OMRON

Confocal Fiber Displacement Sensor

ZW-7000/5000 Series

- Measuring shiny objects with an inclination of ±25°
- ±0.5 µm or less linearity for various materials
- Sampling rate as fast as 20 µs
- Small spot diameter of 10 µm or less

SYSMAC
always in control

Beyond laser displacement sensors

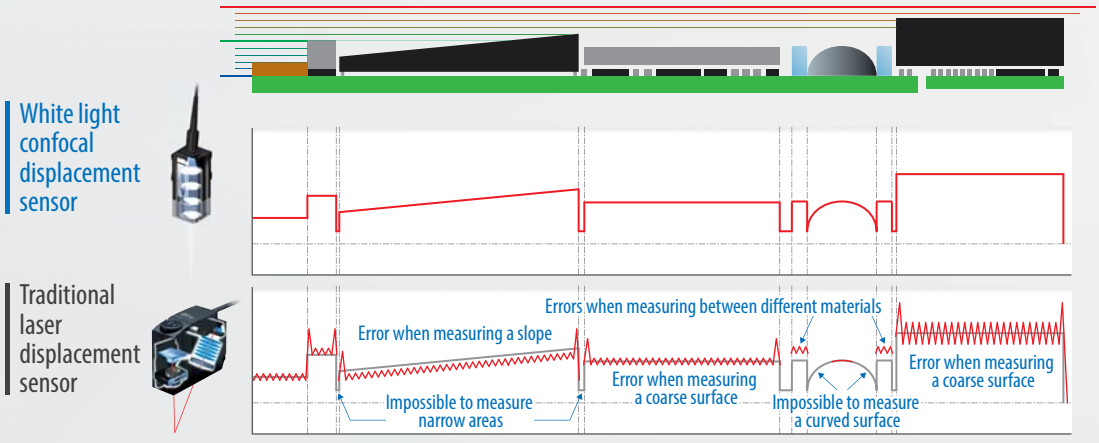
Just like a non-contact optical probe

New White light confocal principle

Measures while moving

Measures using white LED wavelengths (colors)

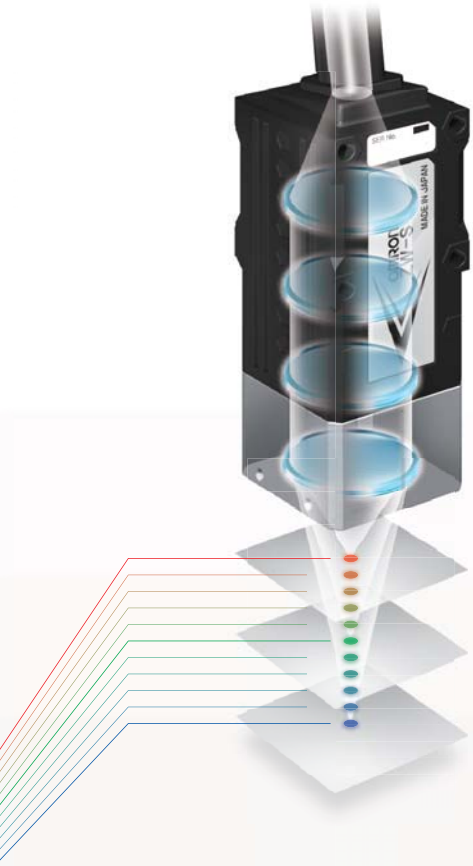
* Conceptual illustration



* 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

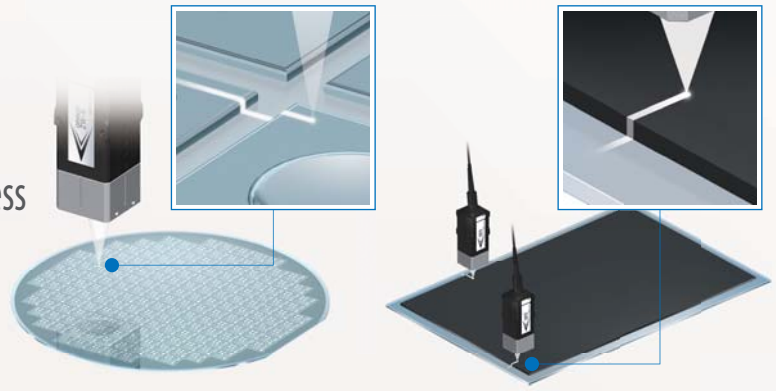
Expansion of lineup NEW

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.

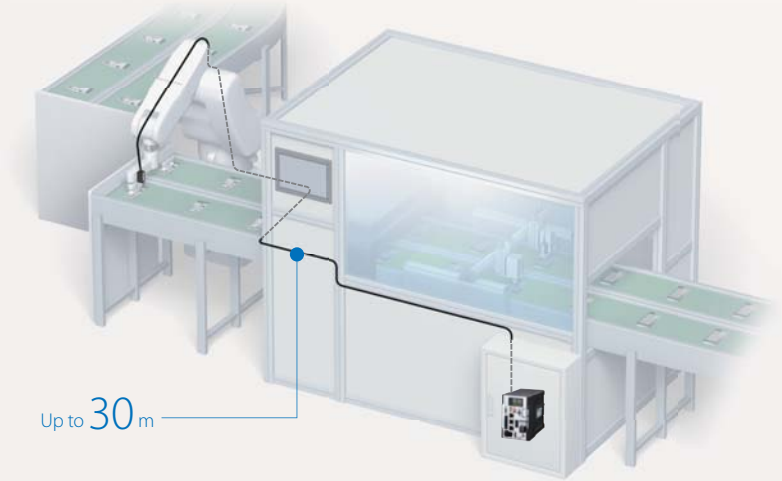


ZW-7000 ZW-5000

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.

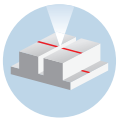


Measure accurately

For all quality inspections, from parts to finished products

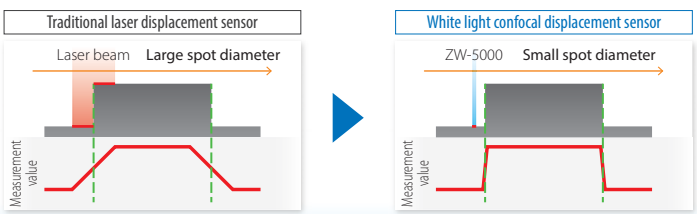
Strict quality control, demands for appearance inspection and production speed are constantly increasing. To meet these demands, stable measurements during movement for quality inspection without compromising manufacturing speed is required. Harnessing the benefits of the white light confocal principle, 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

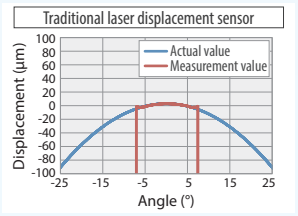
When measuring a level difference or opening with a traditional laser displacement sensor, reflection from multiple surfaces could blunt a profile and then the edge detection position could be shifted, thus resulting in a drop in precision of position detection, whereas the ZW-5000 with minimal spot 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.

