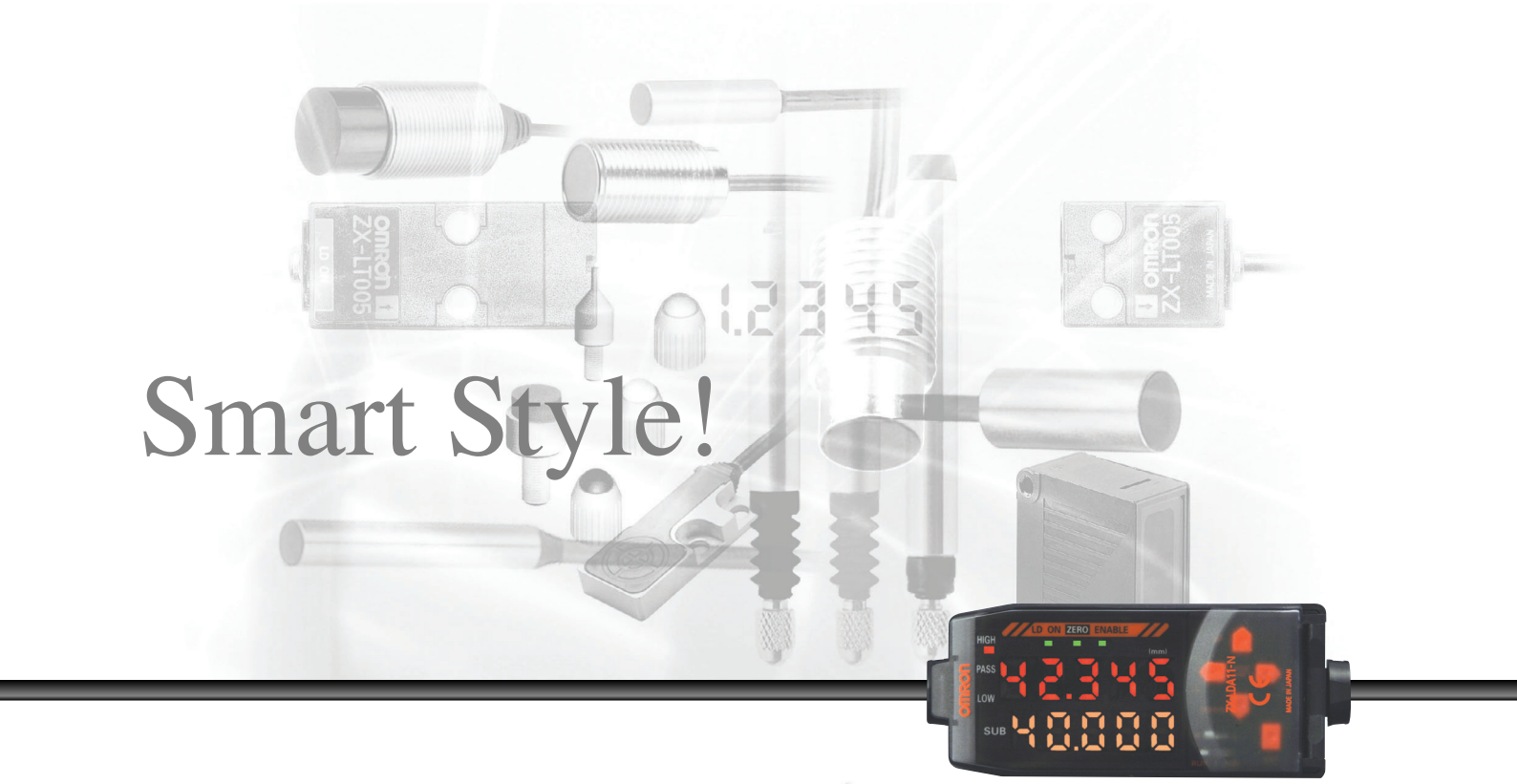
Smart Sensors

ZX Series

The Continuing Evolution of Smart Sensors

Presenting a New Laser-type ZX-LDA□-N Amplifier Unit



ZX

to Smart Style!

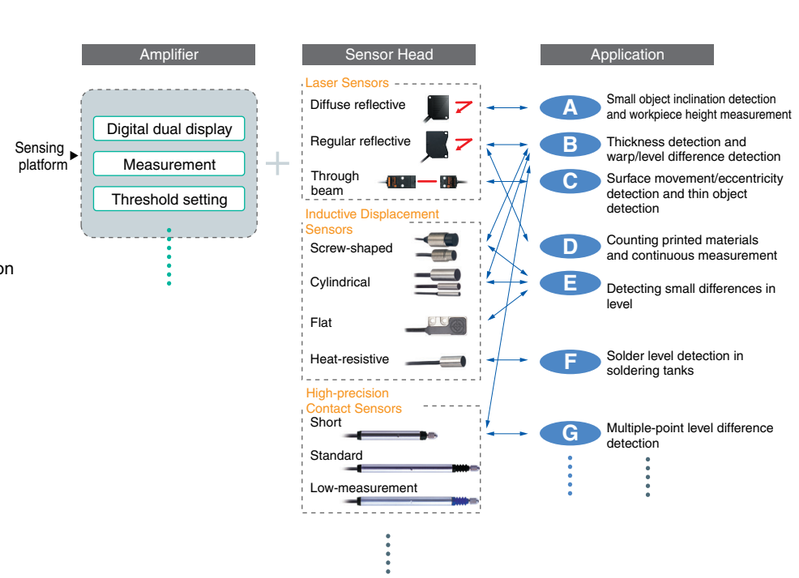
Smart Style... from OMRON

I am a Smart Sensor !!

OMRON Offers Sensor Users New Choices

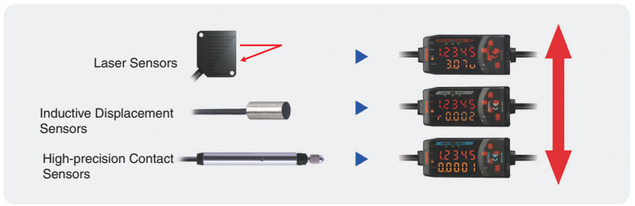
What's Smart?

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 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.



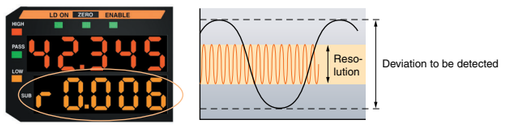
What's Style?

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.

Easy-to-see Resolution Patent Pending

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.



A Full Complement of Practical Functions

Operating Setting with No Need for a Digital Panel Meter Patent Pending

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.

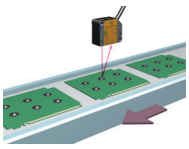
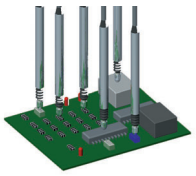
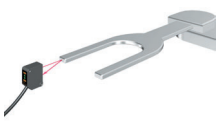
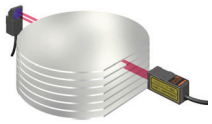
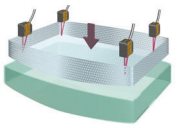
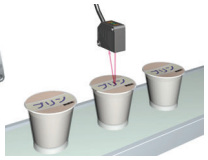
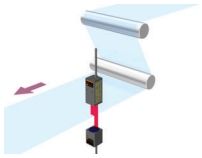
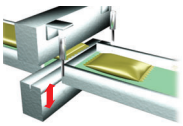
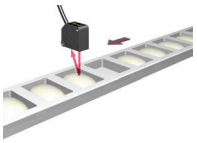
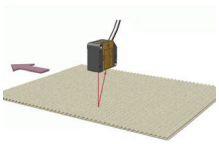
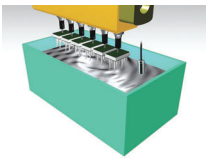
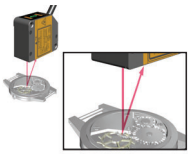
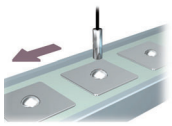
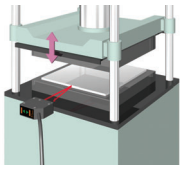
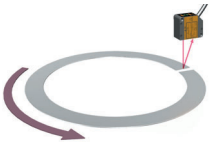
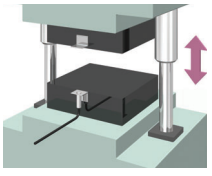
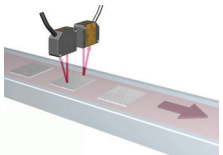
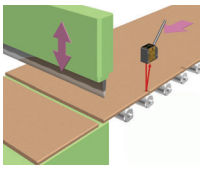
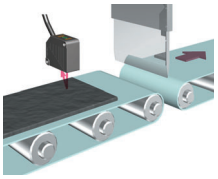
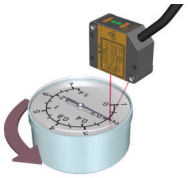
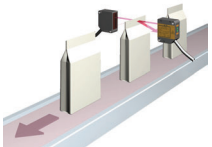
Comprehensive Teaching Functions

Position/2-point/Automatic

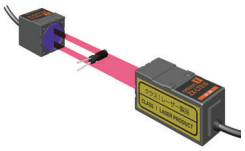
Three teaching functions rival the performance of photoelectric sensors.

- Position teaching
  For high-precision positioning applications
- 2-point teaching
  For detecting ultra-small level differences between two points
- Automatic teaching
  For teaching without stopping the workpiece

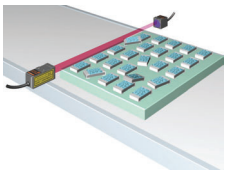
Smart Sensors Application World

	Height and Level Differences		Positioning		Small Level Differences	Thickness
Semiconductors and Electronic Components	 Inspecting PCB mold height	 Measuring electronic component dimensions	 Performing shipping inspections on robot arms	 Wafer mapping (through-beam laser)	 Checking CRTs for shadow mask insertion	 Checking for doubled-up lead frames
Packing, Foods, Chemicals, and Sanitary Items	 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
Household Appliances and Office Automation	 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
Automobiles, Machine Tools, and Robots	 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
Automated Machinery, Inspection Equipment, and Others	 Inspecting ball bearings for foreign matter	 Identifying ceramic types	 Checking cut positions on external walling material	 Checking rubber positioning	 Inspecting pressure indicator dials and pointer gaps	 Detecting glue applied to bags

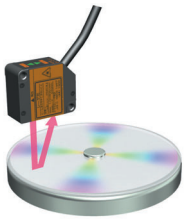
Width and Level Differences	Warp and Raised Items	Eccentricity, Surface Movement, Coating Thickness	Flatness	Counting



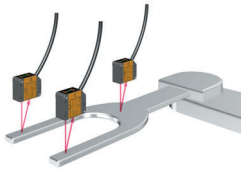
Identifying capacitor types



Inspecting chips for proper arrangement

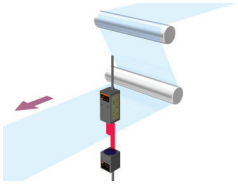


Checking disc motor tables for surface movement

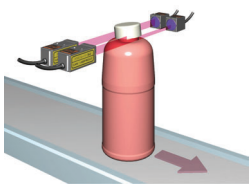


Inspecting robot arms for flatness

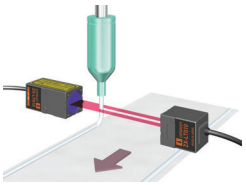
Semiconductors and Electronic Components



