NEW

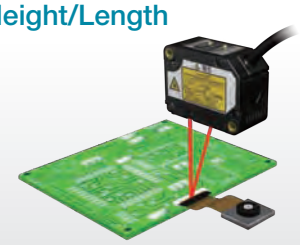
SMART Sensor Series

Laser Displacement Sensor CMOS Type
Model ZX2 Series

Stable, Easy & Affordable

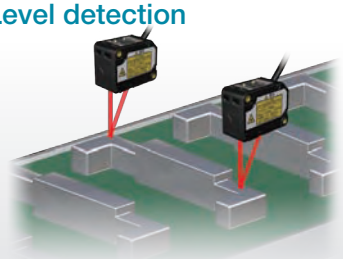
One Solution for Any Application

Height/Length



Thin connector assembly

Level detection

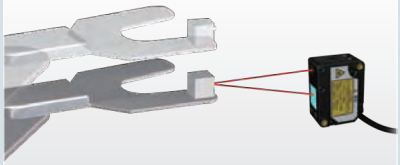


Shape validation for molded parts

Warpage

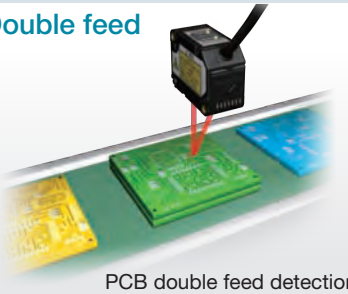
Tray warpage measurement

Positioning



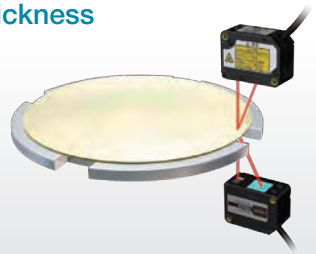
Robot hand positioning

Double feed



PCB double feed detection

Thickness



Wafer thickness measurement

New

Laser Displacement Sensor CMOS Type

ZX2 Series

Realize stable measurements
Resolution 1.5µm*1

Realize stable measurements at 10µm
Linearity*2 0.05% F.S.*3

Reliable measurement of moving objects
Measurement cycle 30µs

Unaffected by environmental changes
Temperature characteristic*4 0.02% F.S./°C*5

*1 When employing Models ZX2-LD50/LD50L (50mm type)
*2 Linearity : Maximum error produced when measuring within measurement range
*3 Linearity ±0.05% F.S. indicates the maximum error is 10µm in the case of using Model ZX2-LD50L with a 40-50mm measurement range.
*4 Temperature characteristic : Error produced when the ambient temperature varies by 1°C
*5 Linearity ±0.02% F.S./°C indicates the maximum error is 4µm when the ambient temperature varies by 1°C in the case of using Models ZX2-LD50/LD50L with a measurement range ±10mm.

Stable Measurement and Easy to Use

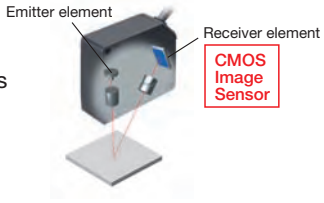
Stability Stable measurements in case of color/material and moving objects

Dynamic range a million times

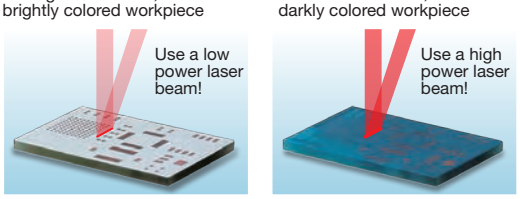
PAT.P

Realizes stable measurements for any color or surface condition including metals, substrates, elastomers and transparent materials through the employment of Omron's own HSDR-CMOS (High Speed and Dynamic Range) image sensor and a step-less laser power adjustment algorithm. A line beam is used in addition to an emitter beam, ideally configured with a Omron sensor lens. Stable measurements are thereby realized, in moving applications.

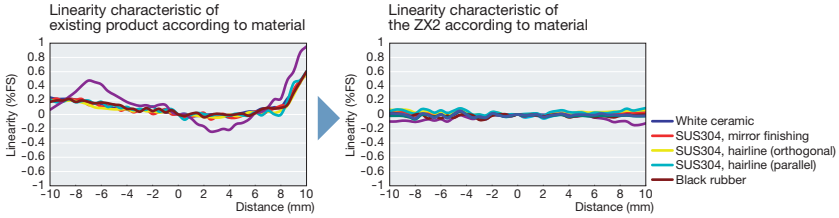
CMOS Image Sensor



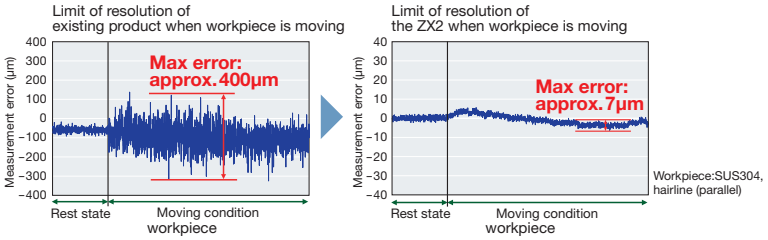
Step-less adjustment of laser power



Stable measurements on objects with changing color/material



Stable measurements on moving objects



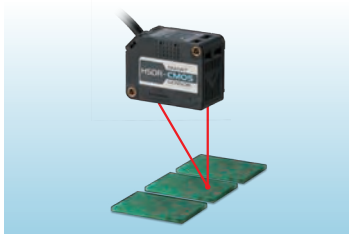
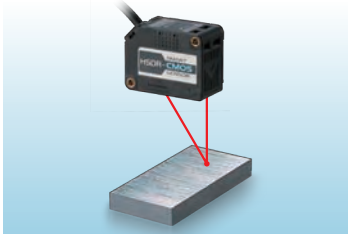
Easy Easy and User-friendly Configuration

Smart tuning

PAT.P

The ideal configuration for stable measurements is realized by a single button through the new feature “smart tuning”, and no longer depends on the skill of the user. A reliable configuration is achieved by three tuning methods, which can be selected to match the type of object and surface conditions to be measured.

