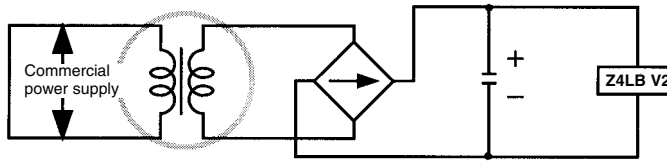
Note Use of controls, adjustments, or procedures other than those specified herein may result in hazardous radiation exposure.

2 Application Precautions

1. Users must operate the product according to the procedures and specifications described in this manual. (Refer to *7-1 Specifications*.)
2. Do not connect or disconnect a connector between the Sensor and Controller when the power is turned ON, otherwise the Sensor may be damaged.
3. Warm up the Z4LB V2 for approximately 5 minutes after turning ON the power.

■ Power Supply and Wiring

1. Do not impose voltage exceeding the rated voltage, otherwise the Sensor may be damaged.
2. When supplying power to the sensor, make sure that the polarity of the power is correct, otherwise, the sensor may be damaged.
3. Do not short-circuit the load supplied with open collector output, otherwise the Sensor may be damaged.
4. The Z49-C13 Extension Cable (3 or 8 m in length) can be connected to the sensor cables or amplifier cables. The total length of the sensor cables or amplifier cables, however, must be 10 m or less. Use a shielded cable to extend the amplifier cable, in which case, a shielded cable that is the same as that of the amplifier cable must be used.
5. Do not lay a power supply cable for the Z4LB V2 together with high-voltage lines or power lines to prevent interference, damage, and malfunction.
6. Use an isolation transformer for the power supply of the Z4LB V2 as shown in the following.



Isolation transformer

7. When using a switching regulator, use a FG (frame ground) terminal as a ground.

3 Environment

1. Do not use the Sensor in strong electromagnetic fields or in an environment where the operation of the Sensor is subject to the reflection of intense light (such as other laser beams or electric arc-welding machine.)
2. The Sensor cannot accurately detect the following types of objects:
   - Mirror-like objects
   - Transparent objects
   - Objects with an extremely low reflection ratio
   - Objects smaller than the Sensor's sensing spot diameter
   - Largely inclined objects
3. Do not install the Z4LB V2 in locations subject to the following conditions:
   - Direct vibration or shock
   - Direct sunlight or heaters
   - High humidity
   - Dust, salt, or iron particles
   - Corrosive or flammable gasses
   - Water, oil, or chemical fumes or spray
   - Strong magnetic or high-voltage fields
   - Condensation due to rapid temperature fluctuations
   - Icing due to low temperature

4 Maintenance

1. Turn OFF the power when making adjustments or removing the Sensor.
2. Install the Sensor in a clean environment and keep the filter on the front panel of the Sensor free from oil and dust. If affected by oil or dust, clean the filter as follows:
   - Use a blower brush (used to clean camera lenses) to blow large dust particles from the surface. Do not blow the dust away with your mouth.
   - Use a soft cloth (for lenses) with a small amount of alcohol to remove the remaining dust. Do not use a scrubbing action when cleaning as scratches on the filter could result in the Sensor malfunctioning.
   - Do not use thinner or benzene. They will damage the optical characteristics of a filter.

5 General Precautions

The user must operate the product according to the performance specifications described in the instruction manual.

Consult your OMRON representative before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

6 Checking the Package

When the product package is delivered, check if the package contains the following items. Although careful attention has been paid to packing the product, please contact your OMRON representative if any item is found to be missing.

Standard Models (Separate Type)

Product	Model	Packing items
Sensor	Z4LB-S10V2	☐ One Z4LB-S10V2 Sensor ☐ Two mounting brackets ☐ Four M3 screws (25-mm long) ☐ Four M3 nuts ☐ Five labels
	Z4LB-S30V2	☐ One Z4LB-S30V2 Sensor ☐ Two mounting brackets ☐ Six M4 screws (25-mm long) ☐ Five labels
Amplifier	Z4LB-CV2 Z4LB-CPV2	☐ One Z4LB-CV2 or Z4LB-CPV2 Amplifier ☐ One instruction manual (this manual) ☐ One screwdriver

One-side Interruption High-precision Models (Integrated Type)

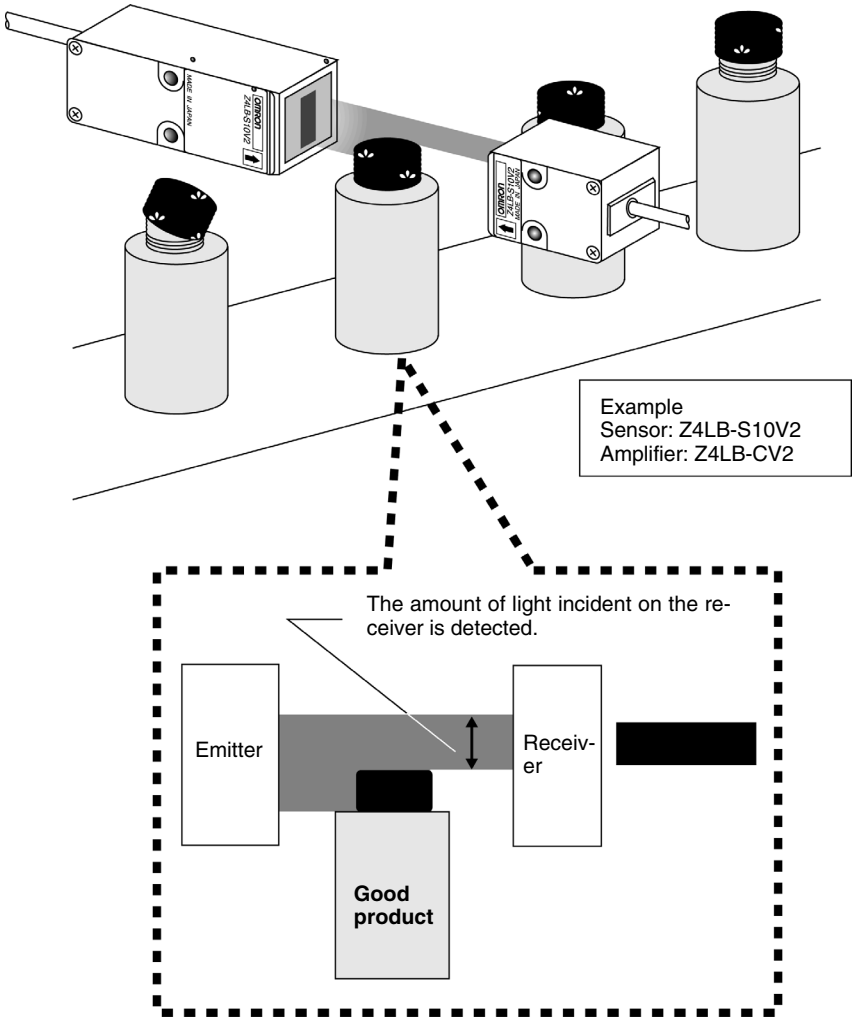
Model	Packing items
Z4LB-A1040V2 Z4LB-A1040PV2 Z4LB-A3040V2 Z4LB-A3040PV2	☐ One Z4LB-A1040V2, Z4LB-A1040PV2, Z4LB-A3040V2, or Z4LB-A3040PV2 Sensor ☐ One instruction manual (this manual) ☐ Five labels

SECTION 1
Application Example

This section provides practical information on the connections, wiring, and operation of the Z4LB V2 with a typical application example. Read this section for a quick application reference.

1-1 Inspection for Loose Bottle Caps

In this application, the height of the cap of each bottle is inspected to see if the caps are loose.



Operation Flow

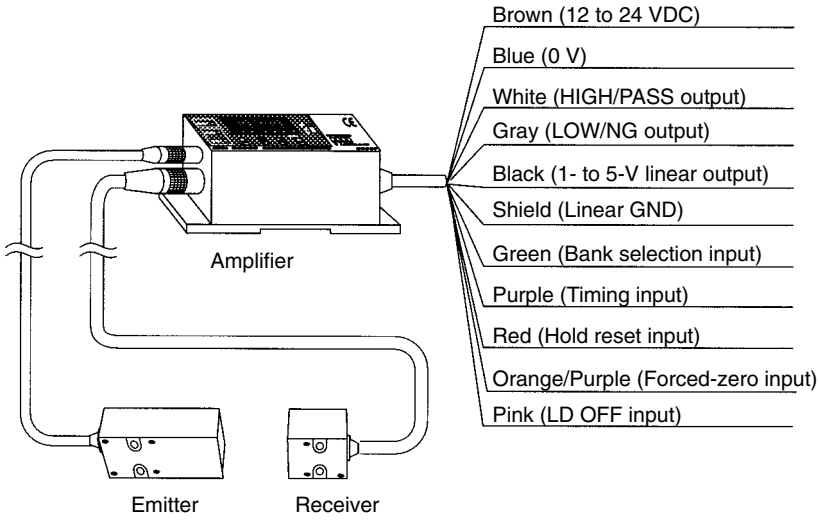
Item	Applicable Sensors
1-1-1 Wiring and Connections	Standard and One-side Interruption High-precision
1-1-2 Axis and Gain Adjustments	Standard
1-1-3 Setting Measurement Unit	Standard
1-1-4 Setting Thresholds	Standard and One-side Interruption High-precision
1-1-5 Detection	Standard and One-side Interruption High-precision

1-1-1 Wiring and Connections

The following information is the same for both Standard and One-side Interruption High-precision Sensors.

1 Wire and connect the sensor components as shown below.

V/mm → **Refer to 2-2 *Wiring (p. 14)* and *2-3 Connections (p. 18).***



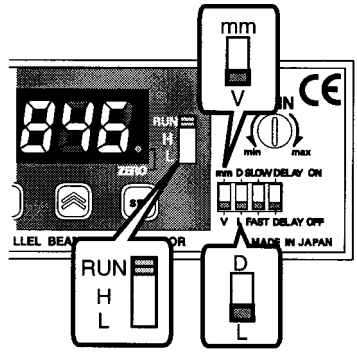
2 Turn ON the power.

1-1-2 Axis and Gain Adjustments

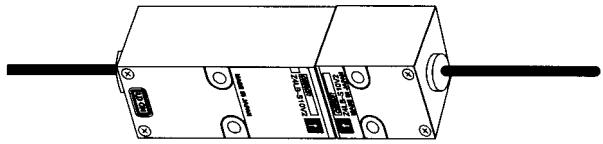
The following information is for Standard Sensors only.

Adjust the laser axis and gain according to the sensing distance.

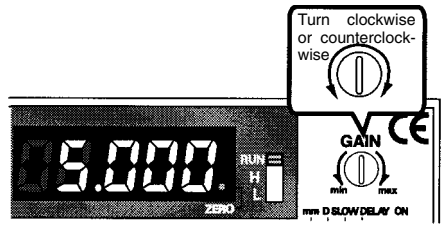
1 Set the selectors on the Amplifier as shown below.



2 Closely attach the emitter and the receiver with the nameplates of both the emitter and the receiver facing the same direction.



3 Use the provided screwdriver and turn the gain adjuster so that the display on the Amplifier reads 5.000 ± 0.1 V.



4 Mount the emitter and the receiver in the desired positions.

Secure the receiver and tentatively secure the emitter.

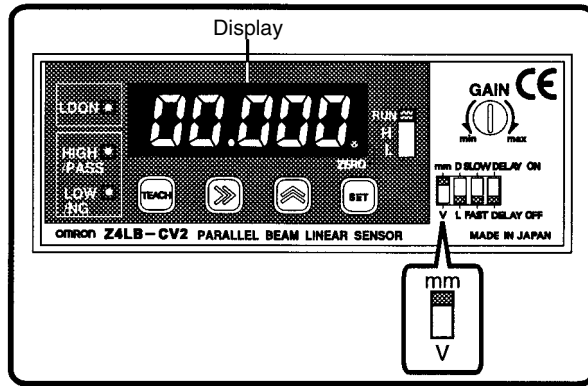
5 Change the angle of the emitter upwards, downwards, left, and right with no sensing object and secure the position of the emitter at the angle where the maximum value is displayed.

6 Turn the gain adjuster so that the display reads 5.000 ± 0.005 V.

1-1-3 Setting Measurement Unit

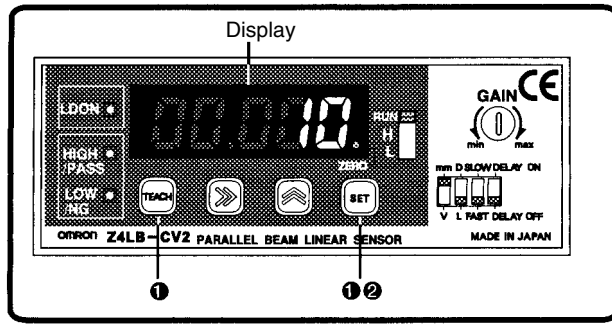
The following information is for Standard Sensors only.

The measurement unit can be set to linear output voltage (V) or length (mm). In the following example, the unit is set to mm.



Set the measurement unit selector to mm. The Sensor is now ready to display in millimeters.

Checking Measurement Width



1 Press the TEACH and SET Keys simultaneously for 3 s.
The present measurement width will be displayed.

2 Press the SET Key.
The Sensor will return to RUN mode.

Note If the displayed width is different from the measured width, change the measurement width of the Amplifier. Otherwise the linear output voltage will not be converted into length correctly.

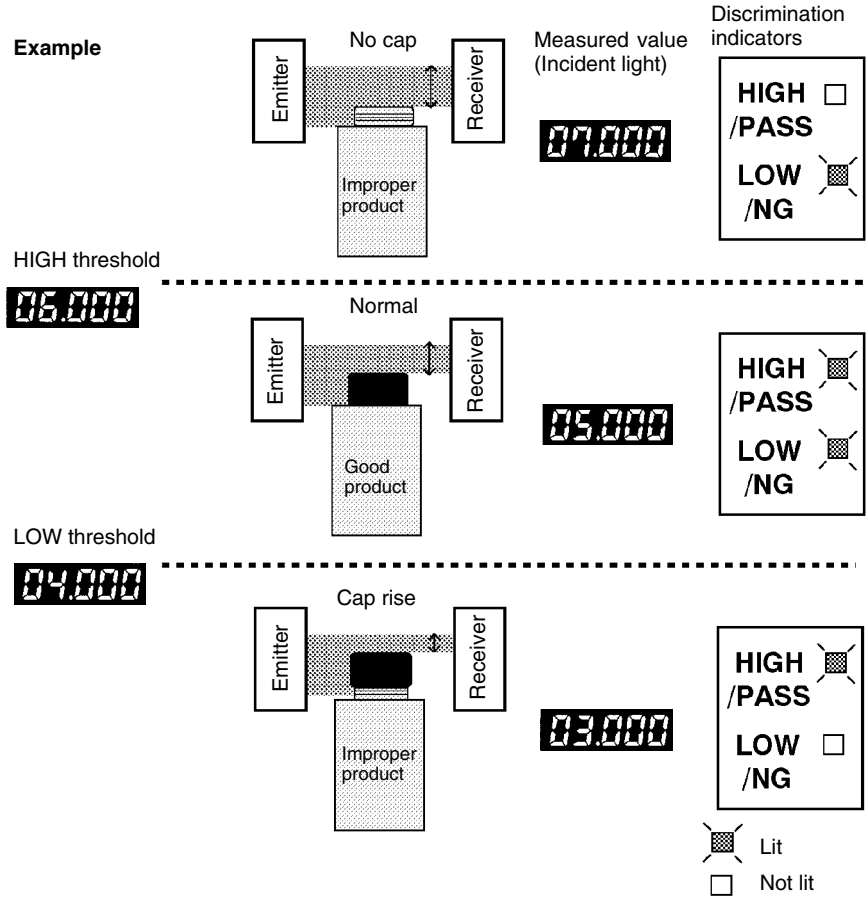
→ **Refer to *Z4LB-S30V2* under *3-1 Selecting the Measurement Unit (p. 24).***

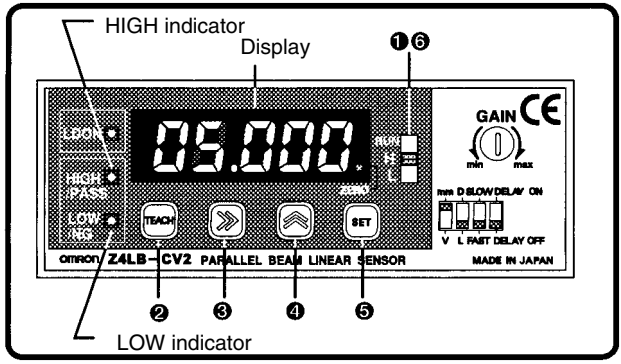
1-1-4 Setting Thresholds

The following information is the same for both Standard and One-side Interruption High-precision Sensors.

