Smart Sensors

ZX Series

The Continuing Evolution of Smart Sensors
Presenting a New Laser-type ZX-LDA-N Amplifier Unit

Smart Style!

realizing
Smart Style... from OMRON

I am a Smart Sensor!!

What's Smart?

A host of remarkable functions inside a compact body. OMRON combined these with an Amplifier display and easy operation to take Sensor detection to a whole new level. OMRON’s sensing platform meets a wide range of diverse applications by offering a broad selection of heads employing different detection methods.

What's Style?

Top Priority Placed on Easy Operation
Advanced functions and performance plus easy operation. This is a major feature of the ZX Series. Experience operation that doesn’t get any easier.

A Full Complement of Practical Functions
Operating Setting with No Need for a Digital Panel Meter
By simply fitting a Calculating Unit between two Amplifiers, the processing results of two Sensors can be displayed on a single Amplifier. Setting parameters need to be input only on one Amplifier.

Comprehensive Teaching Functions
Position/2-point/Automatic
Three teaching functions rival the performance of photoelectric sensors.

Easy-to-see Resolution
The resolution of the desired workpiece can also be easily determined by detection. The resolution display clearly shows the margin available for the threshold setting, to allow accurate judgement of detectability.

What's the Platform?

The ZX-LD-N integrates internal data for the entire ZX Series. This was achieved through technological advancements that vastly improve data communications between Amplifiers and enable calculations between different Sensor Heads. Welcome to the ever-expanding Smart World of sensing.
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Patent Pending

Positioning/2-point/Automatic
Comprehensive Teaching Functions
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### Smart Sensors Application World

#### Height and Level Differences
- Inspecting PCB mold height
- Measuring rivet height
- Measuring electronic component dimensions
- Measuring clock assembly height
- Measuring electronic component dimensions

#### Positioning
- Inspecting ECCI insert height
- Checking the edges of transparent packing film
- Checking the edge of HDD chassis
- Measuring roller gap
- Checking drive belt thickness

#### Small Level Differences
- Measuring small component dimensions
- Measuring roller gap
- Counting copy machine staples and pins
- Counting containers
- Counting small component dimensions

#### Thickness
- Measuring Electronic Component Dimensions
- Measuring small component dimensions
- Measuring small component dimensions
- Measuring small component dimensions
- Measuring small component dimensions

#### Width and Level Differences
- Inspecting defective items
- Checking the flatness of brake pads
- Measuring engine part dimensions
- Measuring engine part dimensions
- Measuring engine part dimensions

#### Warp and Raised Items
- Inspecting the flatness of brake pads
- Measuring paper tube length
- Inspecting the flatness of brake pads
- Inspecting the flatness of brake pads
- Inspecting the flatness of brake pads

#### Flaness
- Measuring the flatness of brake pads
- Measuring the flatness of brake pads
- Measuring the flatness of brake pads
- Measuring the flatness of brake pads
- Measuring the flatness of brake pads

#### Counting
- Counting tea bags
- Counting envelopes
- Counting tea bags
- Counting tea bags
- Counting tea bags

### Applications
- Semiconductors and Electronic Components
- Packaging, Foods, Chemicals, and Sanitary Items
- Household Appliances and Office Automation
- Automobiles, Machine Tools, and Robots
- Automated Machinery, Inspection Equipment, and Others
New Sensor Proposals for IT Applications

Smart Monitor V3

PC Connection Takes Full Advantage of Sensor Performance
Use of the PC screen greatly enhances the panel display. Unlike conventional systems, the detection results from applications such as waveform monitoring and data logging can also be easily processed.

Flexible Quality Control
Data logging
The ability to log detection data and manage the system history enables efficient and effective quality control, and aids in determining necessary countermeasures. Also displays data in waveform during logging.

PC Software Specifications

**Monitoring Digital Values**
- Setting differential direct threshold values
- Teaching settings
- Waveform Monitoring
  - Waveform collection
  - Waveform observation
- Waveform saving and loading

**Data Logging**
- Compilation settings - Microsoft Excel compatible (See note 2.)
- Configurator Functions
  - Setting Amplifier functions
    - (actual measurement scaling, input scaling, etc.)
  - Saving and loading Amplifier setting conditions

Note 1: Smart Monitor V3 is compatible with the ZX-L-N, ZX-L, ZX-E, and ZX-T.
Note 2: Microsoft Excel is a registered trademark of the Microsoft Corporation.

### Note 3
OS: Windows 98 SE or 2000
CPUs: Core 2 duo 2 GHz or better
RAM: 512 MB or more
Available hard disk space: 50 MB or more
Display screen: 800 x 600 dots and 256 colors or more
Baud rate: 38400 bps or more

Note 4: Use an RS-232C crossover cable to connect to the computer.
If the computer does not have an RS-232C port, use a USB-Serial Conversion Cable (CS1W-CF31 made by OMRON).

### Contents

- **ZX-LDA-N Laser Sensors**
- **ZX-EDA Inductive Displacement Sensors**
- **ZX-TDA High-precision Contact Sensors**
- **Datasheet**
- **Datasheet**
- **Datasheet**
- **Common Precautions**
New Sensor Proposals for IT Applications

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List Display Simplifies Setup
Complicated settings can be easily made with only the Amplifier panel while referring to function menus. Settings can also be imported and exported as text data.

Waveform Monitoring
Easy waveform monitoring replaces the conventional oscilloscope. Drag & drop threshold setting and other easy-to-use functions further enhance operation.

Waveforms on up to 5 channels can be drawn with the new ZX-LDA-N.

High-speed waveforms can be obtained and displayed in one-shot operation.

PC Software Specifications
Monitoring Digital Values
- Setting differential direct threshold values
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Note 2: Microsoft Excel is a registered trademark of the Microsoft Corporation.
Note 3: System Requirements
  - OS: Windows 98 or XP
  - CPU: Intel Core 2 Duo 2.0 GHz or better
  - RAM: 512 MB or less
  - Available hard disk space: 1 GB or more
  - Display screen: 1024 x 768 dots and 256 color levels

Note 4: Use an RS-232C crossover cable to connect to the computer.
  - If the computer does not have an RS-232C port, use a USB-Serial Conversion Cable (CS1W-CF31 made by OMRON)
to **Smart Style!**

**ZX-LDA-N**

New Laser Sensors

**Easy as Smart Style!**

Advanced Functions Made Simple. That is the Essence of Smart Style.

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### The World's Smallest and Lightest

*As of October 1, 2001*

In addition to the obvious size difference, the ZX Series offers the world's lightest Sensors. Approximately the same size as a photoelectric sensor, the compact ZX Sensors contribute considerably to space-saving efforts on production sites. Naturally, response speed is also equivalent to that of a photoelectric sensor.

---

### Flexible Mounting Direction

Install a Side-view Attachment (sold separately) for additional installation possibilities.

---

### 8 Reflective Types and 3 Through-beam Types Available

Select the model according to the application. Use a spot beam to detect small items, or a line beam for ordinary workpieces. Measurement distance also ranges from 28 to 500 mm, enabling seamless coverage for various detection applications.

#### Spot form

**Two-spot Sensors**

- 75 µm: 1.8 mm
- 100 µm: 2 mm

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#### Distance range (resolution)

**Three ranges**

- (16 µm) 40 mm ± 10 mm
- (300 µm) 100 mm ± 40 mm
- (2 mm) 300 mm ± 200 mm

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### Light-intensity Mode: High-performance Laser Photoelectric Sensor

**Equipped with a Laser Lifetime Monitor**

Self-detection and Display of Laser Diode Lifetime

When laser diode deterioration is detected, a warning appears on the sub-digital display. Early detection enables timely, trouble-free replacement.