Three selectable tunings

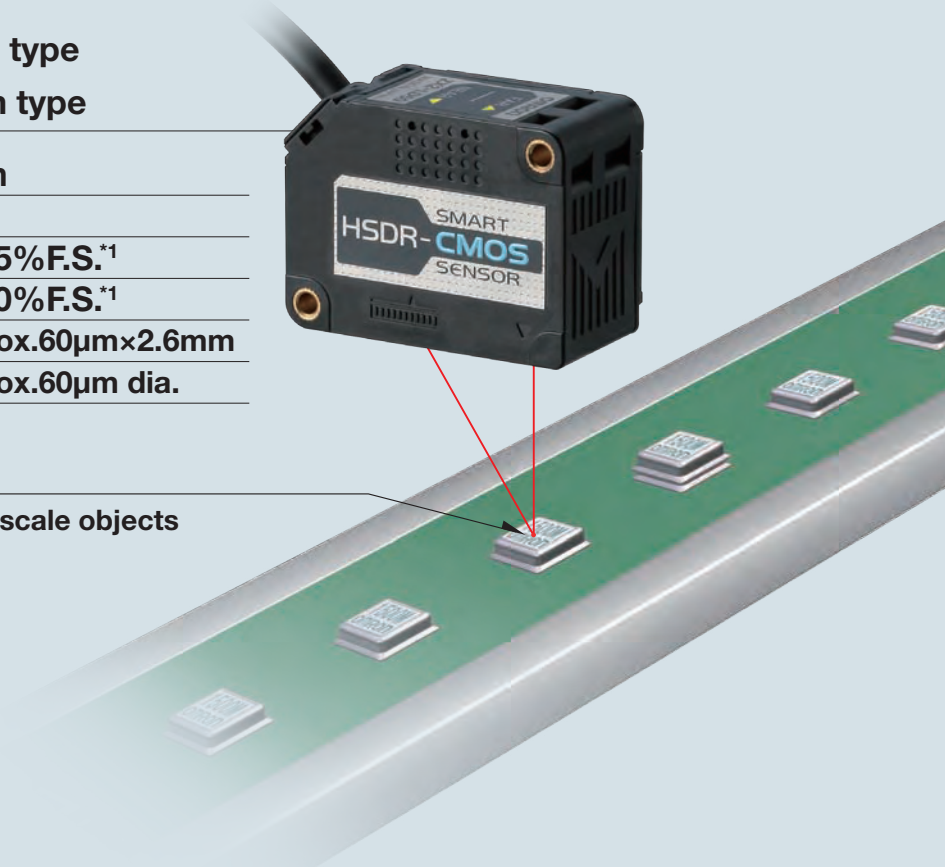
One type of workpiece	Several types of workpiece	Surface conditions of the workpiece are variable
		
Single smart tuning Best configuration for stable detection in case of objects do not change by pushing the button for one second	**Multi-smart tuning** Ideal configuration for stable detection of changing objects by pushing the button for three seconds	**Active smart tuning** Continuous configuration improvement for the stable detection of all locations by pushing the button for five seconds

Sensor head

Sensor Heads for Various Applications -select the Range and Type of Beam

ZX2-LD50L Line beam type
ZX2-LD50 Spot beam type

●Measurement range	50mm±10mm	
●Resolution	1.5μm	
●Linearity	Line beam	±0.05%F.S.*1
	Spot beam	±0.10%F.S.*1
●Beam size	Line beam	Approx.60μm×2.6mm
	Spot beam	Approx.60μm dia.

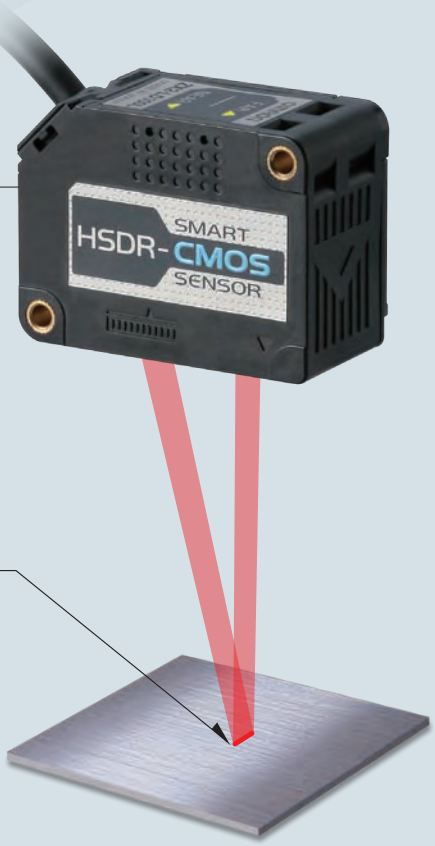


Spot beam

Precise measurement on micro-scale objects

ZX2-LD100L Line beam type
ZX2-LD100 Spot beam type

●Measurement range	100mm±35mm	
●Resolution	5μm	
●Linearity	Line beam	±0.05%F.S.*2
	Spot beam	±0.10%F.S.*2
●Beam size	Line beam	Approx.110μm×2.7mm
	Spot beam	Approx.110μm dia.