Set the thresholds for good/improper product discrimination. There are three methods to set the thresholds. The following description provides information on setting the thresholds by teaching based on a reference workpiece.

→ **Refer to *3-2 Setting Thresholds (p. 26).***





HIGH Threshold Setting

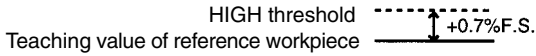
1 Set the operating mode selector to H.

The HIGH indicator will start flashing and the present HIGH threshold will be displayed.

2 Set the workpiece and press the TEACH Key.

Teaching will be performed. The teaching value plus an approximate value of 0.7% F.S. (see note) will be displayed as the HIGH threshold.

Note "F.S." stands for full scale. In the case of the Z4LB-S10V2, for example, the F.S. value is 10 mm.



Fine Adjustment of Values

The thresholds that are taught are reference values that can be changed to desired values. Go to step 3 to change the thresholds, otherwise go to step 5.

3 Press the Right Key to move the cursor to the digit to be changed.

4 Press the Up Key and change the value.

5 Press the SET Key.

The set value will be entered and the value will flash twice.

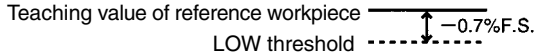
LOW Threshold Setting

6 Set the operating mode selector to L.

The LOW indicator will start flashing and the present LOW threshold will be displayed.

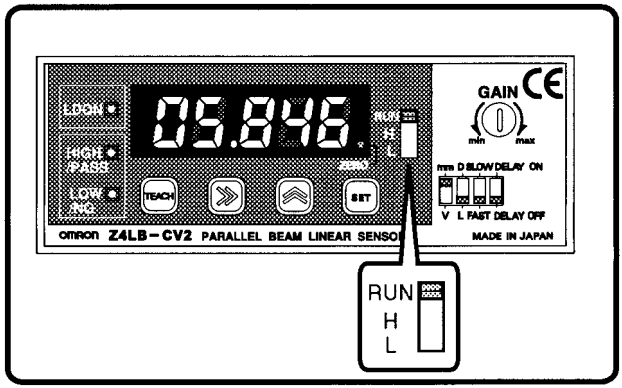
7 Take steps similar to 2 and 5 to set the LOW threshold.

The LOW threshold obtained from the teaching value minus an approximate value of 0.7% F.S. will be displayed.



1-1-5 Detection

The following information is the same for both Standard and One-side Interruption High-precision Sensors.



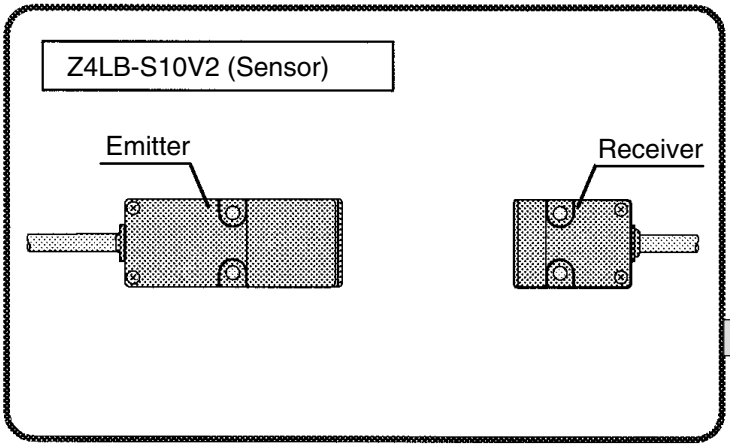
Set the operating mode selector to RUN.
The Sensor will start taking measurements and the indicator will turn ON at the preset threshold value.

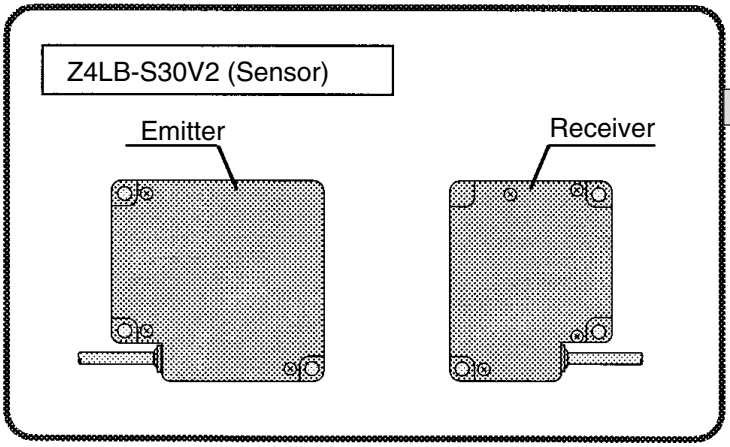
SECTION 2
Preparations

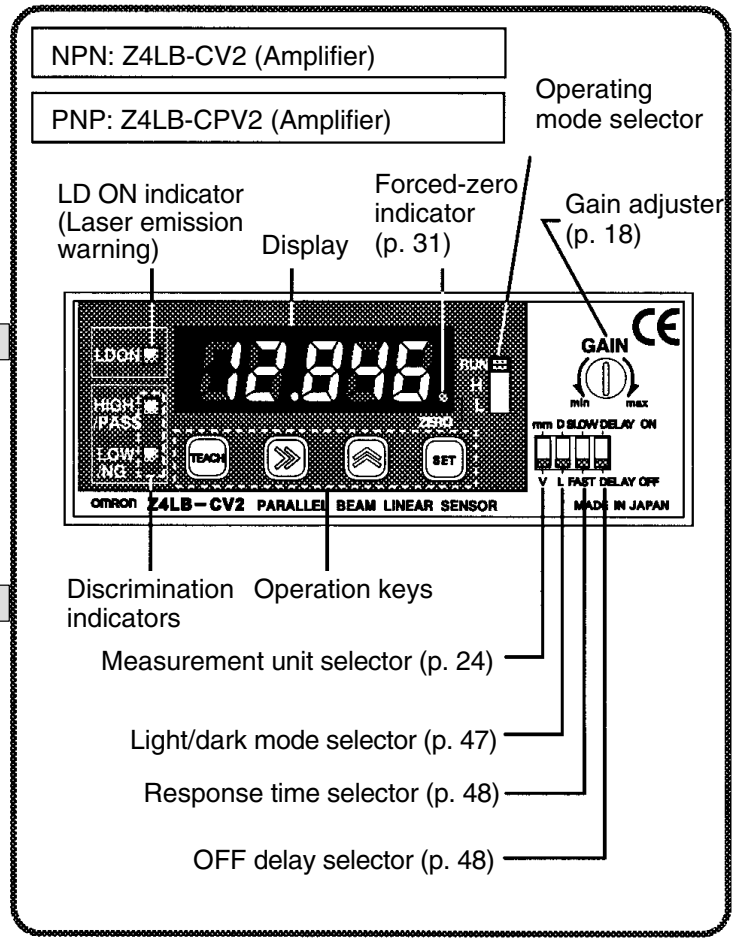
This section provides information on preparations that must be made before turning ON the Sensor, such as wiring, connecting, and installing Sensors and Amplifiers.

2-1 Nomenclature

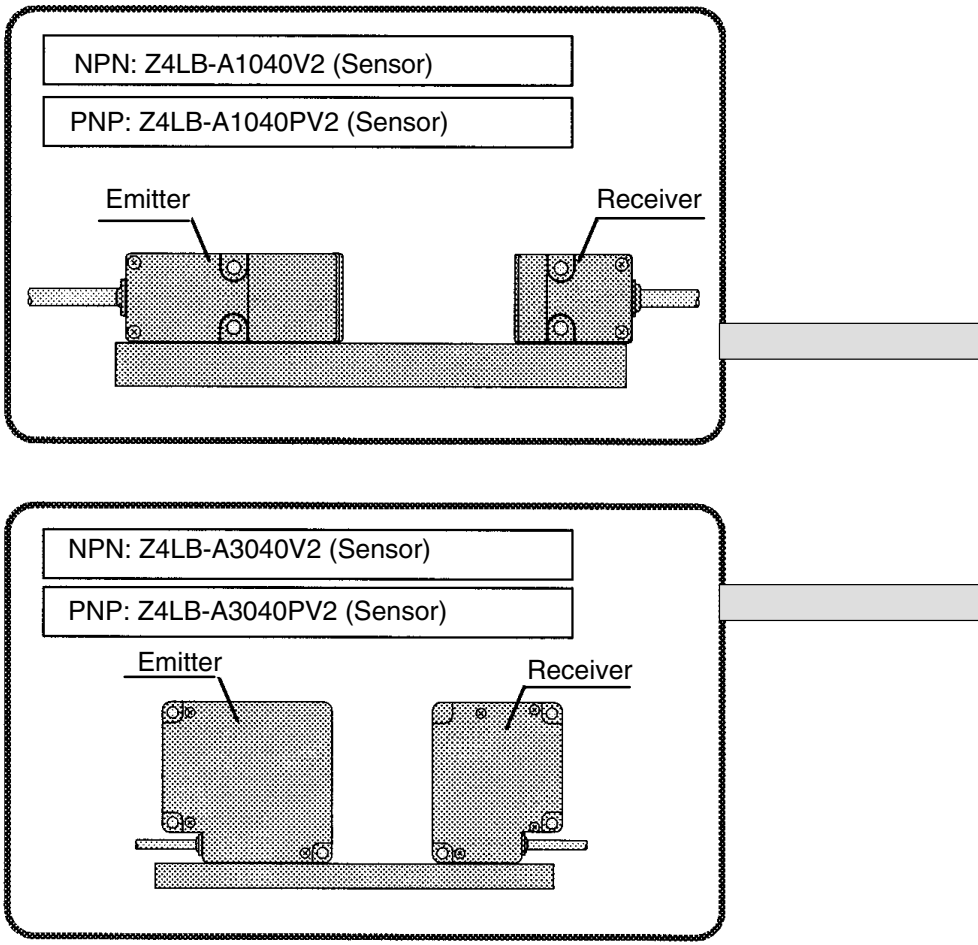
2-1-1 Standard Sensors (Separate Type)





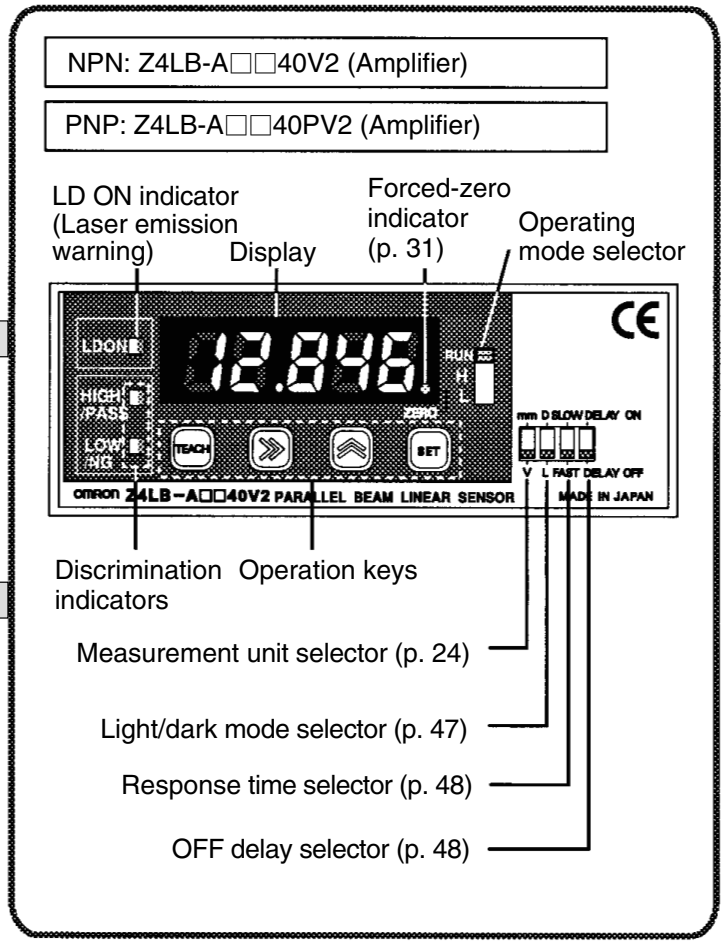

NPN: Z4LB-CV2 (Amplifier)
PNP: Z4LB-CPV2 (Amplifier)
Operating mode selector
LD ON indicator (Laser emission warning)
Display
Forced-zero indicator (p. 31)
Gain adjuster (p. 18)
LDON
HIGH PASS
LOW NG
TEACH
SET
RUN
H
L
GAIN
min
max
mm D.SLOW DELAY ON
V L FAST DELAY OFF
OMRON Z4LB-CV2 PARALLEL BEAM LINEAR SENSOR
MADE IN JAPAN
Discrimination indicators
Operation keys
Measurement unit selector (p. 24)
Light/dark mode selector (p. 47)
Response time selector (p. 48)
OFF delay selector (p. 48)

2-1-2 One-side Interruption High-precision Sensors (Integrated Type)



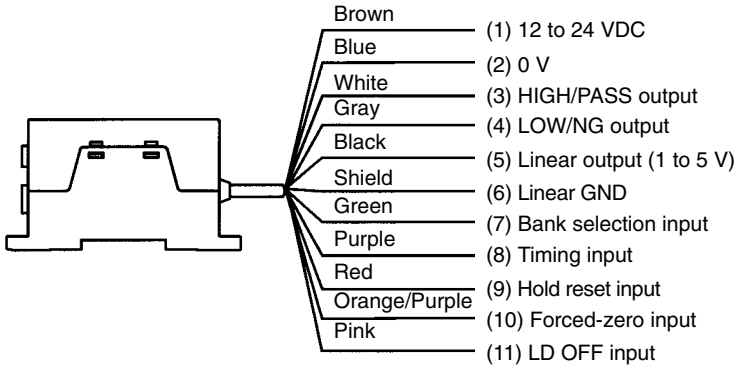
NPN: Z4LB-A□□40V2 (Amplifier)

PNP: Z4LB-A□□40PV2 (Amplifier)



2-2 Wiring

2-2-1 I/O Signals



(1) 12 to 24 VDC
Power terminal. Connect to 12 to 24 VDC power supply.

(2) 0 V
0 V power terminal. Also, common terminals for forced zero input, timing input, and LD OFF input.

(3) HIGH Output
Turns ON when the measured value is less than or equal to the HIGH threshold. (Depends on the discrimination output methods.)

PASS Output
Turns ON when the measured value is above the LOW threshold and below the HIGH threshold. (Depends on the discrimination output methods.)

(4) LOW Output
Turns ON when the measured value is equal to or greater than the LOW threshold. (Depends on the discrimination output methods.)

NG Output
Turns ON when the measured value is equal to or less than the LOW threshold or equal to or greater than the HIGH threshold. (Depends on the discrimination output methods.)

(5) Linear Output (1 to 5 V)
Outputs 1 to 5 VDC in proportion to light received or interrupted. (Selectable with light/dark mode switch)

(6) Linear GND
Connect to input device as linear output GND.

(7) Bank Selection Input

Selects the thresholds to use for measurement.

Bank 1

NPN: Open or connect to 1.

