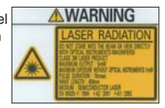
Safety Precautions for Laser Equipment

⚠ WARNING

Do not expose your eyes to laser radiation either directly or reflected from a mirrored surface.
The emitted laser beams have a high power density and direct exposure may result in loss of eyesight.

The warning and explanatory label on the side of the Sensor Head in the ZG Series is in Japanese. Replace it with the English label that comes with the product.



This document provides information mainly for selecting suitable models. Please read the User's Manual carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

Note: Do not use this document to operate the Unit.

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OMRON

NEW

Smart Sensors

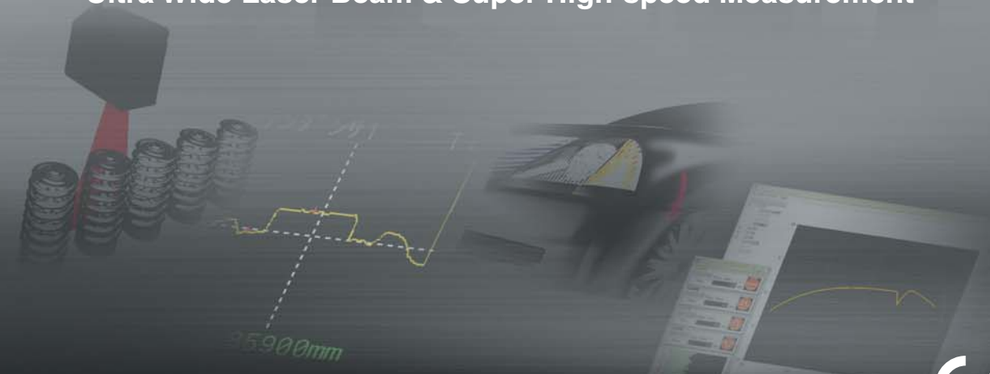
ZG-series 2D Profile Measuring Sensors

New Features

- Adjust for the angle of the measurement object.
- Measure up to 8 areas simultaneously.

2D Profile Measuring Sensors

Ultra Wide Laser Beam & Super High-speed Measurement



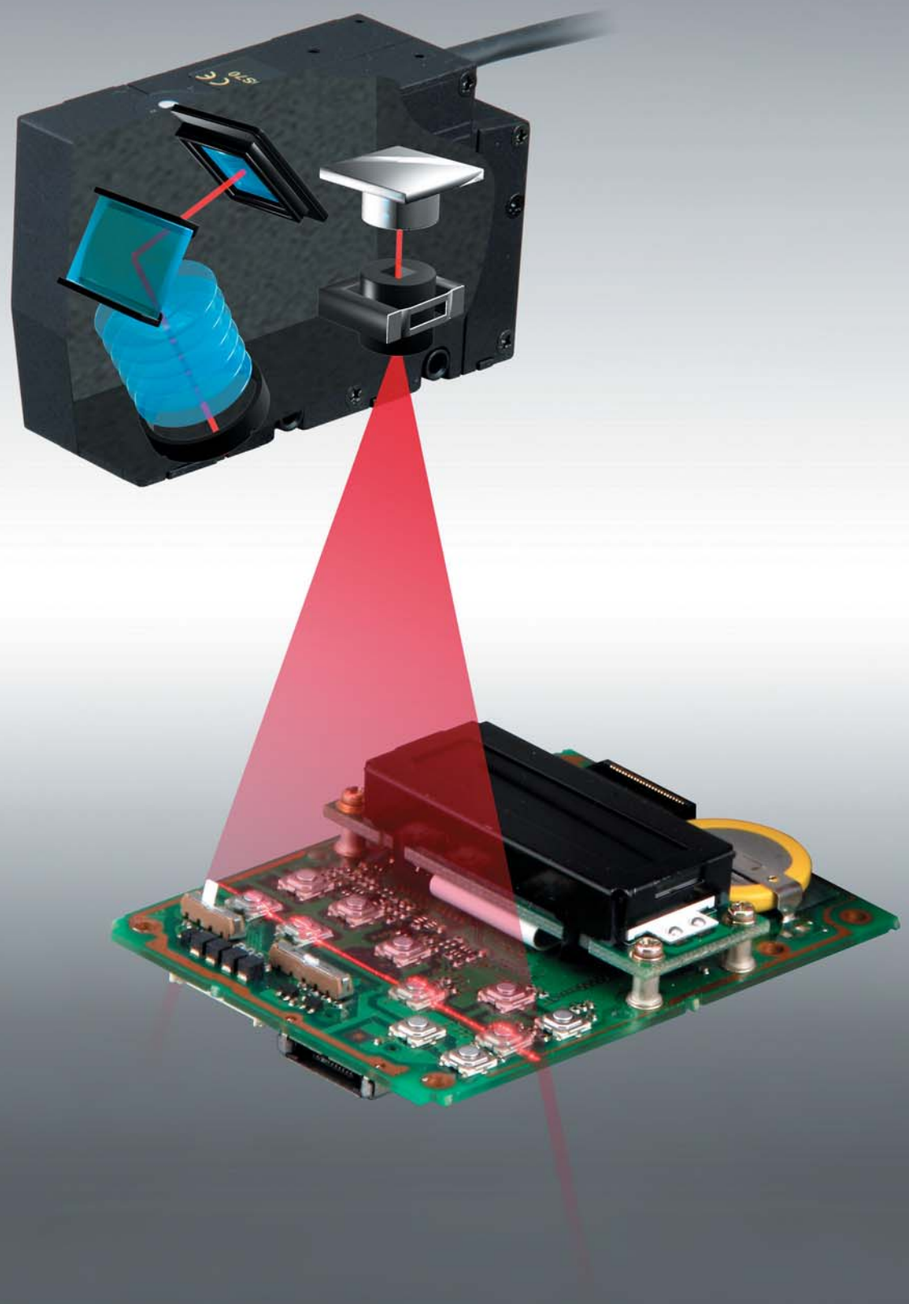
realizing

CE

The Industry's First

A wide laser beam captures entire shapes with ease.

A new Smart Sensor debuts with a light-section method that visualizes cross-sectional shapes.