Line beam

Stable measurement on rough-surfaced objects

*1 Using 40 to 50mm
*2 Using 65 to 100mm

Reliable measurements in harsh environments

IP67, robot cable & temperature characteristic 0.02% F.S./°C

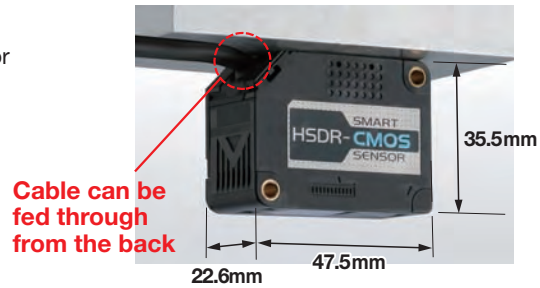
IP67 protection class enables to use the sensor in harsh environments. A robot cable is used as standard between the head and amplifier, that the unit can be used reliably on moving parts. In addition, as 3D UV bond is used to fix the optical components rather than screws, stress can be controlled and a temperature characteristic 0.02% F.S./°C* is realized.

* If the room temperature varies 1°C, the measured value varies 0.02% F.S. (corresponding to 4µm for the Model ZX2-LD50)

Compact sensor for easy mounting

World smallest*

The world's smallest CMOS laser displacement sensor head is realized in a resin case. Enables to mount the sensor in smallest spaces and to minimize measurement errors arising from temperature fluctuations.



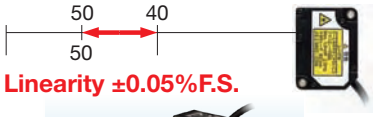
10µm precision measurements

Linearity to meet the application

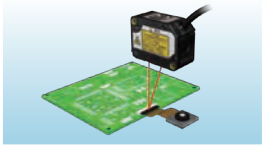
Measurements to an even higher accuracy are realized for applications that do not require the entire measurement range. If the range of the field is less than the length of the measurement center, linearity accuracy improves by 50% compared with that for the full range.*

* Model ZX2-LD□L

Model ZX2-LD50L

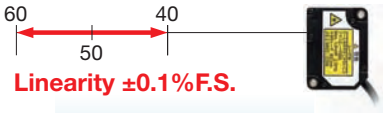


Linearity ±0.05%F.S.

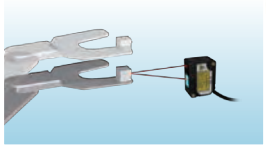


Example of an application that does not require the entire measurement range

Low-profile connector assembly height measurement



Linearity ±0.1%F.S.



Example of an application that requires the entire measurement range

Robot hand registration

Visualization to prevent from stopping the production-line

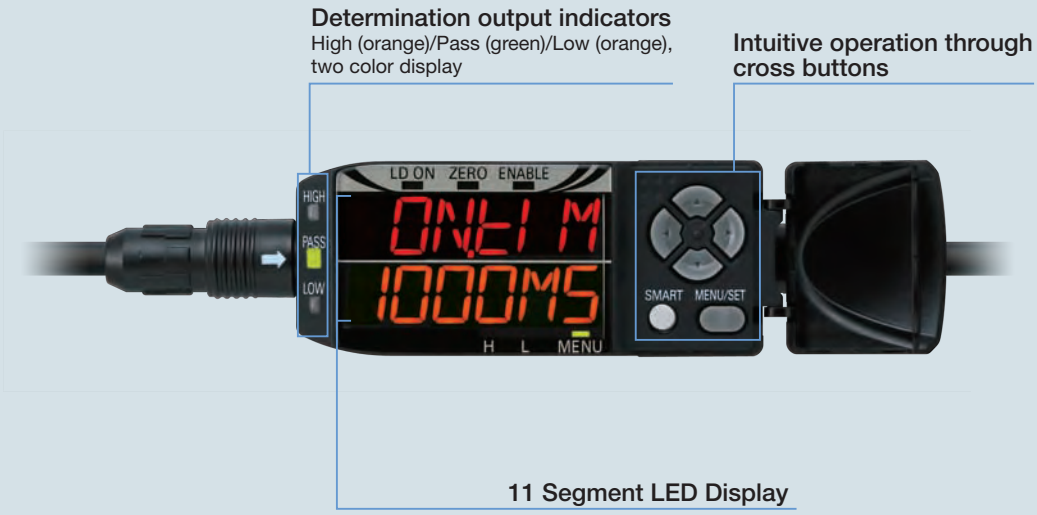
Laser life display function

The end of the laser diode lifespan is automatically detected and displayed so maintenance can be performed systematically. On the main digital display of the amplifier, this is indicated by an LED on the back of the head. Accordingly, in case of amplifier is within the control panel, the lifetime can be confirmed by the head and the indications are not missed.

