

# ZX1



## A CMOS Laser Sensor That's Optimum for Simple Measurements

- A resolution of 0.002 mm that's suitable for simple measurements.
- Stable measurements for any type of workpiece.
- Models available with four different distance specifications.
- Long-distance model for up to 1,000 mm.
- Robot cable that can be safely used even with moving parts.



Refer to **Safety Precautions** on page 4.

This datasheet contains information only for selecting the appropriate model. Be sure to read the instruction sheet for usage precautions prior to using the product.

## Ordering Information

**Sensors** (Refer to Dimensions on page 5.)

| Appearance          | Connection method   | Cable length        | Sensing distance  | Model             |                   |
|---------------------|---------------------|---------------------|-------------------|-------------------|-------------------|
|                     |                     |                     |                   | NPN output        | PNP output        |
|                     | Pre-wired           | 2 m                 |                   | ZX1-LD50A61 2M *  | ZX1-LD50A81 2M *  |
|                     |                     | 5 m                 |                   | ZX1-LD50A61 5M    | ZX1-LD50A81 5M    |
|                     | Pre-wired connector | 0.5 m               | ZX1-LD50A66 0.5M  | ZX1-LD50A86 0.5M  |                   |
|                     |                     | 2 m                 | ZX1-LD100A61 2M * | ZX1-LD100A81 2M * |                   |
|                     | Pre-wired           | 5 m                 |                   | ZX1-LD100A61 5M   | ZX1-LD100A81 5M   |
|                     |                     | Pre-wired connector |                   | 0.5 m             | ZX1-LD100A66 0.5M |
|                     | Pre-wired           | 2 m                 |                   | ZX1-LD300A61 2M * | ZX1-LD300A81 2M * |
|                     |                     | 5 m                 |                   | ZX1-LD300A61 5M   | ZX1-LD300A81 5M   |
| Pre-wired connector | 0.5 m               | ZX1-LD300A66 0.5M   | ZX1-LD300A86 0.5M |                   |                   |
|                     | Pre-wired           | 2 m                 |                   | ZX1-LD600A61 2M * | ZX1-LD600A81 2M * |
| 5 m                 |                     | ZX1-LD600A61 5M     |                   | ZX1-LD600A81 5M   |                   |
| Pre-wired connector | 0.5 m               | ZX1-LD600A66 0.5M   | ZX1-LD600A86 0.5M |                   |                   |

\* Sensors with Class 1 lasers are also available. Add an "L" to the end of the model number when ordering. (Example: ZX1-LD50A61L 2M)

## Accessories (sold separately)

**Extension Cables for Pre-wired Connector Models** An Extension Cable is not provided with the Sensor. Order an Extension Cable separately. (Refer to Dimensions on page 6.)

| Cable length | Model     |
|--------------|-----------|
| 10 m         | ZX0-XC10R |
| 20 m         | ZX0-XC20R |

**Mounting Brackets** A Mounting Bracket is not provided with the Sensor. Order a Mounting Bracket separately if required. (Refer to Dimensions on page 6.)

| Applicable sensors       | Appearance | Model    | Remarks   |
|--------------------------|------------|----------|---|
| ZX1-LD50□<br>ZX1-LD100□  |            | E39-L180 | Mounting Bracket: 1<br>Nut plate: 1<br>Phillips screws (M3×30): 2 |
| ZX1-LD300□<br>ZX1-LD600□ |            | E39-L181 | Mounting Bracket: 1<br>Nut plate: 1<br>Phillips screws (M4×35): 2 |