---

### Through-beam Sensors

**Light-receiving side**

- 1-mm-diа. spot
- 5-mm-wide screen beam

**Light-emitting side**

- 1-mm-diа. spot
- 5-mm-wide screen beam

---

### Through-beam Sensors

**Measurement-width mode**

**Light-receiving display/transmittance display**

---

### Light-receiving side

- 1-mm-diа. spot
- 5-mm-wide screen beam

---

**Measurement-width mode**

**Light-receiving display/transmittance display**

---

**NEW**

**ZX-LDA-N**

8 Reflective Types and 3 Through-beam Types Available

---

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---

**Light-intensity Mode**: High-performance Laser Photoelectric Sensor

**Class 2 visible light laser**

*For 4,096 sampling cycles*

**Class 1 visible light laser**

*For 64 sampling cycles*
**ZX-LDA-N**

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*High-speed sampling: 0.15 ms (response speed: 0.3 ms)*

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Advanced to Smart Style!

ZX-LDA-N
New Laser Type

Advanced Functions Respond to Evolving Needs

More User Friendly

Zero Reset Time Display
A reference value other than zero can be set as the zero reset value.

Present Value Display
The sub-digital display shows present values when the hold function is enabled. This makes it easy to check whether a measurement is within range.

Linear Output Correction
Various factors, such as conversion errors occurring with connected devices, may cause the output value displayed on the Amplifier to differ from the actual output from a voltmeter. Adjusting the Amplifier display while monitoring the actual output on a voltmeter can eliminate the difference between the two values.

Automatic Teaching
Maximum and minimum measurement values can be set as thresholds when automatic teaching is executed. It is useful for setting threshold values from actual measurements while the workpiece is moving.

Enhanced Hold Function
Average hold and delay hold functions were added to enable accurate assessment of changes and the desired measurement position.

Delay Hold/Average Hold
The delay hold function measures only signals within the desired sampling time after a specified time delay from the trigger. The newly added average hold function is especially useful for measuring large workpieces with uneven surfaces.

Previous Value Comparison Function
Gradual changes in measurements due to machine temperature changes or other factors can be ignored in certain situations, such as when detecting foreign matter around bearings. The previous value comparison function effectively detects any changes between previous and present values.

Multiple-point Measurements Computed Using 1 Point
The result computed for one point can be used as a basis for the output for every other point. This is especially useful for multiple-point measurements.

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ZX-LDA-N
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Ordering Information

### Sensors

#### Sensor Heads (Reflective)

<table>
<thead>
<tr>
<th>Optical system</th>
<th>Beam shape</th>
<th>Sensing distance</th>
<th>Resolution*</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse reflective</td>
<td>Spot beam</td>
<td>40±10 mm</td>
<td>2 µm</td>
<td>ZX-LD40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100±40 mm</td>
<td>16 µm</td>
<td>ZX-LD100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300±200 mm</td>
<td>300 µm</td>
<td>ZX-LD300</td>
</tr>
<tr>
<td>Line beam</td>
<td>Spot beam</td>
<td>40±10 mm</td>
<td>2 µm</td>
<td>ZX-LD40L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100±40 mm</td>
<td>16 µm</td>
<td>ZX-LD100L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300±200 mm</td>
<td>300 µm</td>
<td>ZX-LD300L</td>
</tr>
<tr>
<td>Regular reflective</td>
<td>Spot beam</td>
<td>30±2 mm</td>
<td>0.25 µm</td>
<td>ZX-LD30V</td>
</tr>
<tr>
<td></td>
<td>Line beam</td>
<td></td>
<td></td>
<td>ZX-LD30VL</td>
</tr>
</tbody>
</table>

* For an average count of 4,096.

#### Sensor Heads (Through-beam)

<table>
<thead>
<tr>
<th>Optical system</th>
<th>Measuring width</th>
<th>Sensing distance</th>
<th>Resolution*</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-beam</td>
<td>1-mm dia.</td>
<td>0 to 2000 mm</td>
<td>4 µm</td>
<td>ZX-LT001</td>
</tr>
<tr>
<td></td>
<td>5 mm</td>
<td>0 to 500 mm</td>
<td></td>
<td>ZX-LT005</td>
</tr>
<tr>
<td></td>
<td>10 mm</td>
<td></td>
<td></td>
<td>ZX-LT010</td>
</tr>
</tbody>
</table>

* For an average count of 64.

### Amplifier Units

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Power supply</th>
<th>Output type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DC</td>
<td>NPN</td>
<td>ZX-LDA11-N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PNP</td>
<td>ZX-LDA41-N</td>
</tr>
</tbody>
</table>

Note: Compatible connection with the Sensor Head.

### Accessories (Order Separately)

#### Calculating Unit

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ZX-CAL2</td>
</tr>
</tbody>
</table>

#### Side-view Attachments

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Applicable Sensor Head</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ZX-LT010</td>
<td>ZX-XF22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Cables with Connectors on Both Ends (for Extension)*1

<table>
<thead>
<tr>
<th>Cable length</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m</td>
<td>ZXR-XC1A</td>
<td>1</td>
</tr>
<tr>
<td>4 m</td>
<td>ZXR-XC4A</td>
<td></td>
</tr>
<tr>
<td>8 m</td>
<td>ZXR-XC8A</td>
<td></td>
</tr>
<tr>
<td>9 m *2</td>
<td>ZXR-XC9A</td>
<td></td>
</tr>
</tbody>
</table>

*1. ZXR-XCR robot cable type also available.
*2. For use only with Reflective Sensors.

---

### Smart Monitor Sensor Setup Tool for Personal Computer Connection

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Name</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ZXR-series Communications Interface Unit</td>
<td>ZXR-SF11</td>
</tr>
<tr>
<td></td>
<td>ZXR-series Communications Interface Unit + ZXR-series Sensor Setup Software Basic</td>
<td>ZXR-SFW11V3 *1, *2</td>
</tr>
<tr>
<td></td>
<td>ZXR-series Sensor Setup Software CD-ROM</td>
<td>ZXR-SW11EV3 *1</td>
</tr>
</tbody>
</table>

*1. The ZXR-SFW11V3 or ZXR-SW11V3 is required to use Smart Monitor with the ZXR-LDA11-N/41-N. Earlier versions cannot be used.
*2. The ZXR-SFW11EV3 SmartMonitor can be used only to set functions and monitor waveforms.
## Specifications

