OMRON

ZX1 & ZX2 SERIES

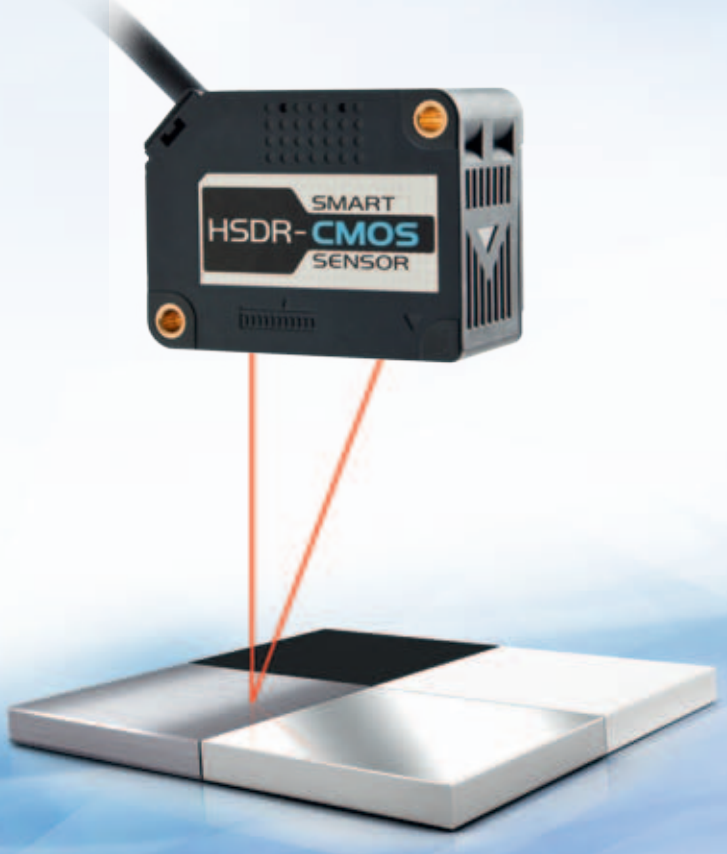
Compact displacement sensing

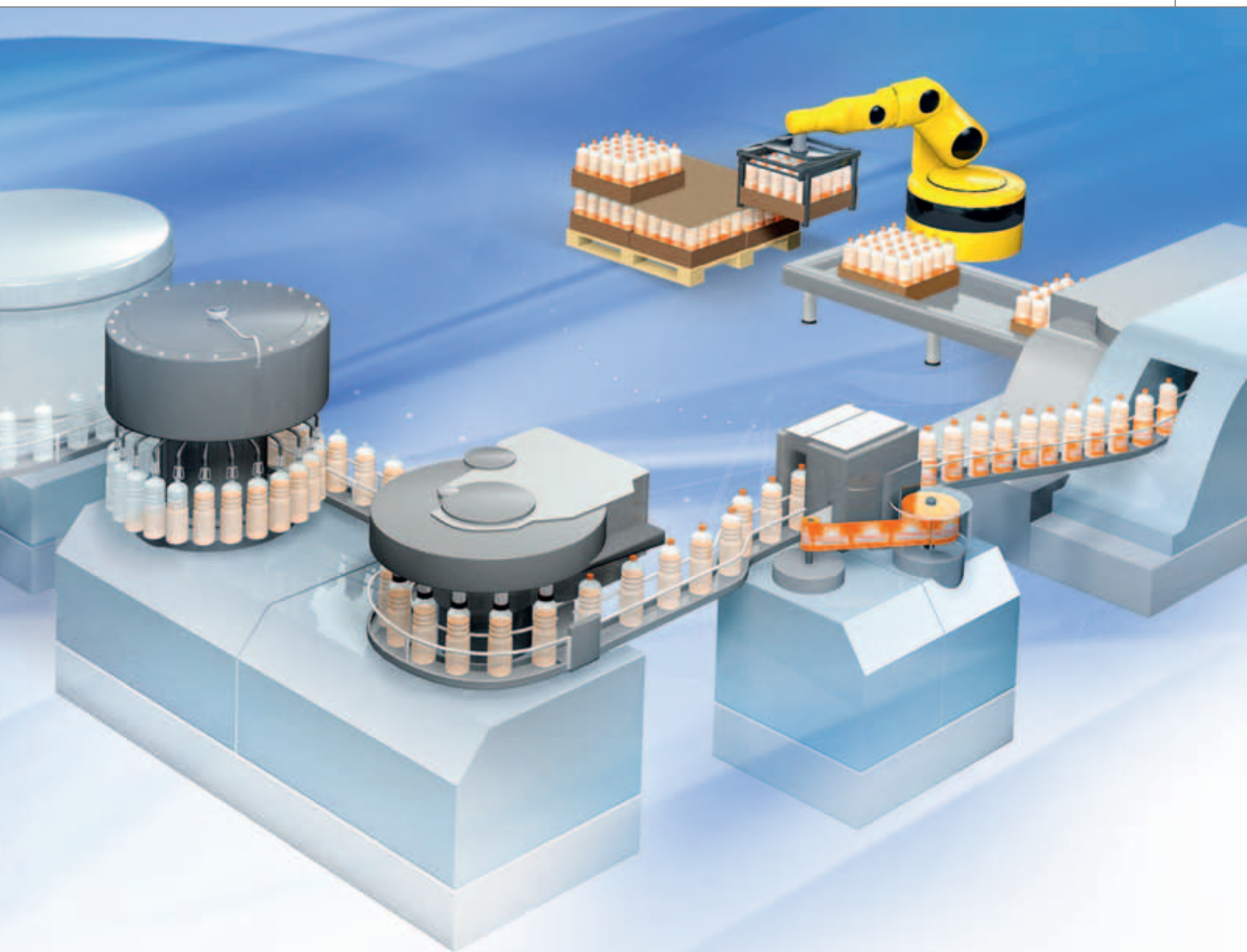
The highest performance...