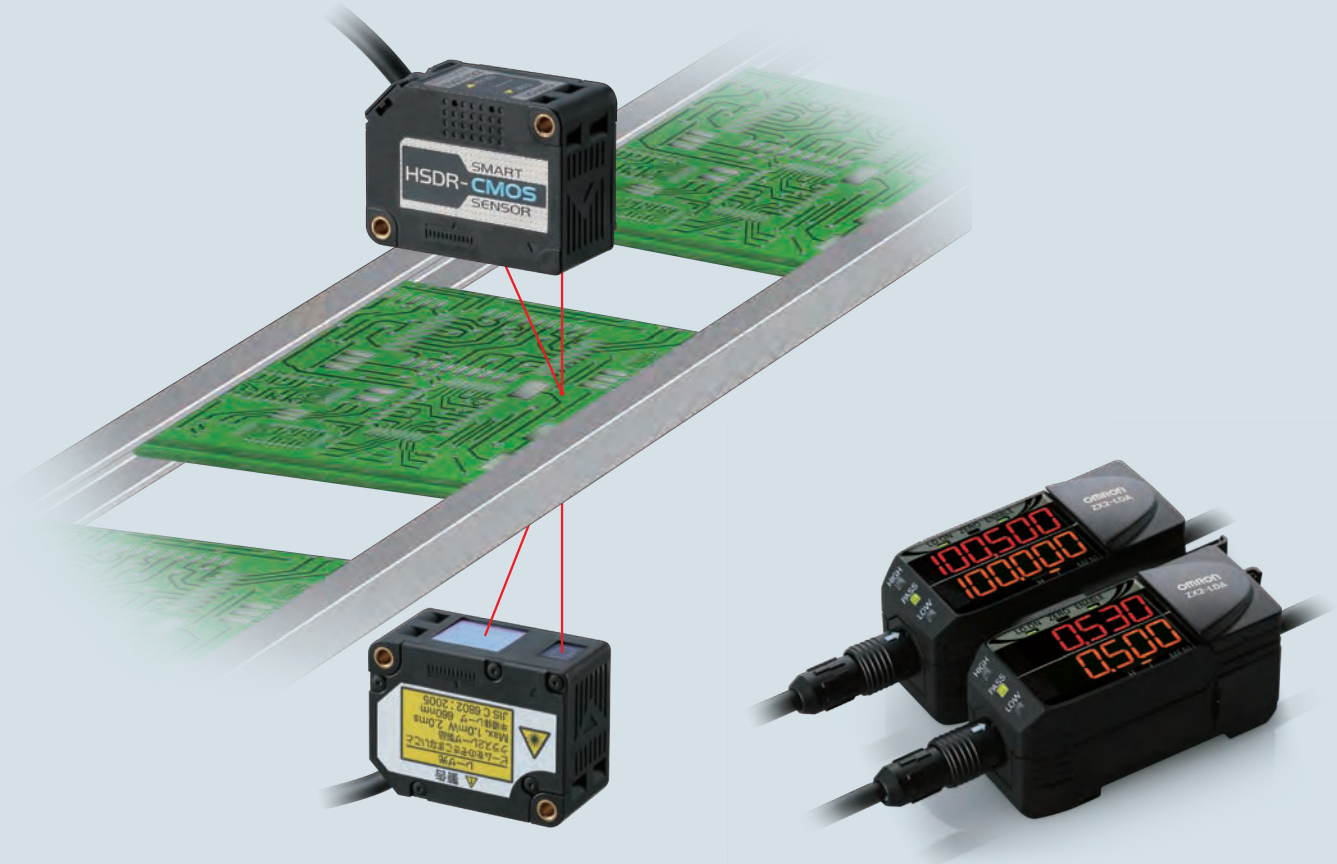
Amplifier unit + Calculating unit

Ease of Use by “LED Display” and “Calculating Unit”

11-segment LED display for intuitive configuration



Easy calculations of measurements

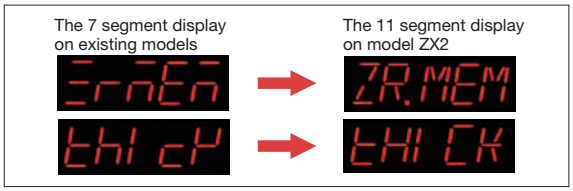


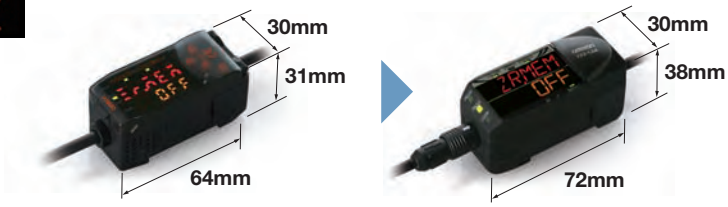
No need for a manual

11 Segment LED Display

An 11 segment LED display is integrated in the compact housing. Alphanumeric characters can be read with ease and there is no need to refer to a manual.

Comparison of the existing 7 segment LED display and the 11 segment LED display





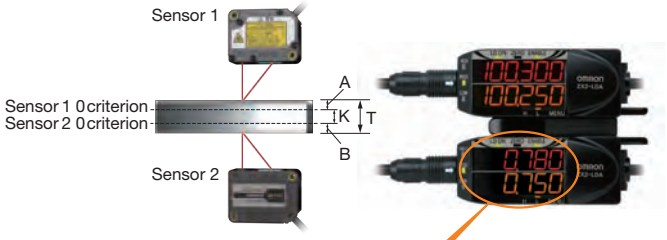
The compact housing stays just as it is

Perform two calculations with ease

Thickness + subtraction mode

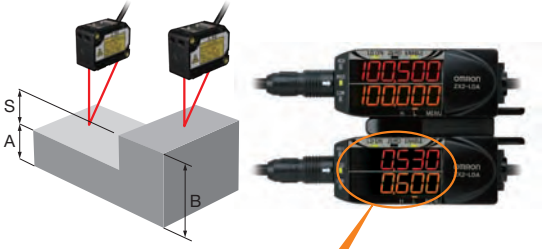
The calculated results of two sensors are displayed on the amplifier by just connecting the calculating unit between the two amplifiers. The calculation function can be chosen from the two modes of thickness and subtraction. It is also possible to prevent mutual interference by coupling via the calculating units.

Thickness mode



Thickness T = K + (A + B)

Subtraction mode



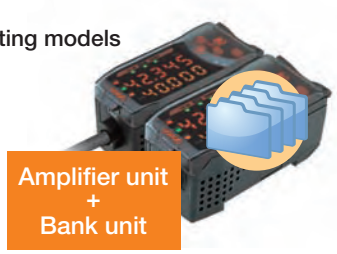
Level difference S = B – A

Easy change of setup

Equipped with 4 banks

The amplifier unit is equipped with four bank functions. Easy change of setup between four modes is supported by just switching between the bank functions.