### Sensor Heads (Reflective)

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>ZX-LD40</th>
<th>ZX-LD100</th>
<th>ZX-LD300</th>
<th>ZX-LD30V</th>
<th>ZX-LD40L</th>
<th>ZX-LD100L</th>
<th>ZX-LD300L</th>
<th>ZX-LD30VL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optical system</strong></td>
<td></td>
<td>Diffuse reflective</td>
<td>Regular reflective</td>
<td>Diffuse reflective</td>
<td>Regular reflective</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Light source (wave length)</strong></td>
<td></td>
<td>Visible-light semiconductor laser with a wavelength of 650 nm and an output of 1 mW max.; class 2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Measurement point</strong></td>
<td></td>
<td>10 mm</td>
<td>30 mm</td>
<td>30 mm</td>
<td>30 mm</td>
<td>40 mm</td>
<td>100 mm</td>
<td>30 mm</td>
<td>30 mm</td>
</tr>
<tr>
<td><strong>Measurement range</strong></td>
<td></td>
<td>±10 mm</td>
<td>±40 mm</td>
<td>±200 mm</td>
<td>±2 mm</td>
<td>±10 mm</td>
<td>±40 mm</td>
<td>±200 mm</td>
<td>±2 mm</td>
</tr>
<tr>
<td><strong>Beam shape</strong></td>
<td></td>
<td>Spot</td>
<td>Line</td>
<td>Line</td>
<td>Line</td>
<td>Line</td>
<td>Line</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td><strong>Beam size</strong></td>
<td></td>
<td>50-μm dia.</td>
<td>100-μm dia.</td>
<td>300-μm dia.</td>
<td>75-μm dia.</td>
<td>75 μm x 2 mm</td>
<td>150 μm x 2 mm</td>
<td>450 μm x 2 mm</td>
<td>100 μm x 1.8 mm</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td></td>
<td>2 μm</td>
<td>16 μm</td>
<td>300 μm</td>
<td>0.25 μm</td>
<td>2 μm</td>
<td>16 μm</td>
<td>300 μm</td>
<td>0.25 μm</td>
</tr>
<tr>
<td><strong>Linearity</strong></td>
<td></td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (entire range)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature characteristic</strong></td>
<td></td>
<td>±0.03% FS/°C (Except for ZX-LD300 and ZX-LD300L, which are ±0.1% FS/°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient illumination</strong></td>
<td></td>
<td>Incandescent lamp: 3,000 lx max. (on light receiving side)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td></td>
<td>Operating: 0 to 50°C, Storage: −15 to 60°C (with no icing or condensation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient humidity</strong></td>
<td></td>
<td>Operating and storing: 35% to 85% (with no condensation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Insulation resistance</strong></td>
<td></td>
<td>20 MΩ min. at 500 VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dielectric strength</strong></td>
<td></td>
<td>1,000 VAC, 50/60 Hz for 1 min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration resistance</strong></td>
<td></td>
<td>10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shock resistance</strong></td>
<td></td>
<td>300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree of protection</strong></td>
<td></td>
<td>IEC60529, IP50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connection method</strong></td>
<td></td>
<td>Connector relay (standard cable length: 500 mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight (packed state)</strong></td>
<td></td>
<td>Approx. 150 g</td>
<td>Approx. 250 g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td>Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td></td>
<td>Instruction sheet, Laser warning label (English)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Beam size: The beam size is defined by 1/e² (13.5%) of the strength of the beam at the beam center (measured value). Incorrect detection may occur if there is light leakage outside the defined spot and the material around the sensing object is more reflective than the sensing object.
2. Resolution: The resolution is the deviation (±3σ) in the linear output when connected to the ZX-LDA Amplifier Unit. (The resolution is measured with the standard reference object (white ceramic), at the measurement point with the ZX-LDA set for an average count of 4,096 per period.) The resolution is given at the repeat accuracy for a stationary workpiece, and is not an indication of the distance accuracy. The resolution may be adversely affected under strong electromagnetic fields.
3. Linearity: Linearity is given as the error in an ideal straight line displacement output when measuring the standard reference object. The linearity and measurement values vary with the object being measured.
4. Temperature characteristic: The temperature characteristic is measured at the measurement point with the Sensor and reference object (OMRON's standard reference object) secured with an aluminum jig.

Note: Highly reflective objects can result in incorrect detection by causing out-of-range measurements.

### Sensor Heads (Through-beam)

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>ZX-LT001</th>
<th>ZX-LT005</th>
<th>ZX-LT010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optical system</strong></td>
<td></td>
<td>Thruough-beam</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Light source (wave length)</strong></td>
<td></td>
<td>Visible-light semiconductor laser with a wavelength of 650 nm; JIS class 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum output</strong></td>
<td></td>
<td>0.2 mW max.</td>
<td>0.35 mW max.</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement width</strong></td>
<td></td>
<td>1-mm dia.</td>
<td>1- to 2.5-mm dia.</td>
<td>5 mm</td>
</tr>
<tr>
<td><strong>Measurement distance</strong></td>
<td></td>
<td>0 to 500 mm</td>
<td>0 to 2,000 mm</td>
<td>0 to 500 mm</td>
</tr>
<tr>
<td><strong>Minimum sensing object</strong></td>
<td></td>
<td>8-μm dia. (opaque)</td>
<td>8- to 50-μm dia. (opaque)</td>
<td>0.05-mm dia. (opaque)</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td></td>
<td>4 μm *2</td>
<td>—</td>
<td>4 μm *3</td>
</tr>
<tr>
<td><strong>Temperature characteristic</strong></td>
<td></td>
<td>0.2% FS/°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient illumination</strong></td>
<td></td>
<td>Incandescent lamp: 10,000 lx max. (on light-receiving side)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td></td>
<td>Operating: 0 to 50°C, Storage: −25 to 70°C (with no icing or condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree of protection</strong></td>
<td></td>
<td>IEC60529, IP40</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Connection method</strong></td>
<td></td>
<td>Connector relay (standard cable length: 500 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight (packed state)</strong></td>
<td></td>
<td>Approx. 220 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cable length</strong></td>
<td></td>
<td>Extendable up to 10 m with special extension cable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td>Case: Polyetherimide, Case cover: Polycarbonate, Unit cover: Glass</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tightening torque</strong></td>
<td></td>
<td>0.3 N m max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td></td>
<td>Optical axis adjustment seal, sensor head-amplifier connection cable (1.5 m), instruction sheet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1. This value is obtained by converting the deviation (±3σ) in the linear output that results when the sensor head is connected to the amplifier unit, into the measurement width.
*2. For an average count of 64. The value is 5 μm for an average count of 32.
*3. This is the value that results when a minimum sensing object blocks the light near the center of the 1-mm measurement width.
*4. For an average count of 64. The value is 5 μm for an average count of 32.
### Amplifier Units

<table>
<thead>
<tr>
<th>Item</th>
<th>ZX-LDA11-N</th>
<th>ZK-LDA41-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement period</td>
<td>150 µs</td>
<td></td>
</tr>
<tr>
<td>Possible average count settings*1</td>
<td>1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic</td>
<td>When connected to a Reflective Sensor Head: 0.07% FSO/°C. When connected to a Through-beam Sensor Head: 0.1% FSO/°C</td>
<td></td>
</tr>
<tr>
<td>Linear output*2</td>
<td>4 to 20 mA/FS, Max. load resistance: 300 Ω, ±4 V (±5 V, 1 to 5 V), Output impedance: 100 Ω</td>
<td></td>
</tr>
<tr>
<td>Judgement outputs (3 outputs: HIGH/PASS/LOW)*1</td>
<td>NPN open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 1.2 V max. PNP open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 2 V max.</td>
<td></td>
</tr>
<tr>
<td>Laser OFF input, zero reset input, timing input, reset input</td>
<td>ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.) OFF: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)</td>
<td></td>
</tr>
<tr>
<td>Functions</td>
<td>Measurement value display, value display (two resolutions: display-scaling, display-reverse, display OFF mode, ECO mode, number of display dig changes, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, intensity mode, zero reset, initial reset, ON-delay timer, OFF-delay timer, one-shot timer, deviation, previous value comparison, sensitivity adjustment, keep/clamp switch, direct threshold value setting, position teaching, 2-point teaching, automatic teaching, hysteresis width setting, timing inputs, reset input, monitor focus, (A-B) calculations<em>2, (A+B) calculations</em>3, mutual interference*4, laser deterioration detection, zero reset memory, key lock</td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td>Operation indicators: High (orange), pass (green), low (yellow), 7-segment main display (red), 7-segment subdisplay (yellow), laser ON (green), zero reset (green), enable (green)</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC ±10%, Ripple (p-p): 10% max.</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>140 mA max. with power supply voltage of 24 VDC (with Sensor connected)</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: 0 to 50°C, Storage: −15 to 60°C (with no icing or condensation)</td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. at 500 VDC</td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC, 50/60 Hz for 1 min</td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions</td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)</td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Prewired (standard cable length: 2 m)</td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 350 g</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Polycarbonate</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction sheet</td>
<td></td>
</tr>
</tbody>
</table>

*1. The response speed of the linear output is calculated as the measurement period × (average count setting + 1) (with fixed sensitivity).

*2. The response speed of the judgement outputs is calculated as the measurement period × (average count setting + 1) (with fixed sensitivity).

*3. Setting is possible via the monitor focus function.

*4. A Calculating Unit (ZX-CAL2) is required.

