Smart Sensor Wide Laser Beam Measurement Sensor (Line Imaging Device Type)

ZX-GT

CSM_ZX-GT_DS_E_1_5

Achieves Micron Accuracy with Longest-in-Class Sensing Distance

- Maximum sensing distance of 500 mm and measuring width of 28 mm provide a wide area.
- 10-μm accuracy anywhere within the area, even though the sensor uses a non-contact method.
- Stable detection of even transparent glass and mirror surfaces.
- Compact sensor and controller provide minimal installation space requirements.

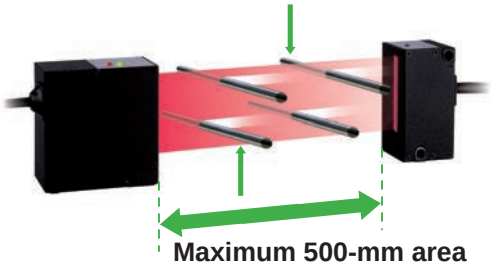
⚠ Refer to *Safety Precautions* on page 8.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Features

Maximum 500-mm area — Measurable at any position

Measurements can be consistently taken within a wide area, whatever stage the work is at or whichever way it is inserted. It can now be set to positions without interference from the work feed and without limitations of size of work area.



Accurate! — 10-μm by non-contact method

ZX-GT is the only sensor with the ability to measure and locate position to an accuracy of 10 μm without contact. Unlike conventional through-beam laser sensors, the ZX-GT's unique algorithm has the flexibility to meet a wide variety of applications, including the ability to accurately measure glass and mirror surfaces.

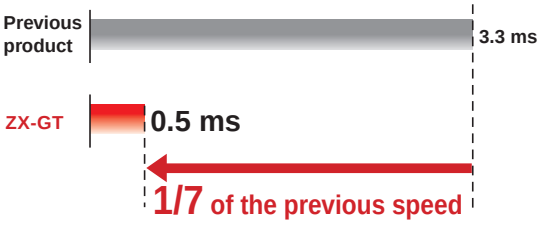
Small! — Compact like palm-top

Compact sensor head that can be set in the gap between equipment.

Its compact controller is a continuation of the ZX series.

New concept "TRIO" — 1/7 in speed compared with conventional products

With OMRONS unique TRIO (Triple parallel processing) algorithm, it is possible to take 2000 high-speed samples per second, 7 times greater than previously possible, greatly reducing tact time.



Ordering Information

Sensors

Sensor Head (Dimensions → page 8)

Appearance	Optical system	Measuring width	Sensing distance	Resolution	Output type	Model
Emitter and receiver, separate type 	Through-beam	28 mm	0 to 500 mm	10 µm	NPN	**ZX-GT28S11**
					PNP	**ZX-GT28S41**
Emitter and receiver, integrated type 			40 mm		NPN	**ZX-GT2840S11**
					PNP	**ZX-GT2840S41**

Controller (Dimensions → page 8)

Appearance	Power supply	Output type	Model
	DC	NPN	**ZX-GTC11**
		PNP	**ZX-GTC41**

Accessories (Order Separately) These are not included with the sensor and controller, so order these accessories separately if necessary.

Set: Interface Unit (RS-232C/Binary output) and PC Setup Software

Output configuration	Model
NPN	**ZX-GIF11A**
PNP	**ZX-GIF41A**

Interface Unit (RS-232C/Binary output) (Dimensions → page 8)

Appearance	Power supply	Output type	Model
	DC	NPN	**ZX-GIF11**
		PNP	**ZX-GIF41**

Setup software PCs

Name	Model
Smart Monitor GT	**ZX-GSW11**

Calculating Units (Dimensions → page 8)

Appearance	Model
	**ZX-CAL2**

Receiver-Controller Extension Cable (Dimensions → page 8)

