Smart Sensors
ZX Series

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

Smart Style!
What's Smart?

A host of remarkable functions inside a compact body. OMRON combined these functions 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.

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.
<table>
<thead>
<tr>
<th>Height and Level Differences</th>
<th>Positioning</th>
<th>Size and Level Differences</th>
<th>Thickness</th>
</tr>
</thead>
</table>

**Smart Sensors Application World**

- **Inspecting**
  - PCB mold height
  - Ceramic types
  - Rubber positioning
  - Glue applied to bags
- **Measuring**
  - Electronic component dimensions
  - Shipping inspections on robot arms
  - Wafer mapping
  - CRTs for shadow mask insertion
  - Checking for doubled-up lead frames
  - Identifying the number of inner caps for sake bottle caps
  - Detecting pinholes in pudding
  - Checking the edge of transparent packing film
  - Detecting the indentation on glass bottles
  - Inspecting packing machine clamps
  - Inspecting cakes in trays for thickness and presence
  - Measuring clock assembly height
  - Inspecting the height of the core in cardboard
  - Inspecting the solder level in soldering tanks
  - Performing final inspections during watch assembly
  - Checking the thickness of flexible items
  - Measuring rivet height
  - Measuring small component dimensions
  - Inspecting the offset positioning of pressed workpieces
  - Checking welding point positions on ring gears
  - Inspecting bottom dead points on presses
  - Measuring engine part dimensions
  - Measuring roller gap
  - Checking dies for fit
  - Counting tea bags
  - Detecting raised caps
  - Checking cut positions on external walling material
  - Inspecting pressure indicator dials and pointer gaps
  - Counting envelops
  - Measuring warpage of HDD chassis
  - Counting copy machine staples and pins
  - Checking the flatness of HDD chassis
  - Measuring the spray from aerosol cans

- **Semiconductors and Electronic Components**
  - Packing, Foods, Chemicals, and Sanitary Items
  - Household Appliances and Office Automation
  - Automobiles, Machine Tools, and Robots
  - Automated Machinery, Inspection Equipment, and Others

- **Warp and Raised Items**
  - Eccentricity, Surface Movement, Coating Thickness

- **Flatness**
  - Counting containers
  - Checking the flatness of brake pads
  - Measuring machine tool eccentricity and vibration
  - Inspecting drive belt thickness
  - Inspecting steel plate surface areas
  - Inspecting the eccentricity of motor shafts
  - Inspecting seat belts for loose threads
  - Inspecting paper tube length
Smart Sensors Application World

**Height and Level Differences**
- Positioning
- Object Level Differences
- Thickness

**Inspecting**
- PCB mold height
- Ceramic types
- Rubber positioning
- Detecting glue applied to bags

**Measuring**
- Electronic component dimensions
- Shipping inspections on robot arms
- Wafer mapping (through-beam laser)
- CRTs for shadow mask insertion
- Checking for doubled-up lead frames

**Identifying**
- Number of inner caps for sake bottle caps
- Pinholes in pudding
- Checking the edge of transparent packing film
- Indentation on glass bottles

**Inspecting**
- Packing machine clamps
- Cakes in trays for thickness and presence
- Measuring clock assembly height

**Performing**
- Final inspections during watch assembly
- Checking the thickness of flexible items

**Measuring**
- Rivet height
- Small component dimensions

**Inspecting**
- Offset positioning of pressed workpieces
- Welding point positions on ring gears
- Bottom dead points on presses

**Checking**
- Engine part dimensions
- Counting tea bags
- Detecting raised caps

**Counting**
- Envelops
- Measuring roller gap

**Measuring**
- Engine plate surface areas
- Eccentricity of motor shafts

**Inspecting**
- Drive belt thickness
- Steel plate surface areas
- Seat belts for loose threads

**Inspecting**
- Paper tube length
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 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.

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.

Waves can be drawn with the new ZX-LDA-N.

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

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 be easily processed.

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

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: System Requirements
- OS: Windows 98 or 2000
- CPU Unit: Celeron 400 MHz or better
- RAM: 64 MB min.
- Available hard disk space: 50 MB min.
- Display screen: 800 x 600 dots and 256 colors min.
- Baud rate: 38,400 bps min.

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
- Datasheet
- ZX-EDA Inductive Displacement Sensors
- Datasheet
- ZX-TDA High-precision Contact Sensors
- Datasheet
- Common Precautions
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 display. Unlike conventional systems, this detection results in applications such as remote monitoring and data logging can 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.

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 function further enhance operation.

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

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

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.
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Datasheet 12
ZX-EDA Inductive Displacement Sensors 18
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Datasheet 30
Common Precautions 35

Notes:
- System Requirements
  OS: Windows 98 or 2000
  CPU Unit: Celeron 400 MHz or better
  RAM: 64 MB min.
  Available hard disk space: 50 MB min.
  Display screen: 800 x 600 dots and 256 colors min.
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- 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).
Smart Style!

