

# Smart Sensor Wide Laser Beam Measurement Sensor (Line Imaging Device Type) ZX-GT

CSM\_ZX-GT\_DS\_E\_1\_3

## 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- $\mu$ m 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.



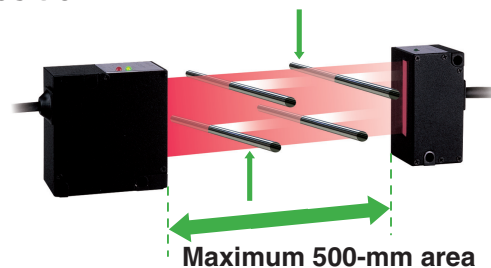
For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

## 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.



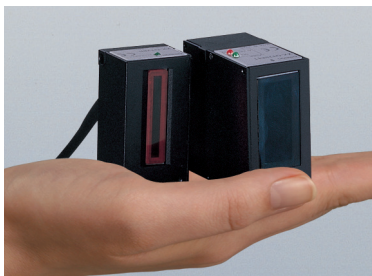
### Accurate!

### 10- $\mu$ m by non-contact method

ZX-GT is the only sensor with the ability to measure and locate position to an accuracy of 10  $\mu$ m 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.

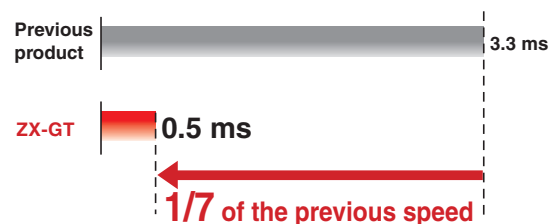


Its compact controller is a continuation of the ZX series.

### New concept "TRIO"

### 1/7 in speed compared with conventional products



With OMRON'S 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<br>   | Through-beam   | 28 mm           | 0 to 500 mm      | 10 μm      | NPN         | <b>ZX-GT28S11</b>   |  |
|  |                |                 |                  |            | PNP         | <b>ZX-GT28S41</b>   |  |
| Emitter and receiver, integrated type<br> |                |                 | 40 mm            |            | NPN         | <b>ZX-GT2840S11</b> |  |
|  |                |                 |                  |            | PNP         | <b>ZX-GT2840S41</b> |  |

**Controller** (Dimensions → page 8)


| Appearance  | Power supply | Output type | Model           |
|---|--------------|-------------|-----------------|
|  | DC           | NPN         | <b>ZX-GTC11</b> |
|   |              | PNP         | <b>ZX-GTC41</b> |

**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                  | <b>ZX-GIF11A</b> |
| PNP                  | <b>ZX-GIF41A</b> |


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

| Appearance  | Power supply | Output type | Model           |
|---|--------------|-------------|-----------------|
|  | DC           | NPN         | <b>ZX-GIF11</b> |
|   |              | PNP         | <b>ZX-GIF41</b> |

**Setup software PCs**

| Name             | Model           |
|------------------|-----------------|
| Smart Monitor GT | <b>ZX-GSW11</b> |

**Calculating Units** (Dimensions → page 8)

| Appearance  | Model          |
|---|----------------|
|  | <b>ZX-CAL2</b> |

**Receiver-Controller Extension Cable** (Dimensions → page 8)

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

**Note:** Up to two extension cables can be connected.

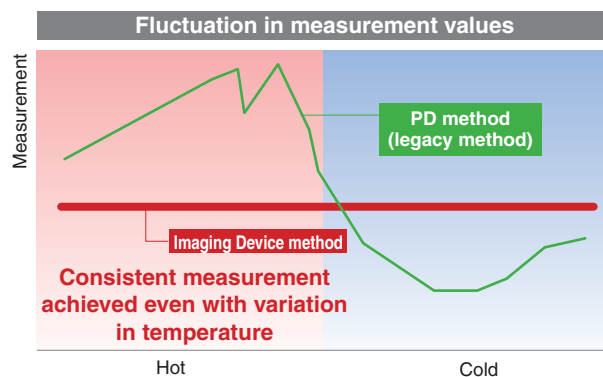
However, be sure to limit the total extension cable length between the receiver and the Controller to 30 meters (including the receiver cable).

