Displacement Sensors / Width-measuring Sensors

Smart Laser Sensor

ZX-L

Unique Plug & Play Measurement Concept for Precise Measurement

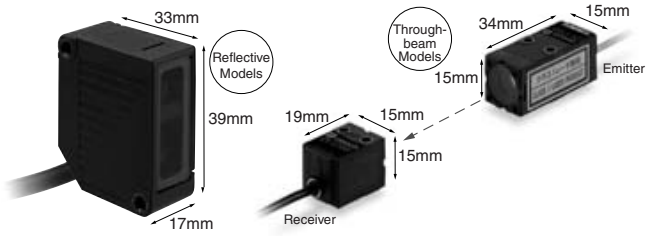
A multitude of "smart" functions packed in a small amplifier. Full line-up of heads for different detection methods and micron detection performance

Features

The world's smallest and lightest laser sensor.

It is the world's lightest. A body size similar to a photoelectric sensor permits space conservation and solves installation space problems.
Naturally, we have also achieved a high-speed response on the same level as a photoelectric sensor.

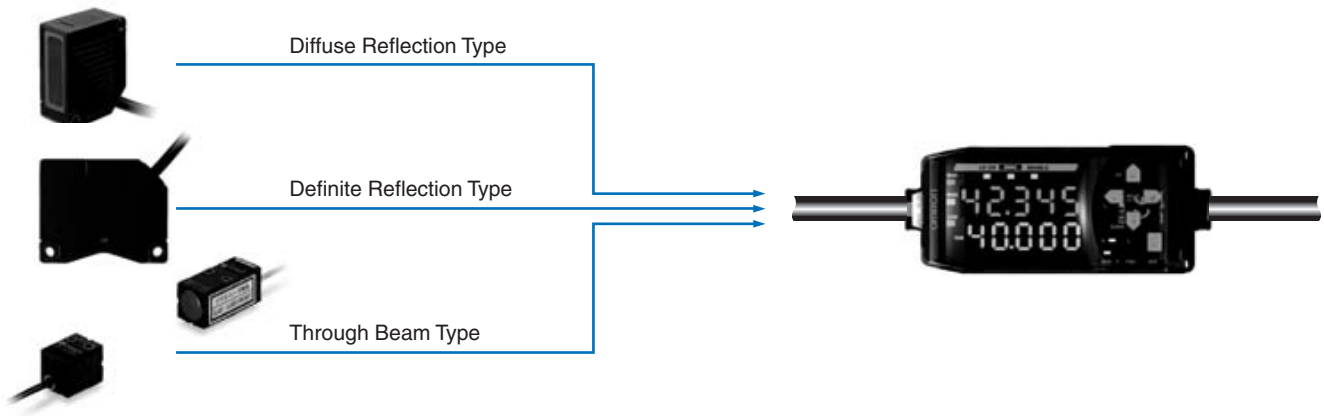
* High-speed sampling: 0.15 ms (response speed: 0.3 ms)



Platform architecture as a optimum solution

Platform architecture allows users to configure a variety range of sensor-heads to one amplifier.

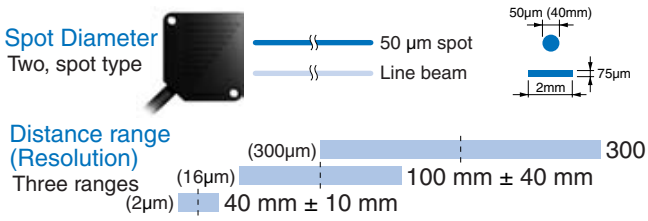
Plug & Play provides easy sensorhead replacement and easy maintenance.

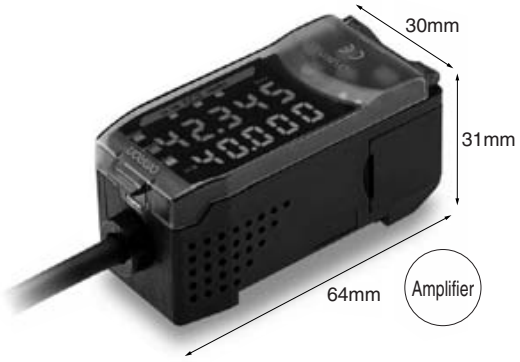


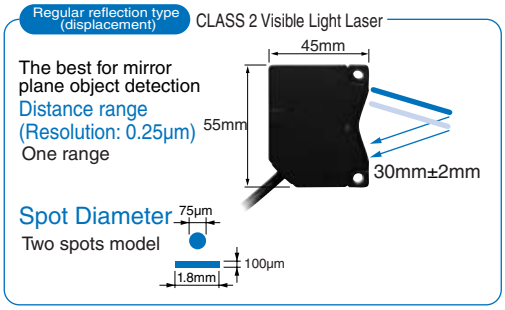
Our line-up includes 8 reflective-type models and 3 Through-beam-type models.

Reflective Models Class 2 visible-light laser

Minute work is detected by a spot beam, and regular work is detected by a line beam.
Smart adaptation to meet the needs of the application.
Furthermore, the system seamlessly covers a measurement range of 28 mm to 500 mm.



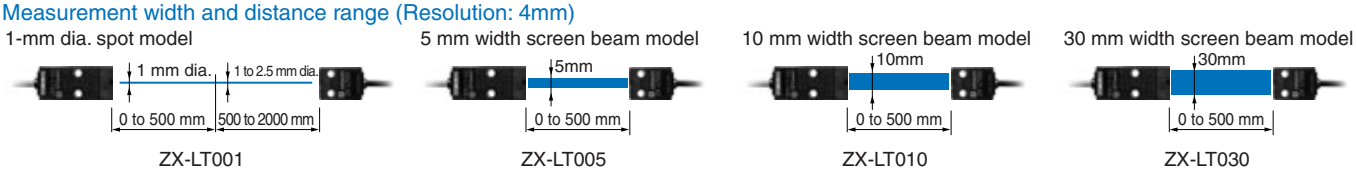




Through-beam Models Class 1 visible-light laser

High-precision positioning is accomplished with a 1 mm dia. spot beam, and area detection is accomplished with a 5 mm width / 10 mm width screen beam.

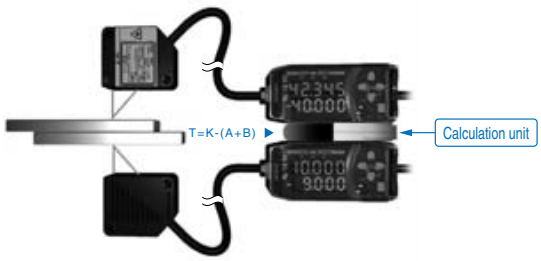
Measurement width and distance range (Resolution: 4mm)



Many useful functions are provided.

Calculation settings that eliminate the need for a digital panel meter Patent pending

A calculation unit can be inserted between two amplifiers to display the calculation results of two sensor units on one of the amplifiers. Settings are accomplished by simply entering the necessary parameters in one of the amplifiers.



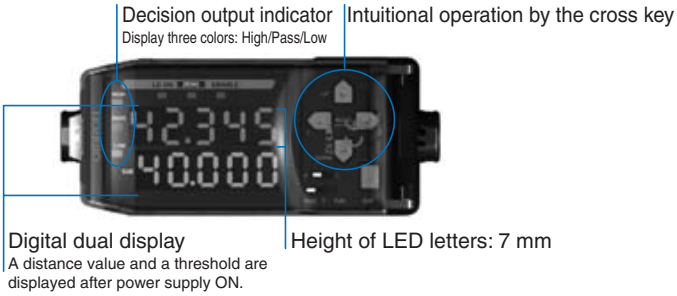
Includes a sensor life monitor.

The laser diode (LD) life is detected automatically and the operator alerted.

When LD deterioration is detected, the sub-display alerts you. This gives you time to take action before the LD dies.

Top priority is given to easy operation.

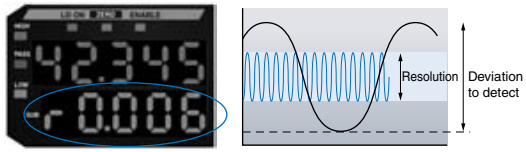
Sophisticated functions and high performance, with ease of use. This is a key feature of the ZX-L-Series. The interface comes from our E3X-DA-N* Digital Fiber Amplifier. Feel how simple it is to operate.



*E3X-DA-N

Obtain the resolution with ease Patent pending

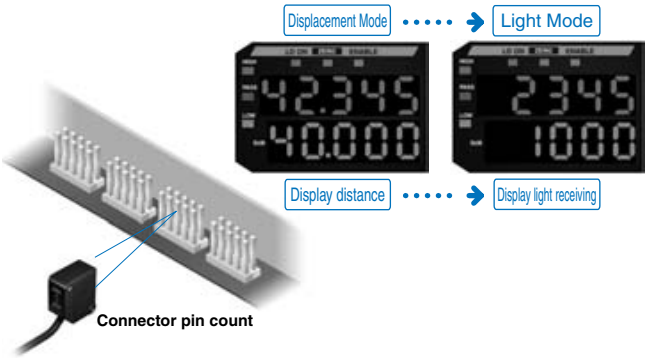
Simply perform detection of the work you wish to test, and you can check the resolution.
The resolution is displayed so you can check how much fluctuation there is to the threshold setting and decide whether detection is possible with certitude.



Reflective Models

Light intensity mode for high-performance laser photoelectric detection

Light intensity detection is possible using the minute spot of the laser beam. The sensor be used not only as a displacement meter, but also as a high-precision laser photoelectric sensor for detection of minute work with a background object and color difference. Select displacement mode or light intensity mode as appropriate for the application to establish the optimum function settings.



Through-beam Models

Multiple teaching functions.

Positioning / 2-point / auto-matching

Includes three types of teaching functions on the same level as a photoelectric sensor.

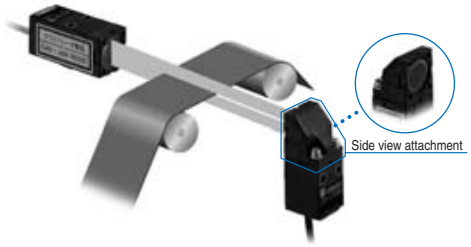
Positioning teaching
Ideal for high-precision positioning applications.

Two-point teaching
Ideal for detection of minute level differences between two points.

Automatic teaching
Ideal for applications where teaching is performed without stopping the work.

Install in any direction.

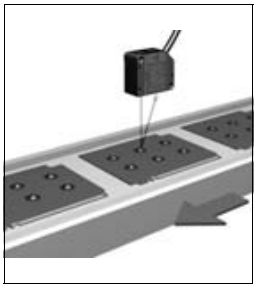
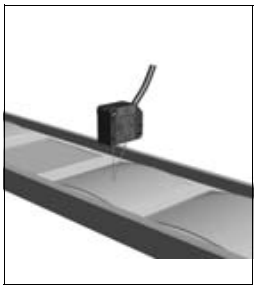
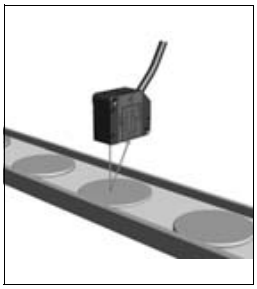
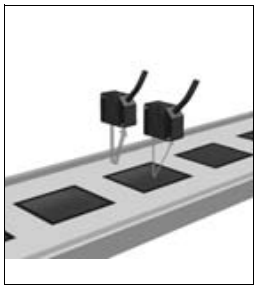
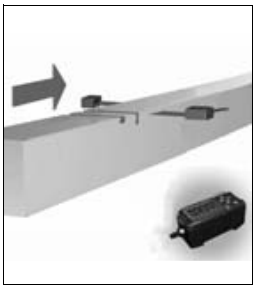
A side viewer attachment (optional) can be installed to enable various installations



Wide variety of easy-to-use functions.

Scaling, display reverse, display off mode, ECO mode, change number of display digits, measurement processing (various timer functions and hold functions), threshold value settings, input/output settings, mutual interference (when using a computing unit), function lock, initial reset, zero reset, differential function, sensitivity selection, monitor focus, etc.

Application

NORMAL Height measurement of a minute object	POSITION Face positioning	P-P Face swing/ eccentricity	EDGE Sheet count	THICK Thickness of object with flutter
				
PEAK BOTTOM Detection of warping / level difference	SELF Continuous measurement	A-B Detection of presence of thin object	APERTURE Gap detection	OUTSIDE Shape detection
				

Features

Connect to a computer for full use of sensor performance.

Use the computer monitor screen for enhanced panel display.
Easy processing of detection results such as waveform monitor and data logging results, which used to make system configuration more easy.

Quality control as you desire.

Data logging

Log detection data and manage a status history for effective and efficient quality control and implementation of countermeasures for problems.

*** Screen images may in some cases differ from the actual product.**

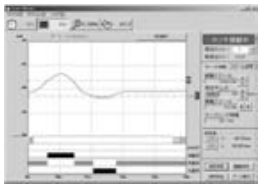
Settings are supported by a list display

Settings that are complicated if the amplifier panel must be used can be easily accomplished by referring to the Function menu. The settings can also be easily imported to and exported from a text editor.

Waveform monitoring function

Easy monitoring of waveforms, which was previously only possible with an oscilloscope. Plenty of easy-to-use functions, such as drag and drop threshold value setting.

Waveform monitoring



Summary of PC software specifications

Digital numerical value monitoring

- Tolerance direct threshold value setting
- Various teaching settings

Waveform monitoring

- Waveform collection
- Waveform observation/editing
- Waveform saving/reading

Data logging

- Various collection condition settings
- Supports Microsoft Excel

Configuration function

- Amplifier unit function settings (observation scaling, input scaling, etc.)
- Saving/reading of amplifier setting conditions

Ordering Information

Sensors

Sensor head (reflection type)

Optical method	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 reflection type	Spot beam	30 ± 2 mm	0.25 µm	**ZX-LD30V**
	Line beam			**ZX-LD30VL**

* At average count of 4,096 times

Sensor head (transmissive type)

Optical method	Measurement width	Sensing distance	Resolution *	Model
Through-beam	1 mm dia.	0 to 2,000 mm	4 µm	**ZX-LT001**
	5 mm	0 to 500 mm		**ZX-LT005**
	10 mm			**ZX-LT010**
	30 mm		12 µm	**ZX-LT030**

* At average count of 64 times

Amplifier Units

Shape	Power supply	Output specifications	Model
	DC	NPN output	**ZX-LDA11-N**
		PNP output	**ZX-LDA41-N**

Note: Compatible with sensor head connection.

Accessories (Order Separately)

Computing unit

Shape	Model
	**ZX-CAL2**[*1]

[*1] Calculation Units are required to connect two or more sensors

Side view attachment

Shape	Suitable sensor head	Model
	ZX-LT001 ZX-LT005	**ZX-XF12**
	ZX-LT010	**ZX-XF22**

Extension cable for robot application

Cable length	Model	Quantity
1m	**ZX-XC1R**	1 pc.
4m	**ZX-XC4R**	
8m	**ZX-XC8R**	
9m	**ZX-XC9R**	

"Smart monitor" communication interface and Setup Tool for Personal Computer and PLC

Shape	Name	Model
	ZX-L-series Communication Interface Unit	**ZX-SF11**
 + CD-ROM	ZX-series Communication Interface Unit + ZX-L-series Sensor Setup and Logging Software	**ZX-SFW11E V3**
CD-ROM	ZX-L-series Sensor Setup and Logging Software	**ZX-SW11E V3**

Two-sided connector cable (for extension)

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

* Only for reflective types.

Rating/Performance

Sensor head (reflection type)

Item Model	ZX-LD40	ZX-LD100	ZX-LD300	ZX-LD30V	ZX-LD40L	ZX-LD100L	ZX-LD300L	ZX-LD30VL
Optical method	Diffuse reflection			Regular reflection	Diffuse reflection			Regular reflection
Light source (wave length)	Visible-light semiconductor laser (wavelength 650 nm, 1 mW or less, Class 2)							
Measurement center distance	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 diameter *1	50 mm dia.	100 mm dia.	300 mm dia.	75 mm dia.	75 μm x 2mm	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% F.S. (entire range)	±0.2% F.S. (80 to 121 mm)	±2% F.S. (200 to 401 mm)	±0.2% F.S. (entire range)	±0.2% F.S. (32 to 49 mm)	±0.2% F.S. (80 to 121 mm)	±2% F.S. (200 to 401 mm)	±0.2% F.S. (entire range)
Temperature drift*4	±0.03% F.S./°C (±0.1% F.S./°C for ZX-LD300/ZX-LD300L)							
Ambient illuminance	Incandescent lamp: 3,000 lux max.							
Ambient temperature	Operating: 0°C to 50°C, Storage: -15°C to 60°C (with no icing or condensation)							
Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)							
Insulation resistance	20 MΩ at 500 VDC							
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute							
Vibration resistance	10 to 150 Hz, 0.7 mm double amplitude for 80 minutes each in X, Y, and Z directions							
Shock resistance	300 m/s^2, 6 directions, 3 times each (up-down, left-right, forward-backward)							
Protective structure	IEC 60529 IP50			IEC Standard IP40	IEC 60529 IP50			IEC Standard IP40
Connection method	Junction connector (standard length: 500 mm)							
Weight (Packed state)	Approx. 150 g			Approx. 250 g	Approx. 150 g			Approx. 250 g
Material	Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass			Case, Cover: Aluminum Lens: Glass	Case: PBT (polybutylene terephthalate), Cover: Aluminum, Lens: Glass			Case, Cover: Aluminum Lens: Glass
Accessories	Operation manual, laser warning labels (English characters)							

*1. Beam diameter: This is the value of the measurement center distance (actual value), and is defined at 1/e^2 (13.5%) of the central light intensity. If there is stray light outside, the defined area and the area around the object has a higher reflectance than the object,

*2. Resolution: Indicates the amount of fluctuation (±3 δ) in the linear output when connected to the ZX-LDA. (The measured value when the average count of the ZX-LDA is set to 4,096 and our standard object (white ceramic) is used for the central distance.) This indicates the repeatability precision when the work is in a static state, and does indicate the distance precision. The resolution performance may not be satisfactory in a strong electromagnetic field.

*3. Linearity: This indicates the error with respect to the ideal straight line of the displacement output when measuring our standard object.

*4. Temperature characteristic: The value when the distance between the sensor and the object (our standard object) is fixed using an aluminum jig. (Measured at the measurement center distance.)

Note: When an object has a high reflectance, detection errors are possible outside the measurement range.

Sensor head (transmissive type)

Item Model	ZX-LT001		ZX-LT005	ZX-LT010	ZX-LT030
Optical method	Through-beam				
Light source (wave length)	Visible-light semiconductor laser (wavelength 650 nm, 1 mW or less, Class 1)				
Measurement width	1 mm dia.	1 to 2.5 mm dia.	5 mm	10 mm	30 mm
Sensing distance	0 to 500 mm	500 to 2,000 mm	0 to 500 mm		
Min. sensing object	8 mm dia. Opaque object	8 to 50 µm Opaque object	Opaque: 0.05 mm dia.	Opaque: 0.1 mm dia.	Opaque: 0.3 mm dia.
Resolution*1	4 µm*2	---	4 µm*3		12 µm
Temperature drift	0.2%F.S./°C				0.3%F.S./°C
Ambient illuminance	Incandescent lamp: 3,000 lux max.				Incandescent lamp: 10,000 lux max.
Ambient temperature	Operating: 0°C to 50°C, Storage: -25°C to 70°C (with no icing or condensation)				
Protective structure	IEC 60529 IP40				IP 40
Cable length	Can be extended to 10 m with the special extension cable.				
Material	Case: polyetherimide, case cover: polycarbonate, front cover: glass				Zinc-die-cast
Clamping torque	0.3 N²m max.				
Accessories	Optical axis adjustment seal, sensor head - amplifier unit connector cable, operation manual				Mounting bracket

*1. The amount of fluctuation (±3 δ) of the linear output when connected to an amplifier unit, converted to a detection span.
*2. When the average count is 64.5 µm when the count is 32. The value when the smallest detection object shades the vicinity of the center of the 1 mm dia. detection span.
*3. When the average count is 64.5 µm when the count is 32.

Amplifier Units

Item Model	ZX-LDA11	ZX-LDA41
Measurement period	150 µs	
Possible average count settings *1	1/2/4/8/16/32/64/128/256/512/1,024/2,048/4,096 times	
Temperature drift	When reflective head is connected: 0.01% F.S./°C, when transmissive head is connected: 0.1% F.S./°C	
Linear output *2	4 to 20 mA/F.S., maximum load resistance of 300 Ω ±4 V (±5 V, 1 to 5 V *3), output impedance of 100 Ω	
Decision output (HIGH/PASS/LOW: 3 outputs) *1	NPN open collector output, 30 VDC 50 mA max., residual voltage 1.2 V or less	PNP open collector output, 30 V DC 50 mA max., residual voltage 2 V or less
Laser OFF input / zero reset input / timing input / reset	When ON: supply voltage 1.5 V or less, when OFF: open circuit (maximum leakage current 0.1 mA or less)	When ON: supply voltage 1.5 V or less, when OFF: open circuit (maximum leakage current 0.1 mA or less)
Functions	Measurement value display, setting value and incident level and resolution display, scaling, display reverse, display off mode, ECO mode, change number of display digits, 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, differential, sensitivity selection, keeping clamp change, threshold value settings, positioning teaching, two-point teaching, automatic teaching, hiss width variable, timing input, reset input, monitor focus, (A-B) operation, (A+B) operation *4, mutual interference *4, laser degradation detection zero reset memory, function lock	
Indicator lamp	Operation indicator lamp: high (orange), pass (green), low (yellow), 7-segment digital main display (red), 7-segment digital sub-display (yellow), laser ON (green), zero reset (green), enable display (green)	
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p) : 10% max.	
Current consumption	200 mA or less (when sensor is connected)	
Ambient temperature	Operating: 0°C to 50°C, Storage: -15°C to 60°C (with no icing or condensation)	
Ambient humidity	Operating/Storage: 35% to 85% RH (with no condensation)	
Insulation resistance	20 M Ω at 500 VDC	
Dielectric strength	1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance	10 to 150 Hz, 0.7 mm double amplitude for 80 minutes each in X, Y, and Z directions	
Shock resistance	300 m/s², 6 directions, 3 times each (up-down, left-right, forward-backward)	
Protective structure	---	
Connection method	Pre-wired models (standard length: 2 m)	
Weight (Packed state)	Approx. 350 g	
Material	Case: PBT (polybutylene terephthalate), Cover: Polycarbonate	
Accessories	Instruction manual	

*1. The response speed of linear output (when the sensitivity is fixed) is calculated as (measurement period) x (average count setting + 1).
The response speed of decision output (when the sensitivity is fixed) is calculated as (measurement period) x (average count setting + 1).
*2. Current/voltage can be switched using the switch on the bottom of the amplifier unit.
*3. Can be set with the monitor focus function.
*4. Computing unit is required.

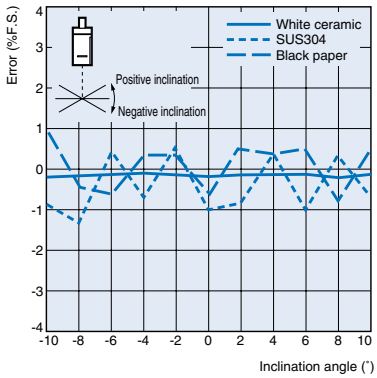
Characteristic data (typical)

Angle characteristics (reflective type)

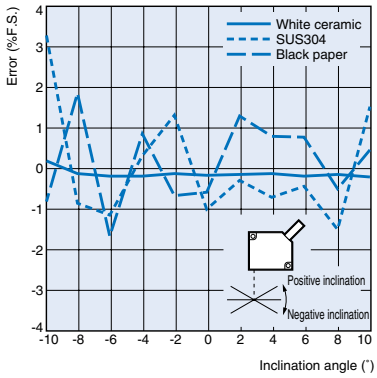
The angle characteristics are a plot of the inclination of the measured object vs. errors occurring in linear output at the measurement center distance.

ZX-LD40

Angular properties of vertical inclination

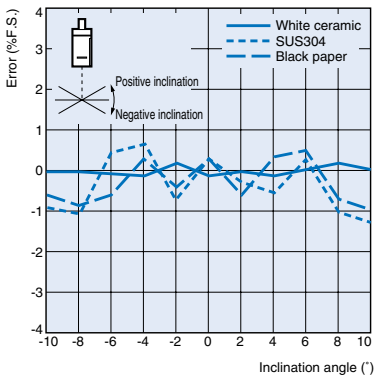


Angle characteristics with respect to horizontal inclination

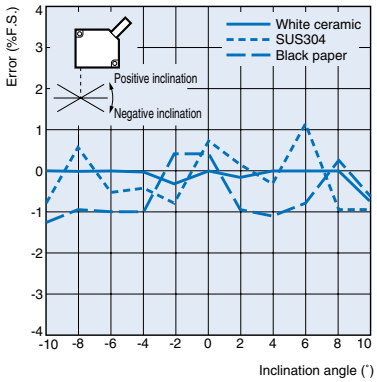


ZX-LD100

Angular properties of vertical inclination

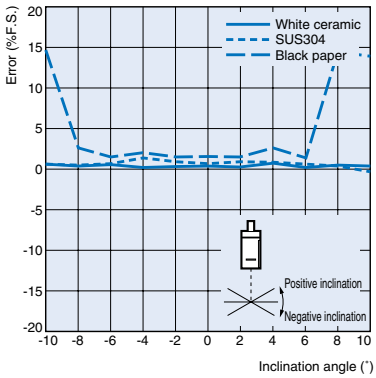


Angle characteristics with respect to horizontal inclination

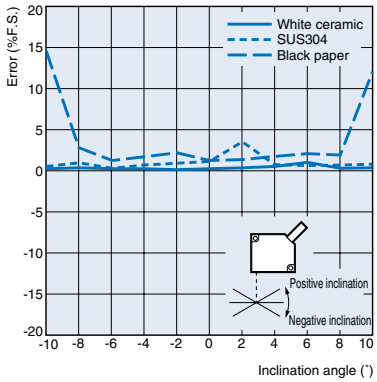


ZX-LD300

Angular properties of vertical inclination

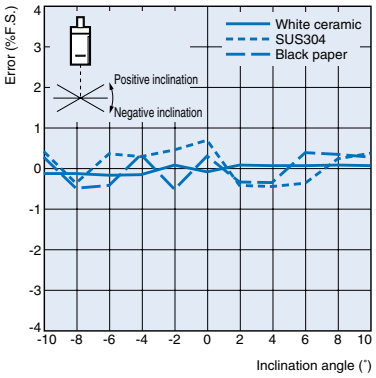


Angle characteristics with respect to horizontal inclination

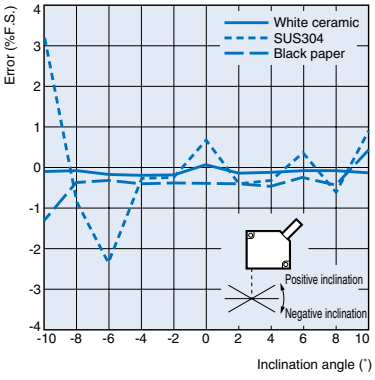


ZX-LD40L

Angular properties of vertical inclination

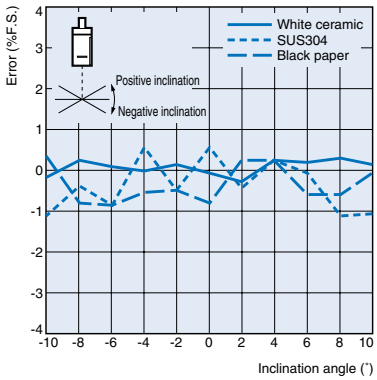


Angle characteristics with respect to horizontal inclination

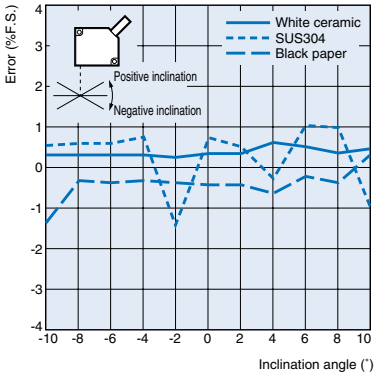


ZX-LD100L

Angular properties of vertical inclination

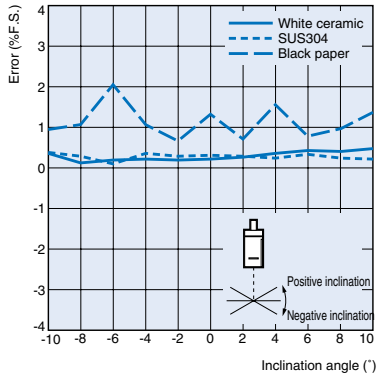


Angle characteristics with respect to horizontal inclination

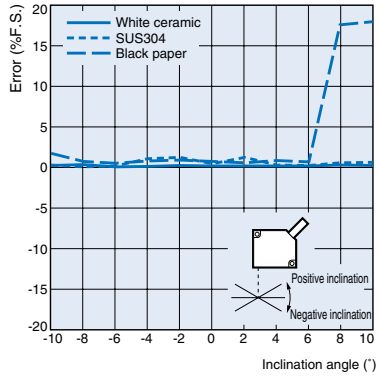


ZX-LD300L

Angular properties of vertical inclination

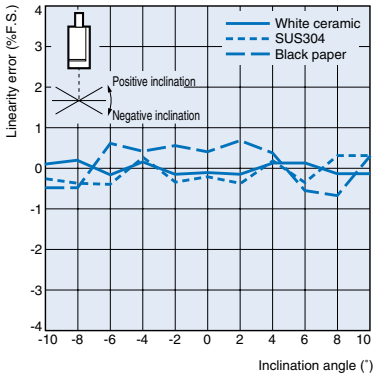


Angle characteristics with respect to horizontal inclination

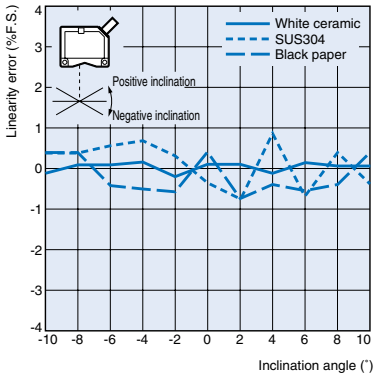


ZX-LD30V

Angular properties of vertical inclination

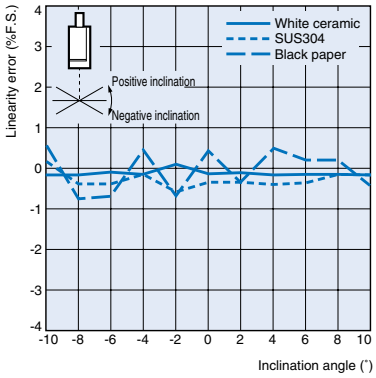


Angle characteristics with respect to horizontal inclination

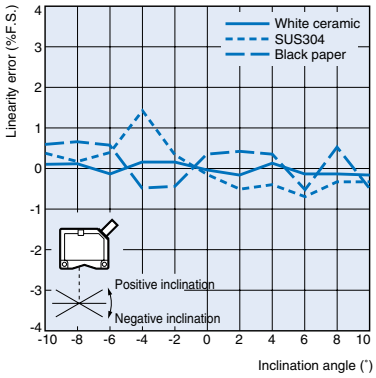


ZX-LD30VL

Angular properties of vertical inclination



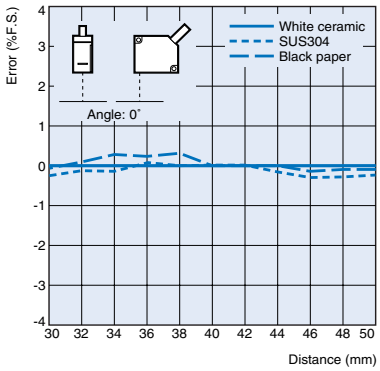
Angle characteristics with respect to horizontal inclination



Linearity characteristics depending on material (reflective type)

