OMRON

Confocal Fiber Displacement Sensor

ZW-7000 Series

SYSMAC
always in control

Beyond laser displacement sensors

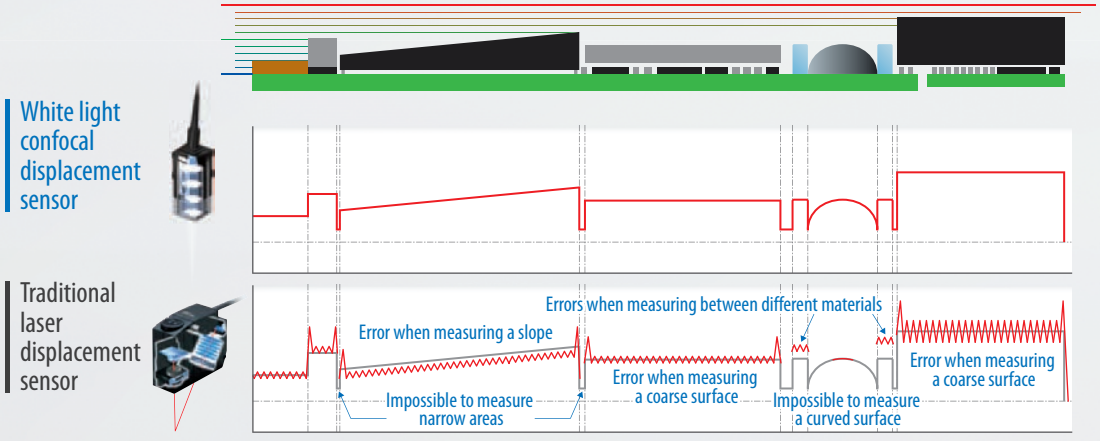
Just like a non-contact optical probe

New **White light confocal principle**

Measures while moving

Measures using white LED wavelengths (colors)

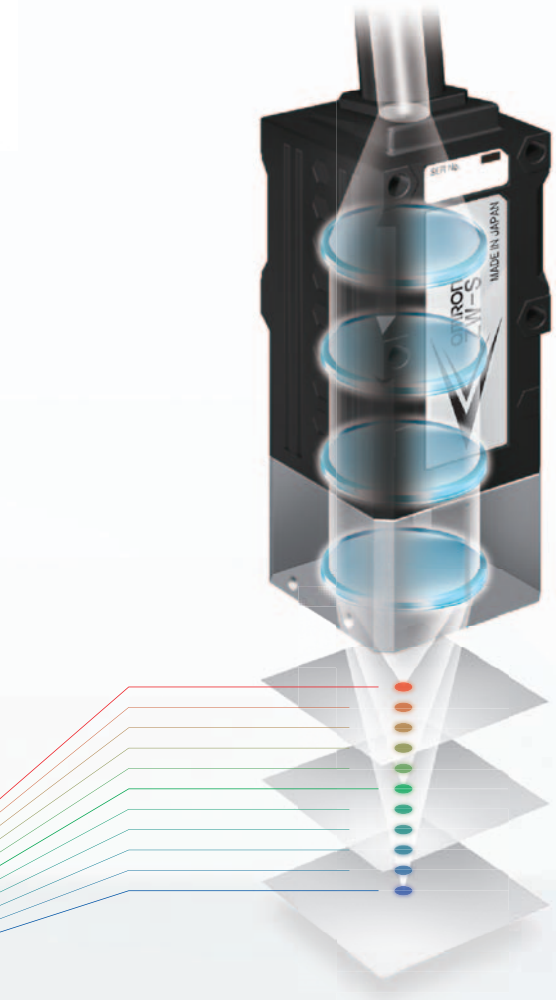
* Conceptual illustration



Profile obtained by moving measurement of various materials and shapes

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

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

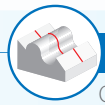
Set up quickly P.8

- 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

Measure accurately

For all quality inspections, from parts to finished products

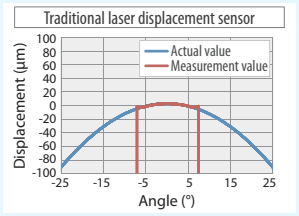
Strict quality control, demands for appearance inspection and production speed are constantly increasing. To meet these demands, stable measurements during movement for quality inspection without compromising manufacturing speed is required. Harnessing the benefits of the white light confocal principle,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



Inclined or curved surfaces

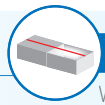
Omron's, unique, white light confocal displacement sensor provides higher resolution measurements of angled or curved and shiny surfaces than traditional laser displacement sensors.

>> Mechanism
P.13 Angle characteristic



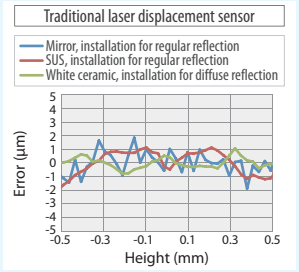
(ZW-7010)

Angle characteristic ±25° for shiny surfaces *1



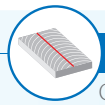
Different materials

With a traditional laser displacement sensors, 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 a different material types while moving, without needing to re-tune the sensor nor changing the sensor head or installation direction.