Quite simply, the ZX1 and ZX2 series of displacement sensors give you genuine best-in-class speed, accuracy and ease-of-use. For example, it has a response time as low as 60 µs and a measuring cycle as low as 30 µs. But perhaps the best thing about the new ZX1 and ZX2 series is its highly stable measurement of any colour or surface condition – including metals, elastomers and even shiny materials. The result? Optimised productivity for your machines and optimised satisfaction for your customers.

Benefits in brief

- Wide range of sensing distances
- Stable measurement for objects with any surface
- Best-in-class performance for accuracy and speed
- World's smallest sensing head – for easy mounting
- Simple configuration via one-button 'Smart Tuning'
- Reliable measurement in harsh environments
- Integrated display





...for optimised productivity

Stable detection on any surface

The ZX1 and ZX2 easily handle previously difficult surfaces such as dark matt-type and shiny surfaces. This ability eliminates production line stoppages caused by sensor failure, and also minimises stoppages caused when the targets surface is changed. This highly stable measurement is a result of the advanced HSDR (High Speed Dynamic Range) CMOS camera chip and the step-less laser power adjustment algorithm.

All-in-one housing

The ZX1 displacement sensor includes an integrated amplifier. So you only need to mount one component. This not only saves time and space but also simplifies cabling. In addition the ZX2 offers the world's smallest sensor head.

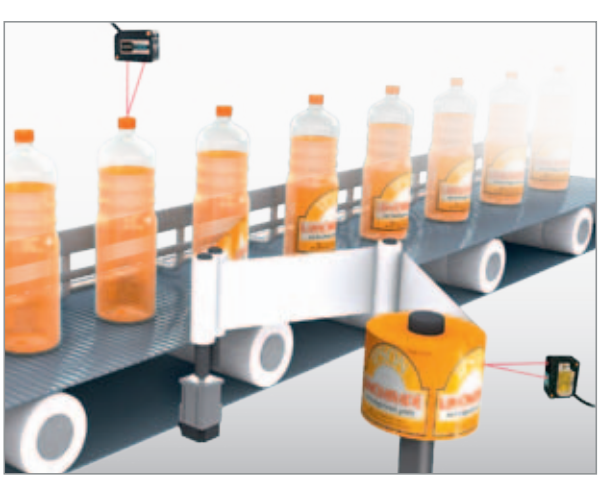
Plug & Play

These compact, easy-to-mount sensors are also easy to configure. Just one button press is all it takes to 'teach' the sensor about which surface type it is sensing. Perfect for fast machine installation, and ideal for use when product designs are changed.

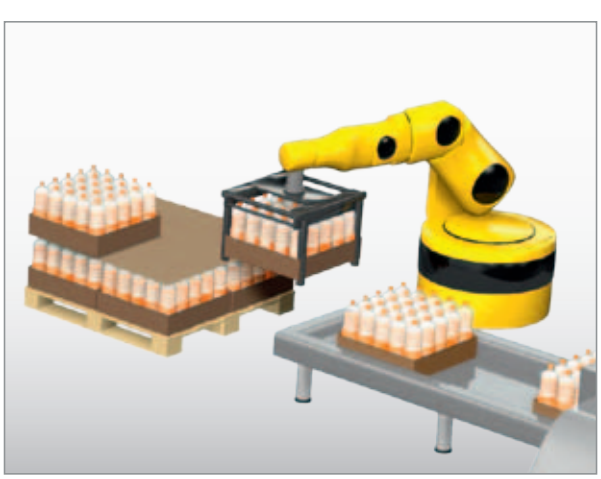
One range – multiple applications

With the new ZX1 and ZX2 range of Omron displacement sensors you have the ideal solution for almost all of your displacement measuring tasks. For example, whether you need to check the tension of a paper-roll feed or the closure of a lid, the ZX1 and ZX2 measurement sensors provide a wide range of solutions, one of which will be fit for your application. That's because these precision measuring sensors are not only fast and highly reliable, they are also extremely flexible – with measuring distances of 20 mm to 1000 mm.