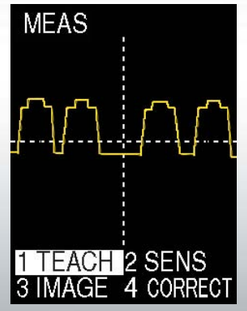
Patent Pending

Three basic steps

An advanced interface maximizes the sensing performance with extremely simple operation.

1st

Display the profile.

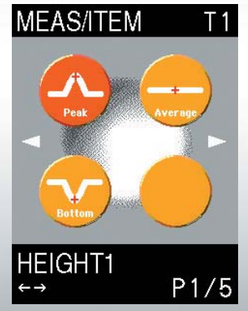


The profile is displayed as soon as the power is turned ON.*
The Sensor Head position can be adjusted while viewing the profile on the screen.

*In FUN mode.

2nd

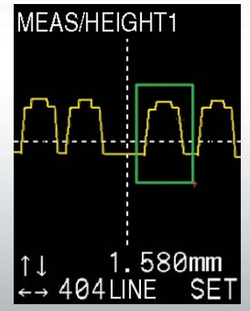
Select the measurement item.



Select the icon for the item to be measured, such as height, step, or cross-sectional area.

3rd

Designate the measurement range.



Simply enclose the range to be measured with the box. The ZG automatically optimizes the sensing conditions.

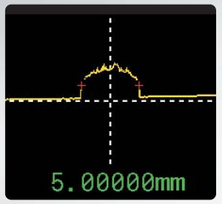
*Screen images are simulated.

High-speed Inspection

High-speed, continuous sampling meets the needs of processes where speed is required.

Inspecting fluid application for formed-in-place gaskets (FIPG) (ZG-WDS22/70)

- Measure continuous motion on a robot arm
- Continuously output profiles



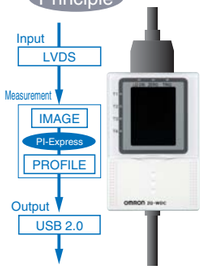
High-speed processing technology

Equipped with the PI-Express image processing core engine.

Newly developed

Several seconds were previously required to output a complete profile.

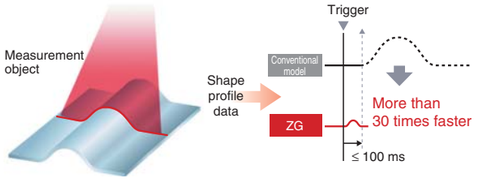
Principle



All processing is done digitally, from sensing input to output. The generation of shape profile data and measurement functions that were conventionally handled by a microprocessor are built into a single chip.
Use of the newly developed PI Express (see note) LSI speeds up processing and saves space.

Note: Profile- Image-Express

Effect



The response time required from receiving an external input (trigger) to outputting complete profile data via USB is 100 ms (see note) maximum.

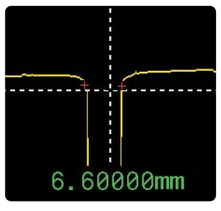
Note: Varies depending on the measurement mode.

High-precision Shape Measurement

The shape of the measurement object is completely reproduced with high precision.

Inspecting vehicle body gaps (ZG-WDS22/70)

- High-precision measurement of the width of grooves during vehicle assembly



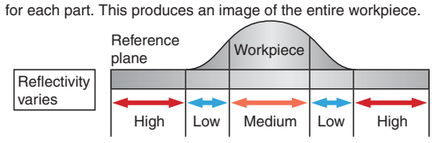
Multi-sensitivity Function

Patent Pending

When a laser is directed at a complicated shape, the light often does not effectively reflect from parts on which the beam strikes at an angle.
This causes a part of the profile to be lost and makes it impossible to reproduce the shape.
The multi-sensitivity function of the ZG-series 2D Shape Sensors determines the optimal sensitivity for each line to reproduce the shape profile.

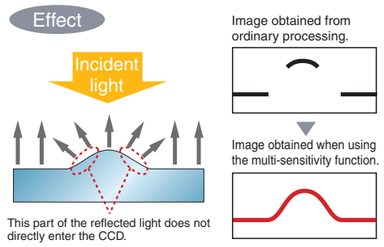
Principle

While switching sensitivity levels for workpieces with reflectivity that varies from part to part, the Sensor inputs multiple images and combines them into a single image with the optimal sensitivity for each part. This produces an image of the entire workpiece.



Example: A mountain-shaped workpiece in which the reflectivity varies from that of the reference plane.

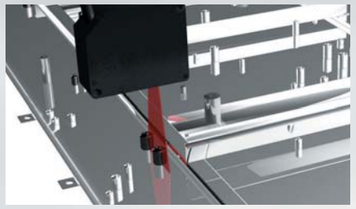
Effect



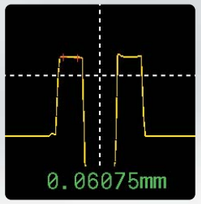
Simple Shape Measurement

Teaching enables simple shape distinguishing and positioning.

Distinguishing the shape of a pin boss (ZG-WDS22)



- Convex or concave pin bosses can be easily distinguished.

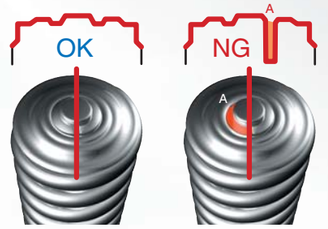


Concave pin

Convex pin

Checking the shape of vehicle structural parts (ZG-WDS22)

- The wide beam allows vehicle structural parts to be measured in a single operation.

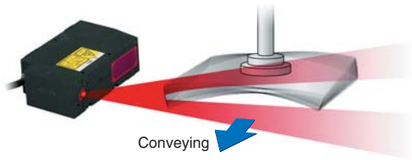


Reflective-type Sensor

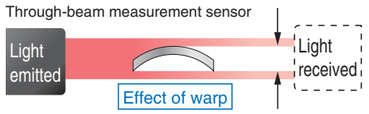
Installs easily just about anywhere.