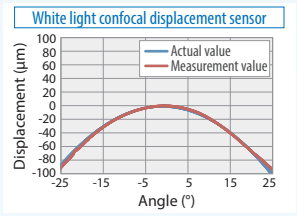


Inclined or curved surfaces

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





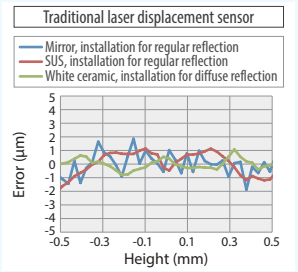
(ZW-S7010)

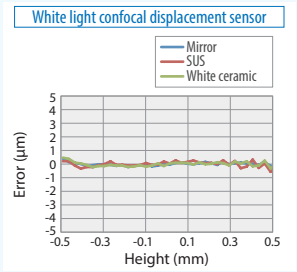
ZW-7000 ZW-5000

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-S7010)

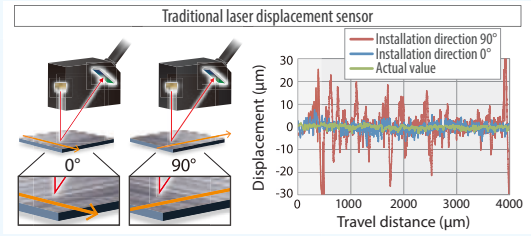
ZW-7000 ZW-5000

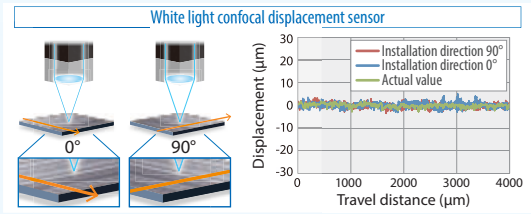
±0.5 µm or less linearity for different materials *1

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





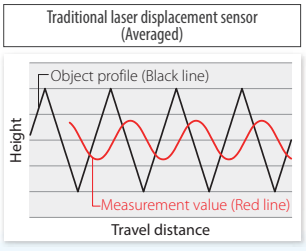
(ZW-S7020)*Please ask Omron sales representative for product data except ZW-S7020.

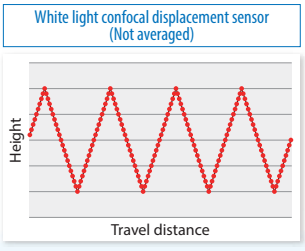
ZW-7000

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

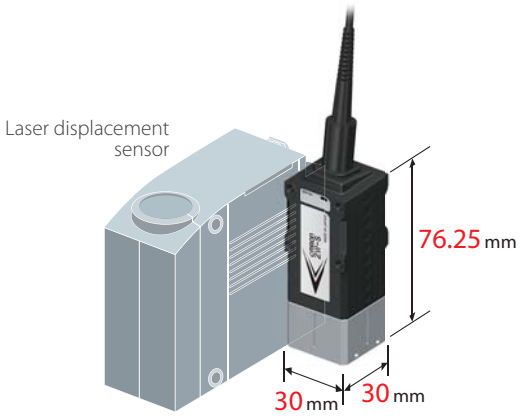
Minimum sampling period 20 µs

*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.



30 mm square
Approx. 180 g

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

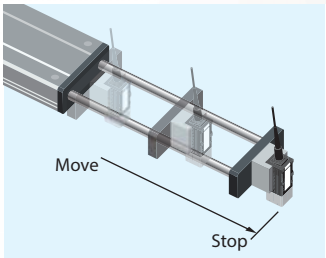
White light confocal displacement sensor
Side-by-side installation reduces measurement time

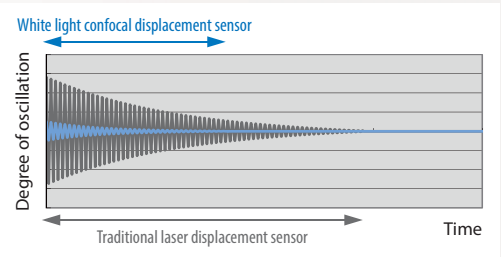
Measurement cycle time reduced by 60 % or more*

* 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.

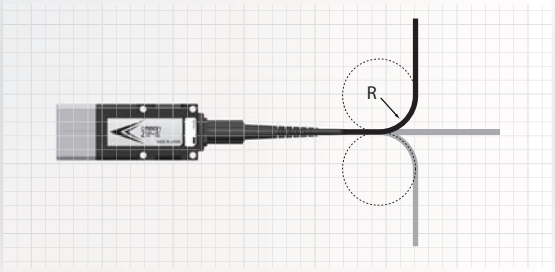




Flexible fiber cable for easy installation

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



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.

Traditional laser displacement sensor

White light confocal displacement sensor

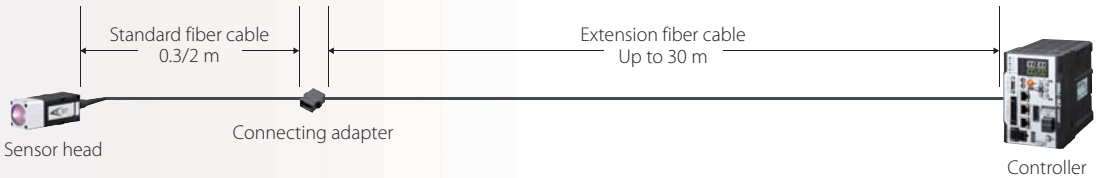
* Calculated when an object with an irregular surface was measured in both vertical and horizontal directions

>> Mechanism
P.13 Direction free

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"



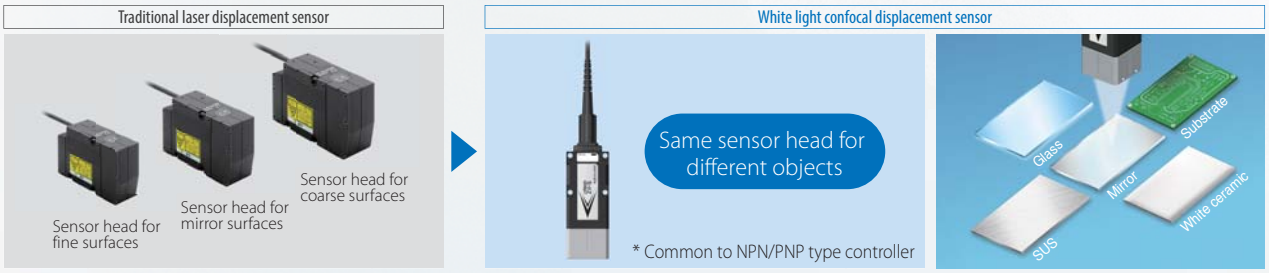
Set up quickly

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.