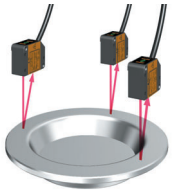
Checking the edge of transparent packing film



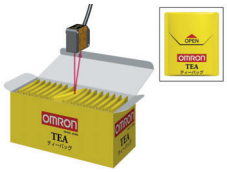
Detecting raised caps



Detecting bonding agent and quantity during packing box assembly

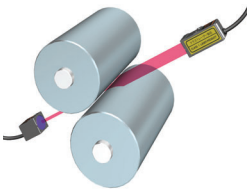


Checking the flatness of battery caps

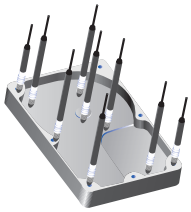


Counting tea bags

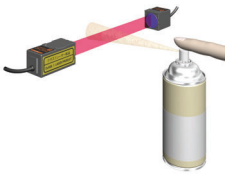
Packing, Foods, Chemicals, and Sanitary Items



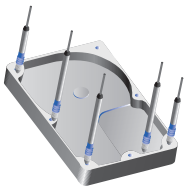
Measuring roller gap



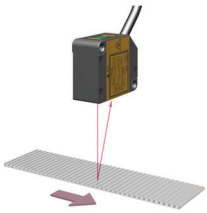
Measuring warpage of HDD chassis



Inspecting the spray from aerosol cans

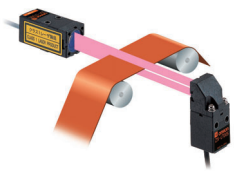


Checking the flatness of HDD chassis

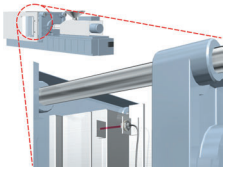


Counting copy machine staples and pins

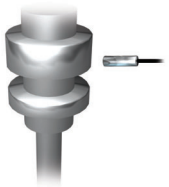
Household Appliances and Office Automation



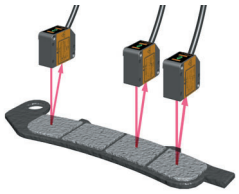
Inspecting drive belt thickness



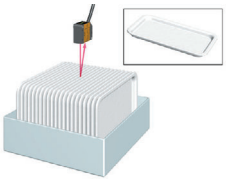
Checking dies for fit



Measuring machine tool eccentricity and vibration

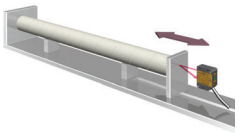


Checking the flatness of brake pads

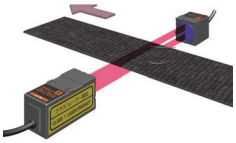


Counting containers

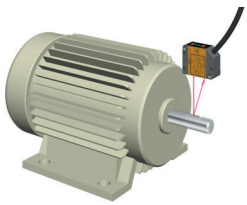
Automobiles, Machine Tools, and Robots



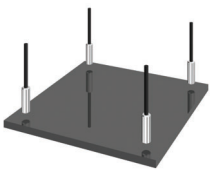
Inspecting paper tube length



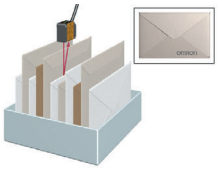
Inspecting seat belts for loose threads



Inspecting the eccentricity of motor shafts



Inspecting steel plate surface areas



Counting envelops

Automated Machinery, Inspection Equipment, and Others

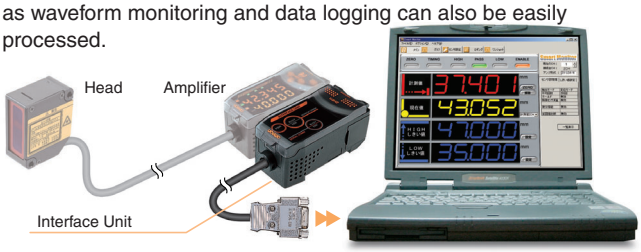
to Smart Style!

New Sensor Proposals for IT Applications

Smart Monitor V3 NEW

PC Connection Takes Full Advantage of Sensor Performance

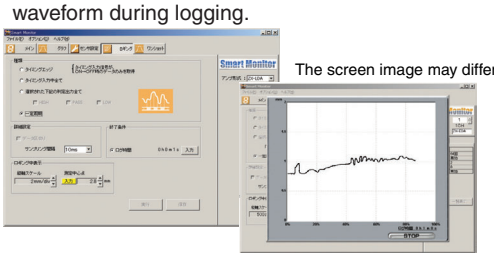
Use of the PC screen greatly enhances the panel display. Unlike conventional systems, the detection results from applications such as waveform monitoring and data logging can also be easily processed.



Flexible Quality Control

Data logging

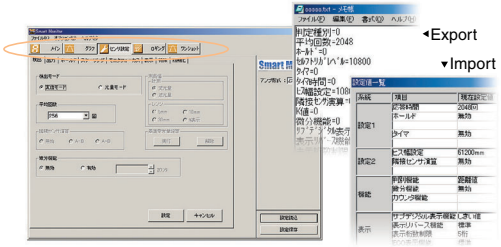
The ability to log detection data and manage the system history enables efficient and effective quality control, and aides in determining necessary countermeasures. Also displays data in waveform during logging.



The screen image may differ from that of the actual product.

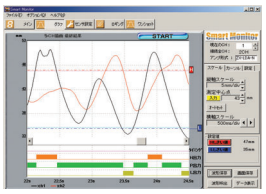
List Display Simplifies Setup

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.



Waveform monitoring

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

One-shot waveform

High-speed waveforms 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.

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

to Smart Style!

ZX-LDA-N

NEW

Laser Sensors

Easy *as* Smart Style!

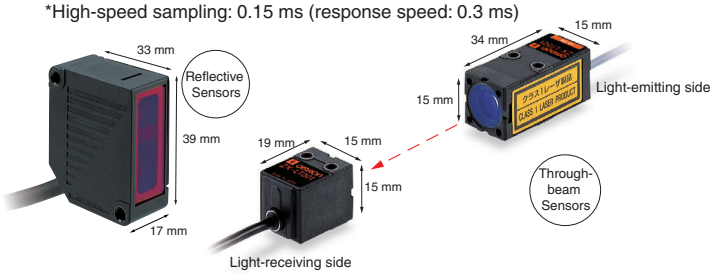
Advanced Functions Made Simple. That is the Essence of Smart Style.

The World's Smallest and Lightest

*As of October 1, 2001

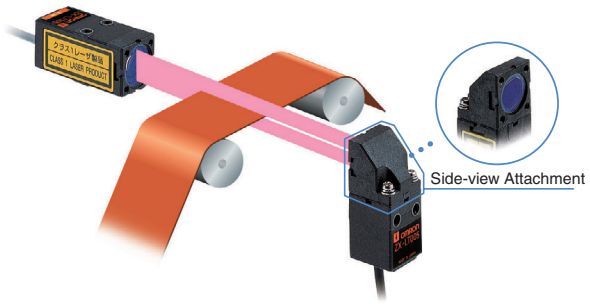
In addition to the obvious size difference, the ZX Series offers the world's lightest Sensors. Approximately the same size as a photoelectric sensor, the compact ZX Sensors contribute considerably to space-saving efforts on production sites. Naturally, response speed is also equivalent to that of a photoelectric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

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



Flexible Mounting Direction

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



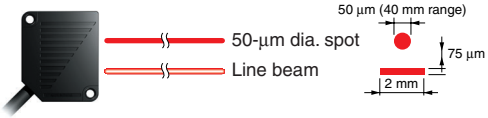
8 Reflective Types and 3 Through-beam Types Available

Reflective Sensors Class 2 visible light laser

*For 4,096 sampling cycles

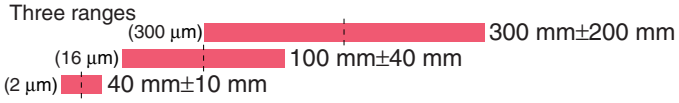
Select the model according to the application. Use a spot beam to detect small items, or a line beam for ordinary workpieces. Measurement distance also ranges from 28 to 500 mm, enabling seamless coverage for various detection applications.

Spot form
Two-spot Sensors



Distance range (resolution)

Three ranges

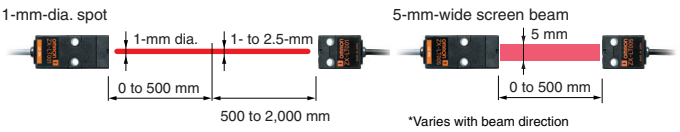


Through-beam Sensors Class 1 visible light laser

*For 64 sampling cycles

Use a 1-mm-dia. spot for precise positioning, or a 5- to 10-mm-wide screen beam for area detection.

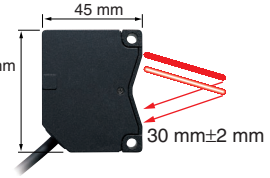
Measuring width and distance range (4-µm resolution)



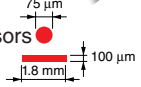
Regular reflection (displacement) Class 2 visible light laser

Ideal for detecting mirror surfaces.

Distance range (0.25 µm resolution)
One range

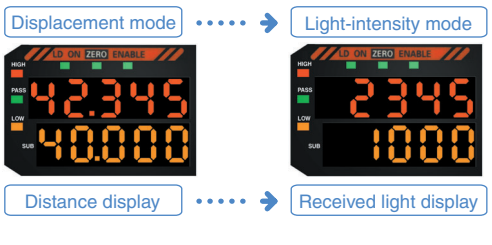


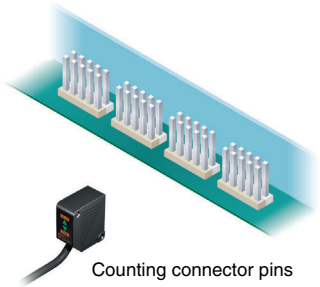
Spot form
Two-spot Sensors



Light-intensity Mode: High-performance Laser Photoelectric Sensor

Reflective Sensors



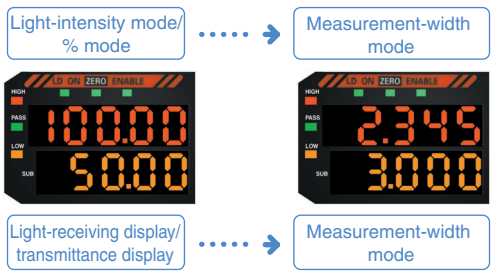


Counting connector pins

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.

Through-beam Sensors



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.

ZX-LDA-N

ZX

to Smart Style!

ZX-LDA-N

NEW

New Laser Type

Advanced *to* Smart Style!