# ZX1

## Ratings and Specifications

| Item   | Model   | NPN output   | ZX1-LD50A61<br>ZX1-LD50A66 | ZX1-LD100A61<br>ZX1-LD100A66 | ZX1-LD300A61<br>ZX1-LD300A66   | ZX1-LD600A61<br>ZX1-LD600A66                                   |
|--|---|--|----------------------------|------------------------------|--|--|
|  |   | PNP output   | ZX1-LD50A81<br>ZX1-LD50A86 | ZX1-LD100A81<br>ZX1-LD100A86 | ZX1-LD300A81<br>ZX1-LD300A86   | ZX1-LD600A81<br>ZX1-LD600A86                                   |
| <b>Measurement range</b>   |   |  | 50 ± 10 mm                 | 100 ± 35 mm                  | 300 ± 150 mm   | 600 ± 400 mm   |
| <b>Light source (wave length)</b>  |   | Visible-light semiconductor laser<br>(wavelength: 660 nm, 1 mW max., IEC/EN Class 2, FDA Class 2 *1)   |                            |                              |  |  |
| <b>Spot diameter (typical)<br/>(Defined at the measurement center distance) *2</b> |   |  | 0.17 mm dia.               | 0.33 mm dia.                 | 0.52 mm dia.   | 0.56 mm dia.   |
| <b>Power consumption</b>   |   | 2,500 mW max. (105 mA max. at 24 VDC, 210 mA max. at 12 VDC)   |                            |                              |  |  |
| <b>Current consumption</b>   |   | 250 mA max. (at power supply voltage 10 VDC)   |                            |                              |  |  |
| <b>Control output</b>  |   | Load power supply voltage: 30 VDC max., Load current: 100 mA max.<br>(Residual voltage: 1 V max. (load current 10 mA or less), 2 V max. (load current of 10 to 100 mA))  |                            |                              |  |  |
| <b>Analog output</b>   |   | Current output: 4 to 20 mA, maximum load resistance: 300 Ω<br>(The output is 20 mA for the nearest point in the measurement range in respect to the Sensor and 4 mA for the farthest point.)                                       |                            |                              |  |  |
| <b>Functions</b>   |   | Smart tuning, keep function, scaling setting, background removal, OFF-delay timer, ON-delay timer, one-shot timer, ON/OFF-delay timer, zero reset, area output, eco function, hysteresis width setting, and setting initialization |                            |                              |  |  |
| <b>Indicators</b>  |   | Digital display (red), output indicator (OUT1, OUT2) (orange), zero reset indicator (orange), menu indicator (orange), laser ON indicator (green), and smart tuning indicator (blue)   |                            |                              |  |  |
| <b>Response time</b>   | <b>Judgment output</b>                        | Super-high-speed (SHS) Mode: 1 ms<br>High-speed (HS) Mode: 10 ms<br>Standard (Std) Mode : 100 ms   |                            |                              |  |  |
|  | <b>Laser OFF input</b>                        | 200 ms max.  |                            |                              |  |  |
|  | <b>Zero reset input</b>                       | 200 ms max.  |                            |                              |  |  |
| <b>Temperature characteristic *3</b>   |   | 0.03% F.S./°C  |                            |                              |  | 0.04% F.S./°C  |
| <b>Linearity *4</b>  |   | ±0.15% F.S.  |                            |                              | ±0.25% F.S.  | ±0.25% F.S.<br>(200 to 600 mm)<br>±0.5% F.S.<br>(entire range) |
| <b>Resolution *5</b>   |   | 2 μm   | 7 μm                       | 30 μm                        | 80 μm  |  |
| <b>Ambient illumination</b>  |   | Illumination on received light surface:<br>7,500 lx or less (incandescent light)   |                            |                              | Illumination on received light surface:<br>5,000 lx or less (incandescent light) |  |
| <b>Ambient temperature</b>   |   | Operating: -10 to +55°C, Storage: -15 to +70°C (with no icing or condensation)   |                            |                              |  |  |
| <b>Ambient humidity</b>  |   | Operating and storage: 35% to 85% (with no condensation)   |                            |                              |  |  |
| <b>Dielectric strength</b>   |   | 1,000 VAC, 50/60 Hz, 1 minute  |                            |                              |  |  |
| <b>Vibration resistance (destruction)</b>  |   | 10 to 55 Hz, 1.5-mm double amplitude, 2 hours each in X, Y, and Z directions   |                            |                              |  |  |
| <b>Shock resistance (destruction)</b>  |   | 500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions  |                            |                              |  |  |
| <b>Degree of protection *6</b>   |   | IEC 60529, IP67  |                            |                              |  |  |
| <b>Connection method *7</b>  |   | Pre-wired model (Standard cable length: 2 m, 5 m)<br>Pre-wired connector model (Standard cable length: 0.5 m)  |                            |                              |  |  |
| <b>Weight<br/>(packed state/<br/>sensor only)</b>                                  | <b>Pre-wired models<br/>(2 m)</b>             | Approx. 240 g / Approx. 180 g  |                            |                              | Approx. 270 g / Approx. 210 g  |  |
|  | <b>Pre-wired models<br/>(5 m)</b>             | Approx. 450 g / Approx. 330 g  |                            |                              | Approx. 480 g / Approx. 360 g  |  |
|  | <b>Pre-wired connector models<br/>(0.5 m)</b> | Approx. 170 g / Approx. 110 g  |                            |                              | Approx. 200 g / Approx. 140 g  |  |
| <b>Materials</b>   |   | Case and cover: PBT (polybutylene terephthalate), Optical window: Glass, Cable: PVC, Mounting hole part: SUS303  |                            |                              |  |  |
| <b>Accessories</b>   |   | Instruction sheet and Laser warning label (English)  |                            |                              |  |  |