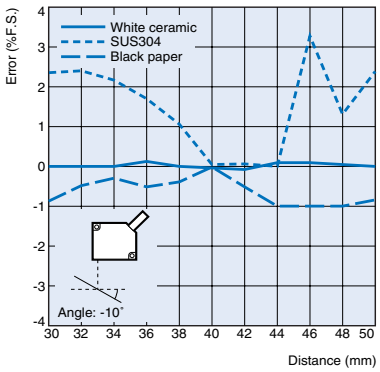
ZX-LD40

Inclination angle 0°

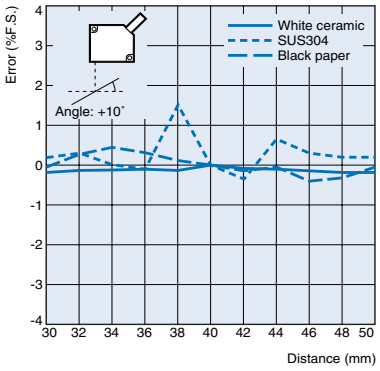


In case of a horizontal inclination

Inclination angle -10°

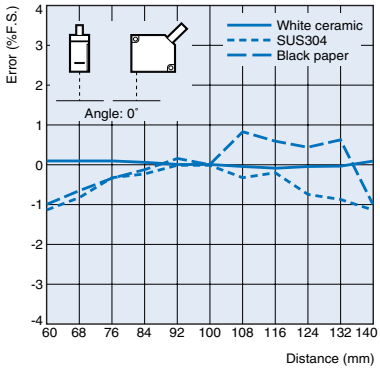


Inclination angle +10°



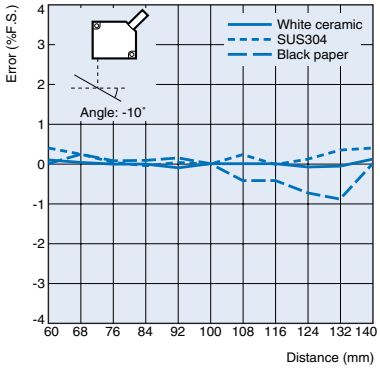
ZX-LD100

Inclination angle 0

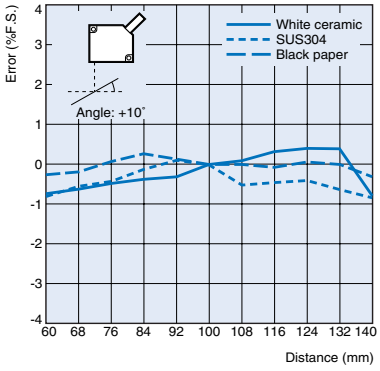


In case of a horizontal inclination

Inclination angle -10°

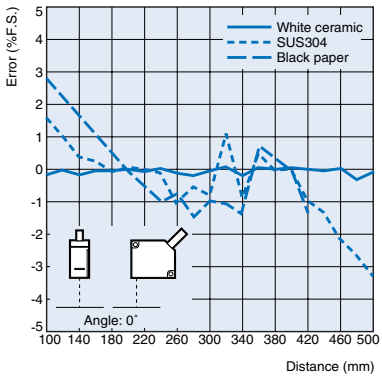


Inclination angle +10°



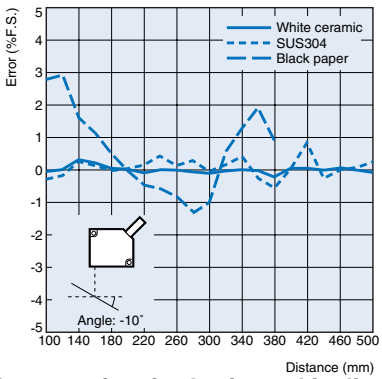
ZX-LD300

Inclination angle 0°

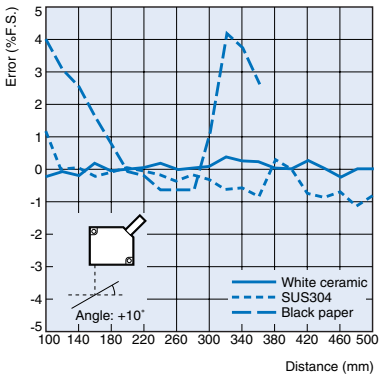


In case of a of a horizontal inclination

Inclination angle -10°

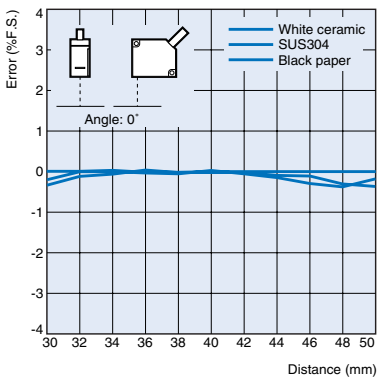


Inclination angle +10°



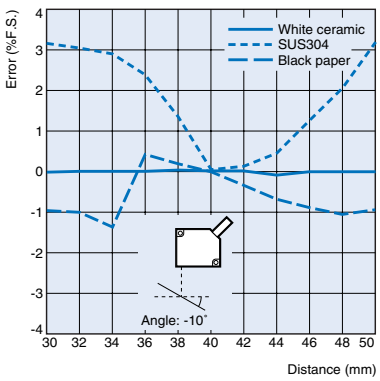
ZX-LD40L

Inclination angle 0°

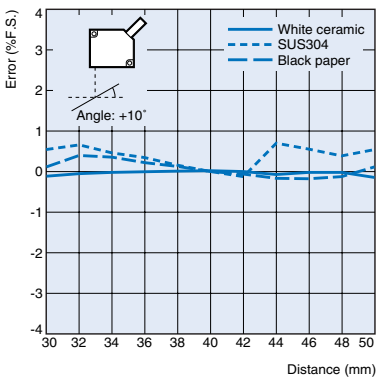


In case of a of a horizontal inclination

Inclination angle -10°

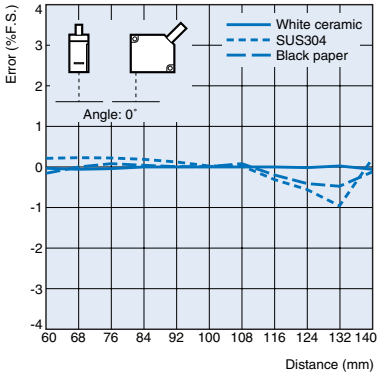


Inclination angle +10°



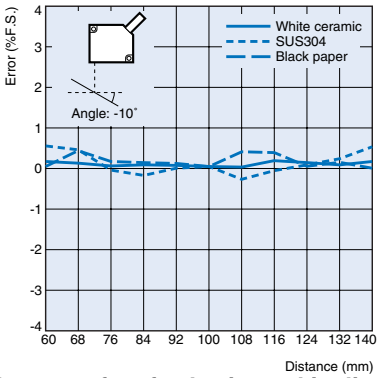
ZX-LD100L

Inclination angle 0°

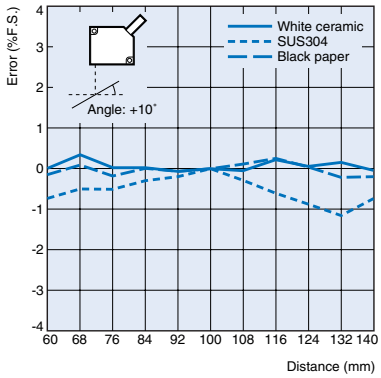


In case of a of a horizontal inclination

Inclination angle -10°

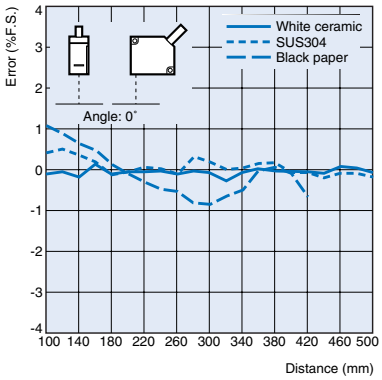


Inclination angle +10°



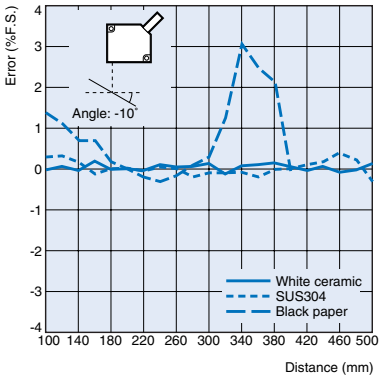
ZX-LD300L

Inclination angle 0°

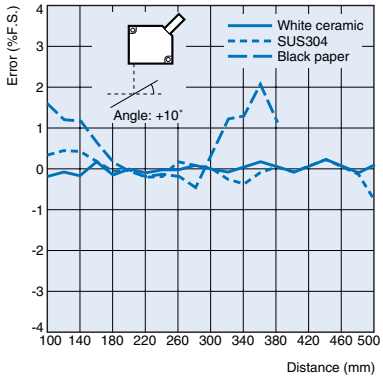


In case of a of a horizontal inclination

Inclination angle -10°

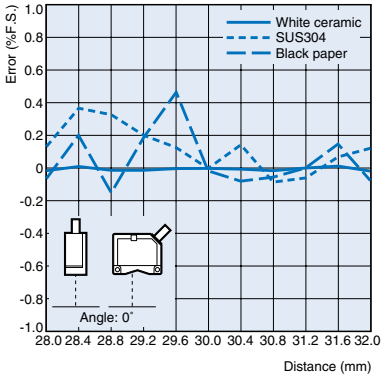


Inclination angle +10°



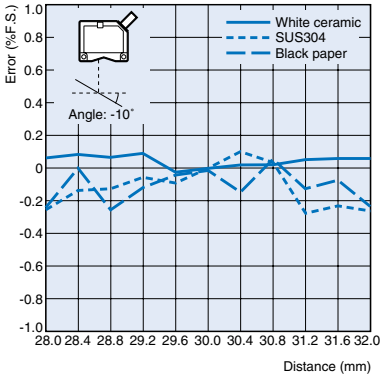
ZX-LD30V

Inclination angle 0°

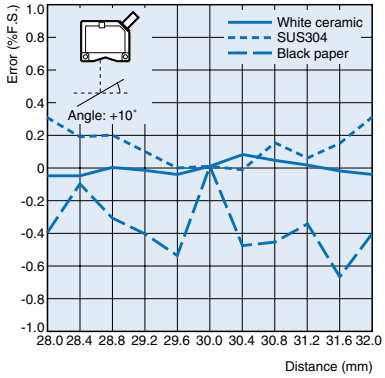


In case of a of a horizontal inclination

Inclination angle -10°

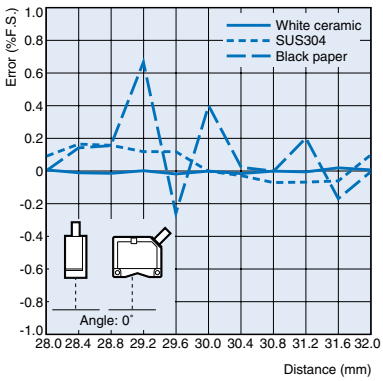


Inclination angle +10°



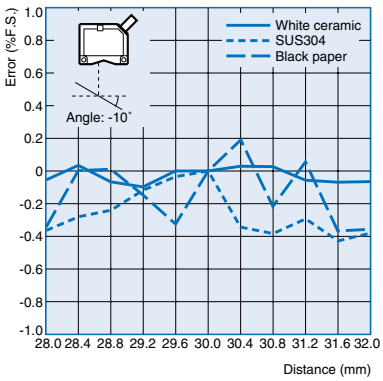
ZX-LD30VL

Inclination angle 0°

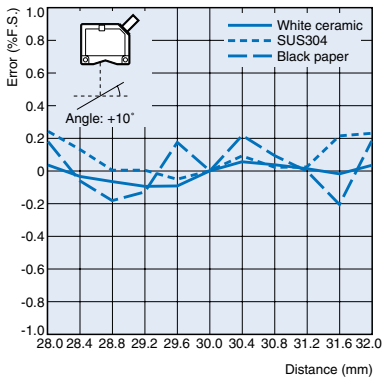


In case of of a a horizontal inclination

Inclination angle -10°

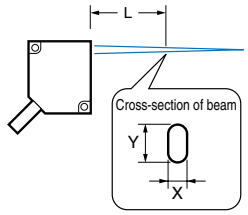


Inclination angle +10°



Spot diameter (reflective type)

Spot beam type



ZX-LD40

L	30 mm	40 mm	50 mm
X (m)	240 µm	40.0 µm	250 µm
Y (m)	350 µm	30.0 µm	370 µm

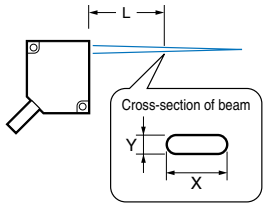
ZX-LD100

L	60 mm	100 mm	140 mm
X (m)	390 µm	100 µm	430 µm
Y (m)	620 µm	65.0 µm	650 µm

ZX-LD300

L	100 mm	300 mm	500 mm
X (m)	1,050 µm	180 µm	1,100 µm
Y (m)	450 µm	300 µm	850 µm

Line beam type



ZX-LD40L

L	30 mm	40 mm	50 mm
X (m)	2,000 µm	2,000 µm	2,000 µm
Y (m)	240 µm	50.0 µm	250 µm

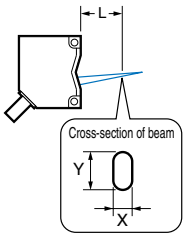
ZX-LD100L

L	60 mm	100 mm	140 mm
X (m)	2,000 µm	2,000 µm	2,000 µm
Y (m)	410 µm	100 µm	430 µm

ZX-LD300L

L	100 mm	300 mm	500 mm
X (m)	2,000 µm	2,000 µm	2,500 µm
Y (m)	750 µm	300 µm	650 µm

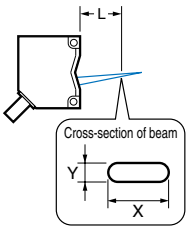
Spot beam type



ZX-LD30V

L	28 mm	30 mm	32 mm
X (m)	60.0 µm	30.0 µm	120 µm
Y (m)	50.0 µm	40.0 µm	90.0 µm

Line beam type

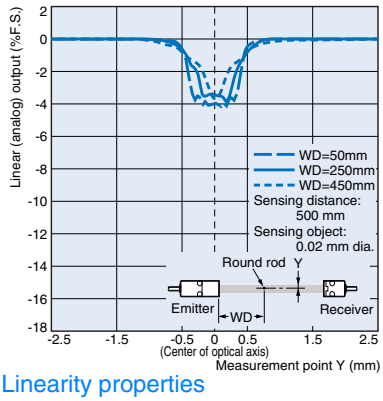


ZX-LD30VL

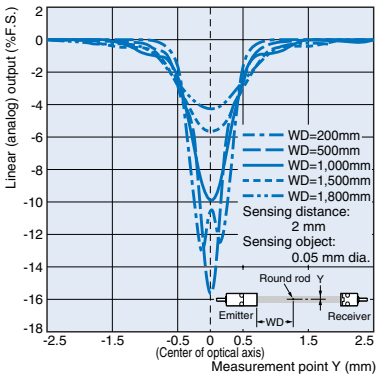
L	28 mm	30 mm	32 mm
X (m)	1,800 µm	1,800 µm	1,800 µm
Y (m)	90.0 µm	60.0 µm	110 µm

Detection object characteristics (transmissive type)

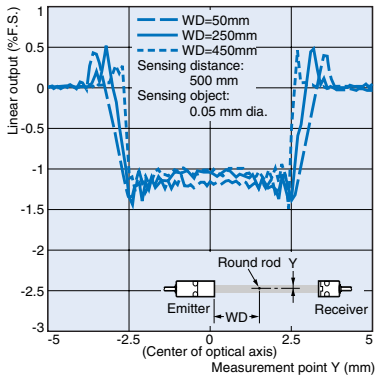
ZX-LT001
(Using a 0.02 mm dia. pin gauge)



ZX-LT001
(Using a 0.05 mm dia. pin gauge)



ZX-LT001
(Using a 0.05 mm dia. pin gauge)



Linearity properties

ZX-LT005

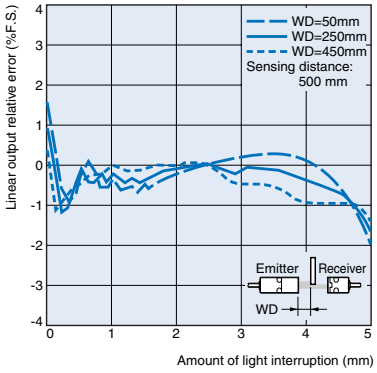
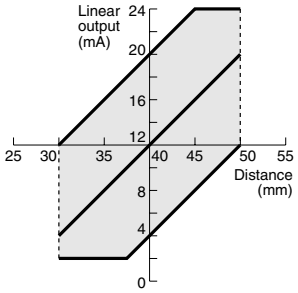


Diagram showing correlation between linear output and detection distance

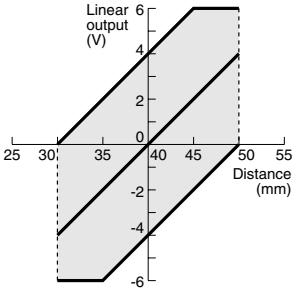
Current or voltage can be selected with the amplifier unit switch.

ZX-LD40/LD40L

(Current output)

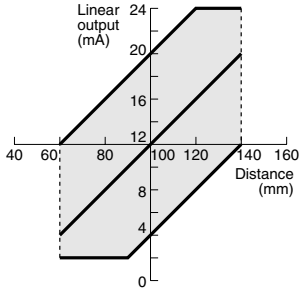


(Voltage output)

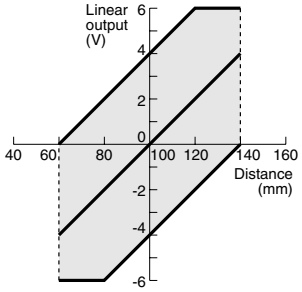


ZX-LD100/LD100L

(Current output)

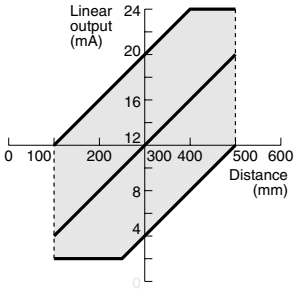


(Voltage output)

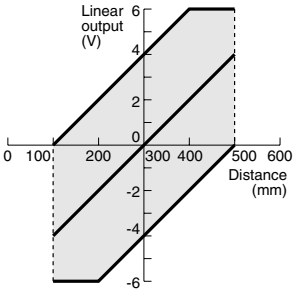


ZX-LD300/LD300L

(Current output)

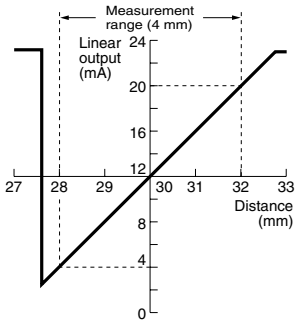


(Voltage output)

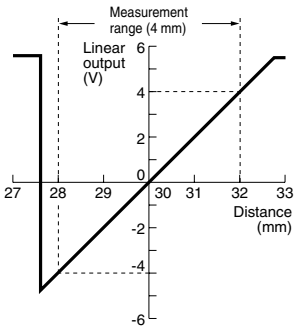


ZX-LD30V/LD30VL

(Current output)

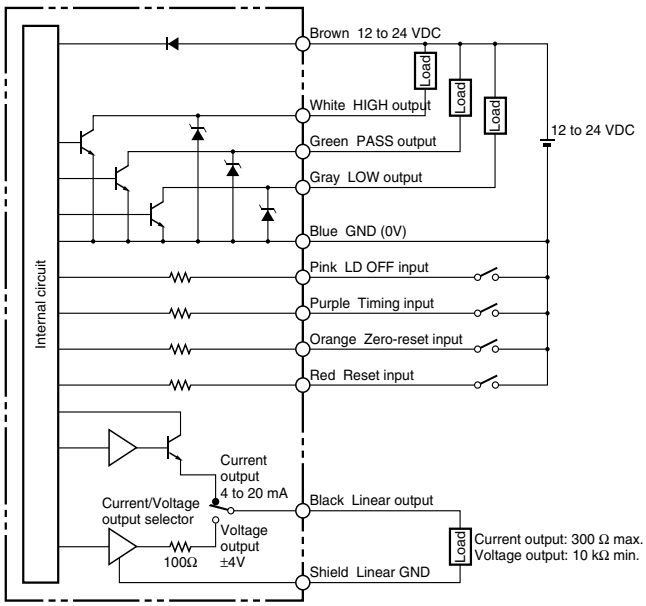


(Voltage output)

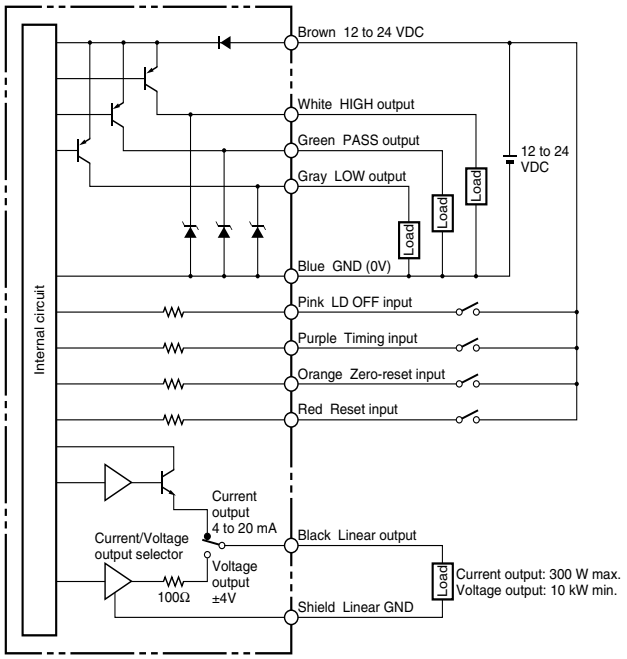


Input/output stage circuit schematic

NPN type: ZX-LDA11

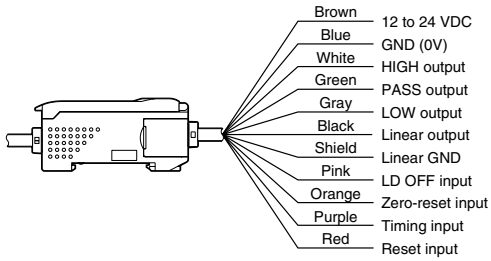


PNP type: ZX-LDA41



Connection

Amplifier Units

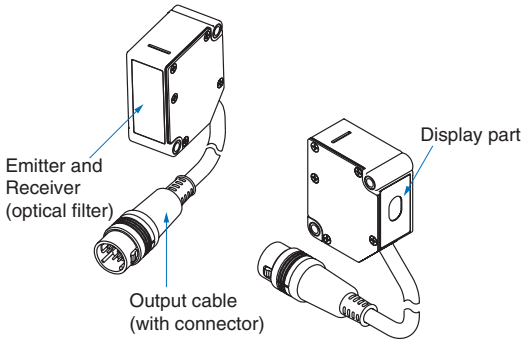


Note: 1 . In particular, when high resolution is necessary, provide a stable power source separate from other power systems.
2 . Damage may result if not wired correctly. (In particular, do not allow the linear output to contact other wires.)
3 . Green (0 V) is for the power supply. The outer covering of the shield wire (linear GND) is used for linear output along with the black wire (linear output). Even if you will not be using the linear output, connect the linear GND to GND (0 V).

Nomenclature:

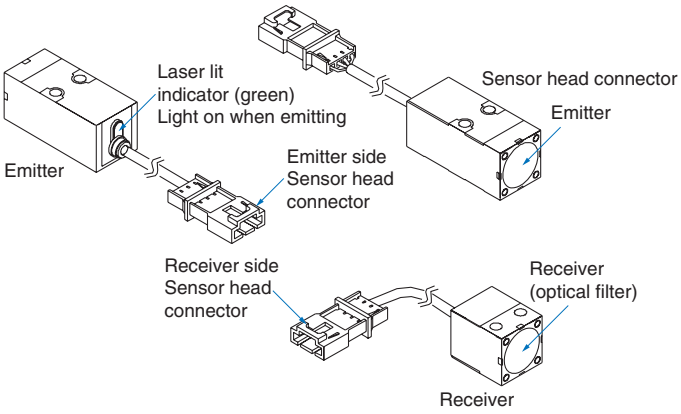
Sensor head (reflection type)

ZX-LD40
ZX-LD100
ZX-LD300
ZX-LD40L
ZX-LD100L
ZX-LD300L
ZX-LD30V
ZX-LD30VL



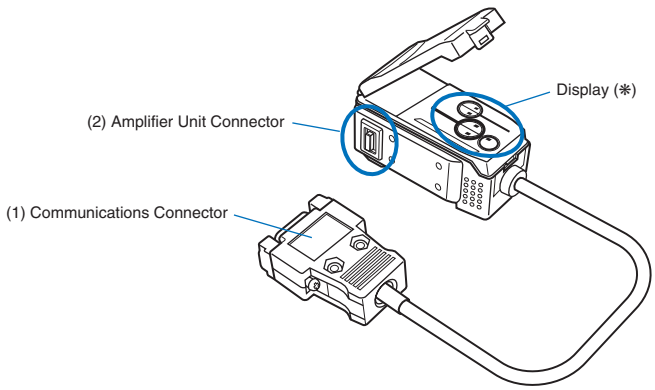
Sensor head (transmissive type)

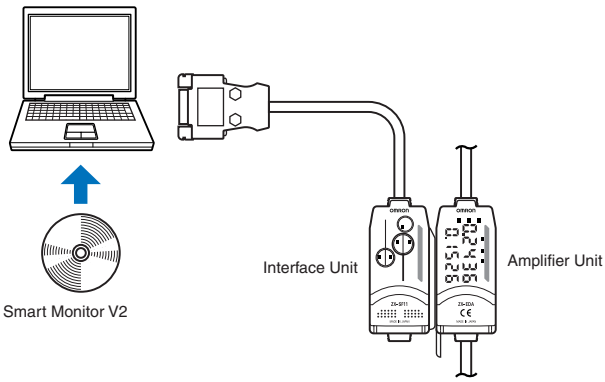
ZX-LT001
ZX-LT005
ZX-LT010



Communication interface

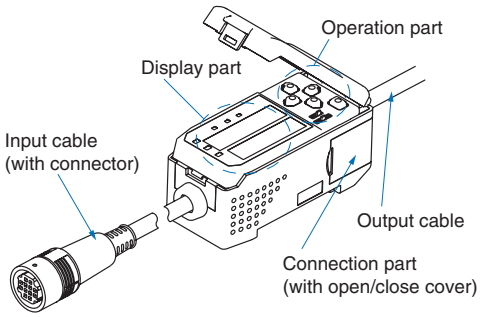
ZX-SF 11





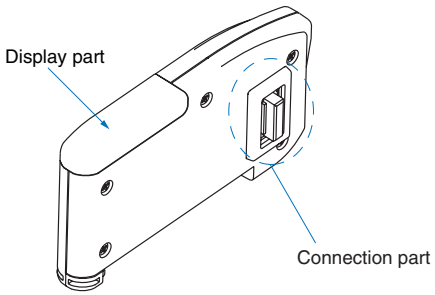
Amplifier Units

ZX-LDA11
ZX-LDA41



Computing unit

ZX-CAL-2



Precautions

⚠ Warning

Laser safety

Safety measures are required for laser devices both in Japan and abroad. Brief explanations of three cases are given below, including use in Japan and assembling in Japan and then exporting to other countries.

Europe

The ZX-L-Series Sensor Heads are Class 1 and Class 2 Laser Products according to EN 60825-1 (IEC825-1).
(The outline is given in the following table.)

Summary of user precautions

Requirements subclause	Classification						
	Class 1	Class 1M	Class 2	Class 2M	Class 3R	Class 3B	Class 4
Laser safety iffucer 10.1	Not required but recommended for applications that involve direct viewing of the laser beam				Not required for visible emission Required for non-visible emission	Required	
Remote interlock 10.2	Not required					Connect to room or door circuits	
Key control 10.3	Not required					Remove key when not in use	
Beam attenuator	Not required					When in use prevents inadvertent exposure	
Emission indicator device	Not required				Indi cates laser is energized for nonvisible wave-lenghts	Indicates laser is energized	
Warning signs 10.5	Not required					Follow precautions on warning signs	
Beam path 10.6	Not required	Class 1M *1 as for Class 3B	Not required	Class 2M *2 as for Class 3B	Terminate beam at end of useful length		
Specular reflection 10.7	No requirements	Class 1M *1 as for Class 3B	No requirements	Class 2M *2 as for Class 3B	Prevent unintentional reflections		
Eye protection 10.8	No requirements					Required if engineering and administrative procedures not practicable and MPE exceeded	
Protective clothing 10.9	No requirements					Sometimes required	Specific requirements
Training 10.10	No requirements	Class 1M *1 as for Class 3R	No requirements	Class 2M *2 as for Class 3R	Required for all operator and maintenance personnel		

*1. Class 1M laser products that failed condition 1 of table 10. Not required for Class 1M laser products that failed condition 2 of table 10.
*2. Class 2M laser products that failed condition of table 10. Not required for Class 2M laser products that failed condition 2 of table 10.

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

ZX-LD□□□/ZX-LD30V□

Classification of reflective-type sensor heads

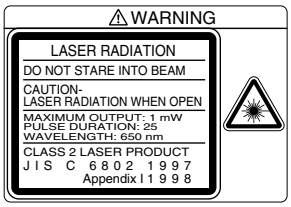
Class 2

Classification of reflective-type sensor head of ZX-LT□□□

Class 1

Laser-related labeling

The warning label at right is attached to the side of the sensor head.



Handing Instructions

The ZX-LD□□□/ZX-LD30V□ emits visible laser light. Do not look directly at the light. Terminate the light path of the laser beam before use. If a reflective mirror surface is in the light path, ensure that the reflected light path is enclosed in the beam. In cases where the light path must be open, ensure that it is kept away from eye-height.

(U.S.A.)

Exports of products equipped with this device to the U.S.A. are governed by the laser standards of the Food and Drug Administration of the U.S.A.

The ZX-L-Series Laser Series is classified as Class I and Class II device according to FDA (21 CFR1040.10).

Please inquire for detailed information on exporting to the U.S.A..

(Countries other than the U.S.A.)

- ZX-LD□□/ZX-LD30V@ reflective-type (displacement) sensor head: In countries other than Japan and the U.S.A., replace the warning label with the provided English label.
- For the ZX-LT□□□ transmissive-type (displacement) sensor head, the warning label already includes English, thus replacement is not necessary.
- With respect to exports to Europe, a different standard exists, Europe EN60825.

Correct Use

Design

Object

Some object materials and forms may not permit measurement, or may reduce the accuracy of measurement (transparent materials or materials with an extremely low reflectance; steeply inclined objects, etc.).

Power Supply and Wiring

- Do not connect or disconnect the connector while powered. Damage may result.
- Allow the system to warm up for about 10 minutes after turning on the power.
- Upon completed wiring, verify that the power source is wired correctly, that there are no incorrect connections that will cause load shorts, and that the load current is appropriate before turning on the power. Incorrect wiring may result in damage.
- When extending the cable, ensure that the overall length does not exceed 10 m from both the sensor head and the amplifier unit. If you need to extend the cable from the sensor head, use the optional extension cable (ZX-XC□A). For wiring from the amplifier unit, use the same type of shielded cable.
- If the power line is subject to surges, connect a surge protector.
- If you are using a computing unit, connect the linear GND terminals of the amplifier units.

Compatibility

The sensor head and amplifier unit are compatible. A sensor head purchased later can also be used.

Mutual Interference

This sensor head allows the amplifier units to be used in conjunction by connecting a computing unit (ZX-CAL) between the amplifier units.

Cleaning

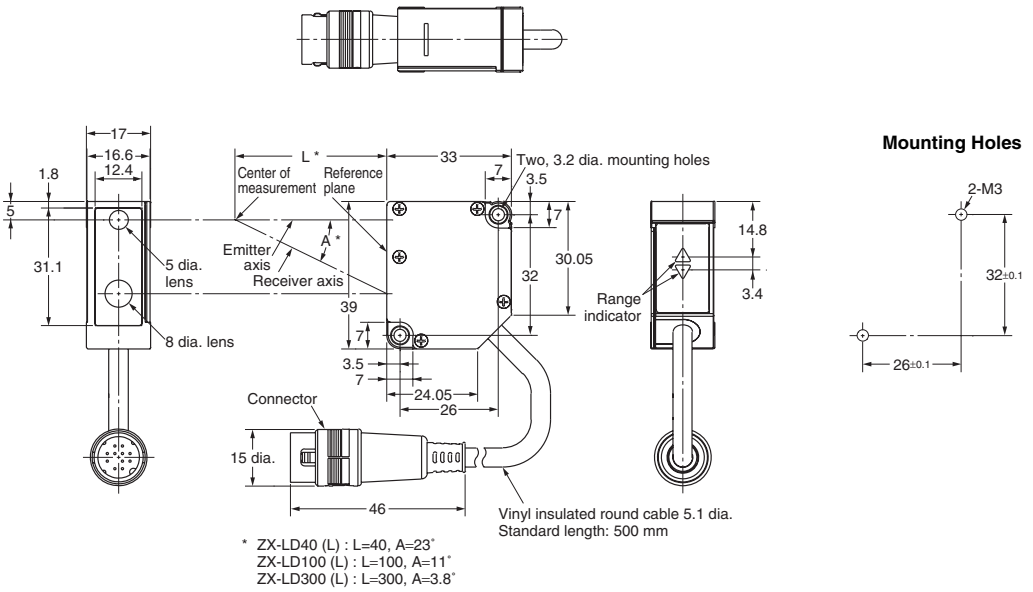
Do not use thinner, benzene, acetone, or kerosene, or similar chemicals.