ZX-LDA-N

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

The World's Smallest and Lightest

In addition to the obvious size difference, the ZX series offers the world's lightest Sensors. Approximately 1/4 the size as a comparable photoelectric sensor, the ZX Sensors considerably space-saving efforts on production line. 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. Laser Sensors offer a multi-measurement span enabling seamless coverage for various detection applications.

Light-intensity Mode: High-performance Laser Photoelectric Sensor

Light intensity can be detected by the ultra-small spot of the laser beam. By operating as a high-precision laser photoelectric sensor, rather than a displacement meter, this enables detection of small items with backgrounds, as well as color detection. Ideal function settings are possible by using both the displacement mode and the light-intensity mode to meet multiple application needs.

Equipped with a Laser Lifetime Monitor

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

Class 2 visible light laser

*For 4,096 sampling cycles

Class 1 visible light laser

*For 64 sampling cycles

Spot form

Two-spot Sensors

Distance range (resolution)

Three ranges

Spot form

Two-spot Sensors

Distance range (resolution)

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Two-spot Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm

Spot form

Through-beam Sensors

Distance range

500 mm/200 mm

100-200 mm/40 mm

30 mm
The World's Smallest and Lightest
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 in production areas. 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. The available spot beam forms provide seamless coverage for various detection applications.

Light-intensity Mode: High-performance Laser Photoelectric Sensor
Equipped with a Laser Lifetime Monitor
When laser diode deterioration is detected, a warning appears on the sub-digital display. Early detection enables trouble-free replacement.

Advanced Functions Made Simple. That is the Essence of Smart Style.
**ZX-LDA-N**

**Advanced Functions Respond to Evolving Needs**

**More User Friendly**
- A reference value other than zero can be set as the zero reset value.

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

**Automatic Teaching**
- Maximum and minimum measurement values can be set as reference values, which is especially useful for measuring large workpieces with uneven surfaces.

**Present 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.

**Enhanced Hold Function**
- Zero reset time display delay hold/average hold

**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.

**Advanced to Smart Style!**
- New Laser Type

**New Function**
- Enhanced Hold Function
- More User Friendly
- Present Value Display
- Automatic Teaching
- Present Value Comparison Function
- Multiple-point Measurements Computed Using 1 Point
Advanced to Smart Style!

Advanced Functions Respond to Evolving Needs

More User Friendly

A reference value other than zero can be set as the zero reset value.

Enhanced Hold Function

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

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.

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.

Zero Reset Time Display Delay Hold/Average Hold

Zero Reset Time Display Delay Hold/Average Hold

Present Value Display

Automatic Teaching Linear Output Correction

Any reset value setting

Present value display

T1

Self-triggering level

Average for T2

Time

Displacement

Delay time Sampling time

Latest Online Comparison

Minimum and maximum measurement values can be set as the reset value. When online comparison is executed, the output turns on when the present value reaches the minimum or maximum value set by the user.

Variable Teaching Values

Maximum and minimum measurement values can be set as the reset value. When online comparison is executed, the output turns on when the present value reaches the minimum or maximum value set by the user.

Display with Output

Maximum and minimum measurement values can be set as the reset values. Display with output is turned on when the present value reaches the minimum or maximum value set by the user.

Signal Shift for Laser Type

Signal shift for laser type. The signal shift is applied only when the laser is in use.

T1

Self-triggering level

Average for T2

Time

Displacement

Delay time Sampling time

Latest Online Comparison

Minimum and maximum measurement values can be set as the reset value. When online comparison is executed, the output turns on when the present value reaches the minimum or maximum value set by the user.

Variable Teaching Values

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T1

Self-triggering level

Average for T2

Time

Displacement

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Signal Shift for Laser Type

Signal shift for laser type. The signal shift is applied only when the laser is in use.
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>100±40 mm</td>
<td>16 µm</td>
<td>ZX-LD100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300±200 mm</td>
<td>300 µm</td>
<td>ZX-LD300</td>
<td></td>
</tr>
<tr>
<td>Line beam</td>
<td>40±10 mm</td>
<td>2 µm</td>
<td>ZX-LD40L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100±40 mm</td>
<td>16 µm</td>
<td>ZX-LD100L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300±200 mm</td>
<td>300 µm</td>
<td>ZX-LD300L</td>
<td></td>
</tr>
<tr>
<td>Regular reflective</td>
<td>Spot beam</td>
<td>30±2 mm</td>
<td>0.25 µm</td>
<td>ZX-LD300V</td>
</tr>
<tr>
<td></td>
<td>Line beam</td>
<td></td>
<td></td>
<td>ZX-LD300VL</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>DC</td>
<td>NPN</td>
<td></td>
<td>ZX-LDA11-N</td>
</tr>
<tr>
<td>PNP</td>
<td></td>
<td></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-LT1001/ LT005</td>
<td>ZX-XF12</td>
</tr>
<tr>
<td></td>
<td>ZX-LT010</td>
<td>ZX-XF22</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>ZX-XC1A</td>
<td>1</td>
</tr>
<tr>
<td>4 m</td>
<td>ZX-XC4A</td>
<td></td>
</tr>
<tr>
<td>8 m</td>
<td>ZX-XC8A</td>
<td></td>
</tr>
<tr>
<td>9 m *2</td>
<td>ZX-XC9A</td>
<td></td>
</tr>
</tbody>
</table>