PNP: Open or connect to 2.

Bank 2

NPN: Connect to 2.

PNP: Connect to 1.

(8) Timing Input

Forcibly turns HIGH/PASS output and LOW/NG output OFF if timing input is turned ON during normal measurement operations. The sampling timing turns ON if the timing input is turned ON during hold measurement operation. ON or OFF input time is set to 0.25 ms or more.

(9) Hold Reset Input

Resets the value held in memory if turned ON during hold measurement operation. ON or OFF input time is set to 0.25 ms or more.

(10) Forced-zero Input

Zero will be displayed for the measured value if forced-zero input is turned ON when the length (mm) is displayed on the display. The value will be set if forced-zero input is ON for 0.2 to 0.8 s and cleared if it is input for 1 s or more.

(11) LD OFF Input

Stops laser emission. "LdOFF" will be displayed on the display. The linear output, HIGH/LOW indicator, and the discrimination outputs will maintain the current status.

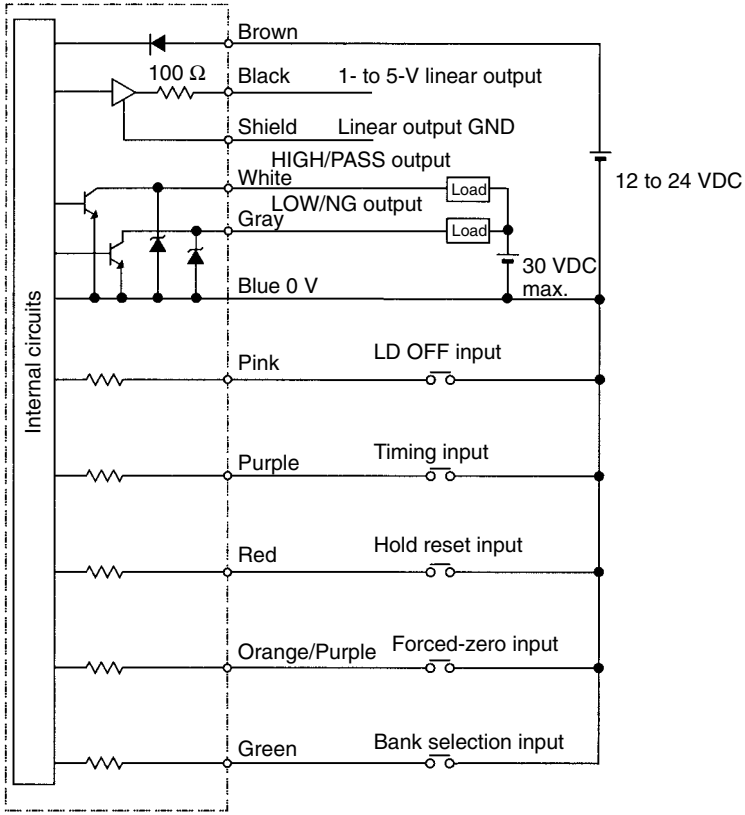
Warm up for 5 min after releasing LD OFF. The response time required to turn laser emission ON or OFF is 30 ms.

→ **Refer to *4-2-2 Selecting the Discrimination Outputs (p. 39)*.**

2-2-2 I/O Stage Circuit Diagrams

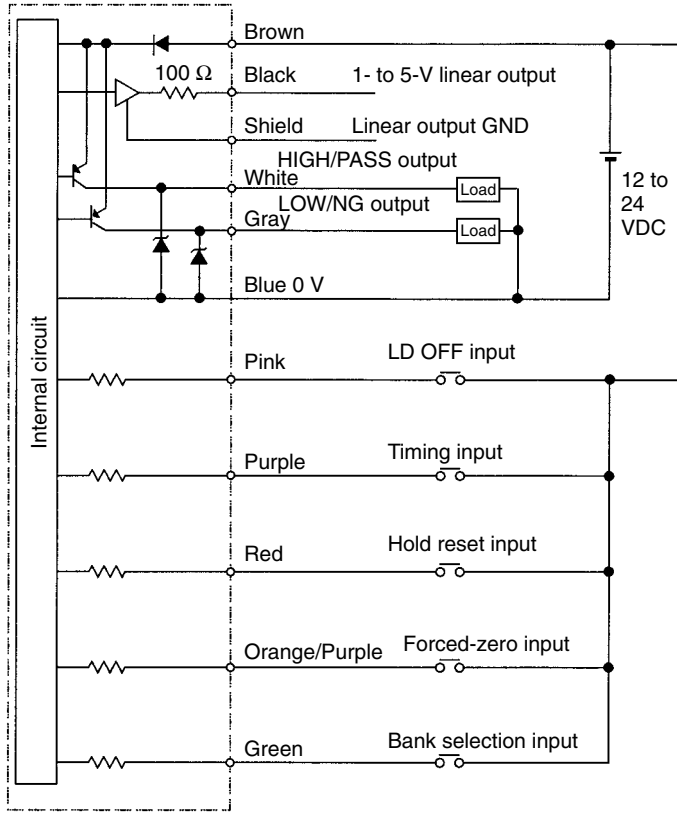
NPN Sensors

Standard Sensor: Z4LB-CV2
One-side Interruption High-precision Sensors: Z4LB-A□□V2



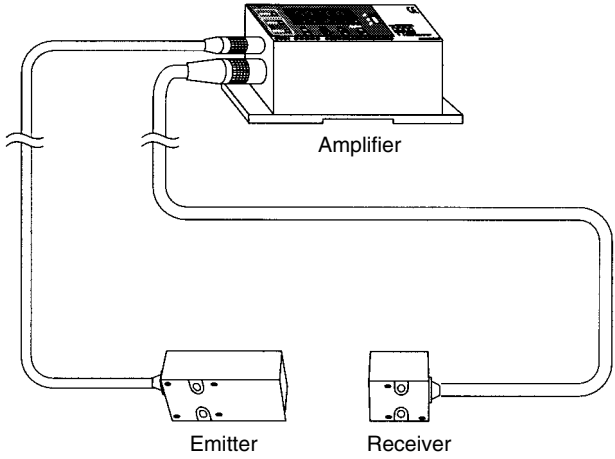
PNP Sensors

Standard Sensor: Z4LB-CPV2
One-side Interruption High-precision Sensors: Z4LB-A□□PV2



2-3 Connections

Connect the connector cables from the emitter and the receiver to the side of the Amplifier as below. The connection method is the same for Standard and One-side Interruption High-precision Sensors.

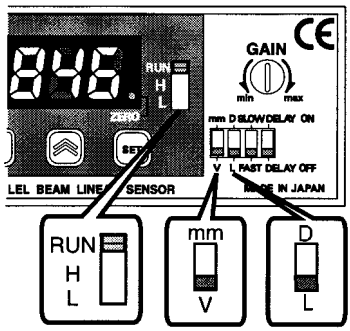


2-4 Axis and Gain Adjustments

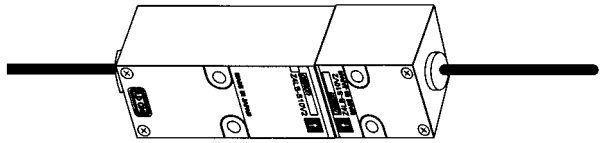
After installing the emitter and the receiver for a Standard Sensor, adjust the laser axis and gain according to the sensing distance. No axis or gain adjustment is required for One-side Interruption High-precision Sensors because proper axis and gain adjustments are made before shipping.

Procedure

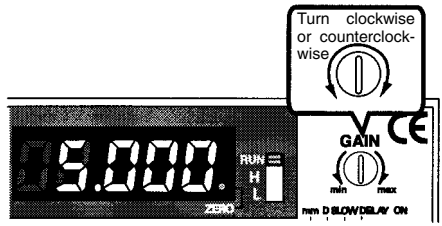
1 Set the selectors on the Amplifier as shown below.



2 Closely attach the emitter and the receiver with the nameplates of both the emitter and the receiver facing the same direction.



3 Use the provided screwdriver and turn the gain adjuster so that the display on the Amplifier reads 5.000 ± 0.1 V.



4 Mount the emitter and the receiver in the desired position. Secure the receiver and tentatively secure the emitter.

5 Change the angle of the emitter upwards, downwards, left, and right with no sensing object and secure the position of the emitter at the angle where the maximum value is displayed.

6 Turn the gain adjuster so that the display reads 5.000 ± 0.005 V.

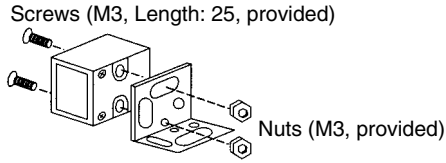
2-5 Sensor Installation

2-5-1 Sensors

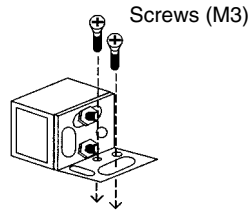
Caution Do not touch the optical filter of a Sensor. If it is stained with finger prints or other material, measurements may not be performed correctly. If you touch the filter by mistake, clean it with a soft cloth.

Z4LB-S10V2 Sensor

1 Screw the mounting brackets to the emitter and the receiver. The same mounting bracket is used for both the emitter and the receiver.



2 Secure the mounting brackets.



→ **Refer to *7-2 Dimensions* for mounting dimensions (p. 64).**

Z4LB-S30V2 Sensor

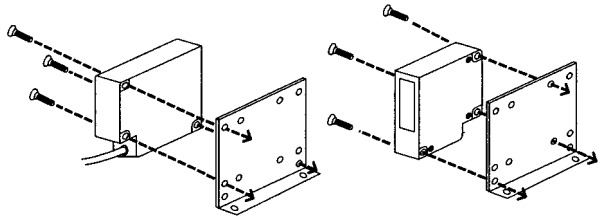
1 Screw the mounting brackets to the emitter and the receiver. The same mounting bracket is used for the emitter and the receiver, but the screw holes are different.

Emitter

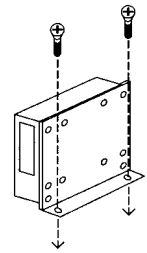
Screws
(M4, Length 25, provided)

Receiver

Screws
(M4, Length 25, provided)



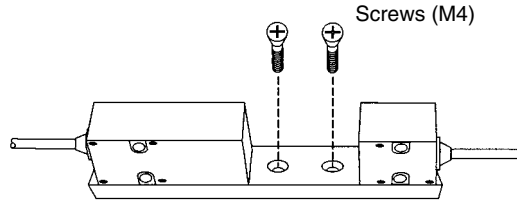
2 Secure the mounting brackets.



→ **Refer to *7-2 Dimensions* for mounting dimensions (p. 64).**

Z4LB-A□□40V2/Z4LB-A□□40PV2 Sensors

There are two mounting holes, one on the right and one on the left. Screw the holes to install and secure the emitter and the receiver. When installed, the head of screws should not enter the beam.

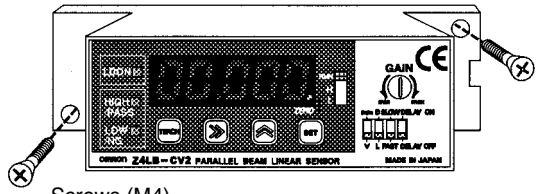


→ **Refer to *7-2 Dimensions* for mounting dimensions (p. 64).**

Note Do not disconnect the coupling bracket that connects the receiver and the emitter, otherwise proper measurement will not be possible.

2-5-2 Amplifiers

There are two mounting holes. Insert the screws into the holes to install the Amplifier. The Amplifier can also be mounted to DIN Track.



Screws (M4)

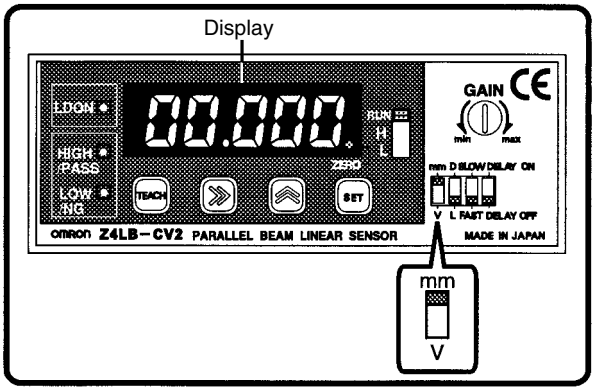
→ **Refer to *7-2 Dimensions* for mounting dimensions (p. 64).**

SECTION 3
Basic Settings

This section provides information on basic settings, such as the threshold settings for good/improper product discriminations.

3-1 Selecting the Measurement Unit

The measurement unit can be set to linear output voltage (V) or length (mm). In the following example, the unit is set to mm.



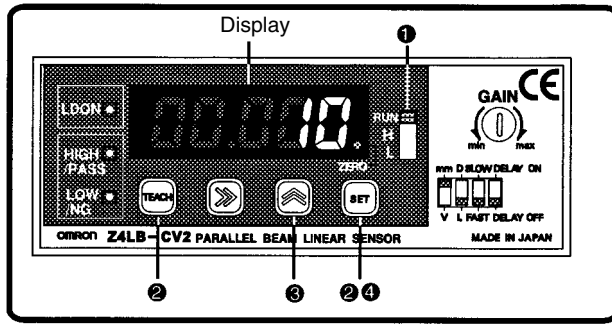
Set the measurement unit selector to mm.
The Sensor will display in millimeters.

Z4LB-S30V2 Sensor

The default setting for the measurement width of the Z4LB-CV2 Amplifier and Z4LB-CPV2 Amplifier is 10 mm. The measurement width of the Z4LB-S30V2 is 30 mm. Therefore, if the Z4LB-CV2 or Z4LB-CPV2 Amplifier is connected to the Z4LB-S30V2, the Amplifier cannot convert a linear output voltage range between 1 and 5 V into length correctly unless the measurement width of the Amplifier is changed to 30 mm. There is no need to change the measurement width for a One-side Interruption High-precision Sensor.

Note Before using the Z4LB-S10V2 Sensor, check that the measurement width is set to 10 mm. Refer to steps 1, 2, and 4.

Checking and Changing the Measurement Width

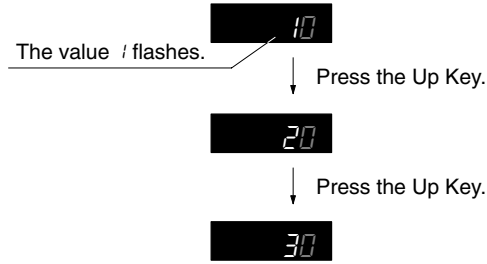


1 Set the operating mode selector to RUN.

2 Press the TEACH and SET Keys simultaneously for 3 s.

The present measurement width will be displayed. (The default setting is 10.)

3 Press the Up Key twice and change the value from 1 to 3.



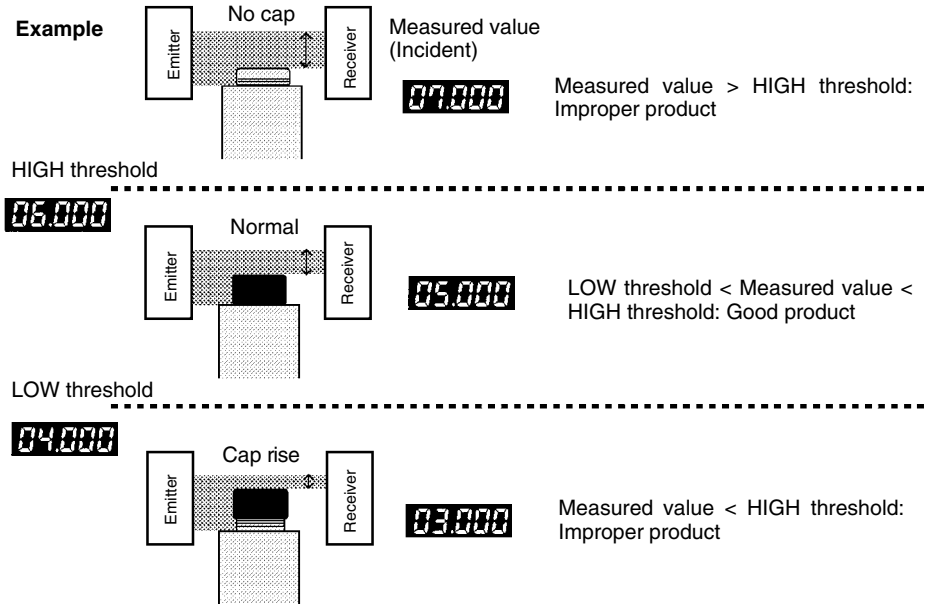
4 Press the SET Key.