(ZW-7010)

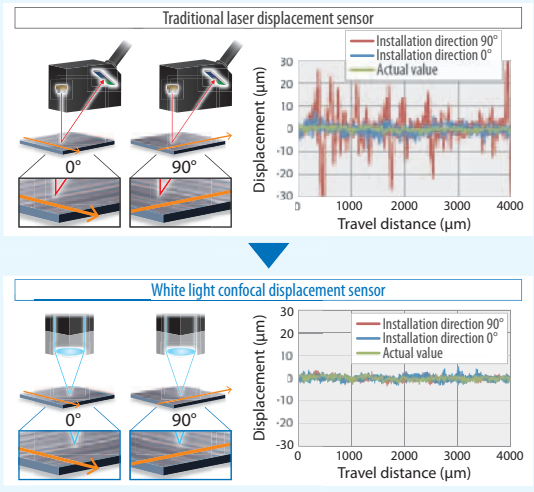
±0.5 µm or less linearity for different materials *1



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

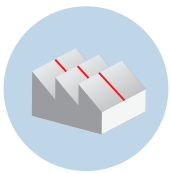


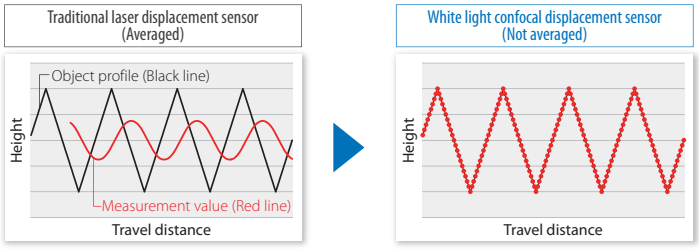
(ZW-7020)

Deviation from actual value Micron accuracy

High-speed sampling for accurate shape measurements

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.





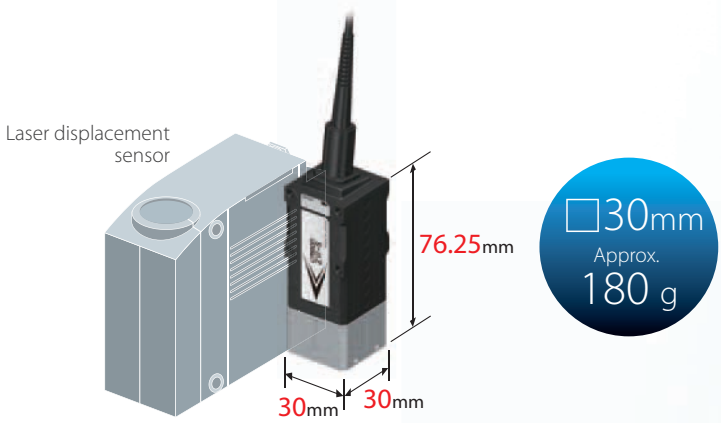
Minimum sampling time 20 µs

*1. Typical value of the ZW-S7010 Sensor Head
*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 sensor head eliminates issues of installation space and installation on moving parts.



□30mm
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-700 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

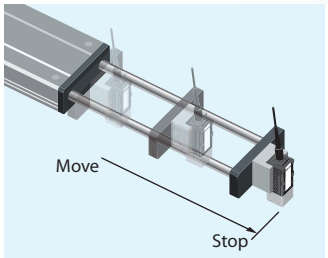
Side-by-side installation reduces measurement time

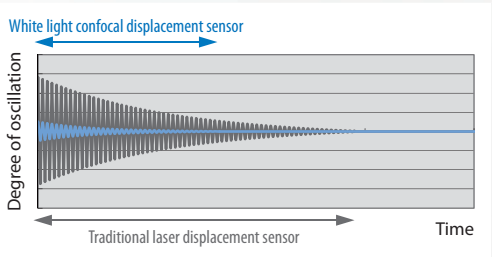
Measurement cycle time reduced by 60% or more*

* 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.

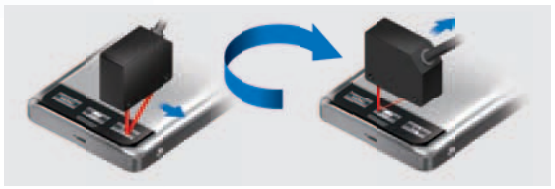




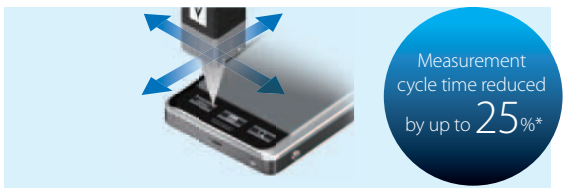
Save Time and Money: No need to rotate the sensor

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.

Traditional laser displacement sensor



White light confocal displacement sensor



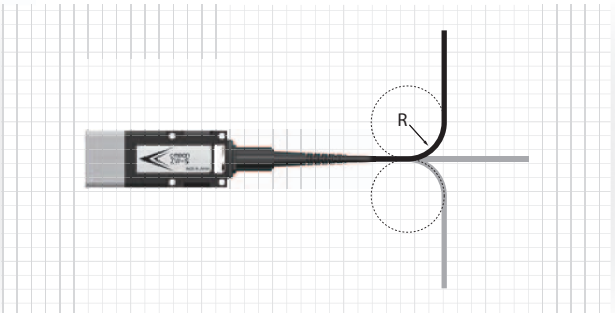
* Calculated when an object with an irregular surface was measured in both vertical and horizontal directions

>> Mechanism
P.13 Direction free

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. An extension fiber cable can be used to extend the distance to up to 7 m, and the cable can be installed in a cable carrier.