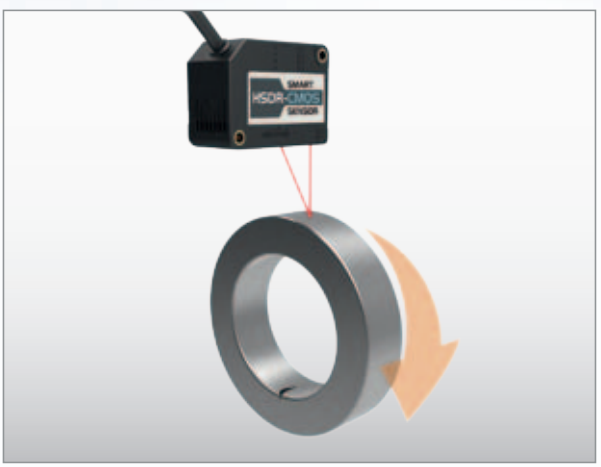
Cap detection



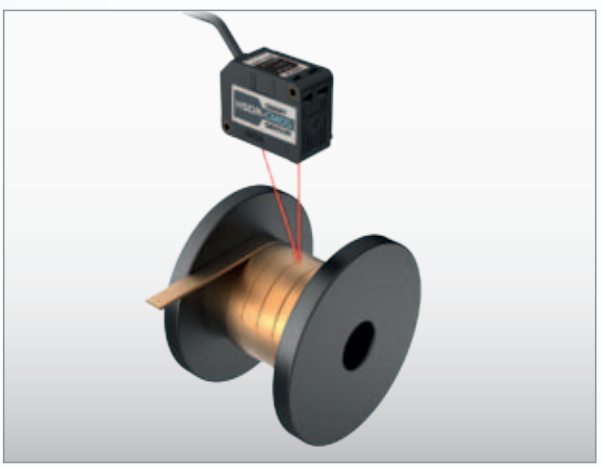
Palletisation



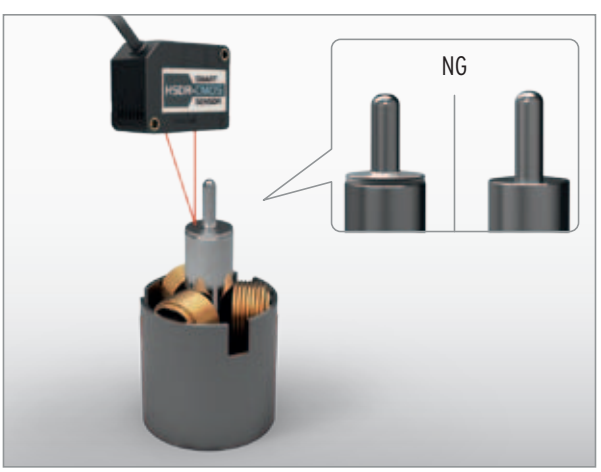
Measuring 'run-out'



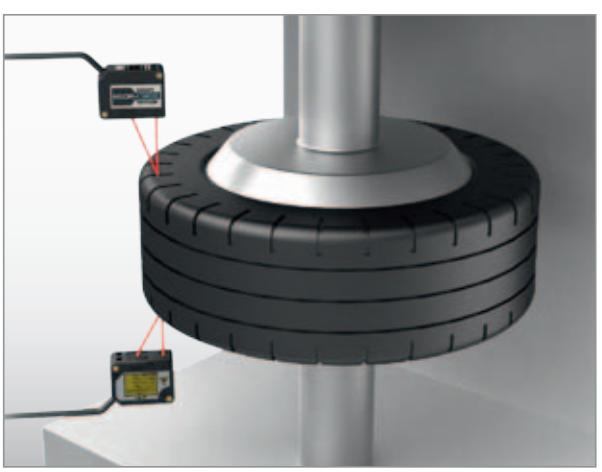
Measuring the remaining amount of a coil



Confirming the number of washers



Measuring the depth of tread



ZX1 Compact convenience

with integrated amplifier and all-in-one housing

Compact size for easy mounting

The highly compact CMOS displacement sensing head means that you can mount them in the smallest of spaces. The integrated LED display can be read with ease and there is no need to refer to a manual.

One-button press for easy 'teaching'

With a single button-press on the ZX1 you get the ideal configuration for your application. This means that set-up and calibration no longer depend on the skills of the operator. A reliable and optimised configuration is achieved by just one button-press.

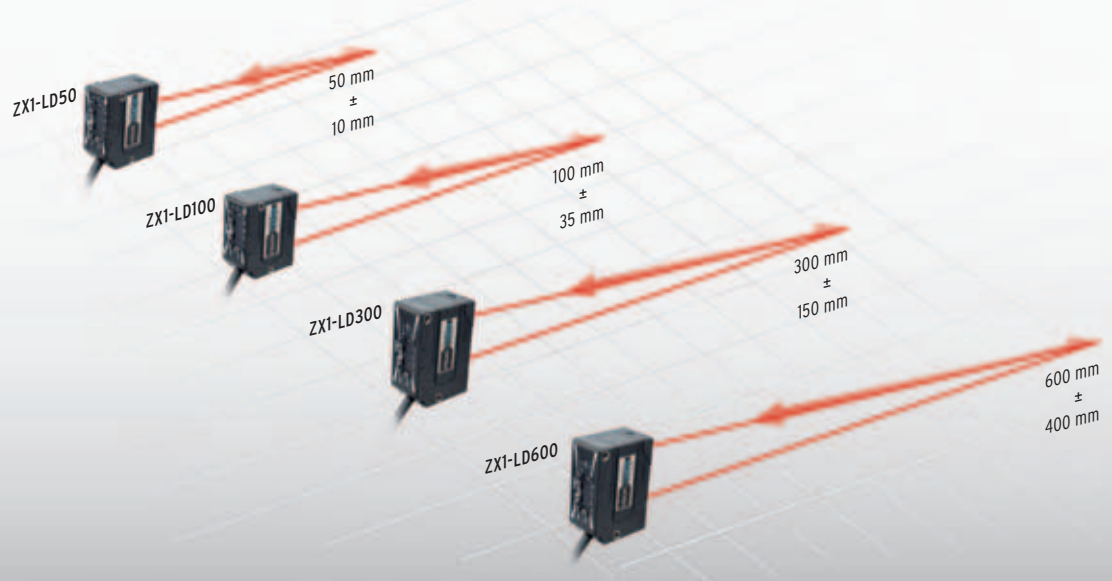
IP67 for high reliability even in harsh environments