The set value will be entered and the indicator will flash twice.

3-2 Setting Thresholds

Set the thresholds for good/improper product discrimination.

Example

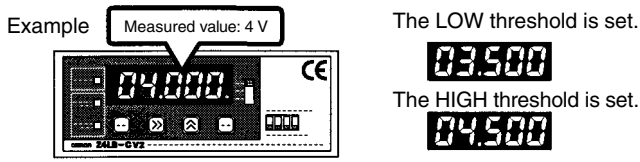


Note The discrimination outputs can be changed. Refer to *4-2-2 Selecting the Discrimination Outputs* for details (p. 39).

There are three methods to set thresholds. Select the most convenient method according to the application.

1 Direct Settings: The thresholds are set directly.

2 Teaching Settings: The thresholds are set based on a reference workpiece.



3 Forced-zero settings: A measured value based on a reference workpiece is set as zero. Add or subtract a tolerance directly to and from the reference value (zero) to set the results as thresholds.

The LOW threshold is set.

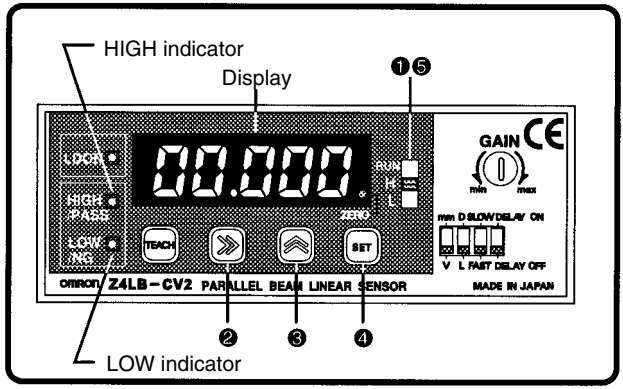
The HIGH threshold is set.

Note Discrimination outputs use HIGH and LOW threshold hysteresis values. Refer to *4-2-3 Hysteresis Setting* for the relationship between discrimination output ON/OFF points and thresholds.

→ **Refer to *Discrimination Outputs Timing Charts* (*p. 40*).**

3-2-1 Direct Setting Thresholds

The following method is convenient if the threshold value for discriminating good/improper products is known because values are input directly in this method.



HIGH Threshold Setting

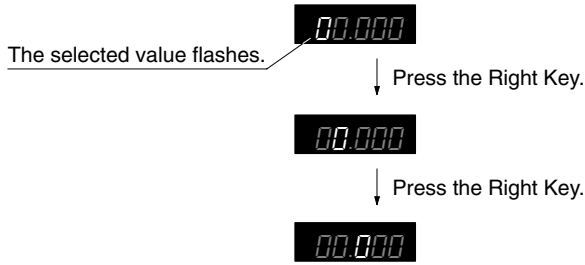
1 Set the operating mode selector to H.

The display will show the present HIGH threshold and the HIGH indicator will flash. If the bank selection is enabled, the bank number will be displayed.

→ **Refer to *4-2-5 Enabling the Bank Selection (p. 44).***

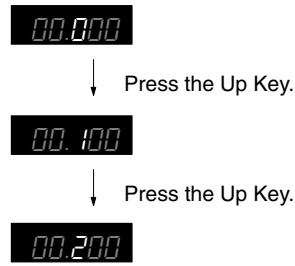
2 Press the Right Key to move the cursor to the value to be changed.

The cursor will shift to the right by one digit whenever the Key is pressed.



3 Press the Up Key to change the value.

The value will increase by 1 whenever the Key is pressed.



4 Press the SET Key.

The value will be entered and the indicator will flash twice.

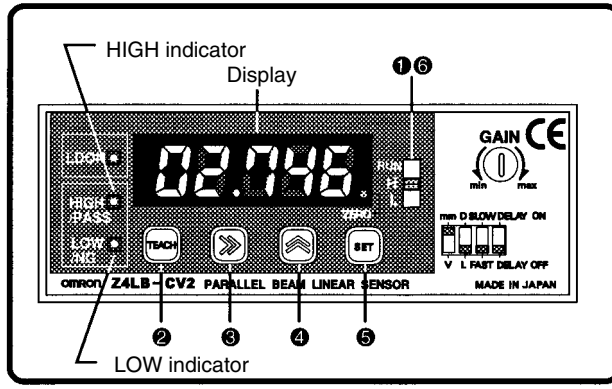
LOW Threshold Setting

5 Set the operating mode selector to L.

The LOW indicator will flash and the display will show the present LOW threshold.

6 Take steps similar to 2 and 4 to set the LOW threshold.

3-2-2 Teaching Thresholds



HIGH Threshold Setting

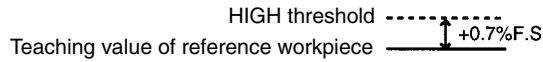
1 Set the operating mode selector to H.

The display will show the present HIGH threshold and the HIGH indicator will flash. If the bank selection is enabled, the bank number will be displayed.

→ **Refer to *4-2-5 Enabling the Bank Selection (p. 44)*.**

2 Set the workpiece and press the TEACH Key.

Teaching will be performed. The HIGH threshold obtained from the teaching value plus an approximate value of 0.7% F.S. will be displayed.

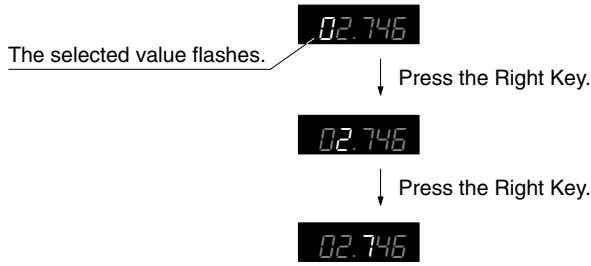


Fine Adjustment of Values

The thresholds after teaching are reference values that can be changed to desired values. Go to step 3 to change the thresholds, otherwise go to step 5.

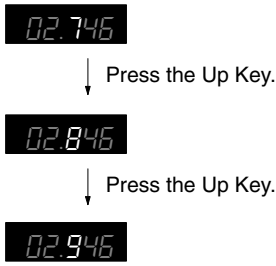
3 Press the Right Key to move the cursor to the value to be changed.

The cursor will shift to the right by one digit whenever the Key is pressed.



4 Press the Up Key and change the value.

The value will increase by 1 whenever the Key is pressed.



5 Press the SET Key.

The value will be entered and the indicator will flash twice.

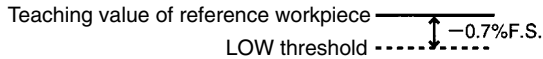
LOW Threshold Setting

6 Set the operating mode selector to L.

The LOW indicator will flash and the display will show the present LOW threshold.

7 Take steps similar to 2 and 5 to set the LOW threshold.

The teaching value minus an approximate value of 0.7% FS will be displayed as the LOW threshold.



3-2-3 Forced-zero Setting

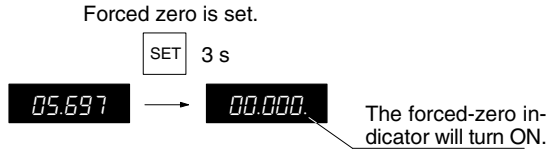
To set the thresholds, a measured value based on a reference workpiece is first set as zero. A tolerance is then added to and subtracted from the reference value (zero) to set the results as HIGH and LOW thresholds. Forced-zero settings are possible only if the unit is set to mm.

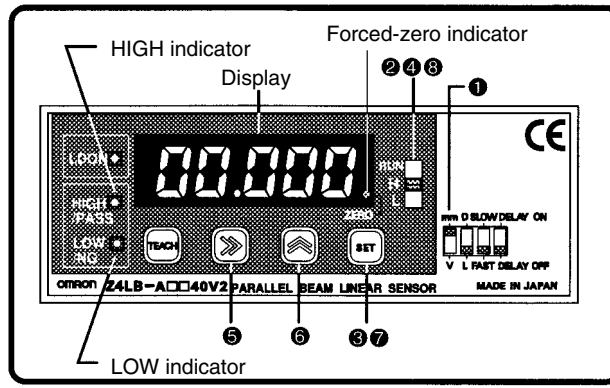
The HIGH and LOW thresholds are kept on hold when the reference workpiece is changed, which enables easy changeovers.

Thresholds are displayed between –9.999 and F.S. (see note), but the linear output voltage will not change.

Note 1 "F.S." stands for full scale. In the case of the Z4LB-S10V2, for example, the F.S. value is 10 mm.

2 Forced-zero Indicator
When the forced-zero settings are enabled, the forced-zero indicator will turn ON.





Display Unit Selection

1 Set the measurement unit selector to mm.

Reference Value Setting

2 Set the operating mode selector to RUN.

3 Set the workpiece and press the SET Key for 3 s.

The forced-zero indicator will turn ON, when the measured value will be set as the reference value (0).

- Clearing Forced-zero Settings
  To clear the forced-zero settings, press the SET value for 3 s.
- Forced-zero settings are possible through the forced-zero input terminal. The value is set if forced-zero input is ON for 0.2 to 0.8 s and cleared if it is input for 1 s or more.

Note When forced-zero settings are enabled, HIGH or LOW threshold cannot be set by teaching. Add or subtract a tolerance directly to and from the reference value (zero) to set the results as thresholds.

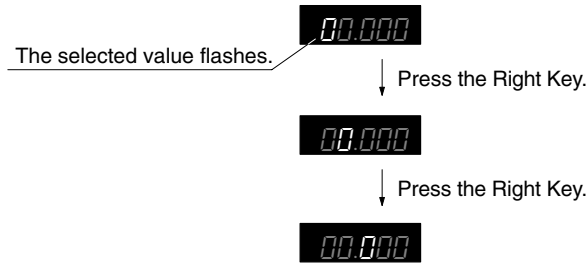
HIGH Threshold Setting

4 Set the operating mode selector to H.

The HIGH indicator will flash and the display will show the present HIGH threshold.

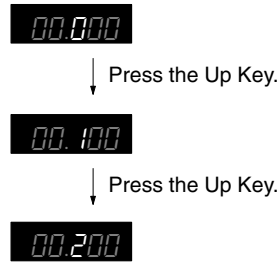
5 Press the Right Key to move the cursor to the value to be changed.

The cursor will shift to the right by one digit whenever the Key is pressed.



6 Press the Up Key and set the tolerance to be added to the reference value.

The value will increase by 1 whenever the Key is pressed.



7 Press the SET Key.

The value will be entered and the indicator will flash twice.

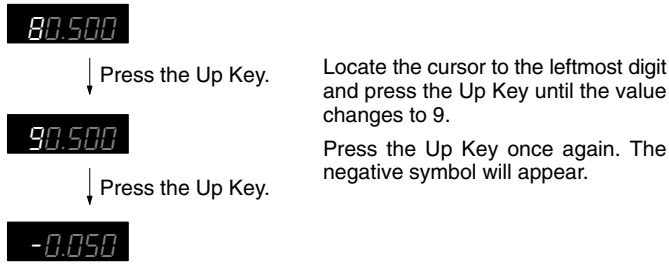
LOW Threshold Setting

8 Set the operating mode selector to L.

The LOW indicator will flash and the display will show the present LOW threshold.

9 Take steps similar to steps 5 and 7 to set the LOW threshold.

Displaying Negative Values



Bank Selection

If the bank selection is enabled, the screen to select the bank number appears after the operating mode selector is set to H or L. Set the thresholds after setting the bank number.

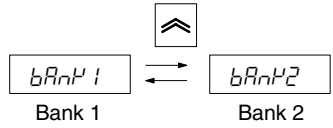
→ **Refer to *4-2-5 Enabling the Bank Selection (p. 44)*.**

Procedure

1 Set the operating mode selector to H or L.

The bank number will be displayed and the HIGH or LOW indicator will flash.

2 Press the Up Key and select the bank number where the threshold will be set.



3 Press the SET Key.

The bank number will be entered and the display will show the present threshold.

4 Set the HIGH or LOW thresholds.

SECTION 4
Optional Settings

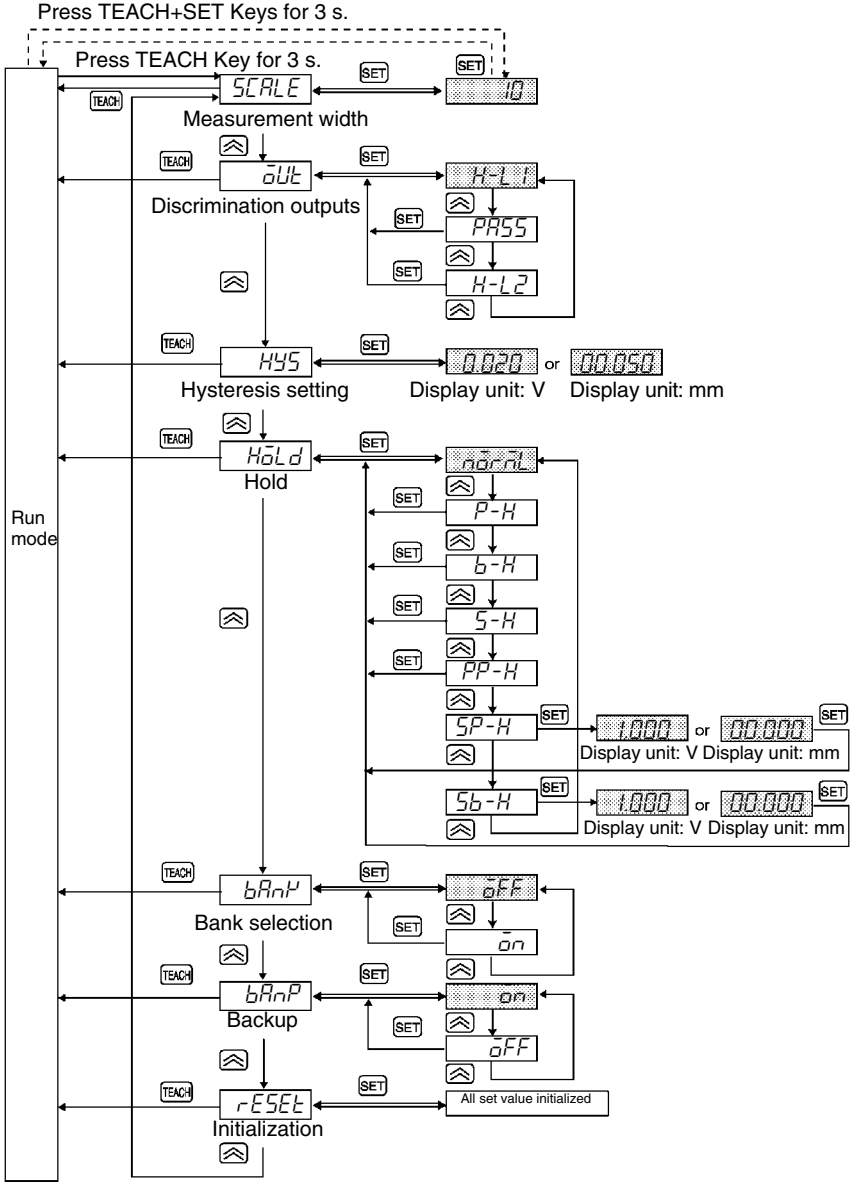
This section provides information on the optional functions that can be set in addition to the basic settings.