Dimensions (Unit: mm)

Sensors

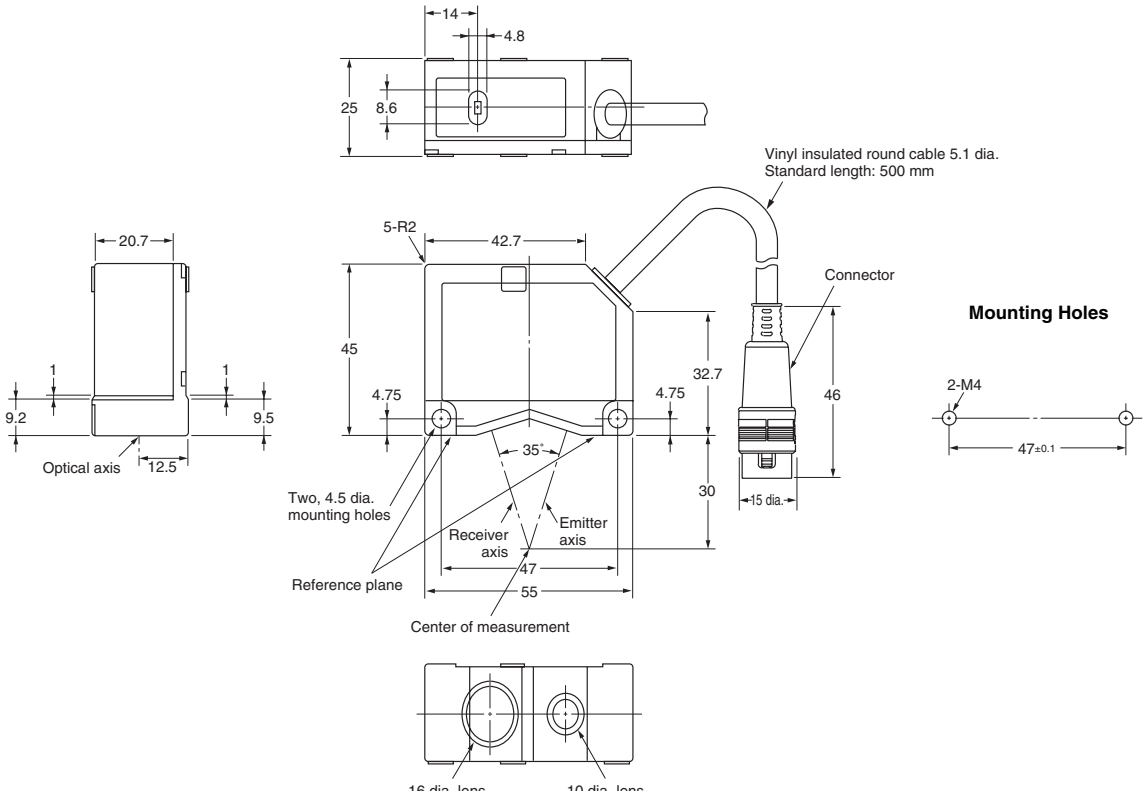
Sensor head (diffuse reflection type)

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



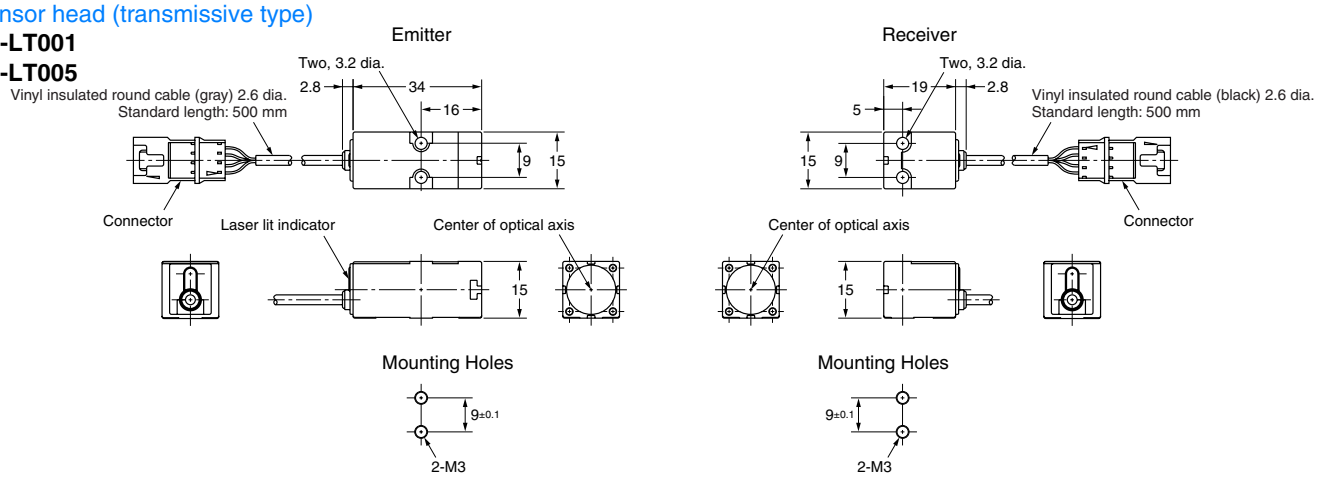
Sensor head (regular reflection type)

ZX-LD30V
ZX-LD30VL



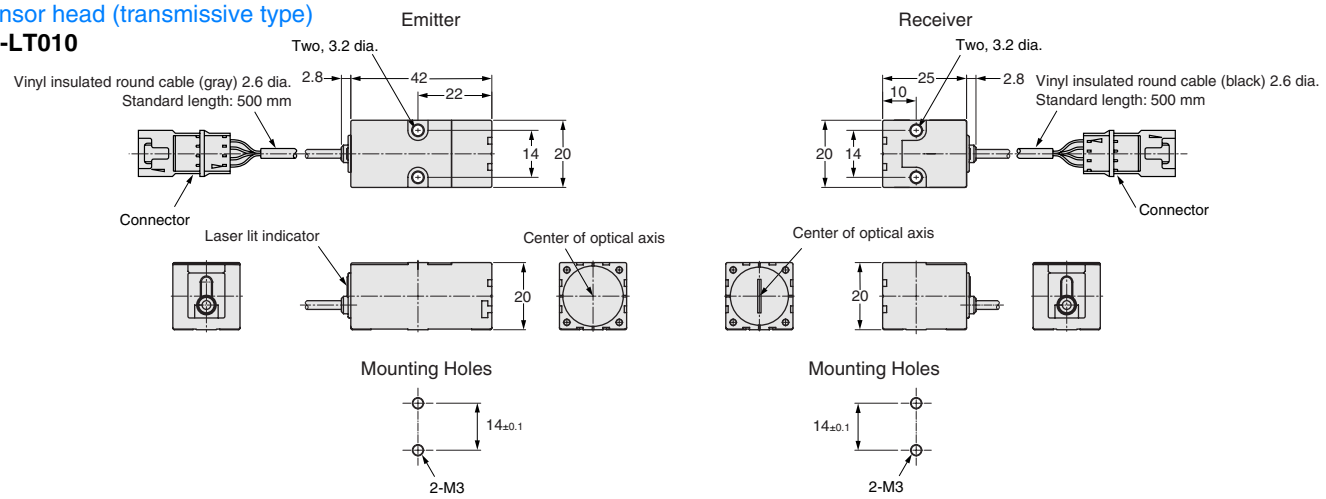
Sensor head (transmissive type)

ZX-LT001
ZX-LT005



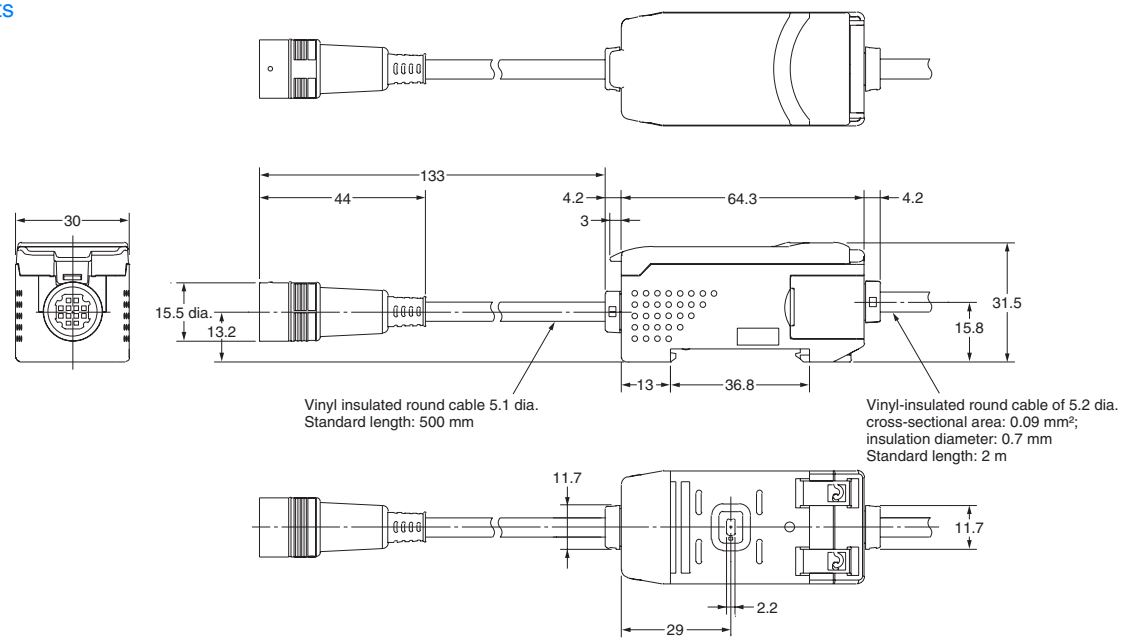
Sensor head (transmissive type)

ZX-LT010



Amplifier Units

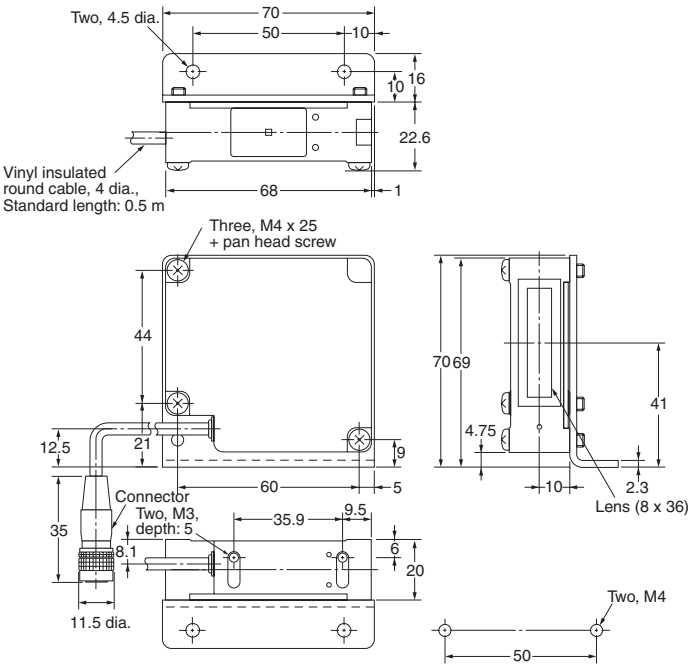
ZX-LDA11
ZX-LDA41



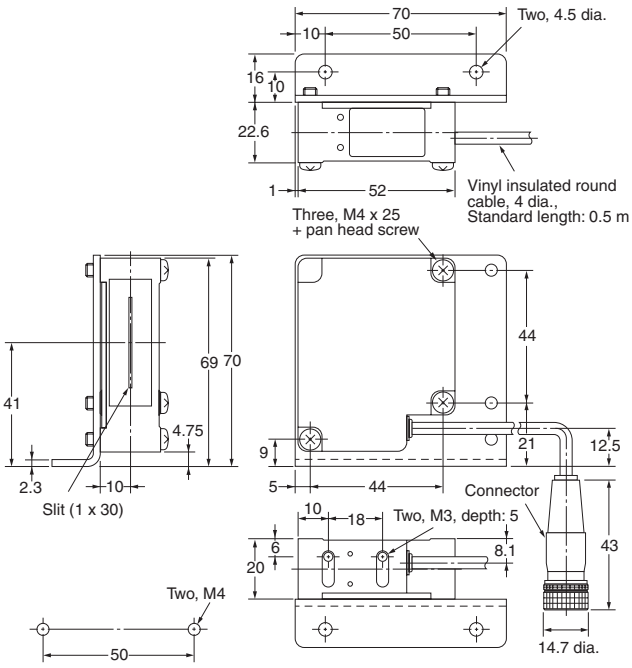
Sensor heads

ZX-LT030

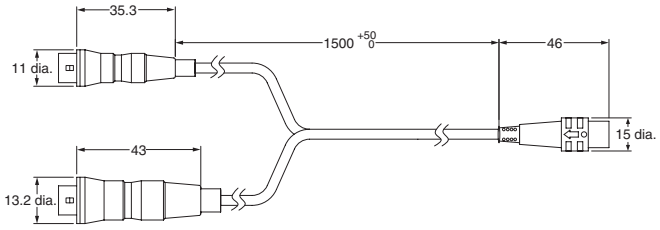
Emitter



Receiver

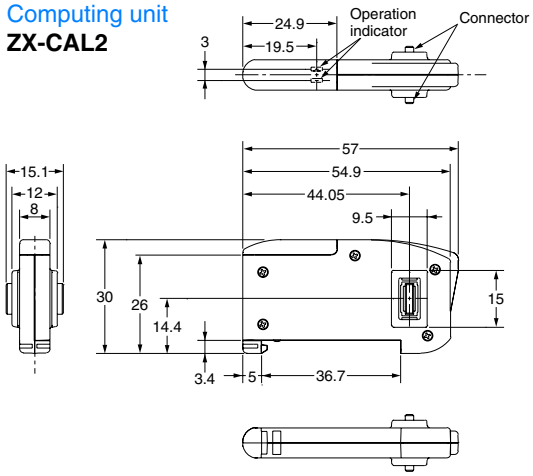


■ Sensor Head - Amplifier Connection Cable

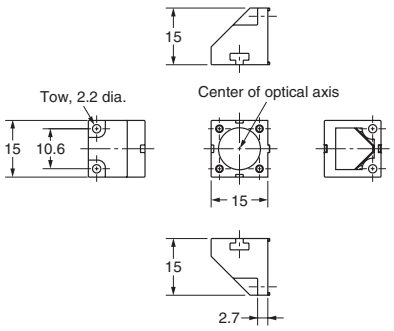


Accessories (Order Separately)

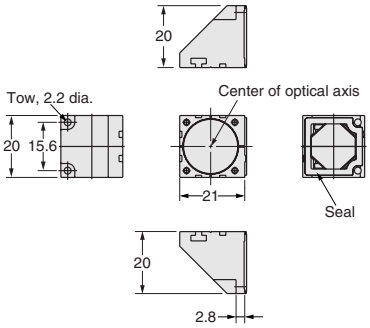
Computing unit
ZX-CAL2



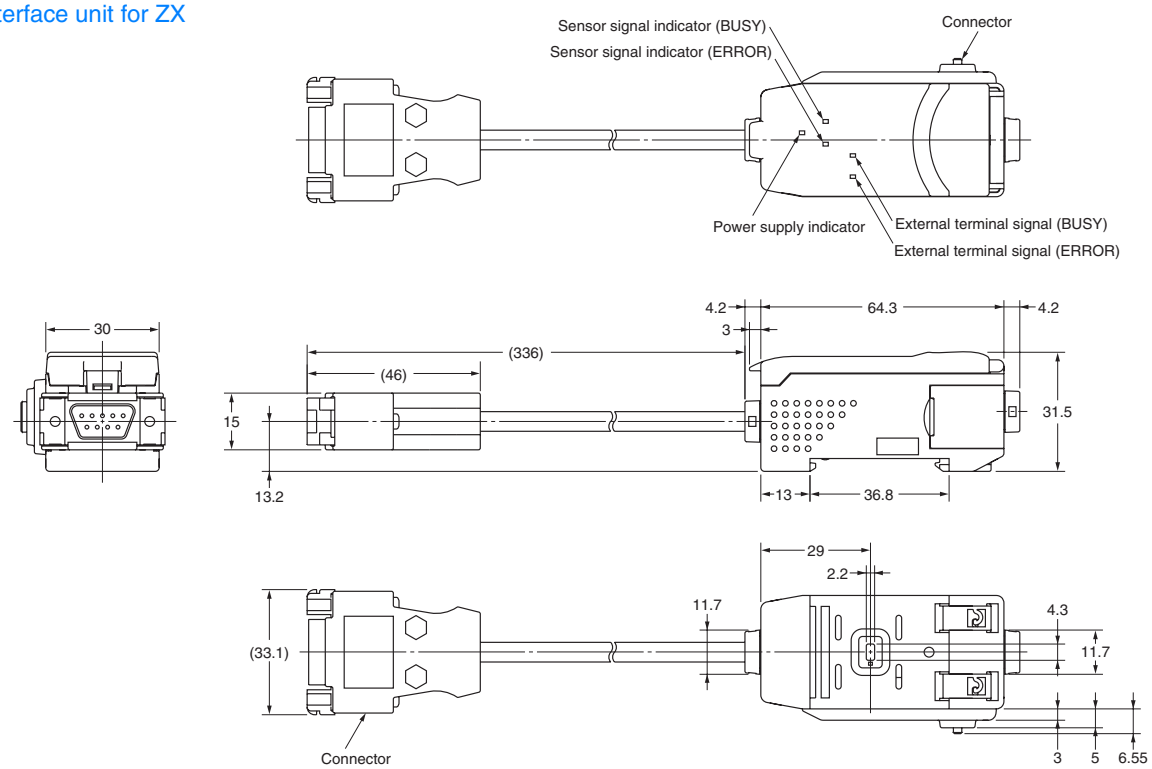
Side view attachment
ZX-XF12



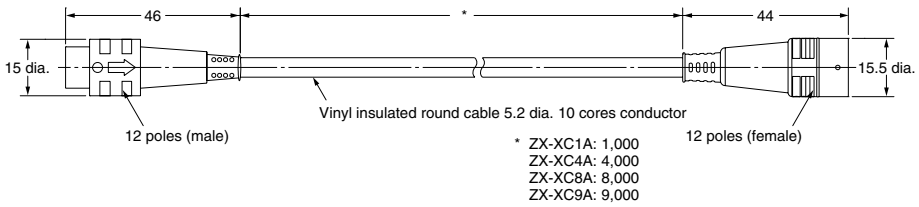
Side view attachment
ZX-XF22



Communication interface unit for ZX
ZX-SF11



Two-sided connector cable (for extension)
ZX-XC1A (1 m)
ZX-XC4A (4 m)
ZX-XC8A (8 m)
ZX-XC9A (9 m)



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

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q15E-EN-01

2D CMOS Laser Measuring Sensor

ZS-L Series

The smart way to get higher performance and more flexibility for your process.

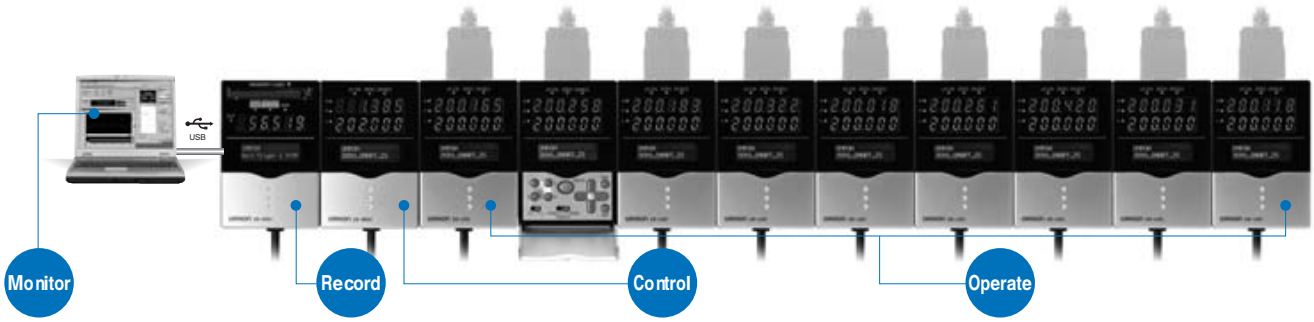
Features

The scalable platform for more flexibility

- Connect and expand up to 9 controllers
- Connect Multi-calculation controller for advanced calculations like evenness or flatness
- Connect Data storage module for process-data logging
- Connect PC software for easy system set up and signal monitoring
- Sensor head with 2D-CMOS technology with high dynamic sensing range for measuring black rubber, plastic, shiny, glass and mirrow surfaces
- Advanced application settings
- Easy reconfiguration and teaching

Measurement Tools:

- Hight measurement
- Step measurement
- Thickness measurement
- Flatness measurement
- Average measurement
- Excentricity
- Warpage/Evenness



Ordering Information

Sensors

Sensor Heads

Optical System	Sensing distance	Beam diameter	Resolution*1	Model
Diffuse reflection	50 ± 5 mm	900 x 60 µm	0.8 µm	ZS-LD50
	80 ± 15 mm	900 x 60 µm	2 µm	ZS-LD80
	200 ± 50 mm	900 x 100 µm	5 µm	ZS-LD200
Regular reflection	20 ± 1 mm	900 x 25 µm	0.25 µm	ZS-LD20T
	40 ± 2.5 mm	2,000 x 35 µm	0.4 µm	ZS-LD40T

*1. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.

Sensor Controllers

Shape	Supply Voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-LDC11
		PNP outputs	ZS-LDC41

Multi Controllers

Shape	Supply Voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-MDC11
		PNP outputs	ZS-MDC41

Data Storage Units

Shape	Supply Voltage	Control outputs	Model
	24 VDC	NPN outputs	ZS-DSU11
		PNP outputs	ZS-DSU41

Accessories (Sold Separately)

Controller Link

Shape	Model
	ZS-XCN

Panel Mount Adapter

Shape	Model	
	ZS-XPM1	For 1st Controller
	ZS-XPM2	For expansion (from 2nd Controller on

RS-232C Cable for Connecting to a Personal Computer

Shape	Model	Qty
	ZS-XRS2	1

Extension Cables for Sensor Heads

Cable length	Model	Qty
1 m	ZS-XC1A	1
4 m	ZS-XC4A	1
5 m	ZS-XC5B*1,*2	1
8 m	ZS-XC8A	1
10 m	ZS-XC10B*1	1

*1. Up to two ZS-XC□B Cables can be connected (22 m max.).
*2. A Robot Cable (ZS-XC5BR) is also available.

Logging Software

Name	Model
Smart Monitor Zero Professional	ZS-SW11E

Memory Card

Model	Model
F160-N64S(S)	64 MB
QM300-N128S	128 MB
F160-N256S	256 MB

Specifications

Sensor Heads

Item / Model	ZS-LD20T		ZS-LD40T		ZS-LD50		ZS-LD80		ZS-LD200	
Applicable Controllers	ZS-LDC Series									
Optical system	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection
Measuring center distance	20 mm	6.3 mm	40 mm	30 mm	50 mm	47 mm	80 mm	78 mm	200 mm	200 mm
Measuring range	±1 mm	±1 mm	±2.5 mm	±2 mm	±5 mm	±4 mm	±15 mm	±14 mm	±50 mm	±48 mm
Light source	Visible semiconductor laser (wavelength: 650 nm, 1 mW max., Class 2)									
Beam diameter*1	900 x 25 µm		2,000 x 35 µm		900 x 60 µm		900 x 60 µm		900 x 100 µm	
Linearity*2	±0.1% F.S.									±0.25% F.S.
Resolution*3	0.25 µm		0.4 µm		0.8 µm		2 µm		5 µm	
Temperature characteristic*4	0.04% F.S./°C		0.02% F.S./°C		0.02% F.S./°C		0.01% F.S./°C		0.02% F.S./°C	
Sampling cycle*5	110 µs									
Indicators: NEAR indicator	Lights near the measuring center distance, and nearer than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
Indicators: FAR indicator	Lights near the measuring center distance, and further than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.									
Operating ambient illumination	Illumination on received light surface: 3,000 lx or less (incandescent light)									
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)									
Degree of protection	Cable length 0.5 m: IP66, cable length 2 m: IP67									
Materials	Case: Aluminum die-cast, Front cover: Glass									
Cable length	0.5 m, 2 m									
Weight	Approx. 350 g									
Accessories	Laser labels (1 each for JIS/EN, 3 for FDA), Ferrite cores (2), Insure Locks (2), Instruction Sheet									

*1. Defined as $1/e^2$ (13.5 %) of the center optical intensity at the actual measurement center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.

*2. This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode of the ZS-LD20T/40T/50. Linearity may change according to the workpiece.

*3. This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.

*4. This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig.

*5. This value is obtained when the measuring mode is set to the high-speed mode.

Sensor Controllers

ZS-LDC11/LDC41

Sensor Controllers / Model			ZS-LDC11	ZS-LDC41
No. of samples to average			1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, or 4096	
Number of mounted Sensors			1 per Sensor Controller	
External interface	Connection method		Serial I/O: connector, Other: pre-wired (standard cable length: 2 m)	
	Serial I/O	USB 2.0	1 port, Full Speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Outputs	Judgement outputs	3 outputs: HIGH, PASS, and LOW NPN open-collector, 30 VDC, 50 mA max., residual voltage: 1.2 V max.	3 outputs: HIGH, PASS, and LOW PNP open-collector, 50 mA max., residual voltage: 1.2 V max.
		Linear outputs	Selectable from 2 types of output, voltage or current (selected by slide switch on base). Voltage output: –10 to 10 V, output impedance: 40 . Current output: 4 to 20 mA, maximum load resistance: 300 .	
	Inputs	Laser OFF, ZERO reset timing, RESET	ON: Short-circuited with 0V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage OFF: Open (leakage current: 0.1 mA max.)
Functions			Display: Measured value, threshold value, voltage/current, received light amount, and resolution Sensing: Mode, gain, measurement object, head installation Filter: Smooth, average, and differentiation Outputs: Scaling, various hold values, and zero reset I/O settings: Linear (focus/correction), judgements (hysteresis and timer), non-measurement, and bank (switching and clear) System: Save, initialization, measurement information display, communications settings, key lock, language, and data load	
Status indicators			HIGH (orange), PASS (green), LOW (orange), LDON (green), ZERO (orange), and ENABLE (green)	
Segment display		Main display	8-segment red LED, 6 digits	
		Sub-display	8-segment green LED, 6 digits	
LCD			16 digits x 2 rows, Color of characters: green, Resolution per character: 5 x 8 pixel matrix	
Setting inputs		Setting keys	Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)	
		Slide switch	Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)	
Power supply voltage			21.6 V to 26.4 VDC (including ripple)	

Sensor Controllers / Model	ZS-LDC11	ZS-LDC41
Current consumption	0.5 A max. (when Sensor Head is 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)	
Materials	Case: Polycarbonate (PC)	
Weight	Approx. 280 g (excluding packing materials and accessories)	
Accessories	Ferrite core (1), Instruction Sheet	

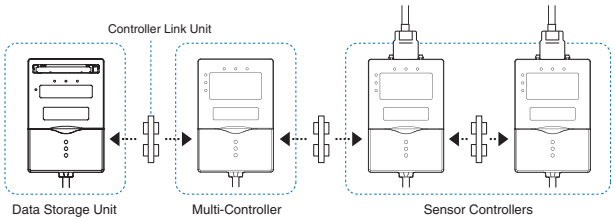
ZS-MDC11/MDC41 Multi-Controllers

Basic specifications are the same as those for the Sensor Controllers.
The following points, however, are different.

(1) Sensor Heads cannot be connected.
(2) A maximum 9 of Controllers can be connected. Control Link Units are required to connect Controllers.
(3) Processing functions between Controllers: Math functions

Controller Link Unit

Connection Using the ZS-XCN



Data Storage Units

Sensor Controllers / Model			ZS-DSU11	ZS-DSU41
Number of mounted Sensor Heads			Cannot be connected	
Number of connectable Controllers			10 Controllers max. (ZS-MDC: 1 Controller, ZS-LDC: 9 Controllers max.)*1	
Connectable Controllers			ZS-LDC□□, ZS-MDC□□	
External interface	Connection method		Serial I/O: connector, Other: pre-wired (standard cable length: 2 m)	
	Serial I/O	USB 2.0	1 port, Full Speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Outputs		3 outputs: HIGH, PASS, and LOW NPN open-collector, 30 VDC, 50 mA max., residual voltage: 1.2 V max.	3 outputs: HIGH, PASS, and LOW PNP open-collector, 50 mA max., residual voltage: 1.2 V max.
	Inputs		ON: Short-circuited with 0V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage OFF: Open (leakage current: 0.1 mA max.)
Data resolution			32 bits	
Functions	Logging trigger functions		Start and stop triggers can be set separately; external triggers, data triggers (self-triggers), and time triggers	
	Other functions		External banks, alarm outputs, saved data format customization, and clock	
Status indicators			OUT (orange), PWR (green), ACCESS (orange), and ERR (red)	
Segment display			8-segment green LEDs, 6 digits	
LCD			16 digits x 2 rows, Color of characters: green, Resolution per character: 5 x 8 pixel matrix	
Setting inputs		Setting keys	Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)	
		Slide switch	Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)	
Power supply voltage			21.6 V to 26.4 VDC (including ripple)	
Current consumption			0.5 A max.	
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)	
Materials			Case: Polycarbonate (PC)	
Weight			Approx. 280 g (excluding packing materials and accessories)	
Accessories			Ferrite core (1) Instruction Sheet, Tools for Data Storage Unit: CSV File Converter for Data Storage Unit, Smart Analyzer Macro Edition (Excel macros for analysis of collected data)	

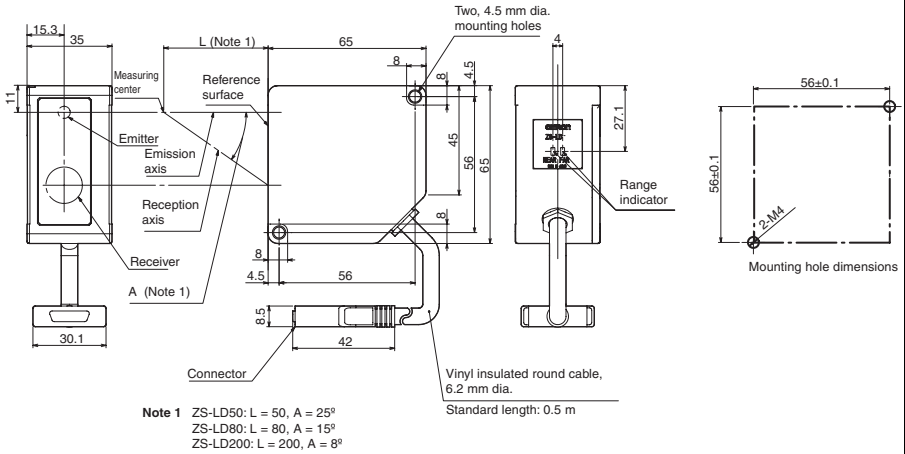
*1. Control Link Units are required to connect Controllers.

Dimensions

Unit: mm

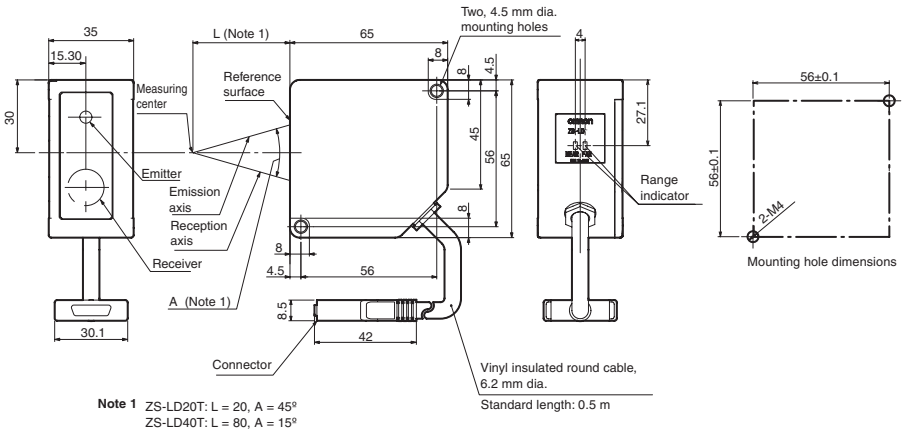
Sensor Heads

ZS-LD50/LD80/LD200



Note 1 ZS-LD50: L = 50, A = 25°
ZS-LD80: L = 80, A = 15°
ZS-LD200: L = 200, A = 8°

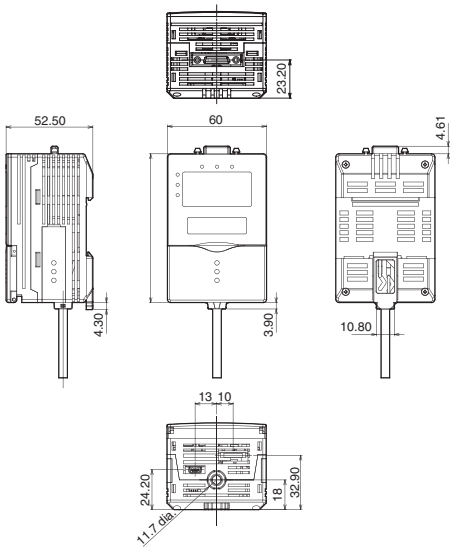
ZS-LD20T/LD40T



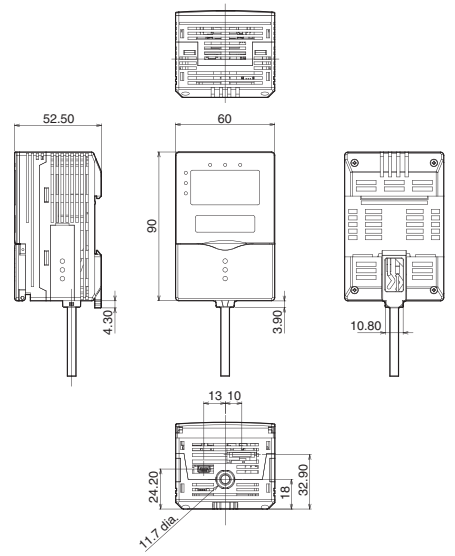
Note 1 ZS-LD20T: L = 20, A = 45°
ZS-LD40T: L = 80, A = 15°

Sensor Controllers

ZS-LDC11/LDC41

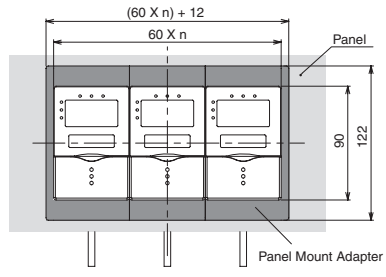


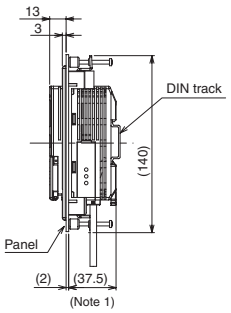
ZS-MDC11/MDC41 Multi-Controllers



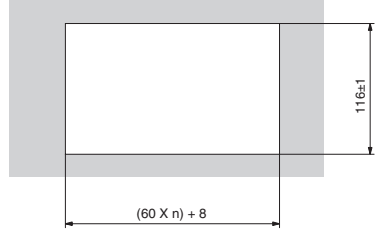
Panel Mount Adapters

ZS-XPM1/XPM2 (Dimension for Panel Mounting)





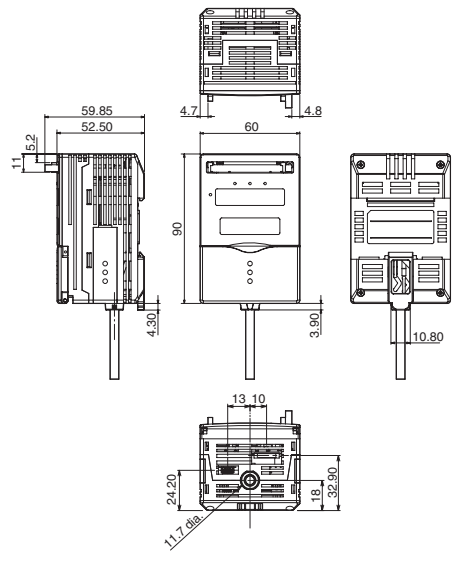
Panel cutout dimensions



Note 1: Dimensions are shown for a panel thickness of 2.0 mm.
n: Number of gang-mounted Controllers (1 to 11)

Data Storage Unit

ZS-DSU11/DSU41



Safety Precautions for Using Laser Equipment

Laser Label Indications

Attach the following warning label to the side of the ZS-L-series Sensor Head.