Cable length	Model		Quantity
	Standard cable	Flexible cable	
1 m	**ZX-XGC1A**	**ZX-XGC1R**	1
2 m	**ZX-XGC2A**	**ZX-XGC2R**	
5 m	**ZX-XGC5A**	**ZX-XGC5R**	
8 m	**ZX-XGC8A**	**ZX-XGC8R**	
20 m	**ZX-XGC20A**	**ZX-XGC20R**	

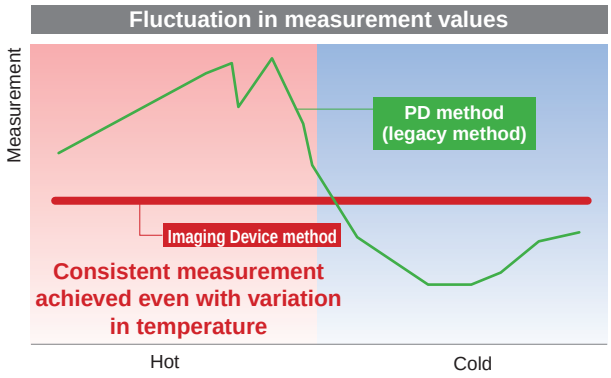
Note: Up to two extension cables can be connected.
However, be sure to limit the total extension cable length between the receiver and the Controller to 30 meters (including the receiver cable).

Leading Technology and Imaging Device Processing Algorithm That Support Stable Measurements

Thoroughly eliminating the effect of the ambient temperature

It is important to eliminate the influence of temperature to ensure the accuracy of a measurement. However, the temperature in the field environment changes according to the time and the season. With the ZX-GT, which employs Imaging Device method, the influence on the resolution from temperature changes is greatly reduced leading to an error rate as low as 0.01% (2.8 micro-meters *).

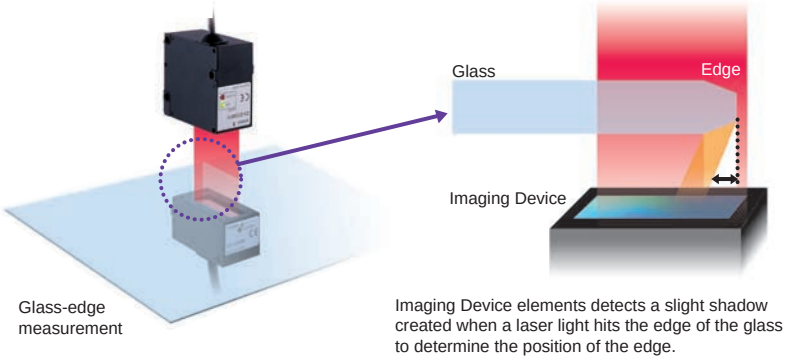
* This is a representative case. Please see the specifications table for the details of the relevant conditions.



Transparent object detection possible Integrated MRC filter Patented *1

The detection of edges has been a problem for transparent objects with traditional transmission type sensors. However, ZX-GT adopts OMRON's unique MRC filter * (Mirror Reflection Cut Filter) and Imaging Device methodology. It can accurately detect work that reflects light such as mirror-finished surface or work that allows light to pass through such as glass (including coated glass).

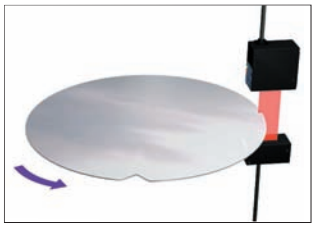
* MRC Filter: OMRON's proprietary optical filter.



Glass-edge measurement

Imaging Device elements detects a slight shadow created when a laser light hits the edge of the glass to determine the position of the edge.

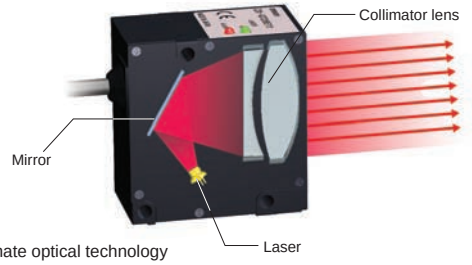
Even effective with mirror finished surfaces



Collimate optical technology

Super parallel-beam

With OMRON's unique collimate optical technology *, the closest to ideal parallel beam is created. Errors are controlled in the measurement area and the longest and most accurate measurement is achieved.