With an ingress protection rating of IP67 you are assured of highly reliable measurements even in harsh environments. Thanks to the robot cable, the sensing head can even be mounted on moving parts.

Clear diagnostics for maximised productivity

When the laser approaches end-of- life, an in-built LED flashes. This enables maintenance to be implemented systematically, without causing an unscheduled production line stoppage.

Wide sensing range for extra design freedom



ZX2 Advanced functionality

that's easy to use

Hold functions for more flexibility

With discrete hold functions equipped within the amplifier, the ZX2 provides a variety of measurement timing functions, which enable you to easily realise otherwise difficult measurement results. Five possible function values can be determined: average, peak-to-peak, sample, bottom and peak.

Scalable output for enhanced flexibility

The ZX2 includes a scaling function which allows you to configure the value on the digital display, as well as the analogue output to the dimension of the application. The analogue output can be configured to either the output voltage or current.

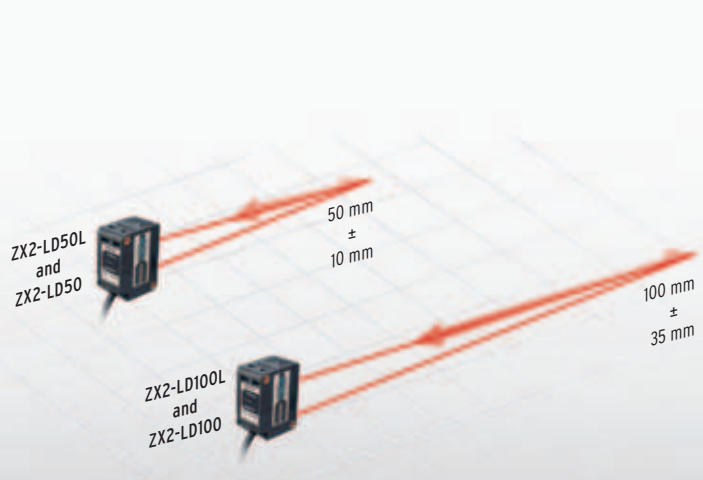
Smart Tuning – for easy configuration

The ZX2 also has a one-button press function for fast and simple configuration, as well as offering the above advanced features for enhanced measuring.

Two calculations

Two ZX2 sensors can be used to measure the thickness or stepchanger for example, of a target. All you need to do is connect the calculating unit between the two amplifiers.

Easy calculations of measurements

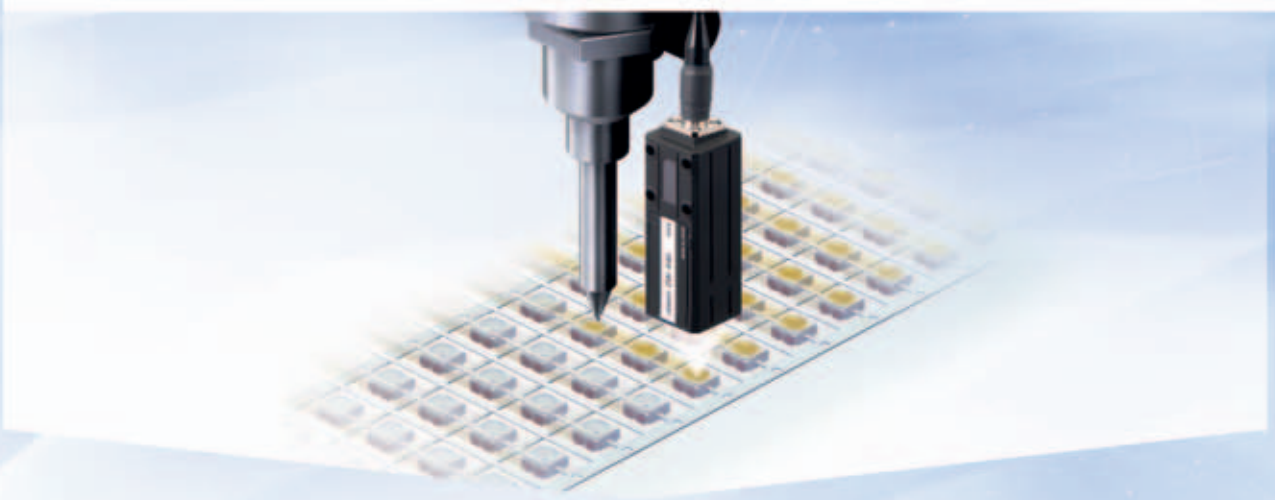


Level difference S=B-A

The complete range of Omron measurement sensors

As a total sensing solutions provider Omron offers a choice of inspection principles and technologies to ensure you always get the solution that best-fits your application. To ensure the highest inspection performance these smart measurement sensors offer accurate, reliable and fast measurement.