Advanced Functions Respond to Evolving Needs

More User Friendly

New Function

Zero Reset Time Display

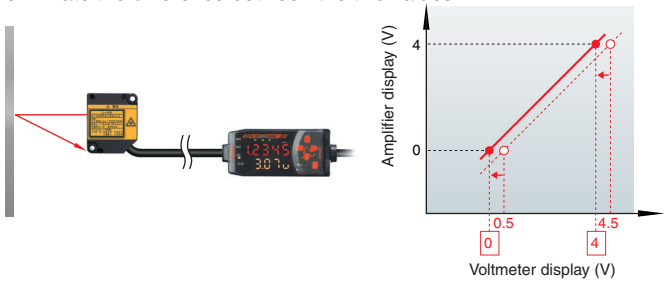
A reference value other than zero can be set as the zero reset value.

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.

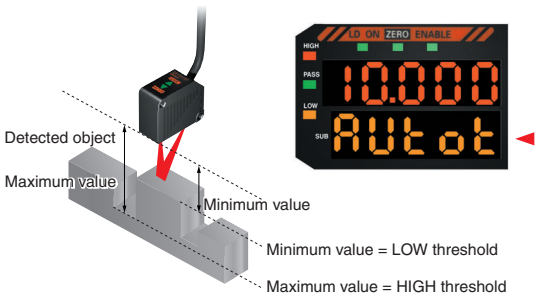
Linear Output Correction

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.

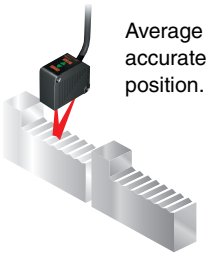


Automatic Teaching

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.



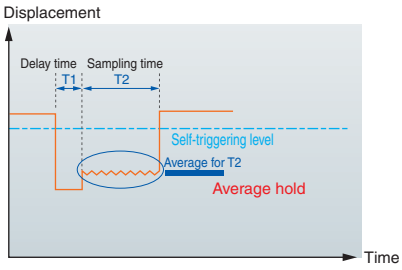
Enhanced Hold Function New Function



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

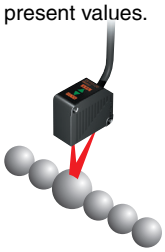
Delay Hold/Average Hold

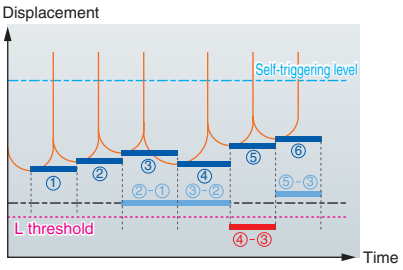
The delay hold function measures only signals within the desired sampling time after a specified time delay from the trigger. The newly added average hold function is especially useful for measuring large workpieces with uneven surfaces.



Previous Value Comparison Function

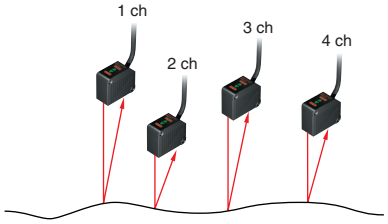
Gradual changes in measurements due to machine temperature changes or other factors can be ignored in certain situations, such as when detecting foreign matter around bearings. The previous value comparison function effectively detects any changes between previous and present values.





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.



ZX-LDA-N

Ordering Information

■ Sensors

Sensor Heads (Reflective)

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

* For an average count of 4,096.

Sensor Heads (Through-beam)

Optical system	Measuring width	Sensing distance	Resolution*	Model
Through-beam	1-mm dia.	0 to 2000 mm	4 μm	ZX-LT001
	5 mm	0 to 500 mm		ZX-LT005
	10 mm			ZX-LT010

* For an average count of 64.

Amplifier Units

Appearance	Power supply	Output type	Model
	DC	NPN	ZX-LDA11-N
		PNP	ZX-LDA41-N

Note: Compatible connection with the Sensor Head.

Accessories (Order Separately)

Calculating Unit

Appearance	Model
	ZX-CAL2

Side-view Attachments

Appearance	Applicable Sensor Head	Model
	ZX-LT1001/ LT005	ZX-XF12
	ZX-LT010	ZX-XF22

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

Cable length	Model	Quantity
1 m	ZX-XC1A	1
4 m	ZX-XC4A	
8 m	ZX-XC8A	
9 m *2	ZX-XC9A	

*1. ZX-XC□R robot cable type also available.

*2. For use only with Reflective Sensors.

Smart Monitor Sensor Setup Tool for Personal Computer Connection

Appearance	Name	Model
	ZX-series Communications Interface Unit	ZX-SF11
 + CD-ROM	ZX-series Communications Interface Unit + ZX-series Sensor Setup Software Basic	ZX-SFW11V3 *1, *2
CD-ROM	ZX-series Sensor Setup Software	ZX-SW11EV3 *1

*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)

Item / Model	ZX-LD40	ZX-LD100	ZX-LD300	ZX-LD30V	ZX-LD40L	ZX-LD100L	ZX-LD300L	Z3X-LD30VL
Optical system	Diffuse reflective			Regular reflective	Diffuse reflective			Regular reflective
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 650 nm and an output of 1 mW max.; class 2							
Measurement point	40 mm	100 mm	300 mm	30 mm	40 mm	100 mm	300 mm	30 mm
Measurement range	±10 mm	±40 mm	±200 mm	±2 mm	±10 mm	±40 mm	±200 mm	±2 mm
Beam shape	Spot				Line			
Beam size*1	50-μm dia.	100-μm dia.	300-μm dia.	75-μm dia.	75 μm x 2 mm	150 μm x 2 mm	450 μm x 2 mm	100 μm x 1.8 mm
Resolution*2	2 μm	16 μm	300 μm	0.25 μm	2 μm	16 μm	300 μm	0.25 μm
Linearity*3	±0.2% FS (entire range)	±0.2% FS (80 to 120 mm)	±2% FS (200 to 400 mm)	±0.2% FS (entire range)	±0.2% FS (32 to 48 mm)	±0.2% FS (80 to 120 mm)	±2% FS (200 to 400 mm)	±0.2% FS (entire range)
Temperature characteristic*4	±0.03% FS/°C (Except for ZX-LD300 and ZX-LD300L, which are ±0.1% FS/°C.)							
Ambient illumination	Incandescent lamp: 3,000 ℓx max. (on light receiving side)							
Ambient temperature	Operating: 0 to 50°C, Storage: –15 to 60°C (with no icing or condensation)							
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)							
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, 0.7-mm double amplitude 80 min each in X, Y, and Z directions							
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)							
Degree of protection	IEC60529, IP50			IEC60529, IP40	IEC60529, IP50			IEC60529, IP40
Connection method	Connector relay (standard cable length: 500 mm)							
Weight (packed state)	Approx. 150 g			Approx. 250 g	Approx. 150 g			Approx. 250 g
Materials	Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass			Case and cover: Aluminum, Lens: Glass	Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass			Case and cover: Aluminum, Lens: Glass
Accessories	Instruction sheet, Laser warning label (English)							

*1. Beam size: The beam size is defined by 1/e^2 (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)

Item / Model	ZX-LT001		ZX-LT005	ZX-LT010
Optical system	Through-beam			
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 650 nm; JIS class1			
Maximum output	0.2 mW max.		0.35 mW max.	
Measurement width	1-mm dia.	1- to 2.5-mm dia.	5 mm	10 mm
Measurement distance	0 to 500 mm	500 to 2,000 mm	0 to 500 mm	
Minimum sensing object	8-μm dia. (opaque)	8- to 50-μm dia. (opaque)	0.05-mm dia. (opaque)	0.1-mm dia. (opaque)
Resolution*1	4 μm *2	---	4 μm *3	
Temperature characteristic	0.2% FS/°C			
Ambient illumination	Incandescent lamp: 10,000 ℓx max. (on light-receiving side)			
Ambient temperature	Operating: 0 to 50°C, Storage: –25 to 70°C (with no icing or condensation)			
Degree of protection	IEC60529, IP40			
Connection method	Connector relay (standard cable length: 500 mm)			
Weight (packed state)	Approx. 220 g			
Cable length	Extendable up to 10 m with special extension cable.			
Materials	Case: Polyetherimide, Case cover: Polycarbonate, Unit cover: Glass			
Tightening torque	0.3 N·m max.			
Accessories	Optical axis adjustment seal, sensor head-amplifier connection cable (1.5 m), instruction sheet			

*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

Item / Model	ZX-LDA11-N	ZX-LDA41-N
Measurement period	150 μs	
Possible average count settings*1	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
Temperature characteristic	When connected to a Reflective Sensor Head: 0.01% FS/°C, When connected to a Through-beam Sensor Head: 0.1% FS/°C	
Linear output*2	4 to 20 mA/FS, Max. load resistance: 300 Ω, ±4 V (± 5 V, 1 to 5 V *3), Output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)*1	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.
Laser OFF input, zero reset input, timing input, reset input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)
Functions	Measurement value display, set value/light level/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*4, (A+B) calculations*4, mutual interference*4, laser deterioration detection, zero reset memory, key lock	
Indications	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)	
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: 0 to 50°C, Storage: −15 to 60°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
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, 0.7-mm double amplitude 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)	
Weight (packed state)	Approx. 350 g	
Materials	Case: PBT (polybutylene terephthalate), Cover: Polycabonate	
Accessories	Instruction sheet	

*1. The response speed of the linear output is calculated as the measurement period × (average count setting + 1) (with fixed sensitivity).
The response speed of the judgement outputs is calculated as the measurement period × (average count setting + 1) (with fixed sensitivity).
*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. Z157).