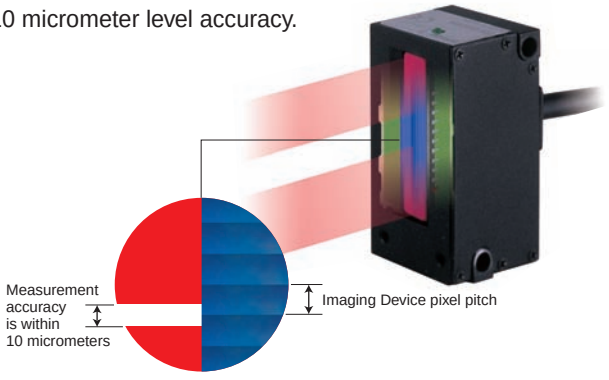


* Collimate optical technology
Collimate optical technology allows laser lights to stay parallel using mirror reflection and lens refraction effects, to take advantage of the laser light's high-level of directivity.

Sub-pixel processing

Imaging Device processing algorithm

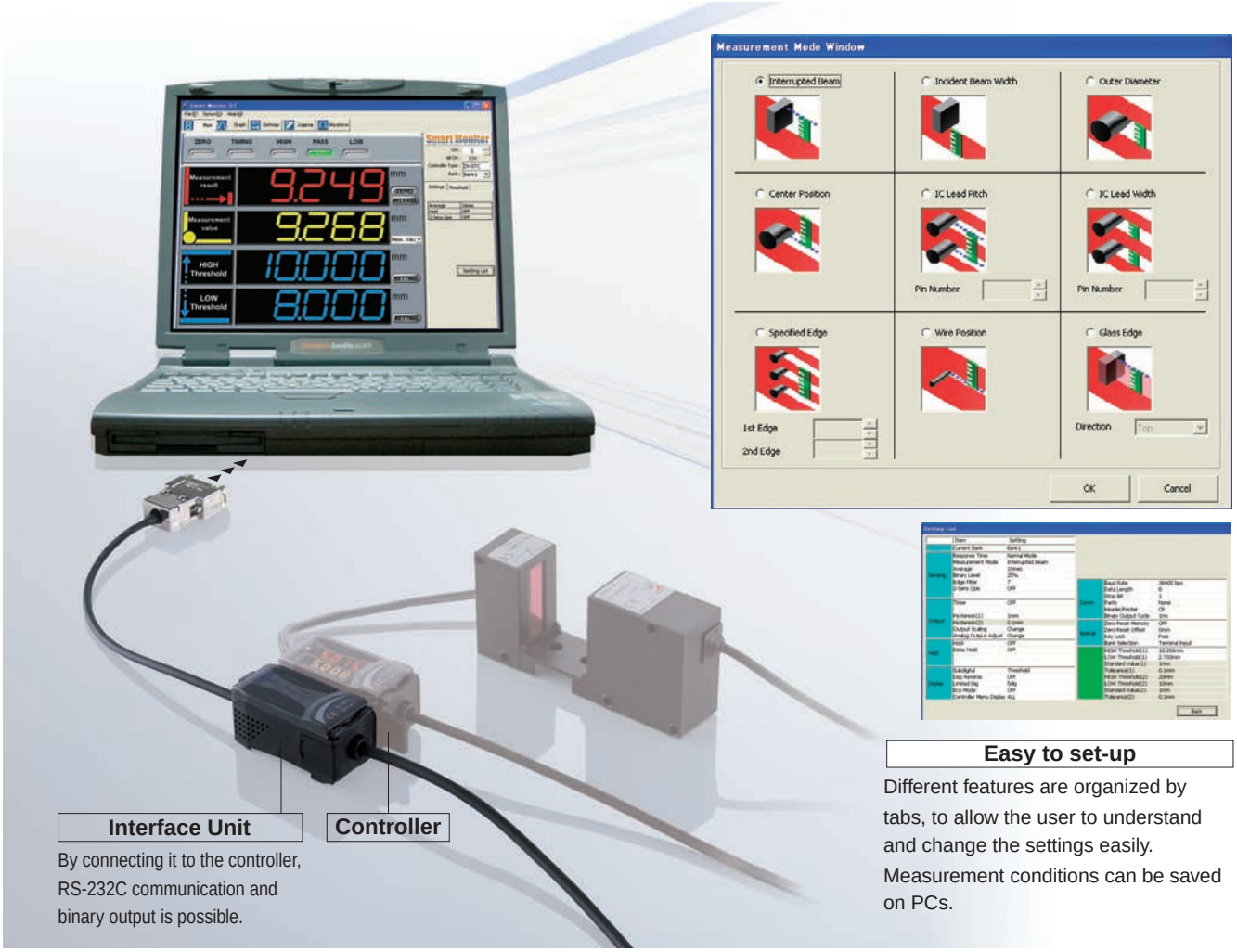
Imaging Device detects the shadow made from measurement objects and by performing sub-pixel calculation, it achieves 10 micrometer level accuracy.