HIGH PERFORMANCE IN



Displacement/Distance

In addition to the ZX1 and ZX2 series Omron offers the ZS family of laser sensors for ultra-critical applications. This provides outstanding measurement performance on all kinds of material and includes a very wide range of sensor heads as well as a scalable concept to provide a highly versatile platform. In addition, the new ZW Confocal Fibre Displacement Sensor has no electrical components and is therefore ideal for applications where there is high electrical and/or magnetic noise.

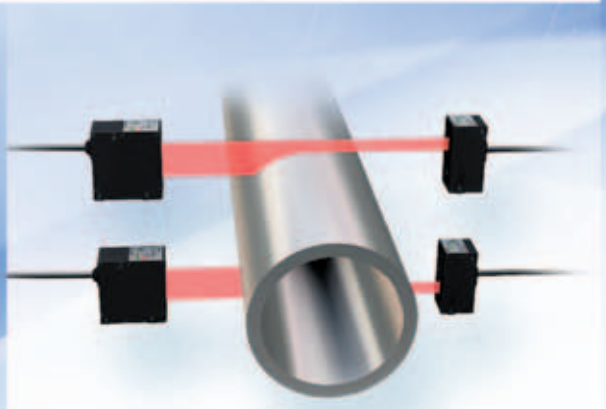
ZW

ZS

THE 3 MEASUREMENT DISCIPLINES

Profile measurement

The smart profile sensors in the ZG range provide an easy to use solution for scanning the profile of an object with a laser beam. Depending on the height, the laser beam is reflected differently and creates the profile information. By moving the sensor or the object, the complete surface can be inspected.



Position/Diameter/Width

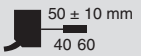
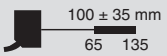
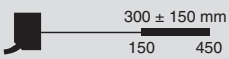
The smart laser micrometer ZX-GT is the perfect choice to accurately determine the position or diameter of an object. The object interrupts the laser beam, which allows the edges of an object to be determined.

ZG

ZX-GT

Ordering Information

ZX1 Sensors

Appearance	Connection method	Cable length	Sensing distance	Model	
				NPN output	PNP output
	Pre-wired	2 m		ZX1-LD50A61 2M	ZX1-LD50A81 2M
		5 m		ZX1-LD50A61 5M	ZX1-LD50A81 5M
	Pre-wired connector	0.5 m		ZX1-LD50A66 0.5M	ZX1-LD50A86 0.5M
	Pre-wired	2 m		ZX1-LD100A61 2M	ZX1-LD100A81 2M
		5 m		ZX1-LD100A61 5M	ZX1-LD100A81 5M
	Pre-wired connector	0.5 m		ZX1-LD100A66 0.5M	ZX1-LD100A86 0.5M
	Pre-wired	2 m		ZX1-LD300A61 2M	ZX1-LD300A81 2M
		5 m		ZX1-LD300A61 5M	ZX1-LD300A81 5M
	Pre-wired connector	0.5 m		ZX1-LD300A66 0.5M	ZX1-LD300A86 0.5M
	Pre-wired	2 m		ZX1-LD600A61 2M	ZX1-LD600A81 2M
		5 m		ZX1-LD600A61 5M	ZX1-LD600A81 5M
	Pre-wired connector	0.5 m		ZX1-LD600A66 0.5M	ZX1-LD600A86 0.5M

Accessories (sold separately)

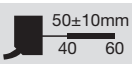
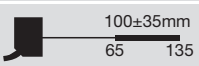
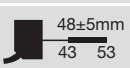
Extension Cables for Pre-wired Connector Models

An Extension Cable is not provided with the Sensor. Order an Extension Cable separately.

Cable length	Model
10 m	ZX0-XC10R
20 m	ZX0-XC20R

ZX2 Sensors

Sensor Heads

Appearance	Optical system	Beam shape	Sensing distance	Resolution	Model
	Diffuse reflective	Line beam		1.5µm	ZX2-LD50L
		Spot beam			ZX2-LD50
		Line beam		5µm	ZX2-LD100L
		Spot beam			ZX2-LD100
	Regular reflective	Spot beam		1.5µm	ZX2-LD50V

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-XC1R
20m	ZX2-XC20R

*1. * Extension cables cannot be coupled and used together.