Existing models



Amplifier unit + Bank unit

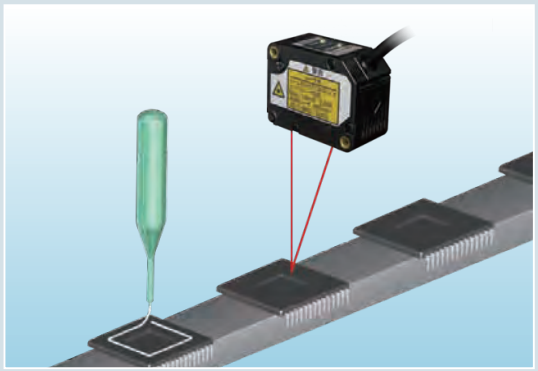
ZX2

Built into the unit

One Sensor for Any Measurement Application

Height/ Length

Height measurements prior to IC package sealing

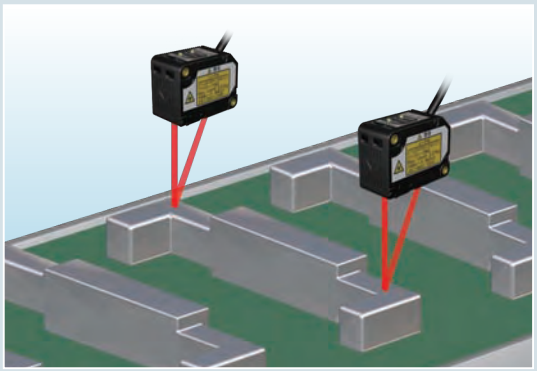


Point

Stable measurements can be performed by the HSDR-CMOS image sensor and Omron's proprietary algorithm, even for measurements on moving IC packages.

Level detection

Shape validation for molded parts



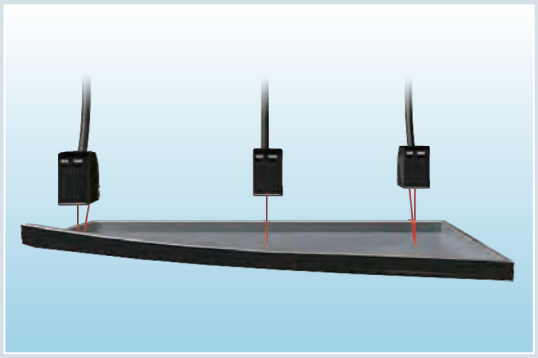
Point

Calculation of the measured values can be carried out and the difference in level can be easily measured by just connecting the calculating unit between two amplifiers.

Even if the surface conditions of a molded part varies, application of a line beam and HSDR-CMOS image sensor results in almost no fluctuation in measured value.

Warpage

Tray flatness measurement prior to chip firing

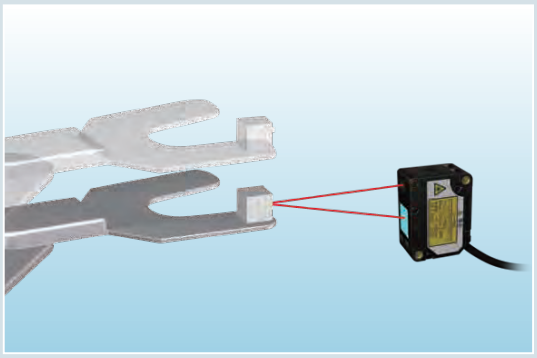


Point

Even if there is temperature variation due to the ambient temperature, a die-cast is used for the optical base and so there is almost no fluctuation in measured value.

Positioning

Robot hand Positioning

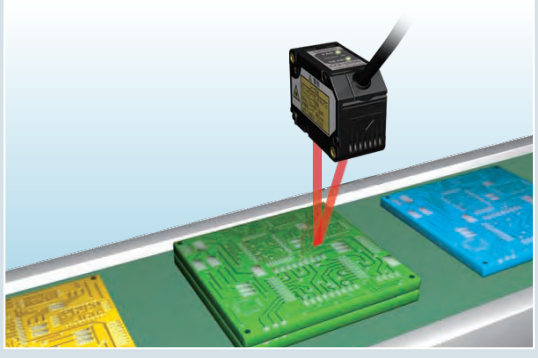


Point

Stable measurements can be performed by the HSDR-CMOS image sensor and Omron' s proprietary algorithm even for robot hand registration.

Double feed

PCB double feed detection

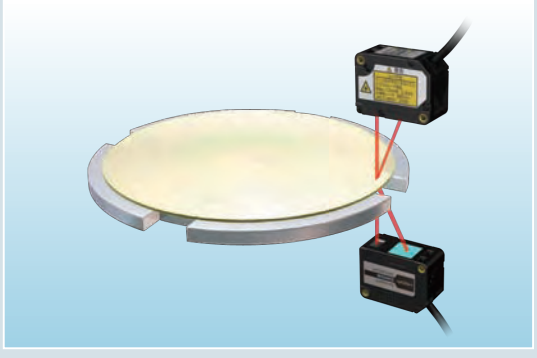


Point

Even if the color of the substrate changes, application of the HSDR-CMOS image sensor and Omron' s proprietary algorithm results in almost no fluctuation in measured value.

Thickness

Wafer thickness measurement



Point

Calculation of the measured values can be carried out and the thickness can be easily measured by just connecting the calculating unit between two amplifiers.

Ordering Information

Units

Sensor Heads

Appearance	Beam shape	Sensing distance	Resolution	Model
Diffuse reflection type	Line beam	50±10mm 40 60	1.5μm	ZX2-LD50L
	Spot beam			ZX2-LD50
	Line beam	100±35mm 65 135	5μm	ZX2-LD100L
	Spot beam			ZX2-LD100

Amplifier Units

Appearance	Power supply	Output type	Model
	DC	NPN	ZX2-LDA11
		PNP	ZX2-LDA41

Accessories (sold separately) These are not included with the Sensor Head or Amplifier Unit. Please order as necessary.

Calculating Unit

Appearance	Model
	ZX2-CAL

Sensor Head Extension Cables

Cable Length	Model
1m	ZX2-XC1R
4m	ZX2-XC4R
9m	ZX2-XC9R

* Extension cables cannot be coupled and used together.