*1. ZX-XC60R 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>ZX-series Communications Interface Unit</td>
<td>ZX-SF11</td>
</tr>
<tr>
<td></td>
<td>ZX-series Communications Interface Unit + ZX-series Sensor Setup Software Basic</td>
<td>ZX-SFW11V3</td>
</tr>
<tr>
<td></td>
<td>ZX-series Sensor Setup Software</td>
<td>ZX-SW11EV3 *1</td>
</tr>
</tbody>
</table>

*1. The ZX-SFW11V3 or ZX-SW11V3 is required to use Smart Monitor with the ZX-LDA11-N/41-N. Earlier versions cannot be used.

*2. The ZX-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>Optical system</td>
<td></td>
<td>Regular reflective</td>
<td>Regular reflective</td>
<td>Regular reflective</td>
<td>Diffuse reflective</td>
<td>Diffuse reflective</td>
<td>Regular reflective</td>
<td>Regular reflective</td>
<td>Regular reflective</td>
</tr>
<tr>
<td>Light source (wave length)</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>
<td></td>
</tr>
<tr>
<td>Measurement point</td>
<td>40 mm</td>
<td>100 mm</td>
<td>300 mm</td>
<td>30 mm</td>
<td>40 mm</td>
<td>100 mm</td>
<td>300 mm</td>
<td>30 mm</td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>±10 mm</td>
<td>±40 mm</td>
<td>±200 mm</td>
<td>±10 mm</td>
<td>±10 mm</td>
<td>±40 mm</td>
<td>±200 mm</td>
<td>±2 mm</td>
<td></td>
</tr>
<tr>
<td>Beam shape</td>
<td>Spot</td>
<td></td>
<td>Line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beam size*1</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>
<td></td>
</tr>
<tr>
<td>Resolution*2</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>
<td></td>
</tr>
<tr>
<td>Linearity*3</td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (80 to 120 mm)</td>
<td>±2% FS (200 to 400 mm)</td>
<td>±0.2% FS (entire range)</td>
<td>±0.2% FS (32 to 48 mm)</td>
<td>±0.2% FS (80 to 120 mm)</td>
<td>±2% FS (200 to 400 mm)</td>
<td>±0.2% FS (entire range)</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic*4</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>
<td></td>
</tr>
<tr>
<td>Ambient illumination</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>
<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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. at 500 VDC</td>
<td></td>
<td></td>
<td></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</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC60529, IP50</td>
<td>IEC60529, IP40</td>
<td>IEC60529, IP50</td>
<td>IEC60529, IP50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Connector relay (standard cable length: 500 mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 150 g</td>
<td>Approx. 250 g</td>
<td>Approx. 150 g</td>
<td>Approx. 250 g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass</td>
<td>Case and cover: Aluminum, Lens: Glass</td>
<td>Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass</td>
<td>Case and cover: Aluminum, Lens: Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction sheet, Laser warning label (English)</td>
<td></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: 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.

*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>Optical system</td>
<td></td>
<td>Through-beam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light source (wave length)</td>
<td>Visible-light semiconductor laser with a wavelength of 650 nm; JIS class 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum output</td>
<td>0.2 mW max.</td>
<td>0.35 mW max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement width</td>
<td>1-mm dia.</td>
<td>1- to 2.5-mm dia.</td>
<td>5 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>Measurement distance</td>
<td>0 to 500 mm</td>
<td>0 to 2,000 mm</td>
<td>0 to 500 mm</td>
<td></td>
</tr>
<tr>
<td>Minimum sensing object</td>
<td>8-µm dia. (opaque)</td>
<td>8- to 50-µm dia. (opaque)</td>
<td>0.05-mm dia. (opaque)</td>
<td>0.1-mm dia. (opaque)</td>
</tr>
<tr>
<td>Resolution*1</td>
<td>4 µm *2</td>
<td>—</td>
<td>4 µm *3</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic</td>
<td>0.2% FS/°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient illumination</td>
<td>Incandescent lamp: 10,000 lx max. (on light-receiving side)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: 0 to 50°C, Storage: −25 to 70°C (with no icing or condensation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC60529, IP40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Connector relay (standard cable length: 500 mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Approx. 220 g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>Extendable up to 10 m with special extension cable.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Case: Polyetherimide, Case cover: Polycarbonate, Unit cover: Glass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tightening torque</td>
<td>0.3 N m max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Optical axis adjustment seal, sensor head-amplifier connection cable (1.5 m), instruction sheet</td>
<td></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. This is the value that results when a minimum sensing object blocks the light near the center of the 1-mm measurement width.