Ratings and Specifications

Model	NPN output	ZX1-LD50A61 ZX1-LD50A66	ZX1-LD100A61 ZX1-LD100A66	ZX1-LD300A61 ZX1-LD300A66	ZX1-LD600A61 ZX1-LD600A66
Item	PNP output	ZX1-LD50A81 ZX1-LD50A86	ZX1-LD100A81 ZX1-LD100A86	ZX1-LD300A81 ZX1-LD300A86	ZX1-LD600A81 ZX1-LD600A86
Measurement range		50 ± 10 mm	100 ± 35 mm	300 ± 150 mm	600 ± 400 mm
Light source (wave length)		Visible-light semiconductor laser (wavelength: 660 nm, 1 mW max., IEC/EN Class 2, FDA Class II *1)			
Spot diameter (typical) (Defined at the measurement center distance) *2		0.17 mm dia.	0.33 mm dia.	0.52 mm dia.	0.56 mm dia.
Power supply voltage		10 to 30 VDC, including 10% ripple (p-p)			
Current consumption		250 mA max. (at power supply voltage 10 VDC)			
Control output		Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 1 V max. (load current 10 mA or less), 2 V max. (load current of 10 to 100 mA))			
Analog output		Current output: 4 to 20 mA, maximum load resistance: 300 Ω			
Indicators		Digital display (red), output indicator (OUT1, OUT2) (orange), zero reset indicator (orange), menu indicator (orange), laser ON indicator (green), and smart tuning indicator (blue)			
Response time	Judgment output	Super-high-speed (SHS) Mode: 1 ms High-speed (HS) Mode: 10 ms Standard (Stnd) Mode : 100 ms			
	Laser OFF input	200 ms max.			
	Zero reset input	200 ms max.			
Temperature characteristic *3		0.03% F.S./°C			0.04% F.S./°C
Linearity *4		±0.15% F.S.		±0.25% F.S.	±0.25% F.S. (200 to 600 mm) ±0.5% F.S. (entire range)
Resolution *5		2 μm	7 μm	30 μm	80 μm
Ambient illumination		Illumination on received light surface: 7,500 lx or less (incandescent light)		Illumination on received light surface: 5,000 lx or less (incandescent light)	
Ambient temperature		Operating: -10 to +55°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, 1 minute3			
Vibration resistance (destruction)		10 to 55 Hz, 1.5-mm double amplitude, 2 hours 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 *6		IEC 60529, IP67			
Connection method		Pre-wired model (Standard cable length: 2 m, 5 m) Pre-wired connector model (Standard cable length: 0.5 m)			
Weight (packed state/ sensor only)	Pre-wired models (2 m)	Approx. 240 g / Approx. 180 g		Approx. 270 g / Approx. 210 g	
	Pre-wired models (5 m)	Approx. 450 g / Approx. 330 g		Approx. 480 g / Approx. 360 g	
	Pre-wired connector models (0.5 m)	Approx. 170 g / Approx. 110 g		Approx. 200 g / Approx. 140 g	
Materials		Case and cover: PBT (polybutylene terephthalate), Optical window: Glass, Cable: PVC, Mounting hole part: SUS303			
Accessories		Instruction sheet and Laser warning label (English)			

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

*1. Classified as Class 2 by EN60825-1 criteria in accordance with the FDA standard previsions of Laser Notice No. 50. Notification to CDRH planned. (Center for Devices and Radiological Health)

*2. Spot diameter: Defined as $1/e^2$ (13.5%) of the central intensity at the measurement center distance.
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.
Accurate measurements may not be possible for workpieces that are smaller than the spot diameter.

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

*4. 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 (white ceramic) at a temperature of 25°C.
Linearity and measured value may vary depending on target object.

*5. Resolution: Defined in Standard Mode for Omron's standard target object (white ceramic) after executing Smart Tuning.
The resolution indicates the repetition accuracy for a still workpiece. Not an indication of the distance accuracy.
Resolution performance may not be satisfied in a strong electromagnetic field.

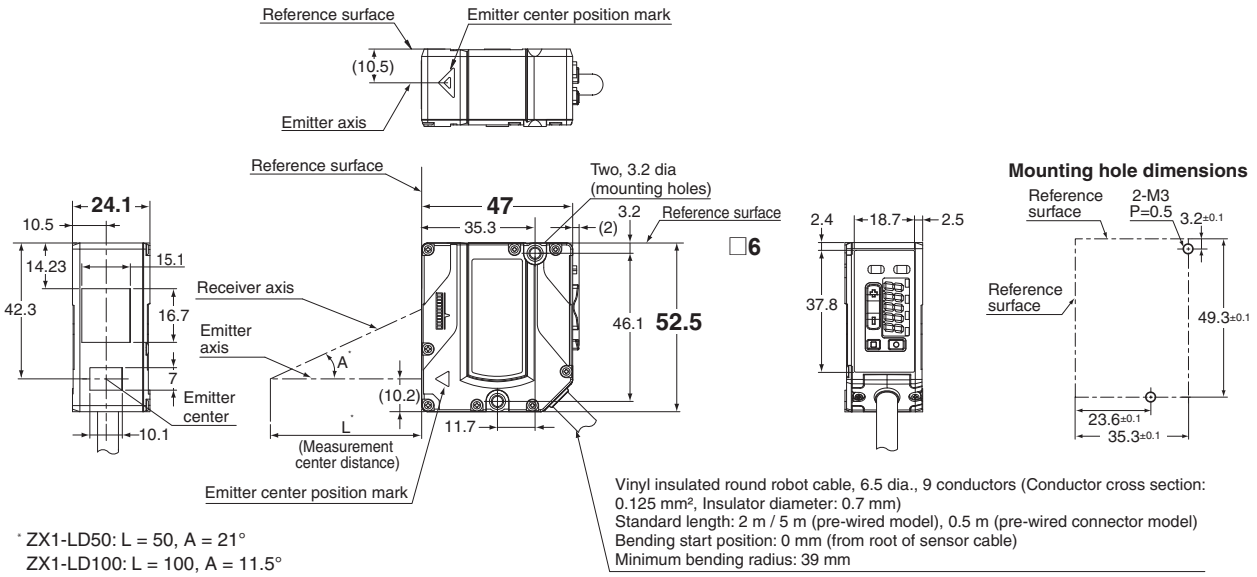
*6. IP67 protection applies to the connector on pre-wired connector models if an extension cable is connected.