■ Calculating Unit

Item	ZX-CAL2
Applicable Amplifier Units	ZX-LD11-N/41-N, ZX-EDA11/41, ZX-TDA11/41
Current consumption	12 mA max. (supplied from the Smart Sensor Amplifier Unit)
Ambient temperature	Operating: 0 to 50°C, Storage: −15 to 60°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Connection method	Connector
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Insulation resistance	100 MΩ (at 500 VDC)
Vibration resistance (destructive)	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions
Shock resistance (destructive)	300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)
Materials	Display: Acrylic, Case: ABS resin
Weight (packed state)	Approx. 50 g
Accessories	Instruction sheet

■ ZX-series Communications Interface Unit

Item		ZX-SF11
Current consumption		60 mA max. (supplied by the Amplifier Unit)
Applicable Amplifier Units		ZX Series
Applicable Amplifier Unit versions		ZX-LDA□1-N Ver. 1.000 or higher ZX-EDA□1 Ver. 1.100 or higher ZX-TDA□1 Ver. 1.000 or higher
Max. No. of Amplifier Units		5
Communications functions	**Communications port**	RS-232C port (9-pin D-Sub Connector)
	Communications protocol	CompoWay/F*
	Baud rate	38,400 bps
	Data configuration	Data bits: 8, Parity: none, Start bits: 1, Stop bits: 1, Flow control: none
Indicators		Power supply: green, Sensor communications: green, Sensor communications error: red, External terminal communications: green, External terminal communications error: red
Protective circuits		Reverse polarity protection
Ambient temperature		Operating: 0 to 50°C, storage: −15 to 60°C (with no icing or condensation)
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min, Leakage current: 10 mA max.
Materials		Case: PBT (polybutylene terephthalate), Cover: Polycarbonate
Accessories		Instruction sheet, 2 clamps

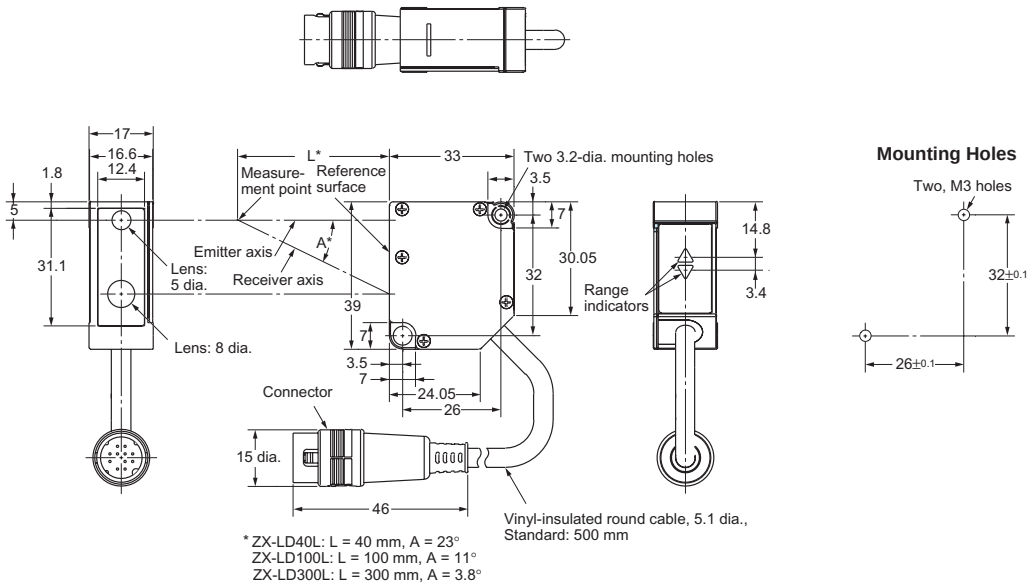
* Contact your OMRON representative for CompoWay/F communications specifications.

Dimensions

(Unit: mm)

■ Sensor Heads (Diffuse Reflective)

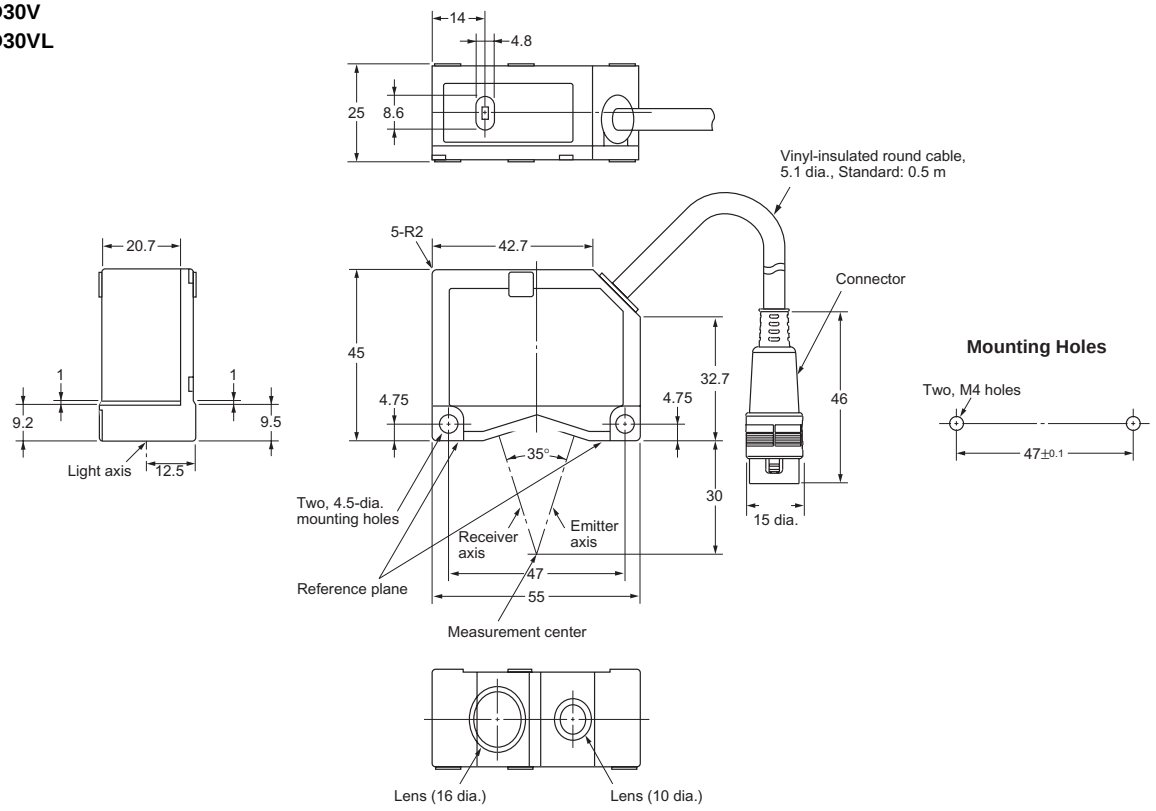
ZX-LD40
ZX-LD100
ZX-LD300
ZX-LD40L
ZX-LD100L
ZX-LD300L



* ZX-LD40L: L = 40 mm, A = 23°
ZX-LD100L: L = 100 mm, A = 11°
ZX-LD300L: L = 300 mm, A = 3.8°

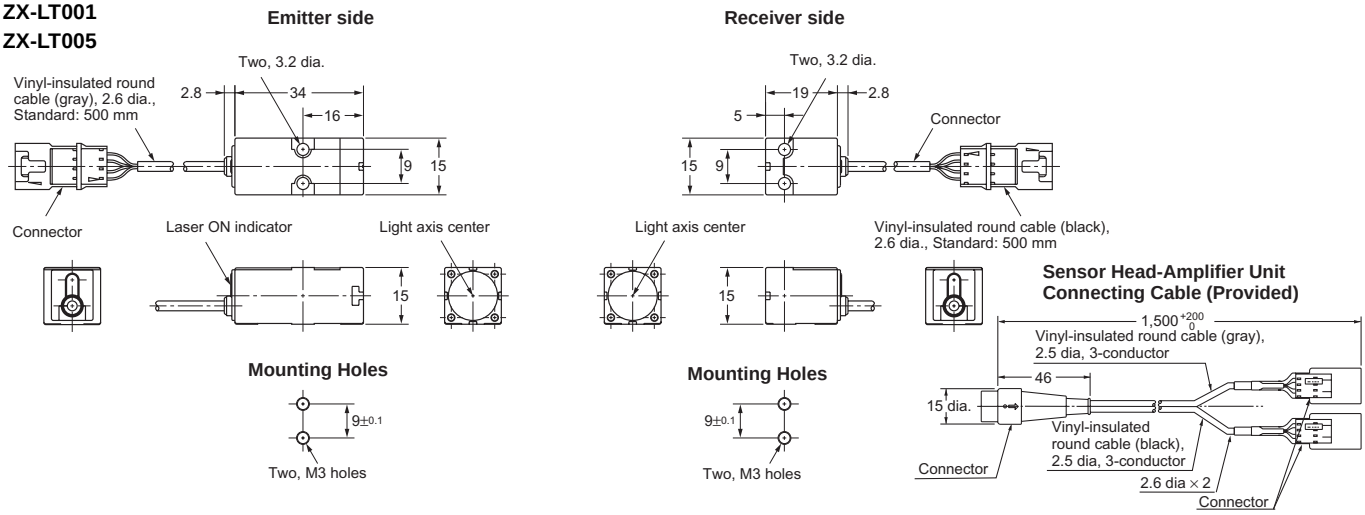
■ Sensor Heads (Regular Reflective)

ZX-LD30V
ZX-LD30VL

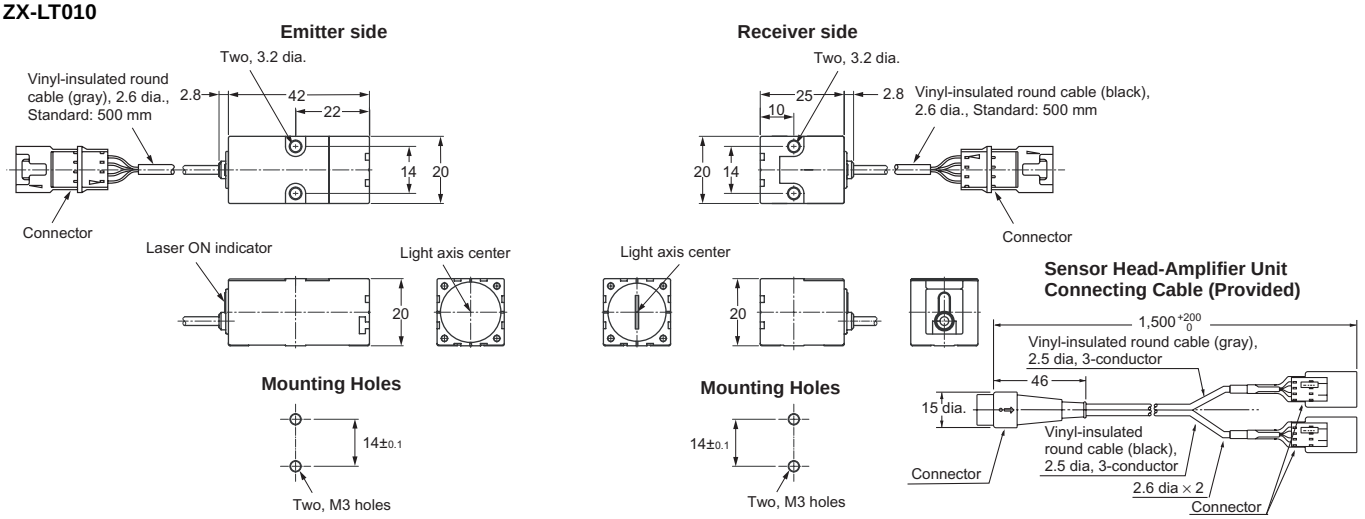


■ Sensor Heads (Through-beam)