**Note:** 1. False detection outside the measurement range can occur in the case of an object with high reflectance.

2. Refer to the next page for the ratings and specifications of Sensors with Class 1 lasers.

\*1. Classified as Class 2 by IEC60825-1 criteria in accordance with the FDA standard provisions of Laser Notice No. 50. CDRH registration has been completed. (Center for Devices and Radiological Health) (Accession Number: 1210041)

\*2. Spot diameter: Defined as 1/e<sup>2</sup> (13.5%) of the central intensity at the measurement center distance.

False detections can occur in the case there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

Accurate measurements may not be possible for workpieces that are smaller than the spot diameter.

\*3. Temperature characteristic: Value for the case the space between the sensor and Omron's standard target object is secured by an aluminum jig. (Measured at the measurement center distance)

\*4. Linearity: Indicates the error with respect to the ideal straight line of the displacement output in the case of measuring Omron's standard target object (white ceramic) at a temperature of 25 °C.

Linearity and measured value may vary depending on target object.

\*5. Resolution: Defined in Standard Mode for Omron's standard target object (white ceramic) after executing Smart Tuning.

The resolution indicates the repetition accuracy for a still workpiece. Not an indication of the distance accuracy.

Resolution performance may not be satisfied in a strong electromagnetic field.

\*6. IP67 protection applies to the connector on pre-wired connector models if an extension cable is connected.

\*7. Use a Pre-wired Connector Model together with an Extension Cable (10 m or 20 m).

## Ratings and Specifications of Sensors with Class 1 lasers (ZX1-LD□□L)

The ratings and specifications that are different from those of the Sensors with Class 2 lasers are given below.

| Item                 | Model | ZX1-LD50A61L/ZX1-LD50A81L<br>ZX1-LD100A61L/ZX1-LD100A81L                     | ZX1-LD300A61L/ZX1-LD300A81L<br>ZX1-LD600A61L/ZX1-LD600A81L                   |
|----------------------|-------|--|--|
| FDA Class            |       | Class1 0.24mW max.   |  |
| IEC/EN Class         |       | Class1 0.24mW max.   |  |
| Functions            |       | No scaling setting   |  |
| Ambient illumination |       | Illumination on received light surface 5,000 lx or less (incandescent light) | Illumination on received light surface 2,500 lx or less (incandescent light) |
| Connection method    |       | Pre-wired model (2 m)  |  |
| Accessories          |       | Instruction sheet and Explanatory label (English), FDA certification label   |  |