*1. "Patented" means that we obtained a patent in Japan. (As of February 2021)

“Smart Recipe”

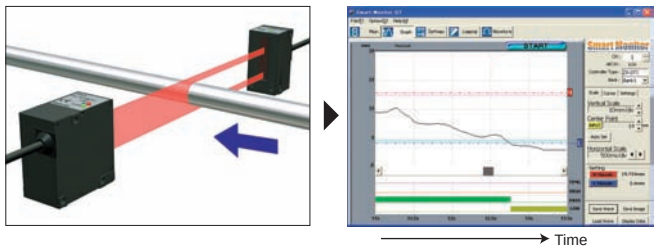
Using the PC software 'Smart-monitor GT', set up is easy with simply clicking the icons. This is OMRON’s Smart Recipe methodology.



Advanced support for data collection and analysis

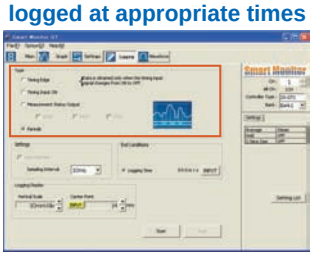
The measurement data is gathered in the PCs in real time so it is easy to ascertain and analyse the current conditions at any time.

●Grasp the data trend and prevent defective parts



The trend of the measurement data and sudden change can be checked in the time-dependent graph, so that the appropriate action can be taken before defective goods are produced.

●Measurement result can be logged at appropriate times



The logged data can be sent to Excel . It is useful for traceability management and for preparing quality assurance reports.

Easy to use, even from a distance

3-way optical axis adjustment Patented *1

Three optical axis adjustment functions are integrated for the industry's longest measurement. This function provides the optimal adjustment when the sensor head is installed on-site.

With the sensor-head

LED on the light-receiving device is lit up to indicate when the light axis is matched.

With the controller

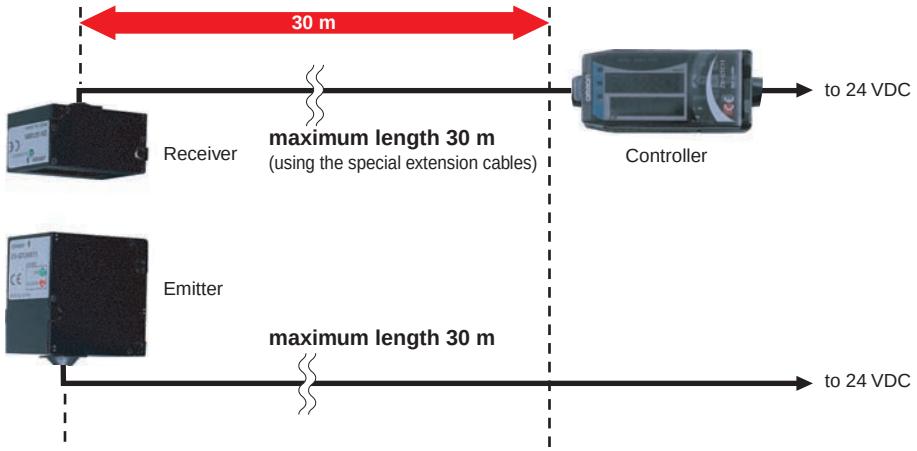
The Imaging Device light reception balance is displayed in the upper display and the amount of light received can be confirmed with numerical values underneath.