ZX-LT001
ZX-LT005

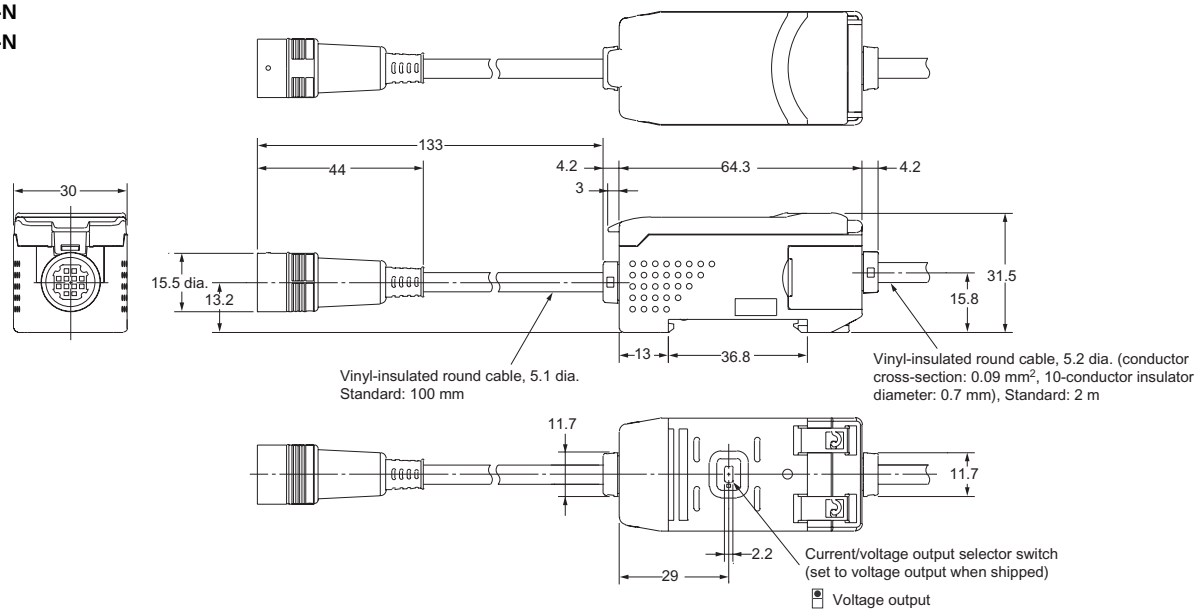


ZX-LT010



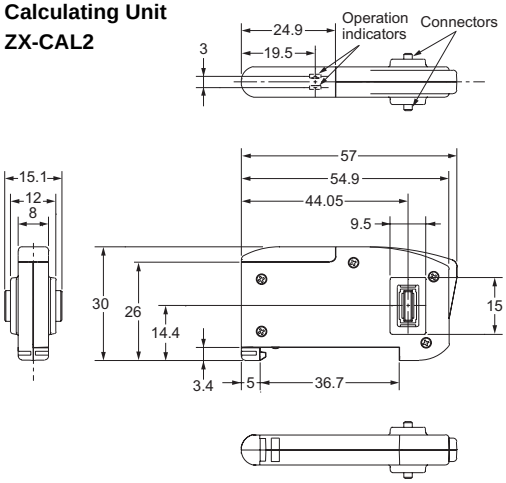
■ Amplifier Units

ZX-LDA11-N
ZX-LDA41-N

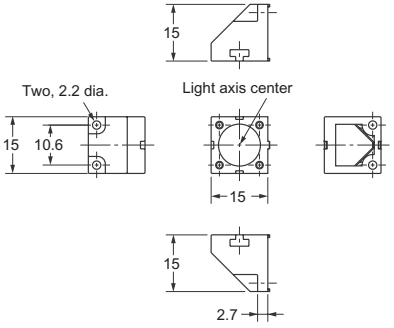


■ Accessories (Order Separately)

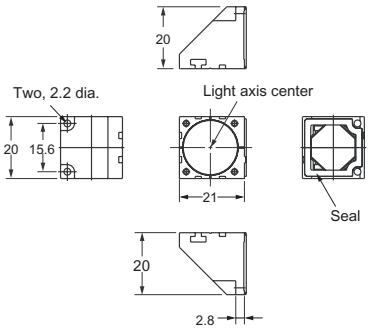
Calculating Unit
ZX-CAL2



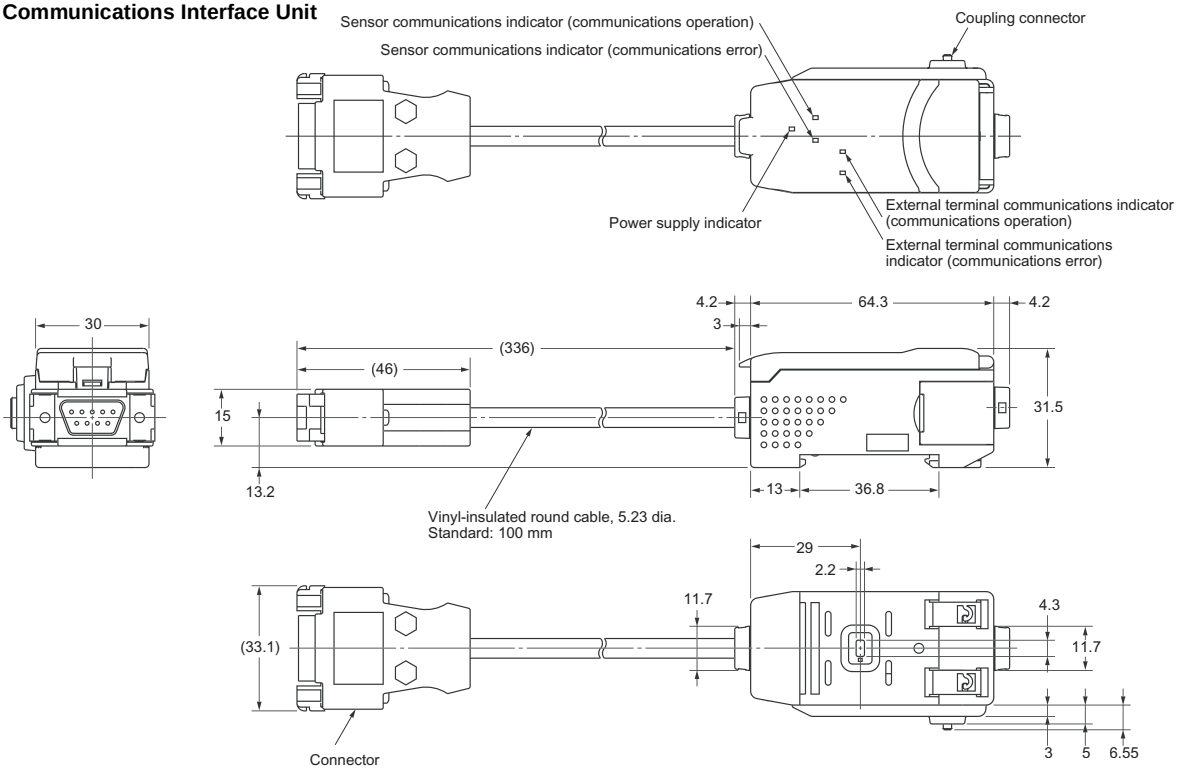
Side-view Attachments
ZX-XF12



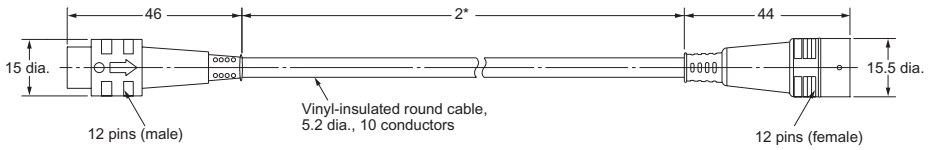
ZX-XF22



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

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.

Sensors with stainless steel Protective Spiral Tubes are also available.

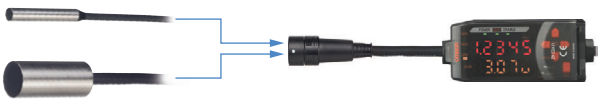
New Flat and Heat-resistive Sensors Broaden Application Possibilities

The temperature characteristic ranks at the top in the industry at 0.1% FS/°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.



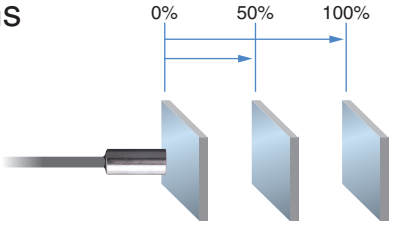
Sensor Head Cords Extendable to 10 m

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

Complete Range of Useful Functions

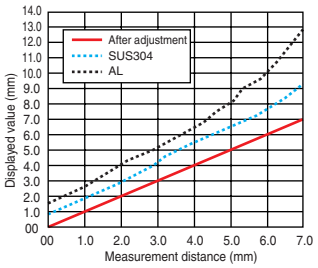
Simple Linearity Adjustment Patent Pending

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.



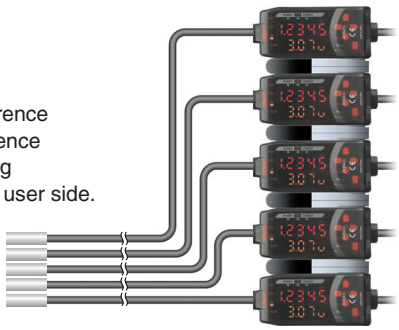
Suitable for Non-ferrous Metals Also

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.



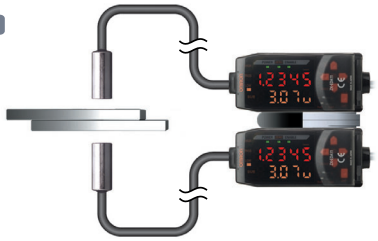
Mutual Interference Prevented for Up to 5 Sensors

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 Patent Pending

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

Ordering Information

■ Sensors

Sensor Heads

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

*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

Appearance	Power supply	Output type	Model
	DC	NPN	ZX-EDA11
		PNP	ZX-EDA41

Note: Compatible connection with the Sensor Head.

Accessories (Order Separately)

Amplifier Mounting Brackets

Appearance	Model	Remarks
	ZX-XBE1	Attached to each Sensor Head
	ZX-XBE2	For DIN track mounting

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

Model			ZX-EDR5T	ZX-ED01T	ZX-ED02T/ EM02T	ZX-EM07MT	ZX-EV04T	ZX-EM02HT
Measurement range			0 to 0.5 mm	0 to 1 mm	0 to 2 mm	0 to 7 mm	0 to 4 mm	0 to 2 mm
Sensing object			Magnetic metals (Measurement ranges and linearities are different for non-magnetic metals.)					
Standard reference object			18 × 18 × 3 mm		30 × 30 × 3 mm	60 × 60 × 3 mm		45 × 45 × 3 mm
			Material: ferrous (S50C)					
Resolution *1			1 μm					
Linearity *2			±0.5% F.S.					±1.0% F.S. *5
Linear output range			Same as measurement range.					
Temperature characteristic *3 (including Amplifier Unit)			0.15% F.S./°C	0.07% F.S./°C				0.1% F.S./°C
Ambient temperature	**Operating *4**		0 to 50°C (with no icing or condensation)	−10 to 60°C (with no icing or condensation)				−10 to 200°C
	Storage *4			−20 to 70°C (with no icing or condensation)				−20 to 200°C
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)					
Insulation resistance			50 MΩ min. (at 500 DC)					
Dielectric strength			1,000 VAC, 50/60 Hz for 1 min between charged parts and case					
Vibration resistance (destruction)			10 to 55 Hz with 1.5-mm double amplitude for 2 h each in X, Y, and Z directions					
Shock resistance (destruction)			500 m/s², 3 times each in X, Y, and Z directions					
Degree of protection (Sensor Head)			IEC60529, IP65	IEC60529, IP67				IEC60529, IP60 *6
Connection method			Connector relay (standard cable length: 2 m)					
Weight (packed state)			Approx. 120 g	Approx. 140 g		Approx. 160 g	Approx. 130 g	Approx. 160 g
Materials	**Sensor Head**	**Case**	Brass	Stainless steel	Brass		Zinc (nickel-plated)	Brass
		Sensing surface	Heat-resistant ABS					PEEK
	Preamplifier		PES					
Accessories			Amplifier Mounting Brackets (ZX-XBE1), Instruction Manual					

*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.

