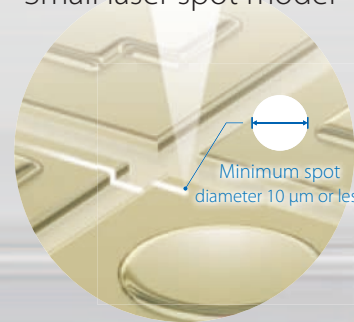


Confocal Fiber Displacement Sensor

ZW-7000/5000 Series

NEW

For minute measurement and positioning
Small laser spot model



Reliable measurements for
any material and surface types



- Measuring shiny objects with an inclination of $\pm 25^\circ$
- $\pm 0.5 \mu\text{m}$ or less linearity for various materials
- Sampling rate as fast as $20 \mu\text{s}$
- Small spot diameter of $10 \mu\text{m}$ or less

NEW



Beyond laser displacement sensors

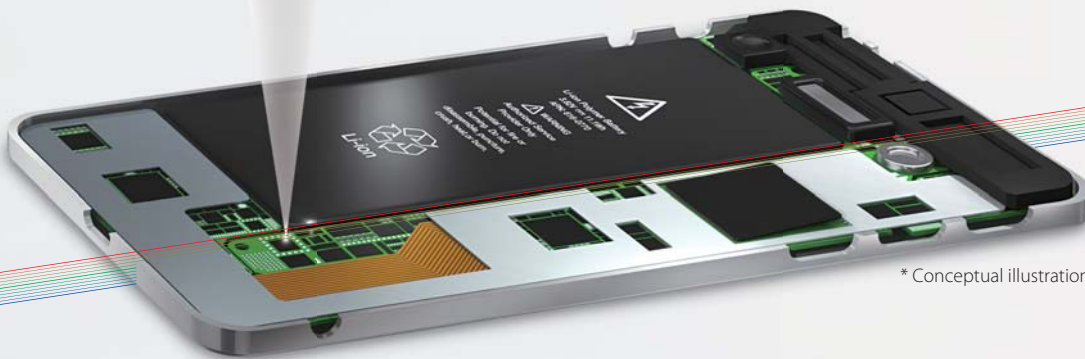
Just like a non-contact optical probe

New

White light confocal principle

Measures while moving

Measures using white LED wavelengths (colors)

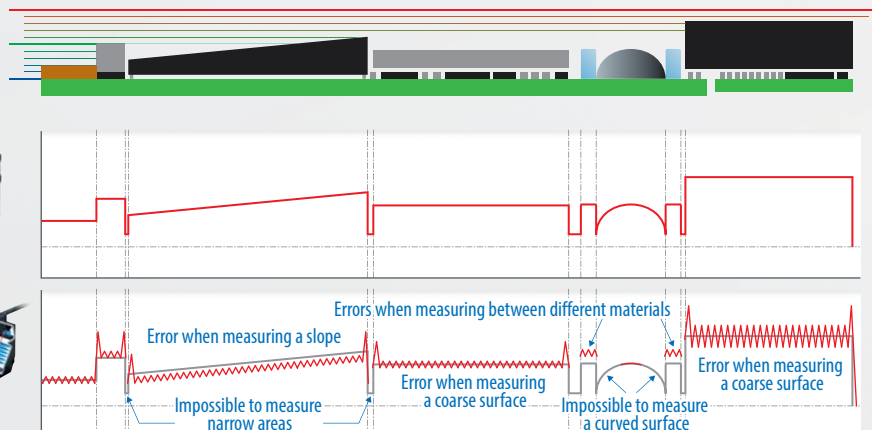


* Conceptual illustration

White light confocal displacement sensor



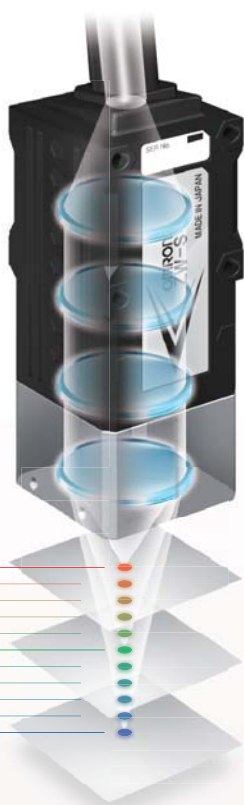
Traditional laser displacement sensor



* This graph represents a result of measurement under specific conditions. Before final installation, test the sensor required for the application to validate the desired measurements are obtained.

Profile obtained by moving measurement of various materials and shapes

Measures from any mounting position
(vertical or horizontal, facing up/down or side ways)



Three new advantages meet the needs of manufacturing innovation

Measure accurately P.4

- Stable measurements of inclined or curved surfaces
- Stable measurements of different materials types
- Stable measurements of smooth or coarse surfaces

Measure more objects quickly P.6

- Small size allows for multiple sensors to be mounted side by side
- Sensor light weight greatly reduces settling time when in motion
- No need to change the sensor head direction even if the part being tested changes direction

Set up quickly P.8

- No need to change the sensor when different material type is run
- No laser safety measures required
- No need to work on EMC or Thermal countermeasures, there are no electronic components in sensor head
- DLL files provide quick integration into machine HMI

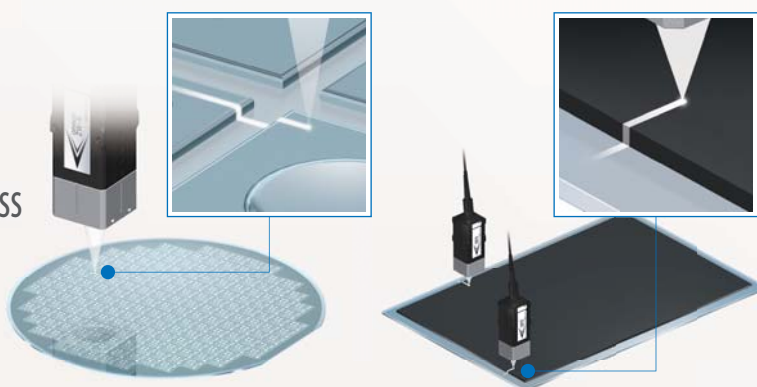
Expansion of lineup **NEW**

ZW-5000

Satisfying the demand of the SEMI/FPD industry

Small laser spot model
minimum spot diameter of 10 μm or less

This model fulfills the demand of the SEMI/FPD industry increasing year by year for more precise profile reproduction in detecting the position of minute wafer street width, the alignment of laminating thin liquid crystal films etc.



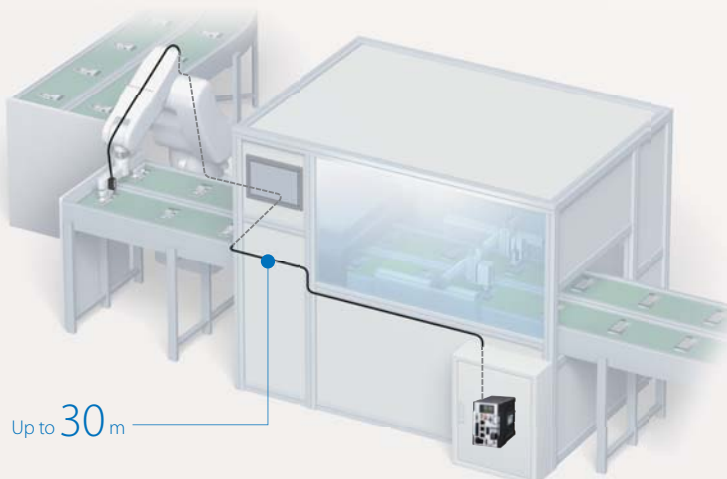
ZW-7000 ZW-5000

Satisfying the demand for installation into a large machine

Extension fiber cable
10 m/20 m/30 m

10 m, 20 m and 30 m cables join the lineup besides 2 m and 5 m.

A long distance wiring from sensor to controller can be flexibly done and supports installation into a large machine.



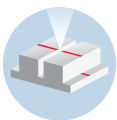
Measure accurately

For all quality inspections, from parts to finished products

Strict quality control, demands for appearance inspection and production speed are constantly increasing. To meet these demands, stable measurements during movement for quality inspection without compromising manufacturing speed is required. Harnessing the benefits of the white light confocal principle, the ZW-7000/5000 Series can provide stable measurements for different material types (glass, metal, plastic, etc.) and shapes (round, flat, uneven, etc.).

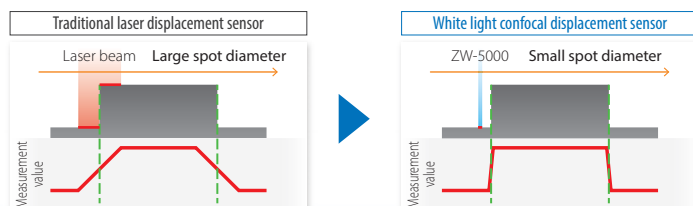


Profile measurement



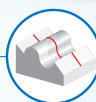
Small laser spot for faithful measurement **NEW**

When measuring a level difference or opening with a traditional laser displacement sensor, reflection from multiple surfaces could blunt a profile and then the edge detection position could be shifted, thus resulting in a drop in precision of position detection, whereas the ZW-5000 with minimal spot diameter of 10 μm can avoid the reflection from multiple surfaces and thus acquire a sharp profile, which leads to improved precision of position detection.



ZW-5000

Minimum spot diameter
10 μm or less

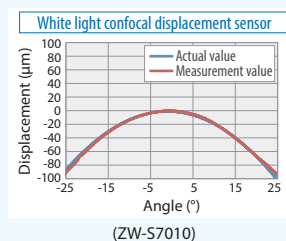
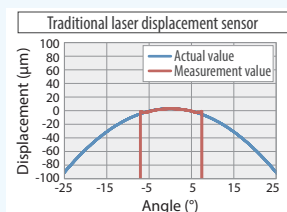


Inclined or curved surfaces

Omron's, unique, white light confocal displacement sensor provides higher resolution measurements of angled or curved and shiny surfaces than traditional laser displacement sensors.

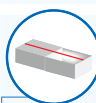
>> Mechanism

p.13 Angle characteristic



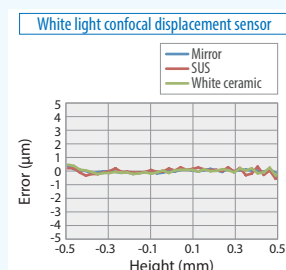
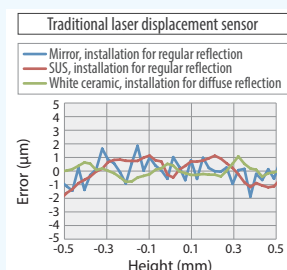
ZW-7000 ZW-5000

Angle characteristic
±25°
for shiny surfaces
*1



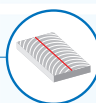
Different materials

With a traditional laser displacement sensor, it is required to re-tune after the sensor head direction is changed for a different material type. Our white light confocal displacement sensor can measure different material types while moving, without needing to re-tune the sensor nor changing the sensor head or installation direction.