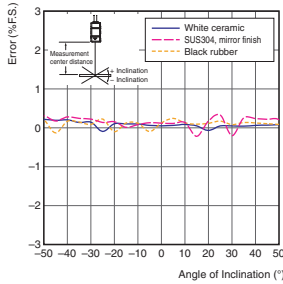
Accession Number: 1210041

## Engineering Data (Typical)

### Angle Characteristic

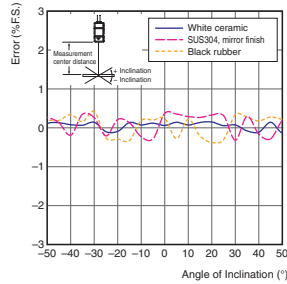
#### ZX1-LD50□

##### Side-to-side Inclination



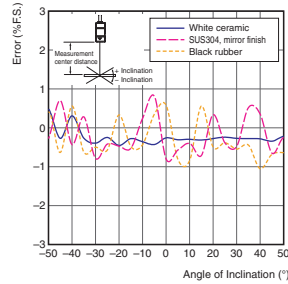
#### ZX1-LD100□

##### Side-to-side Inclination



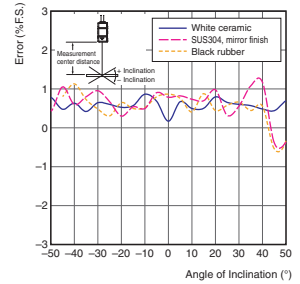
#### ZX1-LD300□

##### Side-to-side Inclination



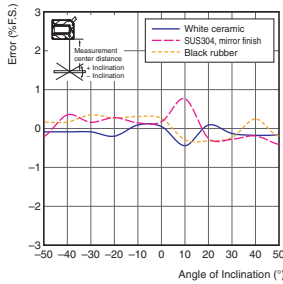
#### ZX1-LD600□

##### Side-to-side Inclination



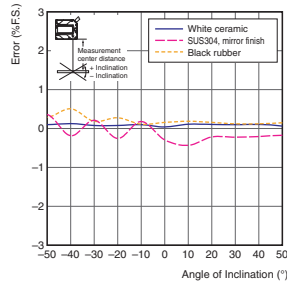
#### ZX1-LD50□

##### Front-to-back Inclination



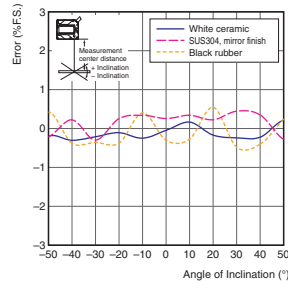
#### ZX1-LD100□

##### Front-to-back Inclination



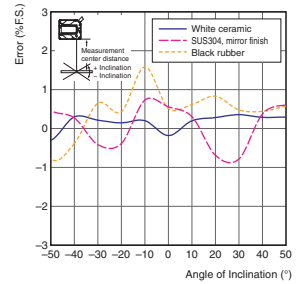
#### ZX1-LD300□

##### Front-to-back Inclination



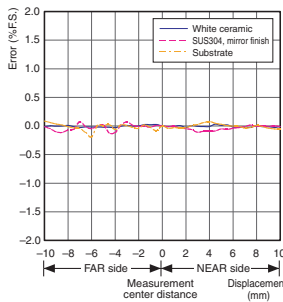
#### ZX1-LD600□

##### Front-to-back Inclination

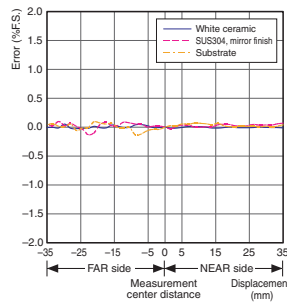


### Linearity Characteristic for Different Materials

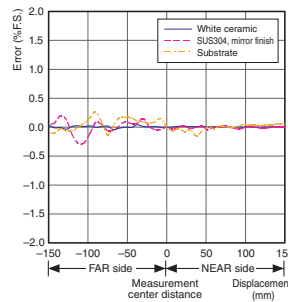
#### ZX1-LD50□



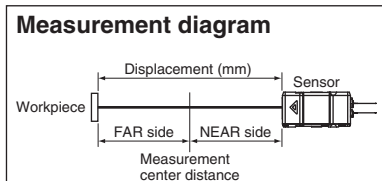
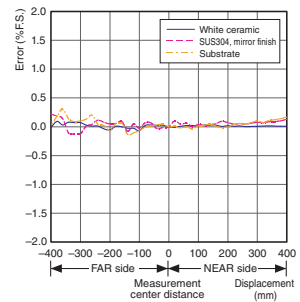
#### ZX1-LD100□



#### ZX1-LD300□



#### ZX1-LD600□



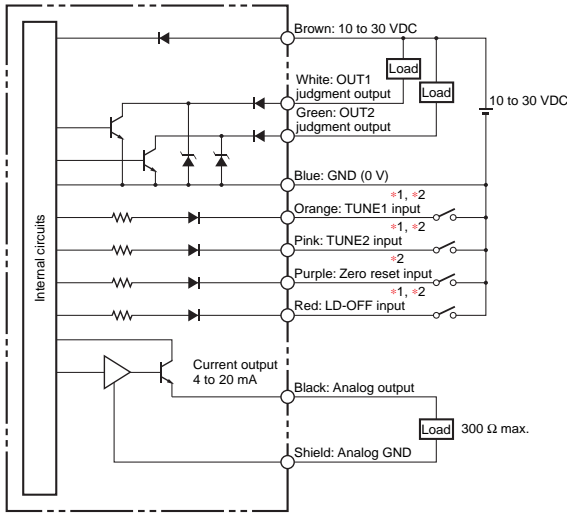
- Note:**
1. Measurement conditions for the ZX1-LD□□: Ambient temperature of 25°C in Standard Mode after executing Smart Tuning.
  2. The ambient conditions or workpiece may adversely affect the engineering data of the ZX1-LD□□.
  3. The X-axis displacement indicates the measurement distance displayed on a digital display.  
The measurement distance displayed on a digital display takes the measurement center distance as 0 and displays the near side of the Sensor as positive and the far side as negative.