## 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 \*).

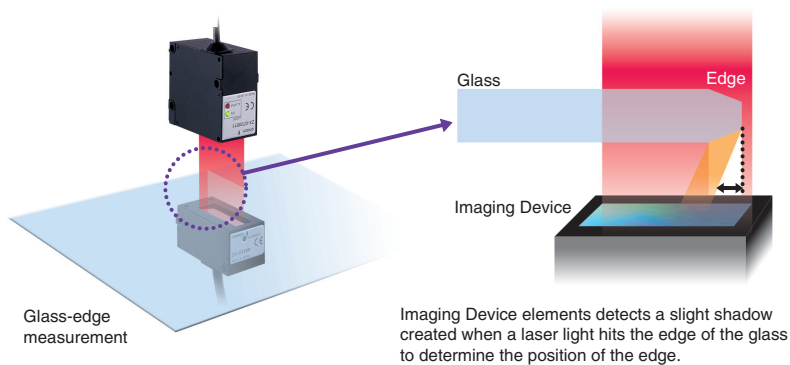
\* This is a representative case. Please see the specifications table for the details of the relevant conditions.



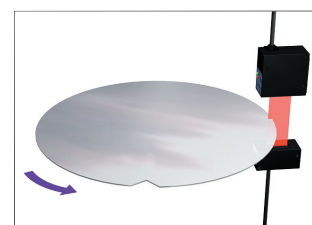
### Transparent object detection possible **Integrated MRC filter** **Patented** \*1

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.



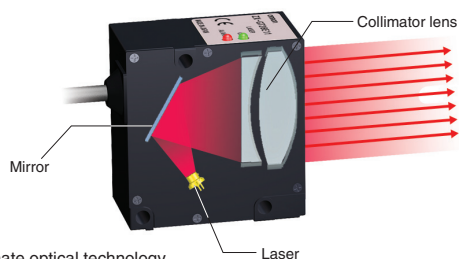
Even effective with mirror finished surfaces



#### 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.

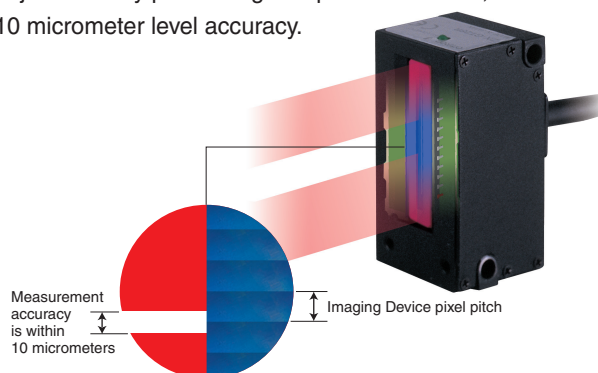


\* Collimate optical technology  
Collimate optical technology allows laser lights to stay parallel using mirror reflection and lens refraction effects, to take advantage of the laser light's high-level of directivity.

#### 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)



## Easy to use, even from a distance

### 3-way optical axis adjustment **Patented** <sup>\*1</sup>

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.