ZW-7000 ZW-5000

±0.5 µm or less
linearity for
different materials
*1

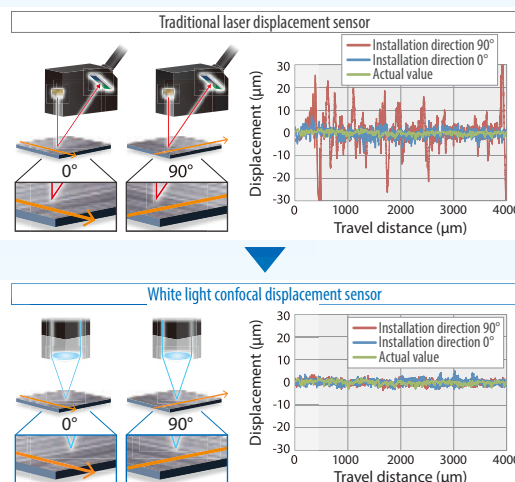


Flatness of coarse surfaces *2

Our white light confocal displacement sensors can provide accurate flatness measurement by tracing an object without being affected by its excessive reflection, the sensor head direction, nor the material hairline direction, which are difficult to track with a traditional laser displacement sensor.

>> Mechanism

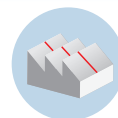
p.12 Stable measurements of coarse surfaces



(ZW-S7020)*Please ask Omron sales representative for product data except ZW-S7020.

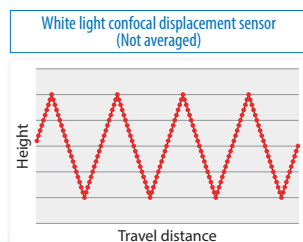
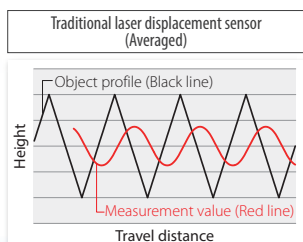
ZW-7000

Deviation from
actual value
Micron
accuracy



High-speed sampling for faithful measurement

Using traditional laser sensors, the measurement accuracy for a moving target can be achieved by increasing the averaging times, but downside is that this lowers the profile reproduction accuracy. The ZW-7000 acquires a sharp profile by a single sampling as fast as 20 µs without averaging, solving this issue.



ZW-7000

Minimum
sampling period
20 µs

*1. Typical value of the ZW-S7010/ZW-S5010 Sensor Heads.

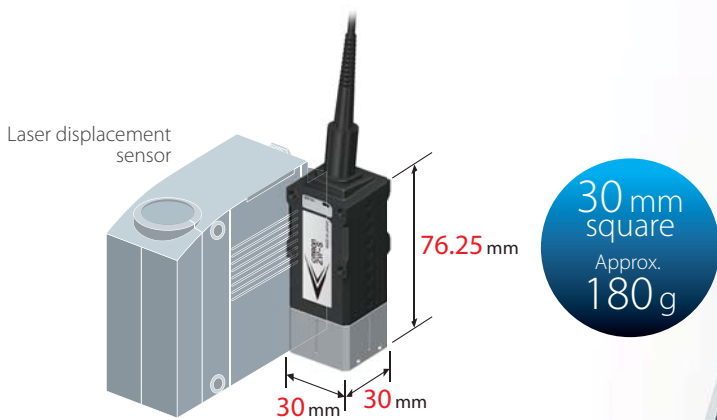
*2. Objects with machining marks or hairline pattern

Note. All measurement graphs represent typical examples. Measurement may be affected by the shape or material of an object to measure. Before final installation, preliminary testing must be done to validate expected performance.

Measure more objects quickly

Efficient installation and motion solutions increase manufacturing speed

Robots and stages are used for assembly and inspection to increase productivity. Manufacturers require measuring devices that are easy to integrate into small-sized machines and easy to move. The compact and lightweight ZW-7000/5000 Series sensor head eliminates issues of installation space and installation on moving parts.



Increase throughput: Simultaneous measurements can be achieved using multiple sensor heads

Space restrictions prevent side-by-side installation of many traditional laser displacement sensors. The compact ZW-7000 sensor heads can be installed side by side to obtain multiple measurements at once, instead of measuring one at a time, thus reducing measurement time.

Traditional laser displacement sensor
Restrictions on installation limit improvement in cycle time



White light confocal displacement sensor
Side-by-side installation reduces measurement time

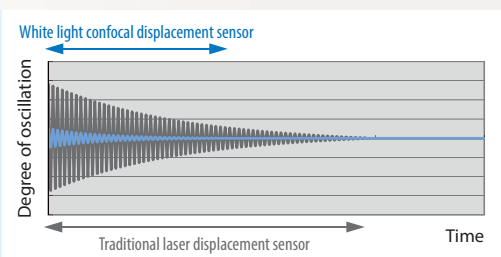
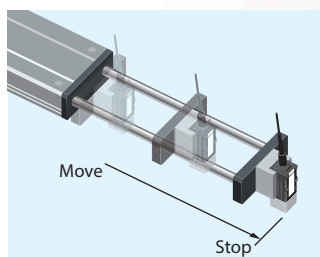


Measurement cycle time reduced by **60% or more***

* Performance comparison with previous Omron products

Increase speed: Reduce settling time

The light weight of the sensor head greatly reduces the waiting time for the oscillation to stop when power cylinders are used to move the sensor head(s) to the measurement position, resulting in faster measurements.





Save Time and Money: No need to rotate the sensor

A traditional laser displacement sensor measures the height of an object based on the position of the spot on the receiver. The machine requires an extra step to rotate the sensor according to the object shape or moving direction. Our white light confocal displacement sensor can measure from the same installation position while moving in any direction, with no restriction on installation direction.



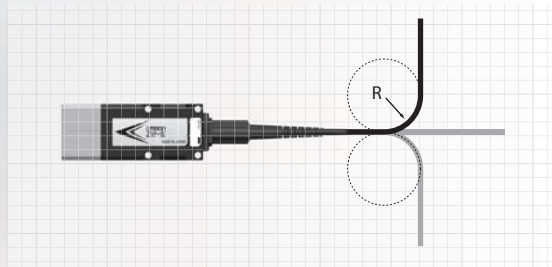
* Calculated when an object with an irregular surface was measured in both vertical and horizontal directions

>> Mechanism
p.13 Direction free

Flexible fiber cable for easy installation

The controller connects to the sensor head through a 3 mm diameter flexible fiber cable. The cable has cleared a bending test consisting of 3,000,000 repetitions* for reliable application on moving parts.

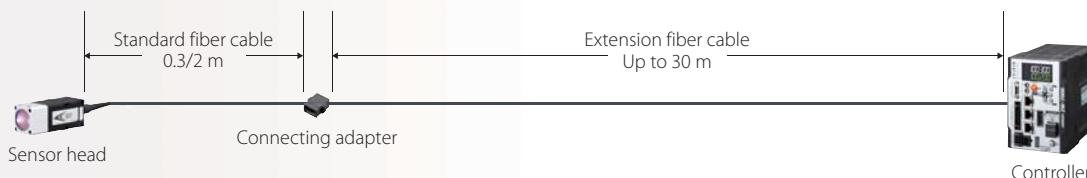
* Omron's bending test condition v3,000,000 bends to a 20 mm bending radius



Expansion of extension fiber cable lineup **NEW**

Up to 30 m long cable is available. An extension fiber cable can be used to extend the distance to up to 32 m, supporting a flexible wiring in a large machine.

>> Extension fiber cable lineup
p.19 "Type/standard price cable"





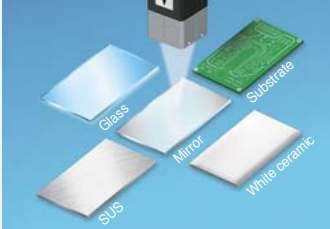
Set up quickly

Easy to design and tune

Quick installation of sensors is required to set up manufacturing equipment in a short time to meet the market needs. The ZW-7000/5000 Series, using the white light confocal principle, reduces significantly the time required to implement measures that are necessary when using laser displacement sensors.


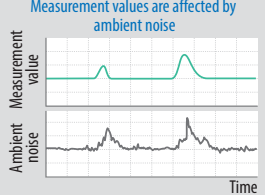
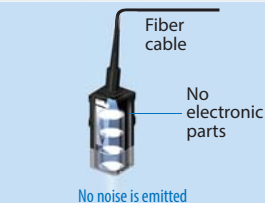
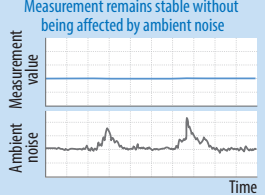
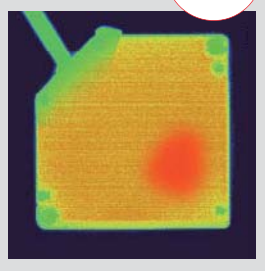

Easy device selection

There is no need to select different sensor heads for different objects, which saves the time required when purchasing and designing. This leads to reductions in set-up work and inventory costs.

Traditional laser displacement sensor	White light confocal displacement sensor
 <p>Sensor head for fine surfaces</p> <p>Sensor head for mirror surfaces</p> <p>Sensor head for coarse surfaces</p>	 <p>Same sensor head for different objects</p> <p>* Common to NPN/PNP type controller</p> 



Reduced work - EMC measures and thermal design are not required

The sensor head design maintains stable operation in installations with electronic or magnetic noise. Devices in close proximity and measurement values will not be affected by noise or heat from the sensor head.

Traditional laser displacement sensor	White light confocal displacement sensor	Traditional laser displacement sensor	White light confocal displacement sensor
 <p>Electronic parts</p> <p>Electromagnetic noise is emitted from the sensor and cable</p>  <p>Measurement values are affected by ambient noise</p> <p>Measures must be taken against noise generated by electronic parts</p>	 <p>Fiber cable</p> <p>No electronic parts</p> <p>No noise is emitted</p>  <p>Measurement remains stable without being affected by ambient noise</p> <p>No measures against noise are required</p>	<p>Change in temperature after 1.5 hours of operation</p> <p>+2°C</p> 	<p>Change in temperature after 1.5 hours of operation</p> <p>+0°C</p> 

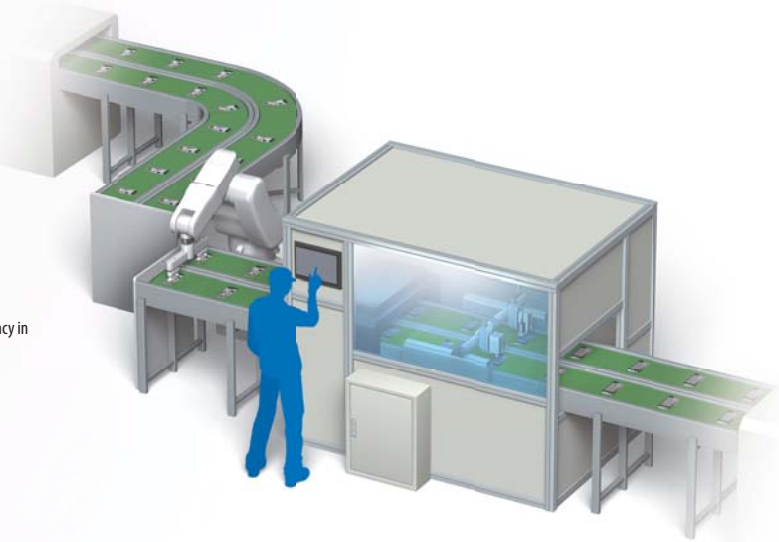
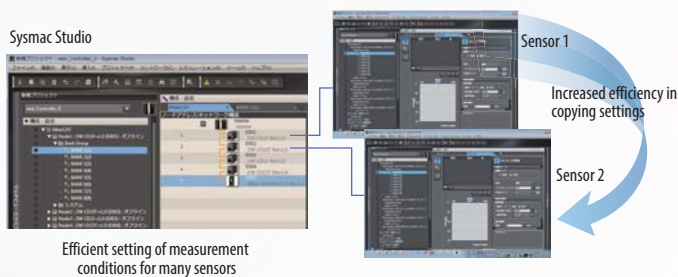
Reduced work for installation and tuning of sensor heads

The white light confocal principle allows stable measurements without fine tuning.