# ZX1

## I/O Circuit Diagrams

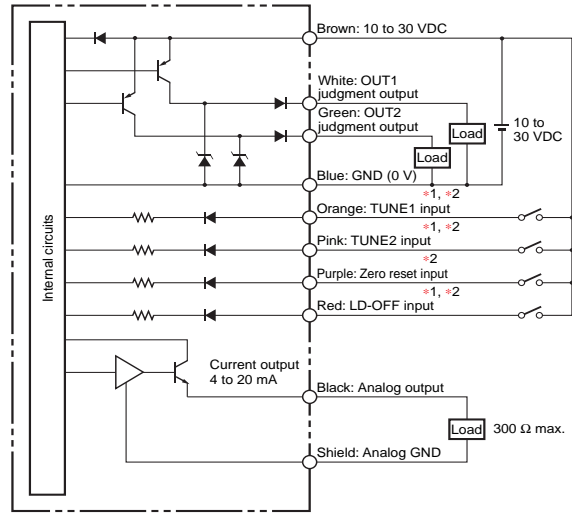
### NPN Output Model (Negative Common)

ZX1-LD50A61(L) / ZX1-LD50A66  
 ZX1-LD100A61(L) / ZX1-LD100A66  
 ZX1-LD300A61(L) / ZX1-LD300A66  
 ZX1-LD600A61(L) / ZX1-LD600A66



### PNP Output Model (Positive Common)

ZX1-LD50A81(L) / ZX1-LD50A86  
 ZX1-LD100A81(L) / ZX1-LD100A86  
 ZX1-LD300A81(L) / ZX1-LD300A86  
 ZX1-LD600A81(L) / ZX1-LD600A86



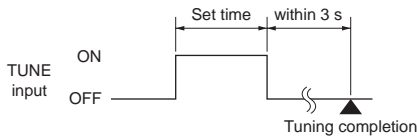
\*1. TUNE1 input: tuning external input for channel 1  
 TUNE2 input: tuning external input for channel 2  
 LD-OFF input: Laser OFF input  
 \*2. The input specification is as follows:

|     | NPN Output Model                                | PNP Output Model   |
|-----|---|--|
| ON  | Short-circuited with 0-V terminal or 1.5 V max. | Supply voltage short-circuited or supply voltage within -1.5 V |
| OFF | Open (leakage current: 0.1 mA max.)             | Open (leakage current: 0.1 mA max.)                            |

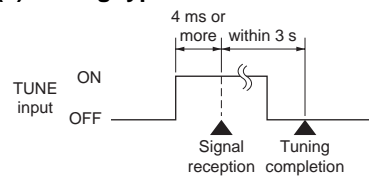
## Timing Charts

### TUNE1 Input / TUNE2 Input

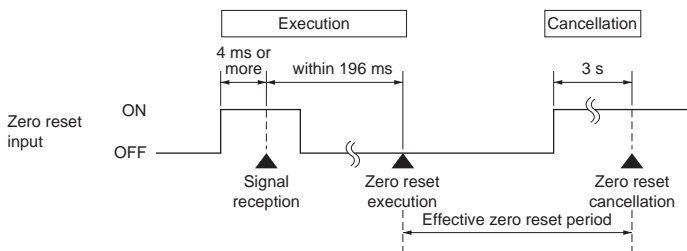
#### (1) Time identification tuning type



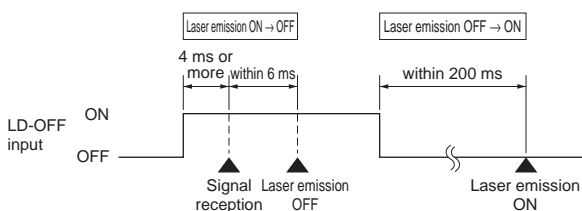
#### (2) Tuning type other than time identification



### Zero Reset Input



### LD-OFF Input



## Safety Precautions

This datasheet contains information only for selecting the appropriate model. Be sure to read the Instruction Sheet for usage precautions prior to using the product.