*3. 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>ZX-LDA41-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement period</td>
<td>150 µs</td>
<td></td>
</tr>
<tr>
<td>Possible average count settings¹</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: 0.01% FS/°C, When connected to a Through-beam Sensor Head: 0.1% FS/°C</td>
<td></td>
</tr>
<tr>
<td>Linear output²</td>
<td>4 to 20 mA/FS, Max. load resistance: 300 Ω, ±14 V (± 5 V to 1 to 5 V), Output impedance: 100 Ω</td>
<td></td>
</tr>
<tr>
<td>Judgement outputs</td>
<td>NPN open-collector outputs, 30 VDC, 50 mA max.</td>
<td>PNP Supply-collector outputs, 30 VDC, 50 mA max.</td>
</tr>
<tr>
<td>Laser OFF input, zero reset input,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>timing input, reset input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functions</td>
<td>Measurement value display, set value/resolution display, scaling, display reverse, display OFF mode, ECO mode, number of display digit 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>4, (A+B) calculations</em>4, mutual interference<em>4, laser deterioration detection, zero reset memory, key lock, measurement value display, set value/resolution display, scaling, display reverse, display OFF mode, ECO mode, number of display digit 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>4, (A+B) calculations<em>4, mutual interference</em>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 (destruction)</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 (destruction)</td>
<td>300 m/s² for 3 times each in six directions (up/down, left/right, forward/backward)</td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Preset (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 Setting is possible via the monitor focus function.

³ The output can be switched between a current output and voltage output using a switch on the bottom of the Amplifier Unit.

⁴ Setting is possible via the monitor focus function.

### Calculating Unit

<table>
<thead>
<tr>
<th>Item</th>
<th>ZX-CAL2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Amplifier Units</td>
<td>ZX-LD11-N/41-N, ZX-EDA11/41, 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 (destruction)</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 (destruction)</td>
<td>300 m/s² for 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. 50 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>ZX-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, ZX-LD11-N Ver. 1.000 or higher, ZX-EDA11-N Ver. 1.100 or higher, ZX-TDA11-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/F²</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</td>
</tr>
<tr>
<td>Protective circuits</td>
<td>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/F 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**

---

*ZX-LD40L: L = 40 mm, A = 23°*
*ZX-LD100L: L = 100 mm, A = 11°*
*ZX-LD300L: L = 300 mm, A = 3.8°*
### Sensor Heads (Through-beam)

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

- **Emitter side**
  - Two, 3.2 dia. Mounting Holes
  - Connector
  - Laser ON indicator
  - Light axis center

- **Receiver side**
  - Two, 3.2 dia. Mounting Holes
  - Connector
  - Light axis center
  - Vinyl-insulated round cable (black), 2.6 dia., Standard: 500 mm

**ZX-LT010**

- **Emitter side**
  - Two, 3.2 dia. Mounting Holes
  - Connector
  - Laser ON indicator
  - Light axis center

- **Receiver side**
  - Two, 3.2 dia. Mounting Holes
  - Connector
  - Light axis center
  - Vinyl-insulated round cable (black), 2.6 dia., Standard: 500 mm

### Amplifier Units

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

- **Connecter**
  - Vinyl-insulated round cable, 5.1 dia. Standard: 100 mm
  - VInyl-insulated round cable, 5.2 dia. (conductor cross-section: 0.09 mm², 10-conductor insulator diameter: 0.7 mm), Standard: 2 m
  - Current/voltage output selector switch (set to voltage output when shipped)
  - Voltage output
  - 1,500 × 2 × 2

---

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

Calculating Unit
ZX-CAL2

Side-view Attachments
ZX-XF12
ZX-XF22

ZX-series Communications Interface Unit
ZX-SF11

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
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 and Sensor Heads can be extended to 3 m, 6 m, or 10 m using a ZX-XC® Cable (sold separately).

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 300°C for flat sensors.

Variation for Smart Style!

Inductive Displacement Sensors for Even More Applications

Wide Selection of Sensor Heads

Sensors Heads in a Choice of 3 dia.

Small Sensor heads are perfect for detecting the height of small objects, and for applications where multiple Sensor Heads are used.

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.

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**

**Smart Style!**

**Variation for Smart Style!**

Inductive Displacement Sensors for Even More Applications

---

**Complete Range of Useful Functions**

**Simpler Linear Adjustment**

Adjustments using the adjustment knobs are no longer required. Linerity adjustment is completed simply by teaching at 0%, 50%, and 100% of the measurement distance, greatly reducing setting time.

**Suitable for Non-ferrous Metallic Alloys**

Linerality 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.

---

**Wide Selection of Sensor Heads**

**New Flat and Heat-resistant Sensors Broaden Application Possibilities**

The temperature characteristics rank at the top in the industry at 0.1% FS/°C for heat-resistant sensors, and it ranges up to 300°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 and Sensor Heads can be extended to 3.0 m, 6.0 m, or 10 m using a ZX-XC@ Cable (sold separately).