READ AND UNDERSTAND THIS DOCUMENT

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

WARRANTY

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

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

LIMITATIONS OF LIABILITY

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

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

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON's ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

SUITABILITY FOR USE

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

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

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

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

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PERFORMANCE DATA

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

CHANGE IN SPECIFICATIONS

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

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

DIMENSIONS AND WEIGHTS

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

ERRORS AND OMISSIONS

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

PROGRAMMABLE PRODUCTS

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

COPYRIGHT AND COPY PERMISSION

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

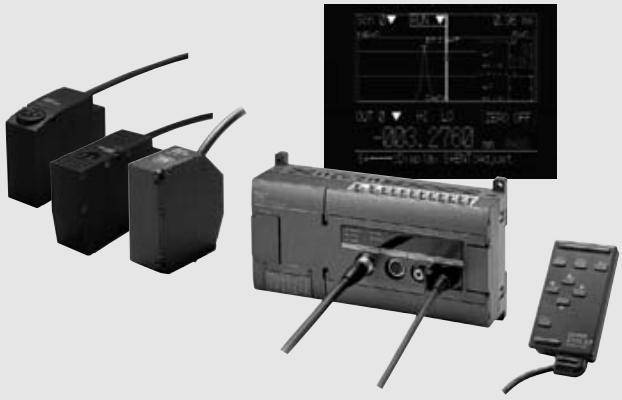
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Z215-E2-01A-X In the interest of product improvement, specifications are subject to change without notice.

High-precision Visual Displacement Measurement System

Z300

2-Dimensional CCD is Built in. A New Type of Displacement Sensor Utilizing the Best and Most Up-to-date Image Processing Technologies.



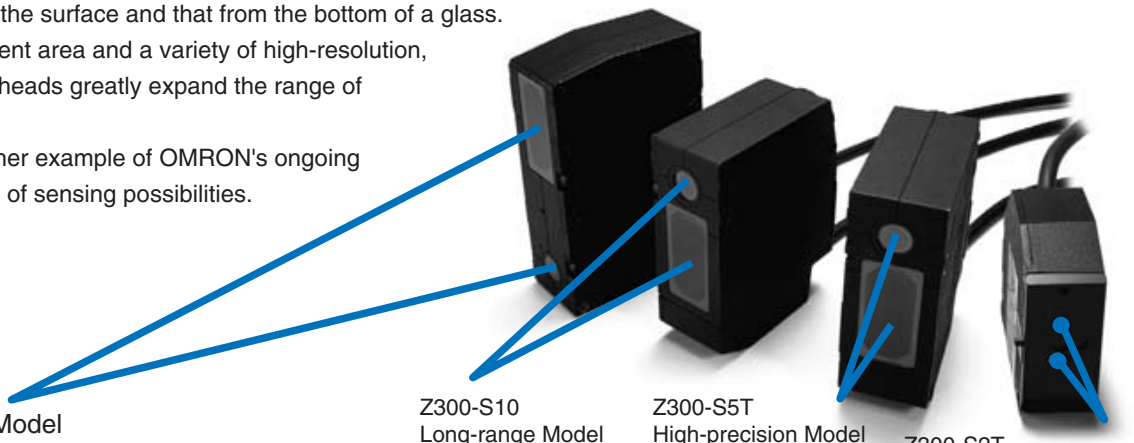
Features

Stable measurement of a transparent object or a glass.
A wide variety of sensor heads for enhanced detection possibilities.

OMRON's Z300 makes the notion that displacement sensors cannot perform stable measurement of a transparent object or a glass a thing of the past. The newly-developed 2-dimensional CCD (S-CCD) incorporated in the Z300, combined with upgraded performance of the controller, provides enhanced stability and accuracy in measurement of a transparent object. The latest algorithm employed by the Z300 enables optimal sensitivity even if there is a big difference between the amount of reflected light from the surface and that from the bottom of a glass.

Enhanced measurement area and a variety of high-resolution, long-distance sensor heads greatly expand the range of applications.

The Z300 is just another example of OMRON's ongoing challenge to the limits of sensing possibilities.



Z300-S60
Super Long-range Model
Detection distance of 600 ± 350 mm

Z300-S10
Long-range Model
Detection distance of
100 ± 20 mm

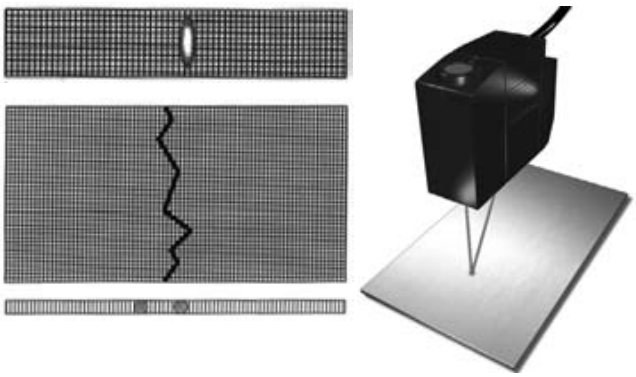
Z300-S5T
High-precision Model
Detection distance of
50 ± 5 mm

Z300-S2T
Super-precision Model
Detection distance of
20 ± 1 mm

The innovative 2-dimensional CCD (S-CCD) is the key to the sensing performance.

The 2-dimensional CCD enables stable, high-speed measurement.

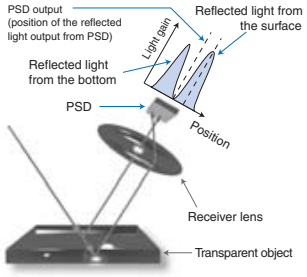
A conventional displacement sensor using a 1-dimensional CCD cannot deal with flutter influence to the output. Therefore, the sensor requires increased number of measurements for signal averaging, which leads to slow response time. The S-CCD with a 2-dimensional CCD has solved this disadvantage, by splitting the measurement point into 60 lines for measurement in finer detail. The value per each pixel is then averaged to produce a reliable output, free from flutter influence caused by the object's surface condition. Stable detection and high-speed processing is thus possible with the Z300.



CCD makes a difference in measurement of a transparent object.

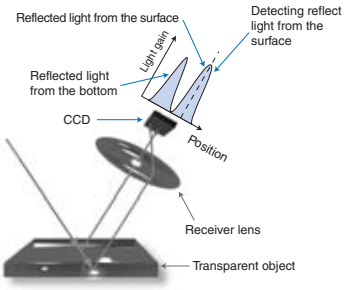
PSD sensor

A PSD sensor using diffuse reflection is virtually prevented from performing measurement due to insufficient reflection distribution from the surface. A sensor using the mirror reflection method, on the other hand, receives reflective light from the bottom or background of the object, which causes an error in determining the target position, impeding accurate measurement.



CCD sensor

A CCD using the mirror reflection method is a solution. It can extract only the light reflected off the surface of the target. Accurate measurement of a transparent object is possible without being affected by reflected light from the bottom or background of the object.



Monitoring as the object is being measured.
Measurement data can be recorded and played back.

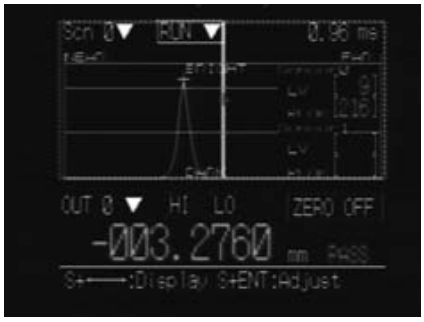
Easy-to-see color display is another great feature of the Z300 (when connected to a color monitor). Monitoring at each key stage including test and adjustment, operation, or maintenance greatly facilitates efficient, error-free measurement.

Real-time monitoring

Digital monitor

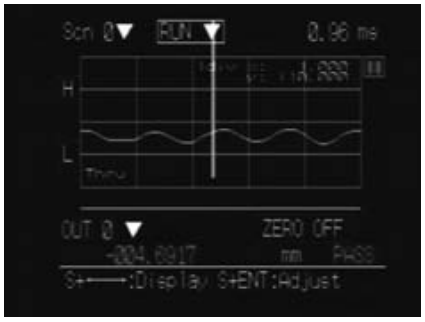
The measured value is displayed. The use of two colors: green for "Pass" judgement, and red for "High/Low," enhances visual recognition of the measurement result.

Image monitor



Displays the position of measurement point as well as intensity of the reflected light.
Conveniently checks whether optimum measurement is taking place.

Trend monitor



Continuous measurement values during a certain period of time are shown in chronological order. Changes in the measured values of a moving or rotating object can be checked at a glance.

Monitoring during recording and playback

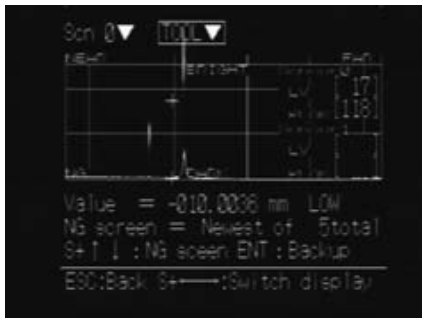
Test mode

Any desired number of measurement data can be stored for testing with a workpiece.

Conditions during Test mode can be recorded and played back

Test measurement data obtained off-line can be saved for reference for actual in-line measurement.

NG (High/Low) judgement status is recorded and played back.

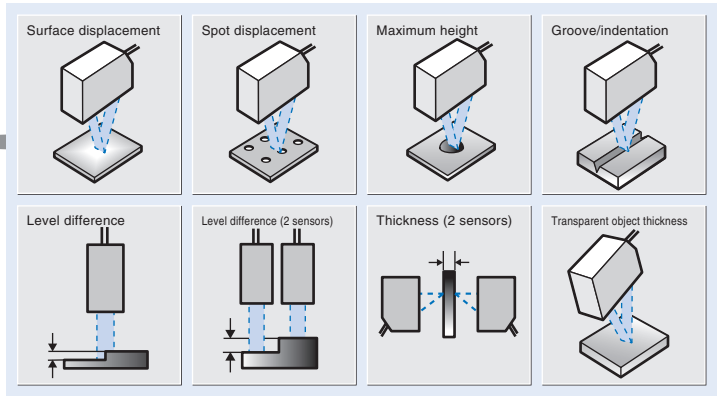


Up to 20 in-line NG data (information including reflected light condition and measurement data) can be recorded for workpiece analysis as well as for troubleshooting.

Interactive menus provide a variety of measurement functions.

Application menu

Settings for measurement methods are easily performed using the menu.
Just follow the guidance of the monitor screen.



Expert menu

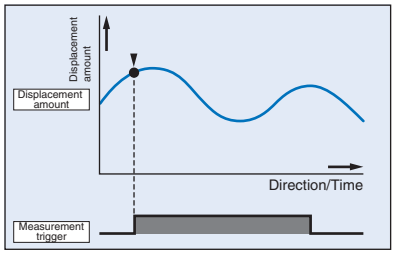
Expert menu is available for more advanced measurement. Detailed setting conditions can be conveniently programmed using the menu.

Enhanced hold functions widen the scope of application.

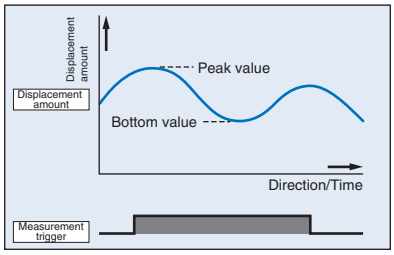
With discrete hold functions equipped within the controller, the Z300 provides a variety of trigger (measurement timing) functions, making otherwise difficult applications a reality — with ease.

Hold functions

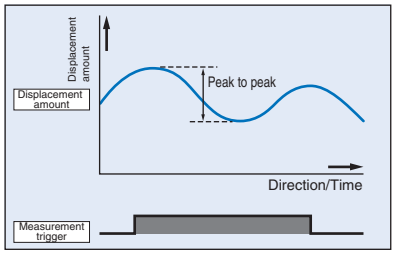
Sampling hold



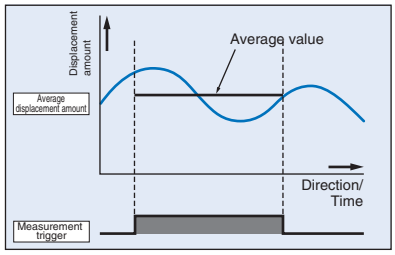
Peak hold (bottom)



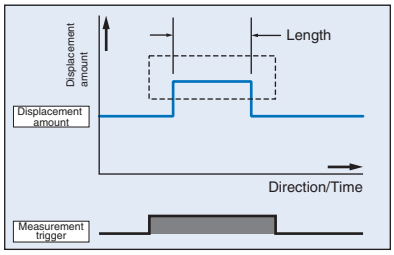
Peak to peak hold



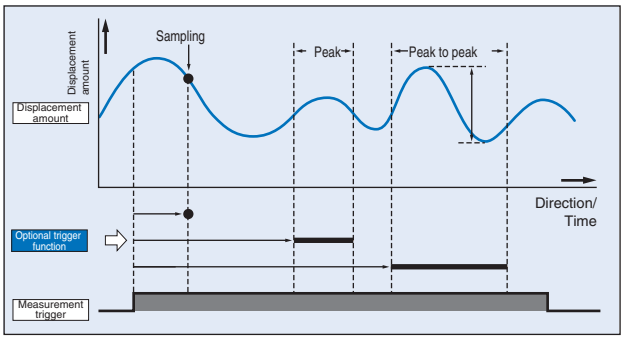
Average hold



Length hold



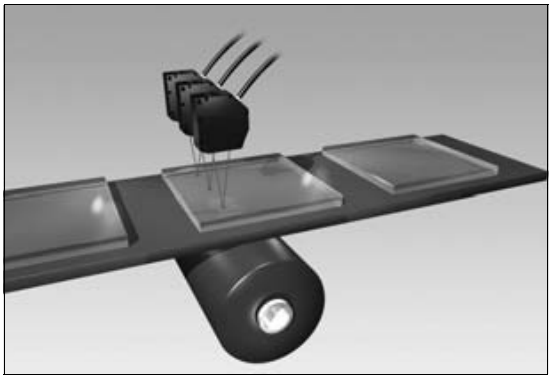
Selectable trigger function



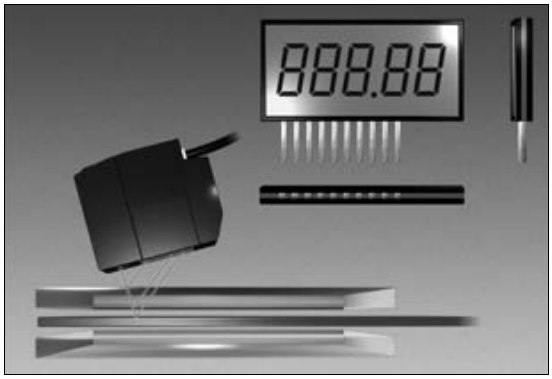
Measurement trigger can be set to the controller for desired measurement timing.

Application

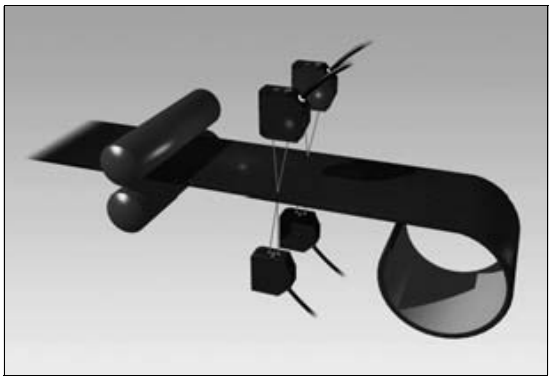
Measuring the thickness of transparent film



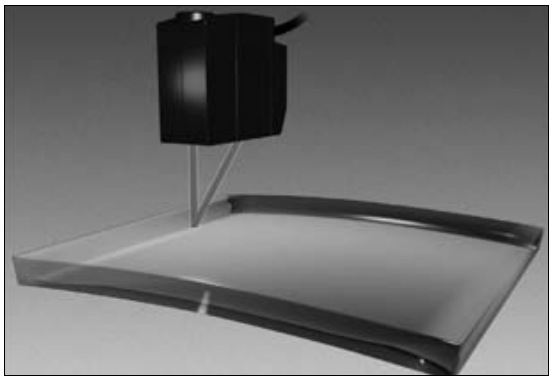
Measurement of electrode position in the display module



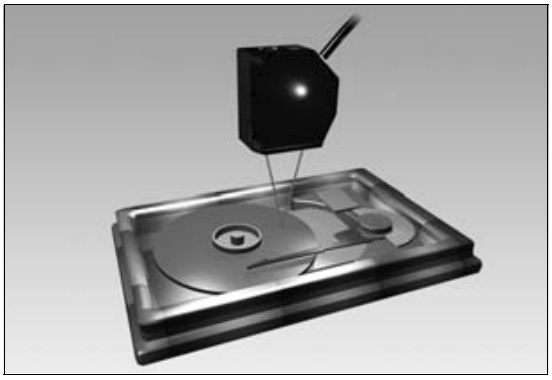
Measuring the thickness of sheet



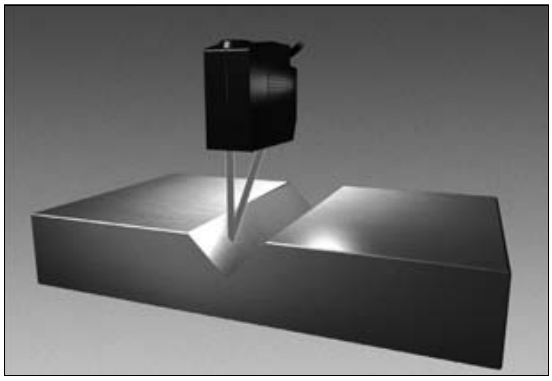
Measurement of warping in transparent plastic



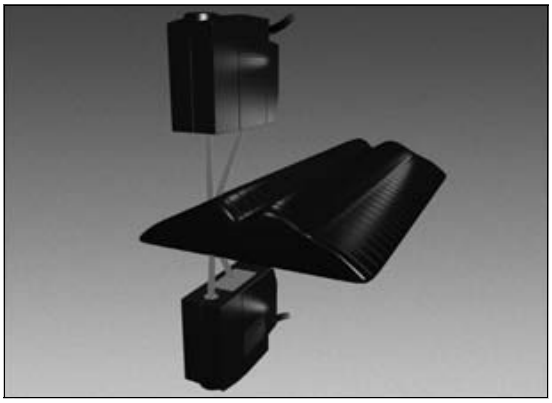
Inspecting the surface uniformity of a hard disk



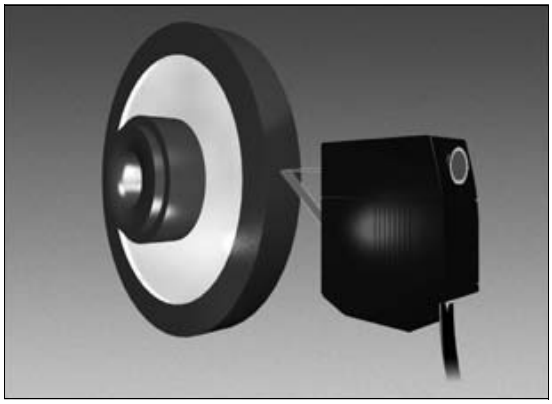
Shape measurement for welding robot control



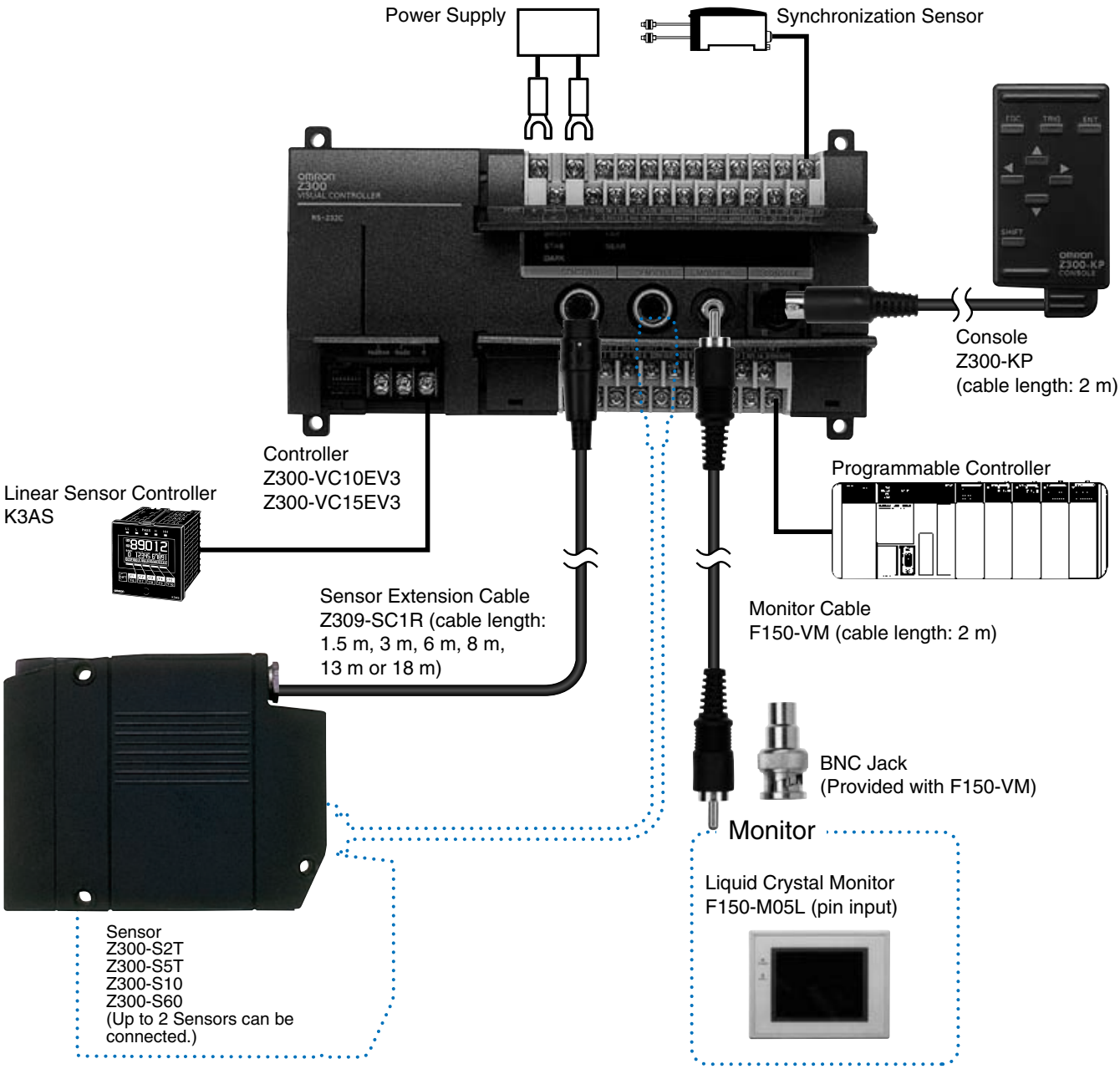
Measuring tire or black rubber thickness



Grinding measurement of a whetstone



System configuration



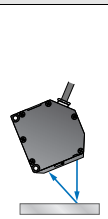
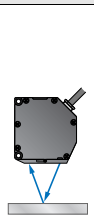
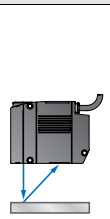
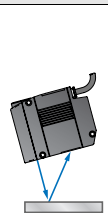
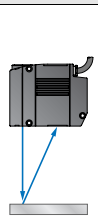
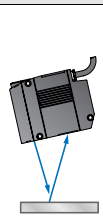
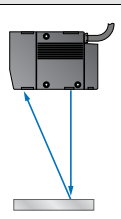
Ordering Information

Name Item	Model	Remarks
Sensor	**Z300-S2T**	
	Z300-S5T	
	Z300-S10	
	Z300-S60	
Controller	**Z300-VC10EV3**	NPN input/output
	Z300-VC15EV3	PNP input/output
Console	**Z300-KP**	
Liquid Crystal Monitor	**F150-M05L**	
Sensor Extension Cable	**Z309-SC1R** (See note)	Cable length: 1.5 m, 3 m, 6 m, 8 m, 13 m or 18 m
Monitor Cable	**F150-VM**	

Note: Specify the required cable length when ordering.

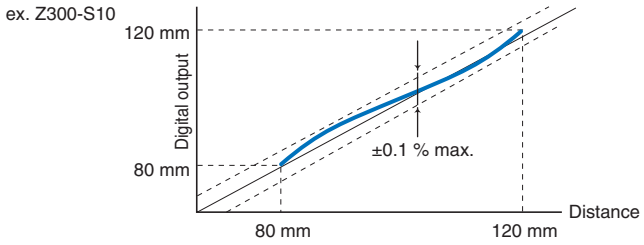
Rating/performance

Sensor: Z300-S2T/Z300-S5T/Z300-S10/Z300-S60

Model		Z300-S2T		Z300-S5T		Z300-S10		Z300-S60
		Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection	Diffuse reflection only
Measurement mode								
Distance to measurement center		±5.2 mm	20 mm (with beam cover attached: 16 mm)	±50 mm	±44 mm	±100 mm	±94 mm	±600 mm
Measurement range		±1 mm		±5 mm	±4 mm	±20 mm	±16 mm	±350 mm (F.S.700 mm)
Light source		Visible-light semiconductor laser (Wavelength: 650 nm, 1 mW max., Class 2)		Visible-light semiconductor laser (Wavelength: 670 nm, 1 mW max., Class 2)				Visible-light semiconductor laser (Wavelength: 658 nm, 15 mW max., Class 3B)
Beam dimensions (See note 1.)		20 μm × 300 μm (200 μm*) TYP. (distance to measurement center) * Measurement region		30 μm × 400 μm TYP. (distance to measurement center)		60 μm × 1000 μm TYP. (distance to measurement center)		0.3 mm × 16 (10.3*) mm (at 500 mm) * Measurement region
Linearity		±0.05 %F.S. (See note 2.)	±0.05 %F.S. (See note 3.)	±0.1 %F.S. (See note 4.)				±0.07 %F.S. (250 to 750 mm) ±0.1 %F.S. (750 to 950 mm) (See note 4.)
Resolution		0.4 μm (See notes 5 and 6.)		0.4 μm (See notes 7 and 9.)		1 μm (See notes 7 and 8.)		8 μm (at 350 mm) 40 μm (at 600 mm) (See notes 7 and 8.)
Sampling period (See note 10.)		540 μs						
LED indicators	NEAR indicator	Lights if the workpiece is close to the measurement center or is on the near side of the measurement center and inside the measurement region. Flashes if the workpiece is outside the measurement region or if the density is excessive or insufficient.						
LED indicators	FAR indicator	Lights if the workpiece is close to the measurement center or is on the far side of the measurement center and inside the measurement region. Flashes if the workpiece is outside the measurement region or if the density is excessive or insufficient.						
Temperature characteristic (See note 11.)		±0.01 %F.S./°C						
Environment resistance	Degree of protection	IEC IP64		IEC IP67				IEC IP66
Environment resistance	Ambient operating illumination	Illumination at light-receiving surface: 3,000 lx max., incandescent light						
Environment resistance	Ambient temperature	Operating: 0 to +50 °C, Storage: -15 to +60 °C (with no icing or condensation)						
Environment resistance	Ambient humidity	Operating and storage: 35 % to 85 % (with no condensation)						
Environment resistance	Vibration resistance	10 to 150 Hz (double amplitude: 0.35 mm) for 8 min. each in X, Y, and Z directions						
Materials		Unit: Die-cast aluminum; Cable sheathing: Heat-resistant chlorinated vinyl Connector: Zinc alloy and brass						
Cable length		2 m						50 cm
Minimum bending radius		68 mm						
Weight		Approx. 600 g (Unit: Approx. 350 g)		Approx. 800 g (Unit: Approx. 600 g)				Approx. 800 g (Unit: Approx. 700 g)
Accessories		3 ferrite cores, laser warning labels (English)						

Note: 1. Defined at $1/e^2$ (13.5 %) of the density at the light center. Light may, however, be present outside this range and if the reflection factor of the light around the workpiece is high compared to the workpiece, measurement may be affected.
2. Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard SUS blocks. The linearity varies with the type of workpiece.

3 . Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard quartz glass. The linearity varies with the type of workpiece.
4 . Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard white alumina ceramics. The linearity varies with the type of workpiece.



5 . Displacement conversion value for peak-to-peak of displacement output. These figures are for measurement of OMRON standard quartz glass (mirror reflection mode) or OMRON standard SUS blocks (diffuse reflection) at the measurement center.
In magnetic fields, it may not be possible to maintain resolution performance characteristics.
6 . These figures are for when the Sensor is connected to the Z300-VC10EV3/VC15EV3, the average number of measurements is 256, and M command RS-232C output is used.
7 . Displacement conversion value for peak-to-peak of displacement output (for measurement of OMRON standard white alumina ceramic at the measurement center).
In strong magnetic fields, it may not be possible to maintain resolution performance characteristics.
8 . With the Z300-VC10EV3/VC15EV3, at an average number of measurements of 64.
9 . With the Z300-VC10EV3/VC15EV3, at an average number of measurements of 512.
10. Value for measurement with 1 line (high speed) set in CCD Mode.
11. Value for measurement with the space between the Sensor and the workpiece (Z300-S5T/S10/S60: white alumina ceramic; Z300-S2T: quartz glass) secured with an aluminum jig.

Controller: Z300-VC10EV3/Z300-VC15EV3

Item	mode	VISUAL mode	NON-VISUAL mode
Performance specifications	Number of Sensors that can be mounted	2	1
	Number of scenes	16	1
	Image memory function	NG images: 20 scenes max.; Surrounding images: 4 scenes max.; Workpiece display images: 4 scenes max.	——
	Processing method	Gray center of gravity, edge centering	Edge centering
	Pre-image processing	Noise removal, smoothing	None
	Averaging/filtering	Average number of times (12 stages, 1 to 4096 times), HPF (high pass filter)	Average number of times (SLOW: 64 times; FAST: 1 time)
	Light intensity tracking function	Automatic (The light intensity tracking range can be specified.) Fixed (Select from 32 stages.)	Automatic (The light intensity tracking range can not be specified.) Fixed (Select either HIGH or LOW.)
	Applications	Select from the following 8 types: Surface displacement, spot displacement, maximum height, groove/indentation, level difference, transparent workpiece thickness, level difference (2 Sensors), or thickness (2 Sensors).	——
	Region specification	Region specification of line beam and displacement direction is possible.	——
	Two region measurement modes	Absolute coordinate mode and relative coordinate mode	——
	Hold functions	Sampling, peak, bottom, peak-to-peak, average, and length	——
	Two Sensor measurement modes	Simultaneous measurement and alternate measurement	——
	Measurement data	4 outputs per scene	1 output
	Equations	The following operations are possible for outputs 0 to 3: K+A, K-A, K+(A+B), K+(A-B), and K-(A+B) A and B: Specified measurement points K: Freed constant	——
	Results output	Judgement output (HIGH, PASS, LOW, ERROR) → RS-232C output → Terminal block output Measurement value output (measurement value) → RS-232C output → Terminal block output → Analog output	Analog output
	Terminal block	11 input points: $\overline{\text{TRIGGER}}$, $\overline{\text{HOLD-RESET}}$, $\overline{\text{LD-OFF}}$, $\overline{\text{ALL-ZERO}}$, $\overline{\text{ZERO0}}$, $\overline{\text{ZERO1}}$, $\overline{\text{RESET}}$, and DI 0 to DI 3 21 output points: $\overline{\text{DO0}}$ to $\overline{\text{DO20}}$	$\overline{\text{LD-OFF}}$
	Input/Output Type	Z300-VC10EV3: NPN Z300-VC15EV3: PNP	
	Monitor interface	1 channel (for pin jack or overscan monitor)	——
	Analog output resolution	The full scale for output can be divided into a maximum of 40000 gradations. Resolution (See note.) * 0.25 mV (±5 V), 0.4 μA (4 to 20 mA)	

Note: For measurement at an average number of times of 64 with an OMRON K3AS Linear Sensor Controller connected.