### Laser Safety

**WARNING**

ZX1-LD□□□: Class 2, ZX1-LD□□□L: Class1

Do not expose your eyes to the laser radiation either directly or indirectly (i.e., after reflection from a mirror or shiny surface).



The laser radiation has a high power density and exposure may result in loss of sight.

Do not disassemble the product.

Doing so may cause the laser beam to leak, resulting in the danger of visual impairment.



Note: For Precautions for safe use and Precautions for correct use, refer to the Instruction Sheet supplied with the product.

Dimensions

Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

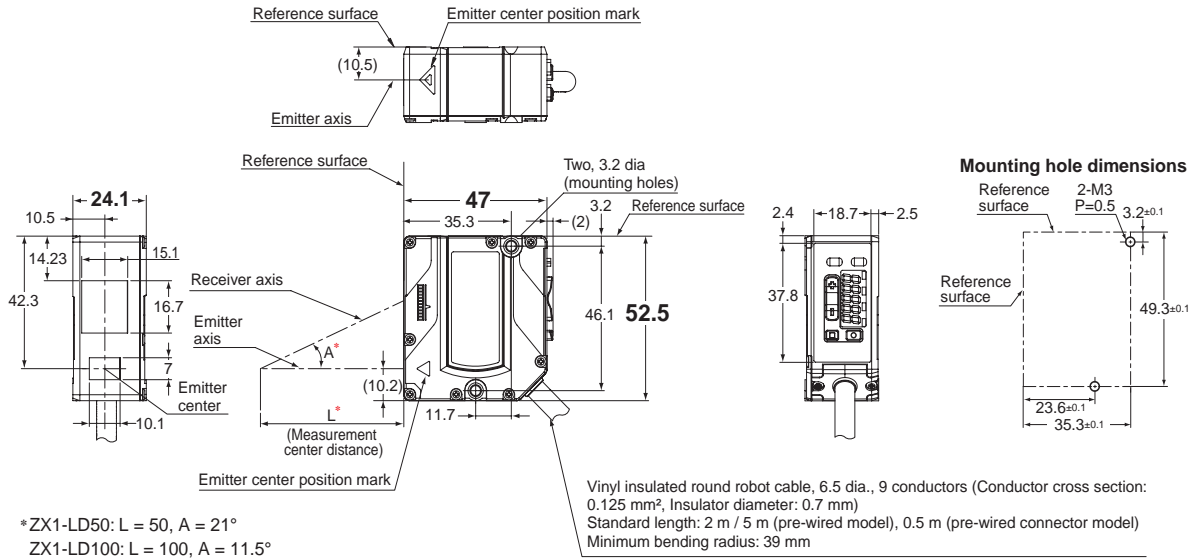
Sensors

Pre-wired Models

- ZX1-LD50A61(L)
- ZX1-LD50A81(L)
- ZX1-LD100A61(L)
- ZX1-LD100A81(L)