Specifications

Sensor Heads

Item / Model	ZX2-LD50L	ZX2-LD50	ZX2-LD100L	ZX2-LD100
Optical system	Diffuse reflective			
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 1mW max.			
	EN class 2,FDA class Ⅱ*5			
Measurement center point	50mm		100mm	
Measurement range	±10mm		±35mm	
Beam shape	Line	Spot	Line	Spot
Beam size *1	Approx. 60μm×2.6mm	Approx. 60μm dia.	Approx.110μm×2.7mm	Approx.110μm dia.
Resolution *2	1.5μm		5μm	
Linearity *3	±0.05%F.S. (40 to 50mm) ±0.1%F.S. (entire range)	±0.1%F.S. (40 to 50mm) ±0.15%F.S. (entire range)	±0.05%F.S. (65 to 100mm) ±0.1%F.S. (entire range)	±0.1%F.S. (65 to 100mm) ±0.15%F.S. (entire range)
Temperature characteristic *4	0.02%F.S./°C			
Ambient illumination	Incandescent lamp: 10,000lx max. (on light receiving side)			
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min.			
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 min. each in X,Y,and Z directions			
Shock resistance (destruction)	300 m/s² 3 times each in six directions (up/down,left/right,forward/backward)			
Degree of protection	IEC60529, IP67			
Connection method	Connector connection (standard cable length: 500 mm)			
Weight (packed state)	Approx.160g (unit only: Approx.75g)			
Materials	Case and cover: PBT (polybutylene terephtahalate), Optical window: Glass, Cable: PVC			
Accessories	Instruction sheet, Ferrite core, Laser warning label (English)			

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

*1. Beam size: Defined as 1/e² (13.5%) of the central intensity at the smallest value of diameter for the measurement range (typical value)
False detections can occur in the case there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

*2. Resolution: indicates the degree of fluctuation (±3σ) of analog output when connected to the ZX2-LDA.
(indicates the measured value for the case the response time of the ZX2-LDA is configured to 128ms and Omron's standard target object (white ceramics) is made the center distance.)
Indicates the repetition accuracy for when the workpiece is in a state of rest. Not an indication of distance accuracy.
Resolution performance may not be satisfied in a strong electromagnetic field.

*3. Linearity: indicates the error with respect to the ideal straight line of the displacement output in the case of measuring Omron's standard target object. Linearity and measured value may vary depending on target object.
F.S. indicates the full scope of the measurement range. (ZX2-LD50□: 20mm)

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

*5. Classified as Class 2 by EN60825-1 criteria in accordance with the FDA standard provisions of Laser Notice No.50. Notification to CDRH planned.

Amplifier Units

Item / Model	ZX2-LDA11	ZX2-LDA41
Measurement period *1	Min. 30µs	
Response time	60µs, 120µs, 240µs, 500µs, 1ms, 2ms, 4ms, 8ms, 12ms, 20ms, 36ms, 66ms, 128ms, 250ms, 500ms	
Analog output *2	4 to 20 mA, Max. load resistance: 300Ω, ±5VDC or 1 to 5 VDC, Output impedance: 100Ω	
Judgement outputs (HIGH/PASS/LOW: 3 outputs), error output	NPN open-collector outputs, 30 VDC, 50 mA max. (residual voltage: 1V max. for load current 10mA max., 2V max. for load current above 10mA)	PNP open-collector outputs, 30 VDC, 50 mA max. (residual voltage: 1V max. for load current 10mA max., 2V max. for load current above 10mA)
Laser OFF input, zero reset input, timing input, reset input, bank input	ON: Short-circuited with 0-V terminal or 1.2V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within -1.2V OFF: Open (leakage current: 0.1 mA max.)
Functions	Smart tuning, scaling, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, average hold, zero reset, On-delay timer, OFF-delay timer, keep/clamp switch, (A-B)calculations *3, thickness calculation *3, mutual interference prevention *3, laser deterioration detection, bank function(4 banks)	
Indications	Judgement indicators: HIGH(orange),PASS(green),LOW(orange),11-segment main display(red),11-segment sub-display(orange),laser ON(green),zero reset(green),enable(green),menu(green), HIGH threshold(orange),LOW threshold(orange)	
Power supply voltage	10 to 30 VDC, including 10% ripple(p-p)	
Power consumption	3,000 mW max. with power supply voltage of 30 VDC and power supply current of 100 mA (with Sensor connected)	
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min.	
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 min. each in X,Y,and Z directions	
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)	
Degree of protection	IEC60529, IP40	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx.200g (unit only: Approx.135g)	
Materials	Case: PBT(polybutylene terephtahalate), Cover: Polycarbonate, Display: Acrylic resin, Button: Polyacetal, Cable: PVC	
Accessories	Instruction sheet	

*1. In the case of Omron's standard target object (white ceramic)
*2. Configure current output (4 to 20mA) and voltage output (±5V or 1 to 5V) by MENU mode.
*3. Calculating unit (ZX2-CAL) is necessary.