Traditional laser displacement sensor	White light confocal displacement sensor
 <p>Fine angle adjustment required</p>	 <p>Easy installation without fine tuning</p>

Efficient setting for multiple ZW-7000's

You can make settings for all of devices that are connected via EtherCAT with the Automation Software Sysmac Studio. Even when you combine many sensors, you can copy the program data to effectively integrate several sensors or you can easily program the processing between the sensors.



DLL Quick integration into machine HMI

DLL files are provided to easily display ZW-7000/5000 Series setting screens and measurement results on a Windows/Mac OS PC used as a machine HMI.



<p>Provided DLL</p>	<ul style="list-style-type: none"> · Settings and measurement conditions reference · Acquiring measurement values · Acquiring light received waveforms · Logging control
---------------------	--

* If you register as a member after purchasing the product, you can download DLL for free. Refer to the member registration sheet that is enclosed with the product for details.

No laser safety measures required

A white LED*, used as the light source instead of a laser, eliminates time to implement safety measures around the machine and the need for safe use training for workers.

Previously safety measures for laser were required

When a laser displacement sensor was used, a shield around the machine for safety was required and workers had to be trained for safe use.

* Do not look directly into the LED light.

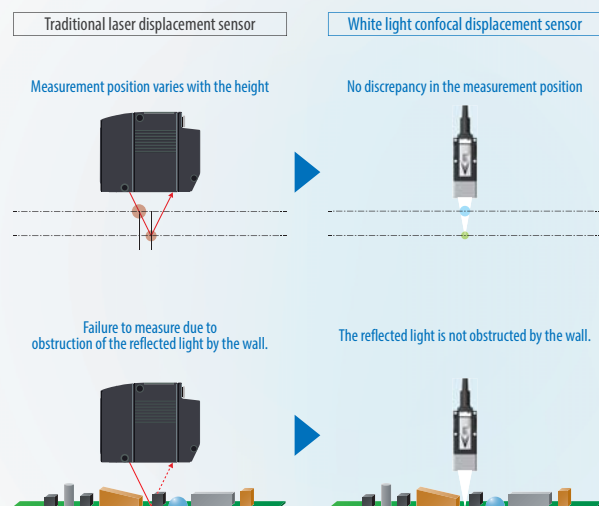
Further Benefits of White light confocal

● No Discrepancy in the Measurement Point

With traditional laser displacement sensor, the measurement position and spot size vary with the height. This means there are times when the position cannot be measured with high resolution due to warping and inclination. With the white light confocal displacement sensor used in the ZW-7000/5000 Series, the measurement point remains the same at any position in the measuring range so that precise measurements can always be made.

● Measurement in narrow area and by the wall

When the traditional laser displacement sensor measures the inside of a narrow tube or the height of a small depression, the wall often obstructs the reflected light, and the orientation of the sensor and workpiece must be adjusted many times. The ZW-7000/5000 Series using the white light confocal displacement sensor can measure the points in narrow spaces or small objects, without changing its installation orientation, because the emitted light and reflected light are positioned along the same axis.



Technical explanation

New technologies to achieve stable measurements during movement

Key components for sensing are improved to achieve high speed, high precision measurements and high compatibility with machines



High photoconductivity Patent Pending

Precise Core Array Fiber

- High speed
- High precision
- Compatibility

The fiber specially designed for the ZW-7000 Series transmits LED light to the sensor head even more efficiently and enables more precise measurement.

Note: Precise Core Array Fiber is incorporated into the ZW-7000 only.

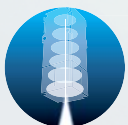


Compact size

Compact Form Design

- High speed
- High precision
- Compatibility

The compact sensor head was designed to solve installation issues caused by the large laser displacement sensor head, fitting into a limited footprint.



Low aberration

Advanced OCFL Module

- High speed
- High precision
- Compatibility

The OCFL*1 module that controls the focal point for each wavelength of white light was further developed. Its multi-lens structure reduces aberration to 1/4*2 to provide stable, high-resolution measurements, without compromising its compact design.

*1. OCFL : Omron Chromatic Focus Lens
*2. Compared to the ZW-S07/-S20/-S30/-S40.



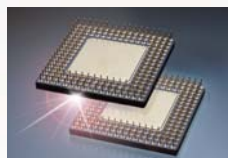
25 times faster data processing speed

High Speed Processor

- High speed
- High precision
- Compatibility

The new processor was designed to increase processing speed for high precision measurements, from LED emission through sensing and processing to data logging.

Note: High Speed Processor is incorporated into the ZW-7000 only.



* Conceptual illustration





High contrast display

White 11 Segment Display

The white 11 segment display was adopted. High contrast white LED display greatly improves visibility and usability.

- High speed
- High precision
- Compatibility



High brightness

Ultra High Power White LED

The new long-term stable, high power LED was adopted to provide fast responses and stable measurements of low-reflective objects. There is no laser hazard. A white LED light source has a longer life than a lamp light source, reducing downtime.

- High speed
- High precision
- Compatibility



* Conceptual illustration



High resolution

Advanced Spectrograph

The new spectroscope Advanced Spectrograph, which converts the color wavelength into the distance, offers increased waveform resolution, enabling high-precision measurements.

- High speed
- High precision
- Compatibility



Large logging capacity

Mega Logging Memory

The memory capacity was greatly increased to log, process and store up to 2,000,000 values* obtained by high-speed sampling.

* Measurement values, emitted light amounts, or received light amounts can be logged.

- High speed
- High precision
- Compatibility

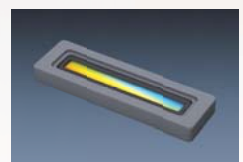


High sensitivity

High Sensitivity High Speed CMOS

The CMOS for the ZW-7000/5000 Series were optimized to measure any object more precisely, sensitively, and stably.

- High speed
- High precision
- Compatibility

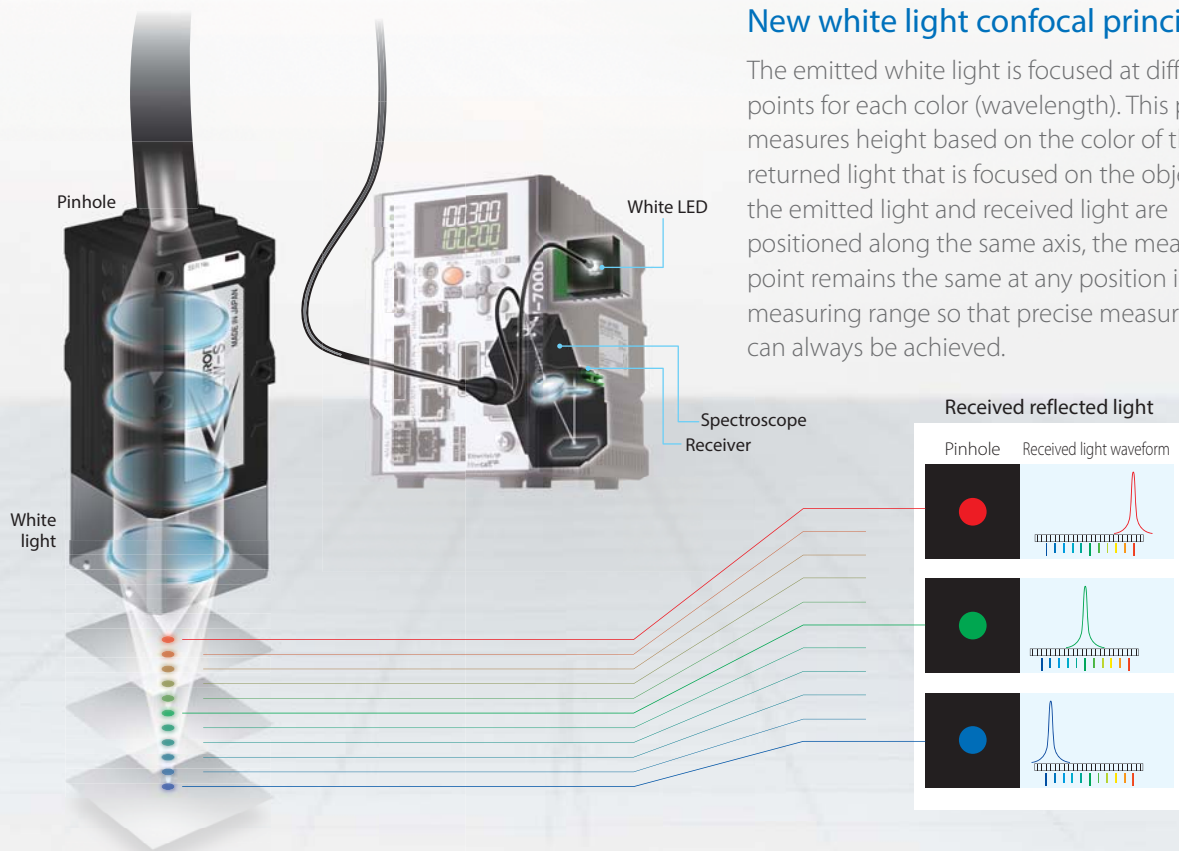


* Conceptual illustration

Technical explanation

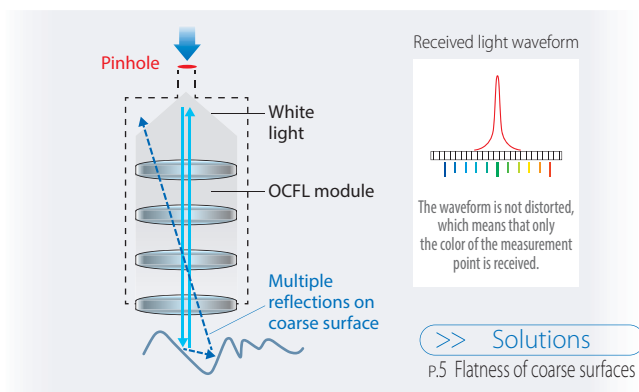
White light confocal principle to achieve stable measurements during movement

White light confocal principle is a breakthrough mechanism to enable a stable measurement even in high-speed transfer process using robots and stages. This new principle allows a continuous measurement of object in any mixed conditions such as coarse, curved, inclined or narrow areas while moving. Its characteristic mechanism is detailed below, compared to the traditional triangulation principle.