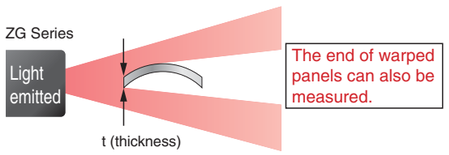
The wide beam enables stable, reflective measurement when mounting limitations do not allow a through-beam configuration to be used or when measuring the ends of warped panels, which is difficult for through-beam systems.

■ Measuring the thickness of metal panels while they are being conveyed



■ Measuring the end of warped panels



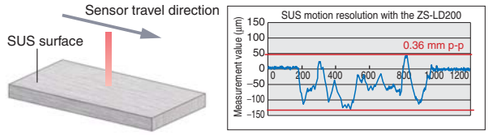


High-precision Displacement Sensor

Virtually any object can be measured.

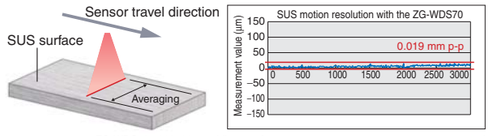
The advantages of the wide beam are not limited to shape measurement. The line beam averages slightly irregular reflections from a bumpy surface to provide a level of precision that was not possible with conventional displacement sensors.

■ OMRON ZS-series Displacement Sensor



ZS-LD200 200±50 mm (distance from measurement center ± measurement range)

■ ZG Series



ZG-WDS70 210±30 mm (distance from measurement center ± measurement range)

Note: Shows the result of using the entire line, with the Sensor being used as a wide displacement gauge.

Flexible Mode Selection — From High Speed to High Precision

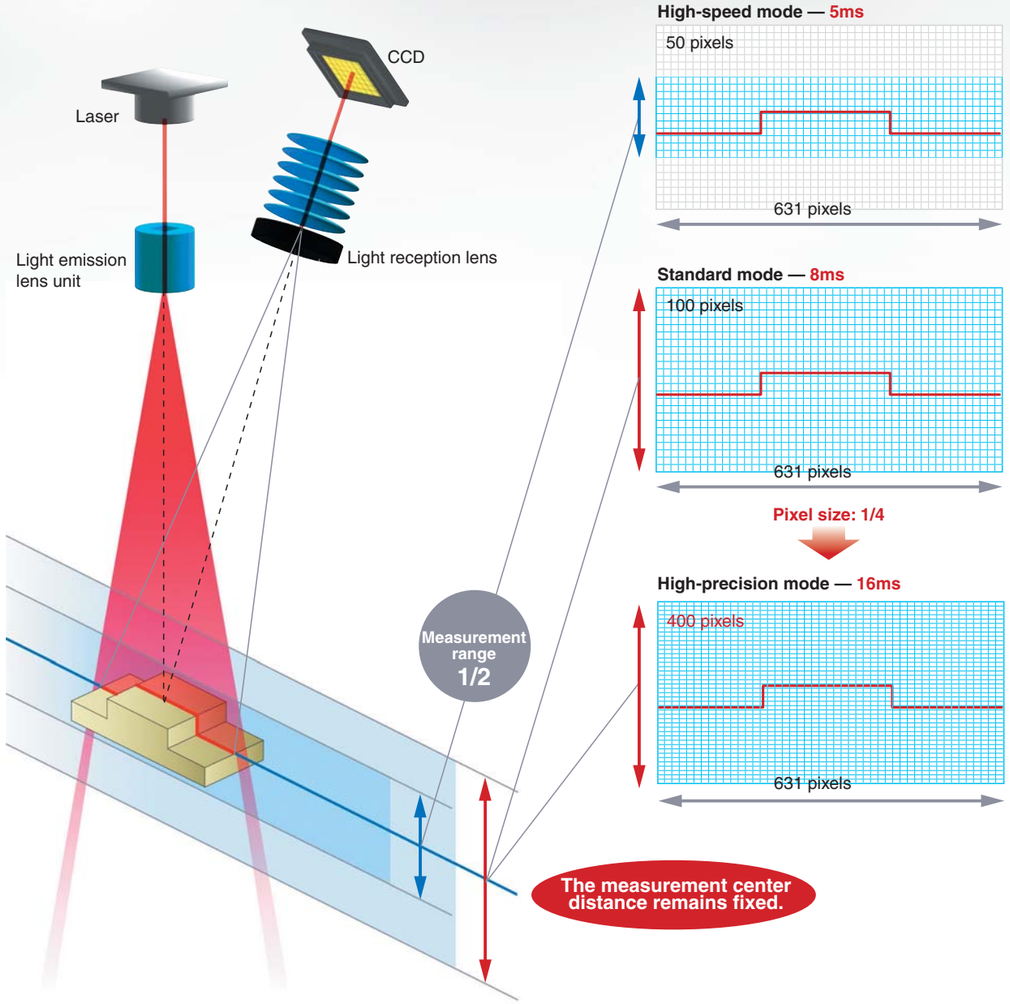
■ Flexible Measurement Technology Patent Pending

Principle

Light-section method

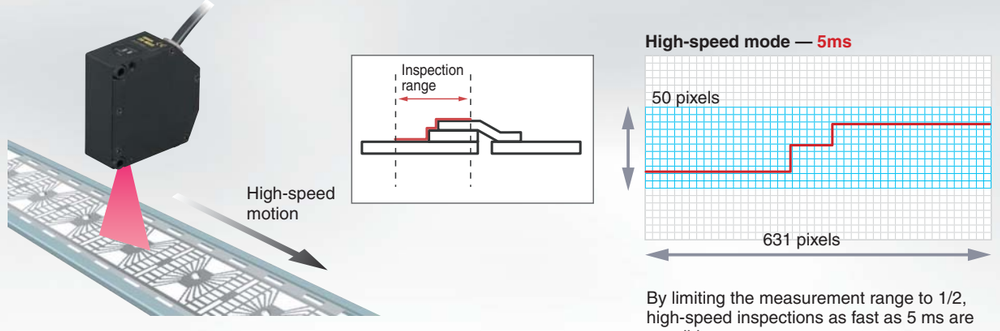
Effect

Functions to alter the measuring precision in the displacement direction and change the sampling period are provided for the first time on a displacement sensor using the light-section method.
Also, installation is easy because the measurement center distance remains fixed even when the measurement made is changed.



■ High-speed Mode

A fast 5 ms satisfies the needs of processes that require speed.