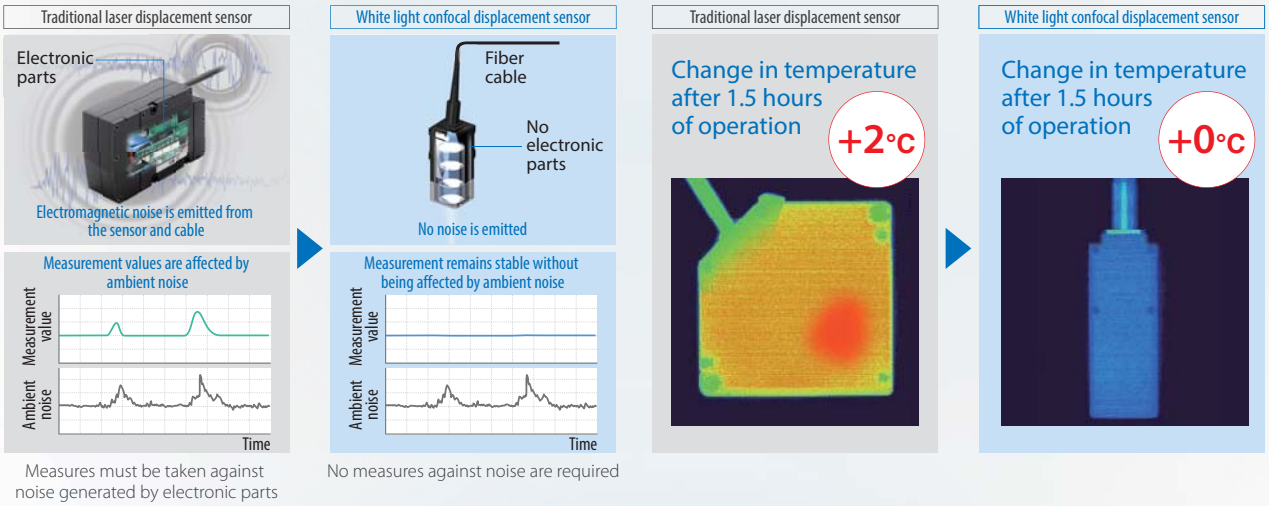
Easy device selection

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.



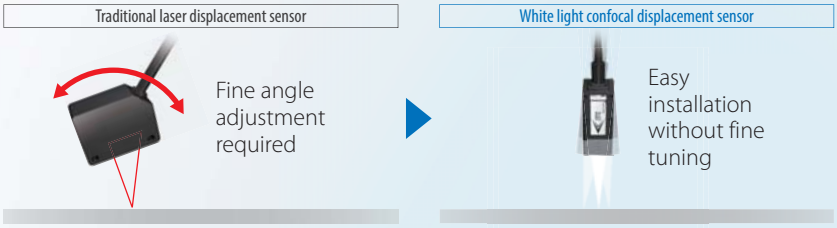
Reduced work - EMC measures and thermal design are not required

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.



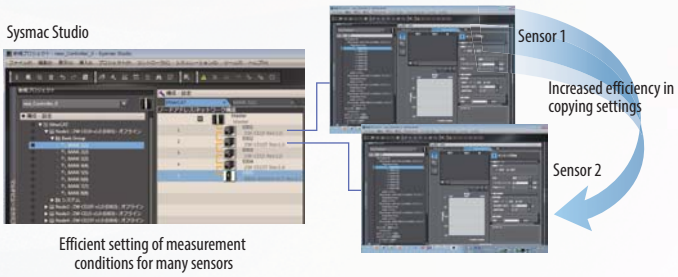
Reduced work for installation and tuning of sensor heads

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

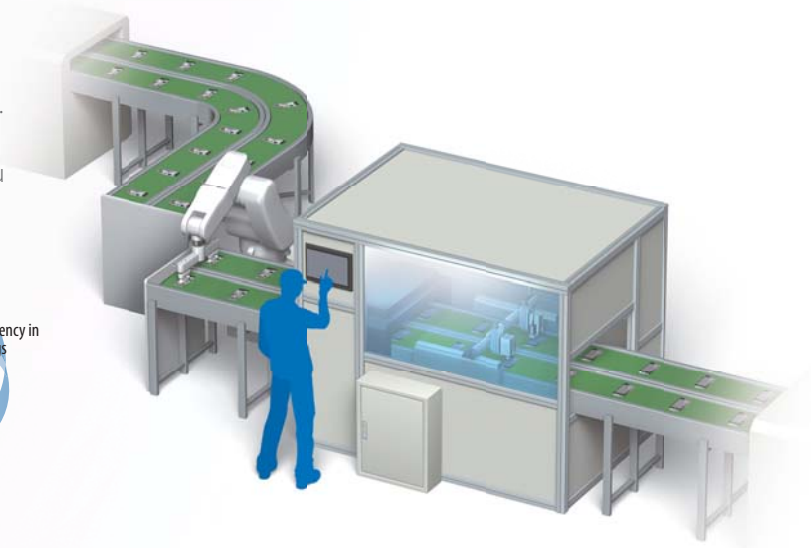


Efficient setting for multiple ZW-7000's

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.



Efficient setting of measurement conditions for many 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.

Provided DLL	· 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

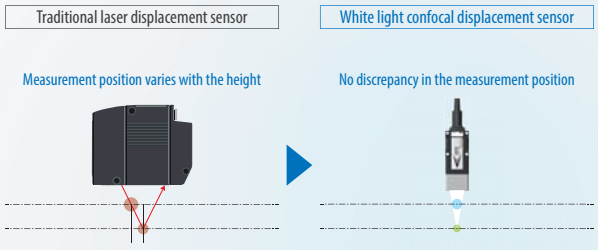
When a laser displacement sensor was used, a shield around the machine for safety was required and workers had to be trained for safe use.

* Do not look directly into the LED light.

Further Benefits of White light confocal

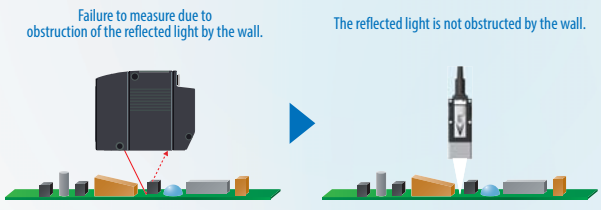
● No Discrepancy in the Measurement Point

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

PCAF

High speed
High precision
Compatibility

High photoconductivity Patent Pending

Precise Core Array Fiber

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 DESIGN

High speed
High precision
Compatibility

Compact size

Compact Form Design

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

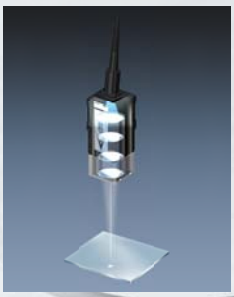
High speed
High precision
Compatibility

Low aberration

Advanced OCFL Module

OCFL

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

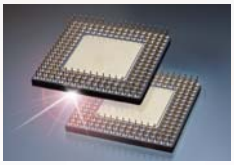
High speed
High precision
Compatibility

25 times faster data processing speed

High Speed Processor

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 speed
High precision
Compatibility

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.

* Conceptual illustration

High speed
High precision
Compatibility

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.

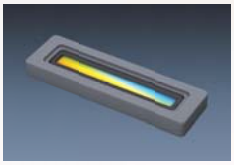
* Measurement values, emitted light amounts, or received light amounts can be logged.

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.