Pre-wired Connector Models

- ZX1-LD50A66
- ZX1-LD50A86
- ZX1-LD100A66
- ZX1-LD100A86

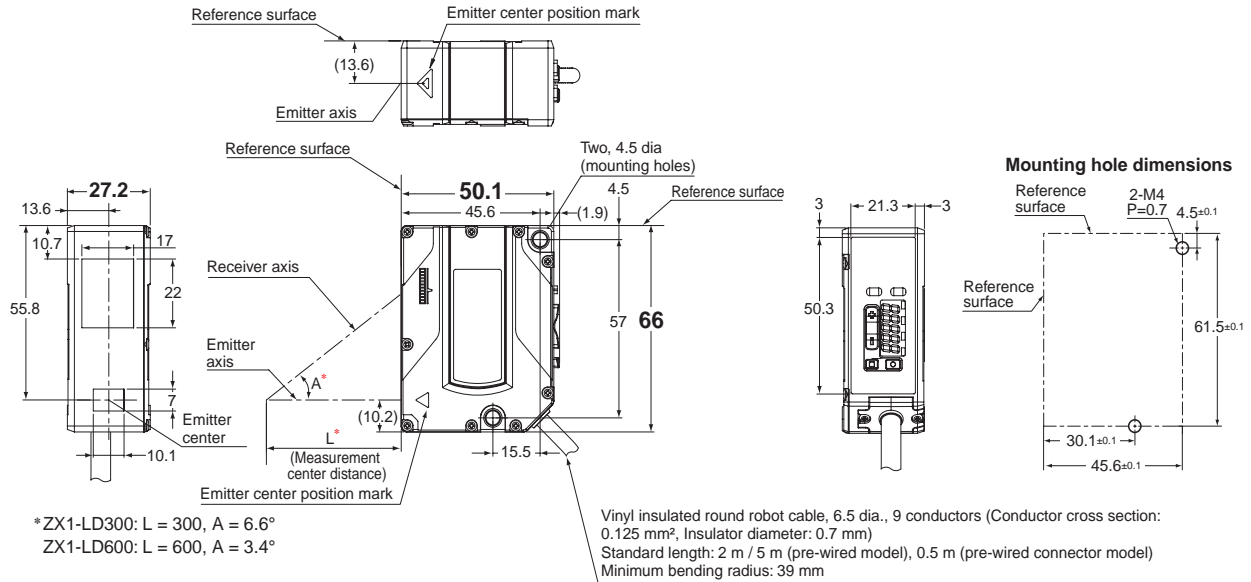


Pre-wired Models

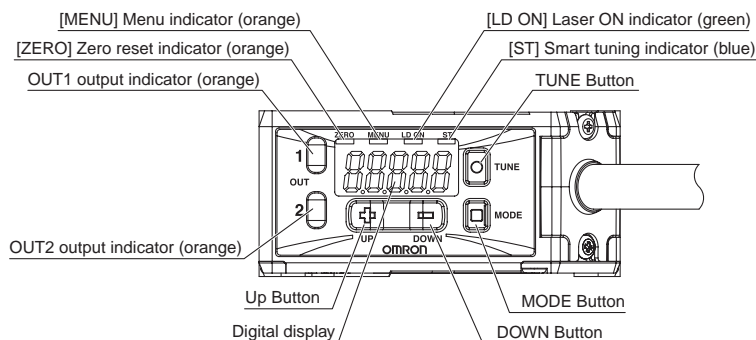
- ZX1-LD300A61(L)
- ZX1-LD300A81(L)
- ZX1-LD600A61(L)
- ZX1-LD600A81(L)

Pre-wired Connector Models

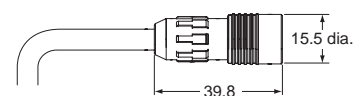
- ZX1-LD300A66
- ZX1-LD300A86
- ZX1-LD600A66
- ZX1-LD600A86