Dimensions

(Unit: mm)
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

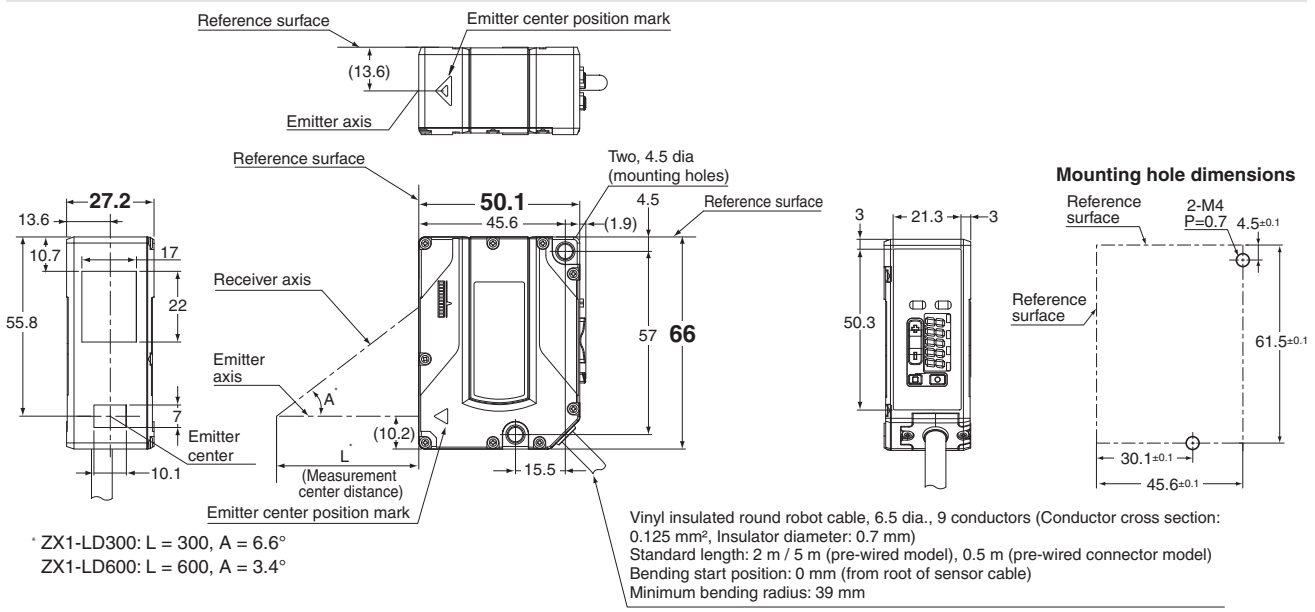
Sensors

Pre-wired Models ZX1-LD50A□1/ZX1-LD100A□1
Pre-wired Connector Models ZX1-LD50A□6/ZX1-LD100A



* ZX1-LD50: L = 50, A = 21°
ZX1-LD100: L = 100, A = 11.5°

Pre-wired Models ZX1-LD300A□1/ZX1-LD600A□1
Pre-wired Connector Models ZX1-LD300A□6/ZX1-LD600A□6



* ZX1-LD300: L = 300, A = 6.6°
ZX1-LD600: L = 600, A = 3.4°

Specifications

Diffuse-reflective 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 minute			
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes, 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, IP67			
Connection method	Connector connection (standard cable length: 500 mm)			
Weight (packed state)	Approx.160g (Sensor Head only: Approx.75g)			
Materials	Case and cover: PBT (polybutylene terephtahalate), Optical window: Glass, Cable: PVC			
Accessories	Instruction sheet, Ferrite core, Laser warning label (English), FDA certification label			

Regular-reflective Sensor Head

Item / Model	ZX2-LD50V
Optical system	Regular reflective
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 0.24 mW max. EN class 1, FDA class I*5
Measurement center point	48mm
Measurement range	±5mm
Beam shape	Spot
Beam size *1	Approx. 60μ dia
Resolution *2	1.5μm
Linearity *3	±0.3%F.S. (entire range)
Temperature characteristic *4	0.06%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 minute
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes, 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	IEC 60529, IP67
Connection method	Connector connection (standard cable length: 500 mm)
Weight (packed state)	Approx.160g (Sensor Head 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 $1/e^2$ (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.
(The measured value is given for the center distance for OMRON' s standard target object (diffuse-reflective models: white ceramic object, regular-reflective models: 1/4 λ flat mirror) when the response time of the ZX2-LDA is set to 128 ms.)
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 (L): 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. These Sensors are classified as Class 2 laser devices for diffuse-reflective models and Class 1 for regular-reflective models under EN 60825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH registration has been completed for diffuse-reflective models and is scheduled for regular-reflective model.