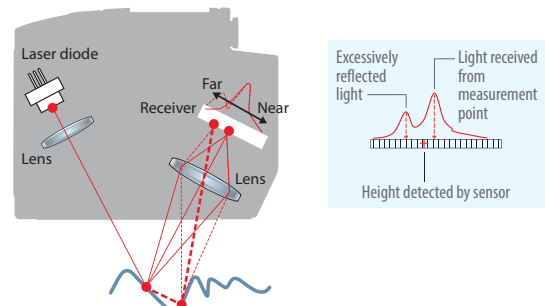
Stable measurements of coarse surfaces

Only the light reflected from the measurement point enters the pinhole even if excessive light reflected from the object changes during movement. This enables stable and precise measurements.



Laser triangulation principle

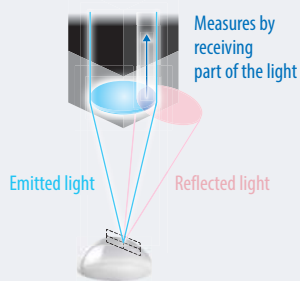
The reflected light is received on a receiver and the height is measured from the received light waveform. The waveform is distorted due to the effect of excessive reflection, resulting in a measurement error. In addition, movement generates excessive reflection, which causes unstable measurements.



Angle characteristic

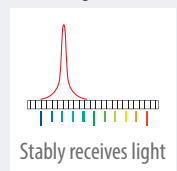
Because light is emitted directly from above, the reflected light is not widely diffused. The wavelength (position) can be obtained by receiving part of the light even if the reflected light amount is reduced. This enables stable height measurements.

Curved surface



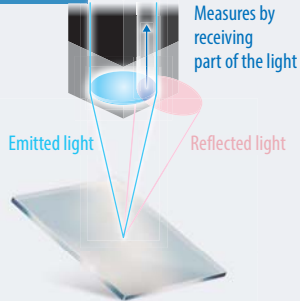
Measures by receiving part of the light

Received light waveform



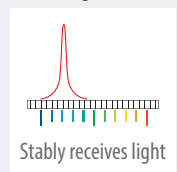
>> Solutions
p.5 Inclined or curved surfaces

Inclined surface



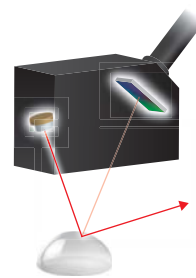
Measures by receiving part of the light

Received light waveform



Laser triangulation principle

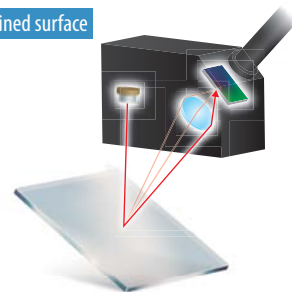
Curved surface



No light received

A laser spot beam is emitted obliquely from above. When the position of a glossy, regular-reflective object, where the beams are reflected in one direction, is shifted, the light reflected from the curved surface cannot be received.

Inclined surface

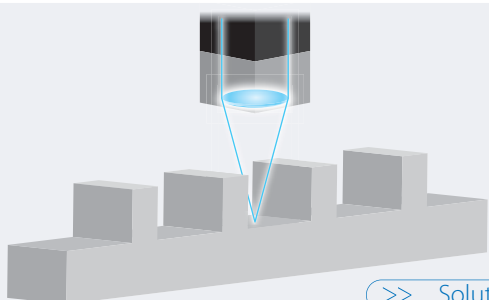


Unstable

Even if the light can be received, the received light waveform is distorted due to lens aberration as a result the measurement becomes unstable.

Direction free

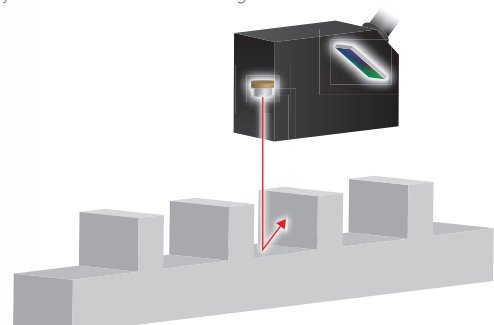
Stable measurement is not affected by moving directions of objects nor the sensor. This is achieved by emitting and receiving a cone-shaped beam of white light. This slim beam is also suitable for measurements in narrow areas.



>> Solutions
p.7 No need to rotate the sensor

Laser triangulation principle

The reflected light is detected obliquely from above. Depending on the installation direction, the sensor cannot measure the object because the reflected light is blocked.



Applications

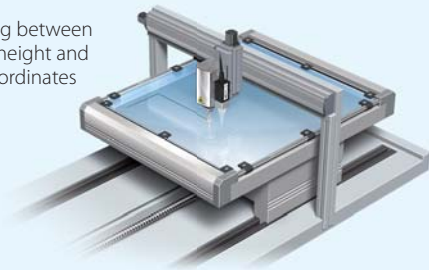
High-precision measurements of target positions during movement

To eliminate measurement errors due to a position offset during moving measurement, the ZW-7000/5000 Sereis provides the functionality to link moving parts with measurement timing.

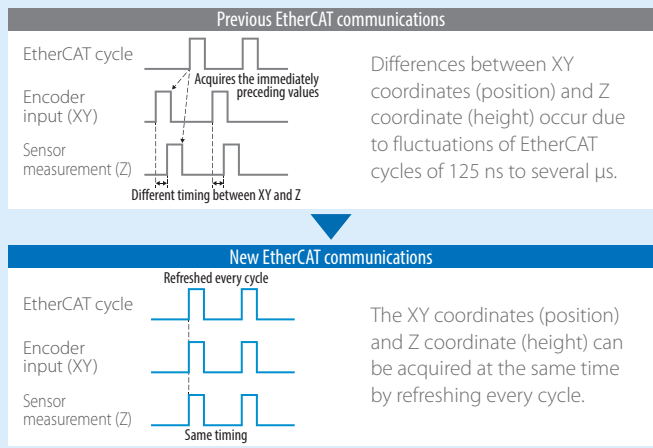
Moving measurement linked to a stage *

Linking encoder positions to measurement values of the sensor allows accurate shape measurement without being affected by acceleration/deceleration of the conveyor.

Linking between glass height and XY coordinates



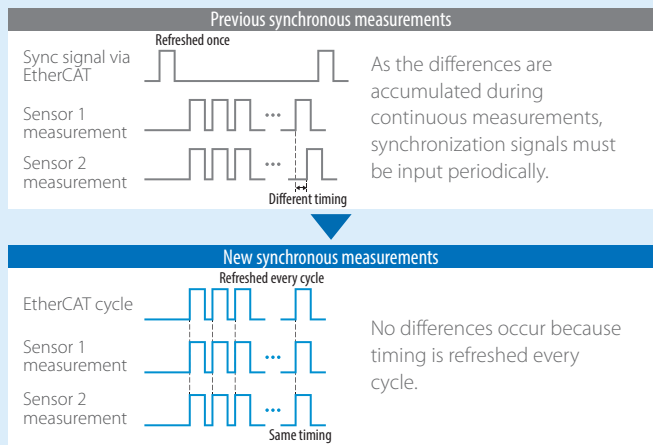
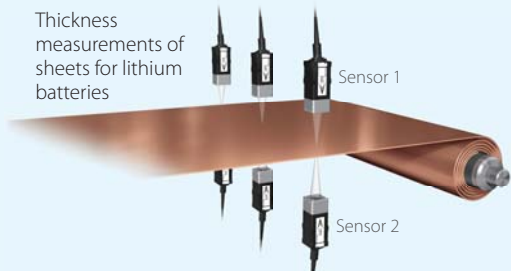
Timing chart



Synchronous measurements with many sensors *

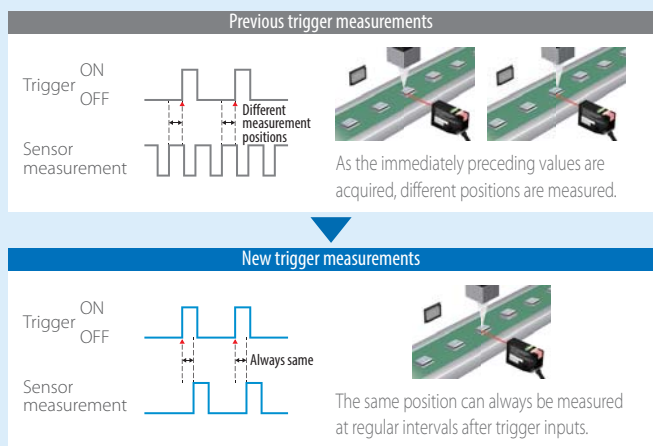
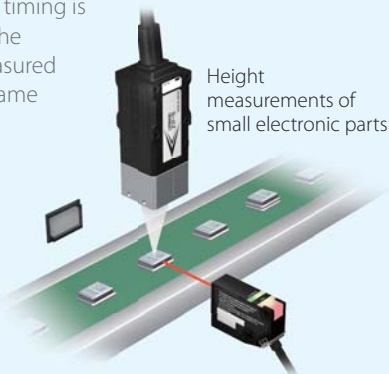
For synchronous measurement of thickness or flatness using multiple sensors, sensors precisely measures heights at the same time.

Thickness measurements of sheets for lithium batteries



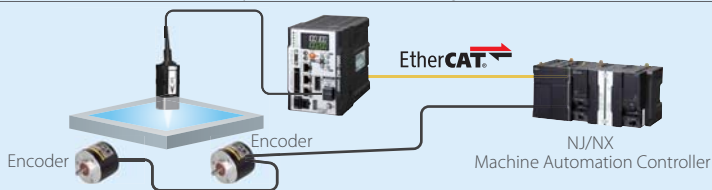
Precise trigger measurements

If the trigger input timing is always the same, the height can be measured accurately at the same position.

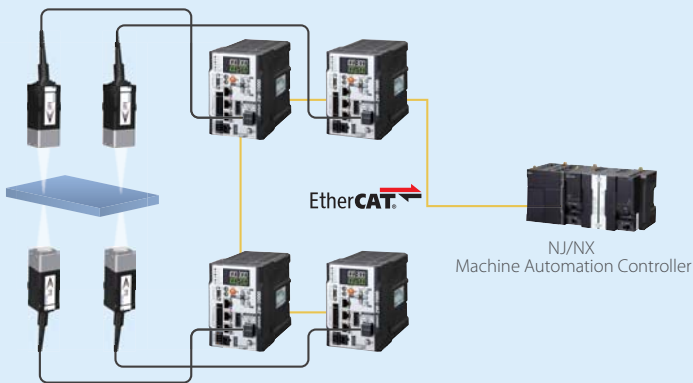
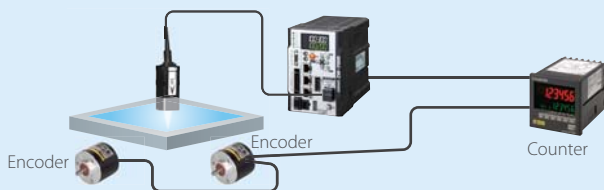


System configurations

Synchronous measurements using EtherCAT



Synchronous measurements using triggers instead of EtherCAT are possible.