■ Amplifier Units

Model	ZX-EDA11	ZX-EDA41
Measurement period	150 μs	
Possible average count settings *1	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
Linear output *2	Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω Voltage output: ±4 V (± 5 V, 1 to 5 V *3), Output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)	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.
Zero reset input, timing input, reset input, judgement output hold input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)
Function	- Measurement value display - Present value/set value/output value/resolution display - Linearity adjustment (materials selection) - 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 - Average hold - Delay hold - Zero reset - Initial reset - Linearity initialization - ON-delay timer - OFF-delay timer - One-shot timer - Previous value comparison - Non-measurement setting - Direct threshold value setting - Position teaching - Automatic teaching - Hysteresis width setting - Timing inputs - Reset input - Judgement output hold input - Monitor focus - Linear output correction - (A-B) calculations *4 - (A+B) calculations *4 - K-(A+B) calculation *4 - Mutual interference prevention *4 - Sensor disconnection detection - Zero reset memory - Zero reset indicator - Key lock	
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/s^2, 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).
The response speed of the judgement outputs 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).

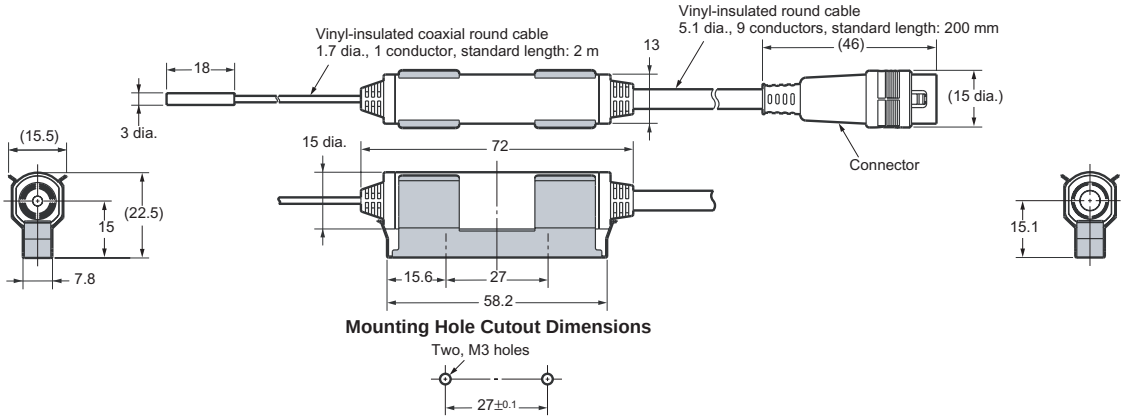
Dimensions

Sensors

Sensor Heads

ZX-EDR5T

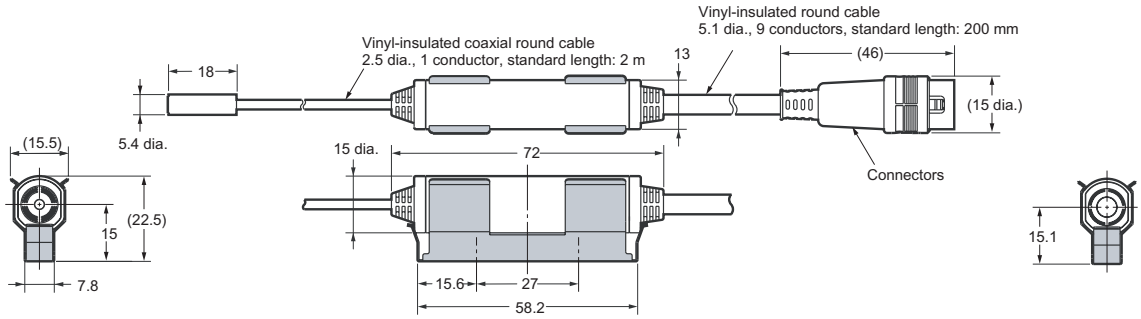
Dimensions with Mounting Bracket Attached