4-1 Optional Functions

The optional settings are made with the selectors or operation keys on the Amplifier.

Setting method	Function	Display	Page
Key	Measurement width	SCALE	38
	Discrimination outputs	out	39
	Hysteresis setting	HYS	40
	Hold	Hold	42
	Bank selection	bAnK	44
	Backup	bAuP	45
	Initialization	rESEt	46
Selectors	Light/dark mode selection	---	47
	Response time selection	---	48
	OFF delay	---	48
	Measurement unit selection	---	24

Function Settings with Keys



* Shaded settings are the default settings.

4-2 Key Settings

4-2-1 Setting the Measurement Width (SCALE)

The following settings are required only if the Z4LB-S30V2 Sensor is to be used with the measurement unit set to mm.

The following steps make it possible to change the measurement width. For details, refer to *3-1 Selecting the Measurement Unit*.

→ **Refer to *Z4LB-S30V2 Sensor* under *3-1 Selecting the Measurement Unit (p. 24).***

Procedure

There are two procedures that can be used to set thresholds. Select the easier method according to the application. The following example shows how to set the measurement width in function selection mode.

1 Set the operating mode selector to RUN.

2 Press the TEACH Key for 3 s.

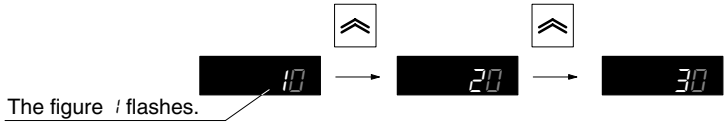
The Sensor will enter function selection mode.

3 Press the Up Key to go to measurement width setting.

Measurement width

4 Press the SET Key.

5 Press the UP Key twice to change 1 to 3.



6 Press the SET Key.

The set value will be entered and the display will flash twice.

7 Press the TEACH Key to return to RUN mode.

4-2-2 Selecting the Discrimination Outputs (out)

There are three methods to discriminate and output measurement data. Select the best method for the application.

1 HIGH/LOW Output Mode (H-L 1)

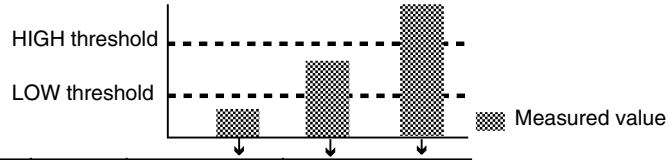
Measured value ≦ HIGH threshold: HIGH output ON
Measured value ≧ LOW threshold: LOW output ON

2 PASS/NG Output Mode (PASS)

LOW threshold < Measured value < HIGH threshold:
PASS output ON
Measured value ≦ LOW threshold or
Measured value ≧ HIGH threshold:
NG output ON

3 HIGH/LOW Inverted Output Mode (H-L2)

Measured value ≧ HIGH threshold: HIGH output ON
Measured value ≦ LOW threshold: LOW output ON



HIGH/LOW output mode	Discrimination output	HIGH	ON	ON	OFF
		LOW	OFF	ON	ON
	Indicator	HIGH	☒	☒	□
		LOW	□	☒	☒
PASS/NG output mode	Discrimination output	PASS	OFF	ON	OFF
		NG	ON	OFF	ON
	Indicator	PASS	□	☒	□
		NG	☒	□	☒
HIGH/LOW inverted output mode	Discrimination output	HIGH	OFF	OFF	ON
		LOW	ON	OFF	OFF
	Indicator	HIGH	□	□	☒
		LOW	☒	□	□

☒ ON
□ OFF

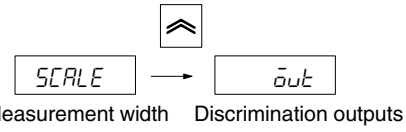
Procedure

1 Set the operating mode selector to RUN.

2 Press the TEACH Key for 3 s.

The Sensor will enter function selection mode.

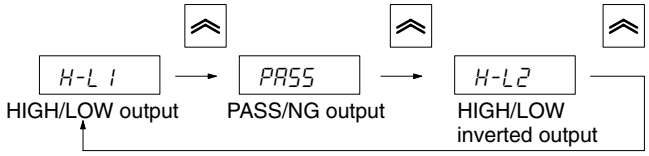
3 Press the Up Key to go to the discrimination outputs.



4 Press the SET Key.

The discrimination outputs can now be selected.

5 Press the Up Key and select the discrimination outputs.



6 Press the SET Key

The discrimination outputs will be entered and the Sensor will return to function selection mode.

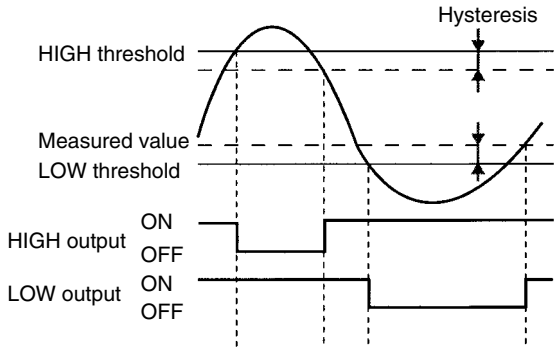
7 Press the TEACH Key to return to RUN mode.

4-2-3 Hysteresis Setting (HYS)

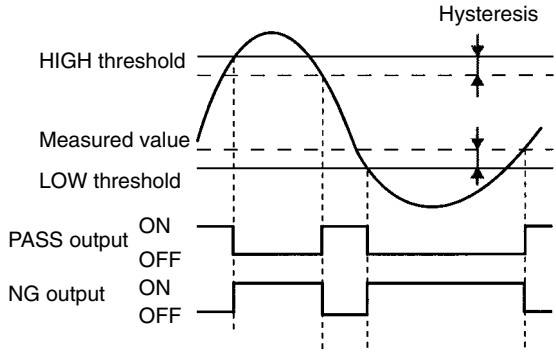
The hysteresis can be set to provide a margin in making discrimination outputs.

Discrimination Outputs Timing Charts

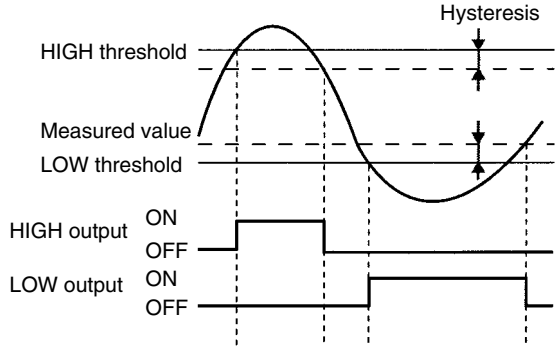
HIGH/LOW Output Mode



PASS/NG Output Mode



HIGH/LOW Inverted OUTPUT Mode

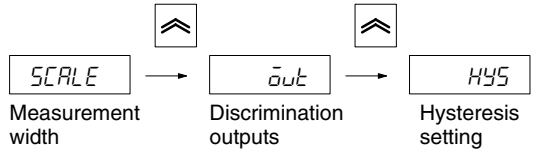


Procedure

1 Set the operating mode selector to RUN.

2 Press the TEACH Key for 3 s.
The Sensor will enter function selection mode.

3 Press the Up Key to go to the hysteresis setting.



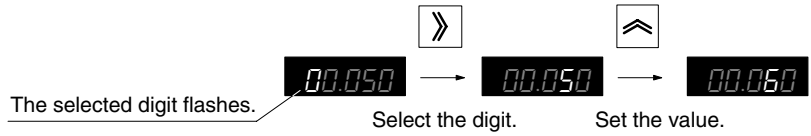
4 Press the SET Key.
The hysteresis can now be set.

5 Press the Right Key to move the cursor the digit to be changed and press the Up Key to set the hysteresis.

Default setting: The hysteresis is set to 0.020 when the measurement unit is V, to 00.050 when the measurement unit is mm and the measurement width is 10 mm, and to 00.150 when the measurement unit is mm and the measurement width is 30 mm.

Setting Range

Measured value display unit	Measurement width of the Sensor	
	10 mm	30 mm
V	0.002 to 0.800	
mm	0.005 to 2.000	0.015 to 6.000



6 Press the SET Key.

The set value will be entered and the Sensor will return to function selection mode.

7 Press the TEACH Key to return to RUN mode.

4-2-4 Display/Output Value Hold (HōLd)

There are six methods to hold the display and output values. Select the best method for the application.

Display	Name	Description	Page
nōrāL	Normal	The result of measurement is always displayed and output. The hold does not work.	50
P-H	Peak hold	The maximum value while the timing input is ON is displayed, output, and held.	51
b-H	Bottom hold	The minimum value while the timing input is ON is displayed, output, and held.	52
S-H	Sample hold	The current value when the timing input turns ON is displayed, output, and held.	53
PP-H	Peak-to-peak hold	The difference between the maximum and minimum values while timing input is ON is displayed, output, and held.	54
SP-H	Self-peak hold	The maximum value while the measured value is equal to or greater than the trigger level is displayed, output, and held.	55
Sb-H	Self-bottom hold	The minimum value while the measured value is equal to or less than the trigger level is displayed, output, and held.	56

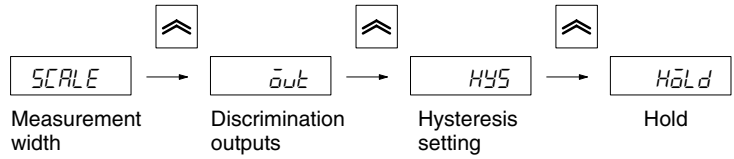
Procedure

1 Set the operating mode selector to RUN.

2 Press the TEACH Key for 3 s.

The Sensor will enter function selection mode.

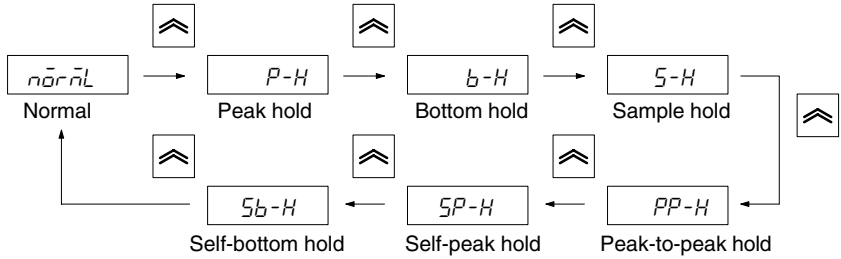
3 Set the Up Key to go to the hold.



4 Press the SET Key

The hold can now be selected.

5 Press the Up Key and select the hold.



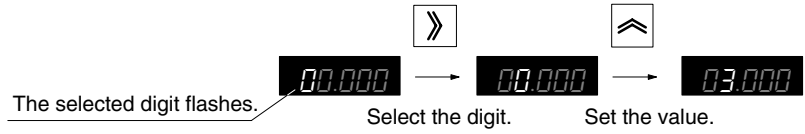
If the self-peak hold or self-bottom hold was selected, go to step 6 and set the trigger level, otherwise go to step 8.

6 Press the SET Key.

The selected hold will be set.

7 Press the Right Key to move the cursor the digit to be changed and press the Up Key to set the trigger level.

Default setting: The trigger level is set to 01.000 when the measurement unit is V and 00.000 when the measurement unit is mm.



8 Press the SET Key.

The trigger level will be entered and the Sensor will return to function selection mode.

9 Press the TEACH Key to return to RUN mode.

4-2-5 Enabling the Bank Selection (bAnK)

The Z4LB V2 has two banks in which thresholds can be set independently. Having different sets of threshold values enables easier changeovers.

If the bank selection is enabled, select the bank when setting the thresholds. Refer to *3-2 Setting Thresholds* for details.

→ **Refer to *Bank Selection (p. 33)*.**

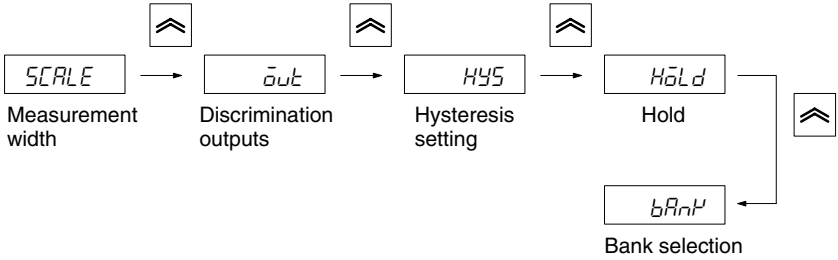
Procedure

1 Set the operating mode selector to RUN.

2 Set the TEACH Key for 3 s.

The Sensor will enter function selection mode.

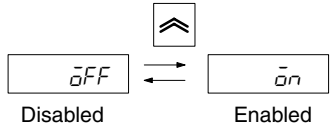
3 Press the Up Key to go to bank selection.



4 Press the SET Key.

The bank selection can now be set.

5 Press the Up Key to enable or disable the bank selection.



6 Press the SET Key

The bank selection setting will be entered and the Sensor will return to function selection mode.

7 Press the TEACH Key to return to RUN mode.

Bank Selection

The bank can be selected externally using the bank selection (green).

Bank	NPN Sensors	PNP Sensors
Bank 1	Open or connect to 12 to 24 VDC.	Open or connect to 0 V.
Bank 2	Connect to 0 V.	Connect to 12 to 24 VDC.

4-2-6 Enabling Backup (bAuP)

Determine whether the forced-zero value is to be backed up or not, i.e., to hold the value after the Sensor is turned OFF. If the backup is not enabled, the value will be lost when the Sensor is turned OFF.

Note If the backup is enabled, the forced-zero value will be written to the internal EEPROM, which is a nonvolatile. The EEPROM has a limit on the number of writing times. Therefore, if the forced-zero value is changed frequently, disable the backup to increase the life of the memory.

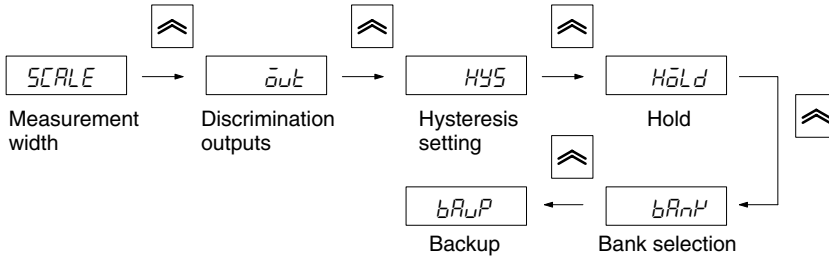
Procedure

1 Set the operating mode selector to RUN.

2 Press the TEACH Key for 3 s.

The Sensor will enter function selection mode.

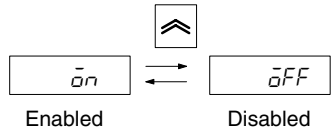
3 Press the Up Key to go to the backup.



4 Press the SET Key.

The backup can now be set.

5 Press the Up Key to enable or disable the backup.



6 Press the SET Key

The backup will be entered and the Sensor will return to function selection mode.

7 Press the TEACH Key to return to RUN mode.

4-2-7 Initialization (rESEt)

The following procedure can be used to clear all set values and return to the default values.

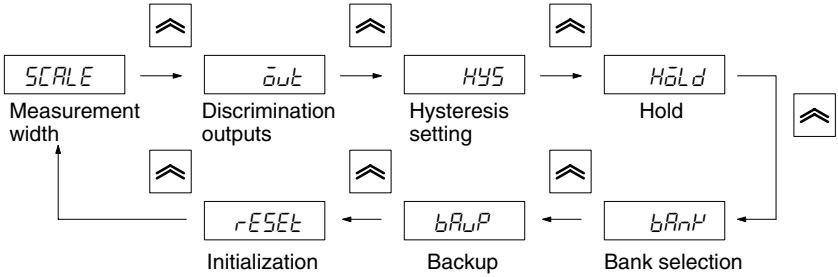
Procedure

1 Set the operating mode switch to RUN.

2 Press the TEACH Key for 3 s.

The Sensor will enter function selection mode.