---

**New Flat and Heat-resistant Sensors**

- Stainless steel heads
- Suitable for non-ferrous metallic alloys
- Temperature characteristics: 0.1% FS/°C for heat-resistant sensors, up to 300°C for flat sensors

---

**Sensor Heads for Even More Applications**

- Small sensor heads suitable for detecting the height of small objects
- New flat and heat-resistant sensors for broadening application possibilities

---

**Sensor Head Options**

- Available in stainless steel protective spiral tubes
- Sizes: 3 dia., 5.4 dia., 8 dia., M10, M18

---

**Inductive Displacement Sensors**

- For detecting the height of small objects
- Flat sensors for applications requiring high accuracy and heat resistance

---

**Linearity Adjustment**

- Simple linear adjustment using knobs
- Teaching at 0%, 50%, and 100% of measurement distance
- Reduces setting time significantly

---

**Material Selection Function**

- Improves linearity for stainless steel and aluminum sensing objects
- Simplifies adjustment process

---

**Calculating Units**

- Eliminate the need for timing signals
- Can be placed between Amplifier Units for multiple-point measurements

---

**Amplifier Units**

- Can be used as is for replacement or changing Sensor Heads
- Distance extension to 3.0 m, 6.0 m, or 10 m with ZX-XC@ Cable

---

**ZX-EDA Specifications**

- Linear range: ±1.0% of full scale
- Temperature characteristic: ±0.1% FS/°C for flat sensors, ±0.2% FS/°C for flat sensors
- Temperature range: -20°C to +80°C

---

**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></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 dia. x 18 mm</td>
<td>0.5 mm</td>
<td>1 µm</td>
<td>ZX-EDR5T</td>
<td></td>
</tr>
<tr>
<td>5.4 dia. x 18 mm</td>
<td>1 mm</td>
<td></td>
<td>ZX-ED01T *2</td>
<td></td>
</tr>
<tr>
<td>8 dia. x 22 mm</td>
<td>2 mm</td>
<td></td>
<td>ZX-ED02T *2</td>
<td></td>
</tr>
<tr>
<td>Screw-shaped</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10 x 22 mm</td>
<td></td>
<td></td>
<td>ZX-EM02T *2</td>
<td></td>
</tr>
<tr>
<td>M18 x 46.3 mm</td>
<td>7 mm</td>
<td></td>
<td>ZX-EM07MT *2</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 x 14 x 4.8 mm</td>
<td>4 mm</td>
<td></td>
<td>ZX-EV04T *2 *3</td>
<td></td>
</tr>
<tr>
<td>Heat-resistant, cylindrical</td>
<td></td>
<td></td>
<td>ZX-EM02HT *4</td>
<td></td>
</tr>
<tr>
<td>M12 x 22 mm</td>
<td>2 mm</td>
<td></td>
<td></td>
<td></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></td>
<td>DC</td>
<td>NPN</td>
<td>ZXEAD11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PNP</td>
<td>ZXEAD41</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></td>
<td>ZX-XBE1</td>
<td>Attached to each Sensor Head</td>
</tr>
<tr>
<td></td>
<td>ZX-XBE2</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>Measurement range</th>
<th>Sensing object</th>
<th>Standard reference object</th>
<th>Resolution *1</th>
<th>Linearity *2</th>
<th>Linear output range</th>
<th>Ambient temperature *4</th>
<th>Ambient humidity</th>
<th>Insulation resistance</th>
<th>Dielectric strength</th>
<th>Vibration resistance (destruction)</th>
<th>Shock resistance (destruction)</th>
<th>Degree of protection (Sensor Head)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZXE1T</td>
<td>0 to 0.5 mm</td>
<td>Magnetic metals</td>
<td>18 × 18 × 3 mm</td>
<td>±1.0 µm</td>
<td>±0.5% F.S.</td>
<td>±1.0% F.S.</td>
<td>0 to 50°C</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td>50 MΩ min. (at 500 DC)</td>
<td>1,000 VAC, 50/60 Hz for 1 min between charged parts and case</td>
<td>10 to 55 Hz with 1.5-mm double amplitude for 2 h each in X, Y, and Z directions</td>
<td>IEC60529, IP67</td>
<td></td>
</tr>
<tr>
<td>ZXE02T</td>
<td>0 to 1 mm</td>
<td></td>
<td>30 × 30 × 3 mm</td>
<td></td>
<td></td>
<td></td>
<td>−10 to 60°C (with no icing or condensation)</td>
<td></td>
<td></td>
<td>500 m/s², 3 times each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXE02T/EM2T</td>
<td>0 to 2 mm</td>
<td></td>
<td>60 × 60 × 3 mm</td>
<td></td>
<td></td>
<td></td>
<td>−20 to 70°C (with no icing or condensation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXE02HT</td>
<td>0 to 7 mm</td>
<td></td>
<td>45 × 45 × 3 mm</td>
<td></td>
<td></td>
<td></td>
<td>−20 to 200°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXE04T</td>
<td>0 to 4 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZXE02HT</td>
<td>0 to 2 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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. 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.
### Amplifier Units

<table>
<thead>
<tr>
<th>Model</th>
<th>ZX-EDA11</th>
<th>ZX-EDA41</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>Linear output *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>Judgement outputs (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>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 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>
</tbody>
</table>