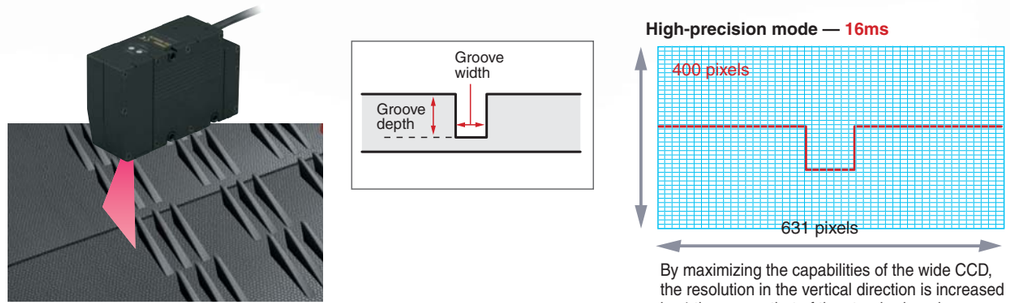


Measuring chip height above a lead frame (ZG-WDS3)

By limiting the measurement range to 1/2, high-speed inspections as fast as 5 ms are possible.

■ High-precision Mode

Completely reproduces the shape of the measurement object to measure with high precision.



Measuring the shape of air-bag grooves (ZG-WDS8)

By maximizing the capabilities of the wide CCD, the resolution in the vertical direction is increased by 4 times over that of the standard mode.

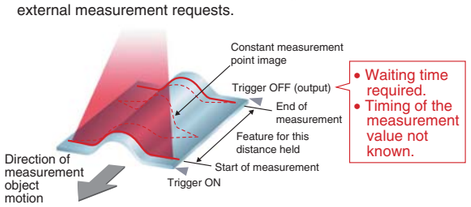
Trigger Synch Measurement

Featuring an operation mode that calculates the measurement value in synch with the command input!

An external command (parallel input with USB 2.0 or RS-232C) can be used in either the fixed or multi sensitivity mode to obtain data at the desired timing.

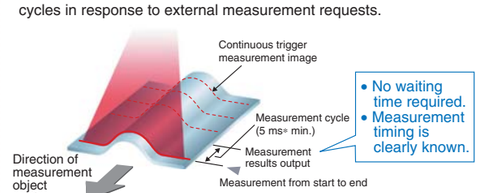
Conventional model

It was not possible to designate the timing for external measurement requests.



Z G

Measurement values can be obtained for specific measurement cycles in response to external measurement requests.



*Varies depending on measurement mode.

The Inspection Status Is Immediately Visible

■ A Compact, All-in-one Controller with LCD Monitor

Sensor-captured status is completely reproduced as a profile.

1/3
of the Conventional Size

(Business card size)

The multifunctional Controller has been condensed to the industry's smallest size so it can be installed wherever it is required, to give precisely the number of inspections that are necessary.

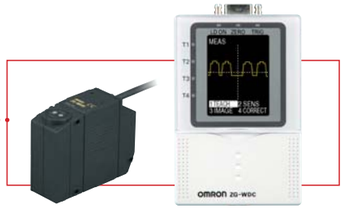
Enlarged Display of Profiles on a Personal Computer

■ Smart Monitor ZG Setup Support Software

Using the included Smart Monitor ZG Setup Support Software (see note), intricate profiles that cannot be sufficiently checked on the Controller's LCD monitor can be displayed and checked on the large screen of a personal computer.

Note: Screen images are simulated.

USB



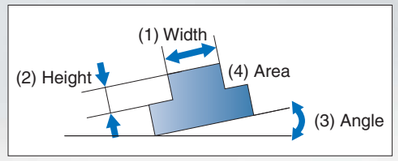
Recommended Operating Environment
Smart Monitor ZG Setup Support Software
OS: Windows 2000/XP
CPU: Pentium Ⅲ 850 MHz or faster (2 GHz or faster recommended)
Memory: 128 MB or more (256 MB or more recommended)
Available hard disk space: 50 MB or more
Display: 1024 768 dots, True Color (32-bit) or higher

Note: Standard equipment with the ZG-WDC□□A Controller

Handy Icons for Versatile Applications

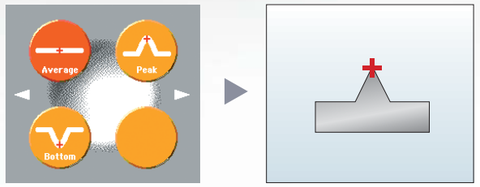
■ Measure up to 8 areas simultaneously. *NEW*

Up to eight measurement items can be made simultaneously from among the 18 measurement items available. The measurement items are indicated by easy-to-understand icons for fast, intuitive operation.



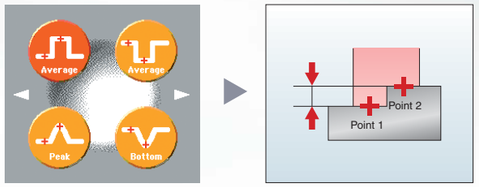
Height

Measures the height within the designated range.



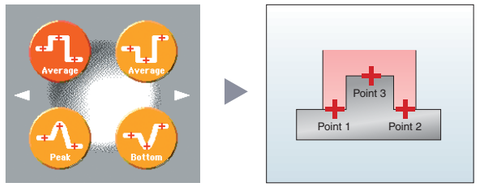
2-point Step (2PTS)

Uses measurement point 1 as a reference, and measures the difference between it and measurement point 2.



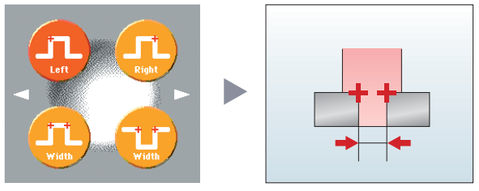
3-point Step (3PTS)

Measures the difference between measurement point 3 and the average of measurement points 1 and 2.



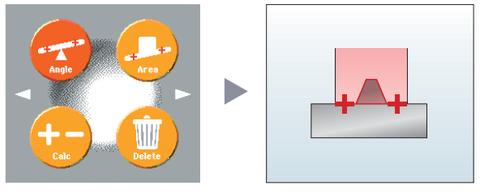
Edge Position, Width

Scans in the X-axis direction to find an edge, then determines its position and width.