**Note:** For operating details, refer to the operation manual (Cat. No. Z157).

### Calculating Unit

<table>
<thead>
<tr>
<th>Item</th>
<th>ZK-CAL2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Amplifier Units</td>
<td>ZX-LDA11-N/41-N, ZX-EADA11/41, ZX-TDA11/41</td>
</tr>
<tr>
<td>Current consumption</td>
<td>12 mA max. (supplied from the Smart Sensor Amplifier Unit)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: 0 to 50°C, Storage: −15 to 60°C (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
</tr>
<tr>
<td>Connection method</td>
<td>Connector</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC, 50/60 Hz for 1 min</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>100 MΩ (at 500 VDC)</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)</td>
</tr>
<tr>
<td>Materials</td>
<td>Display: Acrylic, Case: ABS resin</td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 35 g</td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction sheet</td>
</tr>
</tbody>
</table>

### ZX-series Communications Interface Unit

<table>
<thead>
<tr>
<th>Item</th>
<th>ZK-SF11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption</td>
<td>60 mA max. (supplied by the Amplifier Unit)</td>
</tr>
<tr>
<td>Applicable Amplifier Units</td>
<td>ZX Series</td>
</tr>
<tr>
<td>Applicable Amplifier Unit versions</td>
<td>ZX-LDA11-N Ver. 1.000 or higher</td>
</tr>
<tr>
<td>Max. No. of Amplifier Units</td>
<td>5</td>
</tr>
<tr>
<td>Communications functions</td>
<td>RS-232C port (9-pin D-Sub Connector)</td>
</tr>
<tr>
<td>Communications protocol</td>
<td>CompoWay®</td>
</tr>
<tr>
<td>Baud rate</td>
<td>38,400 bps</td>
</tr>
<tr>
<td>Data configuration</td>
<td>Data bits: 8, Parity: none, Start bits: 1, Stop bits: 1, Flow control: none</td>
</tr>
<tr>
<td>Indicators</td>
<td>Power supply: green, Sensor communications: green, Sensor communications error: red, External terminal communications: green, External terminal communications error: red, Protective circuits: Reverse polarity protection</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: 0 to 50°C, Storage: −15 to 60°C (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. (at 500 VDC)</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC, 50/60 Hz for 1 min, Leakage current: 10 mA max.</td>
</tr>
<tr>
<td>Materials</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Polycarbonate</td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction sheet, 2 clamps</td>
</tr>
</tbody>
</table>

* Contact your OMRON representative for CompoWay® communications specifications.
Dimensions (Unit: mm)

■ Sensor Heads (Diffuse Reflective)

ZX-LD40
ZX-LD100
ZX-LD300
ZX-LD40L
ZX-LD100L
ZX-LD300L

■ Sensor Heads (Regular Reflective)

ZX-LD30V
ZX-LD30VL
Sensor Heads (Through-beam)

**ZX-LT001**
**ZX-LT005**

<table>
<thead>
<tr>
<th>Emitter side</th>
<th>Receiver side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl-insulated round cable (gray), 2.6 dia., Standard: 500 mm</td>
<td>Vinyl-insulated round cable (black), 2.6 dia., Standard: 500 mm</td>
</tr>
<tr>
<td>Connector</td>
<td>Connector</td>
</tr>
<tr>
<td>Laser ON indicator</td>
<td>Light axis center</td>
</tr>
<tr>
<td>Light axis center</td>
<td>Light axis center</td>
</tr>
<tr>
<td>Two, 3.2 dia.</td>
<td>Two, 3.2 dia.</td>
</tr>
<tr>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td>16</td>
<td>2.8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

Mounting Holes
- Two, M3 holes
- Emitter side: 34 x 16
- Receiver side: 19 x 2.8

**ZX-LT010**

<table>
<thead>
<tr>
<th>Emitter side</th>
<th>Receiver side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl-insulated round cable (gray), 2.6 dia., Standard: 500 mm</td>
<td>Vinyl-insulated round cable (black), 2.6 dia., Standard: 500 mm</td>
</tr>
<tr>
<td>Connector</td>
<td>Connector</td>
</tr>
<tr>
<td>Laser ON indicator</td>
<td>Light axis center</td>
</tr>
<tr>
<td>Light axis center</td>
<td>Light axis center</td>
</tr>
<tr>
<td>Two, 3.2 dia.</td>
<td>Two, 3.2 dia.</td>
</tr>
<tr>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>42</td>
<td>10</td>
</tr>
<tr>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

Mounting Holes
- Two, M3 holes
- Emitter side: 14 x 14
- Receiver side: 14 x 14

**Amplifier Units**

**ZX-LDA11-N**
**ZX-LDA41-N**

<table>
<thead>
<tr>
<th>Emitter side</th>
<th>Receiver side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl-insulated round cable, 5.1 dia., Standard: 150 mm</td>
<td>Vinyl-insulated round cable, 5.2 dia. (conductor cross-section: 0.09 mm², 10-conductor insulator diameter: 0.7 mm), Standard: 2 m</td>
</tr>
<tr>
<td>Connector</td>
<td>Connector</td>
</tr>
<tr>
<td>Current/voltage output selector switch (set to voltage output when shipped)</td>
<td>Voltage output</td>
</tr>
<tr>
<td>11.7</td>
<td>11.7</td>
</tr>
<tr>
<td>29</td>
<td>31.5</td>
</tr>
<tr>
<td>15.8</td>
<td>15.5</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>1,500</td>
<td>1,500</td>
</tr>
</tbody>
</table>

**ZX Series (ZX-L-N) Smart Sensors**
**Accessories (Order Separately)**

**Calculating Unit**
ZX-CAL2

**Side-view Attachments**
ZX-XF12
ZX-XF22

**Cables with Connectors on Both Ends (for Extension)**
ZX-XC1A (1 m)
ZX-XC4A (4 m)
ZX-XC8A (8 m)
ZX-XC9A (9 m)*1

*1 For use only with the ZX-L.

*2 ZX-XC1A: 1,000
ZX-XC4A: 4,000
ZX-XC8A: 8,000
ZX-XC9A: 9,000

---

**ZX-series Communications Interface Unit**
ZX-SF11

---

**ZX Series (ZX-L-N) Smart Sensors** 17
Wide Selection of Sensor Heads
Smallest Heads in Its Class at 3 Dia.
Small Sensor Heads are perfect for detecting the height of small objects and for applications where multiple Sensor Heads are used.

New Flat and Heat-resistive Sensors Broaden Application Possibilities
The temperature characteristic ranks at the top in the industry at 0.1 % F/S/°C for heat-resistive sensors, and it ranges up to 200 °C for flat sensors.

More Efficient Maintenance
Complete Compatibility between Sensor Heads and Amplifier Units
The Amplifier Unit can be used as is when replacing damaged Sensor Heads or changing the Sensor Head for different detection distances.

Sensor Head Cords Extendable to 10 m
The distance between the Amplifier Units the Sensor Heads can be extended to 3 m, 6 m, or 10 m using a ZX-XC-1A Cable (sold separately).
**ZX to Smart Style!**

**ZX-EDA** Inductive Displacement Sensors

**Variation for Smart Style!**
Inductive Displacement Sensors for Even More Applications

---

**Wide Selection of Sensor Heads**
Smallest Heads in Its Class at 3 Dia.
Small Sensor Heads are perfect for detecting the height of small objects and for applications where multiple Sensor Heads are used.

![Sensor Heads Image]

- **New Flat and Heat-resistant Sensors Broaden Application Possibilities**
  The temperature characteristic ranks at the top in the industry at 0.1% FS/°C for heat-resistant sensors, and it ranges up to 200°C for flat sensors.

- **More Efficient Maintenance**
  Complete Compatibility between Sensor Heads and Amplifier Units
  The Amplifier Unit can be used as is when replacing damaged Sensor Heads or changing the Sensor Head for different detection distances.