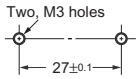
Mounting Hole Cutout Dimensions

ZX-ED01T

Dimensions with Mounting Bracket Attached

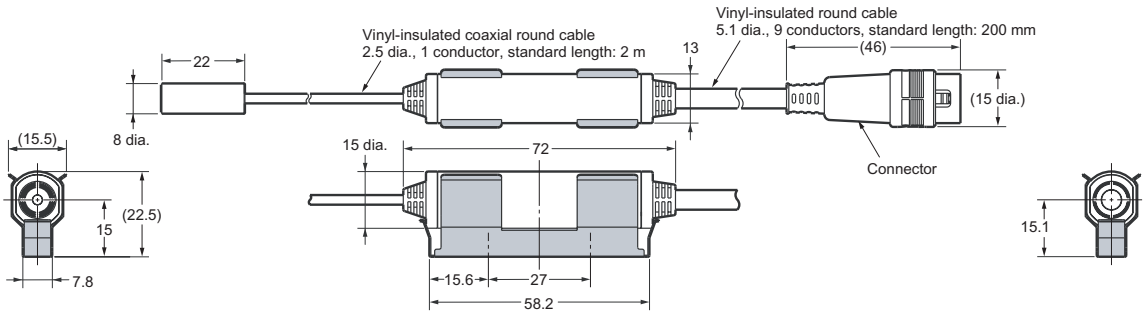


Mounting Hole Cutout Dimensions

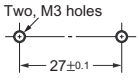


ZX-ED02T

Dimensions with Mounting Bracket Attached

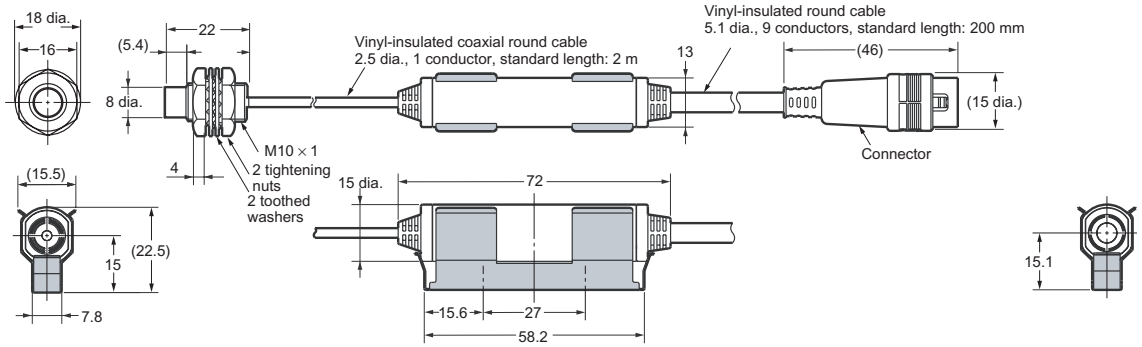


Mounting Hole Cutout Dimensions

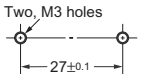


ZX-EM02T

Dimensions with Mounting Bracket Attached

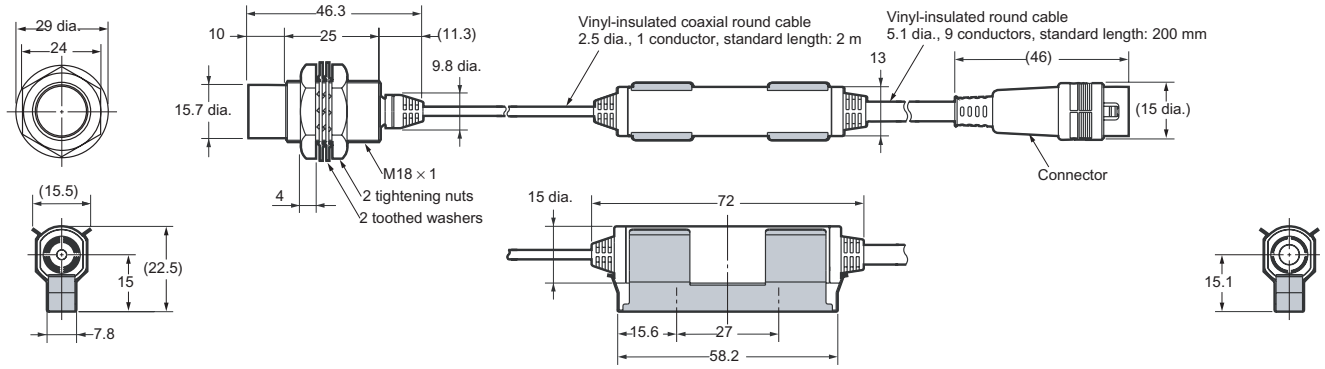


Mounting Hole Cutout Dimensions

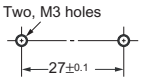


ZX-EM07MT

Dimensions with Mounting Bracket Attached

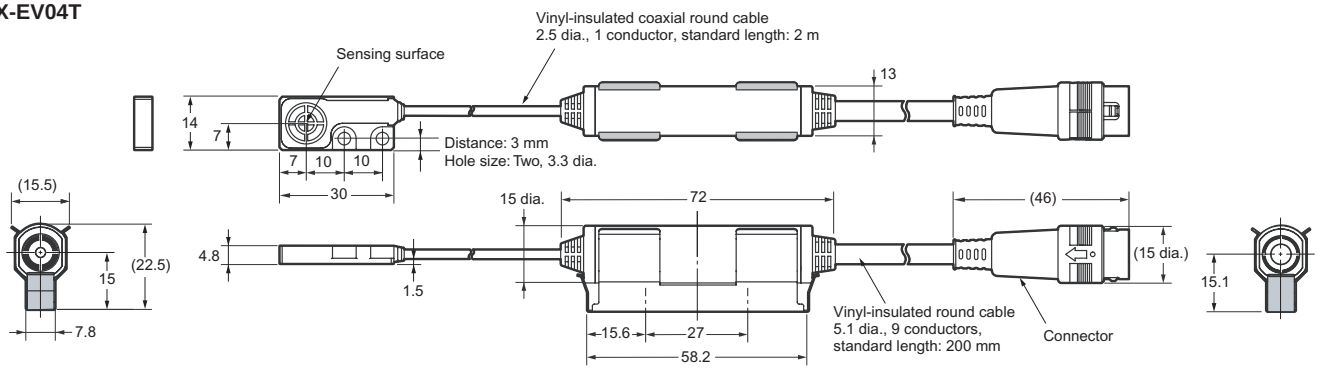


Mounting Hole Cutout Dimensions

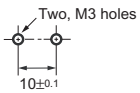


Dimensions with Mounting Bracket Attached

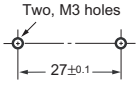
ZX-EV04T



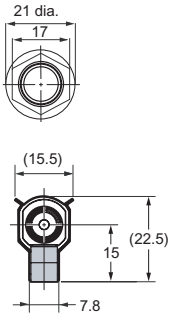
Mounting Hole Cutout Dimensions



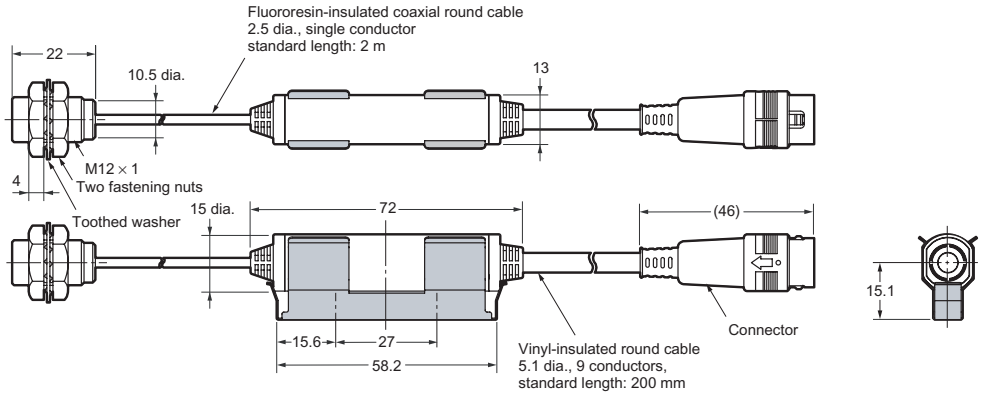
Mounting Hole Cutout Dimensions



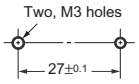
ZX-EM02HT



Dimensions with Mounting Bracket Attached

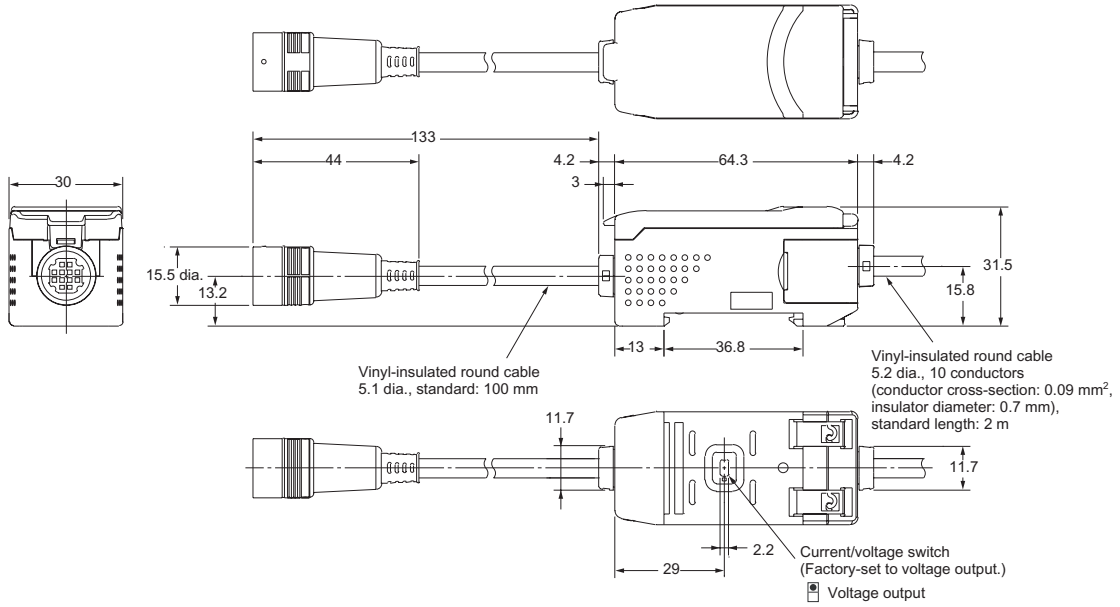


Mounting Hole Cutout Dimensions



Amplifier Units

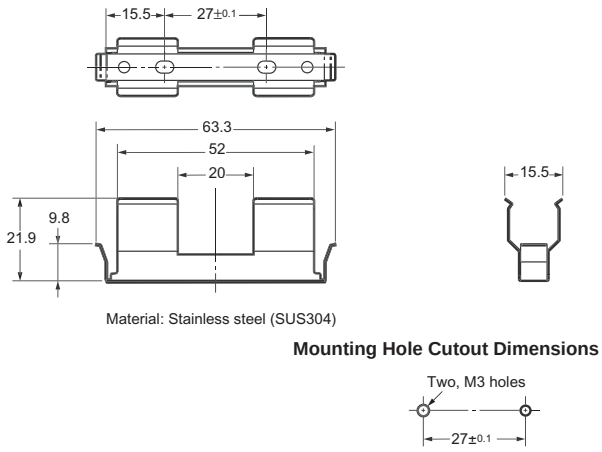
ZX-EDA11
ZX-EDA41



Accessories (Sold Separately)

Preamplifier Mounting Brackets

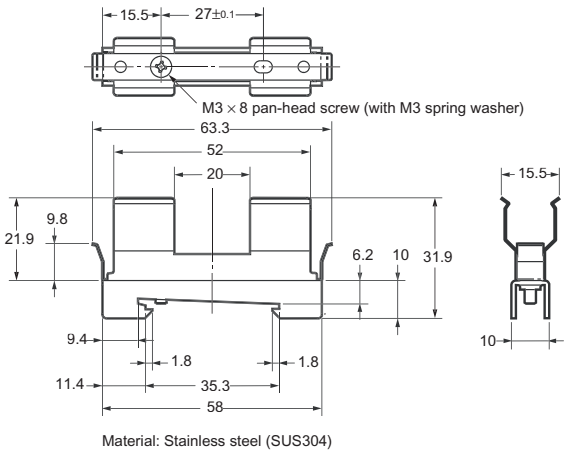
ZX-XBE1



Material: Stainless steel (SUS304)

Mounting Hole Cutout Dimensions

ZX-XBE2



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.

ZX-TDA

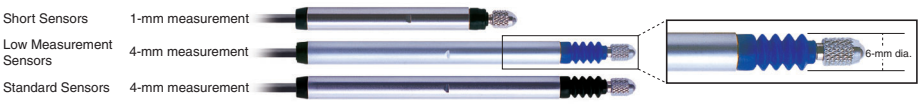
High-precision Contact Sensors

Small & High Accuracy *for* Smart Style!

Highest Level of Detection Performance in the Industry

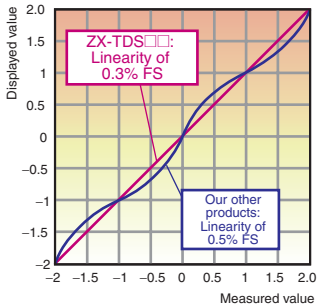
Thinnest Level of Sensor Head in the Industry

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.



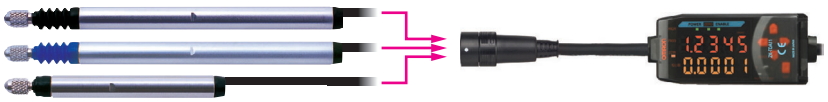
Highest Level of Resolution in the Industry

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.



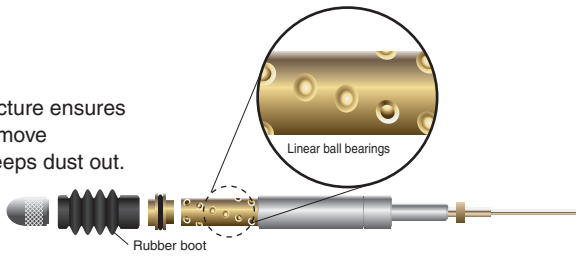
Complete Compatibility between Sensor Heads and Amplifier Units

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

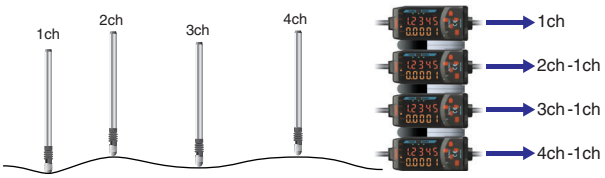
The unique linear ball bearing structure ensures longer life. It has sliding parts that move smoothly and a rubber boot that keeps dust out. Short and Standard Sensors feature IP67 environmental resistance.



Multiple-point Computing Function

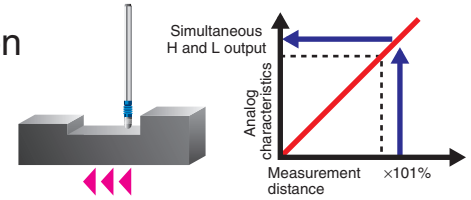
Connect up to 8 Sensor Heads.

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.

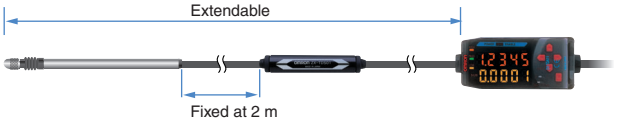


Warm-up Display

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.

ZX-TDA

Ordering Information

■ Sensors

Sensor Heads

Size	Type	Sensing distance	Resolution (See note.)	Model
6 dia.	Short type	1 mm	0.1 μm	ZX-TDS01T
6 dia.	Standard type	4 mm	0.1 μm	ZX-TDS04T
6 dia.	Low measurement type	4 mm	0.1 μm	ZX-TDS04T-L

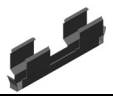
Note: The resolution refers to the minimum value that can be read when a ZX-TDA□1 Amplifier Unit is connected.