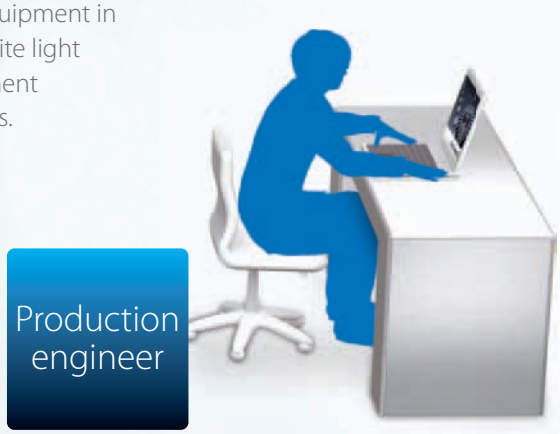
* Omron's bending test condition
3,000,000 bends to a 20-mm bending radius



Set up quickly

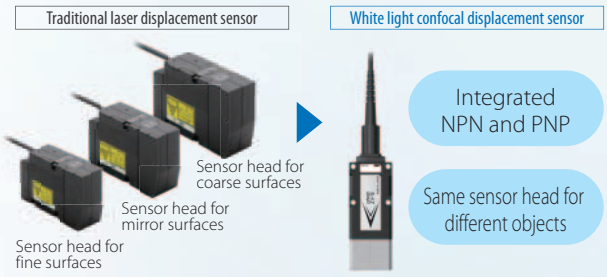
Easy to design and tune

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



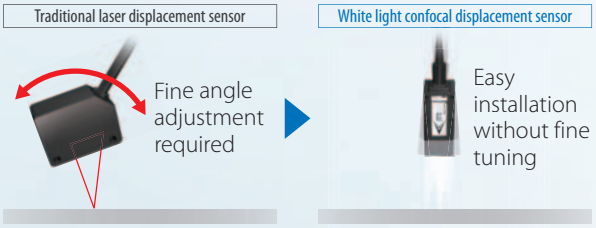
Easy device selection

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 for installation and tuning of sensor heads

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

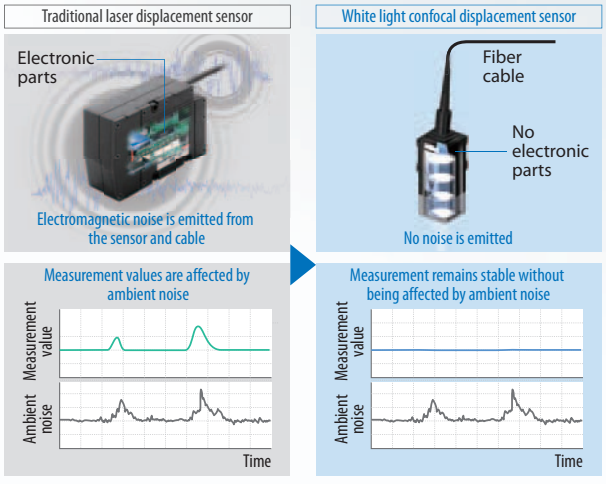


No rigidity measures required

The sensor head can be mounted on moving parts without need to take any rigidity measures, because the sensor head weighs only 180g. You save material costs and design time as there is no need to increase rigidity.

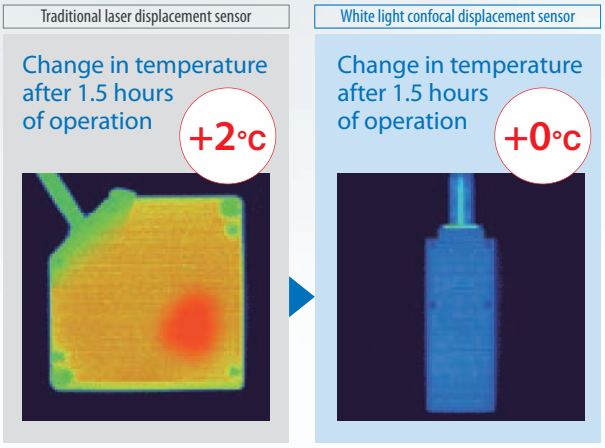
Reduced work - EMC measures and thermal design are not required

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.



Measures must be taken against noise generated by electronic parts

No measures against noise are required



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.

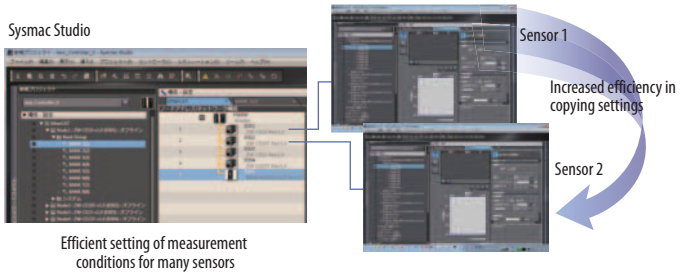
Previously safety measures for laser were required

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.

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 setting screens and measurement results on a Windows 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.

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 speed
High precision
Compatibility

High photoconductivity Patent Pending NEW

Precise Core Array Fiber

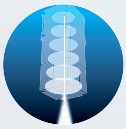
The fiber specially designed for the ZW-7000 transmits LED light to the sensor head even more efficiently and enables more precise measurement.

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.



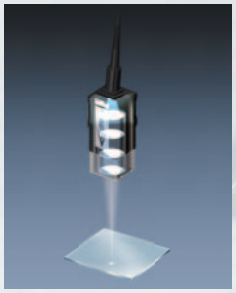
High speed
High precision
Compatibility

Low aberration NEW

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.



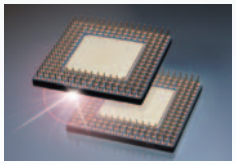
*1. OCFL : Omron Chromatic Focus Lens
*2. Compared to the ZW-S07/-S20/-S30/-S40.

High speed
High precision
Compatibility

25 times faster data processing speed NEW

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.



* Conceptual illustration

11SEG DISPLAY

High speed
High precision
Compatibility

High contrast display

NEW

White 11 Segment Display

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

WHITE LED

High speed
High precision
Compatibility

High brightness

NEW

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

NEW

Advanced Spectrograph

The new spectroscope Spectrograph 7000, which converts the color wavelength into the distance, offers increased waveform resolution, enabling high-precision measurements.

MEGA LOG

High speed
High precision
Compatibility

Large logging capacity

NEW

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.

CMOS

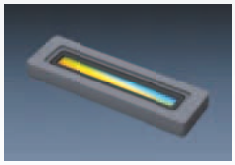
High speed
High precision
Compatibility

High sensitivity

NEW

High Sensitivity High Speed CMOS

The CMOS for the ZW-7000 was optimized to measure any object more precisely, sensitively, and stably.