Function Blocks are packed with Omron's rich technical know-how on control programs

Omron offers Function Blocks to make programming for system link applications easier. For details, please refer to the SYSMAC-XR014 Dimension Measurement Library on the following URL.

http://www.ia.omron.com/sysmac_xr014

Multipoint Measurement	2D Shape Measurement
Thickness	Surface Search/ Tracer Control
Level difference	Height
Maximum/ Minimum value	Edge position
Curve	Inflection point
Flatness	Angle
Mean value	Sectional area
Torsion	Shape comparison

The Sysmac Library is a collection of software functional components that can be used in programs for the NJ/NX Machine Automation Controllers. The Sysmac Library is available to download from Omron website. Install the Sysmac Library to use it in the Sysmac Studio.

http://www.ia.omron.com/sysmac_library

* This functionality is available on the firmware ver.2.10 or later.

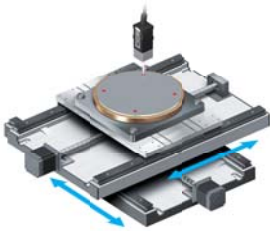
If you register as a member after purchasing the product, the latest firmware for the controller is available for free. Refer to the member registration sheet that is enclosed with the product for details.

Applications

High-speed measurements in applications requiring high accuracy

SEMI/FPD

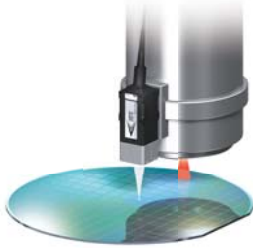
Abrasion profile measurement of target material



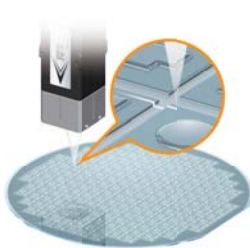
Curvature measurement of rolled glass



height measurement of wafer



Gap measurement of electronic chips **ZW-5000**



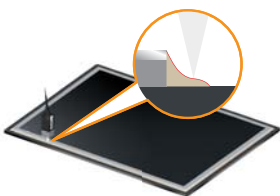
Z axis adjustment of chip mounter



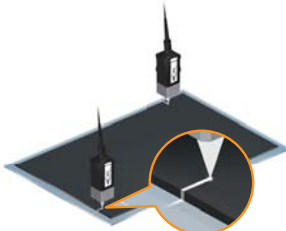
Profile measurement of solder on substrate **ZW-5000**



Profile measurement of silicon **ZW-5000**

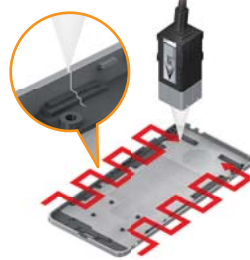


Position inspection of film lamination **ZW-5000**



Smart phone (component process)

Level measurement of casing **ZW-5000**



Flatness measurement of cases



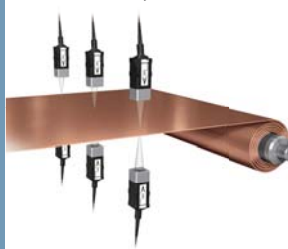
Flatness measurement of cover glass



Groove measurement of camera modules



Thickness measurement of battery sheets



Flatness measurement of batteries



LED potting shape measurement



Coplanarity measurement of connector pins



Smart phone
(assembly process)

Height measurement of assembled parts



Case width measurement



Level difference measurement between buttons and case

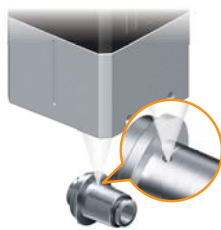


Level difference measurement of logos



Automotive parts

Depth measurement of hole on metal component



Thickness measurement of motor cores



Surface deflection measurement of rotary parts



Profile inspection of sealing materials for assembled parts



Profile inspection of friction materials for clutch



Eccentricity measurement of motor



Flatness measurement of transmission parts

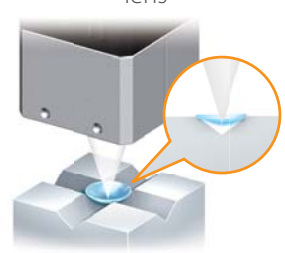


Assembly measurement of ECU boards



Pharmaceuticals

Thickness measurement of lens



Liquid level measurement in small-diameter vessels



Curvature measurement of glass surface



Operation inspection of connecting point of relay



Confocal Fiber Displacement Sensor ZW-7000/5000 Series

Reliable measurements for any material and surface types

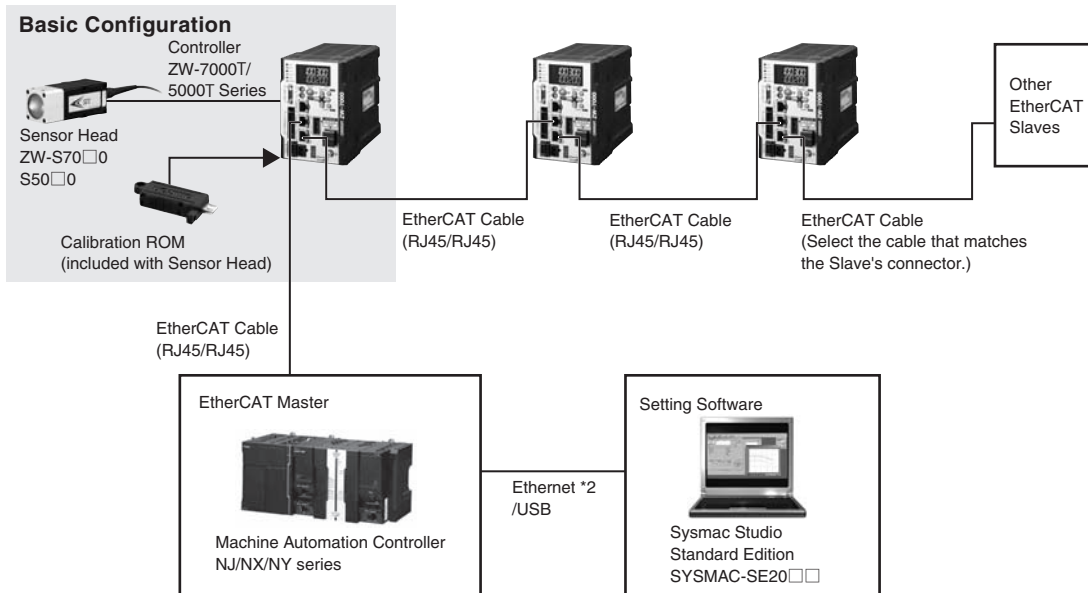
- Measuring shiny objects with an inclination of $\pm 25^\circ$
- $\pm 0.5 \mu\text{m}$ or less linearity for various materials
- Sampling rate as fast as 20 μs
- Small spot diameter of 10 μm or less

Note: Angle characteristic, linearity, sampling period and spot diameter given in the cover differ among models. Please ask OMRON sales representative for details.

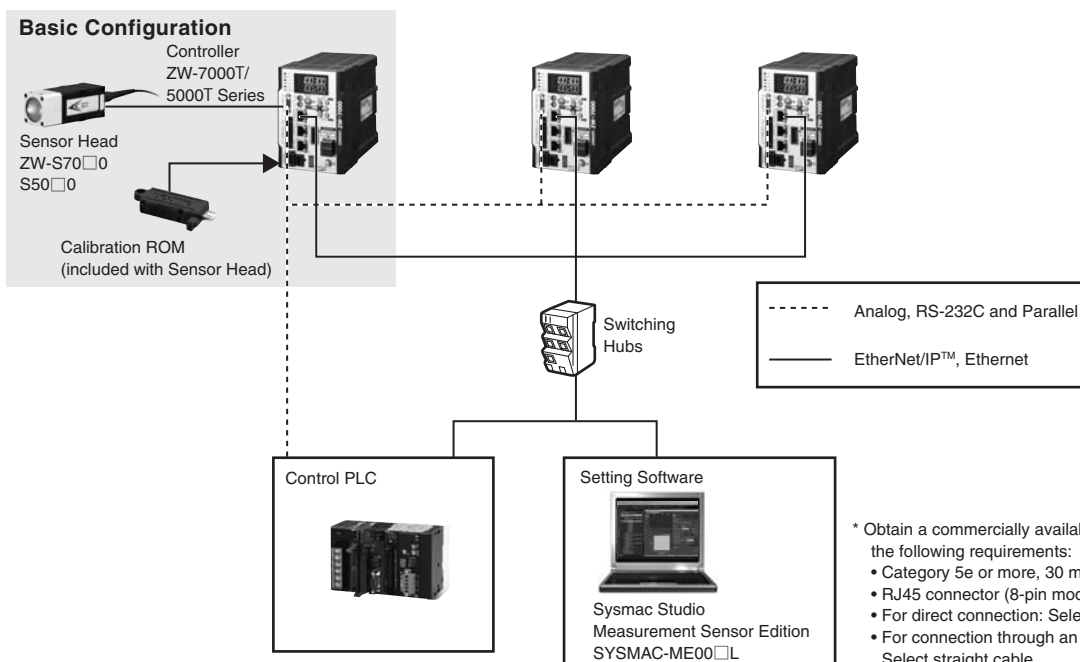


System Configuration

EtherCAT connections



Analog, EtherNet/IP, Ethernet, RS-232C and Parallel connections


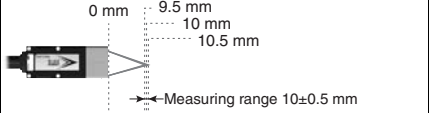
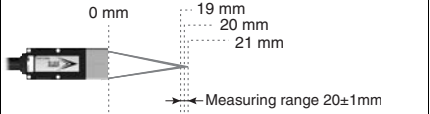
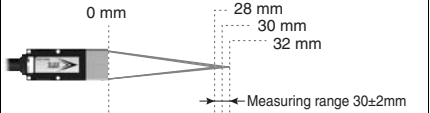


- * Obtain a commercially available Ethernet cable satisfying the following requirements:
- Category 5e or more, 30 m or less
 - RJ45 connector (8-pin modular jack)
 - For direct connection: Select cross cable.
 - For connection through an industrial switching hub: Select straight cable.

Order Information


ZW-7000

●Sensor Head



Appearance	Measuring range	Spot diameter	Static resolution *	Cable length	Model
	 <p>0 mm 9.5 mm 10 mm 10.5 mm ← Measuring range 10±0.5 mm</p>	50 μm dia.	0.25 μm	2 m	ZW-S7010 2M
				0.3 m	ZW-S7010 0.3M
	 <p>0 mm 19 mm 20 mm 21 mm ← Measuring range 20±1mm</p>	70 μm dia.	0.25 μm	2 m	ZW-S7020 2M
				0.3 m	ZW-S7020 0.3M
	 <p>0 mm 28 mm 30 mm 32 mm ← Measuring range 30±2mm</p>	100 μm dia.	0.25 μm	2 m	ZW-S7030 2M
				0.3 m	ZW-S7030 0.3M

* Values when the controller ZW-7000T is used.