Calculating Unit

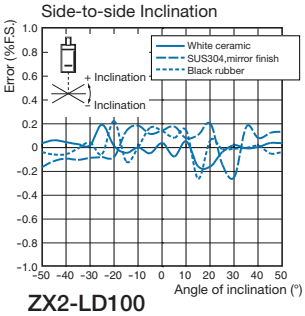
Item / Model	ZX2-CAL
Applicable Amplifier Units	ZX2-LDA11/ZX2-LDA41
Current consumption	12mA max (supplied from the Smart Sensor Amplifier Unit)
Ambient temperature	Operating: 0 to +50°C, storage: -15 to +70°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85% RH (with no condensation)
Connection method	Connector
Dielectric strength	1,000VAC, 50/60 Hz for 1min.
Insulation resistance	100MΩ min. (at 500VDC)
Vibration resistance (destructive)	10 to 150Hz, 0.7-mm double amplitude, 80min. each in X,Y,and Z directions
Shock resistance (destructive)	300m/s^2 3 times each in six directions (up/down, left/right, forward/backward)
Materials	Case: PBT (polybutylene terephthalate), Display: Acrylic resin
Weight (packed state)	Approx. 50g
Accessories	Instruction sheet

Engineering Data (Typical)

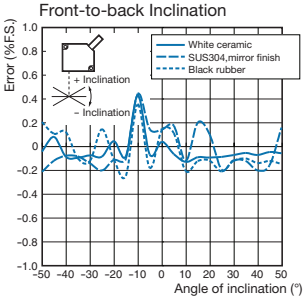
Angle Characteristic

ZX2-LD50

Side-to-side Inclination

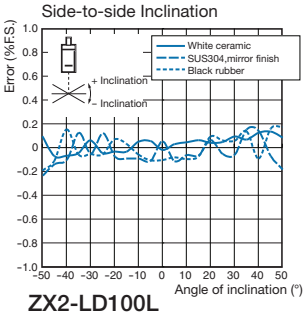


Front-to-back Inclination

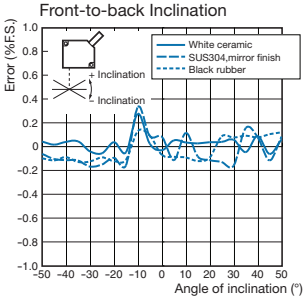


ZX2-LD50L

Side-to-side Inclination

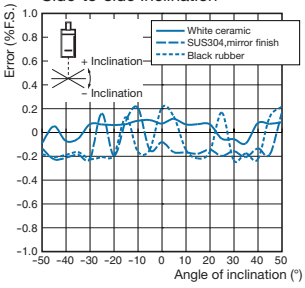


Front-to-back Inclination

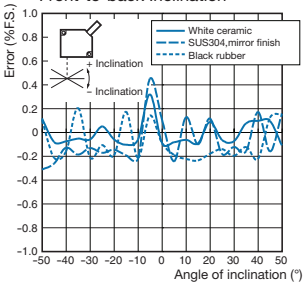


ZX2-LD100

Side-to-side Inclination

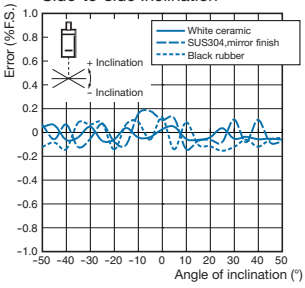


Front-to-back Inclination

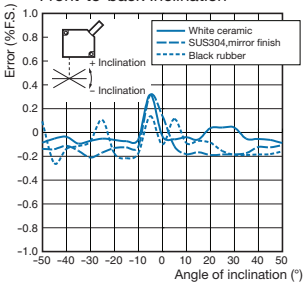


ZX2-LD100L

Side-to-side Inclination



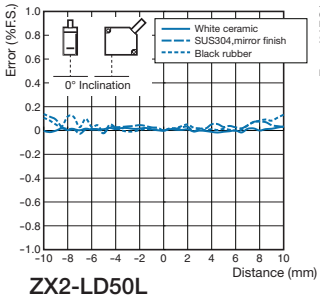
Front-to-back Inclination



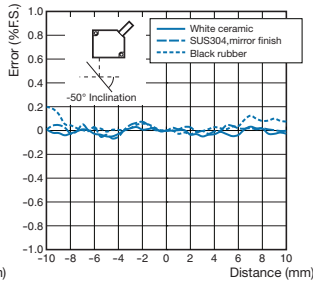
Linearity Characteristic for Different Materials