3 Press the Up Key to go to the initialization.



4 Press the SET Key.

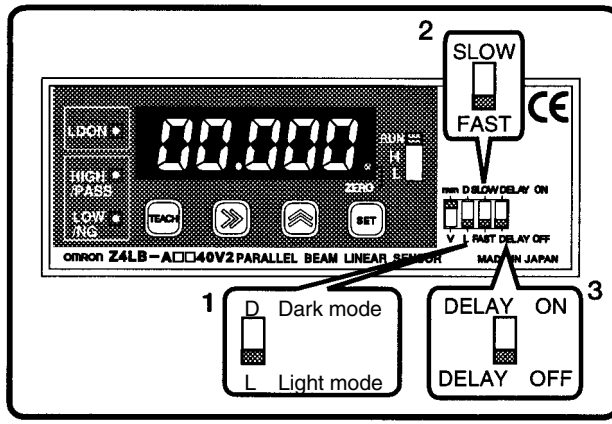
All the settings will be cleared and reset to default values.

5 Press the TEACH Key to return to RUN mode.

Default Settings

Item	Default setting	Meaning
Measurement width	10	10 mm
Discrimination outputs	H-L 1	HIGH/LOW output
Hysteresis setting	0.020	0.020 V
	00.050	0.050 mm
Hold	norAL	Normal
Bank selection	oFF	Disabled
Backup	on	Enabled
HIGH threshold	4.000	4.000 V
	07.500	7.500 mm
LOW threshold	2.000	2.000 V
	02.500	2.500 mm

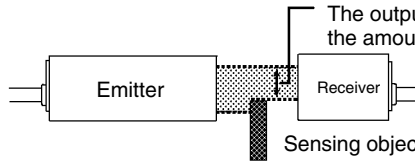
4-3 Selector Settings

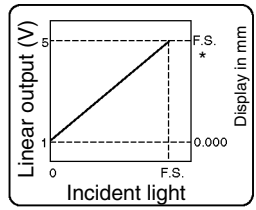


4-3-1 Light/Dark Mode

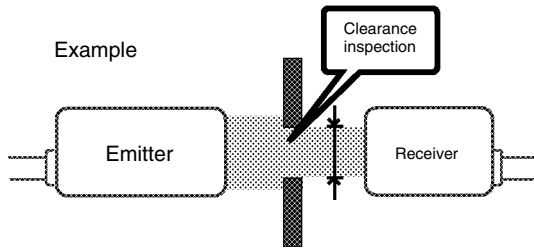
Use the selector to set the Sensor to light mode or dark mode.

Light Mode

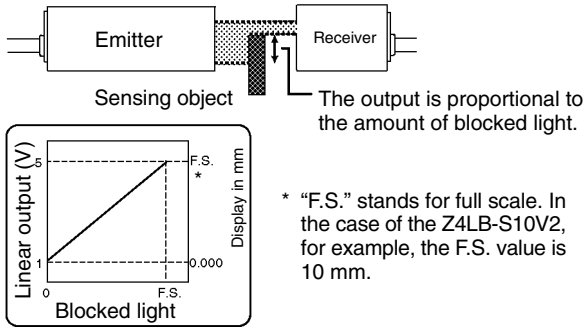




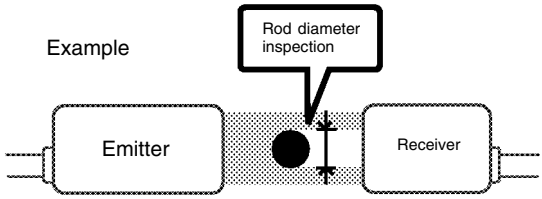
* "F.S." stands for full scale. In the case of the Z4LB-S10V2, for example, the F.S. value is 10 mm.



Dark Mode



* "F.S." stands for full scale. In the case of the Z4LB-S10V2, for example, the F.S. value is 10 mm.



4-3-2 Response Time Selection

The resolution changes with the response time. Select the requiring response time, taking the resolution into consideration.

Selection	Response time	Resolution	
		Z4LB-S10V2 Z4LB-A1040V2 Z4LB-A1040PV2	Z4LB-S30V2 Z4LB-A3040V2 Z4LB-A3040PV2
SLOW	5 ms	5 μm	15 μm
FAST	0.3 ms	10 μm	30 μm

4-3-3 OFF Delay

The discrimination outputs will have a 40-ms OFF delay if the OFF delay selector is set to ON.

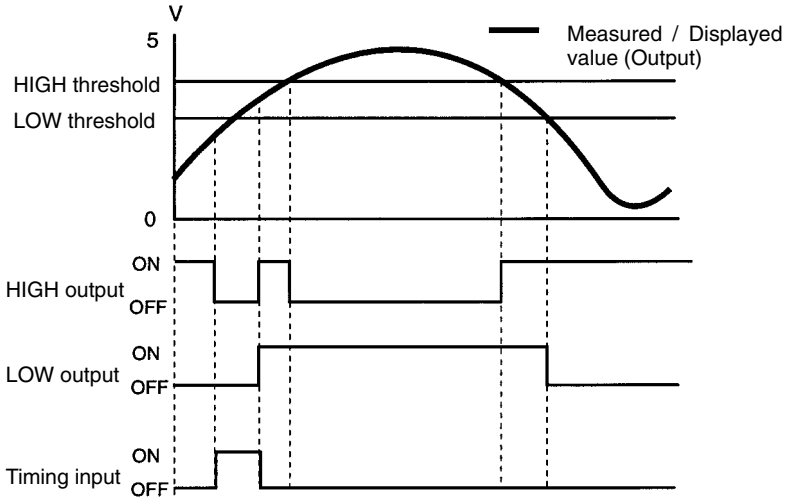
SECTION 5
Timing Charts

This section provides timing charts to show the operation of the holds.

5-1 Normal

The result of measurement is always displayed and output. The hold does not work.

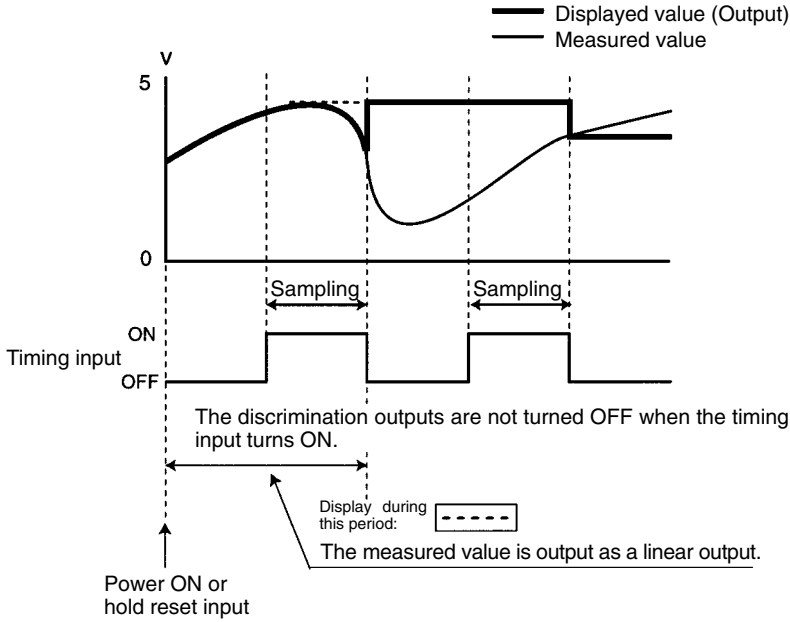
Example: Timing Chart in Normal HIGH/LOW Output Mode



Note The discrimination outputs are turned OFF when the timing input turns ON.

5-2 Peak Hold

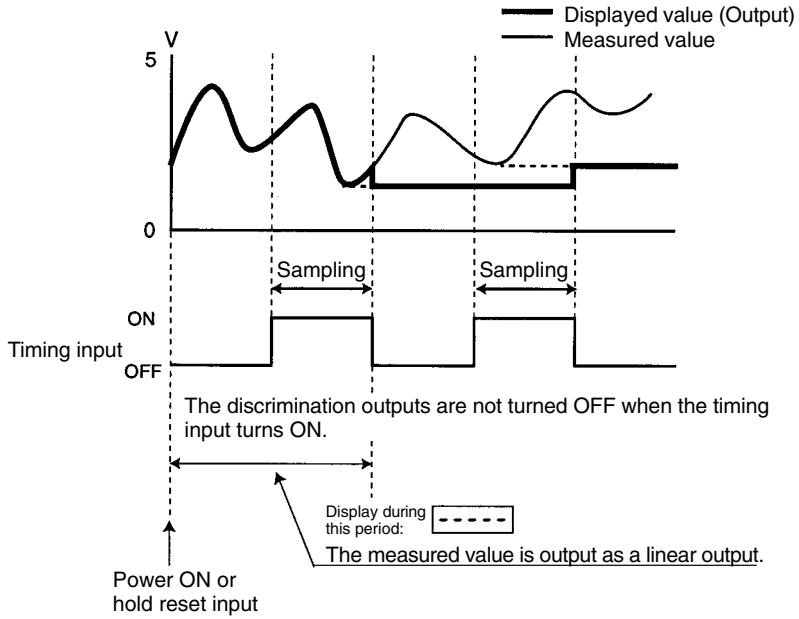
The maximum value while the timing input is ON is displayed, output, and held. The discrimination outputs are controlled according to the displayed value and output value.



Note To clear the held value and restart measurement, turn ON the hold reset input.

5-3 Bottom Hold

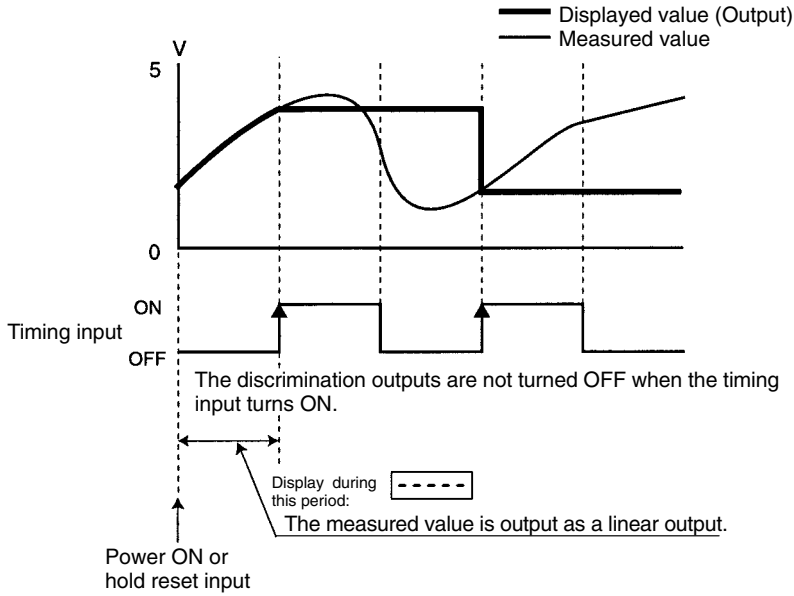
The minimum value while the timing input is ON is displayed, output, and held. The discrimination outputs are controlled according to the displayed value and output value.



Note To clear the held value and restart measurement, turn ON the hold reset input.

5-4 Sample Hold

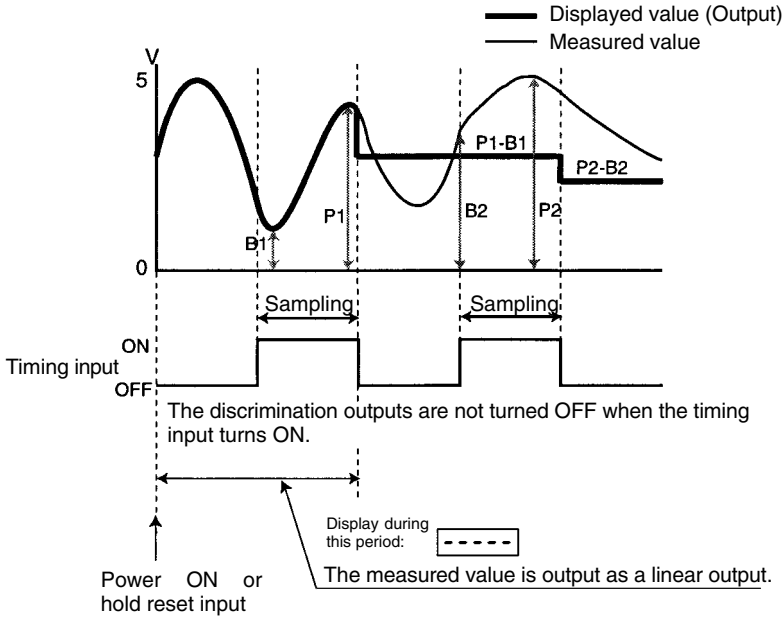
The current value when the timing input turns ON is displayed, output, and held. The discrimination outputs are controlled according to the displayed value and output value.



Note To clear the held value and restart measurement, turn ON the hold reset input.

5-5 Peak-to-peak Hold

The difference between the maximum and minimum values while timing input is ON is displayed, output, and held. The discrimination outputs are controlled according to the displayed value and output value.



Note To clear the held value and restart measurement, turn ON the hold reset input.

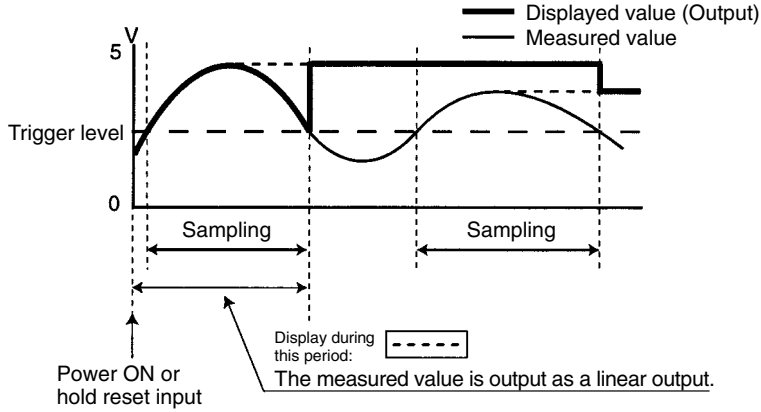
5-6 Self-peak Hold

The maximum value while the measured value is equal to or greater than the trigger level is displayed, output, and held. The discrimination outputs are controlled according to the displayed value and output value.

The trigger level is a threshold value specifying the sampling period of the measured value. When the measured value exceeds the trigger level, the peak measured value during the sampling period is held.

For the trigger level setting method, refer to *4-2-4 Display/Output Value Hold Method (p. 42).*

Note When timing input is ON during self-peak hold, no sampling is performed. The discrimination outputs are not turned OFF when the timing input turns ON.

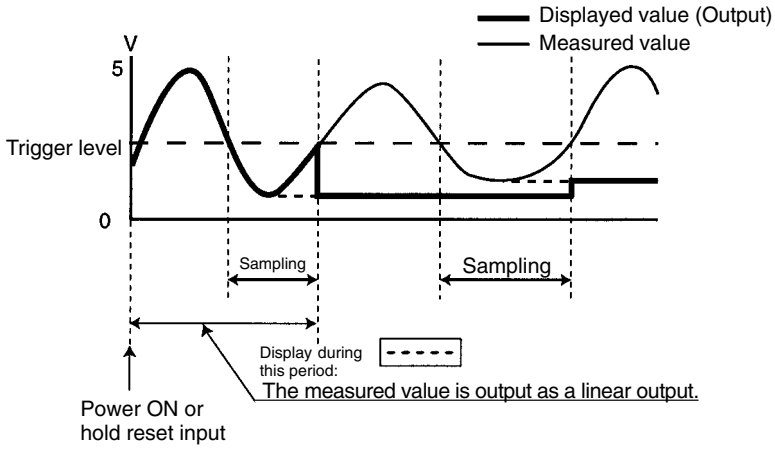


Note To clear the held value and restart measurement, turn ON the hold reset input.