●Controller with EtherCAT

Appearance	Power supply	Output type	Model
	24VDC	NPN/PNP	ZW-7000T


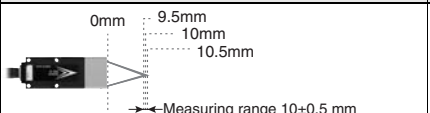
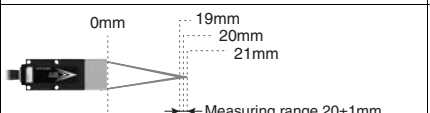
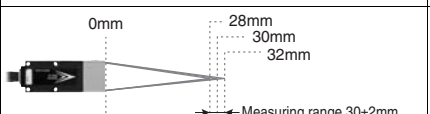
●Cable

Appearance	Item	Cable length	Model
	Extension Fiber Cable (from Sensor Head to Controller), (Fiber Adapter ZW-XFCM is included)	2 m	ZW-XF7002R
		5 m	ZW-XF7005R
		10 m	ZW-XF7010R
		20 m	ZW-XF7020R
		30 m	ZW-XF7030R
	Fiber Adapter (used between Sensor Head pre-wired cable and Extension Fiber Cable)	—	ZW-XFCM

Note: Cables of 10, 20, and 30 m can be used with the firmware version 2.10 or later. If you have an old version controller, register as a Sysmac member and download the latest firmware and tools to update your controller. Refer to the Sysmac member registration sheet that is enclosed with the controller for details on member registration and firmware download.


ZW-5000

●Sensor Head



Appearance	Measuring range	Spot diameter	Static resolution *	Cable length	Model
	 <p>0mm 9.5mm 10mm 10.5mm ← Measuring range 10±0.5 mm</p>	9 μm dia.	0.25 μm	2 m	ZW-S5010 2M
				0.3 m	ZW-S5010 0.3M
	 <p>0mm 19mm 20mm 21mm ← Measuring range 20±1mm</p>	13 μm dia.	0.25 μm	2 m	ZW-S5020 2M
				0.3 m	ZW-S5020 0.3M
	 <p>0mm 28mm 30mm 32mm ← Measuring range 30±2mm</p>	18 μm dia.	0.25 μm	2 m	ZW-S5030 2M
				0.3 m	ZW-S5030 0.3M

* Values when the controller ZW-5000T is used.

●Controller with EtherCAT

Appearance	Power supply	Output type	Model
	24VDC	NPN/PNP	ZW-5000T




●Cable

Appearance	Item	Cable length	Model
	Extension Fiber Cable (from Sensor Head to Controller), (Fiber Adapter ZW-XFC2 is included)	2 m	ZW-XF5002R
		5 m	ZW-XF5005R
		10 m	ZW-XF5010R
		20 m	ZW-XF5020R
		30 m	ZW-XF5030R
	Fiber Adapter (used between Sensor Head pre-wired cable and Extension Fiber Cable)	-	ZW-XFC2

Note: Cables of 10, 20, and 30 m can be used with the firmware version 2.10 or later. If you have an old version controller, register as a Sysmac member and download the latest firmware and tools to update your controller. Refer to the Sysmac member registration sheet that is enclosed with the controller for details on member registration and firmware download.

ZW-7000/5000 Series





●Common cables

Appearance	Item	Cable length	Model
	Parallel cable for ZW-7000T/5000T 32-pole (included with Controller ZW-7000T/5000T)	2 m	ZW-XCP2E
	RS-232C Cable for personal computer	2 m	ZW-XRS2
	RS-232C Cable for PLC/programmable terminal	2 m	ZW-XPT2

●Recommended EtherCAT Communications Cables

Use Straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape) for EtherCAT.

●Cable with Connectors

Item	Appearance	Recommended manufacturer	Cable length(m) *1	Model
Standard type Cable with Connectors on Both Ends (RJ45/RJ45) Wire Gauge and Number of Pairs: AWG26, 4-pair Cable Cable Sheath material: LSZH *2 Cable color: Yellow *3		OMRON	0.3	XS6W-6LSZH8SS30CM-Y
			0.5	XS6W-6LSZH8SS50CM-Y
			1	XS6W-6LSZH8SS100CM-Y
			2	XS6W-6LSZH8SS200CM-Y
			3	XS6W-6LSZH8SS300CM-Y
			5	XS6W-6LSZH8SS500CM-Y
Rugged type Cable with Connectors on Both Ends (RJ45/RJ45) Wire Gauge and Number of Pairs: AWG22, 2-pair Cable		OMRON	0.3	XS5W-T421-AMD-K
			0.5	XS5W-T421-BMD-K
			1	XS5W-T421-CMD-K
			2	XS5W-T421-DMD-K
			5	XS5W-T421-GMD-K
			10	XS5W-T421-JMD-K
Rugged type Cable with Connectors on Both Ends (M12 Straight/RJ45) Wire Gauge and Number of Pairs: AWG22, 2-pair Cable		OMRON	0.3	XS5W-T421-AMC-K
			0.5	XS5W-T421-BMC-K
			1	XS5W-T421-CMC-K
			2	XS5W-T421-DMC-K
			5	XS5W-T421-GMC-K
			10	XS5W-T421-JMC-K
Rugged type Cable with Connectors on Both Ends (M12 Right-angle/RJ45) Wire Gauge and Number of Pairs: AWG22, 2-pair Cable		OMRON	0.3	XS5W-T422-AMC-K
			0.5	XS5W-T422-BMC-K
			1	XS5W-T422-CMC-K
			2	XS5W-T422-DMC-K
			5	XS5W-T422-GMC-K
			10	XS5W-T422-JMC-K

Note: For details, refer to Cat.No.G019.

*1. Standard type cables length 0.2, 0.3, 0.5, 1, 1.5, 2, 3, 5, 7.5, 10, 15 and 20m are available.

Rugged type cables length 0.3, 0.5, 1, 2, 3, 5, 10 and 15m are available.

*2. The lineup features Low Smoke Zero Halogen cables for in-cabinet use and PUR cables for out-of-cabinet use.

*3. Cables colors are available in blue, yellow, or Green


●Cables / Connectors

Wire Gauge and Number of Pairs: AWG24, 4-pair Cable

Item	Appearance	Recommended manufacturer	Model
Cables	—	Hitachi Metals, Ltd.	NETSTAR-C5E SAB 0.5 × 4P *
	—	Kuramo Electric Co.	KETH-SB *
	—	SWCC Showa Cable Systems Co.	FAE-5004 *
RJ45 Connectors	—	Panduit Corporation	MPS588-C *

* We recommend to use above cable and connector together.



Wire Gauge and Number of Pairs: AWG22, 2-pair Cable

Item	Appearance	Recommended manufacturer	Model
Cables	—	Kuramo Electric Co.	KETH-PSB-OMR *
	—	JMACS Japan Co.,Ltd.	PNET/B *
RJ45 Assembly Connector		OMRON	XS6G-T421-1 *

Note: Connect both ends of cable shielded wires to the connector hoods.



* We recommend to use above cable and connector together.

●Industrial switching hubs for Ethernet

Appearance	Number of ports	Failure detection	Current consumption	Model
	3	None	0.22A	W4S1-03B
	5	None	0.22A	W4S1-05B
		Supported		W4S1-05C

Note: Industrial switching hubs are cannot be used for EtherCAT.

●EtherCAT junction slaves

Appearance	Number of ports	Power supply voltage	Current consumption	Model
	3	20.4 to 28.8 VDC (24 VDC -15 to 20%)	0.08A	GX-JC03
	6		0.17A	GX-JC06

Note: 1. Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC□81/□82.
2. EtherCAT junction slaves cannot be used for EtherNet/IP™ and Ethernet.

●Automation Software Sysmac Studio

Please purchase a DVD and required number of licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. Each model of licenses does not include DVD.

Item	Specifications	Number of licenses		Media	Model	Standards
		— (Media only)	1 license*1			
Sysmac Studio Standard Edition Ver.1□□ *2	The Sysmac Studio is the software that provides an integrated environment for setting, programming, debugging and maintenance of machine automation controllers including the NJ/NX-series CPU Units, NY-series Industrial PC, EtherCat Slave, and the HMI. Sysmac Studio runs on the following OS. Windows 7 (32-bit/64-bit version)/Windows 8 (32-bit/64-bit version)/Windows 8.1 (32-bit/64-bit version)/Windows 10(32-bit/64-bit version) This software provides functions of the Measurement Sensor Edition. Refer to Sysmac Catalog (P072) for details such as supported models and functions.	— (Media only)	1 license*1	DVD	SYSMAC-SE200D	—
		1 license	3 license	—	SYSMAC-SE201L	—
Sysmac Studio Measurement Sensor Edition Ver.1.□□	Sysmac Studio Measurement Sensor Edition is a limited license that provides selected functions required for ZW-series Displacement Sensor settings. Because this product is a license only, you need the Sysmac Standard Edition DVD media to install it.	1 license	3 license	—	SYSMAC-ME001L	—
		—	—	—	SYSMAC-ME003L	—

*1. Multiple licenses are available for the Sysmac Studio (3, 10, 30, or 50 licenses).
*2. ZW-series is supported by Sysmac Studio version 1.18 or higher.

●Fiber Cleaner

Item	Recommended manufacturer	Model	Applicable Model		Contacts
			ZW-7000	ZW-5000	
Fiber Connector Cleaner *1	OMRON	ZW-XCL	Yes	Yes	OMRON
NEOCLEAN-M	NTT Advanced	ATC-NE-M1	Yes	No	*2
OPTIPOP R1	Technology Corporation	ATC-RE-01	No	Yes (Sensor Head only)	

*1. Place orders in units of boxes (contacting 10 units).
*2. Contacts
Japan: NTT Advanced Technology Corporation TEL: 0422-47-7888
China: GUANGZHOU LI CHENG OPTOELECTRONIC CO.,LTD. TEL: 020-8165 0508
Hong Kong: ComStar Communications Ltd. TEL: +852 2536 9737
Taiwan: Global Science Instruments Co., Ltd. TEL: +886-2-8913-2737 Ext. 33
India: Aishwarya Telecom Ltd. TEL: +91 40 2753 1324
Singapore: Masstron Pte Ltd TEL: (65) 6763 0309
Malaysia: Masstron Communication Solutions Sdn Bhd TEL: (603) 8061 0309
Thailand: Masstron (Thailand) Co.,Ltd TEL: (66-2) 319-9375/6
Vietnam: Masstron Pte Ltd (Singapore) TEL: (65) 6763 0309
Germany: AMS Technologies AG TEL: +49 (0)89 895 77 0
France: AMS Technologies S.A.R.L. TEL: +33 (0)1 64 86 46 00
Italy: AMS Technologies S.r.l. TEL: +39 0331 596 693
Spain: AMS Technologies S.L. TEL: +34 93 380 84 20
Netherlands: AMS Technologies AG (Germany) TEL: +49 (0)89 895 77 0
USA: AFL Telecommunications TEL: +1 (800) 235-3423