- **Sensor Head Cords Extendable to 10 m**
  The distance between the Amplifier Units the Sensor Heads can be extended to 3 m, 6 m, or 10 m using a ZX-XC/3A Cable (sold separately).

---

**Complete Range of Useful Functions**

- **Simple Linearity Adjustment**
  Adjustments using the adjustment knob are no longer required to adjust linearity.
  Linearity adjustment is completed simply by teaching at 0%, 50%, and 100% of the measurement distance, greatly reducing setting time.

- **Suitable for Non-ferrous Metals Also**
  Linearity is worse for non-ferrous than ferrous sensing objects.
  A material selection function has been developed to improve linearity with stainless steel and aluminum sensing objects.

- **Mutual Interference Prevented for Up to 5 Sensors**
  Multiple Sensors may be used in confined spaces for level difference measurements or multiple-point measurements. Mutual interference between up to 5 Sensors can be prevented simply by connecting Calculating Units to eliminate the need for timing signals on the user side.

- **Calculation Settings without Digital Panel Data**
  The calculation results from two Sensors can be displayed on the Amplifier for one Sensor simply by placing a Calculating Unit between the Amplifier Units. The required parameters need to be input only into one Amplifier Unit.

---

**ZX-EDA** Inductive Displacement Sensors

---

**Patent Pending**
Ordering Information

■ Sensors

Sensor Heads

<table>
<thead>
<tr>
<th>Shape</th>
<th>Dimensions</th>
<th>Sensing distance</th>
<th>Resolution *1</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylindrical</td>
<td>3 dia. x 18 mm</td>
<td>0.5 mm</td>
<td>1 μm</td>
<td>ZX-EDR5T</td>
</tr>
<tr>
<td></td>
<td>5.4 dia. x 18 mm</td>
<td>1 mm</td>
<td></td>
<td>ZX-ED01T *2</td>
</tr>
<tr>
<td></td>
<td>8 dia. x 22 mm</td>
<td>2 mm</td>
<td></td>
<td>ZX-ED02T *2</td>
</tr>
<tr>
<td>Screw-shaped</td>
<td>M10 x 22 mm</td>
<td></td>
<td></td>
<td>ZX-EM02T *2</td>
</tr>
<tr>
<td></td>
<td>M18 x 46.3 mm</td>
<td>7 mm</td>
<td></td>
<td>ZX-EM07MT *2</td>
</tr>
<tr>
<td>Flat</td>
<td>30 x 14 x 4.8 mm</td>
<td>4 mm</td>
<td></td>
<td>ZX-EV04T *2 *3</td>
</tr>
<tr>
<td>Heat-resistant, cylindrical</td>
<td>M12 x 22 mm</td>
<td>2 mm</td>
<td></td>
<td>ZX-EM02HT *4</td>
</tr>
</tbody>
</table>

*1. For an average count of 4096.
*2. Models with Protective Spiral Tubes are also available. Add a suffix of "-S" to the above model numbers when ordering.
  (Example: ZX-ED01-S)
*3. Be sure to use ZX-EDA Amplifier Unit version 1,200 or later with the ZX-EV04T.
*4. Be sure to use ZX-EDA Amplifier Unit version 1,300 or later with the ZX-EM02HT.

Amplifier Units

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Power supply</th>
<th>Output type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>NPN</td>
<td></td>
<td>ZX-EDA11</td>
</tr>
<tr>
<td>PNP</td>
<td></td>
<td></td>
<td>ZX-EDA41</td>
</tr>
</tbody>
</table>

Note: Compatible connection with the Sensor Head.

Accessories (Order Separately)

Amplifier Mounting Brackets

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZX-XBE1</td>
<td></td>
<td>Attached to each Sensor Head</td>
</tr>
<tr>
<td>ZX-XBE2</td>
<td></td>
<td>For DIN track mounting</td>
</tr>
</tbody>
</table>

ZX-CAL2 Calculating Unit
Refer to pages 12 and 14 for details.

ZX-SF11 ZX-series Communications Interface Unit
Refer to pages 12 and 14 for details.

ZX-XCA Cable with Connectors on Both Ends (for Extension)
Refer to page 12 for details.

ZX-SW11V3 Smart Monitor Sensor Setup Tool for Personal Computer Connection
Refer to page 12 for details.
Specifications

■ Sensor Heads

<table>
<thead>
<tr>
<th>Model</th>
<th>ZX-EDR5T</th>
<th>ZX-ED01T</th>
<th>ZX-ED02T/EM02T</th>
<th>ZX-EM07MT</th>
<th>ZX-EV04T</th>
<th>ZX-EM02HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>0 to 0.5 mm</td>
<td>0 to 1 mm</td>
<td>0 to 2 mm</td>
<td>0 to 2 mm</td>
<td>0 to 4 mm</td>
<td>0 to 2 mm</td>
</tr>
<tr>
<td>Sensing object</td>
<td>Magnetic metals (Measurement ranges and lineairties are different for non-magnetic metals.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard reference object</td>
<td>18 x 18 x 3 mm</td>
<td>30 x 30 x 3 mm</td>
<td>60 x 60 x 3 mm</td>
<td>45 x 45 x 3 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution *1</td>
<td>1 µm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity *2</td>
<td>±0.5% F.S.</td>
<td>±1.0% F.S. *5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear output range</td>
<td>Same as measurement range.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic *3 (including Amplifier Unit)</td>
<td>0.15% F.S./°C</td>
<td>0.07% F.S./°C</td>
<td>0.1% F.S./°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating *4</td>
<td>Storage *4</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td>−10 to 50°C (with no icing or condensation)</td>
<td>−20 to 70°C (with no icing or condensation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−10 to 200°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−10 to 200°C</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>50 MΩ min. (at 500 DC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC, 50/60 Hz for 1 min between charged parts and case</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 55 Hz with 1.5-mm double amplitude for 2 h each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>500 m/s², 3 times each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection (Sensor Head)</td>
<td>IEC60529, IP65</td>
<td>IEC60529, IP67</td>
<td>IEC60529, IP60 *6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Connector relay (standard cable length: 2 m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 120 g</td>
<td>Approx. 140 g</td>
<td>Approx. 160 g</td>
<td>Approx. 130 g</td>
<td>Approx. 160 g</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Sensor Head</td>
<td>Brass</td>
<td>Stainless steel</td>
<td>Brass</td>
<td>Zinc (nickel-plated)</td>
<td>Brass</td>
</tr>
<tr>
<td></td>
<td>Case</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sensing surface</td>
<td>Heat-resistant ABS</td>
<td></td>
<td></td>
<td>PEEK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preamplifier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Amplifier Mounting Brackets (ZX-XBE1), Instruction Manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1. Resolution: The resolution is the deviation (±3 s) in the linear output when connected to the ZX-EDA Amplifier Unit. The above values indicate the deviations observed 30 minutes after the power is turned ON. (The resolution is measured with OMRON's standard reference object at 1/2 of the measurement range with the ZX-EDA set for the maximum average count of 4096.) The resolution is given at the repeat accuracy for a stationary workpiece, and is not an indication of the distance accuracy. The resolution may be adversely affected under strong electromagnetic fields.

*2. Linearity: The linearity is given as the error in an ideal straight line displacement output when measuring the standard reference object. The linearity and measurement values vary with the object being measured.

*3. Temperature characteristic: The temperature characteristic is measured with OMRON's standard reference object at 1/2 of the measurement range.

*4. The ambient temperature given is only for the sensor head. It is −10 to 60°C for the preamp.

*5. The value given is for an ambient temperature of 25°C.

*6. Do not use in moist environments because the case is not waterproof.