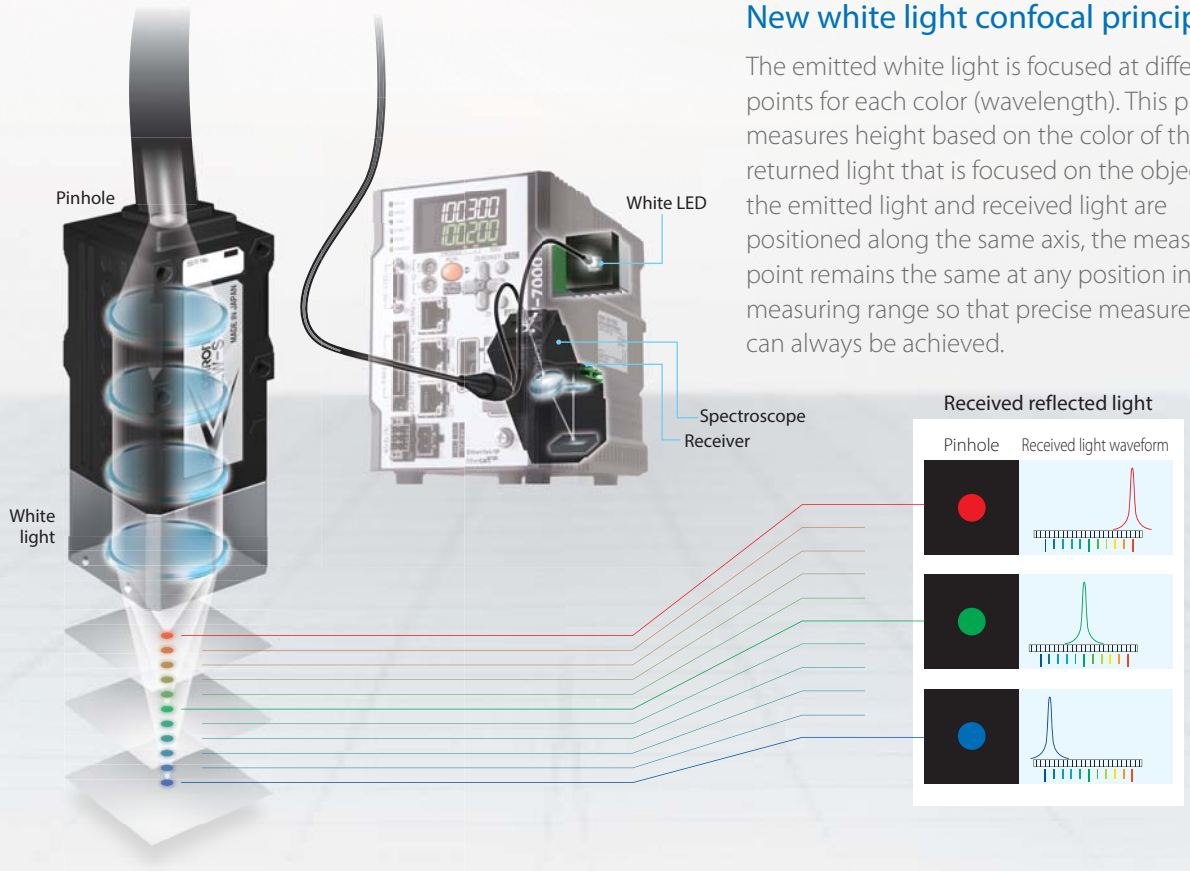


* Conceptual illustration

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.

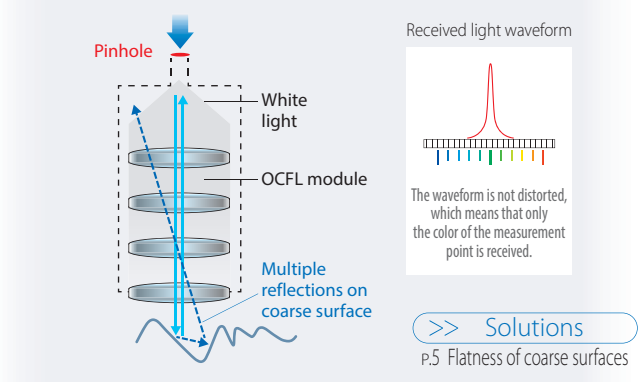


New white light confocal principle

The emitted white light is focused at different points for each color (wavelength). This principle measures height based on the color of the returned light that is focused on the object. As the emitted light and received light are positioned along the same axis, the measurement point remains the same at any position in the measuring range so that precise measurements can always be achieved.

Stable measurements of coarse surfaces

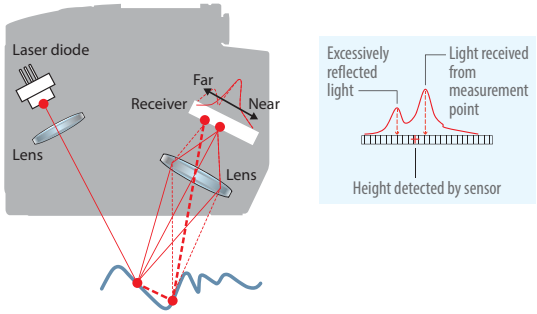
Only the light reflected from the measurement point enters the pinhole even if excessive light reflected from the object changes during movement. This enables stable and precise measurements.



>> Solutions
P.5 Flatness of coarse surfaces

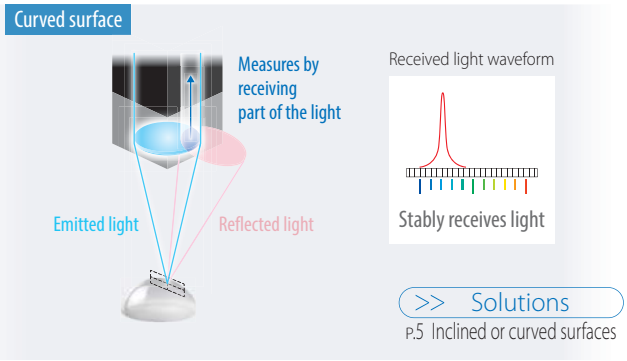
Laser triangulation principle

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.

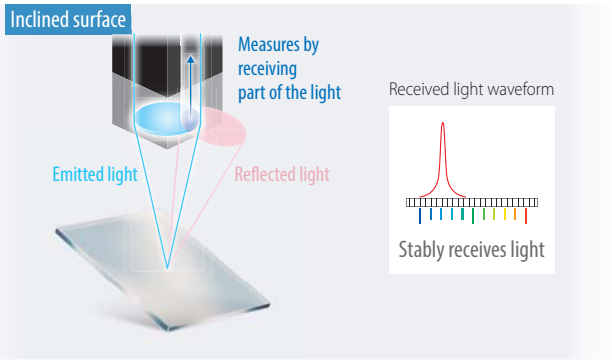


Angle characteristic

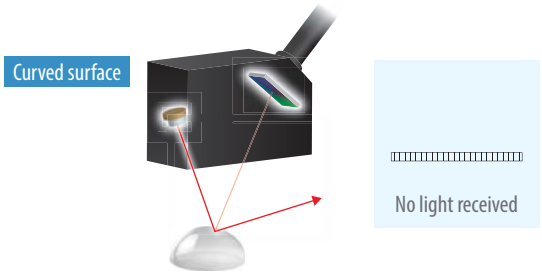
Because light is emitted directly from above, the reflected light is not widely diffused. The wavelength (position) can be obtained by receiving part of the light even if the reflected light amount is reduced. This enables stable height measurements.