Area, Angle

Uses the features of a 2D measurement of the Z axis and X axis to find the area and angle.

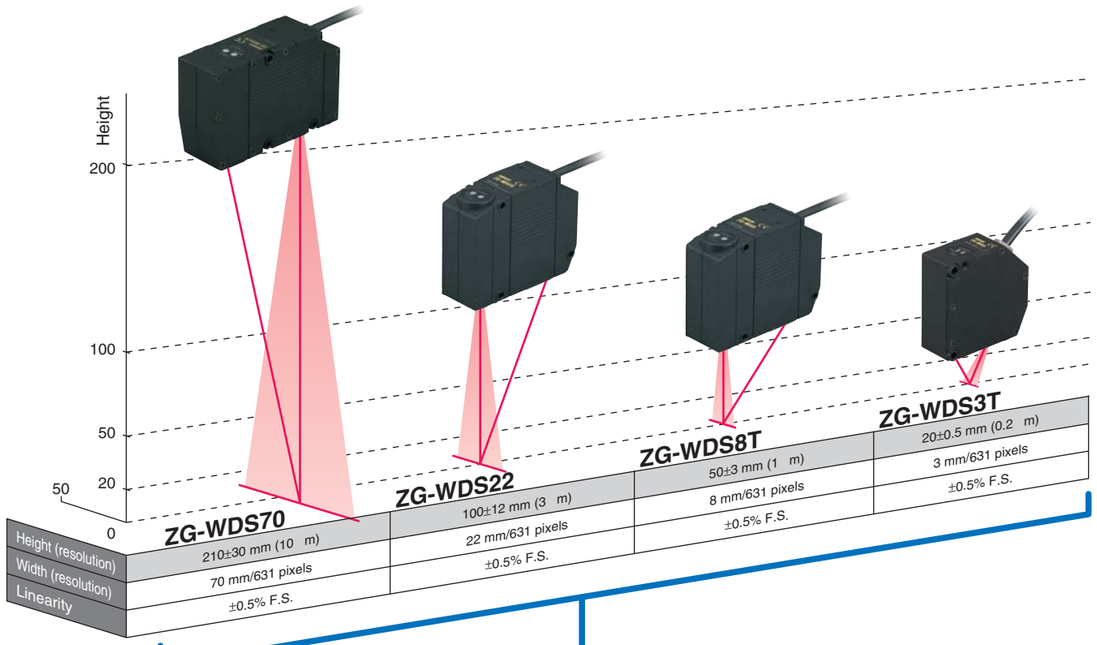


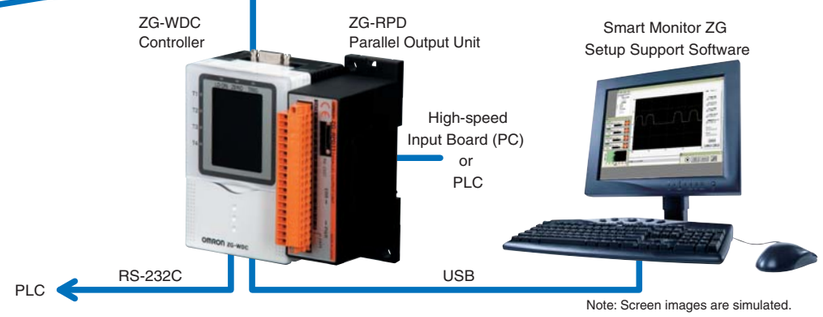
The icons correspond to the function keys, and their descriptions are displayed on the LCD monitor.

Select an icon directly with a function key.

■ Basic Configuration

Sensor Heads

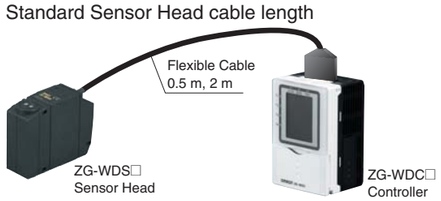




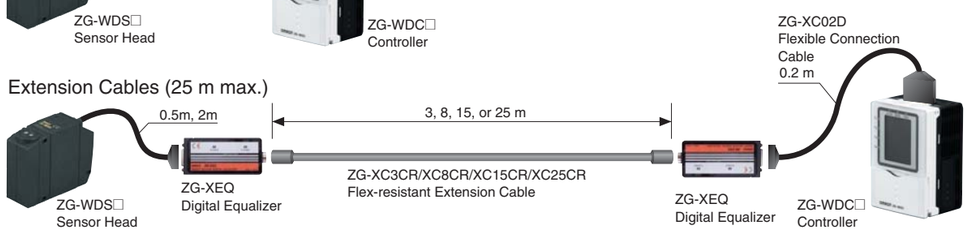
Note: Screen images are simulated.

Cable length between Sensor Head and Controller

Standard Sensor Head cable length



Extension Cables (25 m max.)



■ Ordering Information

Sensor Heads

Optical method	Sensing distance		Resolution		Model
Diffuse reflective	Height direction: 210±30 mm	Width direction: 70 mm	Height direction: 10 m	Width direction: 70 mm/631 pixels	ZG-WDS70
Diffuse reflective	Height direction: 100±12 mm	Width direction: 22 mm	Height direction: 3 m	Width direction: 22 mm/631 pixels	ZG-WDS22
Diffuse reflective	Height direction: 50±3 mm	Width direction: 8 mm	Height direction: 1 m	Width direction: 8 mm/631 pixels	ZG-WDS8T
Regular reflective	Height direction: 20±0.5 mm	Width direction: 3 mm	Height direction: 0.2 m	Width direction: 3 mm/631 pixels	ZG-WDS3T

Note 1. For details, refer to the Ratings and Specifications table.
2. Designate the cable length (0.5 m, 2 m) when ordering.

Sensor Controllers

Appearance	Power supply	Output type	Model
	24 VDC	NPN	ZG-WDC11A (See note.)
			ZG-WDC11
		PNP	ZG-WDC41A (See note.)
			ZG-WDC41

Note: Included with Smart Monitor ZG Setup Support Software.