With the PC

The direction of the sensor head's adjustment is graphically displayed. The adjustment conditions can be confirmed through the shapes of the light reception waveforms.

30-m cable extension

The emitter and receiver do not need to be connected with each other. Each cable can be extended up to 30 m. It is perfectly suited for installation into large-scale production line.



*1. "Patented" means that we obtained a patent in Japan. (As of February 2021)

Ratings and Specifications

Sensor Head

Item / Model	ZX-GT28S11	ZX-GT2840S11	ZX-GT28S41	ZX-GT2840S41
Output type	NPN		PNP	
Appearance	Separate type	Integrated type	Separate type	Integrated type
Light source	Visible semiconductor laser diode (wavelength 650 nm)			
Laser class	Class 1 (JIS, IEC/EN, GB/T) Class II (FDA)			
Measuring width	28 mm			
Sensing distance	0 to 500 mm	40 mm	0 to 500 mm	40 mm
Minimum sensing object	0.5 mm dia. *1	0.2 mm dia.	0.5 mm dia. *1	0.2 mm dia.
Linearity	±0.1%F.S. *2			
Resolution	10 μm (number of process values to average: 16) *3			
Temperature characteristic	0.01%F.S/°C *4			
Indicators (emitter)	Laser ON indicator (green), laser alarm indicator (red)			
Indicators (receiver)	Optical axis setting indicator (green)			
Laser OFF input/sync input	ON: Short-circuited with 0 V or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)		ON: Short-circuited with power supply voltage or power supply voltage –1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	
Laser deterioration alarm output	NPN open-collector output 30 VDC 20 mA max. Residual voltage 1.2 V max.		PNP open-collector output 30 VDC 20 mA max. Residual voltage 2 V max.	
Power consumption (emitter)	30 mA max.			
Power supply voltage (emitter)	24 VDC +10%, –15% ripple (p-p) 10% max.			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min			
Insulation resistance	20 MΩ (at 500 VDC)			
Operating ambient illumination (emitter)	3,000 lx (incandescent light)			
Operating ambient illumination (receiver)	1,000 lx (incandescent light) *5			
Ambient temperature	Operating: 0 to 40°C Storage: –15 to 50°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)			
Vibration resistance (durability)	10 to 150 Hz Single-amplitude: 0.75 mm for 80 min each in X, Y and Z directions			
Shock resistance (durability)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)			
Degree of protection	IEC60529 IP40			
Cable length	2 m			
Material	Case: aluminum die-cast, Lens: glass			
Weight (packed state)	Approx. 550 g	Approx. 570 g	Approx. 550 g	Approx. 570 g
Accessories	Laser warning labels, Instruction Sheet			

F.S.: 28 mm measuring range of receiver

*1. Distance between emitter and receiver: 500 mm, measurement object at 250 mm from receiver.
Glass ends of chamfer 0.1 mm or more can be detected in glass edge measurement mode. (at binary level 70%)
*2. Linearity is given to be a typical error with respect to an ideal straight line when the distance between the emitter and receiver is 100 mm and light is blocked at a distance of 50 mm from the receiver.
(On the ZX-GT2840□□, the measurement object is measured at a distance of 20 mm from the receiver.)
*3. The amount of fluctuation (±3σ) in the analog output when the distance between the emitter and receiver is 100 mm and a ZX-GTC□□ is connected
*4. Change in the light cutoff value on one side when the distance between the emitter and receiver is 100 mm and the light is half-cutoff at a distance of 50 mm from the receiver
(On the ZX-GT2840□□, the measurement object is measured at a distance of 20 mm from the receiver.)
*5. Standard mode (NORM) used