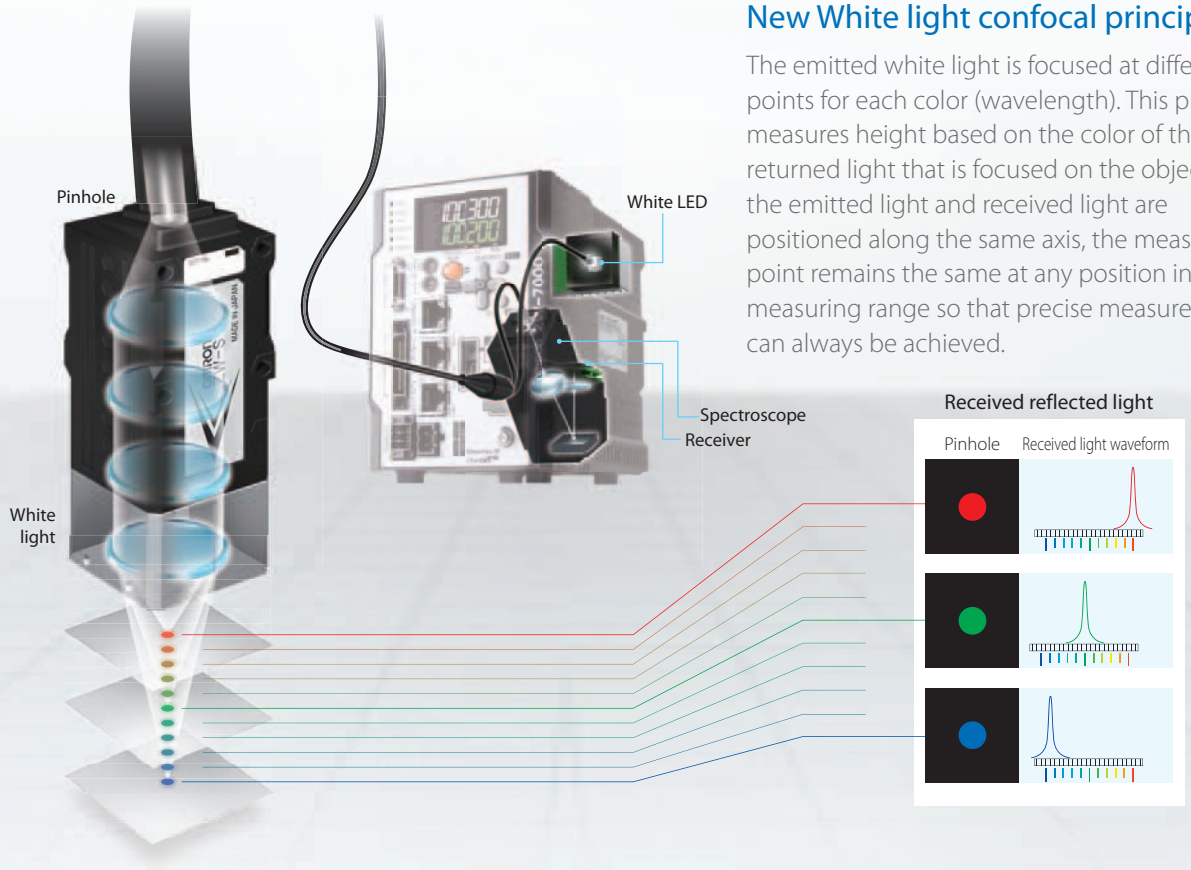


* Conceptual illustration

Technical explanation

White light confocal principle to achieve stable measurements during movement

The new white light confocal principle, provides stable measurements even on production lines where robots and stages move fast. This principle allows continuous measurements of coarse, curved, Inclined surfaces and narrow areas on objects while of moving objects. Its characteristic mechanisms are detailed below, compared to the traditional triangulation.

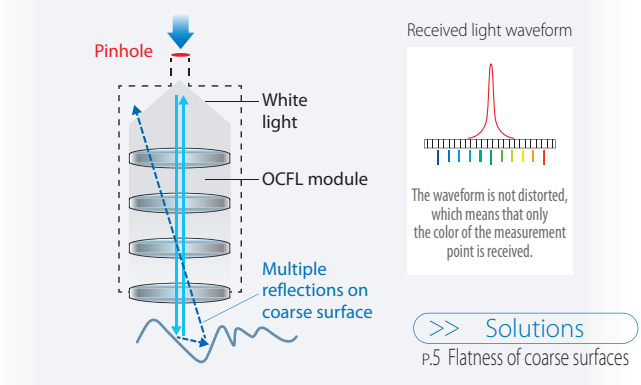


New White light confocal principal

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

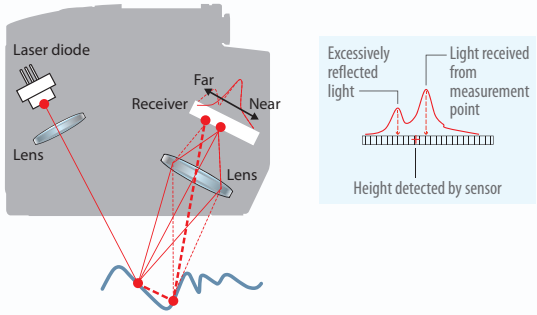
Only the light reflected from the measurement point enters the pinhole even if excessive light is reflected from the object changes during movement. This enables stable and precise measurements.