### Function
- Measurement value display - Present value/set value/output value/resolution display
- Linearity adjustment (materials selection) - Scaling
- Display reverse - ECO mode
- Number of display digit changes - Peak hold
- Bottom hold, peak-to-peak hold - Self-bottom hold
- Average hold - Zero reset
- Initial reset - ON-delay timer
- OFF-delay timer - Previous value comparison
- Non-measurement setting - Position teaching
- Automatic teaching - Timing inputs
- Reset input - Monitor focus
- Linear output correction - (A-B) calculations *4
- K-(A+B) calculation *4 - Mutual interference prevention *4
- Sensor disconnection detection - Zero reset memory
- Key lock - Zero reset indicator

### Indications
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)

### Voltage influence (including Sensor)
0.5% F.S. of linear output value at ±20% of power supply voltage

### Power supply voltage
12 to 24 VDC ±10%, Ripple (p-p): 10% max.

### Current consumption
140 mA max. with power supply voltage of 24 VDC (with Sensor connected)

### Ambient temperature
Operating and storage: 0 to 50°C (with no icing or condensation)

### Ambient humidity
Operating and storage: 35% to 85% (with no condensation)

### Insulation resistance
20 MΩ min. (at 500 DC)

### Dielectric strength
1,000 VAC, 50/60 Hz for 1 min

### Vibration resistance (destruction)
10 to 150 Hz with 0.7-mm double amplitude for 80 min each in X, Y, and Z directions

### Shock resistance (destruction)
300 m/s², 3 times each in 6 directions (up, down, left, right, forward, backward)

### Connection method
Prewired (standard cable length: 2 m)

### Weight (packed state)
Approx. 350 g

### Materials
Case: PBT (polybutylene terephthalate), Cover: Polycarbonate

### Accessories
Instruction Manual

---

*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 coaxial round cable
2.5 dia., 1 conductor, standard length: 2 m

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

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

Connector

(46)

(46)
Amplifier Units

ZX-EDA11  
ZX-EDA41

Dimensions with Mounting Bracket Attached
- Fluororesin-insulated coaxial round cable 2.5 dia., single conductor, standard length: 2 m
- Vinyl-insulated round cable 5.1 dia., 9 conductors, standard length: 200 mm

Mounting Hole Cutout Dimensions

Vinyl-insulated round cable 5.1 dia., standard: 100 mm

Current/voltage switch (Factory-set to voltage output.)  
Voltage output
## Accessories (Sold Separately)

### Preamplifier Mounting Brackets

**ZX-XBE1**

![Preamplifier Mounting Brackets](image)

**ZX-XBE2**

Material: Stainless steel (SUS304)

**Mounting Hole Cutout Dimensions**

```
27\pm0.1
```

Two, M3 holes

Material: Stainless steel (SUS304)

### 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

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.

Thinnest Level of Sensor Head in the Industry

Highest Level of Resolution in the Industry

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 rolling parts that move smoothly and a rubber boot that keeps dust out.

Auto-scaling Function

The measurement distance can be displayed on the Amplifier simply by connecting the Sensor Head. The measurement distance for Short and Standard Sensors 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.

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, the 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).

Multiple-point Computing Function

Connect up to 8 Sensor Heads. The displayed value is the measured value × 101%.

Linearity of 0.3% FS

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.

Highest Level of Detection Performance in the Industry

Our other products:

Linearity of 0.5% FS

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

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 Resolution in the Industry

The long-stroke ZX-TDS04 (4-mm measurement distance) achieves precise measurements with a maximum linear error of 0.03% FS and a resolution of 0.1 µm that ranks in the top class in the industry.

Multiple-point Computing Function

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, the function detects whether the Sensor is in danger of being damaged by overpressure 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).