Accessories (Order Separately)

Real-time Parallel Output Unit (for the ZG-WDC Series)

Appearance	Output type	Model
	NPN	ZG-RPD11
	PNP	ZG-RPD41

RS-232 Cable

Connecting device	Model	Qty.
For personal computer connection (2 m)	ZS-XRS2	1
For PLC/PT connection (2 m)	ZS-XPT2	1

Sensor Head Extension Cable

Name	Model	Qty.
3-m Extension Cable	ZG-XC3CR	1
8-m Extension Cable	ZG-XC8CR	1
15-m Extension Cable	ZG-XC15CR	1
25-m Extension Cable	ZG-XC25CR	1
Digital Equalizer (Relay Device)	ZG-XEQ	1
0.2-m Digital Equalizer Connection Cable	ZG-XC02D	1

Parallel Mounting Adaptor

Appearance	Model	
	ZS-XPM1	For 1 Unit
	ZS-XPM2	For 2 Units or more

■ Ratings and Specifications

Sensor Heads

Item		Model	ZG-WDS70	ZG-WDS22		ZG-WDS8T		ZG-WDS3T	
Optical system			Diffuse reflective	Diffuse reflective	Regular reflective	Diffuse reflective	Regular reflective	Regular reflective	Diffuse reflective
Measurement range	Height direction (in standard mode)		210±30 mm	100±12 mm	94±10 mm	50±3 mm	44±2 mm	20±0.5 mm	5.2±0.4 mm
	Width direction		70 mm (typical)	22 mm (typical)		8 mm (typical)		3 mm (typical)	
Resolution	Height direction (See note 1.)		10 μm	3 μm		1 μm		0.25 μm	
	Width direction		111 μm (70 mm/631 pixels)	35 μm (22 mm/631 pixels)		13 μm (8 mm/631 pixels)		5 μm (3 mm/631 pixels)	
Linearity (in the height direction) (See note 2.)			±0.5% F.S.						
Temperature characteristic (See note 3.)			0.1% F.S./°C						
Light source	Type		Visible semiconductor laser						
	Wavelength		658 nm					650 nm	
	Output		5 mW max. output, 1 mW max. exposure (without using optical instruments)					1 mW max.	
	Laser class		Class 2M of EN60825-1/IEC60825-1 Class IIIB of FDA (21CFR 1040.10 and 1040.11)					Class 2 of EN60825-1/IEC60825-1 Class II of FDA (21CFR 1040.10 and 1040.11)	
Beam shape (at measurement center distance) (See note 4.)			120 μm × 75 mm (typical)	60 μm × 45 mm (typical)		30 μm × 24 mm (typical)		25 μm × 4 mm (typical)	
LED			STANDBY: Lights when laser irradiation preparation is complete (indication color: green) LD_ON: Lights when the laser is irradiating (indication color: red)						
Measurement object			Opaque material						
Environmental resistance	Ambient light intensity		Incandescent lamp: 1,000 lx max. (light intensity on the receiver surface)						
	Ambient temperature		Operating: 0 to 50°C, Storage: –15 to 60°C (with no icing or condensation)						
	Ambient humidity		Operating and storage: 35 to 85% (with no condensation)						
	Degree of protection		IP66 (IEC 60529)					IP64 (IEC 60529)	
	Vibration resistance (destruction)		10 to 150 Hz with 0.35-mm single amplitude for 80 min each in X, Y, and Z directions						
	Shock resistance (destruction)		150 m/s^2, 3 times each in 6 directions (up/down, right/left, forward/backward)						
Materials			Case: Aluminum diecast, Front cover: Glass, Cable insulation: Heat-resistive polyvinyl chloride (PVC), Connector: Zinc alloy or brass						
Cable length			0.5 m, 2 m (flexible cable)						
Minimum bending radius			68 mm						
Weight			Approx. 650 g	Approx. 500 g		Approx. 500 g		Approx. 300 g	
Accessories			Laser Labels (EN, 2 labels), Ferrite Core (1), Instruction Manual						

Note: 1. Obtained by setting an OMRON standard measurement object at the measurement center distance and determining the average height of the beam line. The conditions are given in the table below. However, satisfactory resolution cannot be attained in strong electromagnetic fields.

Model	CCD Mode	Average No. of Operations	Measurement object	
			Regular reflective	Diffuse reflective
ZG-WDS70/WDS22/WDS8T	Standard mode	16	OMRON standard white alumina ceramic object	
ZG-WDS3T	Standard mode	32	OMRON standard mirrored object	OMRON standard diffuse reflective object

2. The tolerance for an ideal straight line obtained by determining the average height of an OMRON standard measurement object for the beam line. The CCD standard mode is used. Linearity varies depending on the measurement object.

Model	Measurement object	
	Regular reflective	Diffuse reflective
ZG-WDS70/WDS22/WDS8T	OMRON standard white alumina ceramic object	
ZG-WDS3T	OMRON standard mirrored object	OMRON standard diffuse reflective object

3. A value attained by using an aluminum jig to secure the distance between the Head and the measurement object. The CCD standard mode is used.
4. Defined as 1/e^2 (13.5%) of the center light intensity. This may be influenced when light leakage also exists outside the defined area and the reflectivity of the light around the measurement object is higher than that of the measurement object.