Item	mode	VISUAL mode	NON-VISUAL mode
General specifications	Supply voltage	21.6 to 26.4 VDC (including ripple)	
	Current consumption	1 A max. (with 2 Sensors connected)	
	Insulation resistance	20 MΩ min. between all DC external terminals and GR terminal (100 VDC Megger, with internal surge absorber removed)	
	Dielectric strength	1000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)	
	Leakage current	10 mA max.	
	Noise resistance	1500 Vp-p; Pulse width: 0.1 μs/ 1 μs; Rising edge: 1-ns pulse	
	Vibration resistance	10 to 150 Hz (double amplitude: 0.1 mm) for 8 min. each in X, Y, and Z directions	
	Shock resistance	200 m/s^2, 3 times each in 6 directions	
	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)	
	Ambient environment	No corrosive gases	
	Ground	Ground the Z300's ground terminal to less than 100 Ω	
	Degree of protection	IEC60529 IP20 (in-panel)	
	Case material	Controller: ABS	
	Weight (including packaging)	Approx. 1300 g (Unit: Approx. 700 g)	
	Accessories	2 manuals, 1 resistor (250 Ω, 1/2 W)	

Monitor

Monitor / Item / Model	Liquid Crystal Monitor F150-M05L
Size	5.5 inches
Type	TFT color liquid crystal
Resolution	320 × 240 dots
Input signal	NTSC composite video (1.0 V / 75 Ω)
Supply voltage	20.4 to 26.4 VDC
Current consumption	Approx. 700 mA
Ambient temperature	Operating: 0 °C to +50 °C, Storage: -25 °C to +65 °C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85 %RH (with no condensation)
Weight (including packaging)	Approx. 870 g (Unit: Approx. 610 g)
Accessories	Operation manual, 4 mounting brackets

Laser Safety

The Z300-S2T, Z300-Z5T and Z300-S10 Sensor Heads are Class 2 Laser Products according to EN60825-1 (IEC60825-1) and Class II Laser Product according to FDA (21 CFR1040.10) (see note). The Z300-S60 Sensor Head is a Class 3B and Class IIIB Laser Product, respectively. The Z300 Series is meant to be built into final system equipment. Pay special attention to the following precautions for the safe use of the product:

Note: Europe: Class 2 and Class 3B of EN60825-1: 1994 = IEC60825-1: 1993
U.S.A.: Class II and Class IIIB of FDA (21 CFR1040.10)

	Z300-S2T	Z300-S5T	Z300-S10	Z300-S60
Wavelength	650 nm	670 nm		658 nm
Peak power	1 mW max.			15 mW max.
Class	2			3B
Maximum pulse duration	7 ms			17.5 ms
Period	0.5 to 10 ms			0.5 to 25 ms

(1)Use this product as specified in the operation manual. Otherwise, you may be exposed to hazardous laser radiation.

(2)The Z300 series radiates laser beams in the visible light range. Do not expose your eyes directly to the laser radiation. Ensure that the laser beam path is terminated during use. If a mirror or shiny surface is positioned in the laser beam path, ensure that the reflected beam path is also terminated.
If the Unit must be used without terminating the laser beam path, position the laser beam path so that it is not at eye level.

(3)To avoid exposure to hazardous laser radiation, do not displace nor remove the protective housing during operation, maintenance, and any other servicing.

(4)The user should return the product to OMRON for all repair and servicing.

(5)As for countries other than those of Europe and the U.S.A., observe the regulations and standards specified by each country.

Precautions

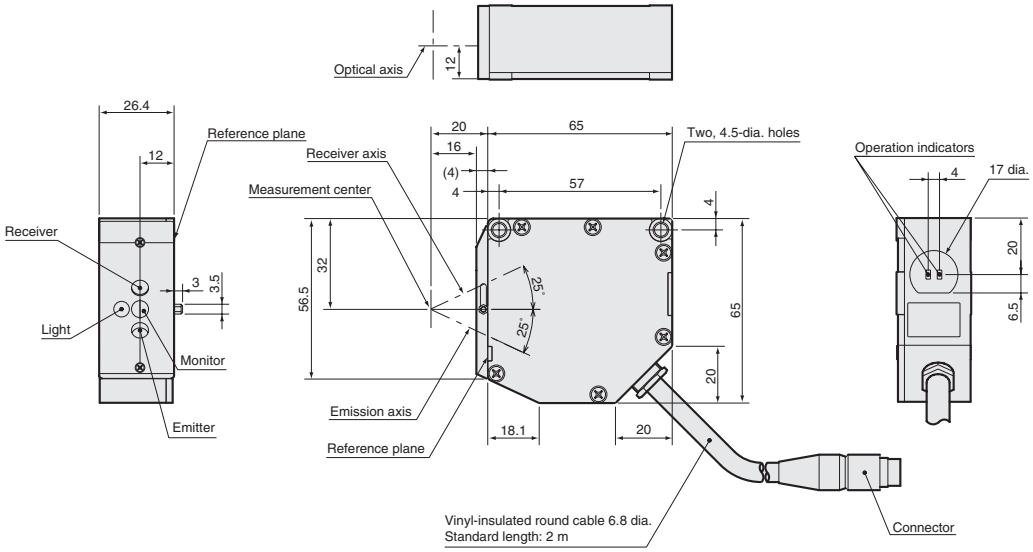
Warming up

After turning on the power, wait about 30 minutes before using the equipment. The circuits are not stable after turning on the power, and thus measured values tend to gradually drift.

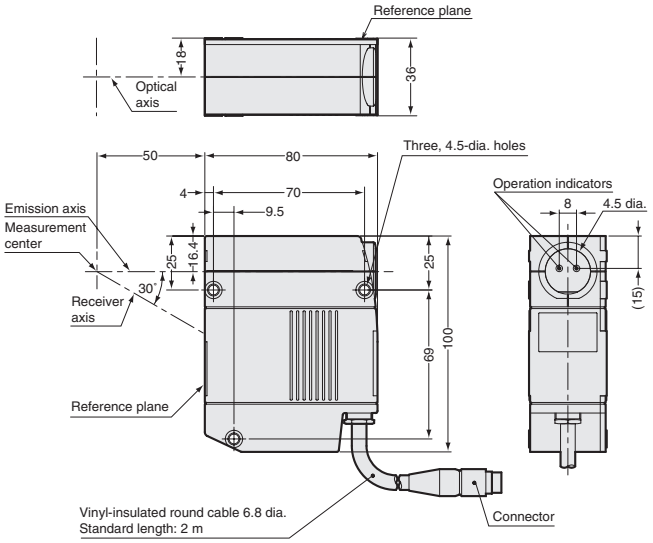
Dimensions (Unit: mm)

Sensor

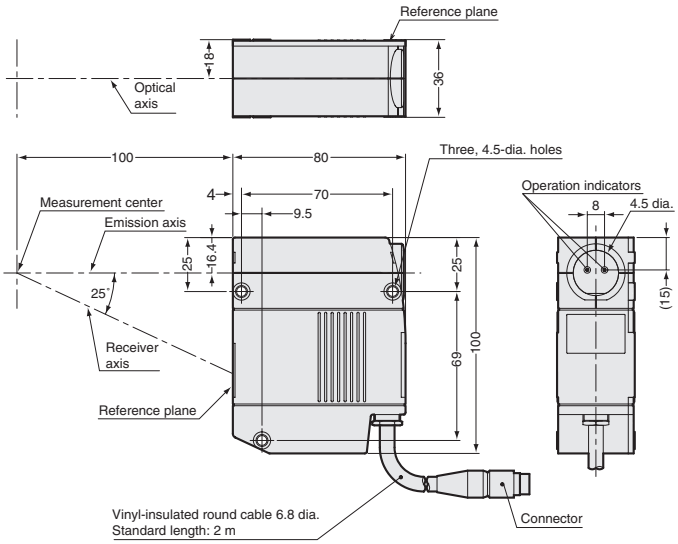
Z300-S2T



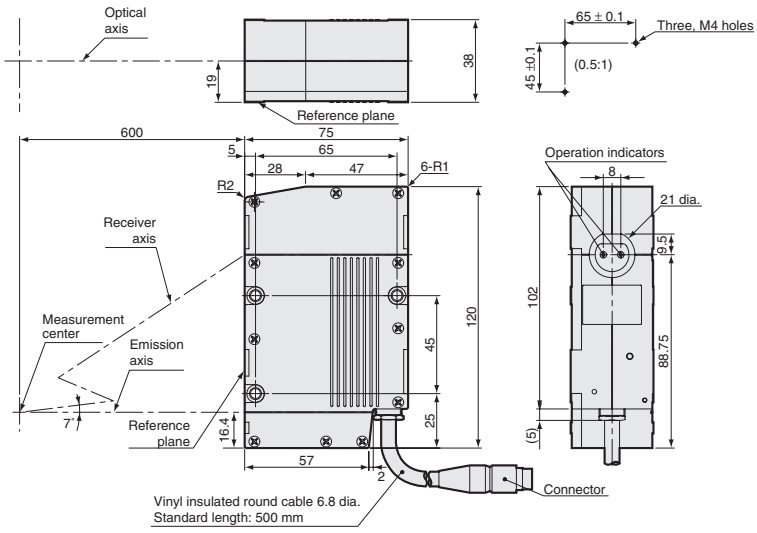
Z300-S5T



Z300-S10

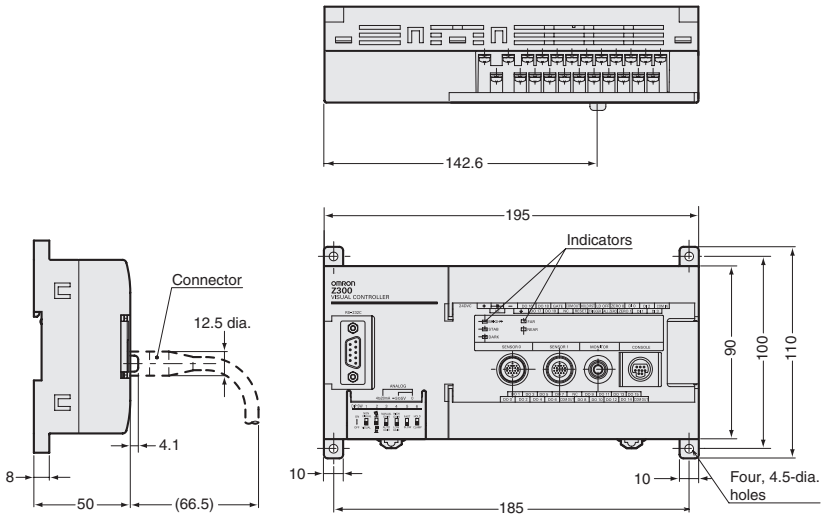


Z300-S60



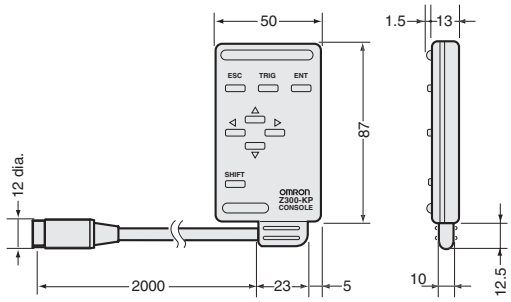
Controller

Z300-VC10EV3
Z300-VC15EV3



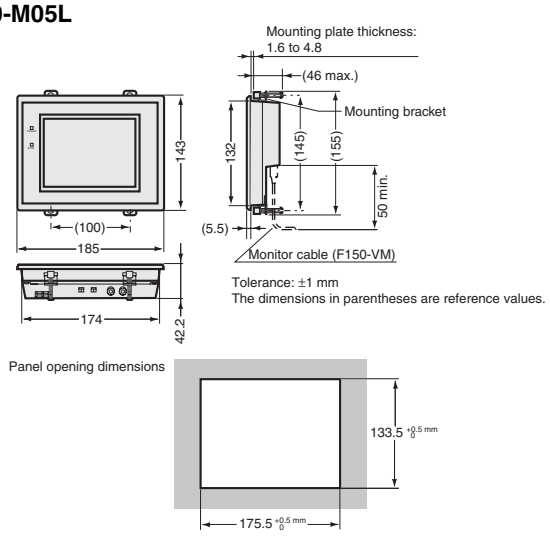
Console

Z300-KP



LCD monitor

F150-M05L



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q01E-EN-02 In the interest of product improvement, specifications are subject to change without notice.

Profile Measuring System

Z500

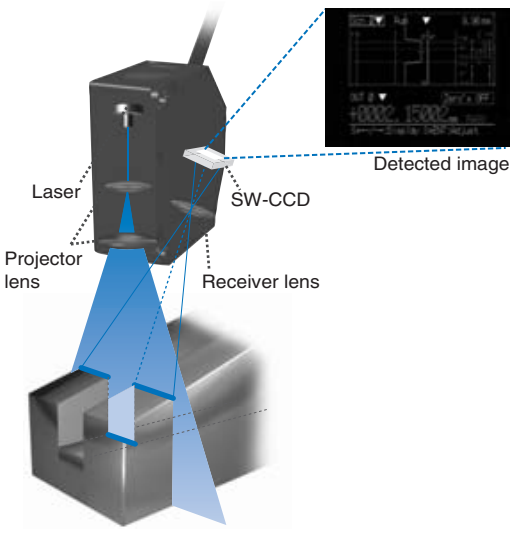
High-Precision Sensor that Measures and Displays an Object's Profile.

CE

Features

OMRON's original line beam method provides a complete solution to profile measurement problems.

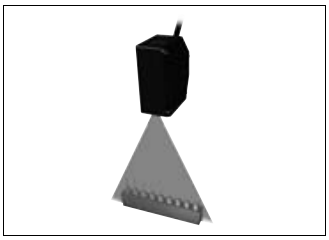
Conventional non-contact measurement of the profile of an object commonly uses a displacement sensor to measure the height of the object, by moving the object or the sensor.
However, this system has several disadvantages, such as lower measurement accuracy resulting from object or sensor movement as well as high system construction cost.
By utilizing a unique wide beam method and 2-dimensional CCD, OMRON's Z500 eliminates these problems.
Through its capability of measuring a diversely-shaped objects in a stable manner, the Z500 can meet a variety of application needs.



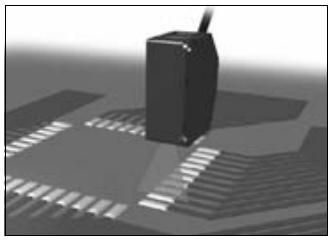
Principle of line beam method
A wide beam is applied to the object to be measured. A 2-dimensional CCD receives the reflected light to measure the 2-dimensional profile of the object.

Application

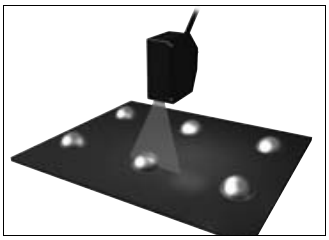
Measurement of connector pin configuration



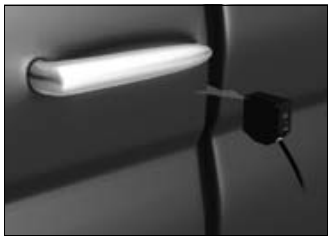
Height measurement for cream-soldered joint on PCB



Rivet height measurement



Door gap measurement

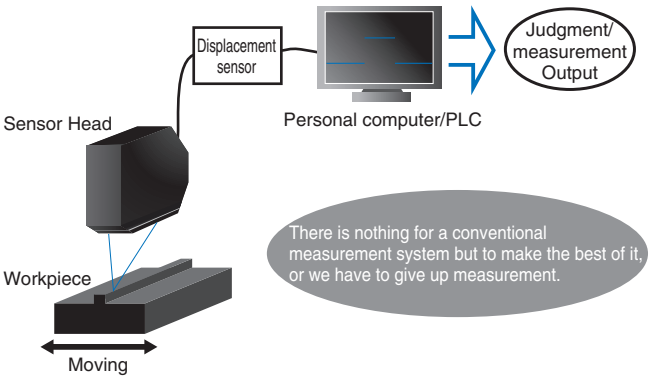


Features

Measures the shape of object instantly.

A complete solution to the disadvantages of conventional measurement systems.

Measurement by displacement sensor

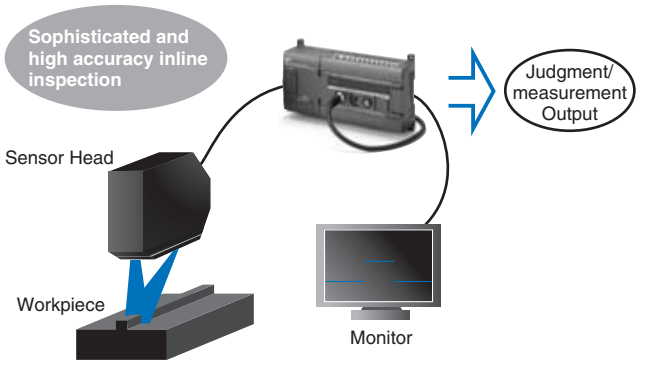


Problems to be resolved
- Object or sensor needs to be moved.
- Personal computer or other device is required for measurement data processing.

Increased system construction cost
Measurement accuracy deterioration caused by movement of object or sensor and data processing.
Measurement takes a long time.

When you use Z500, ---

Measurement by Z500 model



Enjoy the following advantages from Z500 !
- Moving the object or sensor is no longer necessary.
- Various data processing and calculation functions are performed automatically.

Lower system construction cost
Higher measurement accuracy
Shorter measurement time

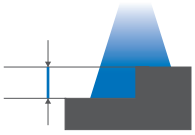
Accurate and stable measurement.

OMRON's original 2-dimensional SW-CCD and multiple light intensity control system enable stable measurement of objects with round shape and other surface conditions.

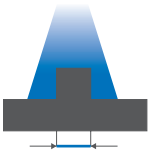
A variety of measurement items.

Various measurement items, such as level difference, width, and edge position, can be selected depending on the specific application.
Permitting simultaneous measurement of up to 8 items, the Z500 is applicable to various measurement purposes.

2-point level difference (Step: 2 pts)



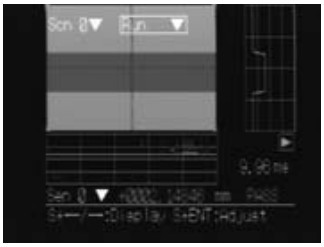
Width



Edge position

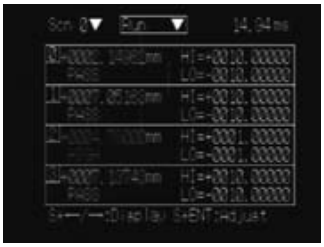
Four types of monitor screens

Measurement data can be displayed on 4 types of monitor screens.
These screens enable analysis and evaluation of measurement data from various viewpoints.

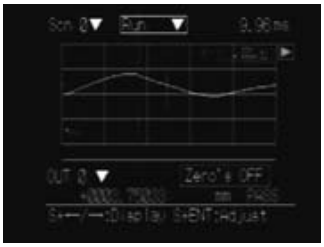


Profile monitor
Time-series change of profile (data on cross section height) can be checked on a 3D gray scale image.

Image monitor
Both measurement data and profile image can be checked at the same time.

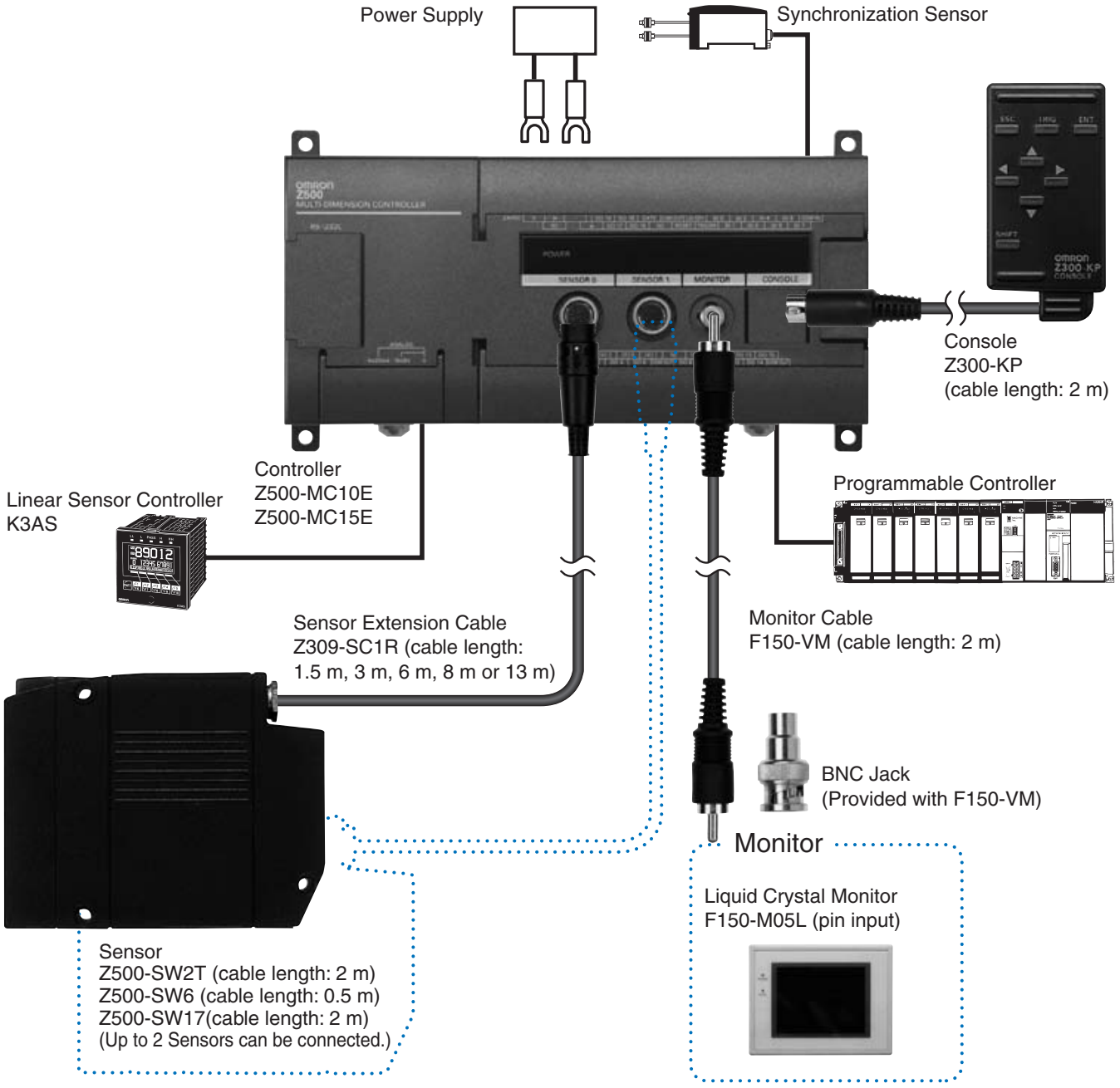


Digital monitor
Two or more measurement data can be checked at the same time.



Trend monitor
Time-series change of measurement data can be checked.

System configuration



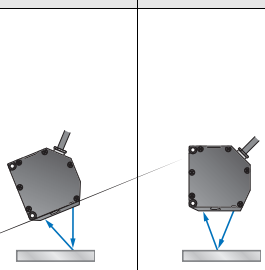
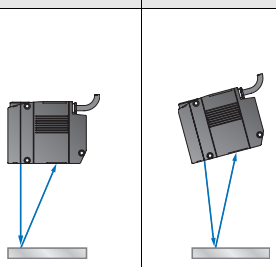
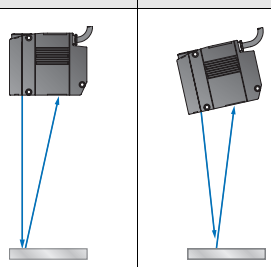
Ordering Information

Name / Item	Model	Remarks
Sensor	**Z500-SW2T**	Cable length: 2 m
	Z500-SW6	Cable length: 0.5 m
	Z500-SW17	Cable length: 2 m
Controller	**Z500-MC10E**	NPN input/output
	Z500-MC15E	PNP input/output
Console	**Z300-KP**	——
Liquid Crystal Monitor	**F150-M05L**	——
Sensor Extension Cable	**Z309-SC1R** (See note)	Cable length: 1.5 m, 3 m, 6 m, 8 m or 13 m
Monitor Cable	**F150-VM**	Cable length: 2 m

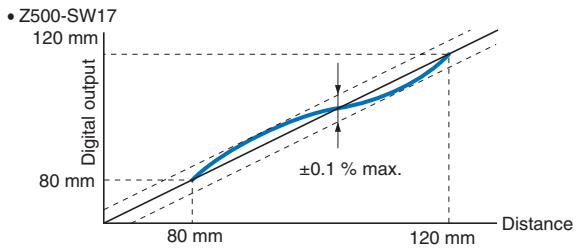
Note: Specify the required cable length when ordering.

Rating/Performance

Sensor Z500-SW2T/-SW6/-SW17

Model	Z500-SW2T		Z500-SW6		Z500-SW17	
Item	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection
Measurement mode						
Distance to measurement center	5.2 mm	20 mm (with beam cover attached: 16 mm)	50 mm	44 mm	100 mm	94 mm
Measurement range	±0.8 mm		±5 mm	±4 mm	±20 mm	±16 mm
Light source	Visible-light semiconductor laser (See note 10) (Wavelength 650 nm, 1 mW max., Class 2)		Visible-light semiconductor laser (Wavelength 658 nm, 15 mW max., Class 3B)			
Beam dimensions (See note 1)	Reference distance: 20 µm × 4 mm TYP. (Measurement region: 2 mm)		Reference distance: 30 µm × 24 mm TYP. (Measurement region: 6 mm)		Reference distance: 60 µm × 45 mm TYP. (Measurement region: 17 mm)	
Linearity	±0.1 %F.S. (See note 3)	±0.1 %F.S. (See note 2)	±0.1 %F.S. (See note 4)			
Resolution	0.25 µm (See notes 5 and 6)		0.3 µm (See notes 7 and 8)		1 µm (See notes 7 and 8)	
Sampling cycle	9.94 ms					
LED indicators (LASER indicator)	Lit while laser is ON.					
Temperature characteristic (See note 9)	0.01 %F.S./°C					
Environment resistance: Degree of protection	IEC IP64		IEC IP66			
Environment resistance: Ambient operating illumination	Illumination at light-receiving surface: 3,000 lx max., incandescent light					
Environment resistance: Ambient temperature	Operating: 0 to +50 °C, Storage: -15 to +60 °C (with no icing or condensation)					
Environment resistance: Ambient humidity	Operating and storage: 35 to 85 % RH (with no condensation)					
Environment resistance: Vibration resistance	10 to 150 Hz (single amplitude: 0.35 mm) for 80 min. each in X, Y, and Z directions					
Materials	Unit: Die-cast aluminum Cable sheathing: Heat-resistant chlorinated vinyl Connector: zinc alloy and brass					
Cable length	2 m		0.5 m		2 m	
Minimum bending radius	68 mm					
Weight (including packaging)	Approx. 600 g (Unit: Approx. 350 g)		Approx. 700 g (Unit: Approx. 600 g)		Approx. 800 g (Unit: Approx. 600 g)	
Accessories	3 ferrite cores, laser warning labels (English)					

Note: 1. Defined at $1/e^2$ (13.5%) of the density at the light center. Light may, however, be present outside this range and if the reflection factor of the light around the workpiece is high compared to the workpiece, measurement may be affected.
2. Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard quartz glass. The linearity varies with the type of workpiece.
3. Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard SUS blocks. The linearity varies with the type of workpiece.
4. Error with respect to the theoretical line representing the displacement output for measurement of OMRON standard white alumina ceramics. The linearity varies with the type of workpiece.



5. Displacement conversion value for peak-to-peak of displacement output. These figures are for measurement of OMRON standard quartz glass (mirror reflec-

tion mode) or OMRON standard SUS blocks (diffuse reflection mode) at the measurement center. In strong magnetic fields, it may not be possible to maintain resolution performance characteristics.

6 . These figures are for when the Sensor is connected to the Z500-MC10E/MC15E, the average number of measurements is 16. Measurement data are sent to PC via RS-232C cable for calculation of their average values.

7 . Displacement conversion value for peak-to-peak of displacement output (for measurement of OMRON standard white alumina ceramic at the measurement center). In strong magnetic fields, it may not be possible to maintain resolution performance characteristics.

8 . With the Z500-MC10E/MC15E, at an average number of measurements of 64. Measurement data are sent to PC via RS-232C cable for calculation of their average values.

9 . Value for measurement with the space between the Sensor and the workpiece (white alumina ceramic) secured with an aluminum jig.

10. Higher power laser type (Class 3B) is also available. For further information, please contact us.

Controller Z500-MC10E/MC15E

Item	Model	Z500-MC10E	Z500-MC15E
	Input/Output Type	NPN	PNP
Performance specifications	Number of Sensors that can be mounted	2	
	Number of scenes	16	
	Light intensity tracking function	Automatic (The light intensity tracking range can be specified)/Fixed (Select from 31 stages)/ Multiple (The light intensity range can be specified)	
	Measurement item	Select from the following 8 types: Height, Step: 2 pts, Step: 3 pts, Edge position, With, Edge center, Peak/Bottom, Define	
	Region specification	Region specification of line beam and displacement direction is possible.	
	Number of data to be stored	2048 points max.	
	Trigger function	Free/External 1/External 2/Auto	
	Results output	• Judgment output → RS-232C output → Terminal block output • Measurement value output (measurement value) → RS-232C output → Analog output	
	Terminal block	11 input points: $\overline{\text{TRIGGER}}$, $\overline{\text{LD-OFF}}$, $\overline{\text{RESET}}$, $\overline{\text{D10}}$ to $\overline{\text{D17}}$ 21 output points: $\overline{\text{DO0}}$ to $\overline{\text{DO19}}$, $\overline{\text{GATE}}$	
	Monitor interface	1CH (for pin jack or overscan monitor)	
	Analog output resolution	The full scale for output can be divided into a maximum of 40,000 gradations. Resolution (See note): 0.25 mV (±5 V), 0.4 μA (4 to 20 mA)	
General specifications	Power supply voltage	21.6 to 26.4 VDC	
	Current consumption	1 A max. (with 2 Sensors connected)	
	Insulation resistance	20 MΩ min. between all DC external terminals and GR terminal (100 VDC megger) (with internal surge absorber removed)	
	Dielectric strength	1000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)	
	Leakage current	10 mA max.	
	Noise resistance	1500 Vp-p; pulse width: 0.1 μs/1 μs, Rising edge: 1-ns pulse	
	Vibration resistance	10 to 150 Hz (double amplitude: 0.1 mm) for 8 min. each in X, Y, and Z directions	
	Shock resistance	200 m/s^2, 3 times each in 6 directions	
	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 %RH (with no condensation)	
	Ambient environment	No corrosive gases	
	Ground	Ground the Z500's ground terminal to less than 100 Ω	
	Degree of protection	IEC IP20 (in-panel)	
	Material	Unit: ABS	
	Weight (including packaging)	Approx. 1300 g (Unit: Approx. 700 g)	
	Accessories	2 manuals, 1 resistor (250 Ω, 1/2 W)	

Note: For measurement at an average number of times of 64 with an OMRON K3AS Linear Sensor Controller connected.

Monitor

Item / Monitor Model	Liquid Crystal Monitor F150-M05L
Panel size	5.5 inches
Panel type	TFT color liquid crystal
Resolution	320 × 240 dots
Input signal	NTSC composite video (1.0 V/75 Ω)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approx. 700 mA
Ambient temperature	Operating: 0 to +50 °C, Storage: -25 to +65 °C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85 %RH (with no condensation)
Weight (including packaging)	Approx. 870 g (Unit: Approx. 610 g)
Accessories	Operation manual, 4 mounting brackets

Laser Safety

The Z500-SW2T Sensor Head is a Class 2 Laser Product according to EN60825-1 (IEC60825-1) and Class II Laser Product according to FDA (21 CFR1040.10) (see note). The Z500-SW6 and Z500-SW17 Sensor Heads are Class 3B and Class IIIB Laser Products, respectively. The Z500 Series is meant to be built into final system equipment. Pay special attention to the following precautions for the safe use of the product:

Note: Europe: Class 2 and Class 3B of EN60825-1: 1994 = IEC60825-1: 1993
U.S.A.: Class II and Class IIIB of FDA (21 CFR1040.10)

	Z500-SW2T	Z500-SW6/Z500-SW17
Wavelength	650 nm	658 nm
Maximum pulse duration	10 ms	17.5 ms
Cycle	0.5 to 10 ms	0.5 to 25 ms
Peak power	1 mW max.	15 mW max.
Class	2	3B

(1)Use this product as specified in the operation manual. Otherwise, you may be exposed to hazardous laser radiation.