Built for Longer Life

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

Auto-scaling Function

The measurement distance can be displayed on the Amplifier simply by connecting the Sensor Head. The measurement distance of 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>ZX-TDA11</td>
<td></td>
</tr>
<tr>
<td>PNP</td>
<td>ZX-TDA41</td>
<td></td>
<td></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>ZX-XBT1</td>
<td>ZX-XBT1</td>
<td>Attached to each Sensor Head</td>
</tr>
<tr>
<td>ZX-XBT2</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-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>Approx. 0.25 N</td>
<td></td>
</tr>
<tr>
<td>Degree of protection (Sensor Head)</td>
<td>IEC60529, IP67</td>
<td>IEC60529, IP54</td>
<td></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>Storage: −15°C 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 icing or condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature characteristic *4</td>
<td>Sensor Head 0.03% F.S./°C</td>
<td>0.01% F.S./°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preamplifier 0.01% F.S./°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</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>Sensor Head Stainless steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rubber boot Fluorocarbon rubber</td>
<td>Silicon rubber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preamplifier 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>ZX-TDA11</th>
<th>ZX-TDA41</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement period</td>
<td>1 ms</td>
<td></td>
</tr>
<tr>
<td>Possible average count settings*1</td>
<td>1, 2, 4, 8, 16, 32, 64, 128, 256, 512, or 1,024</td>
<td></td>
</tr>
<tr>
<td>Linear output*2</td>
<td>Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω</td>
<td>Voltage output: ±14 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>Residual voltage: 1.2 V max.</td>
<td>Residual voltage: 2 V max.</td>
<td></td>
</tr>
</tbody>
</table>
| Zero reset input, timing input, reset input, judgment output hold input | ON: Short-circuited with 0-V terminal or 1.5 V or less | ON: Supply voltage short-circuited or supply voltage of 1.5 V or less
OFF: Open (leakage current: 0.1 mA max.) |
| Function | - Measurement value display | - Present value/current/value output value display
- Display reverse | - ECD mode
- Sample hold | - Number of display digit changes
- Self-peak hold | - Peak hold
- Initial reset | - Bottom hold, peak-to-peak hold
- Hysteresis width setting | - Direct threshold value setting
- Judgment output hold input | - Timing inputs
- (A+B) calculations *4 | - Monitor focus
- (A-B) calculations *4 | - Sensor disconnection detection
- Zero reset memory | - Function lock
- Clamp value setting | - Scale inversion
- Span adjustment | - Non-measurement setting
- Warming-up display | - Zero reset indicator
- Pressing force alarm |
| Indicators | 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) | |
| Power supply voltage | 12 to 24 VDC ±10%, Ripple (p-p): 10% max. | |
| Current consumption | 140 mA max. (with Sensor connected), For 24-VDC power supply: 140 mA max. (with Sensor connected) | |
| Ambient temperature | Operating and storage: 0 to 50°C (with no icing or condensation) | |
| Ambient humidity | Operating and storage: 35% to 85% (with no icing or condensation) | |
| Temperature characteristic | 0.03%/°F°C | |
| Insulation resistance | 20 MΩ min. at 500 VDC | |
| Dielectric strength | 1,000 VAC, 50/60 Hz for 1 min | |
| Vibration resistance (destruction) | 10 to 150 Hz with 0.7-mm double amplitude for 80 min each in X, Y, and Z directions | |
| Shock resistance (destruction) | 300 m/s², 3 times each in six directions (up, down, left, right, forward, backward) | |
| Connection method | Prewired (standard cable length: 2 m) | |
| Materials | Case: PBT (polyybutylene terephthalate), Cover: Polycarbonate | |
| Weight (packed state) | Approx. 350 g | |
| Accessories | Instruction sheet | |

*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. 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. E346) provided by OMRON.

### Options (Actuators)

<table>
<thead>
<tr>
<th>Model</th>
<th>Type (material)</th>
<th>Screw section</th>
<th>Appearance</th>
<th>Application</th>
<th>Applicable Sensor*</th>
</tr>
</thead>
<tbody>
<tr>
<td>D5SN-</td>
<td>TB1</td>
<td>Ball type (steel)</td>
<td>Female screw M2.5 x 0.45</td>
<td>Measuring ordinary flat surfaces (standard actuator supplied with the ZX-TDS Series)</td>
<td></td>
</tr>
<tr>
<td>TB2</td>
<td>Ball type (carbide steel)</td>
<td>Female screw M2.5 x 0.45</td>
<td>Measurements where abrasion resistance is critical Measured objects: Carbide (HR90) or lower.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB3</td>
<td>Ball type (ruby)</td>
<td>Female screw M2.5 x 0.45</td>
<td>Measurements where abrasion resistance is critical Measured objects: Carbide (HR90) or higher.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TN1</td>
<td>Needle type (carbide steel)</td>
<td>Male screw M2.5 x 0.45</td>
<td>Measuring the bottom of grooves and holes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TF1</td>
<td>Flat (carbide steel)</td>
<td>Male screw M2.5 x 0.45</td>
<td>Measuring spherical objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA</td>
<td>Conversion Adapter (stainless steel)</td>
<td>Through-hole female screw M2.5 x 0.45</td>
<td>Mounting D5SN-TN1/-TF1 or commercially available actuators on ZX-TDS-series Sensors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: For optional Actuator combinations, the circle means the Actuator is replaceable and the triangle means that a Conversion Adapter is required.

### Dimensions

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

### Sensors

**ZX-TDS01T**

- **Mounting Hole Cutout Dimensions**
  - Two, M3
  - 27 x 0.1

**ZX-TDS04T**

- **Mounting Hole Cutout Dimensions**
  - Two, M3
  - 27 x 0.1

**ZX-TDS04T-L**

- **Mounting Hole Cutout Dimensions**
  - Two, M3
  - 27 x 0.1

### Amplifier Units

**ZX-TDA11**

- **Mounting Hole Cutout Dimensions**
  - 27 x 0.1

**ZX-TDA41**

- **Mounting Hole Cutout Dimensions**
  - 27 x 0.1
■ Accessories (Order Separately)

Preamplifier Mounting Bracket (Supplied with Each Sensor)

**ZX-XBT1**

![Diagram of ZX-XBT1](image1)

**ZX-XBT2 (For DIN Track Mounting)**

![Diagram of ZX-XBT2](image2)

- **Mounting Hole Cutout Dimensions**
- **Material:** Stainless steel

**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-XC1A Extension Cable (sold separately) to extend the Sensor’s cable. Extend the Amplifier Unit’s cable using a shielded cable of the same type.