ZX Series (ZX-E) Smart Sensors (Inductive Displacement Type) 21
### Amplifier Units

<table>
<thead>
<tr>
<th>Model</th>
<th>ZX-EDA11</th>
<th>ZX-EDA41</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measurement period</strong></td>
<td>150 µs</td>
<td></td>
</tr>
<tr>
<td><strong>Possible average count settings</strong> *1</td>
<td>1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096</td>
<td></td>
</tr>
<tr>
<td><strong>Linear output</strong> *2</td>
<td>Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω</td>
<td>Voltage output: ±4 V (± 5 V, 1 to 5 V *3), Output impedance: 100 Ω</td>
</tr>
<tr>
<td><strong>Judgement outputs</strong> (3 outputs: HIGH/PASS/LOW)</td>
<td>NPN open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 1.2 V max.</td>
<td>PNP open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 2 V max.</td>
</tr>
<tr>
<td><strong>Zero reset input, timing input, reset input, judgement output hold input</strong></td>
<td>ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)</td>
<td>ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>- Measurement value display - Present value/set value/output value/resolution display - Linearity adjustment (materials selection) - Display reverse - Number of display digit changes - Bottom hold, peak-to-peak hold - Average hold - Initial reset - OFF-delay timer - Non-measurement setting - Automatic teaching - Reset input - Linear output correction - K−(A+B) calculation *4 - Sensor disconnection detection - Key lock - Present value/set value/output value/resolution display - Linearity adjustment (materials selection) - Display reverse - Number of display digit changes - Bottom hold, peak-to-peak hold - Average hold - Initial reset - OFF-delay timer - Non-measurement setting - Automatic teaching - Reset input - Linear output correction - K−(A+B) calculation *4 - Sensor disconnection detection - Key lock - Scaling - ECO mode - Peak hold - Self-bottom hold - Zero reset - ON-delay timer - Previous value comparison - Position teaching - Timing inputs - Monitor focus - (A+B) calculations *4 - Mutual interference prevention *4 - Zero reset indicator</td>
<td></td>
</tr>
<tr>
<td><strong>Indications</strong></td>
<td>Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-digital display (yellow), power ON (green), zero reset (green), enable (green)</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage influence (including Sensor)</strong></td>
<td>0.5% F.S. of linear output value at ±20% of power supply voltage</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply voltage</strong></td>
<td>12 to 24 VDC ±10%, Ripple (p-p): 10% max.</td>
<td></td>
</tr>
<tr>
<td><strong>Current consumption</strong></td>
<td>140 mA max. with power supply voltage of 24 VDC (with Sensor connected)</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>Operating and storage: 0 to 50°C (with no icing or condensation)</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient humidity</strong></td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td></td>
</tr>
<tr>
<td><strong>Insulation resistance</strong></td>
<td>20 MΩ min. (at 500 DC)</td>
<td></td>
</tr>
<tr>
<td><strong>Dielectric strength</strong></td>
<td>1,000 VAC, 50/60 Hz for 1 min</td>
<td></td>
</tr>
<tr>
<td><strong>Vibration resistance (destruction)</strong></td>
<td>10 to 150 Hz with 0.7-mm double amplitude for 80 min each in X, Y, and Z directions</td>
<td></td>
</tr>
<tr>
<td><strong>Shock resistance (destruction)</strong></td>
<td>300 m/s², 3 times each in 6 directions (up, down, left, right, forward, backward)</td>
<td></td>
</tr>
<tr>
<td><strong>Connection method</strong></td>
<td>Prewired (standard cable length: 2 m)</td>
<td></td>
</tr>
<tr>
<td><strong>Weight (packed state)</strong></td>
<td>Approx. 350 g</td>
<td></td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Case: PBT (polybutylene terephthalate), Cover: Polycarbonate</td>
<td></td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td>Instruction Manual</td>
<td></td>
</tr>
</tbody>
</table>

*1. The response speed of the linear output is calculated as the measurement period × (average count setting + 1).

*2. The output can be switched between a current output and voltage output using a switch on the bottom of the Amplifier Unit.

*3. A Calculating Unit (ZX-CAL2) is required. Setting is possible via the monitor focus function.

*4. A Calculating Unit (ZX-CAL2) is required.

**Note:** For operating details, refer to the operation manual (Cat. No. Z166).
Dimensions

Sensors

Sensor Heads

ZX-EDR5T

Dimensions with Mounting Bracket Attached

Mounting Hole Cutout Dimensions

Two, M3 holes

ZX-ED01T

Dimensions with Mounting Bracket Attached

Mounting Hole Cutout Dimensions

Two, M3 holes

ZX-ED02T

Dimensions with Mounting Bracket Attached

Mounting Hole Cutout Dimensions

Two, M3 holes

Vinyl-insulated coaxial round cable
1.7 dia., 1 conductor, standard length: 2 m

Vinyl-insulated round cable
5.1 dia., 9 conductors, standard length: 200 mm

Connector

(46)

(15 dia.)

(46)

(15 dia.)

Vinyl-insulated round cable
5.1 dia., 9 conductors, standard length: 200 mm

Connector

(46)

(15 dia.)

(46)

(15 dia.)
ZX-EM02T

Dimensions with Mounting Bracket Attached

Mounting Hole Cutout Dimensions

ZX-EM07MT

Dimensions with Mounting Bracket Attached

Mounting Hole Cutout Dimensions

ZX-EV04T

Dimensions with Mounting Bracket Attached

Mounting Hole Cutout Dimensions
Amplifier Units

**ZX-EDA11**
**ZX-EDA41**

**ZX Series (ZX-E) Smart Sensors (Inductive Displacement Type)**

---

**Dimensions with Mounting Bracket Attached**
- Fluorescent-insulated coaxial round cable
  - Dia.: 2.5 mm, single conductor
  - Standard length: 2 m

**Mounting Hole Cutout Dimensions**
- Two M3 holes

---

**ZX-EM02HT**

- 21 dia.
- (15.5)
- 15
- (22.5)
- 7.8

---

**Fluorescent-insulated coaxial round cable**
- Dia.: 2.5 mm, single conductor
- Standard length: 2 m

---

**Connectors**

**Fluorescent-insulated coaxial round cable**
- Dia.: 5.1 mm, 9 conductors
- Standard length: 200 mm

---

**Vinyl-insulated round cable**
- Dia.: 5.1 mm, standard length: 100 mm

---

**Vinyl-insulated round cable**
- Dia.: 5.2 mm, 10 conductors
  - (Conductor cross-section: 0.09 mm², insulator diameter: 0.7 mm)
  - Standard length: 2 m

---

**Current/Voltage switch**
(Factory-set to voltage output.)

---

**Voltage output**
**Accessories (Sold Separately)**

**Preamplifier Mounting Brackets**

**ZX-XBE1**

- Material: Stainless steel (SUS304)
- Mounting Hole Cutout Dimensions:
  - Two, M3 holes

**ZX-XBE2**

- Material: Stainless steel (SUS304)
- M3 × 8 pan-head screw (with M3 spring washer)

**ZX-CAL2 Calculating Unit**

Refer to page 17 for details.

**ZX-SF11 ZX-series Communications Interface Unit**

Refer to page 17 for details.

**ZX-XC1A (1 m), ZX-XC4A (4 m), ZX-XC8A (8 m) Cables with Connectors on Both Ends (for Extension)**

Refer to page 17 for details.
Complete Compatibility between Sensor Heads and Amplifier Units
The Amplifier Unit can be used as is when replacing damaged Sensor Heads or changing the Sensor Head for a different measurement distance.

Highest Level of Resolution in the Industry
The long-stroke ZX-TDS04 (4-mm measurement distance) achieves precise measurements with a maximum linearity of 0.3% FS and a resolution of 0.1 µm that ranks in the top class in the industry.

Thinnest Level of Sensor Head in the Industry
With some of the thinnest Sensor Heads in the industry at just 6 mm in diameter, these Sensors are ideal for use in confined spaces and for multiple-point measurements.

Highest Level of Detection Performance in the Industry
The long-stroke ZX-TDS04 (4-mm measurement distance) achieves precise measurements with a maximum linearity of 0.3% FS and a resolution of 0.1 µm that ranks in the top class in the industry.