>> Solutions
P.5 Flatness of coarse surfaces

Laser triangulation principle

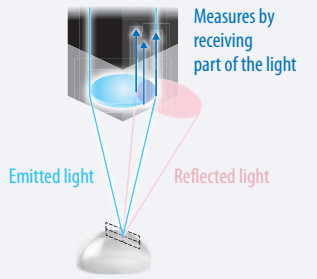
The reflected light is received on a receiver and the height is measured from the received light waveform. The waveform is distorted due to the effect of excessive reflection, resulting in a measurement error. In addition, movement generates excessive reflection, which causes unstable measurements.

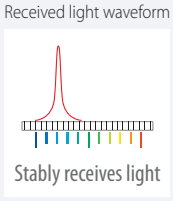


Angle characteristic

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.

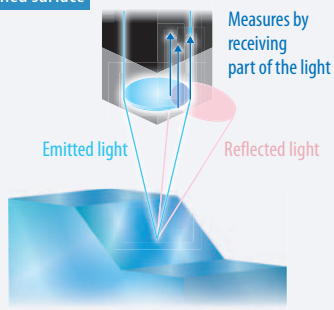
Curved surface

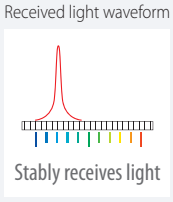




>> Solutions
P.5 Sloped or curved surfaces

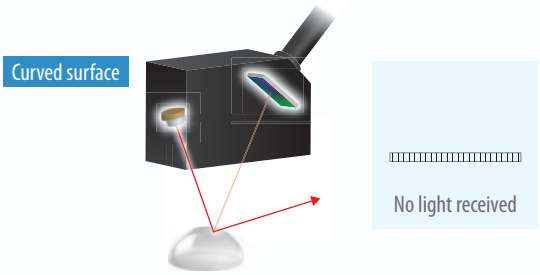
Inclined surface





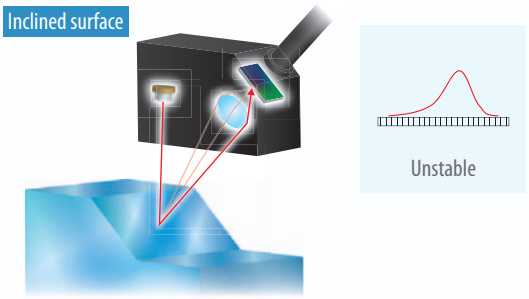
Laser triangulation principle

Curved surface



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.

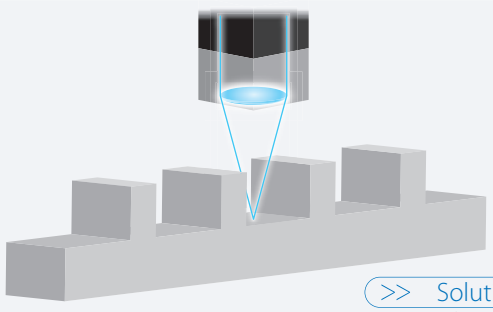
Inclined surface



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

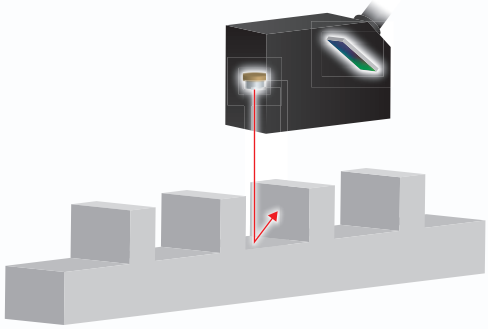
Stable measurement is not affected by moving directions of objects nor the sensor. This is achieved by emitting and receiving a cone-shaped beam of white light. This slim beam is also suitable for measurements in narrow areas.



>> Solutions
P.7 No need to rotate a 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

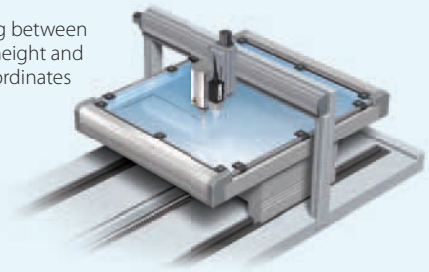
High-precision measurements of target positions during movement

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

Moving measurement linked to a stage *1

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

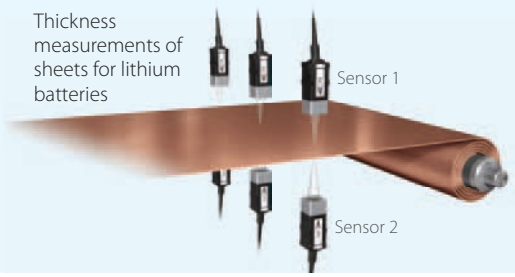
Linking between glass height and XY coordinates



Synchronous measurements with many sensors *1

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

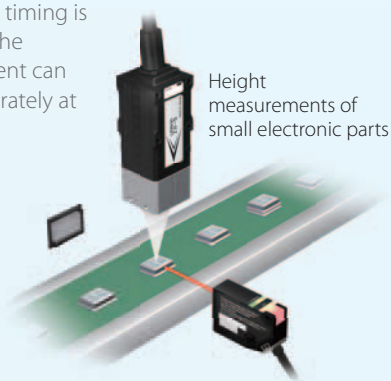
Thickness measurements of sheets for lithium batteries



Precise trigger measurements

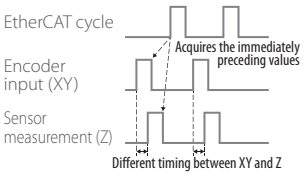
If the trigger input timing is always the same, the height measurement can be measured accurately at the same position.

Height measurements of small electronic parts



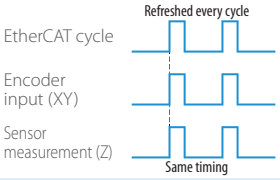
Timing chart

Previous EtherCAT communications



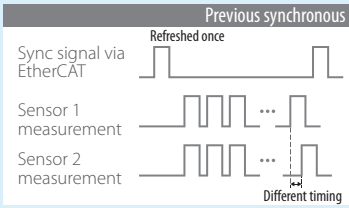
Differences between XY coordinates (position) and Z coordinate (height) occur due to fluctuations of EtherCAT cycles of 125 ns to several µs.