Wiring
Do not use the product at voltages exceeding the rated values. Doing so may result in damage.
Do not connect the product to an AC power supply or connect the power supply in reverse.
Do not short loads connected to open-collector outputs.
Do not lay the cable for the product together with or in the same duct as high-voltage lines or power lines. Doing so may result in incorrect operation or damage due to induction.

Other Precautions
Do not attempt to disassemble, repair, or modify the product.
Dispose of the product using standard procedures for industrial waste.
Do not connect combinations of ZX-L-, ZX-E-, and ZX-T-series Smart Sensors.

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 to 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.
Terms and Conditions of Sale

1. Offer; Acceptance. These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalog, product brochures and stated in documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiaries or affiliates ("Omron"). Buyer accepts Omron's obligations as to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.

2. Force Majeure. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are for the exclusive benefit of Omron and shall not be construed to release Buyer from any other obligations or responsibilities. Buyer shall have no right to set off any amounts due from Omron against any balance paid in advance or other amounts owed by Omron to Buyer.

3. Discounts. Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be (i) the invoice is paid in accordance with Omron's payment terms and (ii) Buyer has no past due amounts.

4. Interest. Unless otherwise expressly agreed in writing by Omron, interest at 1-1/2% per month or the highest rate allowable by law, whichever is less, on any balances paid in advance or other amounts owed by Omron to Buyer.

5. Orders. Buyer will accept no order less than $200 net billing.

6. Governmental Approvals. Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or use of the Products.

7. Taxes. All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and all taxes and duties levied under any revenue or excise laws), shall be charged to Buyer and paid by Buyer.

8. Financial. Buyer shall not be liable for the payment of any taxes, duties or other governmental charges due to any governmental entity, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.

9. Cancellation: Etc. Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.

10. Force Majeure. Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes, or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirement of any government authority.

11. Shipping, Delivery. Unless otherwise expressly agreed in writing by Omron:
   a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship any Products for any reason.
   b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer; and
   c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid; and
   d. Delivery and shipping dates are estimates only; and
   e. Omron will not take title to any Products as it deems necessary for protection against normal handling and extra charges apply to special conditions.

12. Claims. Any claim by Buyer against Omron for shortage or damage to the Products before delivery to the carrier must be presented in writing to Omron within 10 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products in good condition.

13. Warranties. (a) Exclusive Warranty. Omron's exclusive warranty is that the Products will conform to the specifications, drawings, tolerances, and tests set forth in the Purchasing Order, if any, and for a period of 12 months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied, and waives any kind of claim or cause of action by Buyer against Omron, whether based on warranty, tort or otherwise of any intellectual property right. (b) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace in the form ordered any Products shipped with defects that, at the time of acceptance and without replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) return or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly maintained, stored, installed, used, operated, adjusted, tested, maintained or alarmed, in use, or at any repair or modification, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment.

14. Limitation on Liability. Etc. OMROM COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

15. Insurance. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace in the form ordered any Products shipped with defects that, at the time of acceptance and without replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) return or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly maintained, stored, installed, used, operated, adjusted, tested, maintained or alarmed, in use, or at any repair or modification, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment.

16. Property; Confidentiality. Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any changes to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron Companies. All information supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.

17. Export Controls. Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (ii) disclosure to non-citizens of regulated technology or information.

18. Miscellaneous. (a) Waiver. No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) Assignment. Buyer may not assign its rights hereunder without Omron's written consent. (c) Law. These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles) and constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (d) Severability. If any provision hereof is held invalid or unenforceable, any other provision of this Agreement shall remain in full force and effect. (e) Entire Agreement. This Agreement contains all of the terms and conditions relating to the sale of Omron Products and omits any other representations, warranties, conditions or agreements which may be presented herein, "including means including "without limitation" and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

Certain Precautions on Specifications and Use

1. Suitability of Use. Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product and the application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying reliable systems in which a particular Product can be used safely.

2. Programmable Products. Omron Companies shall not be responsible for the use of a user's programming of a programmable Product, or any consequence thereof.

3. Performance Data. Performance data reported in Omron Company websites, catalogs, manuals, brochures and other documents, whether electronic or in writing, are for indication purposes only and are subject to change without notice by Omron. Omron电子产品 are subject to quality control measures. All performance data, unless otherwise stated in writing by Omron, are subject to change. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace in the form ordered any Products shipped with defects that, at the time of acceptance and without replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) return or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly maintained, stored, installed, used, operated, adjusted, tested, maintained or alarmed, in use, or at any repair or modification, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment.

4. Change in Specifications. Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our prac- tice to change part numbers, functions, and performance specifications for materials, and when significant construction changes are made. However, no specifi- cations of the Product may be changed without any notice. When in doubt, spe- cifications for the Purchase Order or the product name shall govern. Please consult with your Omron's representative at any time for the actual specifications of the Product. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace in the form ordered any Products shipped with defects that, at the time of acceptance and without replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) return or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly maintained, stored, installed, used, operated, adjusted, tested, maintained or alarmed, in use, or at any repair or modification, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment.

5. Errors and Omissions. Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.
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