Multiple-point Computing Function
Connect up to 8 Sensor Heads.
Data obtained from one Sensor can be added and subtracted from the data for up to 7 other Sensors.

Early Warning Detection Function
In non-measurement situations, this function detects whether the Sensor is in danger of being damaged by overpressing and outputs an alarm signal. A sequence can be added with devices such as PLCs to provide measures to avoid damage, such as stopping measurements when this occurs.

Warm-up Display
After the power is turned ON, the warm-up display indicates when the Sensor is ready to start measuring at optimum conditions (i.e. at the specified resolution).

Auto-scaling Function
The measurement distance can be displayed on the Amplifier simply by connecting the Sensor Head. The distance between the Amplifier Units and Sensor Heads can be extended to 3 m, 6 m, or 10 m using a ZX-XC@ Cable (sold separately).

Origin Alignment No Longer Required
The differential transformer system eliminates the need for master adjustment and origin alignment every time the system is started. It also eliminates the time-consuming step of returning to the origin when power is interrupted.

Built for Longer Life
The unique linear ball bearing structure ensures longer life. It has sliding parts that move smoothly and a rubber boot that keeps dust out. Short and Standard Sensors feature IP67 environmental resistance.
Complete Compatibility between Sensor Heads and Amplifier Units

The Amplifier Unit can be used as is when replacing damaged Sensor Heads or changing the Sensor Head for a different measurement distance.

Built for Longer Life

The unique linear ball bearing structure ensures longer life. It has sliding parts that move smoothly and a rubber boot that keeps dust out. Short and Standard Sensors feature IP67 environmental resistance.

Multiple-point Computing Function

Connect up to 8 Sensor Heads.

Data obtained from one Sensor can be added and subtracted from the data for up to 7 other Sensors.

Early Warning Detection Function

In non-measurement situations, this function detects whether the Sensor is in danger of being damaged by overpressing and outputs an alarm signal. A sequence can be added with devices such as PLCs to provide measures to avoid damage, such as stopping measurements when this occurs.

Warm-up Display

After the power is turned ON, the warm-up display indicates when the Sensor is ready to start measuring at optimum conditions (i.e. at the specified resolution).

Auto-scaling Function

The measurement distance can be displayed on the Amplifier simply by connecting the Sensor Head. The distance between the Amplifier Units and Sensor Heads can be extended to 3 m, 6 m, or 10 m using a ZX-XC@A Cable (sold separately).

Origin Alignment No Longer Required

The differential transformer system eliminates the need for master adjustment and origin alignment every time the system is started. It also eliminates the time-consuming step of returning to the origin when power is interrupted.
### Ordering Information

#### Sensors

**Sensor Heads**

<table>
<thead>
<tr>
<th>Size</th>
<th>Type</th>
<th>Sensing distance</th>
<th>Resolution (See note.)</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 dia.</td>
<td>Short type</td>
<td>1 mm</td>
<td>0.1 μm</td>
<td>ZX-TDS01T</td>
</tr>
<tr>
<td>6 dia.</td>
<td>Standard type</td>
<td>4 mm</td>
<td>0.1 μm</td>
<td>ZX-TDS04T</td>
</tr>
<tr>
<td>6 dia.</td>
<td>Low measurement type</td>
<td>4 mm</td>
<td>0.1 μm</td>
<td>ZX-TDS04T-L</td>
</tr>
</tbody>
</table>

**Note:** The resolution refers to the minimum value that can be read when a ZX-TDA1 Amplifier Unit is connected.

#### Amplifier Units

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Power supply</th>
<th>Output type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>NPN</td>
<td></td>
<td>ZX-TDA11</td>
</tr>
<tr>
<td></td>
<td>PNP</td>
<td></td>
<td>ZX-TDA41</td>
</tr>
</tbody>
</table>

#### Accessories (Order Separately)

**Preamplifier Mounting Brackets**

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ZX-XBT1</td>
<td>Attached to each Sensor Head</td>
</tr>
<tr>
<td></td>
<td>ZX-XBT2</td>
<td>For DIN track mounting</td>
</tr>
</tbody>
</table>

**ZX-CAL2 Calculating Unit**

Refer to pages 12 and 14 for details.

**ZX-SF11 ZX-series Communications Interface Unit**

Refer to pages 12 and 14 for details.

**ZX-XC[]A Cable with Connectors on Both Ends (for Extension)**

Refer to page 12 for details.

**ZX-SW11V3 Smart Monitor Sensor Setup Tool for Personal Computer Connection**

Refer to page 12 for details.
Specifications

### Sensor Heads

<table>
<thead>
<tr>
<th>Item</th>
<th>ZX-TDS01T</th>
<th>ZX-TDS04T</th>
<th>ZX-TDS04T-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>1 mm</td>
<td>4 mm</td>
<td></td>
</tr>
<tr>
<td>Maximum actuator travel distance</td>
<td>Approx. 1.5 mm</td>
<td>Approx. 5 mm</td>
<td></td>
</tr>
<tr>
<td>Resolution *1</td>
<td>0.1 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity *2</td>
<td>0.3% F.S.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating force *3</td>
<td>Approx. 0.7 N</td>
<td></td>
<td>Approx. 0.25 N</td>
</tr>
<tr>
<td>Degree of protection (Sensor Head)</td>
<td>IEC60529, IP67</td>
<td></td>
<td>IEC60529, IP54</td>
</tr>
<tr>
<td>Mechanical durability</td>
<td>10,000,000 operations min.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: 0°C to 50°C (with no icing or condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating and storage: 35% to 85% (with no icing or condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic *4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor Head</td>
<td>0.03% F.S./°C</td>
<td>0.01% F.S./°C</td>
<td></td>
</tr>
<tr>
<td>Preamplifier</td>
<td>0.01% F.S./°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 55 Hz with 0.35-mm single amplitude in the X, Y, and Z directions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>150 m/s², 3 times each in the X, Y, and Z directions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Connector relay (standard cable length: 2 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td>Isolated (Sensor Head enclosure and I/O lines)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 100 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor Head</td>
<td>Stainless steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber boot</td>
<td>Fluorocarbon rubber</td>
<td>Silicon rubber</td>
<td></td>
</tr>
<tr>
<td>Preamplifier</td>
<td>Polycarbonate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction manual, Preamplifier Mounting Brackets (ZX-XBT1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1. The resolution is given as the minimum value that can be read when a ZX-TDA Amplifier Unit is connected. This value is taken 15 minutes after turning ON the power with the average number of operations set to 256.

*2. The linearity is given as the error in an ideal straight line displacement output.

*3. These figures are representative values that apply for the measurement mid-point, and are for when the provided actuator is used, with the actuator moving downwards. If the actuator moves horizontally or upwards, the operating force will be reduced. Also, if an actuator other than the standard one is used, the operating force will vary with the weight of the actuator itself.