5-7 Self-bottom Hold

The minimum value while the measured value is equal to or less than the trigger level is displayed, output, and held. The discrimination outputs are controlled according to the displayed value and output value.

Note When timing input is ON self-bottom hold, no sampling is performed. The discrimination outputs are not turned OFF when the timing input turns ON.



Note To clear the held value and restart measurement, turn ON the hold reset input.

SECTION 6
Troubleshooting

This section provides information on error messages and remedies to be taken. Refer to this section before requesting service from your OMRON representative.

When an error occurs, refer to the following list. If the error cannot be corrected, contact your OMRON representatives.

Display	Cause and action	Recovery method
Error	The setting is out of range. ▶Set the data again.	Automatically reset.
Er.SEn	The measurement width of the Sensor is incorrect. ▶Set the measurement width of the Sensor again in function selection mode.	Automatically reset.
Er.SEt	An error exists in data set in function selection mode. ▶Reset the data in function selection mode.	Automatically reset.
Err.HL	An error exists in HIGH threshold data. ▶Reset the HIGH threshold.	Automatically reset.
Err.Lo	An error exists in LOW threshold data. ▶Reset the LOW threshold.	Automatically reset.
Er.HYS	An error exists in hysteresis. ▶Reset the hysteresis.	Automatically reset.
Err.tL	An error exists in the trigger level. ▶Reset the trigger level.	Automatically reset.
Err.0	An error exists in forced-zero data. ▶Reset the forced-zero data.	Automatically reset.
SHort	One or both of the discrimination outputs are short-circuited. ▶Release the load short circuiting.	Power ON reset.
Ld.oFF	The LDOFF input is ON. ▶Turn OFF the LDOFF input.	Automatically reset.
Err.EP	The EEPROM has been destroyed or there is an error in the data. ▶Standard Sensors: Replace the Amplifier. ▶One-side Interruption High-precision Sensors: Replace the Sensor and Amplifier.	Replace the Sensor and/or Amplifier.
In run mode, the display will flash.	LD deterioration ▶Standard Sensors: Replace the amplifier. ▶One-side Interruption High-precision Sensors: Replace the Sensor and Amplifier.	Replace the Sensor and/or Amplifier.

SECTION 7
Specifications and Dimensions

This section provides the Sensor specifications and dimensions.

7-1 Specifications

7-1-1 Standard Sensors (Separate Type)

Sensors

Item	Z4LB-S10V2	Z4LB-S30V2
Light source	Visible-light semiconductor laser (Wavelength: 650 nm, IEC Class 1, FDA Class II)	
Measurement width	10 mm	30 mm
Sensing distance	0 to 300 mm	
Minimum sensing object	0.1 mm dia.	0.2 mm dia.
Linear output	Temperature characteristic: 0.1% F.S./°C (see notes 1 and 2)	
Ambient operating illumination	3,000 lx max. (incandescent lamp)	
Ambient temperature	Operating: 0 to 50°C Storage: –15 to 60°C (with no icing)	
Ambient humidity	Operating: 35% to 85% (with no condensation) Storage: 35% to 85% (with no condensation)	
Vibration resistance	10 to 150 Hz, half-amplitude of 0.75 mm, acceleration of 100 m/s^2 max.	
Dielectric strength	1,000 VAC 50/60 Hz 1 min	
Degree of protection	IEC60529 IP40	
Cable	Cable with connector (standard length: 2 m)	
Material	Zinc die-cast	
Weight (in package)	310 g	790 g
Accessories	Two mounting brackets Four, 25-mm M3 screws Four, M3 nuts Five labels	Two mounting brackets Six, 25-mm M4 screws Five labels

Note 1 “F.S.” stands for full scale. In the case of the Z4LB-S10V2, for example, the F.S. value is 10 mm.

2 The temperature characteristic value for the linear output is a typical value on condition that a single sensor is applied to measurement.

Amplifiers

Item		NPN Amplifier: Z4LB-CV2	PNP Amplifier: Z4LB-CPV2
Response time		0.3 or 5 ms (switch-selectable)	
Linear output	Output voltage	1 to 5 V (output impedance: 100 Ω, allowable load resistance: 10 kΩ min.)	
	Resolution	Z4LB-S10V2: 5 μm (5 ms), 10 μm (0.3 ms) (see note 1) Z4LB-S30V2 15 μm (5 ms), 30 μm (0.3 ms)	
	Temperature characteristic	0.02% F.S./°C (see note 2)	
Control outputs	Discrimination outputs HIGH, LOW (PASS, NG)	NPN open-collector outputs 100 mA max. at 30 VDC Residual voltage: 1.2 V max.	PNP open-collector outputs 100 mA max. at 30 VDC Residual voltage: 2.0 V max.
Control inputs	LD OFF input Timing input Forced-zero input Bank selection input Hold reset input	ON: 0 V short-circuited or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	ON: Power supply voltage short-circuited or power supply voltage –1.5 V max. OFF: Open (leakage current: 0.1 mA max.)
Main functions		Measured value display, measurement unit selection, threshold setting, teaching, forced-zero, discrimination outputs, hysteresis setting, hold, bank selection, backup, initialization, light/dark mode selection, response time selection, OFF delay	
Power supply voltage		12 to 24 VDC ±10% ripple (p-p): 10% max.	
Current consumption		200 mA max.	
Ambient temperature		Operating: 0 to 50°C Storage: –15 to 60°C (with no icing)	
Ambient humidity		Operating: 35% to 85% (with no condensation) Storage: 35% to 85% (with no condensation)	
Vibration resistance		10 to 150 Hz, half-amplitude of 0.15 mm, acceleration of 20 m/s^2 max.	
Dielectric strength		300 VAC 50/60 Hz 1 min	
Degree of protection		IEC60529 IP40	
Cable		Standard length: 2 m	
Material		ABS	
Weight (in package)		450 g	
Accessories		Instruction manual and screwdriver	

Note
1 The resolution values are conversion values for peak-to-peak linear outputs.
2 The temperature characteristic value for the linear output is a typical value on condition that a single sensor is applied to measurement.

7-1-2 One-side Interruption High-precision Sensors (Integrated Type)

Item		Z4LB-A1040V2	Z4LB-A3040V2
Input/ Output type	NPN	Z4LB-A1040V2	Z4LB-A3040V2
	PNP	Z4LB-A1040PV2	Z4LB-A3040PV2
Light source		Visible-light semiconductor laser (Wavelength: 650 mm, IEC Class 1, FDA Class II)	
Sensing width		10 mm	30 mm
Sensing distance		40 mm	
Min. sensing object		0.1 mm dia.	0.2 mm dia.
Response time		0.3 ms/5 ms (switch-selectable)	
Linear output	Output voltage	1 to 5 V (output impedance: 100 Ω, Allowable load resistance: 10 kΩ min.)	
	Resolution	5 μm (5 ms) 10 μm (0.3 ms) (see note 1)	15 μm (5 ms) 30 μm (0.3 ms)
	Linearity	±0.5% F.S. (see note 2)	
	Temperature drift	Sensor 0.1% F.S./°C (see note 3) Controller 0.02% F.S./°C (see note 3)	
Control outputs	Discrimination outputs HIGH, LOW (PASS/ NG)	NPN open collector outputs: 30 VDC 100 mA max., Residual voltage: 1.2 V max. PNP open collector output: 30 VDC 100 mA max., Residual voltage: 2.0 V max.	
Control inputs	LD OFF input Timing input Forced-zero input Bank selection input Hold reset input	NPN model ON: Short-circuited to 0 V or 1.5 V max. OFF: Open (Leakage current: 0.1 mA max.) PNP model ON: Power supply voltage short-circuited or power-supply voltage –1.5 V max. OFF: Open (residual current: 0.1 mA max.)	
Main functions		Measured value display, measurement unit selection, threshold setting, teaching, forced-zero, discrimination outputs, hysteresis setting, hold, bank selection, backup, initialization, light/dark mode selection, response time selection, OFF delay	
Power supply voltage		12 to 24 VDC±10% ripple (p-p) 10% max.	
Current consumption		200 mA max.	
Ambient illumination		3,000 lx max. (incandescent lamp)	
Ambient temperature		Operating: 0 to +50°C Storage: –15 to +60°C (with no icing)	
Ambient humidity		Operating/Storage: 35 to 85% (with no condensation)	

Item		Z4LB-A1040V2	Z4LB-A3040V2
Vibration resistance	Sensor	10 to 150 Hz, half-amplitude of 0.75 mm, acceleration of 100 m/s^2 max.	
	Amplifier	10 to 150 Hz, half-amplitude of 0.15 mm acceleration of 20 m/s^2 max.	
Dielectric strength	Sensor	1,000 VAC 50/60 Hz 1 min	
	Amplifier	300 VAC 50/60 Hz 1 min	
Degree of protection		IEC60529 IP40	
Connection method		Connector (Standard sensor cable length; 2 m, Standard amp cable length; 2 m)	
Material		Sensor: Diecast zinc, Amplifier: ABS	
Weight (including package)		610 g	900 g
Attachments		Instruction manual, 5 labels	

Note

1 The resolution is the peak-to-peak displacement conversion value for the linear output.

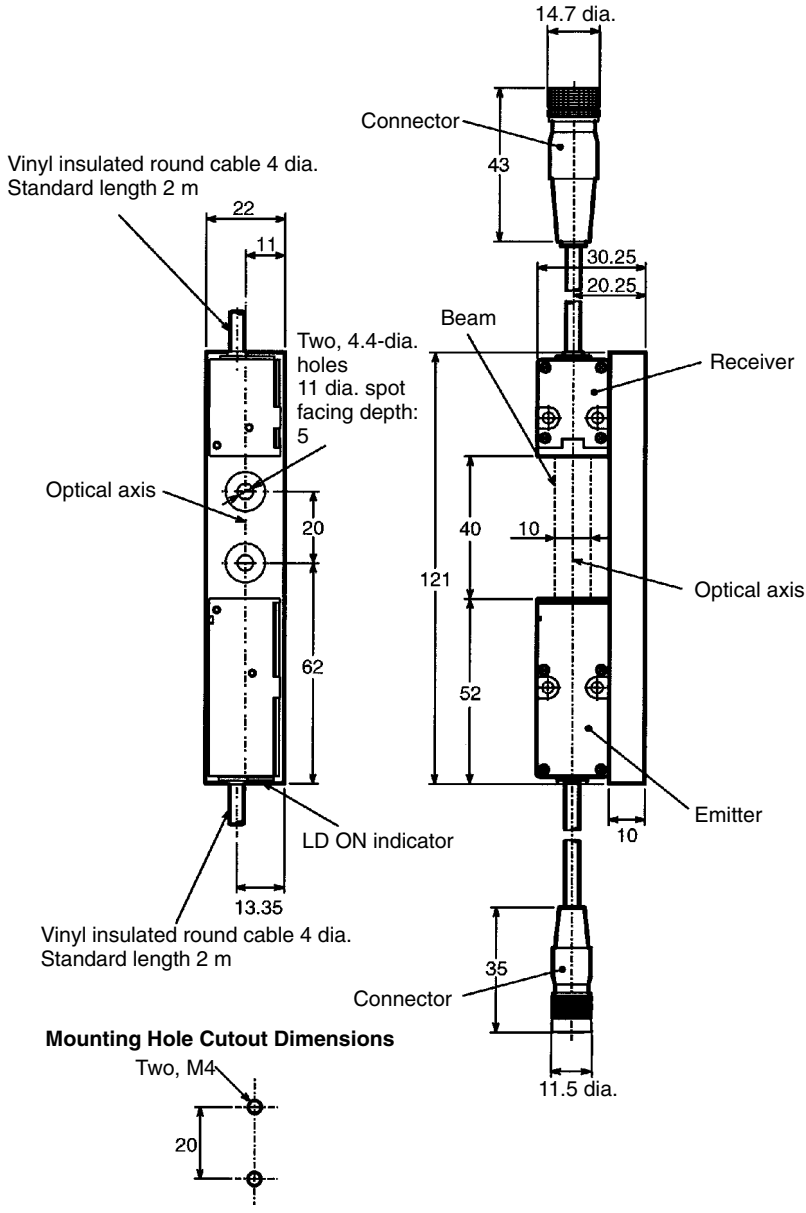
2 The typical value measured with only a Sensor and an Amplifier.

3 Linearity: The value deviated from the ideal straight line measured at the center point between Emitter and Receiver with 5% to 95% F.S. one-side light interruption. For the Z4LB-A1040V2 or Z4LB-A1040PV2, the range is from 0.5 to 9.5 mm.