ZW-7000/5000 Series

Specifications

● Sensor Head

Item	Specifications					
	ZW-S7010	ZW-S7020	ZW-S7030	ZW-S5010	ZW-S5020	ZW-S5030
Sensor controller	ZW-7000T			ZW-5000T		
Measurement center distance	10 mm	20 mm	30 mm	10 mm	20 mm	30 mm
Measuring range	±0.5 mm *1	±1 mm*1	±2 mm*1	±0.5 mm	±1 mm	±2 mm
Static resolution *2	0.25 μm					
Linearity *3	±0.45 μm	±0.9 μm	±2.0 μm	±0.45 μm	±0.9 μm	±2.0 μm
Spot diameter (Total measurement range) *4	50 μm dia.	70 μm dia.	100 μm dia.	9 μm dia.	13 μm dia.	18 μm dia.
Measurement cycle *5	20 μs to 400 μs			80 μs to 1600 μs		
Operating ambient illumination	Illumination on object surface max.30000 Lx: (incandescent light)					
Ambient temperature range	Operation: 0 to 50°C, Storage: -15 to +60°C (No freezing and condensation)					
Ambient humidity range	Operation/storage: 35 or 85%RH (No condensation)					
Degree of protection	IP40 (IEC60529)					
Vibration resistance (destructive)	10 to 150 Hz (half amplitude 0.35 mm), 80 mins in each of X/Y/Z directions					
Shock resistance (destructive)	150 m/s ² , 6 direction, 3 times each (up/down, left/right, forward/backward)					
Temperature characteristic *6	0.6 μm/°C	1.1 μm/°C	1.8 μm/°C	0.6 μm/°C	1.1 μm/°C	1.8 μm/°C
LED Safety	Risk Group 3 (IEC62471)					
Material	Chassis: aluminum die cast Fiber cable sheath: PVC Calibration ROM: PC					
Fiber cable length	0.3 m, 2 m (flex-resistant cable)					
Fiber cable minimum bend radius	20 mm					
Insulation resistance (Calibration ROM)	Between case and all terminals: 20 MΩ (by 250 VDC)					
Dielectric strength (Calibration ROM)	Between case and all terminals: 1000 VAC, 50/60 Hz, 1 min					
Weight	Fiber cable length 0.3m Approx. 170g Fiber cable length 2m Approx. 180g					
Accessories	Calibration ROM fixing screws (M2) Fiber protection cap Strap × 2 Instruction Manual Precautions			Calibration ROM fixing screws (M2) Fiber protection cap Strap × 1 Instruction Manual Precautions		

*1. The measurement range is higher 28 μs than measurement cycle.

*2. Capacity value when OMRON standard mirror surface target is measured at the measurement center distance as the average of 16,384 times
The value when the controller ZW-7000T/5000T is connected

*3. Material setting for the OMRON standard mirror surface target: Error from an ideal straight line when measuring on mirror surface.

*4. Capacity value defined by $1/e^2$ (13.5%) of the peak optical intensity of the measurement wavelength.

*5. When an extension fiber cable of 5 m or longer is connected, the setting rage of the measurement cycle (exposure time) changes.

*6. Capacity value of temperature characteristic at the measurement center distance when fastened with an aluminum jig between the Sensor Head and the target and the Sensor Head and the Sensor Controller are set in the same temperature environment.

● Controller

Item	Specifications		
	ZW-7000T	ZW-5000T	
Input/output type	NPN/PNP dual type		
Number of connected sensor heads	1		
Sensor head compatibility	ZW-S70□□	ZW-S50□□	
Light source for measurement	White LED		
LED Safety	Risk Group 3 (IEC62471)		
Segment Display	Main display	11-segment white display, 6 digits	
	Sub-display	11-segment green display, 6 digits	
LED display	Status indicators	HIGH (orange), PASS (green), LOW (orange), STABILITY (green), ZERO (green), ENABLE (green), THRESHOLD-H (orange), THRESHOLD-L (orange), RUN (green)	
	EtherCAT indicator	ECAT RUN (green), L/A IN (Link/Activity IN) (green), L/A OUT (Link/Activity OUT) (green), ECAT ERR (red)	
External I/F	Ethernet	100BASE-TX/10BASE-T, Non-procedure (TCP/UDP), EtherNet/IP	
	EtherCAT	EtherCAT exclusive protocol 100BASE-TX	
	RS-232C	Max. 115,200 bps	
	Analog output terminal block	Analog voltage output (OUT V)	-10 V to +10 V, output impedance: 100 Ω
		Analog current output (OUT A)	4 mA to 20 mA, max. load resistance: 300 Ω
	32-pole expansion connector	Judgment output (HIGH/PASS/LOW)	Transistor output system Output voltage: 21.6 to 30 VDC Load current: 50 mA or less Residual voltage when turning ON: 2 V or less Leakage voltage when turning OFF: 0.1 mA or less
		Busy output (BUSY)	
		Alarm output (ALARM)	
		Enable output (ENABLE)	
		Sync flag output (SYNFLG)	
		Trigger busy output (TRIGBUSY)	
		Logging state output (LOGSTAT)	
		Logging error output (LOGERR)	
		Stability output (STABILITY)	
		Task state output (TASKSTAT)	
		LIGHT OFF input (LIGHT OFF)	
		Zero reset input (ZERO)	
Timing input (TIMING)	DC input system Input voltage: 24 VDC ± 10% (21.6 to 26.4 VDC) Input current: 7 mA Type. (24 VDC) ON voltage/ON current: 19 V/3 mA or less ON voltage/OFF current: 5 V/1 mA or less		
Reset input (RESET)			
Sync input (SYNC)	DC input system Input voltage: 24 VDC ± 10% (21.6 to 26.4 VDC) Input current: 7 mA Type. (24 VDC) ON voltage/ON current: 19 V/3 mA or more OFF voltage/OFF current: 5 V/1 mA or less		
Trigger input (TRIG)			
Bank	Currently selected bank output (BANK_OUT 1 to 3)	Transistor output system Output voltage: 21.6 to 30 VDC Load current: 50 mA or less Residual voltage when turning ON: 2 V or less Leakage voltage when turning OFF: 0.1 mA or less	
	Bank Selection input (BANK_SEL 1 to 3)	DC input system Input voltage: 24 VDC ± 10% (21.6 to 26.4 VDC) Input current: 7 mA Type. (24 VDC) ON voltage/ON current: 19 V/3 mA or more OFF voltage/OFF current: 5 V/1 mA or less	
Main functions	Exposure time	Automatic/Fixed	
	Measuring cycle *1	20 μs to 400 μs	
	Material setting	Standard/Mirror/Rough surfaces	
	Measurement item	Height/Thickness of transparent object/Calculation	
	Filtering	Median/Average/Differentiation/High pass/Low pass/Band pass	
	Output	Scaling/Different holds/Zero reset/Logging for a measured value	
	Display	Measured value/Threshold value/Analog output voltage or current value/Judgment result/Resolution/Light power/Internal logging condition /Peak amount of received light	
	Number of configurable banks	Max. 8 banks	
	Task process	Multi-task (up to 4 tasks per bank)	
	System	Save/Initialization/Display measured information/Communication settings/Sensor head calibration/Key-lock/Zero reset memory/Timing input	
Rating	Power supply voltage	21.6 to 26.4 VDC (including ripple)	
	Current consumption	800 mA max.	
	Insulation resistance	Across all lead wires and FG terminal: 20 MΩ (by 250 VDC)	
	Dielectric strength	Between all lead wires and FG terminal: 500 VAC, 50/60 Hz, 1 minute	
Environmental resistance	Degree of protection	IP20 (IEC60529)	
	Vibration resistance (destructive)	10 to 55 Hz (half amplitude 0.35 mm), 50 mins in each of X/Y/Z directions	
	Shock resistance (destructive)	150 m/s ² , 6 direction, 3 times each (up/down, left/right, forward/backward)	
	Ambient temperature range	Operation: 0 to 40°C, Storage: -15 to +60°C (No freezing and condensation)	
	Ambient humidity range	Operation/storage: 35 to 85%RH (No condensation)	
Grounding	D-type grounding (grounding resistance of 100 Ω or less) Note: For conventional Class D grounding		
Material	Chassis: PC		
Weight	Approx. 900g (main unit only), Approx. 150 g (Parallel cable)		
Accessories	Parallel cable (ZW-XCP2E)	Parallel cable (ZW-XCP2E)	
	10 Fiber cleaners (ZW-XCL) Instruction Manual Member registration sheet	10 Fiber cleaners (ZW-XCL) Fiber adapter cap, Strap × 1 Instruction Manual, Member registration sheet	

Note: The Export Trade Control Order compatible Controller (ZW-7000T/5000T) is available.
When using this Controller, the minimum resolution is 0.25 μm regardless of the connected Sensor Head and setting conditions.
*1. When an extension fiber cable of 5 m or longer is connected, the setting range of the measurement cycle (exposure time) changes.

ZW-7000/5000 Series

●EtherCAT Communications Specifications

Item	Specification
Communications standard	IEC61158 Type12
Physical layer	100BASE-TX(IEEE802.3)
Connectors	RJ45 × 2 ECAT IN: EtherCAT input ECAT OUT: EtherCAT output
Communications media	Category 5 or higher (cable with double, aluminum tape and braided shielding) is recommended.
Communications distance	Distance between nodes: 100 m max.
Process data	Variable PDO mapping
Mailbox (CoE)	Emergency messages, SDO requests, SDO responses, and SDO information
Distributed clock	Synchronization in DC mode.
LED display	L/A IN (Link/Activity IN) × 1, AL/A OUT (Link/Activity OUT) × 1, AECAT RUN × 1, AECAT ERR × 1

●Automation Software Sysmac Studio

Item	Operating environment *3
Operating system (OS) *1	Windows 7 (32-bit/64-bit version)/Windows 8 (32-bit/64-bit version)/Windows 8.1 (32-bit/64-bit version)/Windows 10(32-bit/64-bit version)
CPU	Windows computers with Intel® Celeron® processor 540 (1.8 GHz) or faster CPU. Intel® Core™ i5 M520 processor (2.4 GHz) or equivalent or faster recommended.
Main memory	2 GB min. 4 GB min. recommended
Hard disk	Minimum 4.6 GB of Hard disk space is required to install. *2
Display	XGA 1024 × 768, 16 million colors. WXGA 1280 × 800 min. recommended
Disk drive	DVD-ROM drive
Communications ports	USB port corresponded to USB 2.0, or Ethernet port *4
Supported languages	Japanese, English, German, French, Italian, Spanish, simplified Chinese, traditional Chinese, Korean

*1. Note about Sysmac Studio compatible operating systems: The required system and hard disk capacity differs according to the system environment.

*2. Separate logging memory is required to use the file logging function.

*3. Describes System Requirements and notes of Sysmac Studio Measurement Sensor Edition.

For detail of System Requirements and notes of Sysmac Studio Measurement Sensor Edition, refer to Sysmac Studio Version 1 Operation Manual.

*4. For information on how to connect a personal computer with the controller or other hardware and information on required cables, refer to manuals for each hardware.

●Version Information

ZW-7000/5000 Series and Sysmac Studio

Use the latest version of Sysmac Studio Standard Edition/Measurement Sensor Edition.

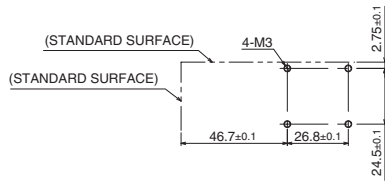
ZW Series	Version of Controller	Corresponding version of Sysmac Studio Standard Edition/Measurement Sensor Edition
ZW-7000□	Ver.2.03	Supported by version 1.15 or higher.
ZW-5000□	Ver.2.10	Supported by version 1.18 or higher.