New EtherCAT communications



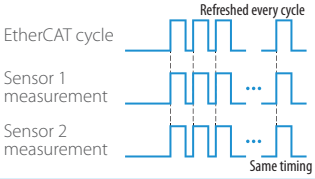
The XY coordinates (position) and Z coordinate (height) can be acquired at the same time by refreshing every cycle.

Previous synchronous measurements



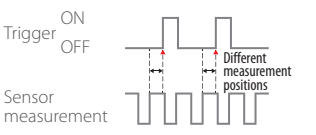
As the differences are accumulated during continuous measurements, synchronization signals must be input periodically.

New synchronous measurements



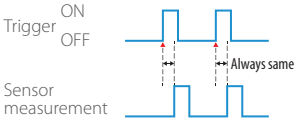
No differences occur because timing is refreshed every cycle.

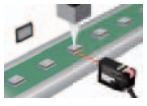
Previous trigger measurements



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

New trigger measurements

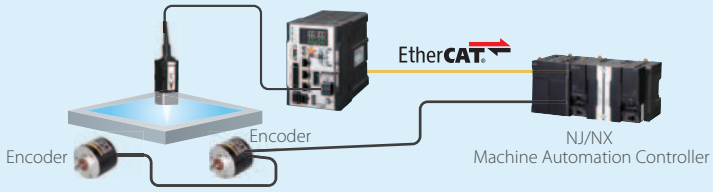




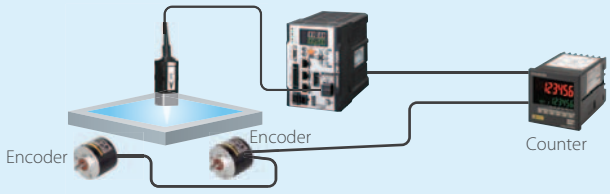
The same position can always be measured at regular intervals after trigger inputs.

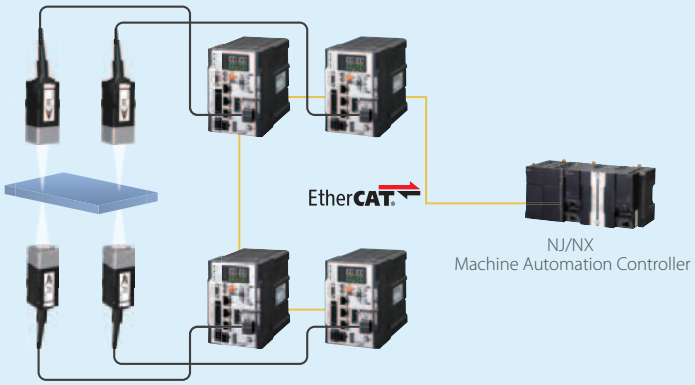
System configurations

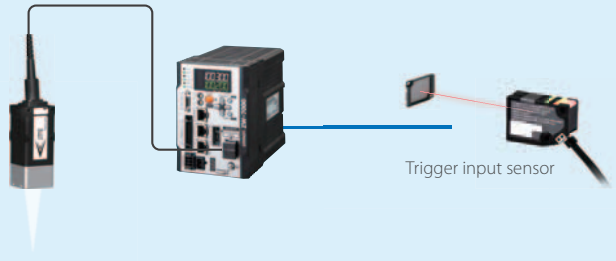
Synchronous measurements using EtherCAT



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.*2

<Example>

- Thickness
- Level difference
- Peak/Bottom
- Warp
- Flatness
- Average
- Distortion

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/

*1. The firmware that supports this functionality will be available soon. (As of April 2016)
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.

*2. Will be available soon. (As of April 2016)