■ Ratings and Specifications

Sensor Controllers

Item			Model	ZG-WDC11/WDC11A	ZG-WDC41/WDC41A
Input/output type				NPN	PNP
No. of connectable Sensor Heads				1 per Controller	
Measurement cycle (See note 1.)				16 ms (high-precision mode), 8 ms (standard mode), 5 ms (high-speed mode)	
Min. display unit				10 nm	
Display range				–999.99999 to 999.99999	
Display			LCD monitor	1.8-inch TFT color LCD (557 × 234 pixels)	
			LEDs	• Judgment indicators for each task (indication color: orange): T1, T2, T3, T4 • Laser indicator (indication color: green): LD_ON • Zero reset indicator (indication color: green): ZERO • Trigger indicators (indication color: green): TRIG	
External interface	Input/output signal lines		Analog outputs	Select voltage or current (using the sliding switch on the bottom surface) • Voltage output: –10 to 10 V, output impedance: 40 Ω • Current output: 4 to 20 mA, maximum load resistance: 300 Ω	
			Judgment output (ALL-PASS/NG/ERROR)	NPN open collector 30 VDC, 50 mA max. Residual voltage: 1.2 V max.	PNP open collector 50 mA max. Residual voltage: 1.2 V max.
			Trigger auxiliary output (ENABLE/GATE)		
			Laser stop input (LD-OFF)	ON: O V short or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	ON: Power supply voltage short or power supply voltage –1.5 V max. OFF: Open (leakage current: 0.1 mA max.)
			Zero reset input (ZERO)		
			Measurement trigger input (TRIG)		
			Bank switching input (BANK A, B)		
	Serial I/O		USB2.0	1 port, full speed (12 Mbps), MINI-B	
			RS-232C	1 port, 115,200 bps max.	
Main functions			No. of setting banks	16 (See note 2.)	
			Sensitivity adjustment	Multi/auto/fixed	
			Measurement items	Height, 2-point Step, 3-point Step, Edge position, Edge width, Angle/Area/Calculation (up to eight items can be measured simultaneously)	
			Trigger modes	External trigger/continuous	
Ratings			Power supply voltage	21.6 to 26.4 VDC (including ripple current)	
			Current consumption	0.8 A max.	
			Insulation resistance	20 MΩ at 250 V between lead wires and Controller case	
			Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between lead wires and Controller case	
Environmental resistance			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%	
			Degree of protection	IP20 (IEC 60529)	
			Vibration resistance (destruction)	Vibration frequency: 10 to 150 Hz, single amplitude: 0.35 mm, acceleration: 50 m/s^2, 10 times for 8 min each	
			Shock resistance (destruction)	150 m/s^2, 3 times each in 6 directions (up/down, right/left, forward/backward)	
Materials				Case: Polycarbonate (PC), Cable insulation: Heat-resistive polyvinyl chloride (PVC)	
Cable length				2 m (flexible cable)	
Weight				Approx. 300 g (including cable) (Packed state: Approx. 450 g)	
Accessories				ZG-WDC□1: Large Ferrite Core, Insulation lock, Instruction Manual ZG-WDC□1A: Large Ferrite Core, Small Ferrite Core, Insulation lock, Instruction Manual, Smart Monitor ZG Setup Support Software (CD-ROM)	

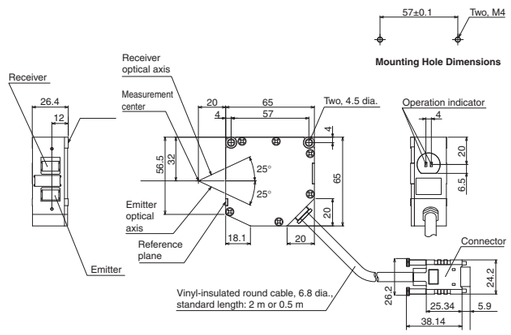
Note: 1. The image input periods listed here are for fixed/auto sensitivity. The image input period will be longer for multi-sensitivity or other settings. Use the eco monitor in RUN mode to determine the actual image input period.
Note: 2. You can use input signal lines to switch between banks 1 to 4. You can use serial communications commands or the Controller keys to switch between banks 5 to 16.

Dimensions

Sensor Heads

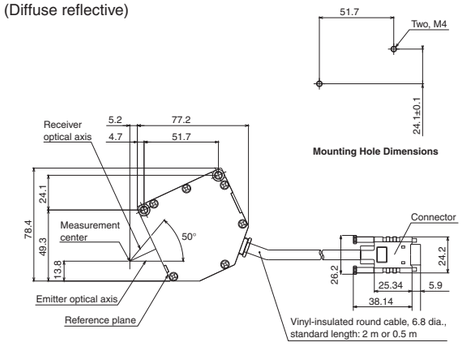
ZG-WDS3T
(Regular reflective)

(Unit: mm)



(Diffuse reflective)

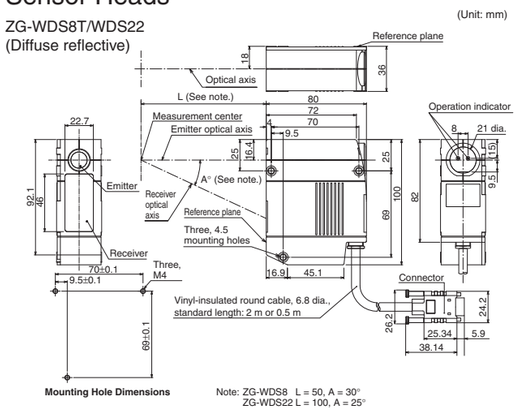
(Unit: mm)



Sensor Heads

ZG-WDS8T/WDS22
(Diffuse reflective)

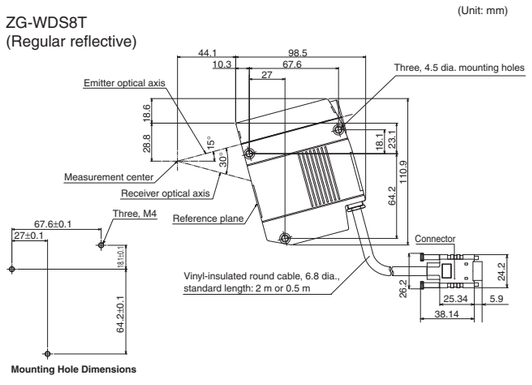
(Unit: mm)



Note: ZG-WDS8 L = 50, A = 30°
ZG-WDS22 L = 100, A = 25°

ZG-WDS8T
(Regular reflective)

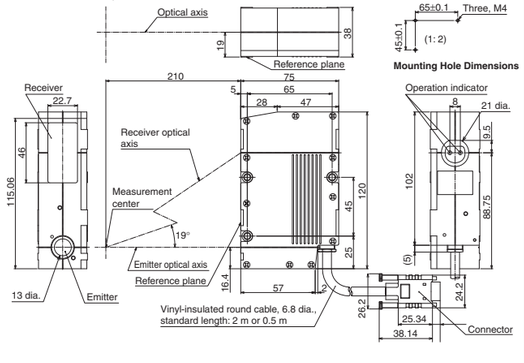
(Unit: mm)