External Dimensions

(Unit: mm)

Sensor Head

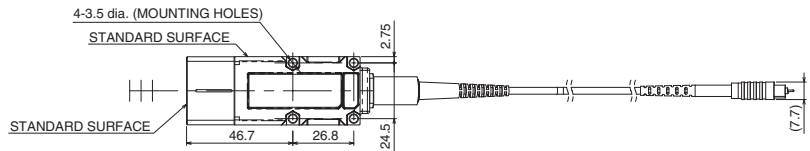
ZW-S7010 M/S7020 M/S7030 M



MOUNTING SCREW HOLES

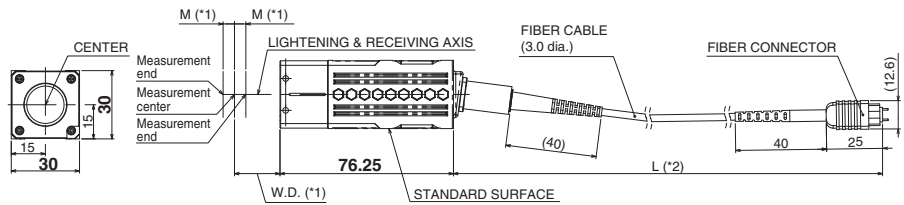
*1.

Type	W.D.	M
ZW-S7010	10	0.5
ZW-S7020	20	1
ZW-S7030	30	2

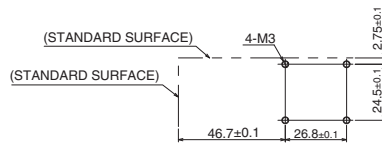


*2.

Length	L
0.3 m	(300)
2 m	(2000)



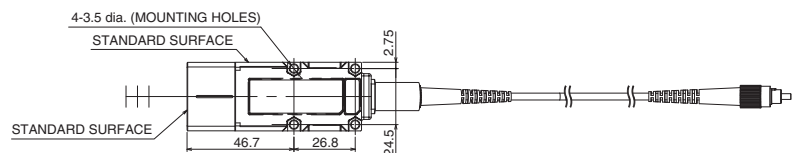
ZW-S5010 M/S5020 M/S5030 M



MOUNTING SCREW HOLES

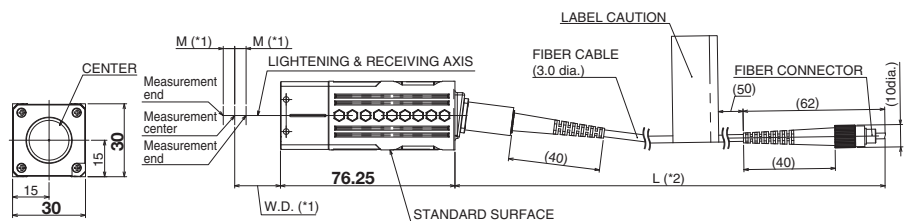
*1.

Type	W.D.	M
ZW-S5010	10	0.5
ZW-S5020	20	1
ZW-S5030	30	2



*2.

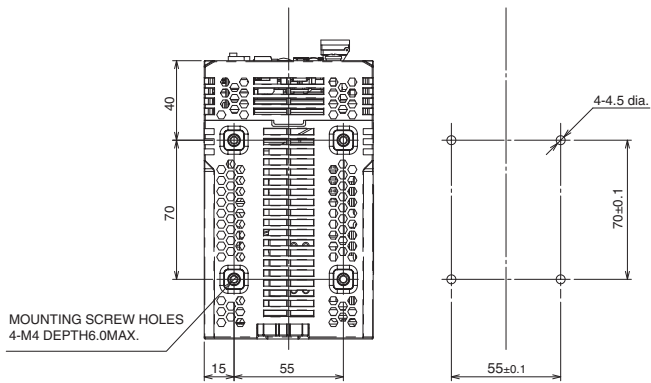
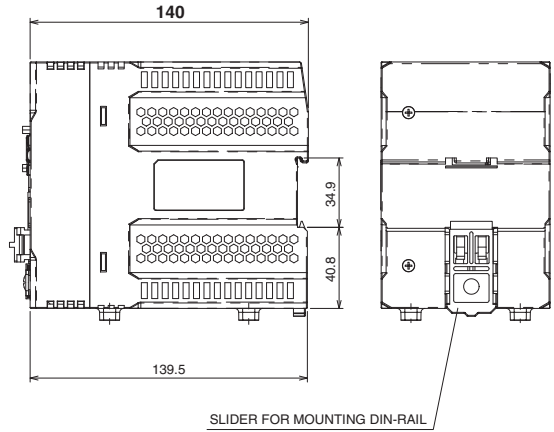
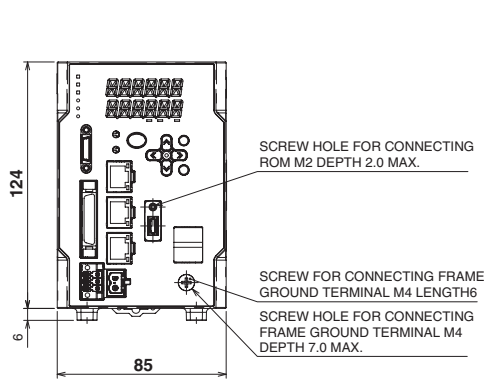
Length	L
0.3 m	(300)
2 m	(2000)



ZW-7000/5000 Series

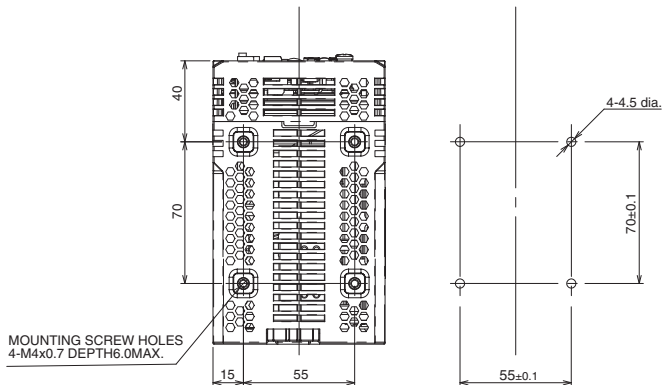
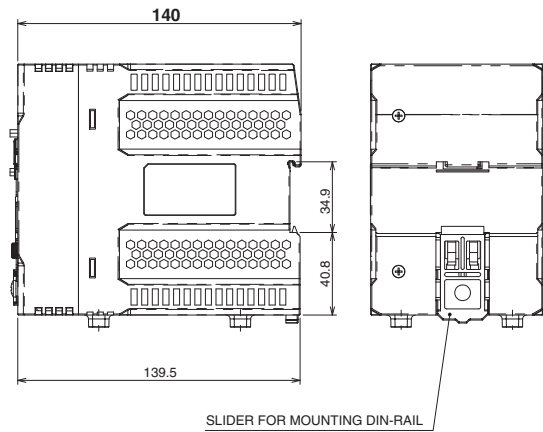
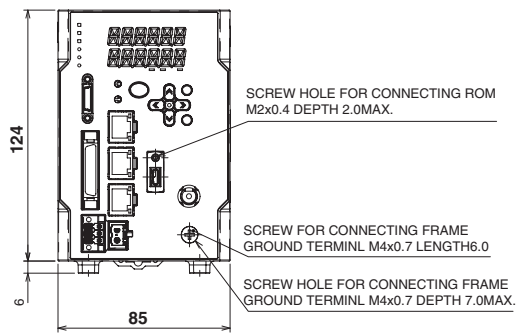
Controller

ZW-7000T



MOUNTING SCREW HOLES

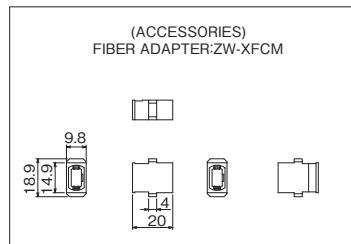
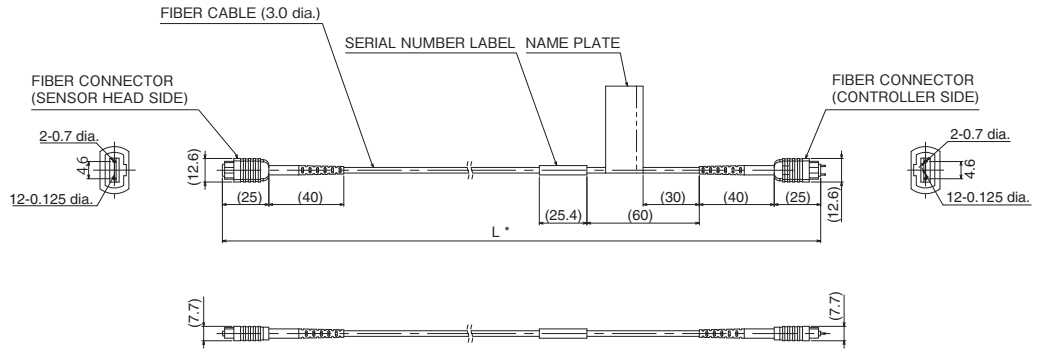
ZW-5000T



MOUNTING SCREW HOLES

Extension Fiber Cable

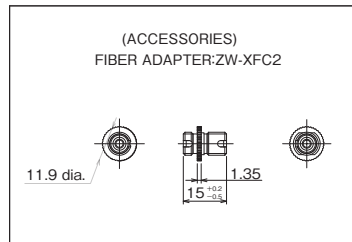
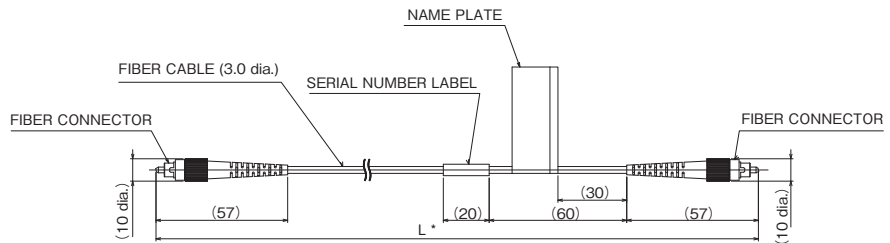
ZW-XF7002R/XF7005R/XF7010R/XF7020R/XF7030R



* The following table lists cable lengths per models.

Type	Specification	L
ZW-XF7002R	2 m	2000+40/0
ZW-XF7005R	5 m	5000+100/0
ZW-XF7010R	10 m	10000+200/0
ZW-XF7020R	20 m	20000+400/0
ZW-XF7030R	30 m	30000+600/0

ZW-XF5002R/XF5005R/XF5010R/XF5020R/XF5030R



* The following table lists cable lengths per models.

Type	Specification	L
ZW-XF5002R	2 m	2000+200/0
ZW-XF5005R	5 m	5000+200/0
ZW-XF5010R	10 m	10000+200/0
ZW-XF5020R	20 m	20000+500/0
ZW-XF5030R	30 m	30000+500/0

Related Manuals

Man.No.	Model number	Manual
Z362	ZW-7000□/5000□	Displacement Sensor ZW-7000/5000 User's Manual
Z363	ZW-7000□/5000□	Displacement Sensor ZW-7000/5000 User's Manual for Communications Settings
W504	SYSMAC-SE2	Sysmac Studio Version 1 Operation Manual

- Angle characteristic, linearity, sampling period and spot diameter given in the cover differ among models. Please ask Omron sales representative for details.
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OMRON Corporation Industrial Automation Company
Kyoto, JAPAN

Contact: www.ia.omron.com

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON ELECTRONICS LLC

2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Authorized Distributor:

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