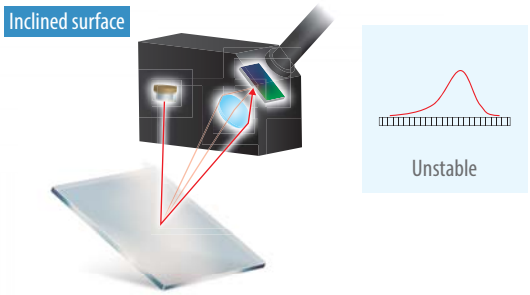
>> Solutions
P.5 Inclined or curved surfaces



Laser triangulation principle



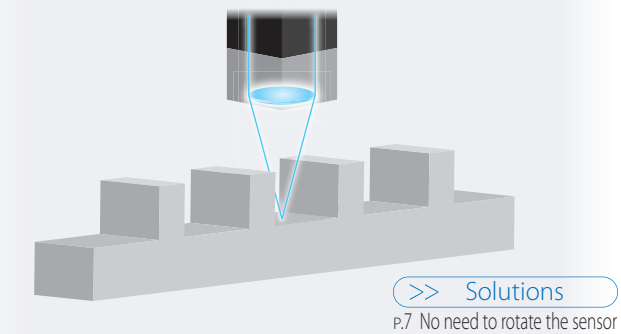
A laser spot beam is emitted obliquely from above. When the position of a glossy, regular-reflective object, where the beams are reflected in one direction, is shifted, the light reflected from the curved surface cannot be received.



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

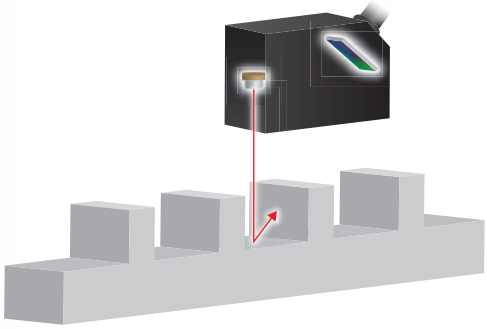
Stable measurement is not affected by moving directions of objects nor the sensor. This is achieved by emitting and receiving a cone-shaped beam of white light. This slim beam is also suitable for measurements in narrow areas.



>> 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

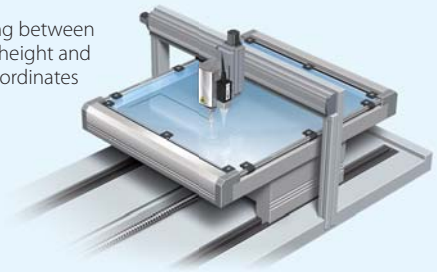
High-precision measurements of target positions during movement

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.

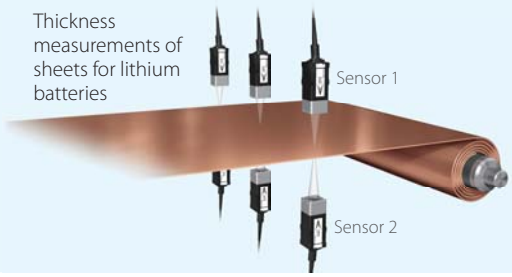
Linking between glass height and XY coordinates



Synchronous measurements with many sensors *

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

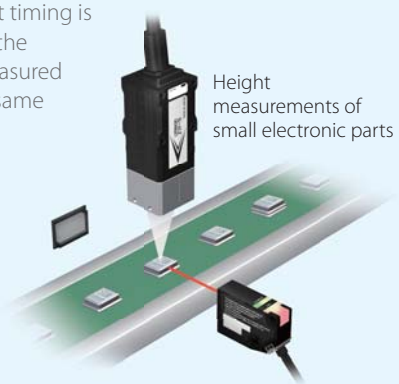
Thickness measurements of sheets for lithium batteries



Precise trigger measurements

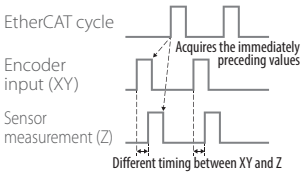
If the trigger input timing is always the same, the height can be measured accurately at the same position.

Height measurements of small electronic parts



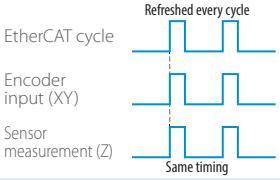
Timing chart

Previous EtherCAT communications



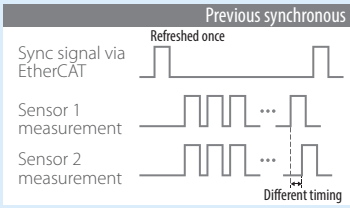
Differences between XY coordinates (position) and Z coordinate (height) occur due to fluctuations of EtherCAT cycles of 125 ns to several µs.

New EtherCAT communications



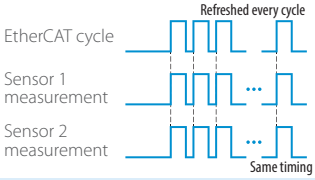
The XY coordinates (position) and Z coordinate (height) can be acquired at the same time by refreshing every cycle.

Previous synchronous measurements



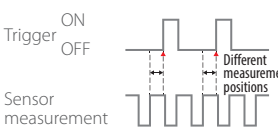
As the differences are accumulated during continuous measurements, synchronization signals must be input periodically.

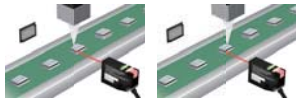
New synchronous measurements



No differences occur because timing is refreshed every cycle.

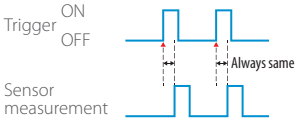
Previous trigger measurements

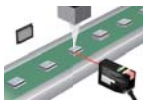




As the immediately preceding values are acquired, different positions are measured.

New trigger measurements

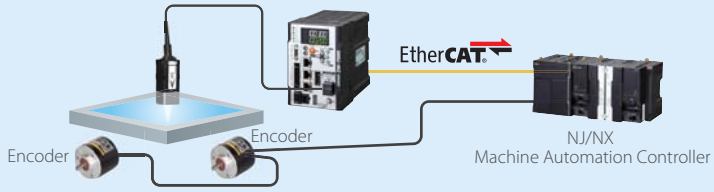




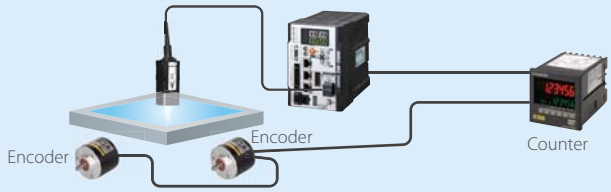
The same position can always be measured at regular intervals after trigger inputs.