Display, Indicators, and Controls



Pre-wired connector

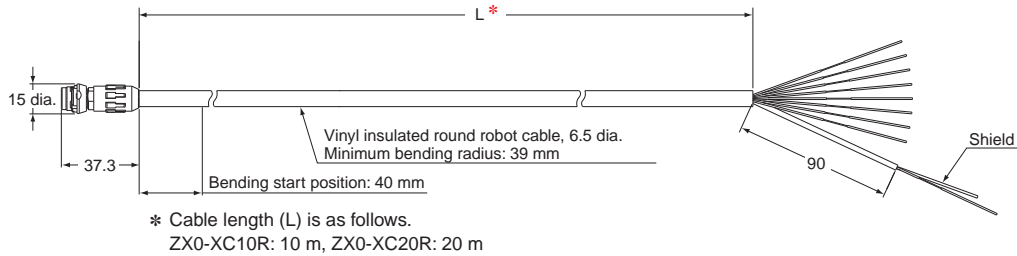


## Accessories (sold separately)

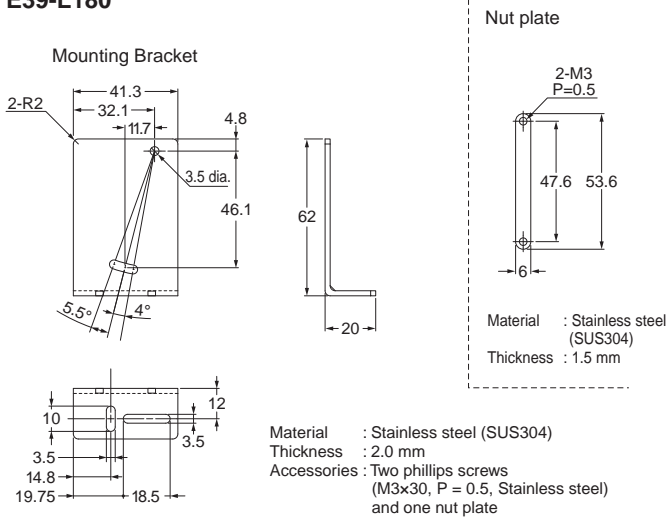
### Extension Cables for Pre-wired Connector Models

ZX0-XC10R (10 m)

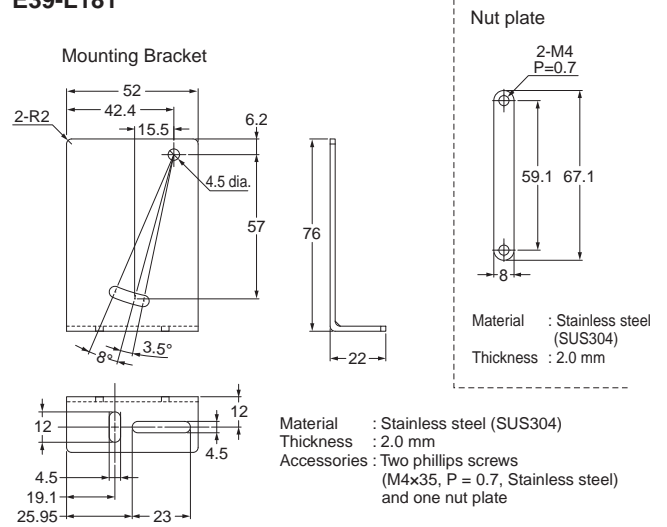
ZX0-XC20R (20 m)



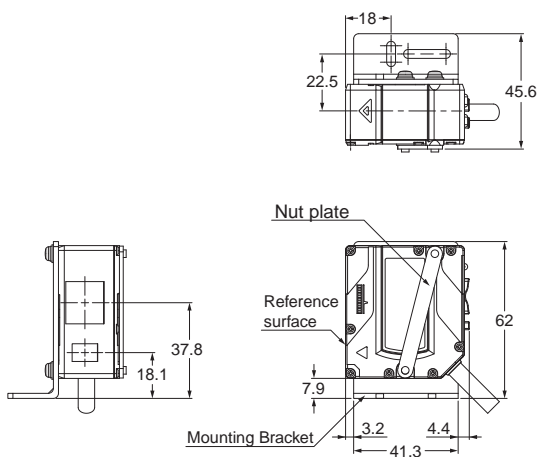
### Mounting Bracket for ZX1-LD50□/ZX1-LD100□ E39-L180



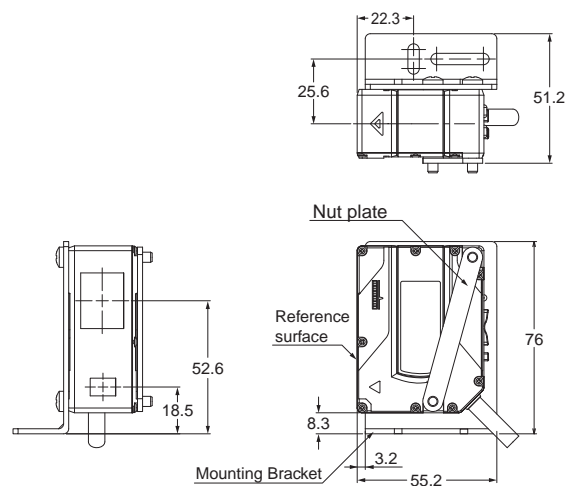
### Mounting Bracket for ZX1-LD300□/ZX1-LD600□ E39-L181



### Installation Method (ZX1-LD50□/ZX1-LD100□) Using E39-L180 Mounting Bracket



### Installation Method (ZX1-LD300□/ZX1-LD600□) Using E39-L181 Mounting Bracket



**READ AND UNDERSTAND THIS DOCUMENT**

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**LIMITATIONS OF LIABILITY**

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

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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.

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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, amusement 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**

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**DIMENSIONS AND WEIGHTS**

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To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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