Applications

High-speed measurements in applications requiring high accuracy

Digital devices

Flatness measurement of cases

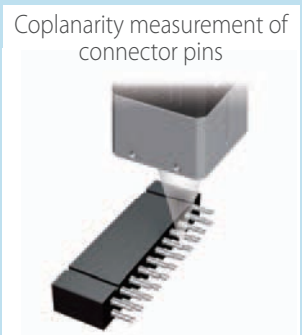
Flatness measurement of cover glass

Flatness measurement of cover glass by itself

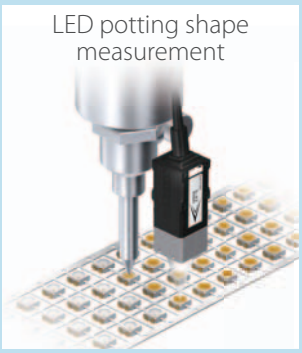
Thickness measurement of battery sheets

Groove measurement of camera modules

Coplanarity measurement of connector pins

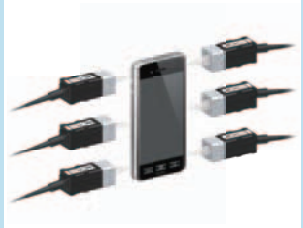


LED potting shape measurement



Height measurement of assembled parts

Case width measurement



Level difference measurement between buttons and case

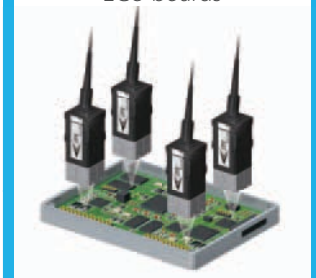
Level difference measurement of logos

Pharmaceuticals

Liquid level measurement in small-diameter vessels

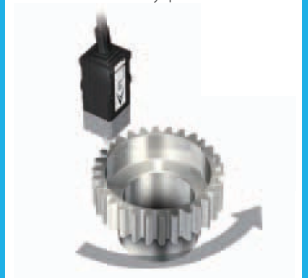
Automotive parts

Assembly measurement of ECU boards



Thickness measurement of motor cores

Surface deflection measurement of rotary parts



Flatness measurement of transmission parts

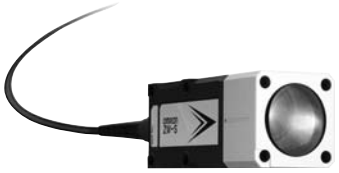
Confocal Fiber Displacement Sensor

ZW-7000 Series

Reliable measurements for any material and surface types

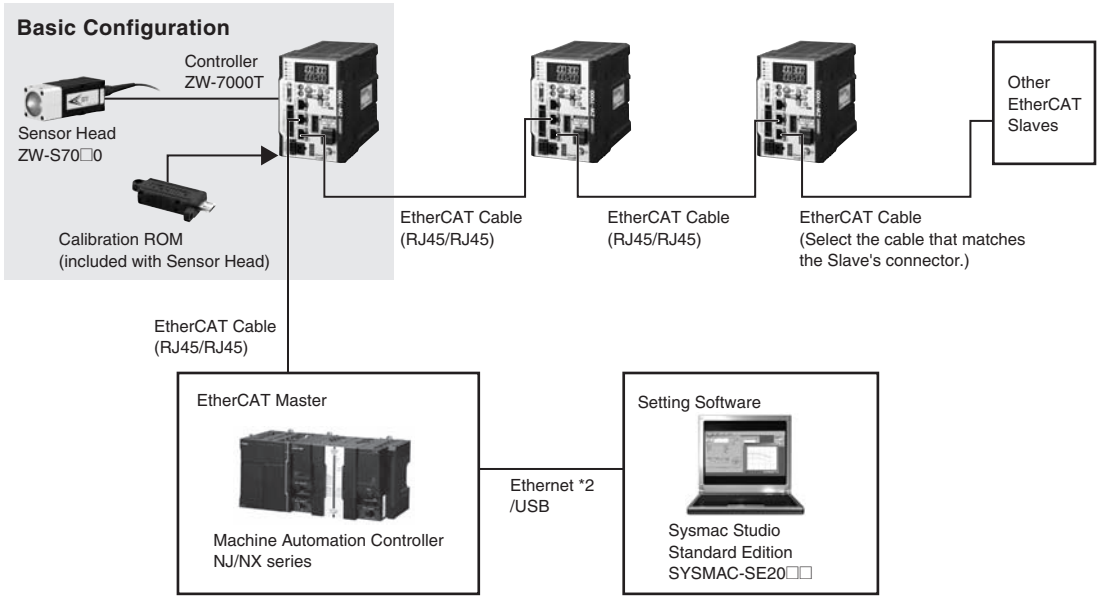
- Measuring shiny objects with an inclination of ±25° *
- ±0.5 μm or less linearity for various materials *
- Sampling rate as fast as 20 μs

* Typical value of the ZW-S7010 Sensor Head

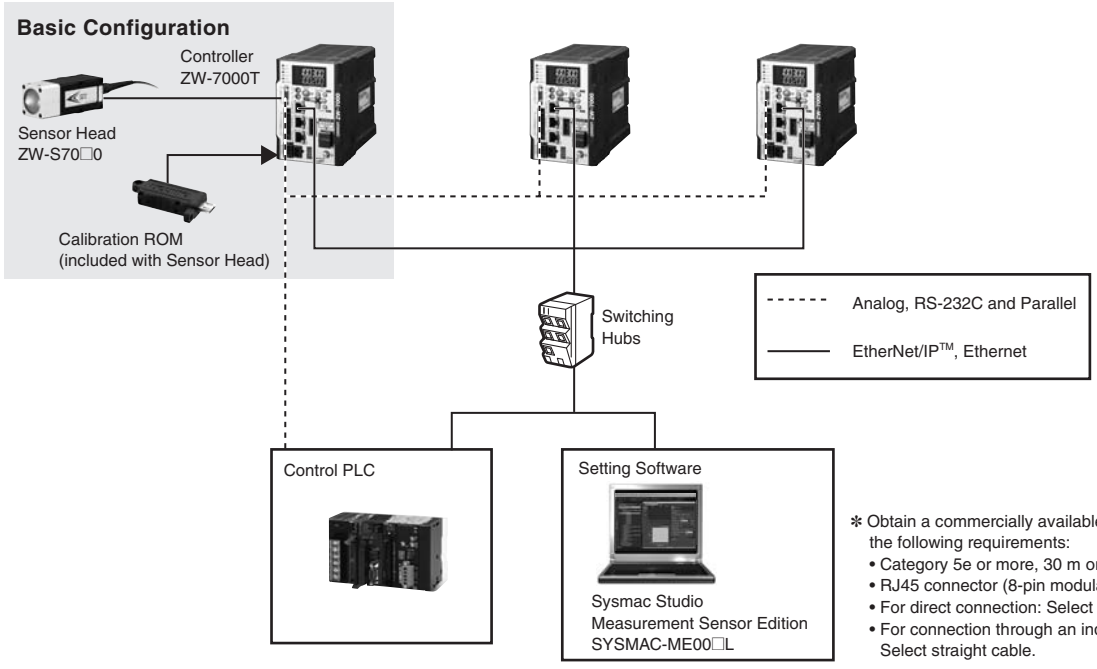


System Configuration

EtherCAT connections



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

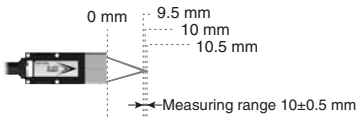
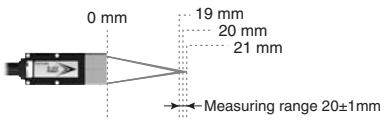
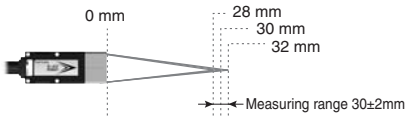


* Obtain a commercially available Ethernet cable satisfying the following requirements:
  - Category 5e or more, 30 m or less
  - RJ45 connector (8-pin modular jack)
  - For direct connection: Select cross cable.
  - For connection through an industrial switching hub: Select straight cable.