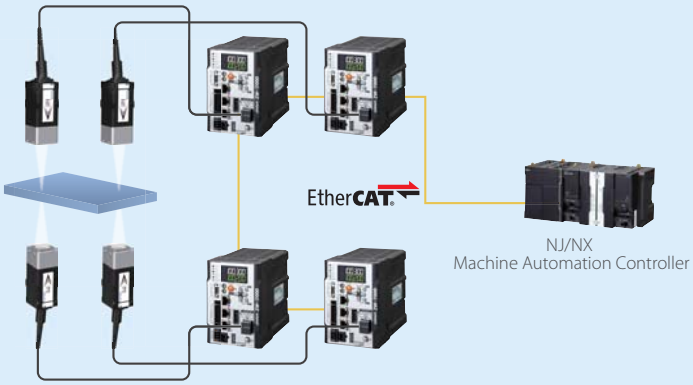
System configurations

Synchronous measurements using EtherCAT



Synchronous measurements using triggers instead of EtherCAT are possible.





Sysmac Library

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

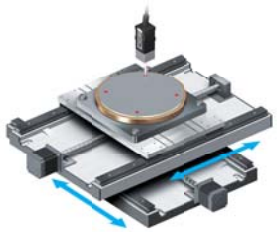
* This functionality is available on the firmware ver.2.10 or later.
If you register as a member after purchasing the product, the latest firmware for the controller is available for free. Refer to the member registration sheet that is enclosed with the product for details.

Applications

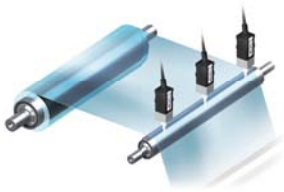
High-speed measurements in applications requiring high accuracy

SEMI/FPD

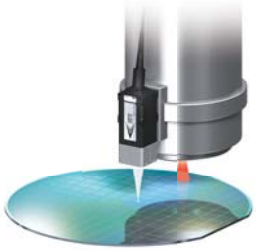
Abrasion profile measurement of target material



Curvature measurement of rolled glass

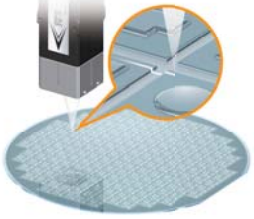


height measurement of wafer



ZW-5000

Gap measurement of electronic chips



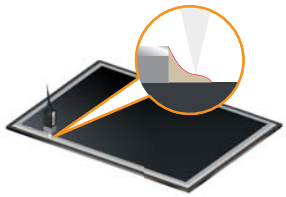
Z axis adjustment of chip mounter

ZW-5000

Profile measurement of solder on substrate

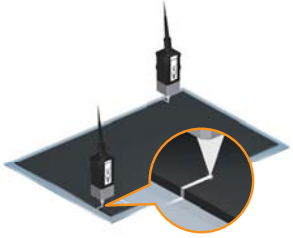
ZW-5000

Profile measurement of silicon



ZW-5000

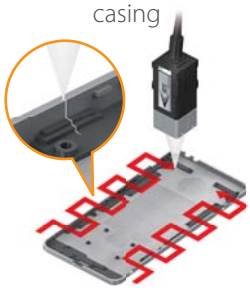
Position inspection of film lamination



Smart phone (component process)

ZW-5000

Level measurement of casing



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

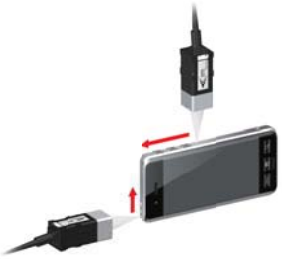
Coplanarity measurement of connector pins

Smart phone (assembly process)

Height measurement of assembled parts

Case width measurement

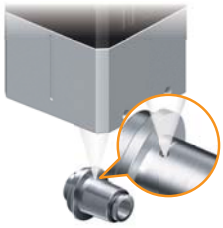
Level difference measurement between buttons and case



Level difference measurement of logos

Automotive parts

Depth measurement of hole on metal component



Profile inspection of friction materials for clutch

Thickness measurement of motor cores

Eccentricity measurement of motor

Surface deflection measurement of rotary parts

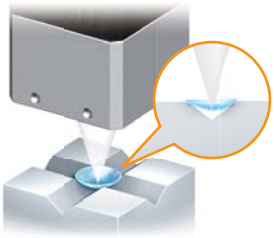
Flatness measurement of transmission parts

Profile inspection of sealing materials for assembled 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

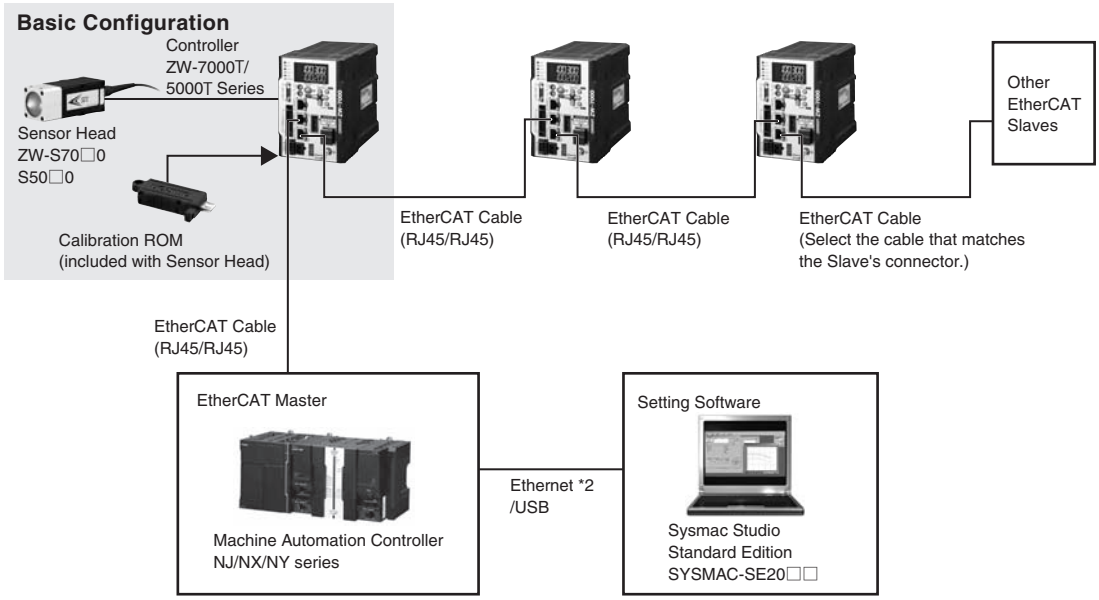
- Measuring shiny objects with an inclination of ±25°
- ±0.5 µm or less linearity for various materials
- Sampling rate as fast as 20 µs
- Small spot diameter of 10µm or less