Sensor Heads

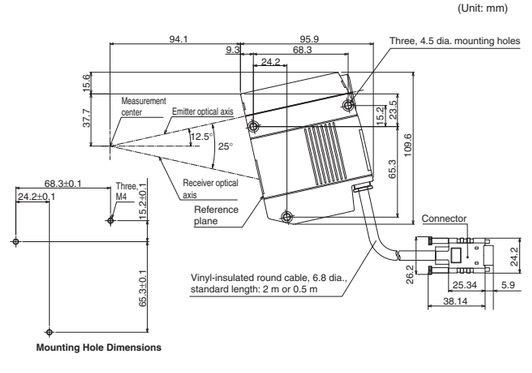
ZG-WDS70
(Diffuse reflective)

(Unit: mm)



ZG-WDS22
(Regular reflective)

(Unit: mm)



Sensor Controllers

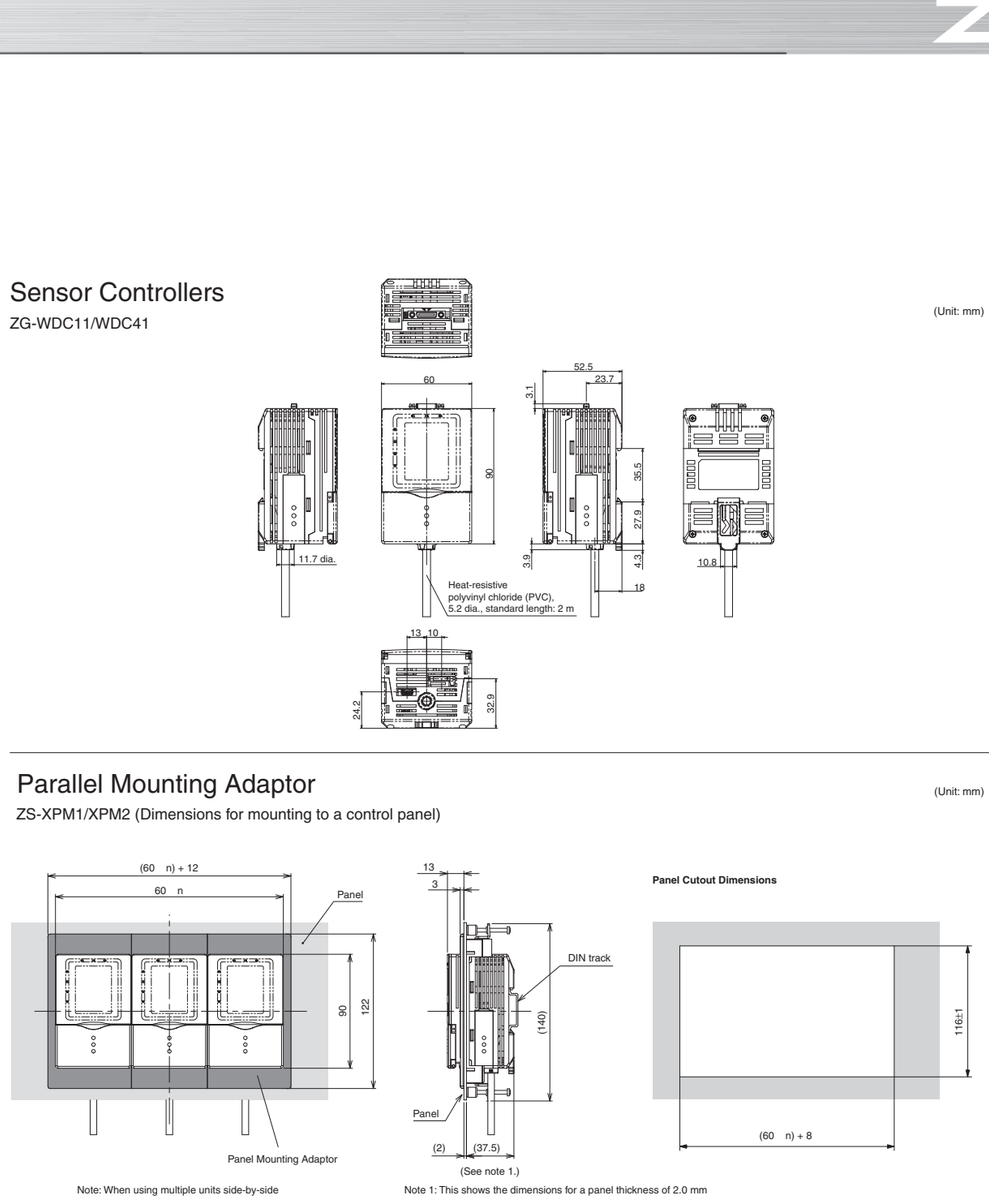
ZG-WDC11/WDC41

(Unit: mm)

Parallel Mounting Adaptor

ZS-XPM1/XPM2 (Dimensions for mounting to a control panel)

(Unit: mm)



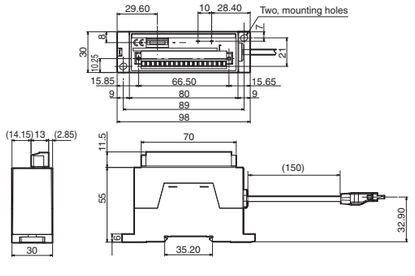
Note: When using multiple units side-by-side

Note 1: This shows the dimensions for a panel thickness of 2.0 mm

Real-time Parallel Output Unit

ZG-RPD11/RPD41

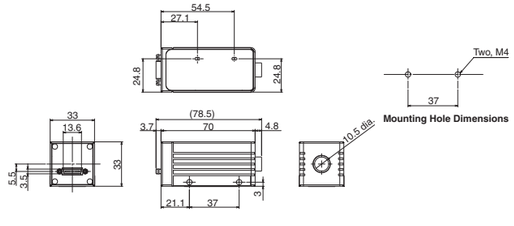
(Unit: mm)



Digital Equalizer

ZG-XEQ

(Unit: mm)



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