(2)The Z500 series radiates laser beams in the visible light range. Do not expose your eyes directly to the laser radiation. Ensure that the laser beam path is terminated during use. If a mirror or shiny surface is positioned in the laser beam path, ensure that the reflected beam path is also terminated. If the Unit must be used without terminating the laser beam path, position the laser beam path so that it is not at eye level.

(3)To avoid exposure to hazardous laser radiation, do not displace nor remove the protective housing during operation, maintenance, and any other servicing.

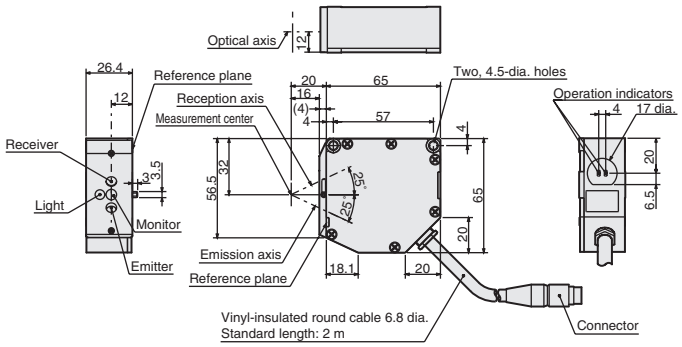
(4)The user should return the product to OMRON for all repair and servicing.

(5)As for countries other than those of Europe and the U.S.A., observe the regulations and standards specified by each country.

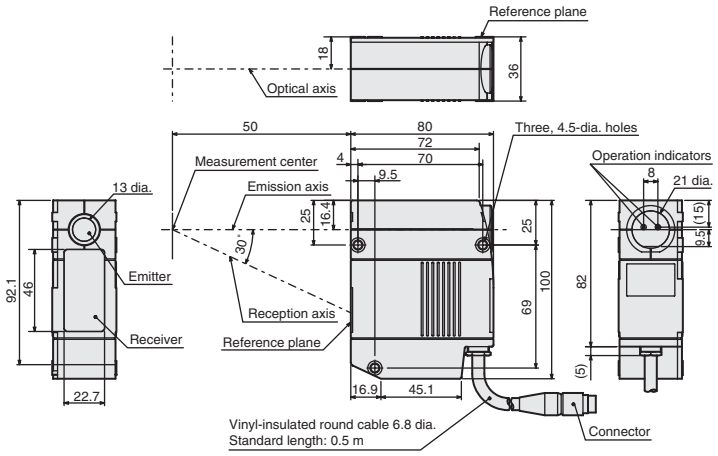
Dimensions (Unit: mm)

Sensor

Z500-SW2T

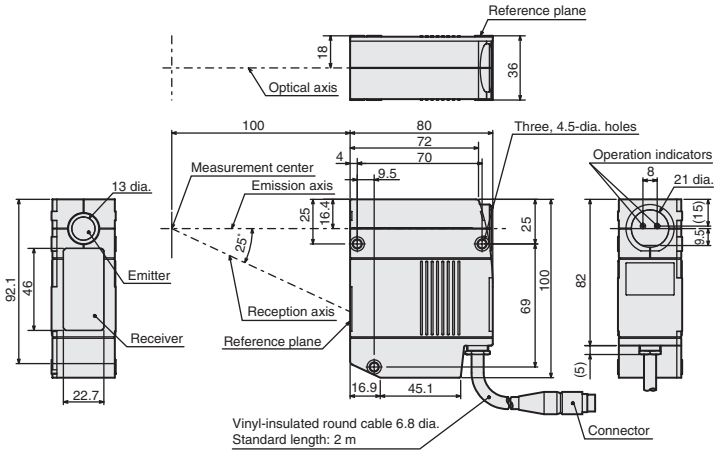


Z500-SW6



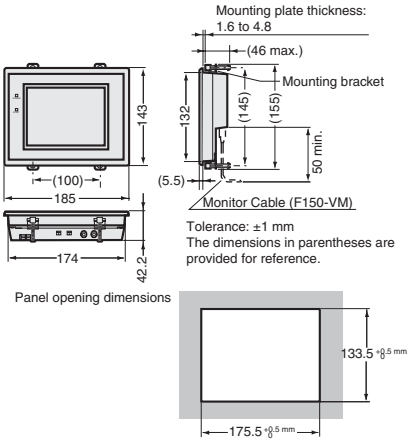
Sensor

Z500-SW17



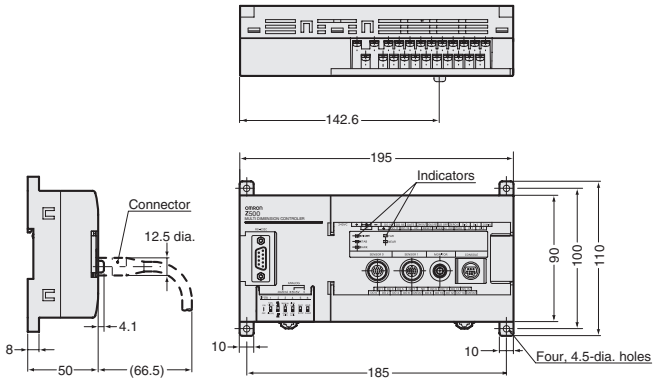
Liquid Crystal Monitor

F150-M05L



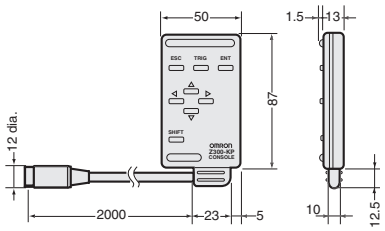
Controller

Z500-MC10E/MC15E



Console

Z300-KP



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q02E-EN-02

In the interest of product improvement, specifications are subject to change without notice.

Welding Bead Sensor

Z510

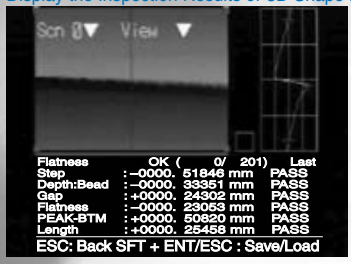
In-line Inspection of Welding Beads

- Inspect for welding flaws by measuring the bead shape.
- Accumulate and output the profile data. Greatly simplify the management of welding bead quality.
- The high-speed 10-ms measurement period allows 100% in-line inspection.
- Automatic light intensity (brightness) adjustment provides stable measurement of fluctuating metal surfaces.
- The compact sensor head contains both the transmitter and receiver, so mounting space is not an issue.

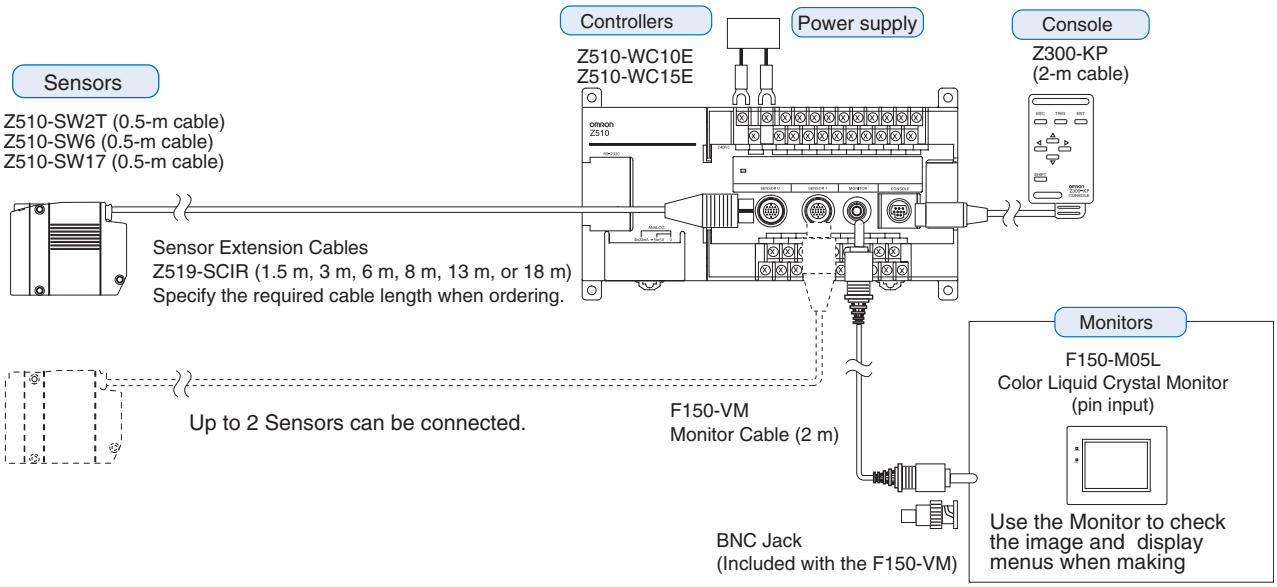
Features

Improve quality by performing 100% inspection of weld strength uniformity.

Display the Inspection Results or 3D Shape Data



Basic System Configuration



Specifications

Controllers:
Z510-WC10E and Z510-WC15E

General Specifications

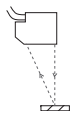
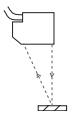
Item	Specification
Supply voltage	21.6 to 26.4 VDC
Current consumption	1 A max. (with 2 Sensors connected)
Insulation resistance	20 MΩ min. (at 100 V DC) between DC external terminals and GR terminal (with internal surge absorber removed)
Dielectric strength	1,000 VAC, 50/60 Hz between DC external terminals and GR terminal (with internal surge absorber removed)
Leakage current	10 mA max.
Noise resistance	1,500 V_{P-P}; pulse width: 0.1 μs/1 μs; rising edge: 1-ns pulse
Vibration resistance	10 to 150 Hz (double amplitude of 0.1 mm) for 8 minutes each in the X, Y, and Z directions
Shock resistance	200 m/s^2 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no icing or condensation) Storage: -15 to 60°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Atmosphere	No corrosive gases
Grounding	Less than 100 Ω
Degree of protection	IEC60529 IP20 (In-panel)
Material	Case: ABS

Characteristics

Item	Specification
Number of Sensors	Up to 2 Sensors can be connected.
Number of scenes	16
Light intensity tracking function	Automatic (The light intensity tracking range can be specified.) Fixed (Select one of 31 stages.)
Measurement items	Select one of the following 6 items: Deviation from reference surface, Bead height, Width, Bead change, Peak/Bottom, Inspection length
Region specification	A region can be specified in the direction of the line beam.
Data storage	2,048 points max.
Trigger function	Free-run, External 1, External 2, or Auto
Results output	• Judgement output RS-232C output Terminal block output • Measurement value output (measurement value) RS-232C output Analog output
Terminal block	8 input points: $\overline{\text{TRIGGER}}$, $\overline{\text{LD-OFF}}$, $\overline{\text{RESET}}$, $\overline{\text{DI0}}$, and $\overline{\text{DI4}}$ to $\overline{\text{DI7}}$ 12 output points: $\overline{\text{DO0}}$ to $\overline{\text{DO5}}$, $\overline{\text{DO8}}$, $\overline{\text{DO15}}$, $\overline{\text{DO17}}$ to $\overline{\text{DO19}}$, and $\overline{\text{GATE}}$
Monitor interface	1 channel (for pin jack or overscan monitor)
Analog output resolution	The full-scale output can be divided into 40,000 gradations max. Resolution (See note.): 0.25 mV (±5 V) 0.4 μA (4 to 20 mA)
Weight	Approx. 700 g (Controller only)

Note: This resolution is for measurements with an OMRON K3AS Linear Sensor Controller connected and values averaged over 64 measurements.

Sensors: Z510-SW2T, Z510-SW6, and Z510-SW17

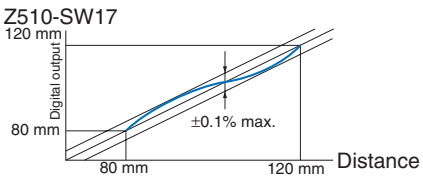
Sensor model		Z510-SW2T		Z510-SW6		Z510-SW17	
Measurement mode		Mirror reflection	Diffuse reflection	Diffuse reflection	Mirror reflection	Diffuse reflection	Mirror reflection
							
Measurement distance at center		20 mm (16 mm with beam cover mounted)	5.2 mm	50 mm	44 mm	100 mm	94 mm
Measurement range		±0.8 mm		±5 mm	±4 mm	±20 mm	±16 mm
Light source		Visible semiconductor laser (Wavelength: 670 nm, 15 mW max., class 3B)		Visible semiconductor laser (Wavelength: 658 nm, 15 mW max., class 3B)			
Beam dimensions (See note 1.)		20 μm × 4 mm typical at the reference distance (2-mm measurement region)		30 μm × 24 mm typical at the reference distance (6-mm measurement region)		60 μm × 45 mm typical at the reference distance (17-mm measurement region)	
Linearity		±0.1% F.S. (See note 2.)	±0.1% F.S. (See note 3.)	±0.1% F.S. (See note 4.)			
Resolution		0.25 μm (See notes 5 and 6.)		0.3 μm (See notes 7 and 8.)		1 μm (See notes 7 and 8.)	
Sampling period		9.94 ms					
LED indicator (Laser indicator)		Lit when the laser is ON.					
Temperature characteristic (See note 9.)		0.01% F.S./°C					
Environmental resistance	Degree of protection	IP64		IP66			
	Ambient operating illumination	Illumination at light-receiver surface: 3,000 lx max. (incandescent light)					
	Ambient temperature	Operating: 0 to 50°C (with no icing or condensation) Storage: -15 to 60°C (with no icing or condensation)					
	Ambient humidity	Operating and storage: 35% to 85% (with no condensation)					
	Vibration (destruction)	10 to 150 Hz (double amplitude of 0.35 mm) for 8 minutes each in the X, Y, and Z directions					
Materials		Controller: Die-cast aluminum Cable sheathing: Heat-resistant PVC Connector: Zinc alloy and brass					
Cable length		0.5 m					
Minimum bending radius		68 mm					
Weight		Approx. 350 g		Approx. 600 g			

Note: 1. The minimum light intensity at the edges of the beam is defined as $1/e^2$ (13.5%) of the intensity at the center of the beam. Some light will scatter beyond this beam region and the measurement may be affected if the immediate vicinity around the workpiece is highly reflective.

2. This is the error with respect to the theoretical line of the displacement output when measuring the standard OMRON quartz glass. The linearity may vary depending on the workpiece being used.

3. This is the error with respect to the theoretical line of the displacement output when measuring a standard OMRON stainless-steel block. The linearity may vary depending on the workpiece being used.

4. This is the error with respect to the theoretical line of the displacement output when measuring the standard OMRON white alumina ceramic. The linearity may vary depending on the workpiece being used.



5. This is the displacement output's peak-to-peak displacement conversion value. These figures are for measurement of the standard OMRON quartz glass (mirror reflection) or standard OMRON stainless-steel block (diffuse reflection) at the center of the measurement region. The resolution performance characteristics may not be met when operating in a magnetic field.

6. These figures are for Sensors connected to a Z510-WC10E or Z510-WC15E and averaged over 16 measurements. The averaged data was transmitted to a PC through an RS-232C connection for storage and processing.

7. This is the displacement output's peak-to-peak displacement conversion value. (These figures are for measurement of the standard OMRON white alumina ceramic at the center of the measurement region.)
The resolution performance characteristics may not be met when operating in a strong magnetic field.

8. These figures are for Sensors connected to a Z510-WC10E or Z510-WC15E and averaged over 64 measurements. The averaged data was transmitted to a PC through an RS-232C connection for storage and calculations.

9. This is the value measured when the gap between the Sensor and workpiece (white alumina ceramic) is fixed with an aluminum jig.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

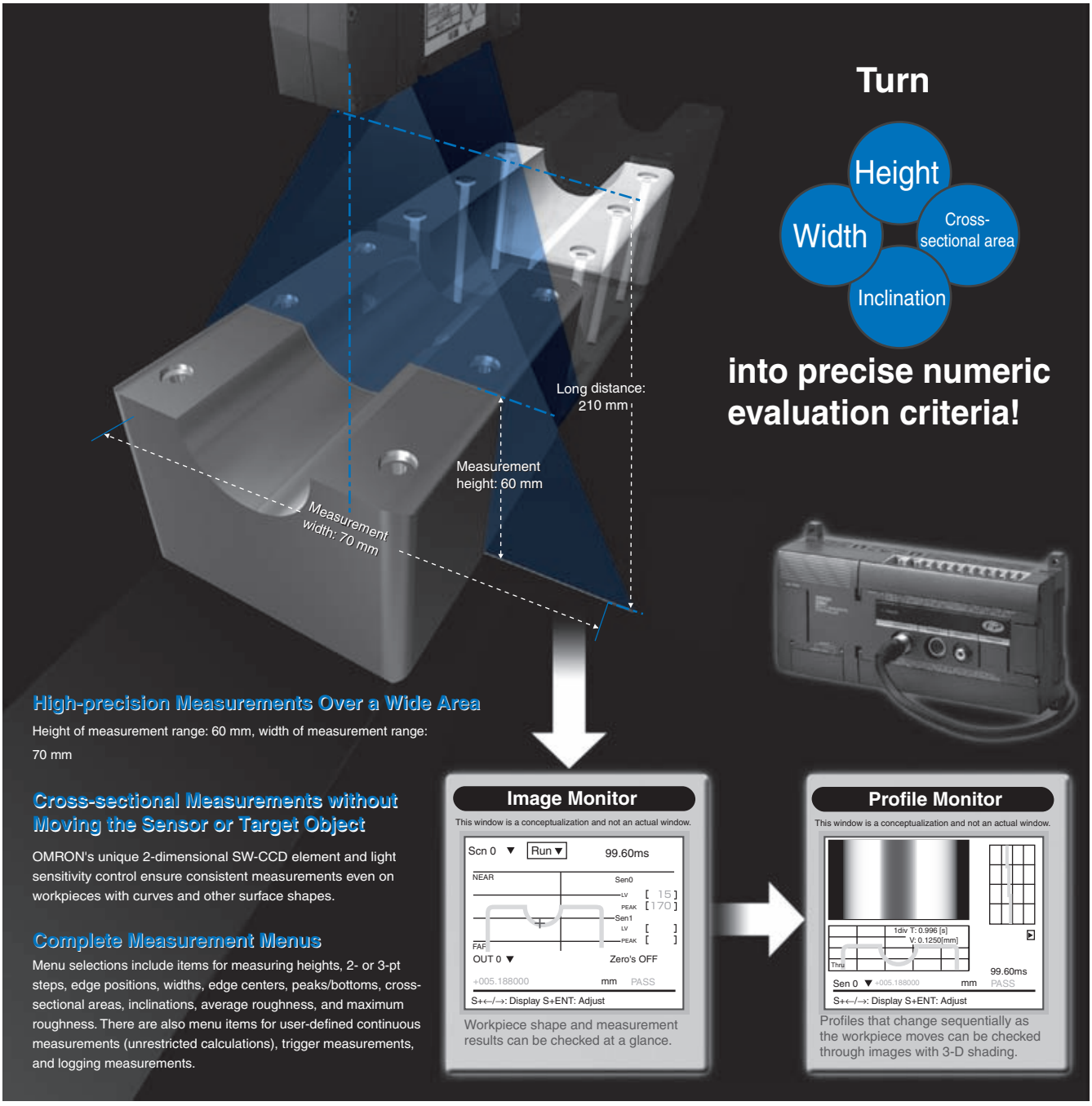
Cat. No. Q03E-EN-02

Multi-Dimensional Sensor

Z550

- Inline profile inspections for workpieces made of metal, plastic, or other materials all at one time

Features



High-precision Measurements Over a Wide Area

Height of measurement range: 60 mm, width of measurement range: 70 mm

Cross-sectional Measurements without Moving the Sensor or Target Object

OMRON's unique 2-dimensional SW-CCD element and light sensitivity control ensure consistent measurements even on workpieces with curves and other surface shapes.

Complete Measurement Menus

Menu selections include items for measuring heights, 2- or 3-pt steps, edge positions, widths, edge centers, peaks/bottoms, cross-sectional areas, inclinations, average roughness, and maximum roughness. There are also menu items for user-defined continuous measurements (unrestricted calculations), trigger measurements, and logging measurements.

Specifications

Z550-MC10/MC15 Controller

Model	Z550-MC10	Z550-MC15
I/O type	NPN	PNP
Power supply voltage	21.6 to 26.4 V DC	
Current consumption	1 A max. (with 2 sensors connected)	
Insulation resistance	Between the group of external DC terminals and the ground terminal: 20 MΩ max. (at 100 V DC) (when the built-in surge absorber is removed)	
Dielectric strength	Between the group of external DC terminals and the ground terminal: 1000 V AC at 50/60 Hz (when the built-in surge absorber is removed)	
Leakage current	10 mA max.	
Noise resistance	1,500 Vp-p; Pulse width: 0.1 ms/1 ms; Rising edge: 1-ns pulse	
Vibration resistance	10 to 150 Hz (at a double amplitude of 0.1 mm) for 8 minutes each in the X, Y, and Z directions	
Shock resistance	200 m/s²; 3 times each in 6 directions	
Ambient temperature	0 to +50 °C at operation, -15 to +60 °C at storage (no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (no condensation)	
Ambient environment	No corrosive gases	
Ground	D-type ground (ground resistance of 100 W or less) * conventional class 3 ground	
Degree of protection	IEC60529 IP20 (in-panel)	
Materials	Console: ABS	
Weight	Approx. 0.7 kg	
Number of connectable sensors	Up to two Z550-SW70 sensors can be connected.	
Number of scenes	16	
Averagin number	9 levels (1 to 256 times)	
Sensor control	6 levels (varies depending on the sensor)	
Area specification function	Available	
Control of quantity of light	Multi-sensitivity adjustment (dynamic range or sampling interval takes precedence) fixed sensitivity, automatic sensitivity adjustment	
Measurement time[*1]	100 ms (at fixed sensitivity) 120 ms (at automatic sensitivity) 100 ms to 250 ms (when sampling interval takes precedence) 100 ms to 620 ms (when dynamic range takes precedence)	
Run Mode	Continuous measurement or trigger measurement	
Image pre-processing	Noise removal	
Measurement pre-processing	Interpolation processing, filter processing, Inclination compensation processing, Height and position compensation processing	
Detection method	Height position method, Reflectance method	
Measurement item	Height, Step: 2 pts, Step: 3 pts, Edge position, Width, Edge center, Peak/Bottom, Cross-sectional area, Inclination, Roughness, User-defined	
Logging function	The measurement results of up to 3,000 measurements can be stored. (It is possible to select the number ofmeasurements after which the measurement results will be stored.)	
Output pre-processing	Forced zero, Offset/span adjustment	
Profile data output	Up to 1024 height profiles can be output in one batch. The output format may be either ASCII code or binary format (when sending via XMODEM)	
Results output	Terminal block: Judgment result Analog: Measurement result RS-232C: Measurement result, judgment result, profile data	
Screen display	Image monitor, Trend monitor, Digital monitor, Profile monitor	
Tool function	Peripheral image display function, test measurement function	
Terminal blocks	11 input points: $\overline{\text{TRIGGER}}$, $\overline{\text{LD-OFF}}$, $\overline{\text{RESET}}$, $\overline{\text{DI0}}$ to $\overline{\text{DI7}}$ 21 output points: $\overline{\text{DO0}}$ to $\overline{\text{DO19}}$ and $\overline{\text{GATE}}$	
RS-232C (Baud rate)	Up to 115 kbps (at XMODEM transmission, external trigger measurement) Normally 38.4 kbps	
Monitor interface	1 channel (for pin jack or overscan monitor)	
Analog output resolution	The full output scale can be divided into a maximum of 40,000 divisions. Resolution[*2]: 0.25 mV (±5 V), 0.4 mA (4 to 20 mA)	

*1. The sampling interval varies depending on the measurement settings. Check the actual sampling interval on the image monitor.
*2. When performing measurement taking the average of every 64 measurements with an OMRON K3AS linear sensor controller connected.

Z550-SW70 Sensor

Sensor installation		Diffuse reflection only
Reference distance (direction of height)		210 mm (for 60-mm measurement range mode)
Measurement range	Direction of width	70 mm (at 200 mm-reference distance)
	Direction of height*1	±30 mm max. (for 60-mm measurement range mode)
Light source		Visible semiconductor laser (wave length: 658 nm, 15 mW max, class 3B)
Beam dimensions*2		120 µm x 75 mm typical at the 200 mm-reference distance
Resolution in the direction of width*3		0.1 mm
Resolution in the direction of height*4		10 µm
Linearity in the direction of height*5		±0.5% F.S.
LED indicator lamp		Lit when the laser is on
Temperature characteristic*6		0.1% F.S./°C
Operation environment robustness	Degree of protection	IP66
	Ambient operating illumination	Illumination at light-receiving surface: 3,000 lx max., incandescent light
	Ambient temperature	0 to +50°C at operation, -15 to +60°C at storage (no icing)
	Ambient humidity	Operating and storage: 35% to 85% (no condensation)
	Vibration (durability)	10 to 150 Hz (at a double amplitude of 0.35 mm) for 8 minutes each in the X, Y, and Z directions
Materials		Body: Aluminum die-cast Cable sheathing: Heat-resistant PVC Connector: Zinc alloy and brass
Cable length		0.5 m
Minimum bending radius		68 mm
Weight		Approx. 550g
Accessory		CLASS 3B Warning label (IEC60825-1: 1993 +A1: 1997) x 2

*1. For 60-mm measurement range mode

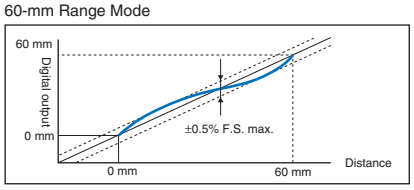
*2. Defined as $1/e^2$ (13.5%) of the central light intensity. Leakage of light is also present in areas other than those defined. Thus, there are some influences in cases where the reflection factor of the area surrounding the workpiece is higher than that of the workpiece itself.

*3. When an OMRON-standard workpiece (alumina ceramics) is placed at 200-mm distance, and edge position is measured. 60-mm measurement range mode is used. The average of 16 measurements is taken. Note that the resolution performance may not be satisfied in the presence of strong magnetic fields.

*4. When an OMRON-standard workpiece (alumina ceramics) is placed 200-mm away and the average height of all lines is measured. The measuring range is 60 mm and the average of 16 measurements is taken. Resolution performance, however, may not be satisfied in the presence of strong magnetic fields.

*5. The error in relation to an ideal straight line when the average height of all lines on an OMRON-standard workpiece (alumina ceramics) is measured. The measuring range is 60 mm. The degree of linearity may change depending on the workpiece.

60-mm Range Mode



*6. The value obtained at measurement with the space between the sensor and the workpiece fixed with an aluminum jig. The measurement range is 60 mm.

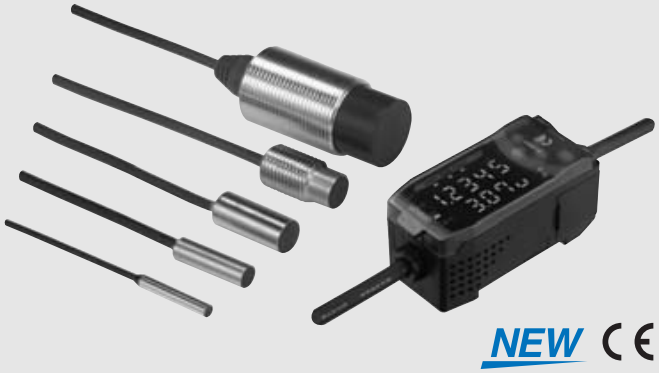
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Z192-E2-01-X In the interest of product improvement, specifications are subject to change without notice.

Smart Sensors (Inductive Displacement Type)

ZX-E Series

Smart Sensors that use the eddy current method are now available. Develop new applications with sub-micron sensing technology.



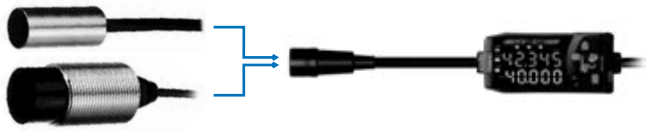
Features

Designed to meet your measurement needs

What's innovative about the ZX-E sensor is that the same amplifer unit can be attached to any one of five sensor headds; It's simply a matter of selecting the sensor head that best suits your measurement application. And there's total compatibility between all sensor heads and the amplifier, making maintenance quick and easy.

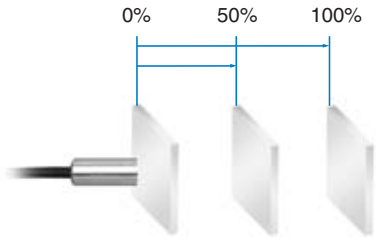
Plug & Play Concept

All sensor heads are fully compatible to the amplifier unit and can be selected based on application. Also for maintenance reason it is more efficient and cost saving to replace only the sensor head.



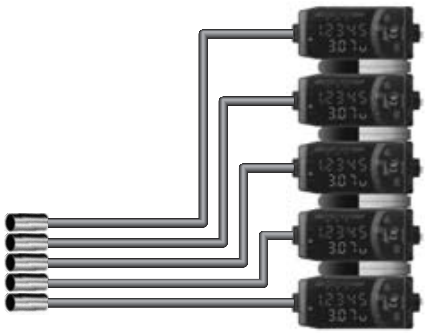
Simply Linearity Adjustment

With the ZX-E it is possible to adjust the linearity of the sensor for different types of metals, ferrous and non-ferrous. Using Omron's patented Linearity Adjustment Function you can perform a teaching function at 0%, 50% and 100% of the measurement distance from the object to the sensor head. The amplifier then confirms the result. This feature greatly reduces setting time.



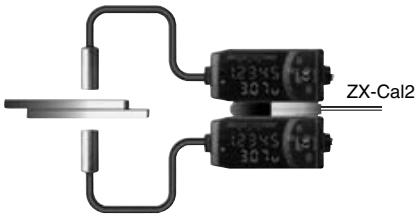
Mutual interference prevention function

Up to five sensors can be combined very closely together without any mutual interference occurring between them. This is achieved by placing a calculating unit (ZX-CAL2) between each sensor. With this unique feature multiple measurements can be made in a machine or a process.



Smart calculation function

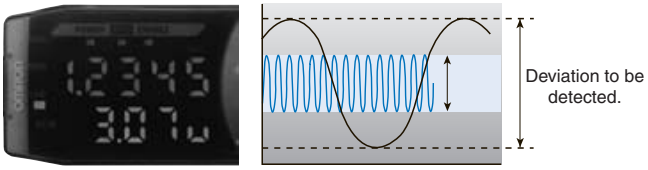
By inserting a 'calculation unit' (ZX-CAL2) between two amplifiers the thickness and difference measurements are easily obtained, and these results will be displayed on the amplifier. This technology, patented by Omron, eliminates the need for connecting a digital panel meter and the troubles one wiring and setting up associated with it.



Calculation unit for thickness-measurement

Easy-to-read resolution display

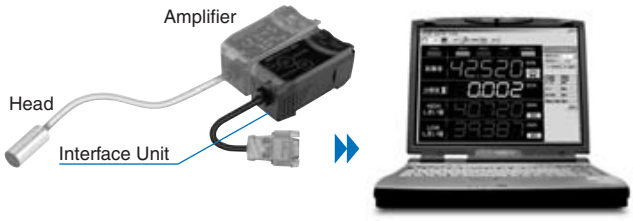
With Omron's resolution display function (patend pending), the resolution based on the object being measured is displayed and can be verified in realtime. It is easy to learn the margin for threshold values with this resolution display, allowing accurate judgements on whether or not detection is possible.



Easy-to-see resolution (patent pending)

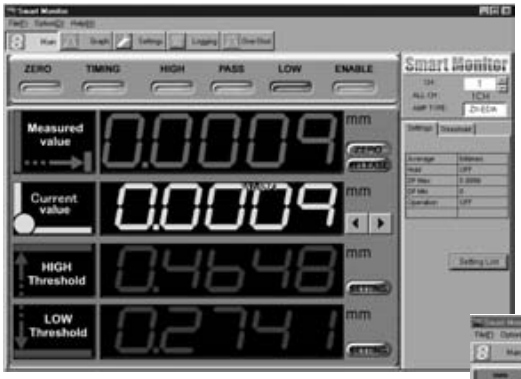
Intelligent Communiction

SmartMonitor V2 software makes sensor set-up easier!
With Omron's interface unit and SmartMonitor V2 software the ZX-E sensor can be easily connected to a Notebook or PC. The software is ideal for quickly and easily setting up parameters and values via the menu screen from a PC or using the serial port of a PLC. It offers full visualisation of all measured values on the spot. Threshold settings can be done using the Position Teach feature or by entering the values directly. All parameters and modes can be changed within seconds and interrupt time is kept to a minimum, which is very important in production processes. In addition, all settings can be saved on a computer, end reloaded based on production requirements.