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

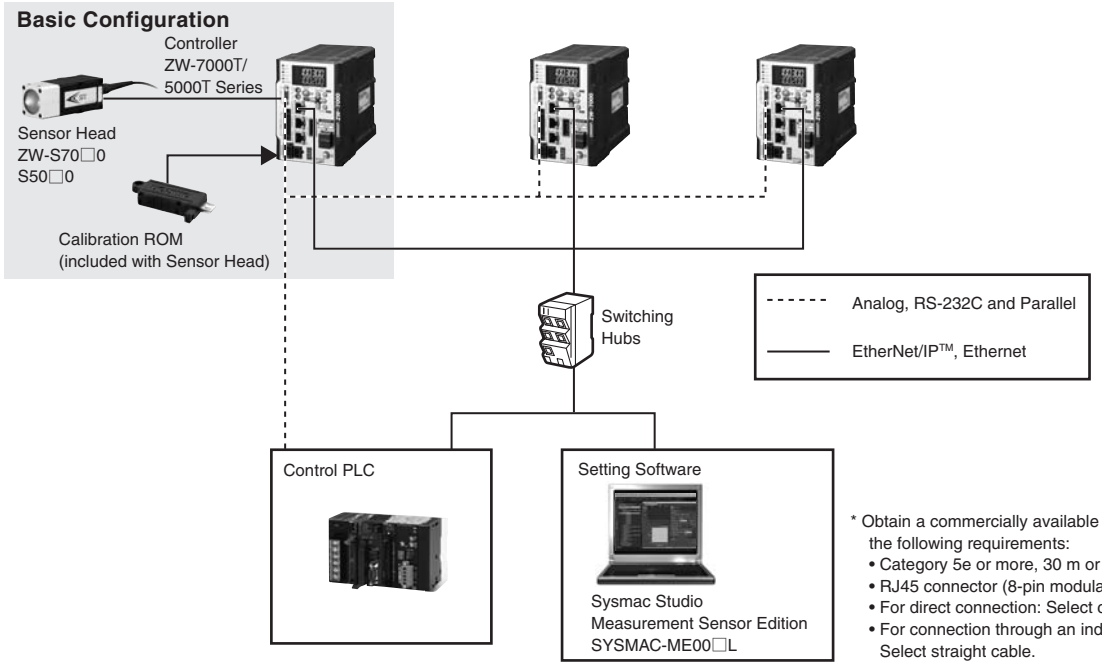
CE

System Configuration

EtherCAT connections



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

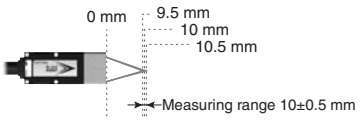
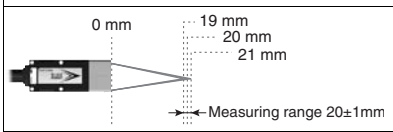
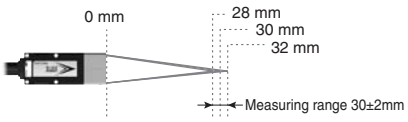


* Obtain a commercially available Ethernet cable satisfying the following requirements:
  - Category 5e or more, 30 m or less
  - RJ45 connector (8-pin modular jack)
  - For direct connection: Select cross cable.
  - For connection through an industrial switching hub: Select straight cable.

Order Information

ZW-7000

●Sensor Head

Appearance	Measuring range	Spot diameter	Static resolution *	Cable length	Model
		50 µm dia.	0.25 µm	2 m	**ZW-S7010 2M**
				0.3 m	**ZW-S7010 0.3M**
		70 µm dia.	0.25 µm	2 m	**ZW-S7020 2M**
				0.3 m	**ZW-S7020 0.3M**
		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**

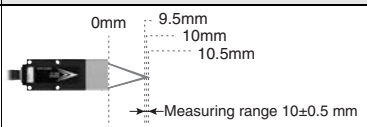
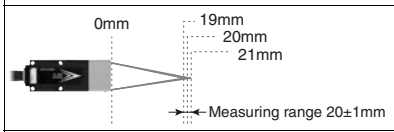
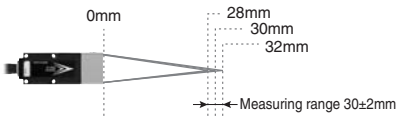
●Cable

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
		9 µm dia.	0.25 µm	2 m	**ZW-S5010 2M**
				0.3 m	**ZW-S5010 0.3M**
		13 µm dia.	0.25 µm	2 m	**ZW-S5020 2M**
				0.3 m	**ZW-S5020 0.3M**
		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

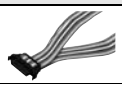
Appearance	Power supply	Output type	Model
	24VDC	NPN/PNP	**ZW-5000T**

●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.

●Common cables

Appearance	Item	Cable length	Model
	Parallel caable 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
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)	DVD	**SYSMAC-SE200D**	—
		1 license*1	—	**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	—	**SYSMAC-ME001L**	—
		3 license	—	**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 Technology Corporation	ATC-NE-M1	Yes	No	*2
OPTIPOP R1		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

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 measurent 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)		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/ON current: 5 V/1 mA or less	
		Zero reset input (ZERO)			
		Timing input (TIMING)			
		Reset input (RESET)			
		Sync input (SYNC)			
		Trigger input (TRIG)			
		Logging input (LOGGING)			
		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	80 µs to 1600 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) 10 Fiber cleaners (ZW-XCL) Instruction Manual Member registration sheet	Parallel cable (ZW-XCP2E) 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 rage of the measurement cycle (exposure time) changes.

●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 dots or higher resolution is 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.

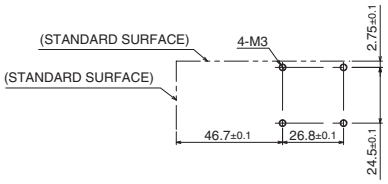
ZW Series	Version of Controller	Corresponding version of Sysmac Studio Standard Edition/Measurement Sensor Edition
ZW-7000□	Ver.2.03	Supported by version 1.15 or higher.
ZW-5000□	Ver.2.10	Supported by version 1.18 or higher.

External Dimensions

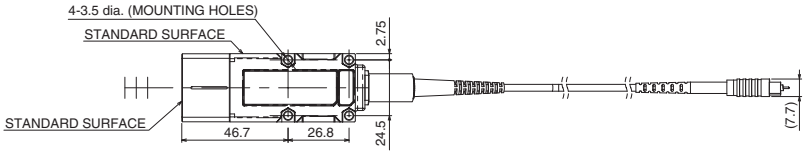
(Unit: mm)

Sensor Head

ZW-S7010 □M/S7020 □M/S7030 □M



MOUNTING SCREW HOLES

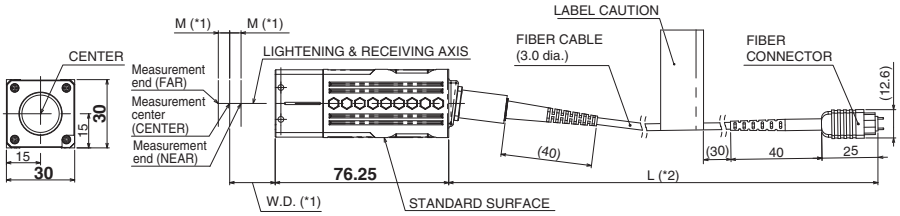


*1.

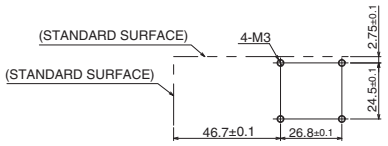
Type	W.D.	M
ZW-S7010	10	0.5
ZW-S7020	20	1
ZW-S7030	30	2

*2.