Controller

Item	Model	ZX-GTC11	ZX-GTC41
Output type		NPN	PNP
Measurement cycle *1		1.5 ms (standard mode (NORM)) 0.5 ms (high-speed mode (FAST)) *2	
Samples to average		1/2/4/8/16/32/64/128/256/512/1,024/2,048/4,096	
Analog output *3		For current output: 4 to 20 mA/F.S., max. load resistance 300 Ω For voltage output: ±4 V, (±5 V, 1 to 5 V *4), output impedance 100 Ω	
Timing input, bank switching input, zero reset input, reset input		ON: short-circuited with 0 V or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	ON: short-circuited with power supply voltage or power supply voltage −1.5 V max. OFF: Open (leakage current: 0.1 mA max.)
HIGH/PASS/LOW Judgment output *5 Sync output *6		NPN open-collector output 30 VDC 50 mA max. Residual voltage 1.2 V max.	PNP open-collector output 30 VDC 50 mA max. Residual voltage 2 V max.
Indicator		Judgment output indicator: HIGH (orange), PASS (green), LOW (orange) Main display (red) Sub-display (yellow) Bank 1/2 (orange), zero reset (green)	
Main functions	Number of registered setups	2 banks	
	Measurement Mode	Interrupted beam width measurement, incident beam width measurement, outer diameter measurement, center position measurement, IC lead pitch, IC lead width judgment, specified edge measurement, wire position measurement, glass edge position measurement	
	Display during measurement	Measured value, resolution, threshold, voltage output value, current output value (number of display digits can be changed)	
	Zero reset functions	Offset setting of zero reset value, zero reset value memory	
	Hold	Sample hold, peak hold, bottom hold, peak-to-peak hold, average hold, delay hold	
	Timer functions	ON delay, OFF delay, one-shot	
	Adjustment functions	Optical Axis adjust mode/light intensityt writing mode, variable binary level, variable edge filter, analog output scaling	
	Calculation	2 Possible on up to two Controllers (Calculation Unit ZX-CAL2 is required for connecting Controllers to each other.) A-B, A+B, width	
	Other	Measurement cycle setting, threshold setting, hysteresis setting, initialization, key lock	
Temperature characteristic		0.005%F.S./°C	
Current consumption		150 mA max. with power supply voltage of 24 VDC (including receiver) *7	
Power supply voltage		24 VDC +10%, −15% ripple (p-p) 10% max.	
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min	
Insulation resistance		20 MΩ (at 500 VDC)	
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)	
Vibration resistance (durability)		10 to 150 Hz Single-amplitude: 0.35 mm for 80 min each in X, Y and Z directions	
Shock resistance (durability)		300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)	
Degree of protection		IEC60529 IP20	
Cable length		2 m	
Material		Case: PBT (polybutylene terephthalate), Cover: Polycarbonate	
Weight (packed state)		Approx. 330 g	
Accessories		Instruction Sheet	

*1. A simple average is used in IC lead pitch judgment mode or IC lead width judgment mode.
The measurement cycle time can be calculated as follows: Specified measurement cycle time × (Number of samples to average + 1) + 1 ms max.
In other measurement modes, a moving average is used. The first measurement cycle time can be calculated as follows: Specified measurement cycle time × (Number of samples to average + 1) + 1 ms max. The second and later measurement cycle times will be equal to the specified measurement cycle time.
*2. The response time in the high-speed mode (FAST) for the IC lead pitch and IC lead width judgment modes is 1 ms.
*3. Current/voltage can be switched using the switch provided on the rear of the Controller.
*4. Can be set by the analog output scaling function.
*5. The error (ERR) state is displayed when all HIGH/PASS/LOW outputs turn OFF.
*6. Normally, wire the sync output wire directly to the emitter's sync input wire and run the Controller in the standard mode. On an NPN type Controller, use an NPN type emitter, and on a PNP type Controller, use a PNP type emitter. Wiring of the sync wires is not required when the Controller is run in the high-speed mode. (Note, however, that the Controller becomes more susceptible to the influence of ambient light in this case.)
*7. The value is 175 mA max. (including receiver) when current output is set.