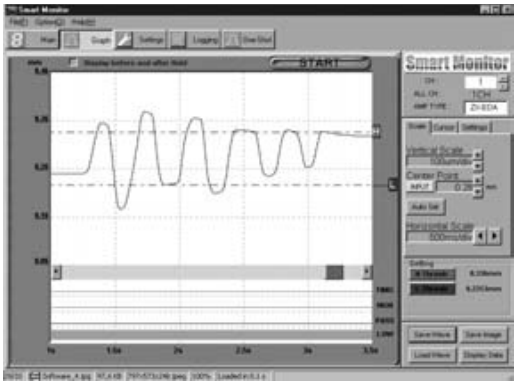


Smart Monitor software tool enables easy system set-up via PC or Notebook

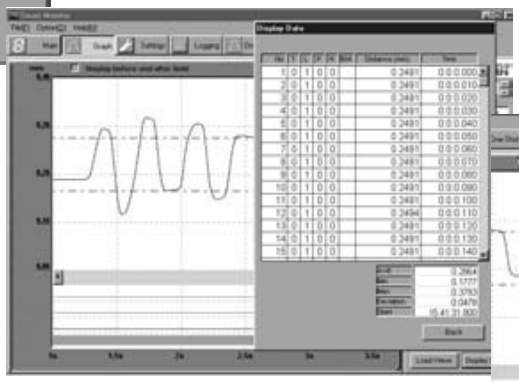
Data logging results can be processed using SmartMonitor V2 software and stored automatically (as an Excel csv file) for quality control information, leading to smoother production runs. Data can also be displayed in waveform during logging. Waveforms can be easily monitored and threshold values set simply by dragging an dropping. High-speed waveforms can be obtained and displayed in a one-shot operation. This innovative feature is ideal for use in high-speed processes, where the software can be used to generate a waveform.



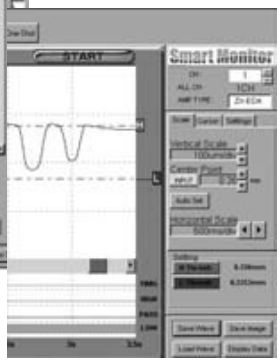
Visualisation and monitoring of all saved data



Wave form monitoring



Data logging and processing

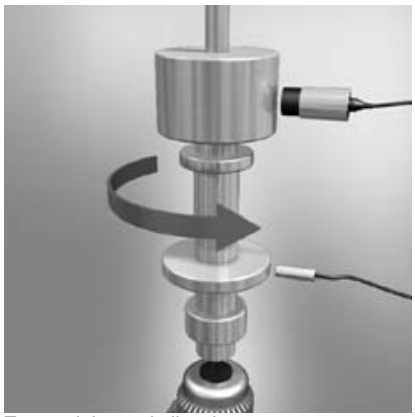


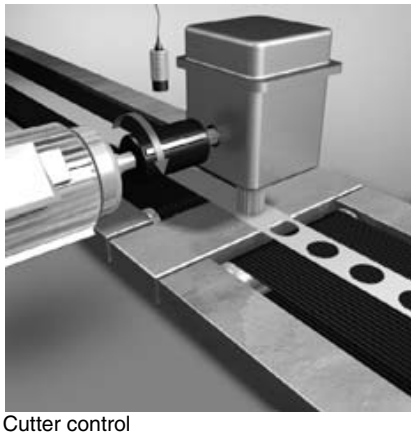
Threshold setting by drag & drop graphic function

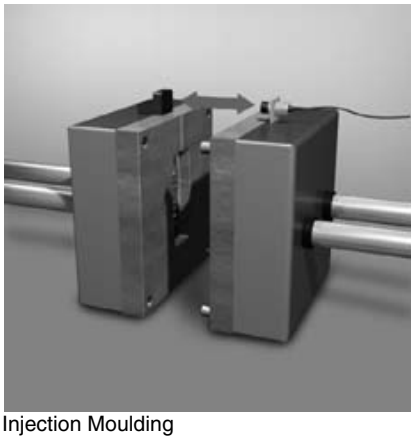
Application

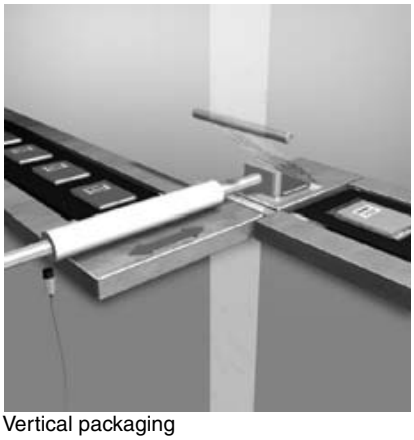

Minute gap detection


Height and step detection


Eccentricity and vibration


Cutter control


Injection Moulding


Vertical packaging

Ordering Information

Sensors

Sensor Heads

Shape	Dimensions	Sensing distance	Accuracy *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	2 mm		ZX-EM02T *2
	M18 x 46.3 mm	7 mm		ZX-EM07MT *2

***1:** For an average count of 4,096.

***2:** Models with Protective Spiral Tubes are also available. Add a suffix of "-S" to the above model numbers when ordering. (Example: ZX-ED01T-S)

Amplifier Units

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

Note: Compatible connection with the Sensor Head.

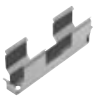
Accessories (Order Separately)

Calculating Unit

Appearance	Model
	ZX-CAL2 *

*Calculating Units are required to connect three or more Sensors.

Amplifier Mounting Brackets

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

SmartMonitor Sensor Setup Tool for Personal Computer Connection

Appearance	Name	Model
	ZX-series Communications Interface Unit	ZX-SF11
 + CD-ROM	ZX-series Communications Interface Unit + Setup Software	ZX-SFW11EV3
CD-ROM	ZX-series Sensor Setup and Logging Software	ZX-SW11EV3

Cables with Connectors on Both Ends (for Extension)

Cable length	Model	Quantity
1 m	ZX-XC1A	1
4 m	ZX-XC4A	
8 m	ZX-XC8A	

Specifications

Sensor Heads

Model			ZX-EDR5T	ZX-ED01T	ZX-ED02T/EM02T	ZX-EM07MT
Measurement range			0 to 0.5 mm	0 to 1 mm	0 to 2 mm	0 to 7 mm
Sensing object			Magnetic metals (Measurement ranges and linearities are different for non-magnetic metals. Refer to *Engineering Data* on B-67.)			
Standard reference object			18×18×3 mm		30×30×3 mm	60×60×3 mm
			Material: ferrous (S50C)			
Accuracy *1			1 μm			
Linearity *2			±0.5% F.S.			
Linear output range			Same as measurement range.			
Temperature characteristic *3 (including Amplifier Unit)			0.15% F.S./°C	0.07% F.S./°C		
Ambient temperature	Operating		0 to 50°C (with no icing or condensation)	-10 to 60°C (with no icing or condensation)		
	Storage		0 to 50°C (with no icing or condensation)	-20 to 70°C (with no icing or condensation)		
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/s^2, 3 times each in X, Y, and Z directions			
Degree of protection (Sensor Head)			IEC60529, IP65	IEC60529, IP67		
Connection method			Connector relay (standard cable length: 2 m)			
Weight (packed state)			Approx. 120 g	Approx. 140 g		Approx. 160 g
Materials	Sensor Head	Case	Brass	Stainless steel	Brass	
		Sensing surface	Heat-resistant ABS			
	Preamplifier		PES			
Accessories			Amplifier Mounting Brackets (ZX-XBE1), Instruction Manual			

***1:** Accuracy: The resolution is the deviation (±3σ) 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 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.

***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.

Amplifier Units

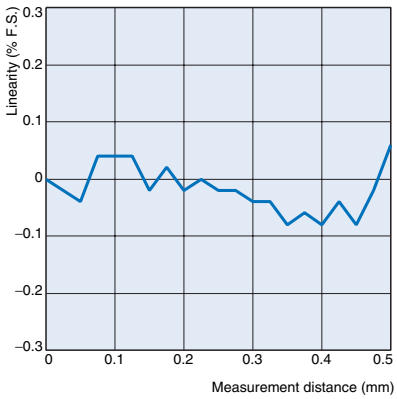
Model	ZX-EDA11	ZX-EDA41
Measurement period	150 μs	
Possible average count settings *1	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
Linear output *2	Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω Voltage output:±4 V (±5 V, 1 to 5 V *3), Output impedance: 100 Ω	
Judgement 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 - 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: Polycabonate	
Accessories	Instruction Manual	

***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-CAL or ZX-CAL2) is required.

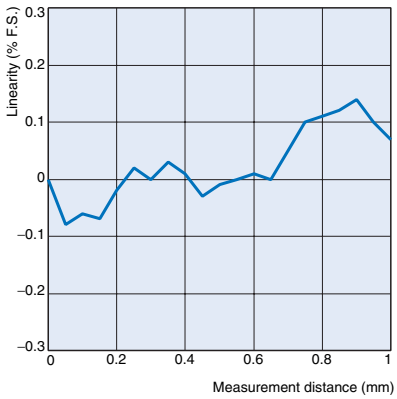
Engineering Data (Typical)

Measurement Distance vs. Linearity (with Linearity Adjusted for Standard Sensing Object)

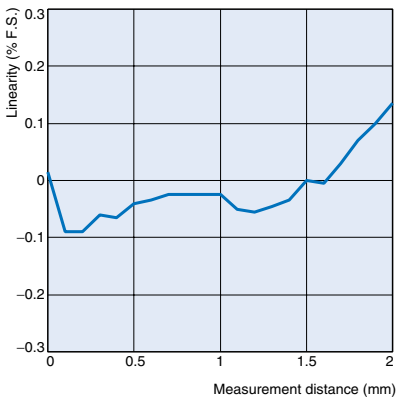
ZX-EDR5T



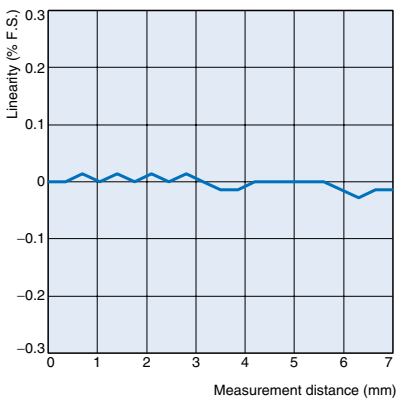
ZX-ED01T



ZX-ED02T/ZX-EM02T

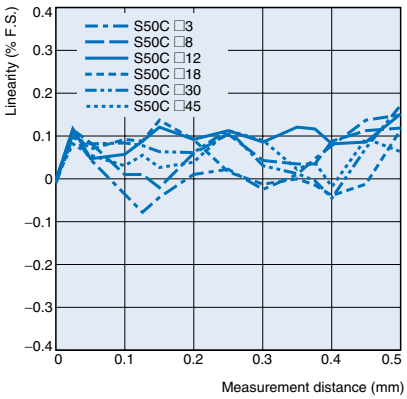


ZX-EM07MT

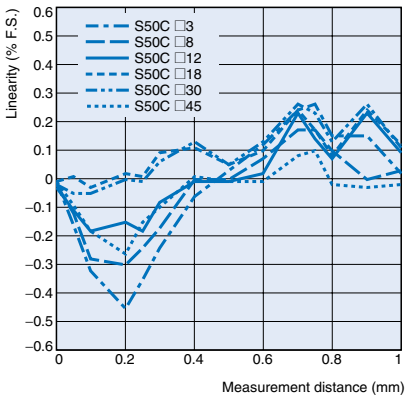


Size of Sensing Object vs. Linearity (with Linearity Adjusted for Each Sensing Object)

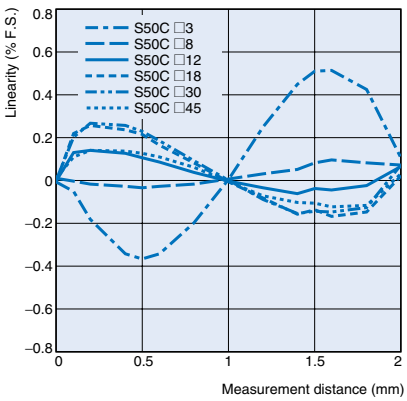
ZX-EDR5T



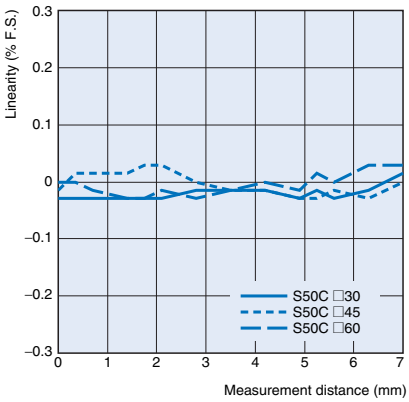
ZX-ED01T



ZX-ED02T/ZX-EM02T

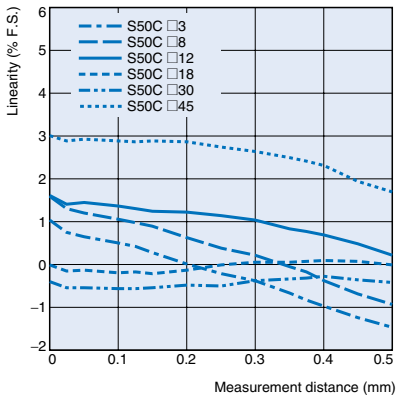


ZX-EM07MT

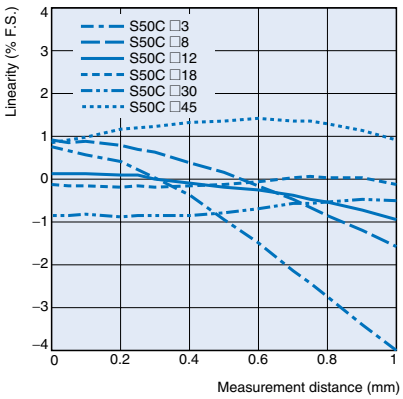


Size of Sensing Object vs. Linearity (with Linearity Adjusted for Standard Sensing Object)

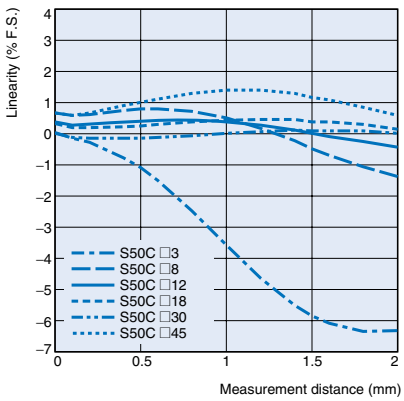
ZX-EDR5T



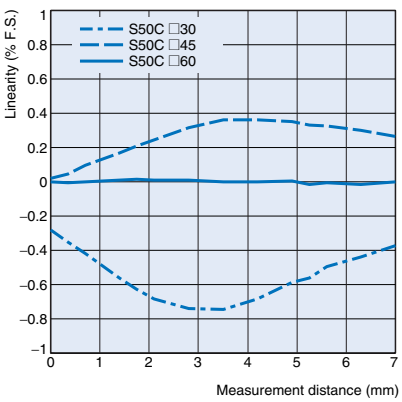
ZX-ED01T



ZX-ED02T/ZX-EM02T

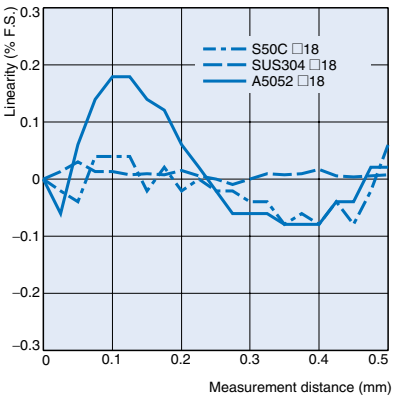


ZX-EM07MT

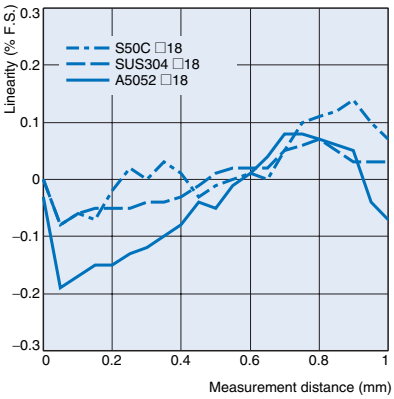


Material of Sensing Object vs. Linearity (with Linearity Adjusted for Each Sensing Object)

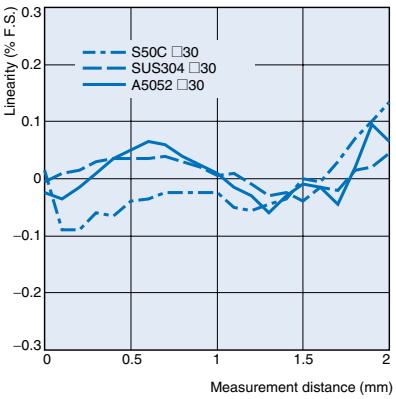
ZX-EDR5T



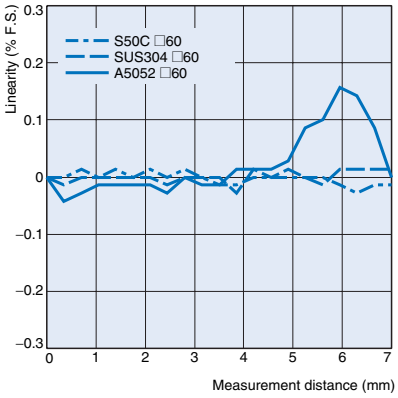
ZX-ED01T



ZX-ED02T/ZX-EM02T

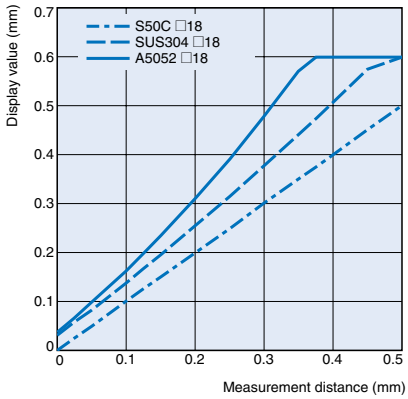


ZX-EM07MT

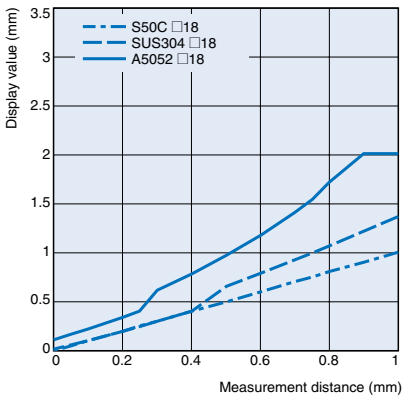


Material of Sensing Object vs. Linearity (with Linearity Adjusted for Standard Sensing Object and Iron)

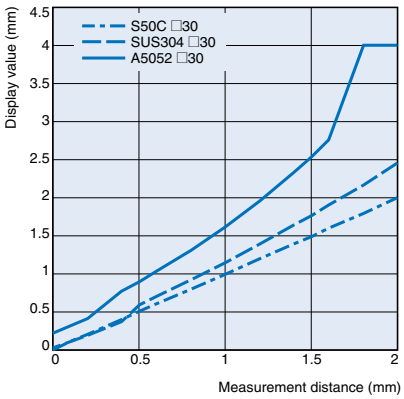
ZX-EDR5T



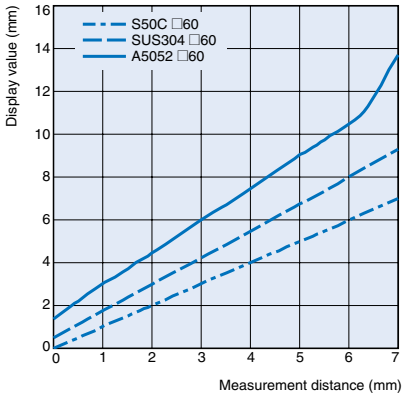
ZX-ED01T



ZX-ED02T/ZX-EM02T

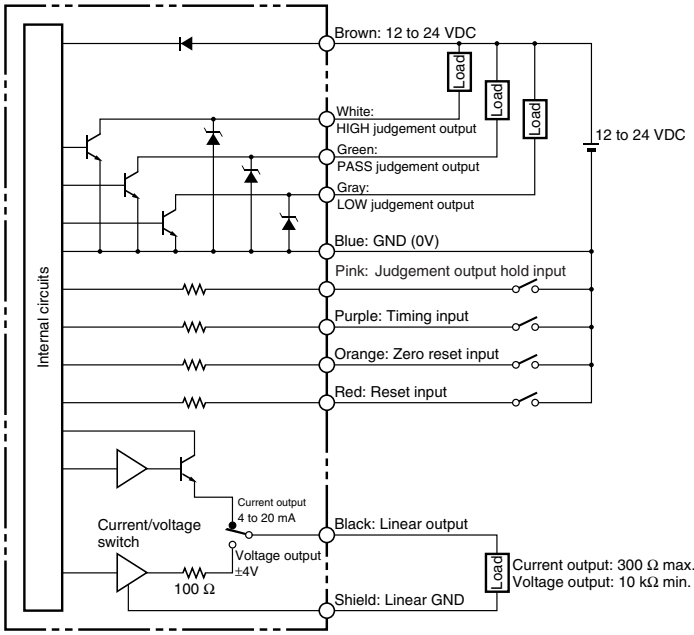


ZX-EM07MT

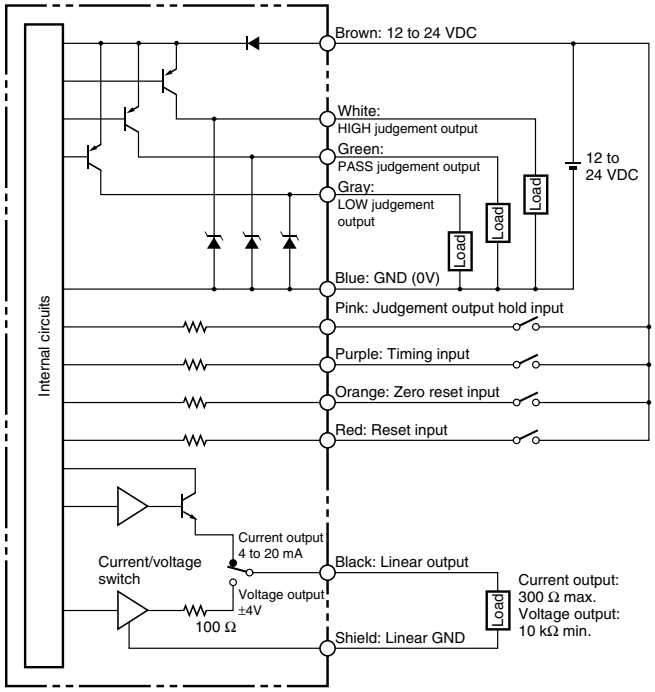


I/O Circuit Diagrams

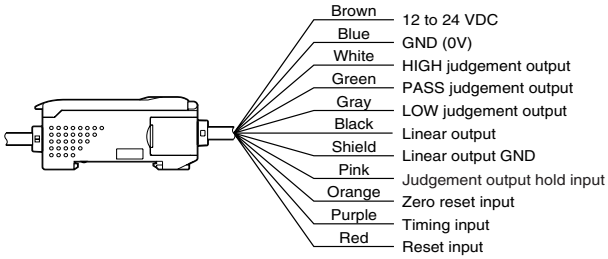
NPN Amplifier Unit: ZX-EDA11



PNP Amplifier Unit: ZX-EDA41



Connections: Amplifier Unit



Note 1. Use a separate stabilized power supply for the Amplifier Unit, particularly when high resolution is required.

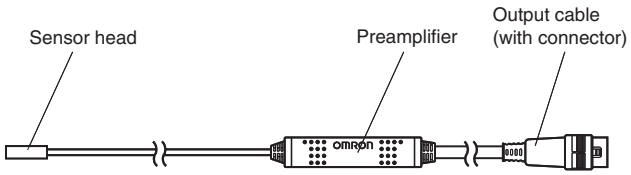
2. Wire the Unit correctly. Incorrect wiring may result in damage to the Unit. (Do not allow wiring, particularly the linear output, to come into contact with other lines.)

3. Use the blue (0-V) line for the power supply and use the shield wire (linear output ground) together with the black (linear output) line for linear output. Each of these grounds must be used for the designed purpose. When not using the linear output, connect the linear output ground to the 0-V ground.

Part Names

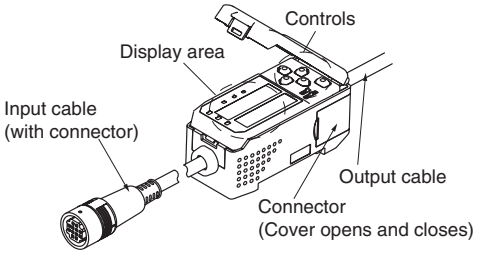
Sensors

ZX-EDR5T
ZX-ED01T
ZX-ED02T
ZX-EM02T
ZX-EM07MT



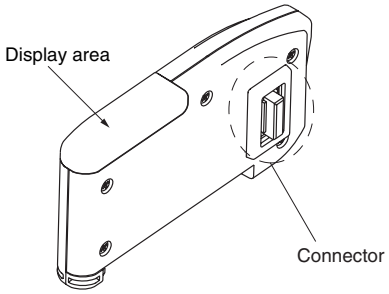
Amplifier Units

ZX-EDA11
ZX-EDA41



Calculating Unit

ZX-CAL / ZX-CAL2



Precautions

Design Precautions

Conform to the specified ratings and performance. Refer to page B-65 *Specifications* for details.

Objects of certain materials or shapes may not be detectable, or the detection accuracy may not be sufficiently high.

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.

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-circuit the load for open-collector output.

Do not lay the power 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.

Do not connect or disconnect connectors while the power is ON. Doing so may result in damage.

Adjustment

Setting

When setting threshold values, ensure that the Amplifier Unit's judgement output hold input line is ON so that there is no judgement output to external devices.

Other Precautions

Do not attempt to disassemble, repair, or modify the product. Dispose of the product using standard procedures for industrial waste.

These Sensors are not compatible with the ZX-L□□ Smart Sensors (laser type). Do not connect combinations of ZX-E□□ Smart Sensors and ZX-L□□ Smart Sensors.

Correct Use

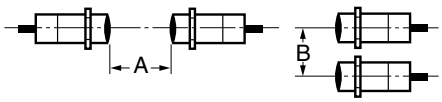
Design Precautions

Power Supplies

Allow a warm-up period of approximately 30 minutes after turning ON the power supply.

Mutual Interference

Up to 5 Sensor Heads can be used together by connecting the ZX-CAL/ZX-CAL2 Calculating Unit between Amplifier Units. When installing Sensor Heads facing each other or in parallel, separate them by the minimum distances given in the table below.



Mutual Interference

Model	A	B
ZX-EDR5T	5 mm	20 (3.1) mm
ZX-ED01T	10 mm	50 (5.4) mm
ZX-ED02T	20 mm	50 (8) mm
ZX-EM02T	20 mm	50 (10) mm
ZX-EM07MT	100 mm	150 (30) mm

Note: The figures in parentheses apply when the mutual interference prevention function is used.

Compatibility

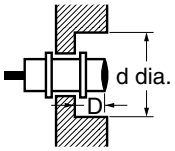
Sensors and Amplifier Units are mutually compatible. Sensors can be added or replaced individually.

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.

Influence of Metallic Objects

When installing the product, separate it from metallic objects by the distances shown below.



Influence of Metallic Objects

Model	d	D
ZX-EDR5T	8 mm	9 mm
ZX-ED01T	10 mm	
ZX-ED02T/EM02T	12 mm	
ZX-EM07MT	55 mm	20 mm

Wiring

Wiring Check

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

Cable Extension

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

Power Supply

When using a commercially available switching regulator, ground the FG (frame ground) terminal.

If the power supply line is subject to surges, connect a surge absorber that meets the conditions of the operating environment.

Calculating Unit

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

Connectors

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

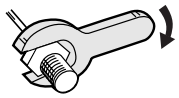
Mounting

Handling

When mounting the Sensor Head, do not apply excessive shock by, for example, using a hammer. Doing so may result in damage or a reduction in the level of water-proofing. Also, there are screw-shaped models that require a toothed washer to allow for a tolerance in the tightening torque for the nut.

Tightening Torque

Do not apply excessive torque when tightening the nut. Use a toothed washer if necessary.

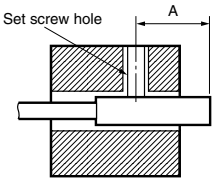


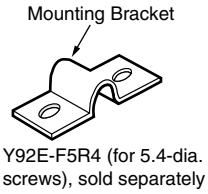
Model	Tightening torque
ZX-EM02T	15 N·m
ZX-EM07MT	

Note: The above figure applies for use with a toothed washer.

Mounting Cylindrical Models:

Tighten set screws with a tightening torque of 0.2 N·m max.





Model	A
ZX-EDR5T	9 to 18 mm
ZX-ED01T	
ZX-ED02T	11 to 22 mm

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 direct sunlight
- 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.