7-2 Dimensions

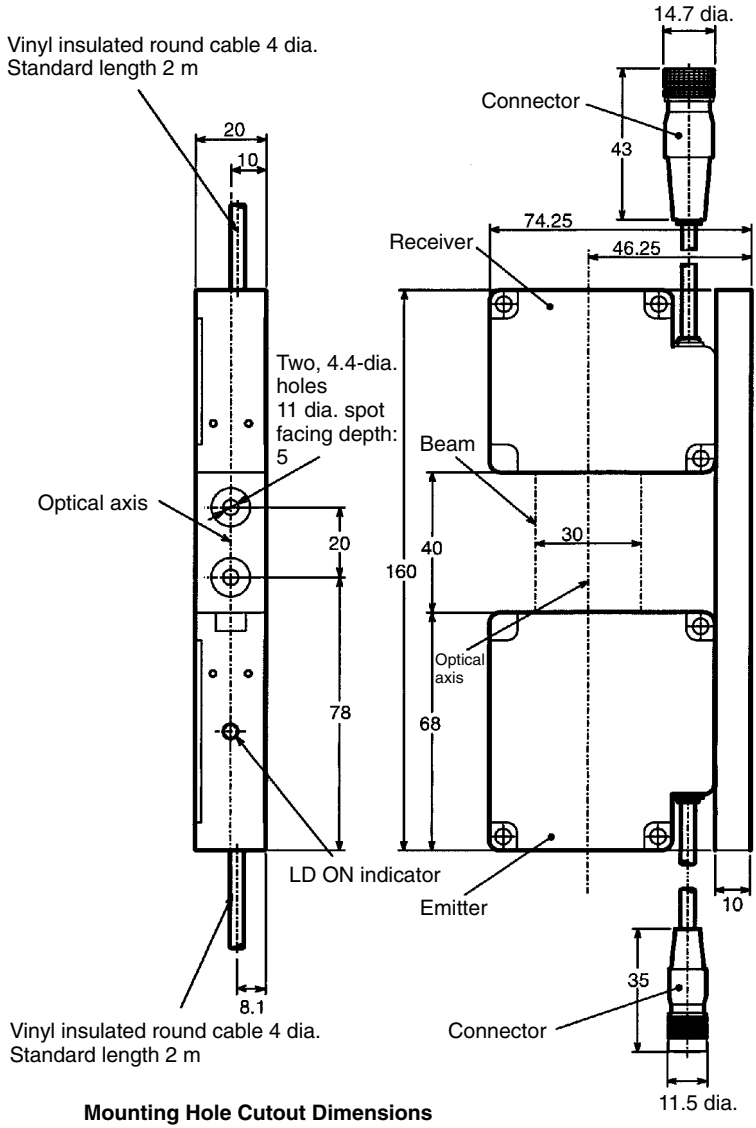
7-2-1 Sensors

Z4LB-A1040V2/Z4LB-A1040PV2 **(Unit: mm)**

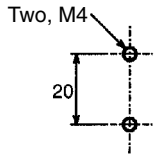


Mounting Hole Cutout Dimensions

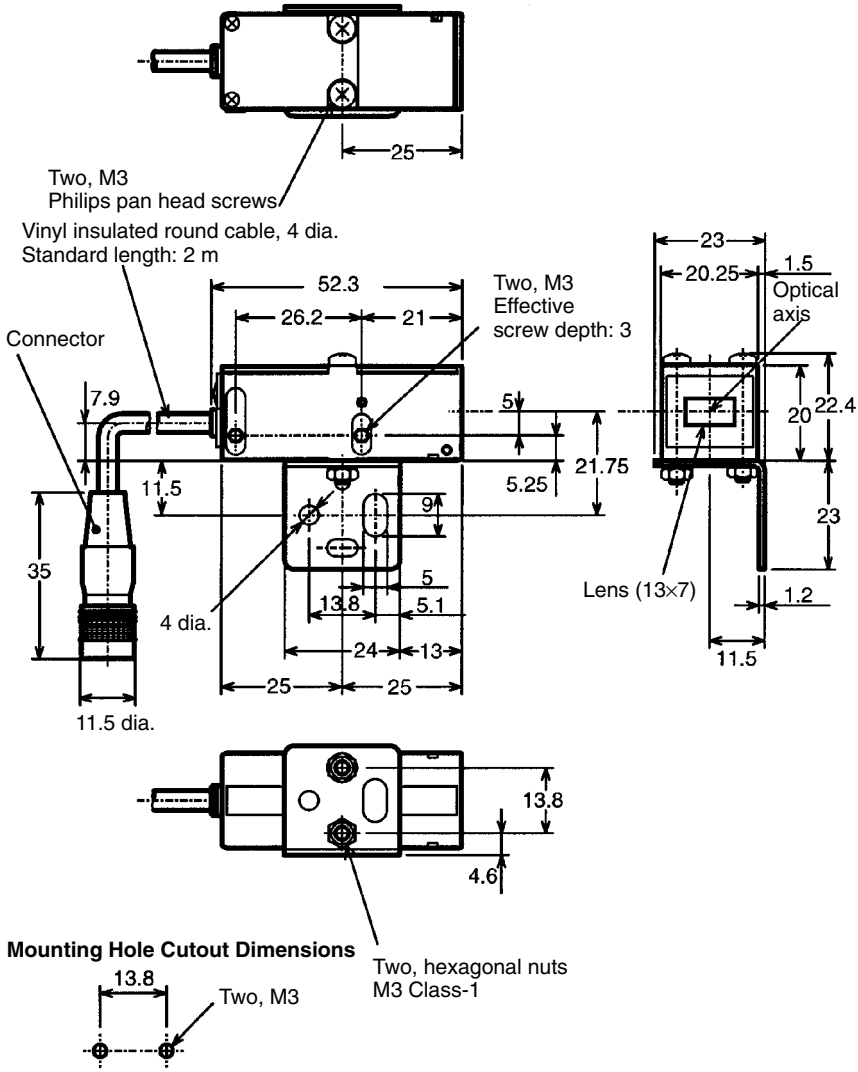
Z4LB-A3040V2/Z4LB-A3040PV2 **(Unit: mm)**



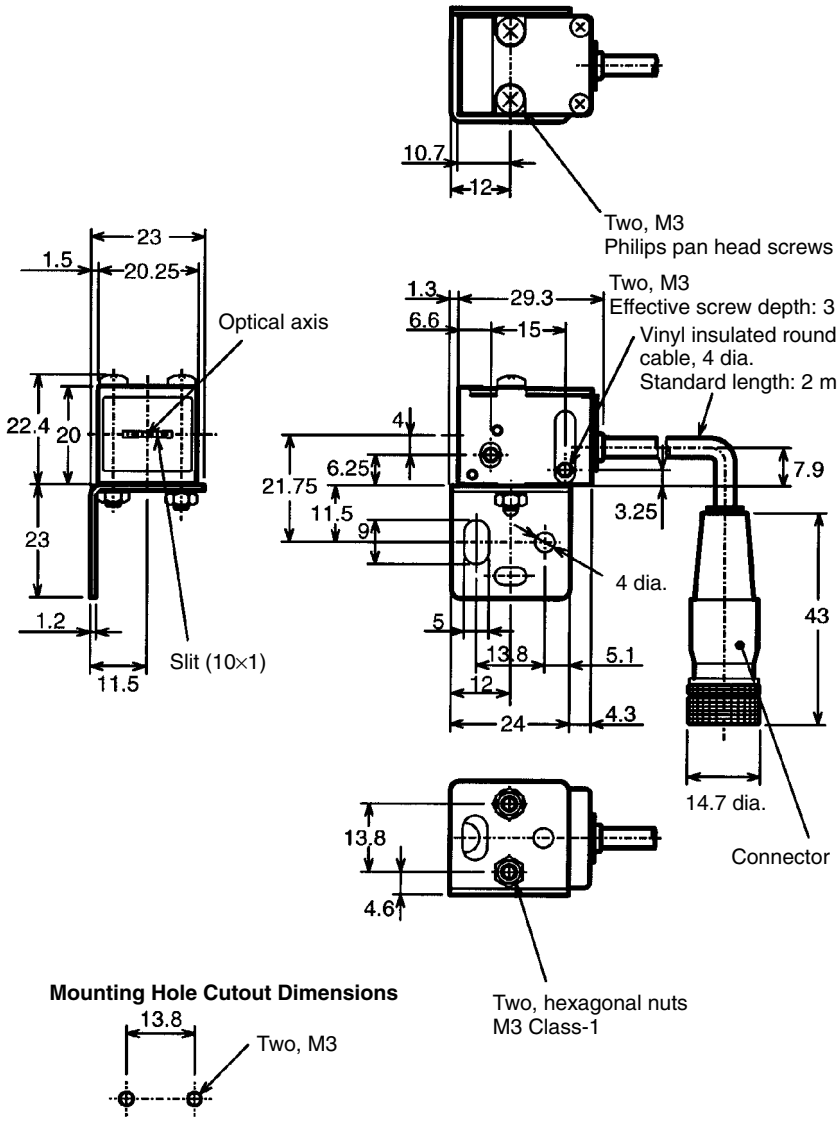
Mounting Hole Cutout Dimensions



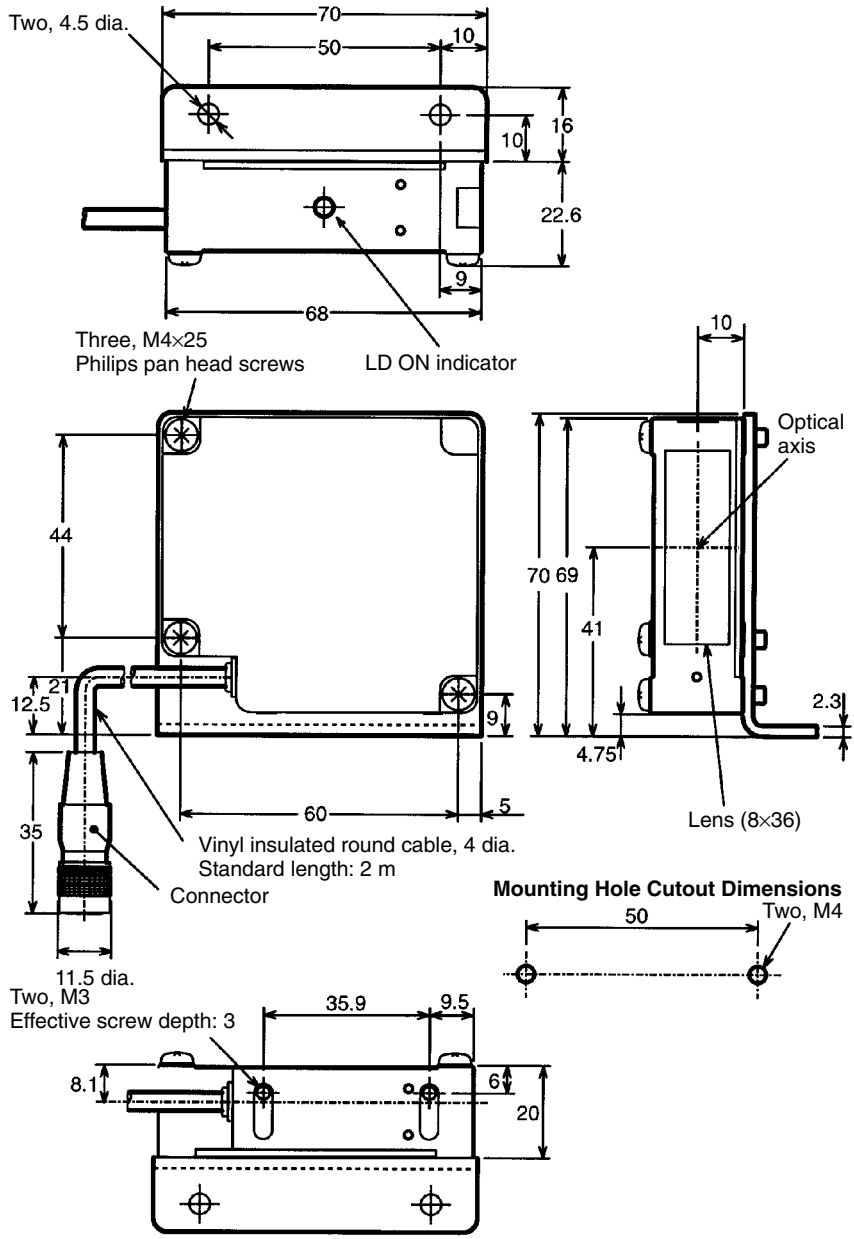
Z4LB-S10V2 Emitter **(Unit: mm)**



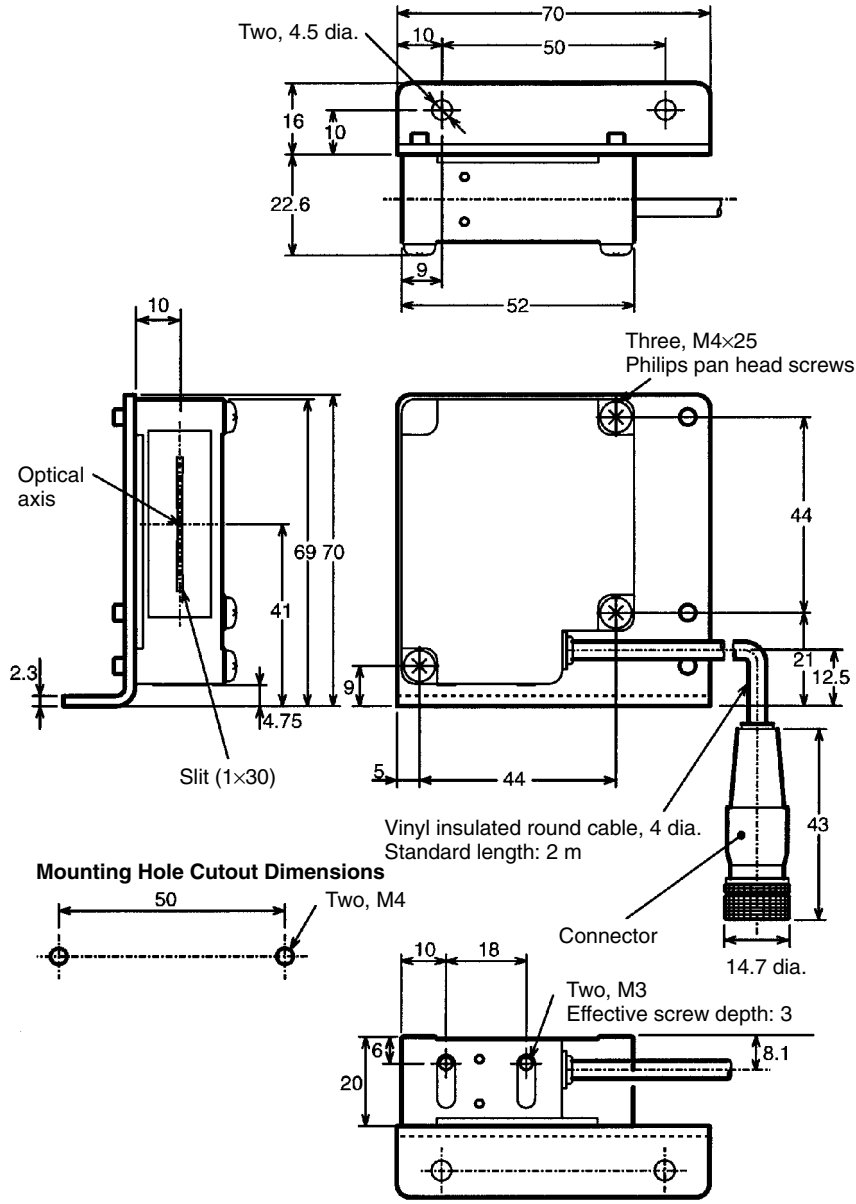
Z4LB-S10V2 Receiver **(Unit: mm)**



Z4LB-S30V2 Emitter **(Unit: mm)**

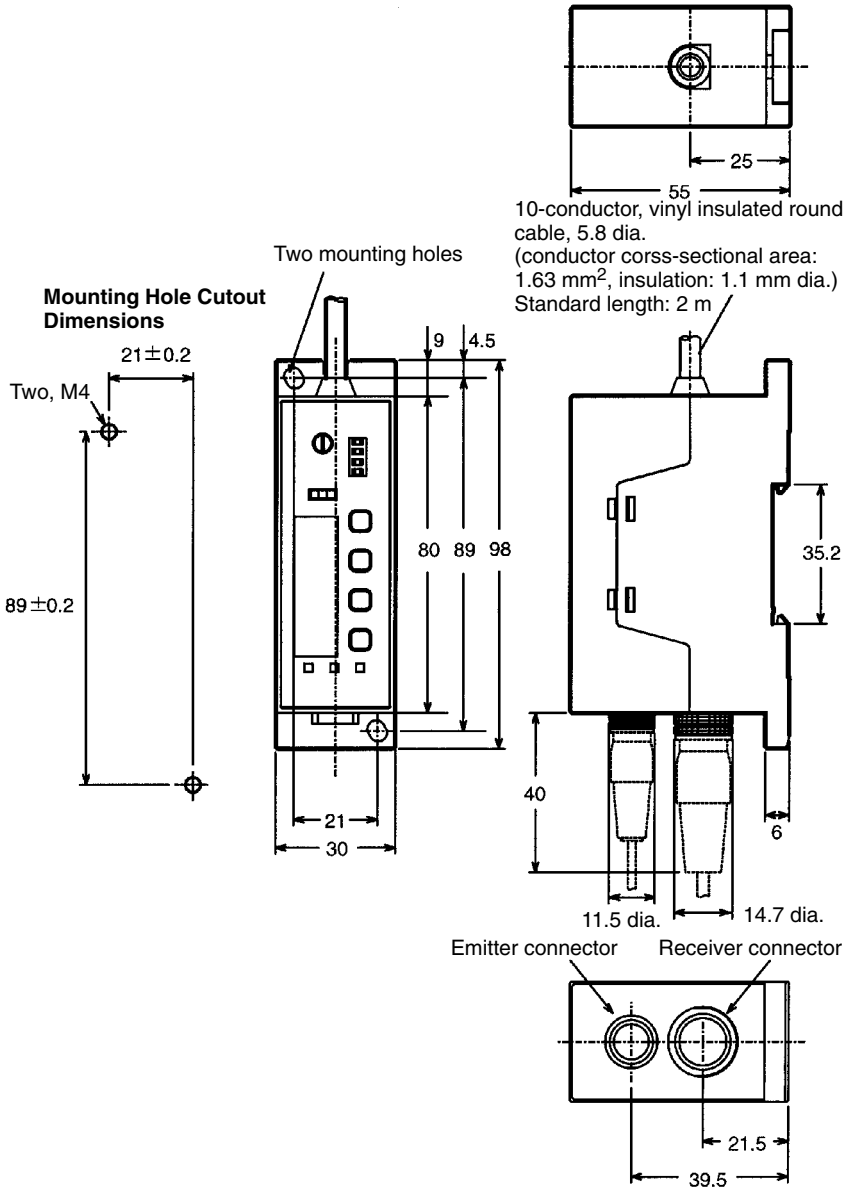


Z4LB-S30V2 Receiver **(Unit: mm)**



7-2-2 Amplifiers

Z4LB-CV2/Z4LB-CPV2
Z4LB-A□□40V2/Z4LB-A□□40PV2 **(Unit: mm)**



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