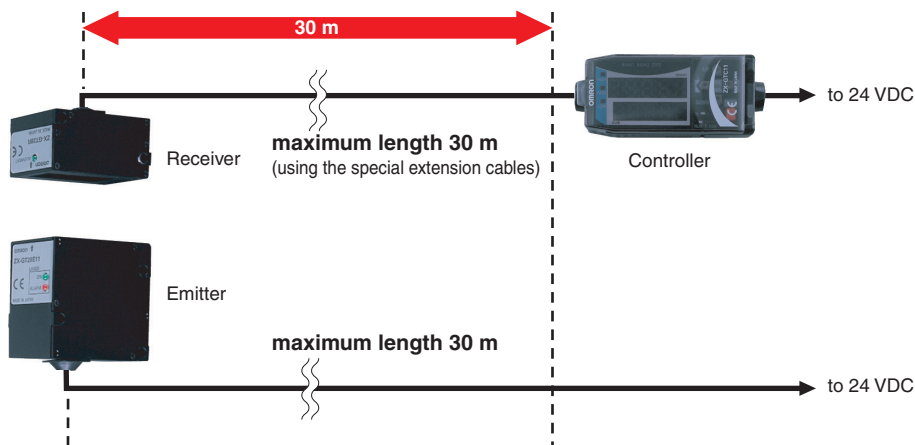
#### With the PC



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, CLASS 1 of EN60825-1/IEC60825-1, CLASS II of FDA (21CFR 1040.10 and 1040.11)) |            |                 |   |                 |
| 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.<br>OFF: Open (leakage current: 0.1 mA max.)  |            |                 | ON: Short-circuited with power supply voltage or power supply voltage −1.5 V max.<br>OFF: Open (leakage current: 0.1 mA max.) |                 |
| Laser deterioration alarm output          | NPN open-collector output<br>30 VDC 20 mA max.<br>Residual voltage 1.2 V max.   |            |                 | PNP open-collector output<br>30 VDC 20 mA max.<br>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 <sup>2</sup> 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.<br>OFF: Open (leakage current: 0.1 mA max.)  | ON: short-circuited with power supply voltage or power supply voltage –1.5 V max.<br>OFF: Open (leakage current: 0.1 mA max.) |
| HIGH/PASS/LOW Judgment output *5<br>Sync output *6                |                             | NPN open-collector output<br>30 VDC 50 mA max.<br>Residual voltage 1.2 V max.   | PNP open-collector output<br>30 VDC 50 mA max.<br>Residual voltage 2 V max.   |
| Indicator   |                             | Judgment output indicator: HIGH (orange), PASS (green), LOW (orange)<br>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/s <sup>2</sup> 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<br>30 VDC 20mA max.<br>Residual voltage 1.2 V max.   | PNP open-collector output<br>30 VDC 20 mA max.<br>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/s <sup>2</sup> 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<br>ZX-GIF□1: Approx. 330 g  |   |
| Accessories                            |       | ZX-GIF□1A: Setup Software (CD-ROM), 2 clamps, Instruction Sheet<br>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).