■ Amplifier Units

Appearance	Power supply	Output type	Model
	DC	NPN	ZX-TDA11
		PNP	ZX-TDA41

■ Accessories (Order Separately)

Preamplifier Mounting Brackets

Appearance	Model	Remarks
	ZX-XBT1	Attached to each Sensor Head
	ZX-XBT2	For DIN track mounting

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

Item		ZX-TDS01T	ZX-TDS04T	ZX-TDS04T-L
Measurement range		1 mm	4 mm	
Maximum actuator travel distance		Approx. 1.5 mm	Approx. 5 mm	
Resolution *1		0.1 μm		
Linearity *2		0.3% F.S.		
Operating force *3		Approx. 0.7 N		Approx. 0.25 N
Degree of protection (Sensor Head)		IEC60529, IP67		IEC60529, IP54
Mechanical durability		10,000,000 operations min.		
Ambient temperature		Operating: 0°C to 50°C (with no icing or condensation) Storage: −15°C to 60°C (with no icing or condensation)		
Ambient humidity		Operating and storage: 35% to 85% (with no icing or condensation)		
Temperature characteristic *4	Sensor Head	0.03% F.S./°C	0.01% F.S./°C	
	Preamplifier	0.01% F.S./°C		
Vibration resistance (destruction)		10 to 55 Hz with 0.35-mm single amplitude in the X, Y, and Z directions		
Shock resistance (destruction)		150 m/s^2, 3 times each in the X, Y, and Z directions		
Connection method		Connector relay (standard cable length: 2 m)		
Isolation		Isolated (Sensor Head enclosure and I/O lines)		
Weight (packed state)		Approx. 100 g		
Materials	Sensor Head	Stainless steel		
	Rubber boot	Fluorocarbon rubber		Silicon rubber
	Preamplifier	Polycarbonate		
Accessories		Instruction manual, Preamplifier Mounting Brackets (ZX-XBT1)		

*1. The resolution is given as the minimum value that can be read when a ZX-TDA□1 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

Item	ZX-TDA11	ZX-TDA41
Measurement period	1 ms	
Possible average count settings *1	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, or 1,024	
Linear output *2	Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω Voltage output: ±4 V (±5 V, 1 to 5 V), Output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)	NPN open-collector outputs, 30 VDC, 30 mA max. Residual voltage: 1.2 V max.	PNP open-collector outputs, 30 VDC, 30 mA max. Residual voltage: 2 V max.
Zero reset input, timing input, reset input, judgement output hold input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	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 - Display reverse - Sample hold - Self-peak hold - Initial reset - Hysteresis width setting - Judgement output hold input - (A+B) calculations *4 - Zero reset memory - Clamp value setting - Span adjustment - Present value/set value/output value display - ECO mode - Peak hold - Self-bottom hold - Direct threshold value setting - Timing inputs - Monitor focus - Sensor disconnection detection - Function lock - Scale inversion - Warming-up display - Number of display digit changes - Bottom hold, peak-to-peak hold - Zero reset - Position teaching - Reset input - (A-B) calculations *4 - Non-measurement setting - 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.S./°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/s^2, 3 times each in six 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 sheet	

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

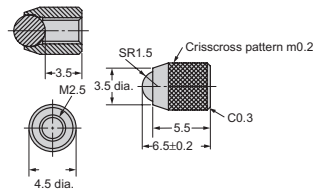
Options (Actuators)

Model		Type (material)	Screw section	Appearance	Application	Applicable Sensor *
						ZX-TDS□T
D5SN-	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 D5SN-TN1/-TF1 or commercially available actuators on ZX-TDS-series Sensors	○

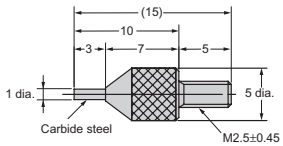
Note: For optional Actuator combinations, the circle means the Actuator is replaceable and the triangle means that a Conversion Adapter is required.

■ Dimensions

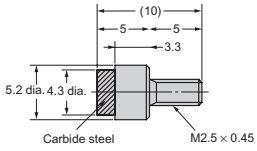
D5SN-TB1/TB2/TB3



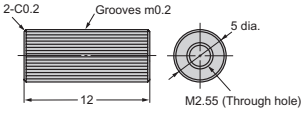
D5SN-TN1



D5SN-TF1



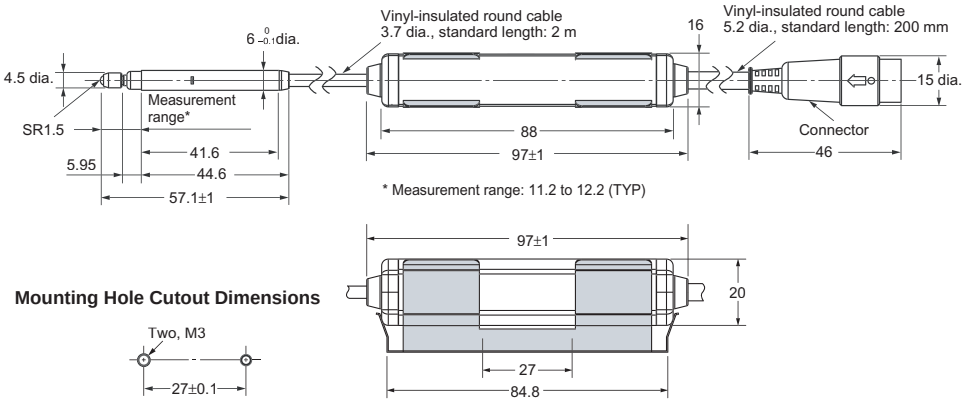
D5SN-TA



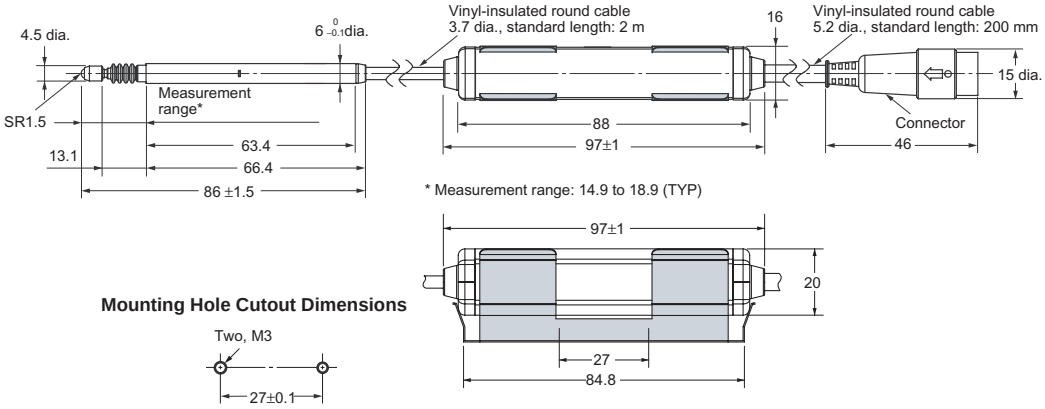
Dimensions

Sensors

ZX-TDS01T

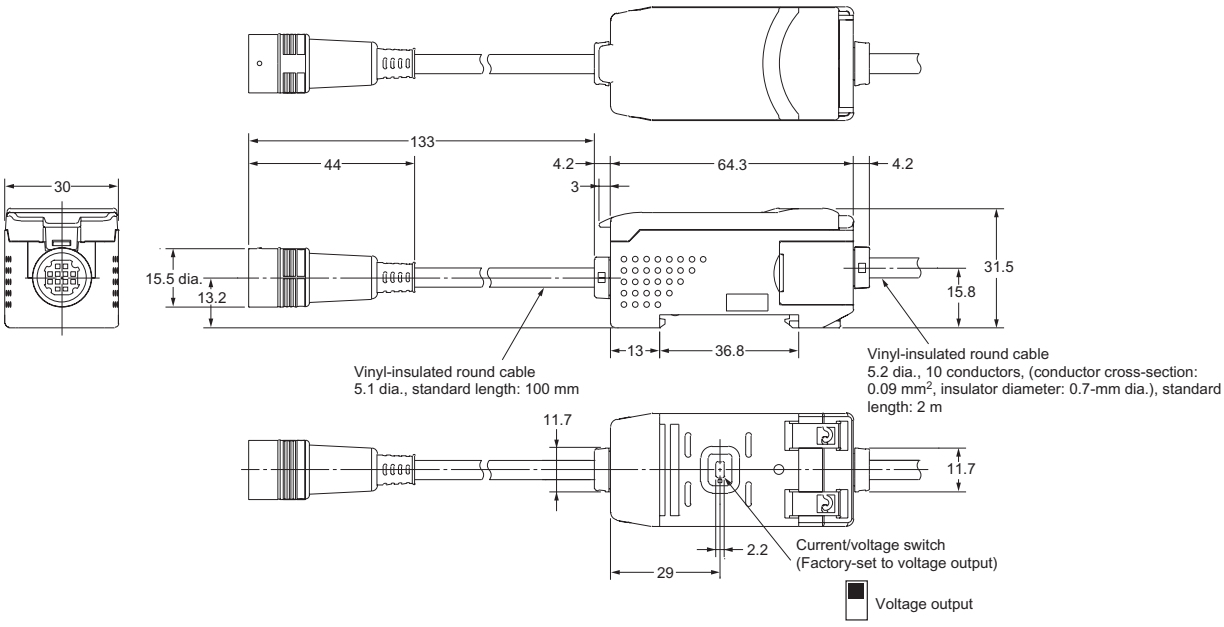


ZX-TDS04T
ZX-TDS04T-L



Amplifier Units

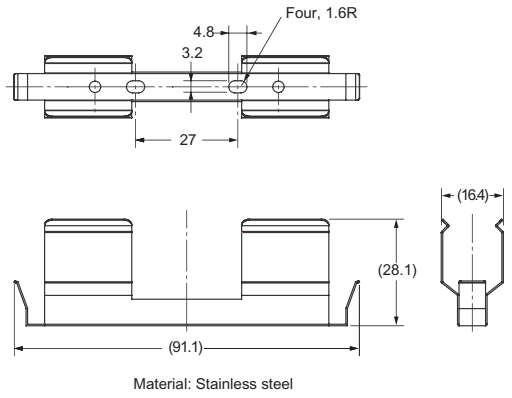
ZX-TDA11
ZX-TDA41



■ Accessories (Order Separately)

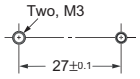
Preamplifier Mounting Bracket (Supplied with Each Sensor)

ZX-XBT1

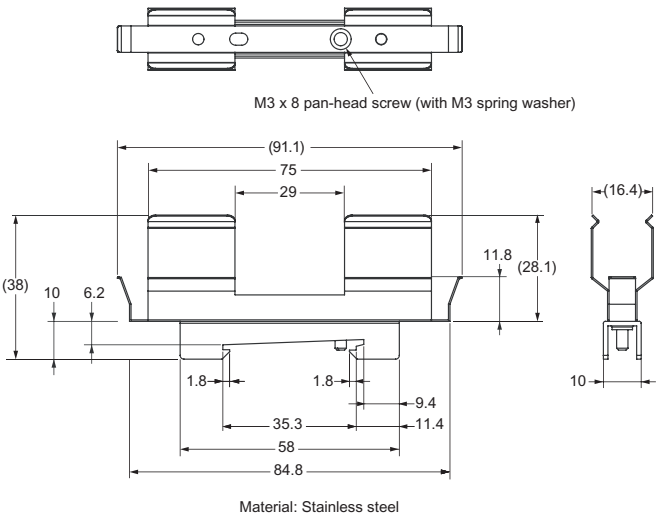


Material: Stainless steel

Mounting Hole Cutout Dimensions



ZX-XBT2 (For DIN Track Mounting)



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-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.

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 duet 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 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, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects 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. Prices; Payment Terms. All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
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 allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
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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 requirements of any government authority.
11. Shipping; Delivery. Unless otherwise expressly agreed in writing by Omron:
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    b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
    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;
    d. Delivery and shipping dates are estimates only; and
    e. Omron will package Products as it deems proper 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 occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
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17. Export Controls. Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (iii) sale of products to "forbidden" or other proscribed persons; and (ii) disclosure to non-citizens of regulated technology or information.
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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 in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
   (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
   (ii) Use in consumer products or any use in significant quantities.
   (iii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
   (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
   NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
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ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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Cat. No. E351-E1-02 8/06 Specifications subject to change without notice Printed in USA