*4. These figures are representative values that apply for the mid-point of the measurement range.
## Amplifier Units

<table>
<thead>
<tr>
<th>Item</th>
<th>ZXTDA11</th>
<th>ZXTDA41</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement period</td>
<td>1 ms</td>
<td></td>
</tr>
<tr>
<td>Possible average count settings</td>
<td>1, 2, 4, 8, 16, 32, 64, 128, 256, 512, or 1,024</td>
<td></td>
</tr>
<tr>
<td>Linear output</td>
<td>Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω</td>
<td>Voltage output: ±4 V (±5 V, 1 to 5 V), Output impedance: 100 Ω</td>
</tr>
<tr>
<td>Judgement outputs (3 outputs: HIGH/PASS/LOW)</td>
<td>NPN open-collector outputs, 30 VDC, 30 mA max.</td>
<td>PNP open-collector outputs, 30 VDC, 30 mA max.</td>
</tr>
<tr>
<td>Zero reset input, timing input, reset input, judgement output hold input</td>
<td>ON: Short-circuited with 0-V terminal or 1.5 V or less</td>
<td>OFF: Supply voltage short-circuited or supply voltage of 1.5 V or less</td>
</tr>
<tr>
<td>Function</td>
<td>- Measurement value display</td>
<td>- Measurement value display</td>
</tr>
<tr>
<td></td>
<td>- Display reverse</td>
<td>- Present value/new value/output value display</td>
</tr>
<tr>
<td></td>
<td>- Sample hold</td>
<td>- ECD mode</td>
</tr>
<tr>
<td></td>
<td>- Self-peak hold</td>
<td>- Number of display digit changes</td>
</tr>
<tr>
<td></td>
<td>- Initial reset</td>
<td>- Bottom hold, peak-to-peak hold</td>
</tr>
<tr>
<td></td>
<td>- Hysteresis width setting</td>
<td>- Zero reset</td>
</tr>
<tr>
<td></td>
<td>- Judgement output hold input</td>
<td>- Position teaching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Timing inputs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reset input</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- (A+B) calculations *4</td>
</tr>
<tr>
<td>Indicators</td>
<td>- Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-display (yellow), power ON (green), zero reset (green), enable (green)</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC ±10%, Ripple (p-p): 10% max.</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>140 mA max. (with Sensor connected), For 24-VDC power supply: 140 mA max. (with Sensor connected)</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating and storage: 0 to 50°C (with no icing or condensation)</td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating and storage: 35% to 85% (with no icing or condensation)</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic</td>
<td>0.03% F.S./°C</td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. at 500 VDC</td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC, 50/60 Hz for 1 min</td>
<td></td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 150 Hz with 0.7-mm double amplitude for 80 min each in X, Y, and Z directions</td>
<td></td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>300 m/s², 3 times each in six directions (up, down, left, right, forward, backward)</td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Prewired (standard cable length: 2 m)</td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 350 g</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Polycarbonate</td>
<td></td>
</tr>
</tbody>
</table>

### Accessories
- Instruction sheet

---

## Options (Actuators)

### Models

**DSSN-**

- **TB1** Ball type (steel)  
  - Female screw M2.5 x 0.45  
  - Measuring ordinary flat surfaces (standard actuator supplied with the ZX-TDS Series)

- **TB2** Ball type (carbide steel)  
  - Female screw M2.5 x 0.45  
  - Measurements where abrasion resistance is critical  
  - Measured objects: Carbide (HR90) or lower.

- **TB3** Ball type (ruby)  
  - Female screw M2.5 x 0.45  
  - Measurements where abrasion resistance is critical  
  - Measured objects: Carbide (HR90) or higher.

- **TN1** Needle type (carbide steel)  
  - Male screw M2.5 x 0.45  
  - Measuring the bottom of grooves and holes

- **TF1** Flat (carbide steel)  
  - Male screw M2.5 x 0.45  
  - Measuring spherical objects

- **TA** Conversion Adapter (stainless steel)  
  - Through-hole female screw M2.5 x 0.45  
  - Mounting DSSN-TN1/TF1 or commercially available actuators on ZX-TDS-series Sensors

### Notes
- For optional Actuator combinations, the circle means the Actuator is replaceable and the triangle means that a Conversion Adapter is required.

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## Dimensions

**DSSN-TB1/TB2/TB3**

- Cross pattern m0.22-C0.2
- Carbide steel
- M2.5 x 0.45

**DSSN-TN1**

- Needle type (carbide steel)
- Male screw M2.5 x 0.45
- Measuring the bottom of grooves and holes

**DSSN-TF1**

- Ball type (carbide steel)
- Female screw M2.5 x 0.45
- Measuring ordinary flat surfaces

**DSSN-TA**

- Conversion Adapter (stainless steel)
- Through-hole female screw M2.5 x 0.45
- Mounting DSSN-TN1/TF1 or commercially available actuators on ZX-TDS-series Sensors

---

### ZX Series (ZX-1) Smart Sensors (High-precision Contact Type)
**Dimensions**

**Sensors**

**ZX-TDS01T**

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Diameter (mm)</th>
<th>Measurement Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR1.5</td>
<td>4.5</td>
<td>11.2 to 12.2 (TYP)</td>
</tr>
</tbody>
</table>

**ZX-TDS04T**

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Diameter (mm)</th>
<th>Measurement Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR1.5</td>
<td>4.5</td>
<td>14.9 to 18.9 (TYP)</td>
</tr>
</tbody>
</table>

**Mounting Hole Cutout Dimensions**

For **ZX-TDS01T**:
- **ZX-TDS04T**
- **ZX-TDS04T-L**

**Amplifier Units**

**ZX-TDA11**

- **ZX-TDA41**

---

**Notes**:
- Measurement ranges are provided in typical values (TYP).
- Cable specifications and current/voltage switch settings are also included.
■ Accessories (Order Separately)

Preamplifier Mounting Bracket (Supplied with Each Sensor)

ZXCAL2 Calculating Unit
Refer to page 17 for details.

ZX-SF11 ZX-series Communications Interface Unit
Refer to page 17 for details.

ZX-XC1A (1 m), ZX-XC4A (4 m), ZX-XC8A (8 m) Cables with Connectors on Both Ends (for Extension)
Refer to page 17 for details.
Precautions

■ Design Precautions
Conform to the specified ratings and performance. Refer to the Specifications for each product on the following pages.
ZX-L: Pages 13 and 14
ZX-E: Pages 21 and 22
ZX-T: Pages 31 and 32

Environment
Do not operate the product in locations subject to flammable or explosive gases.
In order to ensure safe operation and maintenance, do not install the product in the vicinity of high-voltage devices or power equipment.

Correct Use
This product consists of precision parts that may fail if it is dropped.

Design Precautions
Compatibility
Sensors and Amplifier Units are mutually compatible. Sensors can be added or replaced individually.

Influence of High-frequency Electromagnetic Fields
Using the product in the vicinity of devices that generate high-frequency electromagnetic fields, such as ultrasonic cleaning equipment, high-frequency generators, transceivers, mobile phones, and inverters, may result in malfunction.

Wiring

Wiring Check
After wiring is completed, before turning ON the power, confirm that the power supply is connected correctly, that there are no faulty connections, such as load short-circuits, and that the load current is correct. Incorrect wiring may result in failure.

Cable Extension
Do not extend the cable for the Sensor and the Amplifier Unit to a length exceeding 10 m. Use a ZX-XC...A Extension Cable (sold separately) to extend the Sensor's cable. Extend the Amplifier Unit's cable using a shielded cable of the same type.

Power Supply
When using a commercially available switching regulator, ground the FG (frame ground) terminal.
If the power supply line is subject to surges, connect a surge absorber that meets the conditions of the operating environment.

Calculating Unit
When using a Calculating Unit, connect the linear output ground of the corresponding Amplifier Unit.

Connectors
Do not connect or disconnect connectors while the power is ON.
Be sure hold to connectors by the cover when connecting or disconnecting.

Installation Location
Do not install the product in the following locations.
• Locations subject to temperatures outside the specified range
• Locations subject to condensation due to sudden temperature changes
• Locations subject to humidity levels outside range 35% to 85%
• Locations subject to corrosive or flammable gases
• Locations subject to dust, salts, or metallic powder.
• Locations directly subject to vibrations and shocks
• Locations subject to splashes of water, oil, or chemicals
• Locations subject to strong electromagnetic or electrical fields

Maintenance and Inspection
• Be sure to turn OFF the power supply before adjusting or removing the Sensor Head.
• Cleaning:
  Do not use thinners, benzine, acetone, or kerosene for cleaning.
...more!

This document provides information mainly for selecting suitable models. Please read the User's Manual carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

- The application examples provided in this catalog are for reference only. Check functions and safety of the equipment before use.
- Never use the products for any application requiring special safety requirements, such as nuclear energy control systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, or other 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 products are properly rated and installed for the intended use within the overall equipment or system.

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