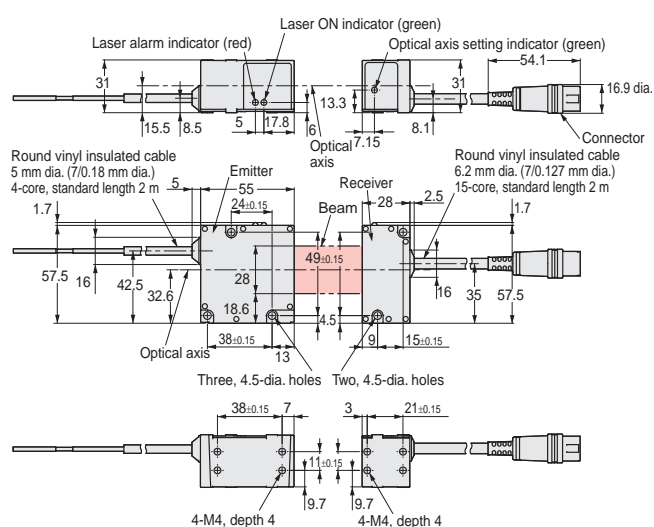
## Dimensions

**(Unit: mm)**

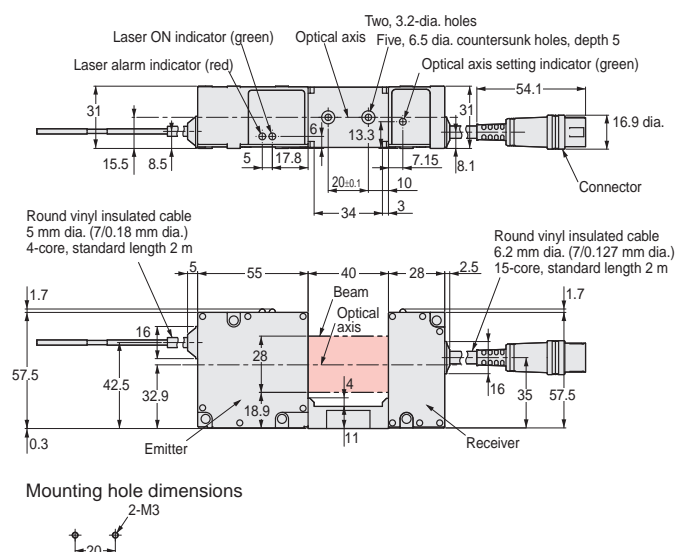
**Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.**

## Sensor Head

**Separate type: ZX-GT28S11/-GT28S41**

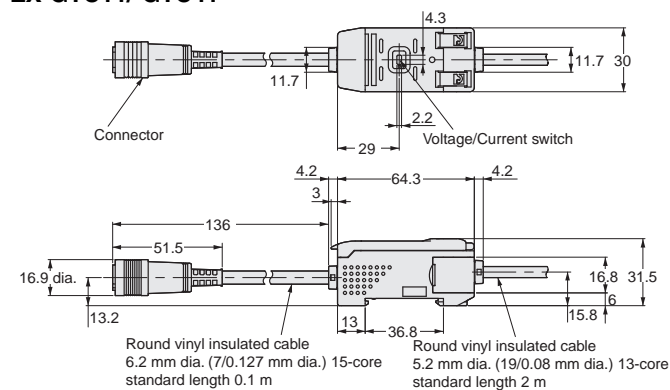


**Integrated type: ZX-GT2840S11/-GT2840S41**

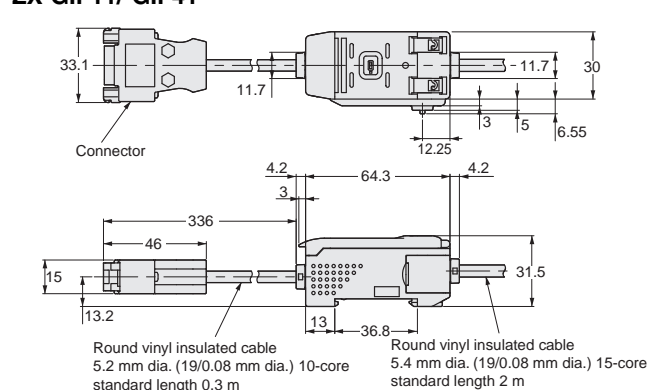


## Controller

### ZX-GTC11/-GTC41

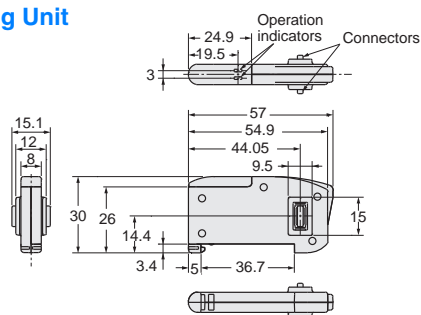


### Interface Unit

**ZX-GIF11/-GIF41**

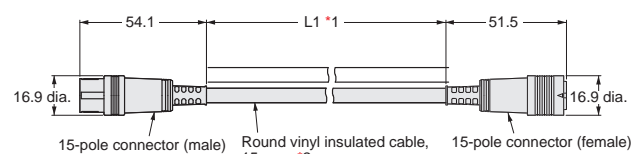
## Calculating Unit

## 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.