ZX2-LD50

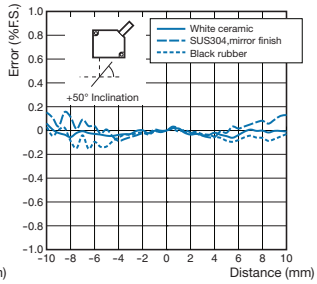
0° Inclination



-50° Inclination Front-to-back

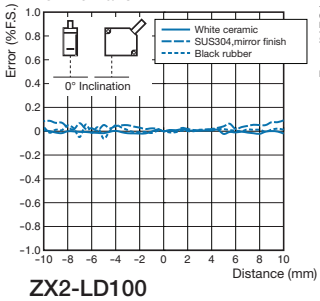


+50° Inclination

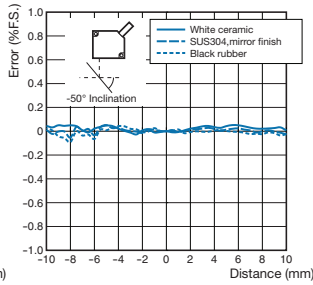


ZX2-LD50L

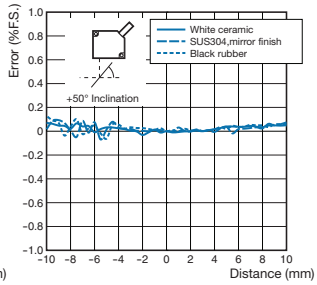
0° Inclination



-50° Inclination Front-to-back

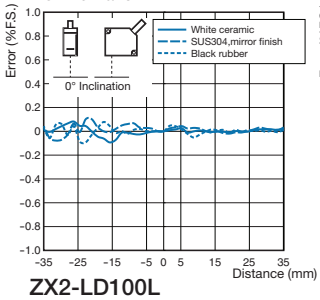


+50° Inclination

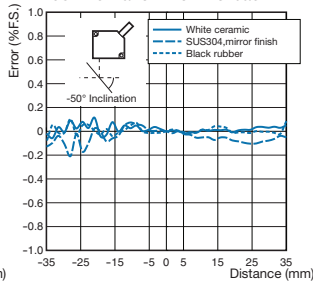


ZX2-LD100

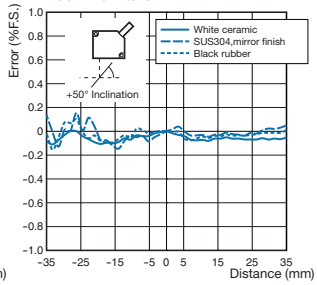
0° Inclination



-50° Inclination Front-to-back

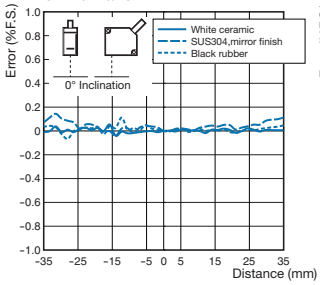


+50° Inclination

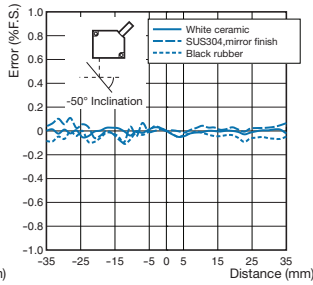


ZX2-LD100L

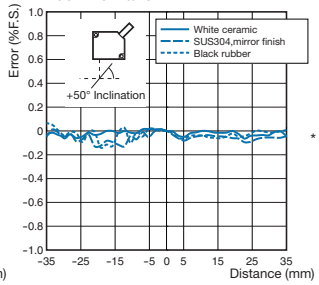
0° Inclination



-50° Inclination Front-to-back



+50° Inclination



* The x-axis distance indicates the measurement distance displayed by the amplifier unit. The measurement distance displayed by the amplifier unit takes the measurement center distance as 0 and displays the near-field from the sensor as plus and the far-field as minus.

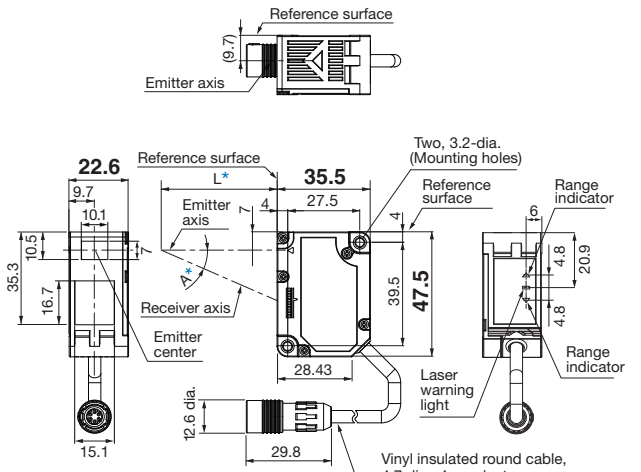
Dimensions

(Unit: mm)

Units

Sensor Heads

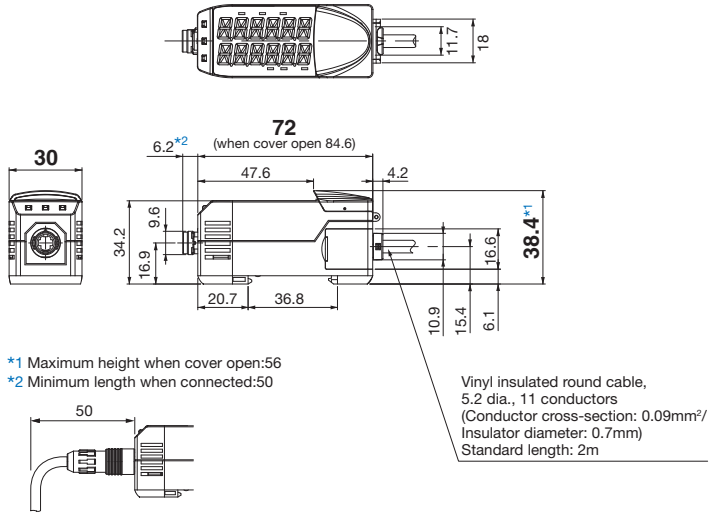
ZX2-LD50/ZX2-LD50L
ZX2-LD100/ZX2-LD100L



* In the case of ZX2-LD50 (L), L=50, A=21°
In the case of ZX2-LD100 (L), L=100, A=11.5°

Amplifier Units

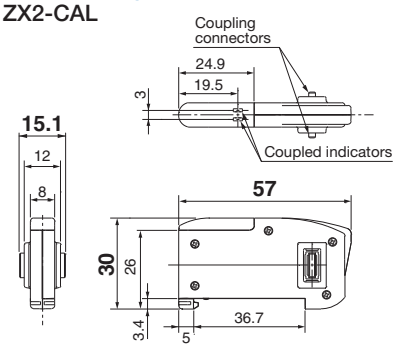
ZX2-LDA11/ZX2-LDA41



*1 Maximum height when cover open:56
*2 Minimum length when connected:50

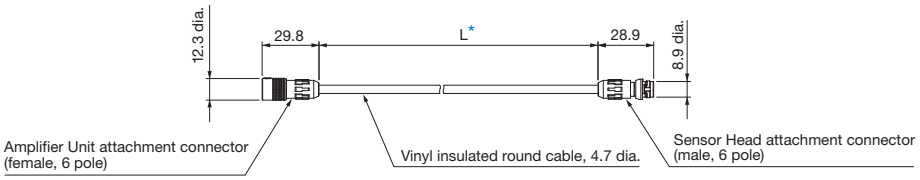
Calculating Unit

ZX2-CAL



Sensor Head Extension Cables

ZX2-XC1R
ZX2-XC4R
ZX2-XC9R



* Length L is as follows. ZX2-XC1R:1m, ZX2-XC4R:4m, ZX2-XC9R:9m

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