Interface Unit

Item	Model	ZX-GIF11/-GIF11A	ZX-GIF41/-GIF41A
Compatible Controller		ZX-GTC11	ZX-GTC41
Indicator		Power ON (green), Controller communications (orange), Controller communications error (red), RS-232C communications (orange), RS-232C communications error (red), binary output (orange)	
Communications port		RS-232C (9-pin D-sub connector)	
12-bit binary output (D11 to D0, GATE)		NPN open-collector output 30 VDC 20mA max. Residual voltage 1.2 V max.	PNP open-collector output 30 VDC 20 mA max. Residual voltage 2 V max.
Power supply voltage		Supplied from Controller (power consumption: 60 mA max.)	
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min	
Insulation resistance		20 MΩ (at 500 VDC)	
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)	
Vibration resistance (durability)		10 to 150 Hz Single-amplitude: 0.35 mm for 80 min each in X, Y and Z directions	
Shock resistance (durability)		300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)	
Degree of protection		IEC60529 IP20	
Cable length		RS-232C 0.5 m, binary output 2 m	
Materials		Case: PBT (polybutylene terephthalate), Cover: Polycarbonate	
Weight (packed state)		ZX-GIF□1A: Approx. 550 g ZX-GIF□1: Approx. 330 g	
Accessories		ZX-GIF□1A: Setup Software (CD-ROM), 2 clamps, Instruction Sheet ZX-GIF□1: 2 clamps, Instruction Sheet	

Safety Precautions

Refer to the *Technical Guide*.

⚠ WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.

⚠ CAUTION

Never look into the laser beam. Doing so continuously will result in visual impairment.

Do not attempt to dismantle, pressurize, or incinerate the product. Doing so may cause the laser beam to leak, resulting in the danger of visual impairment.

For details on information such as the usage precautions → refer to the ***ZX-GT Series Smart Sensor User's Manual*** (Cat. No.: Z263).

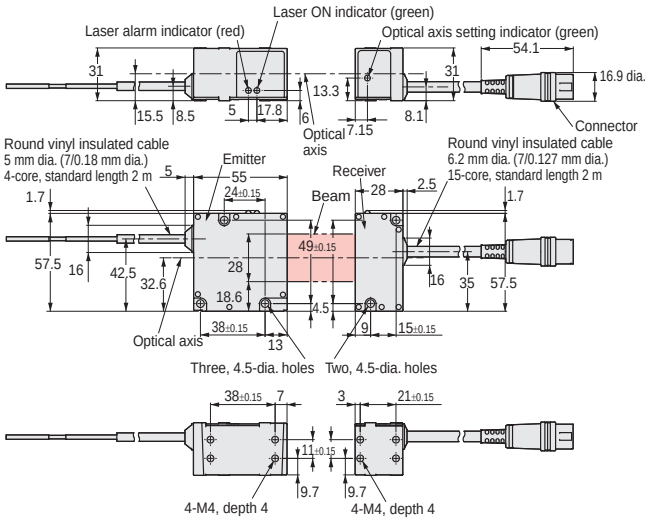
Dimensions

(Unit: mm)