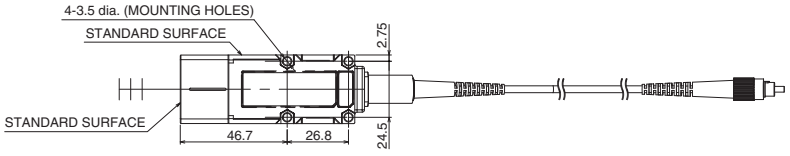
Length	L
0.3 m	(300)
2 m	(2000)



ZW-S5010 □M/S5020 □M/S5030 □M



MOUNTING SCREW HOLES

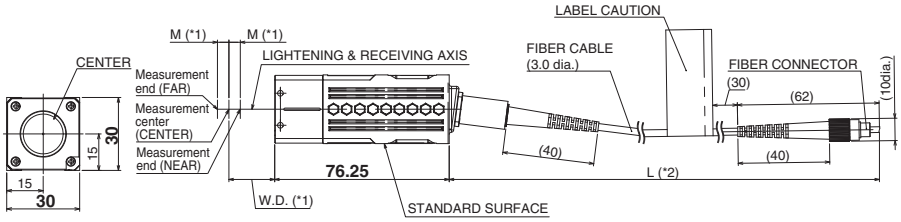


*1.

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

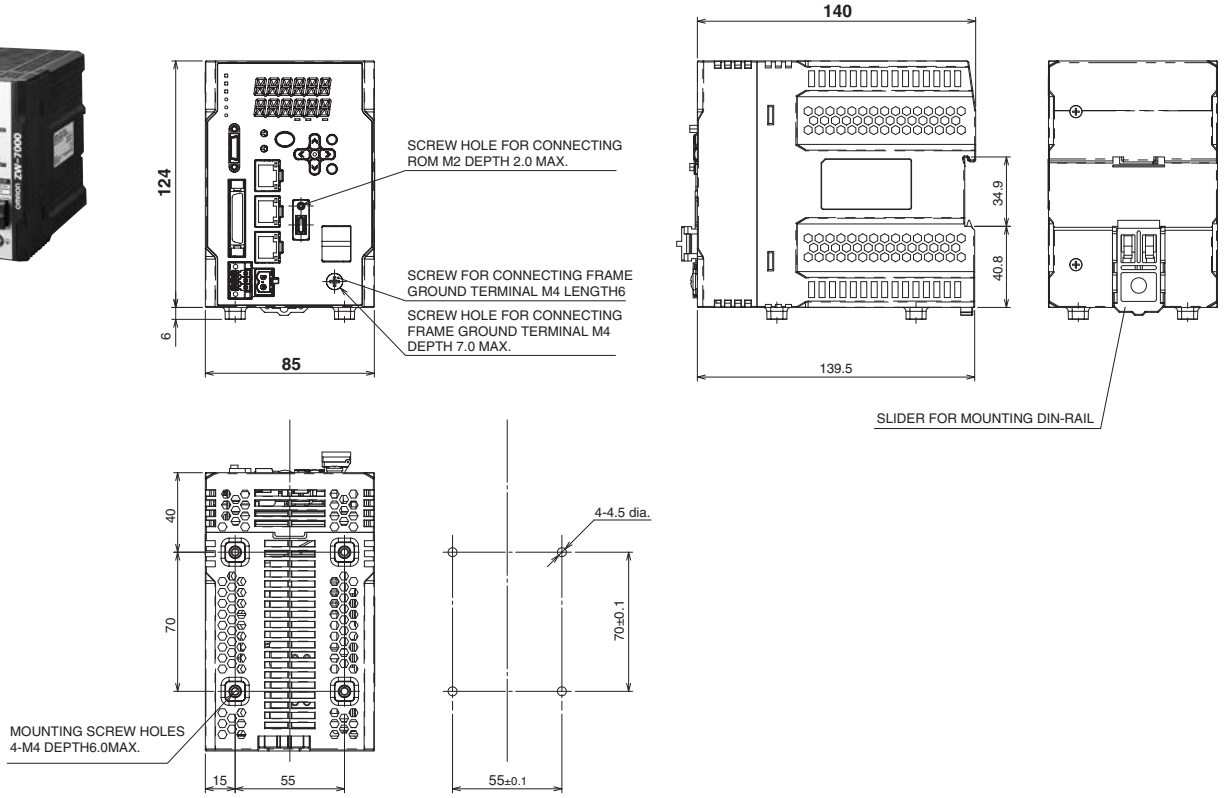
*2.

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



Controller

ZW-7000T



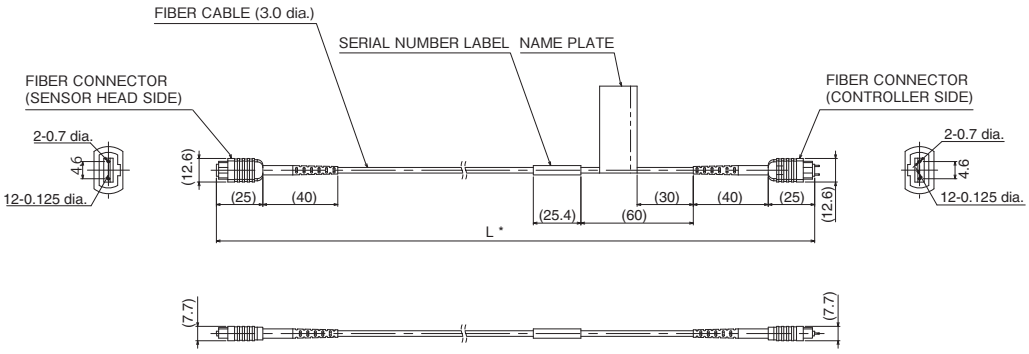
MOUNTING SCREW HOLES

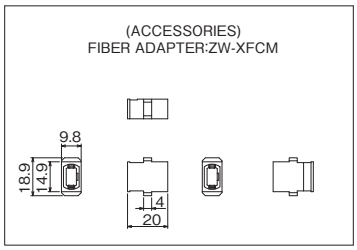
ZW-5000T

MOUNTING SCREW HOLES

Extension Fiber Cable

ZW-XF7002R/XF7005R/XF7010R/XF7020R/XF7030R

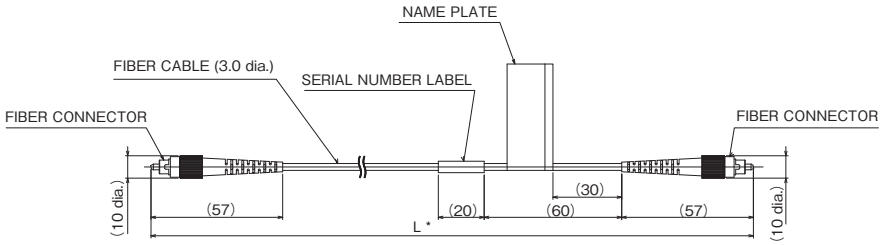


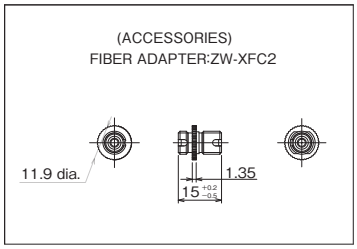


* The following table lists cable lengths per models.

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.

· EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

· EtherNet/IP™ is a trademark of ODVA.

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