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), differential function	
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 minute	
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes, 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 (Amplifier 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. Calculations are possible for two amplifier units. Mutual interference prevention is possible for up to five amplifier units.

Calculating Units

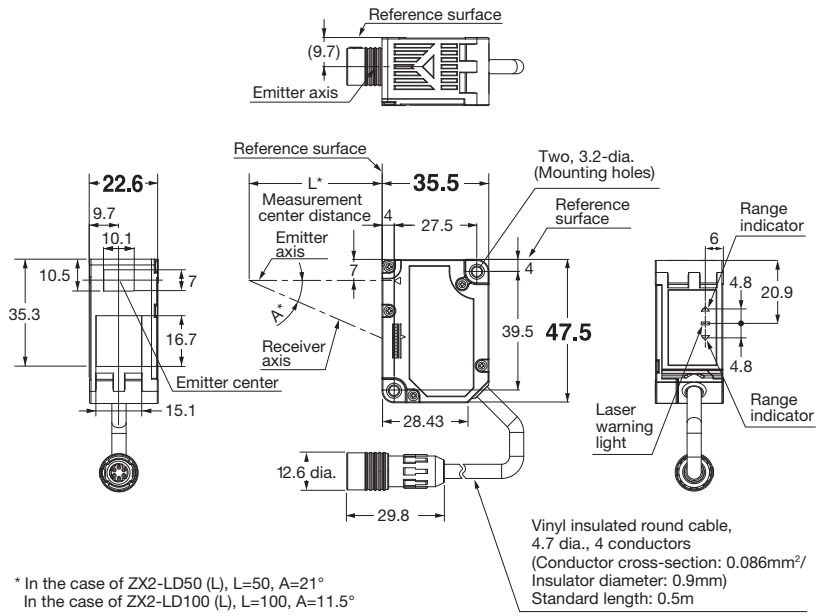
Item / Model	ZX2-CAL
Applicable Amplifier Units	ZX2-LDA11/ZX2-LDA41
Current consumption	12mA max (supplied from the Smart Sensor Amplifier Unit)
Ambient temperature	Operating: 0 to +50°C, storage: -15 to +70°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)
Connection method	Connector
Dielectric strength	1,000VAC, 50/60 Hz for 1minute
Vibration resistance (destructive)	10 to 150Hz, 0.7-mm double amplitude, 80minutes, 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: ABS, Display: Acrylic resin
Weight (packed state)	Approx. 50g (Calculating Unit only: Approx. 15g)
Accessories	Instruction sheet

Dimensions

(Unit: mm)

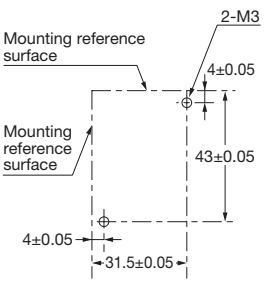
Units

Sensor Heads ZX2-LD50/ZX2-LD50L/ZX2-LD100/ZX2-LD100L/ZX2-LD50V

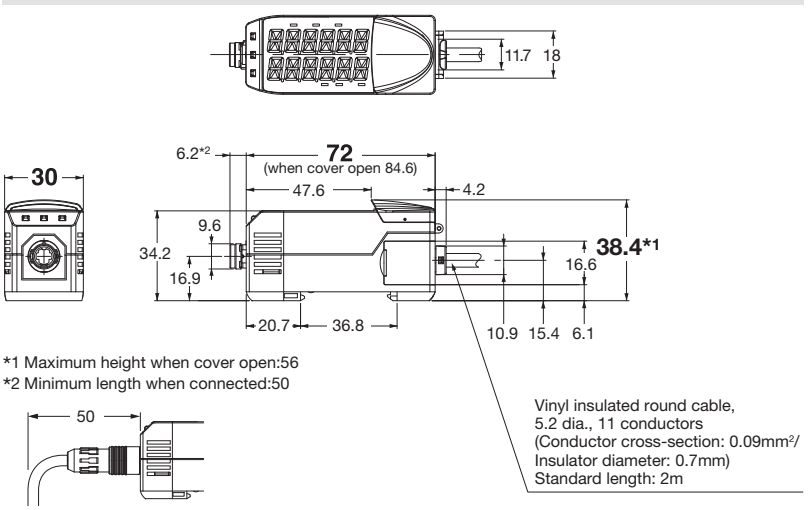


* In the case of ZX2-LD50 (L), L=50, A=21°
In the case of ZX2-LD100 (L), L=100, A=11.5°

Mounting Dimensions



Amplifier Units ZX2-LDA11/ZX2-LDA41



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

Accessoires

Calculating Unit ZX2-CAL