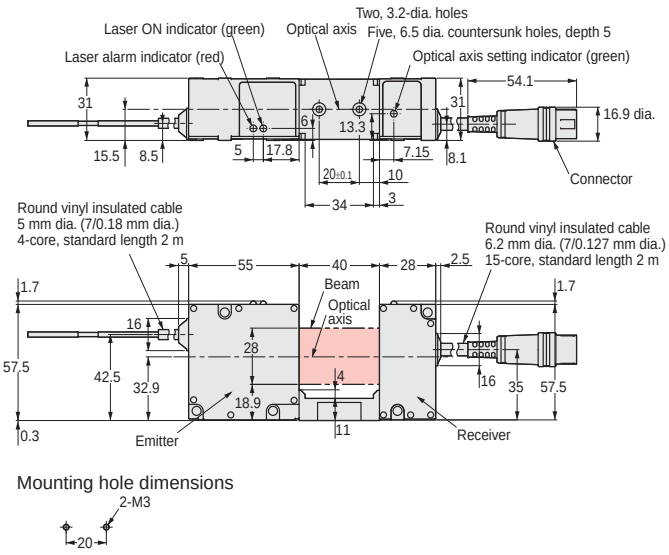
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Sensor Head

Separate type: ZX-GT28S11/-GT28S41

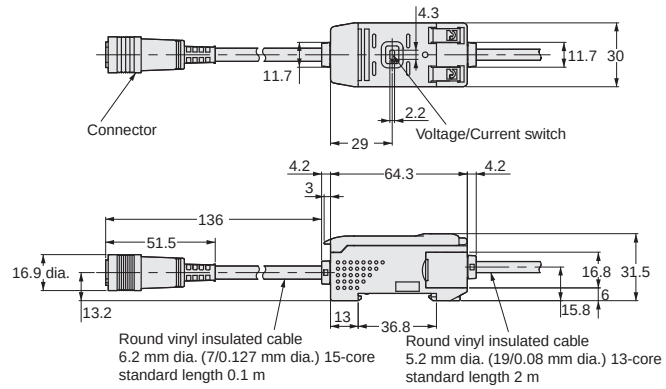


Integrated type: ZX-GT2840S11/-GT2840S41



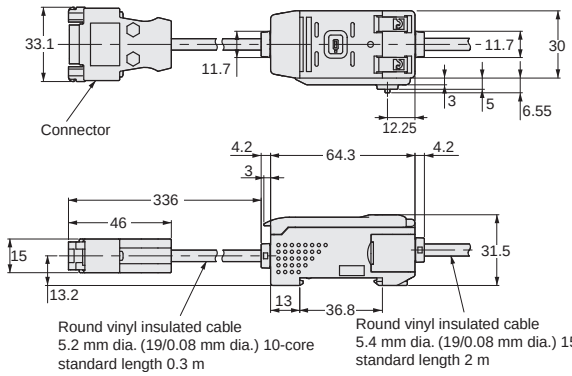
Controller

ZX-GTC11/-GTC41



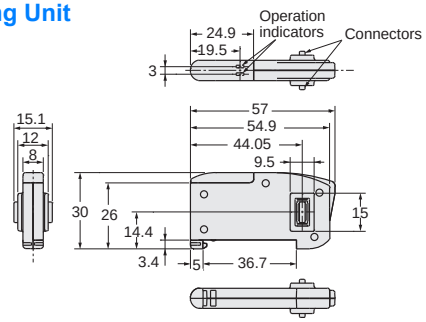
Interface Unit

ZX-GIF11/-GIF41



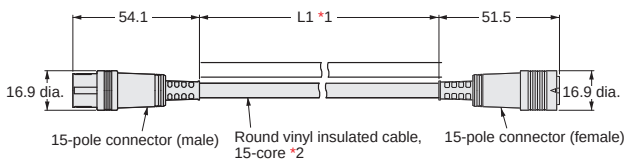
Calculating Unit

ZX-CAL2



Receiver-Controller Extension Cable

ZX-XGC□A/-XGC□R



*1. ZX-XGC1A/R : 1M
ZX-XGC2A/R : 2M
ZX-XGC5A/R : 5M
ZX-XGC8A/R : 8M
ZX-XGC20A/R : 20M

*2. Standard cable : 6.2 dia.
Flexible cable : 6.1 dia.

Terms and Conditions Agreement

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

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

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

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Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part 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 part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

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

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

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