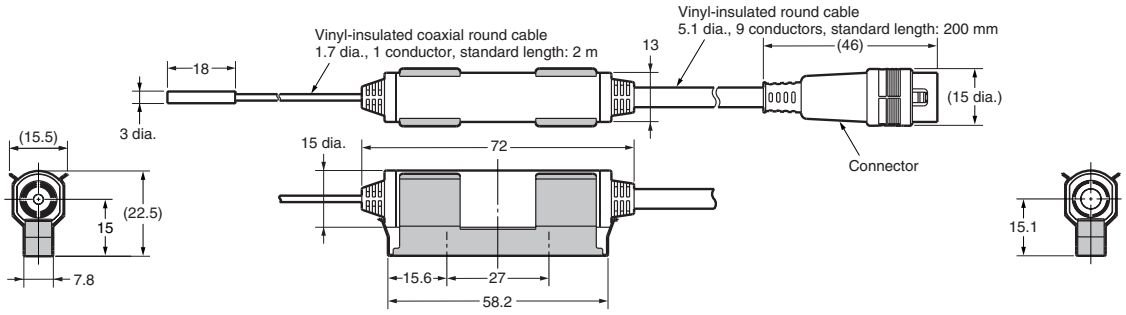
Dimensions

Sensors

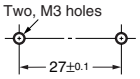
Sensor Heads

ZX-EDR5T

Dimensions with Mounting Bracket Attached

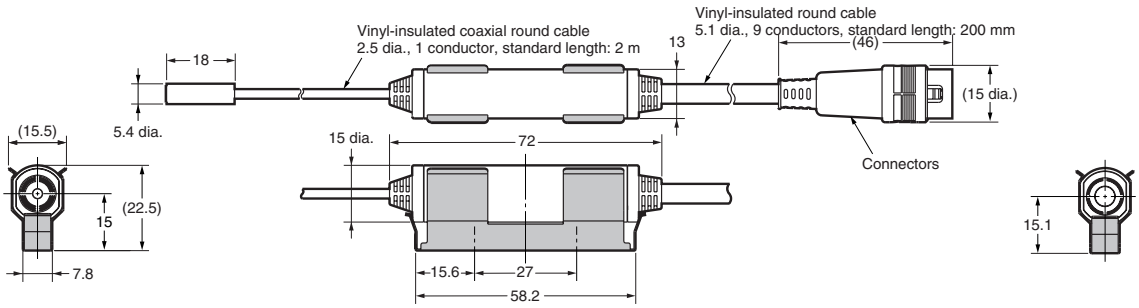


Mounting Hole Cutout Dimensions

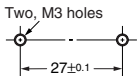


ZX-ED01T

Dimensions with Mounting Bracket Attached

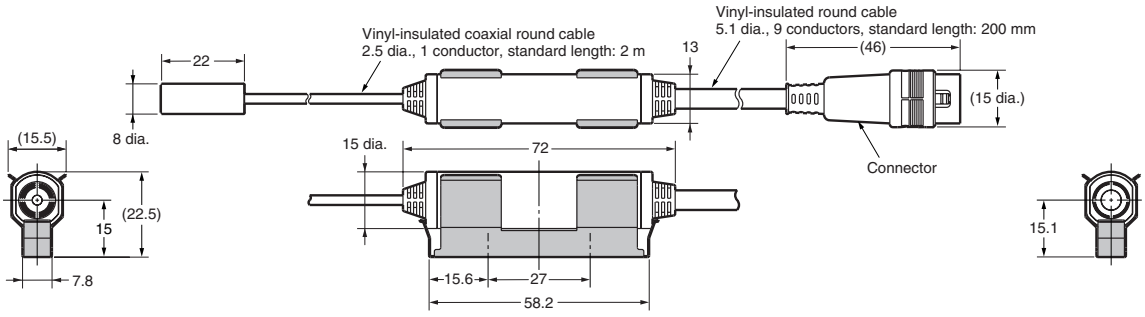


Mounting Hole Cutout Dimensions

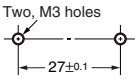


ZX-ED02T

Dimensions with Mounting Bracket Attached

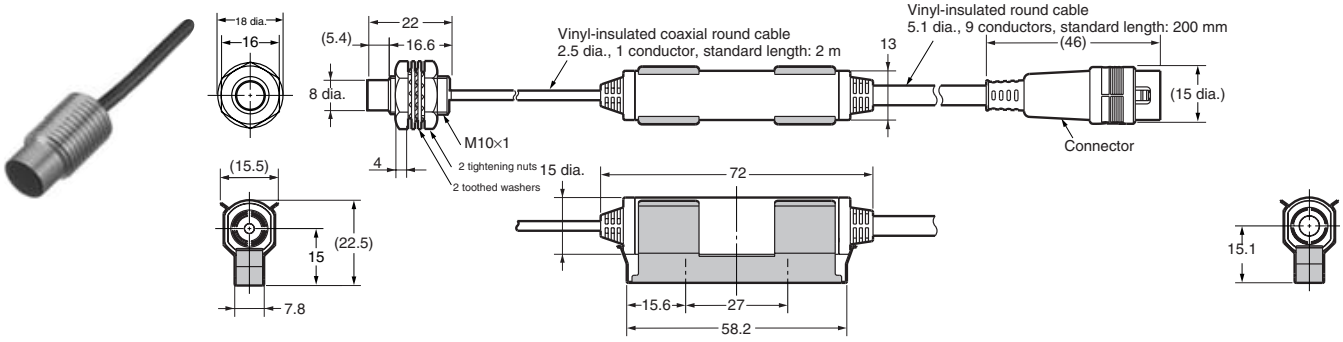


Mounting Hole Cutout Dimensions

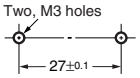


ZX-EM02T

Dimensions with Mounting Bracket Attached

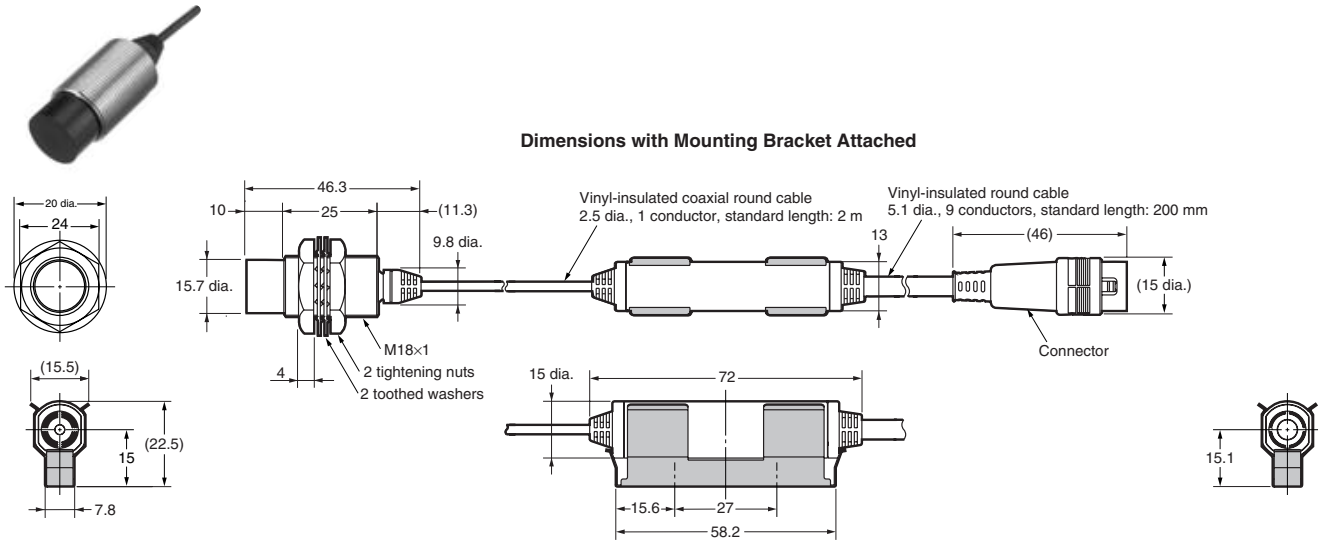


Mounting Hole Cutout Dimensions

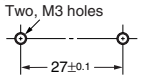


ZX-EM07MT

Dimensions with Mounting Bracket Attached

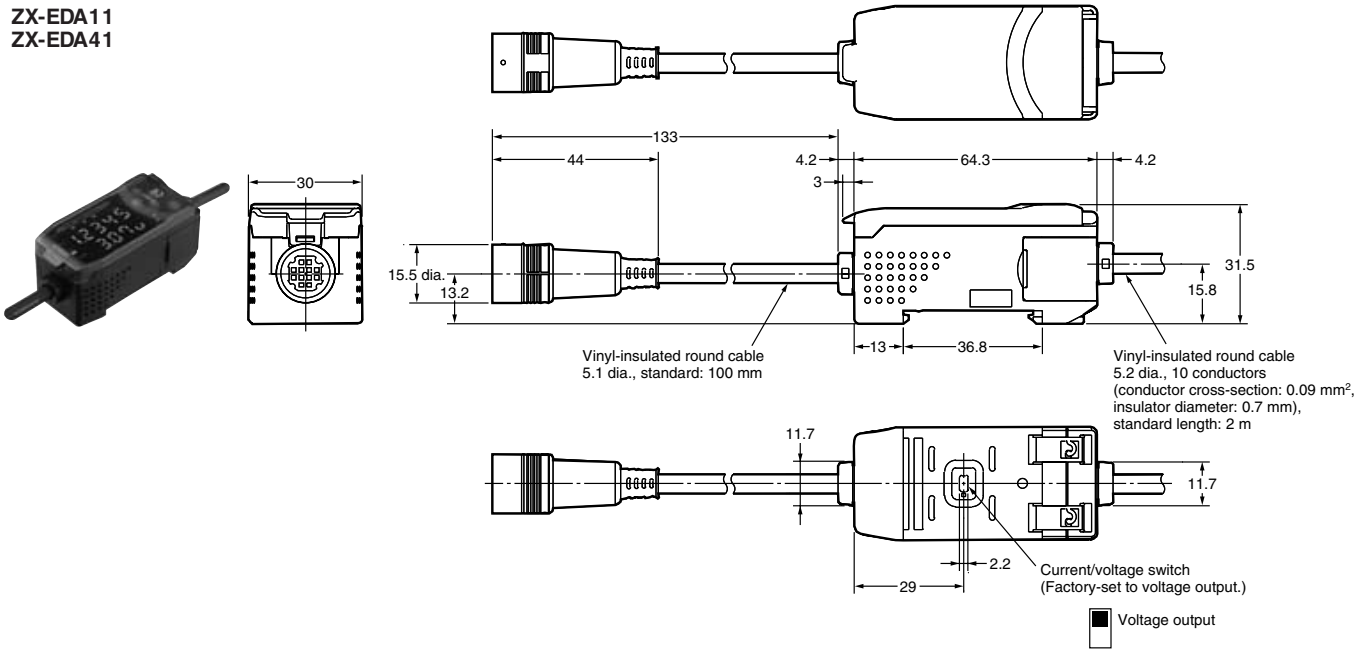


Mounting Hole Cutout Dimensions



Amplifier Units

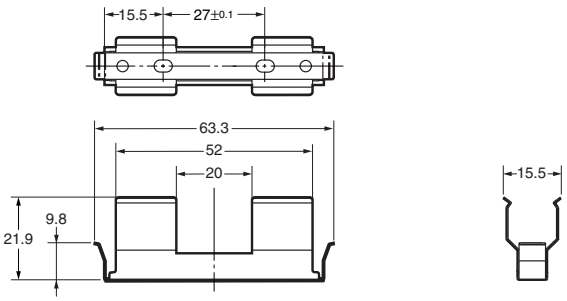
ZX-EDA11
ZX-EDA41



Accessories (Sold Separately)

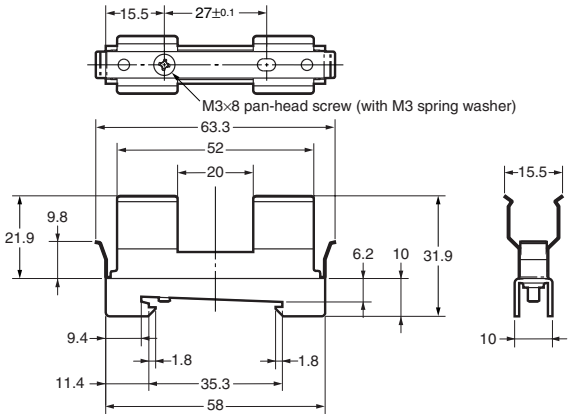
Preamplifier Mounting Bracket

ZX-XBE1



Material: Stainless steel (SUS304)

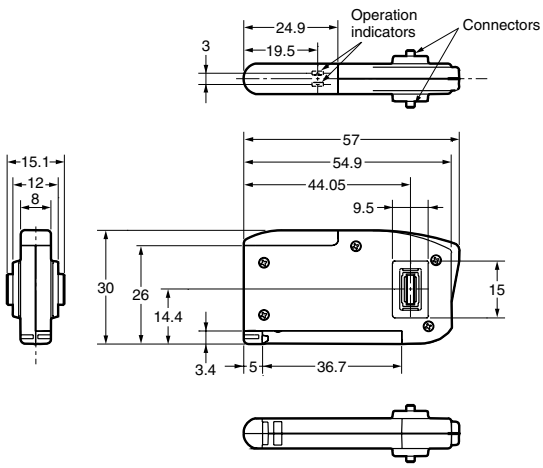
ZX-XBE2



Material: Stainless steel (SUS304)

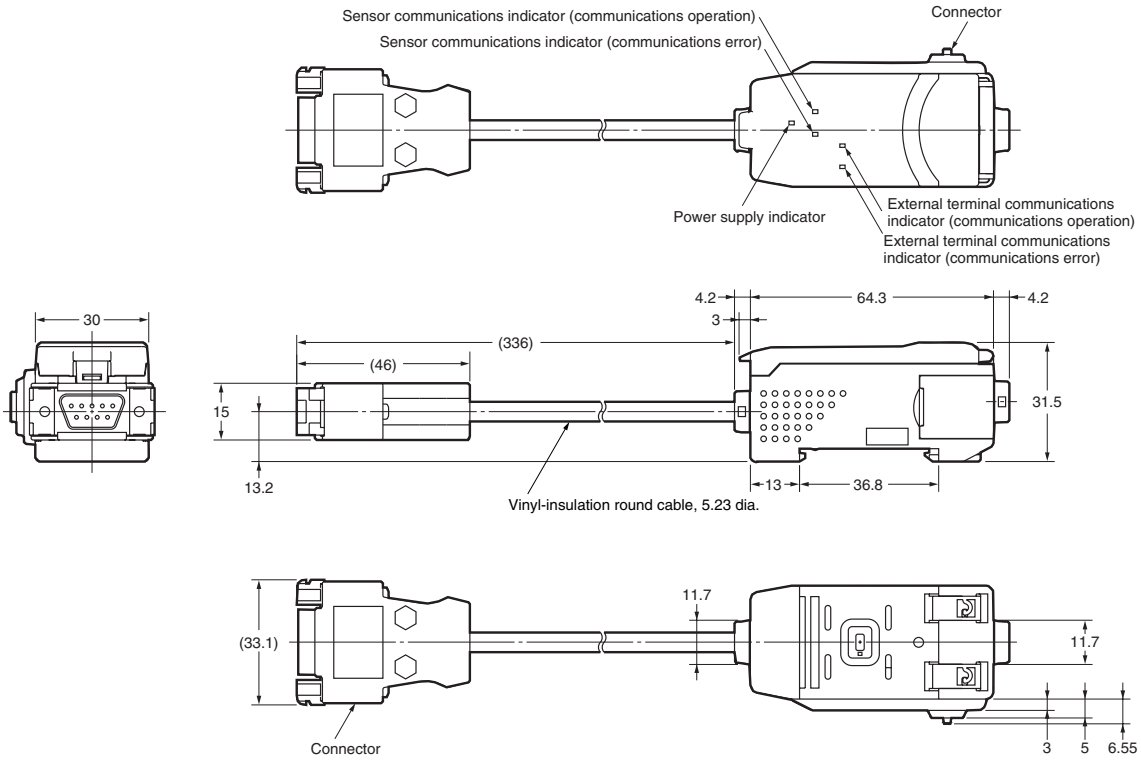
Calculating Unit

ZX-CAL/ZX-CAL2



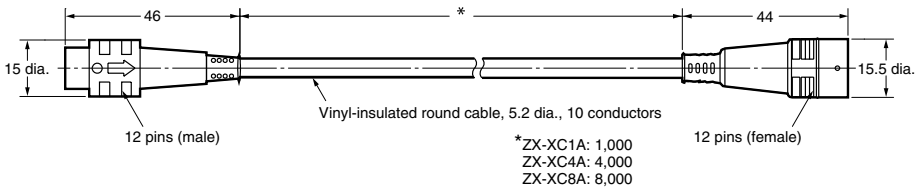
ZX-series Communications Interface Unit

ZX-SF11



Cables with Connectors on Both Ends (for Extension)

ZX-XC1A (1 m)
ZX-XC4A (4 m)
ZX-XC8A (8 m)



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. Q16E-EN-01

Smart Sensor High precision contact type ZX-T Series

ZX-T Series

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)

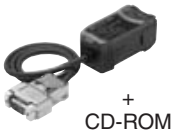
Calculating Unit

Appearance	Model
	ZX-CAL2

ZX-series Communicationys Interface Unit

Appearance	Model
	ZX-SF11

SmartMonitor 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-SFW11EV3 *1, *2
CD-ROM	ZX-series Sensor Setup Software	ZX-SW11EV3 *2

Note: *1. When using the ZX-TDA11/41 with the SmartMonitor, either the ZX-SFW11EV3 or the ZX-SW11EV3 SmartMonitor must be used. Earlier versions cannot be used.
Note: *2. The ZX-SFW11EV3 SmartMonitor can be used for parameter setting, data logging and waveform monitoring.

Cables with Connectors on Both Ends (for Extension)*

Cable length	Model	Quantity
1 m	ZX-XC1A	1
4 m	ZX-XC4A	
8 m	ZX-XC8A	

Note: *Robot Cable models are also available.
The model numbers are ZX-XC□R.

Preamplifier Mounting Brackets

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

Cables with Connectors on Both Ends (for Extension)

Cable length	Model	Quantity
1 m	ZX-XC1A	1
4 m	ZX-XC4A	
8 m	ZX-XC8A	

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 (See note 1.)		0.1 μm		
Linearity (See note 2.)		0.3% F.S.		
Operating force (See note 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 (See note 4.)	Sensor Head	0.03% F.S./°C		
	Preamplifier	0.01% F.S./°C		
Weight (packed state)		Approx. 100 g		
Materials	Sensor Head	Stainless steel		
	Preamplifier	Polycarbonate		
Accessories		Instruction manual, Preamplifier Mounting Brackets (ZX-XBT1)		

Note 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 (See note 1.)	1, 16, 32, 64, 128, 256, 512, or 1,024	
Linear output (See note 2.)	Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω Voltage output: ±4 V (±5 V, 1 to 5 V (See note 3.)), 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- Present value/set value/output value display - Display reverse- ECO mode - Number of display digit changes - Sample hold- Peak hold- Bottom hold, peak-to-peak hold - Self-peak hold - Self-bottom hold- Zero reset - Initial reset- Direct threshold value setting- Position teaching - Hysteresis width setting- Timing inputs- Reset input - Judgement output hold input - Monitor focus- (A-B) calculations (See note 4.) - (A+B) calculations (See note 4.) - Sensor disconnection detection - Zero reset memory- Function lock- Non-measurement setting - Clamp value setting- Scale inversion- Zero reset indicator - Span adjustment- Warming-up display- 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 voltage: 140 mA max. (with Sensor connected)	
Ambient temperature	Operating and storage: 0 to 50°C (with no icing or condensation)	
Temperature characteristic	0.03% F.S./°C	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 350 g	
Materials	Case: PBT (polybutylene terephthalate), Cover: Polycarbonate	

Note 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.

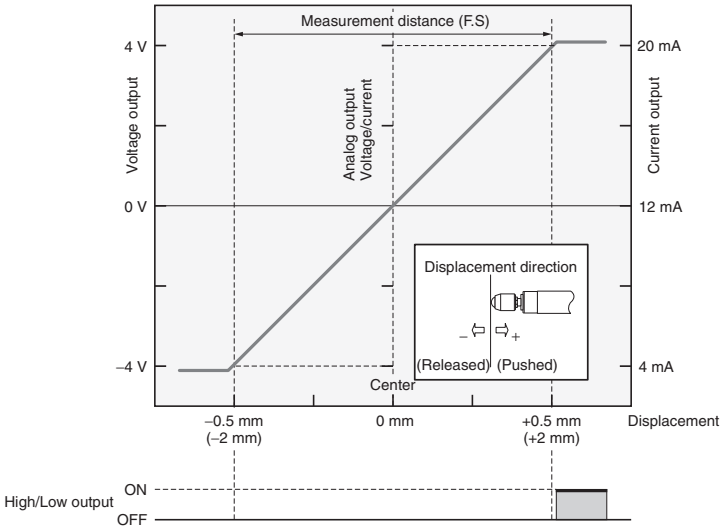
4. A Calculating Unit (ZX-CAL2) is required.

Characteristic Data

Output Characteristics

Voltage/Current Output

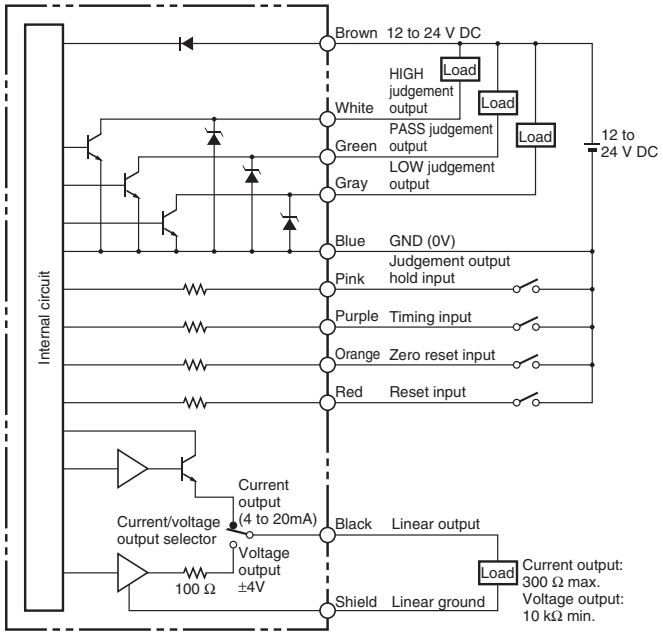
ZX-TDS01T/-S04T/-S04T-L



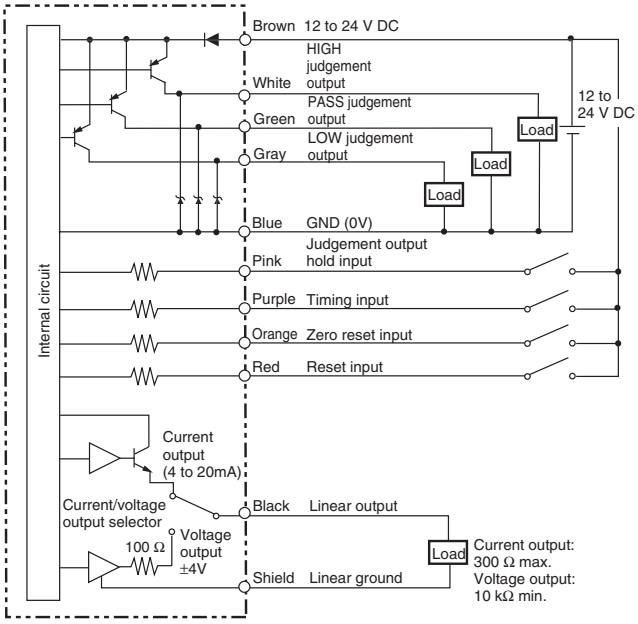
Note: To prevent destroying the Sensor Head, both the high and low judgment outputs will light if 101% of the upper limit of the measurement distance is reached.

I/O Circuit Diagrams

NPN Amplifier Unit: ZX-TDA11

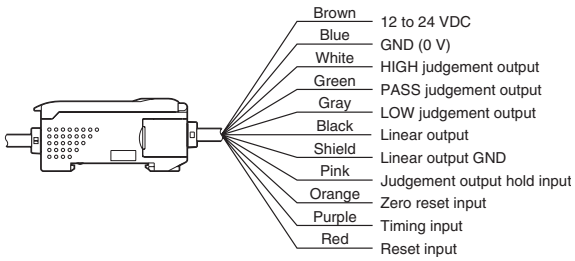


PNP Amplifier Unit: ZX-TDA41



Connectors

Amplifier Unit



Note 1. Use a stabilized power supply separate from other devices and power systems for the Amplifier Unit, particularly when high resolution is required.

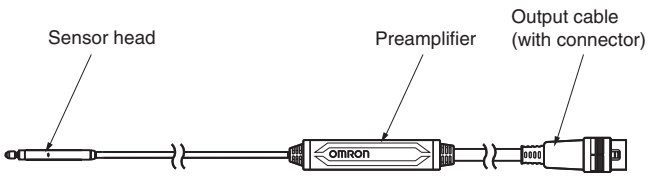
2. Always wire correctly. Incorrect wiring may damage the Unit. Use a different ground for the linear output from the normal ground.

3. The blue line (0 V) is the 0 V power supply line. The shield wire (linear output GND) is used together with the black line (linear output) to connect the linear output. Wire these lines correctly. Always ground the linear output terminal even when the linear output is not used.

Part Names

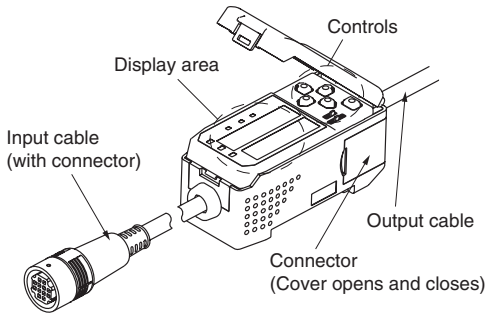
Sensor Heads

ZX-TDS01T
ZX-TDS04T
ZX-TDS04T-L



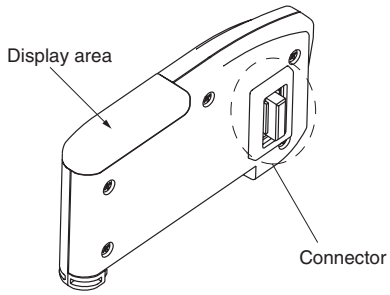
Amplifier Unit

ZX-TDA11
ZX-TDA41



Calculating Unit

ZX-CAL2



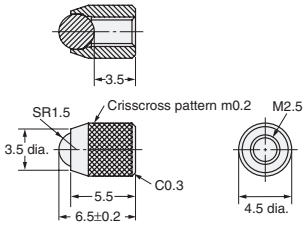
Options (Actuators)

Model		Type (material)	Screw section	Appearance	Application	Applicable Sensor (See note.)
						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	○

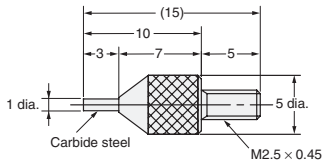
Note: ○ Replacement possible △ Conversion Adapter required

Dimensions

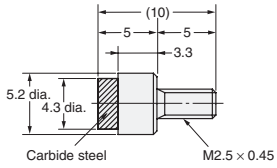
D5SN-TB1/TB2/TB3



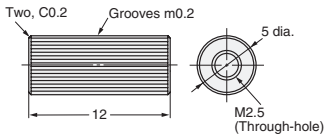
D5SN-TN1



D5SN-TF1

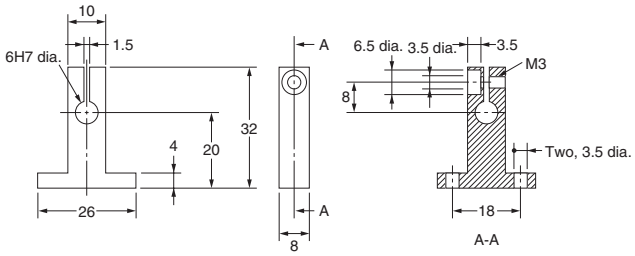


D5SN-TA



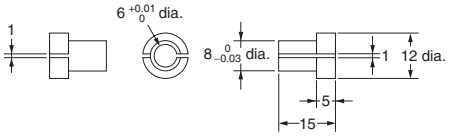
Mounting Jigs

Recommended Mounting Jigs for ZX-TDS Sensors



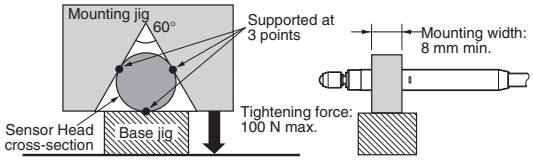
Tightening torque: 0.6 to 0.8 N·m (M3 screws)
Material: Aluminum

Mounting Jigs for an 8-diameter Stand



Material: Brass

Mounting with 3-point Support

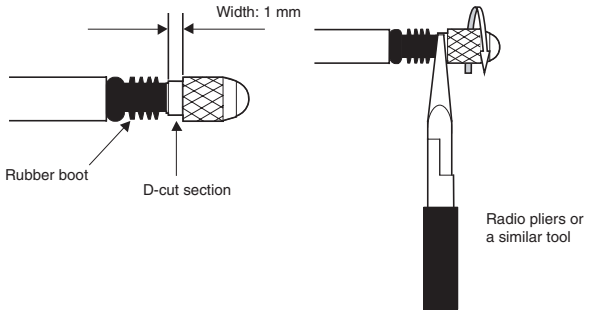


Replacing Actuators

Be careful not to damage the rubber boot with pliers or other tools when replacing the actuator.

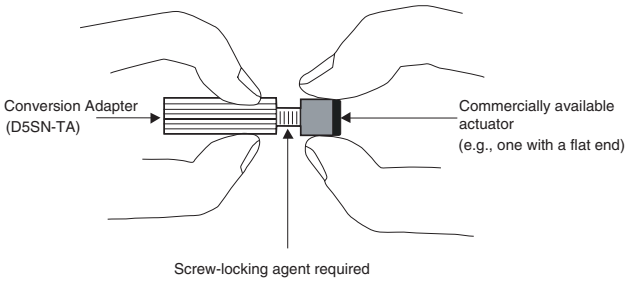
1. Remove the standard actuator.

- Hold the plunger's D-cut section with radio pliers or a similar tool while removing the actuator.
- If the replacement must be performed by holding the Sensor Head itself, ensure that a torque exceeding 0.15 N·m is not applied. Applying excessive torque may have an adverse affect on plunger operation.



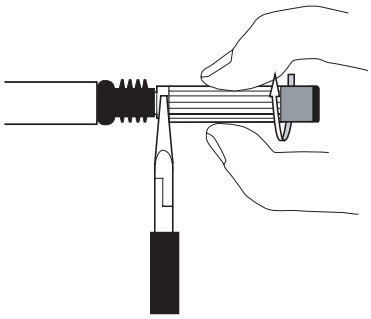
2. Mount the commercial actuator to the Conversion Adapter.

- Tighten the actuator securely, and ensure that there is no looseness.
- If necessary, apply a screw-locking agent. (Recommended: Three-Bond 1401B)



3. Mount the Conversion Adapter to the plunger.

- Hold the plunger's D-cut section with radio pliers or a similar tool while mounting and securing the Conversion Adapter.
- If the replacement must be performed by holding the Sensor Head itself, ensure that a torque exceeding 0.15 N·m is not applied. Applying excessive torque may have an adverse affect on plunger operation.



Precautions

Design Precautions

- Conform to the specified ratings and performance. Refer to *Specifications* on page B-78 for details.
- Measurements may not be possible or may not be accurate for some materials and shapes.
- The Sensor will be destroyed if the Actuator is pressed too far. Do not use the Actuator past the point where a pressing force alarm (OVER) is displayed.
- Do not remove the rubber boot. Without the rubber boot, foreign matter may enter the Sensor Head, possibly causing the Sensor Head to malfunction.
- Use suitable torque and force when mounting the Sensor. Refer to page B-81 for details.
- The Sensor may be destroyed if excessive force is applied.

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.

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-circuit the load for open-collector output.

Correct Use

- System Design

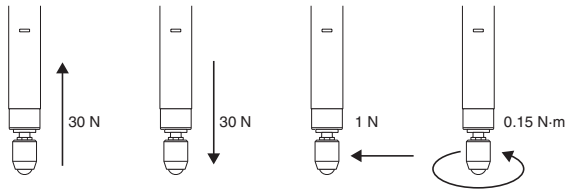
Warming Up

After turning ON the power, allow the Smart Sensor to warm up for 15 minutes minimum prior to use.

Measurements

Do not expose the plunger to forces exceeding the limits in the following diagram. Doing so may damage the plunger.

ZX-TDS-Series Sensors



- Adjustments

Settings

When setting the threshold value with the Smart Sensor connected to an external device, turn ON the Amplifier Unit's judgement output hold input to prevent the judgement from being output to the external device.

- 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.

Other Precautions

Do not attempt to disassemble, repair, or modify the product.

Dispose of the product using standard procedures for industrial waste.

These Sensors are not compatible with the ZX-L□□ Smart Sensors (laser type). Do not connect combinations of ZX-E□□ Smart Sensors and ZX-T□□ Smart Sensors.

Wiring

- Wiring Check

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

- Cable Extension

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

- Power Supply

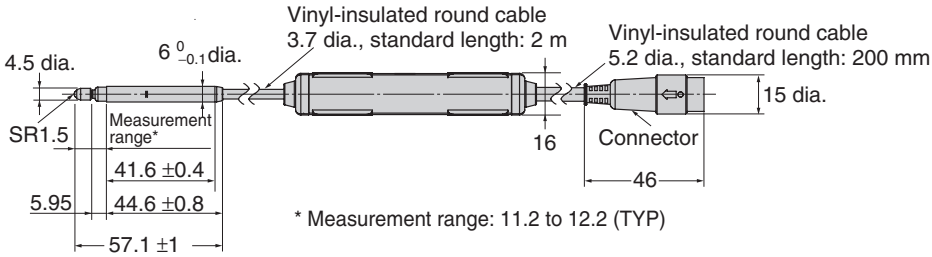
When using a commercially available switching regulator, ground the FG (frame ground) terminal.

If the power supply line is subject to surges, connect a surge absorber that meets the conditions of the operating environment.

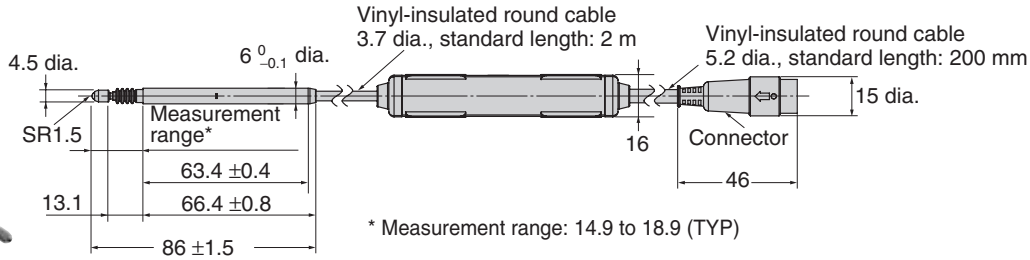
Dimensions

Sensors

ZX-TDS01T



ZX-TDS04T
ZX-TDS04T-L



Amplifier Unit

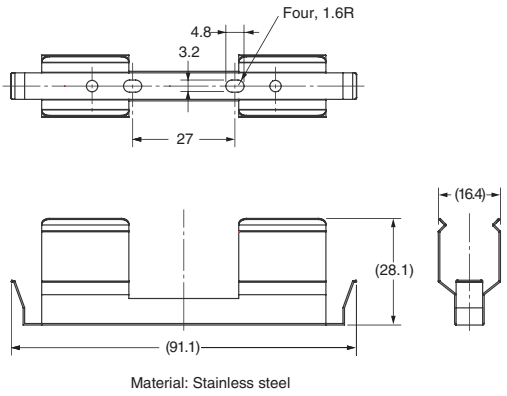
ZX-TDA11
ZX-TDA41

Accessories (Order Separately)

Preamplifier Mounting Bracket (Supplied with Each Sensor)

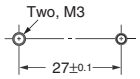
ZX-XBT1

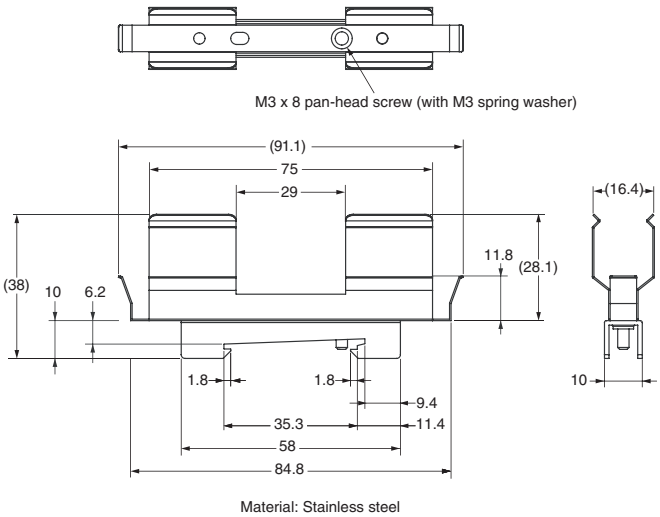
ZX-XBT2 (For DIN Track Mounting)



Material: Stainless steel

Mounting Hole Cutout Dimensions





Material: Stainless steel

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E345-E2-02-X