ZW-7000 Series

Order Information

●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)	2m *	**ZW-XF7002R**
		5m *	**ZW-XF7005R**
	Fiber Adapter (used between Sensor Head pre-wired cable and Extension Fiber Cable)	—	**ZW-XFCM**
	Parallel cable for ZW-7000T 32-pole (included with Controller ZW-7000T)	2m	**ZW-XCP2E**
	RS-232C Cable for personal computer	2m	**ZW-XRS2**
	RS-232C Cable for PLC/programmable terminal	2m	**ZW-XPT2**

✻Ask your Omron representative if you require a cable longer than 5 m.

●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 Series, EtherCat Slave, and the HMI.	— (Media only)	DVD	**SYSMAC-SE200D**	—
	Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version)/Windows Vista (32-bit version)/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.	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 1.15 or higher.

●Accessories

Fiber Cleaner

Item	Recommended manufacturer	Model	Contacts	Remarks
Fiber Connector Cleaner	OMRON	ZW-XCL	OMRON	Place orders in units of boxes (contacting 10 units).
NEOCLEAN-M	NTT Advanced Technology Corporation	ATC-NE-M1	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"	

●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: AWG27, 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.

Specifications

●Sensor Head

Item	Specifications		
	ZW-S7010	ZW-S7020	ZW-S7030
Sensor controller	ZW-7000T		
Measurement center distance	10 mm	20 mm	30 mm
Measuring range *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
Spot diameter (Total measurent range) *4	50 µm dia.	70 µm dia.	100 µm dia.
Measurement cycle	20 µs to 400 µs		
Operating ambient illumination	Illumination on object surface max.30000: (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% (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 *5	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 V megger)		
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	Instruction Manual, 2 straps, Calibration ROM fixing screws (M2), Note on Use		

✻1. The measurement range is based on 28 µs, or higher, 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 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. 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
Input/output type				NPN/PNP dual type
Number of connected sensor heads				1
Sensor head compatibility				ZW-S70□□
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
	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: 1.2 V or less Leakage voltage when turning OFF: 0.1 mA or less
		Busy output (BUSY)		
		Alarm output (ALARM)		
		Enable output (ENABLE 1)		
		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 1)		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 1)		
		Timing input (TIMING 1)		
		Reset input (RESET 1)		
		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			20 µs to 10 ms
	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/Exposure time/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 V megger)
	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% (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				Instruction Manual Member registration sheet Parallel cable (ZW-XCP2E) 10 Fiber cleaners (ZW-XCL)

Note: Material setting for the OMRON standard mirror surface target: Error from an ideal straight line when measuring on mirror surface
The reference values for linearity when targets to measure are other than the above are as in the table below.

●ZW 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

System Requirements *3

Item	Requirement
Operating system (OS) *1	Windows XP (Service Pack 3 or higher, 32-bit version)/Windows Vista (32-bit version)/ 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.
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 *2
Supported languages	Japanese, English, German, French, Italian, Spanish, simplified Chinese, traditional Chinese, Korean

✻1. Sysmac Studio Operating System Precaution: System requirements and hard disk space may vary with the system environment.
✻2. Refer to the hardware manual for your Controller for hardware connection methods and cables to connect the computer and Controller.
✻3. These system requirements and notes are for the Sysmac Studio Measurement Sensor Edition. Refer to the SYSMAC-SE2 Sysmac Studio Version 1 Operation Manual (Cat. No. W504) for system requirements and notes for the Standard Edition.

●Version Information

ZW-7000 Series and Sysmac Studio
Use the latest version of Sysmac Studio Standard Edition/Measurement Sensor Edition.

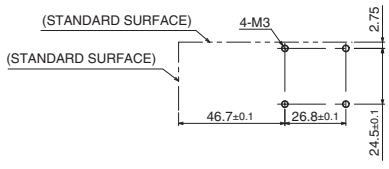
ZW Series	Version of ZW Series	Corresponding version of Sysmac Studio Standard Edition/Measurement Sensor Edition
ZW-7000T	Ver.2.01	Supported by version 1.15 or higher.

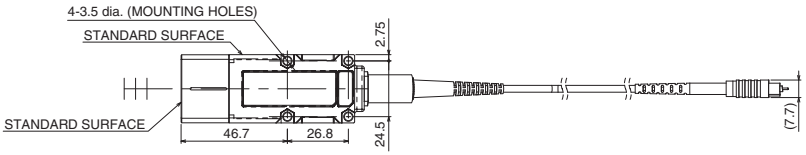
External Dimensions

(Unit: mm)

Sensor Head

ZW-S7010 □M/-S7020 □M/-S7030 □M



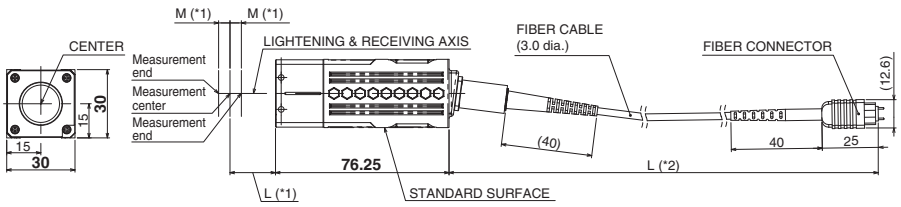


✻1. Each dimension is as follows.

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

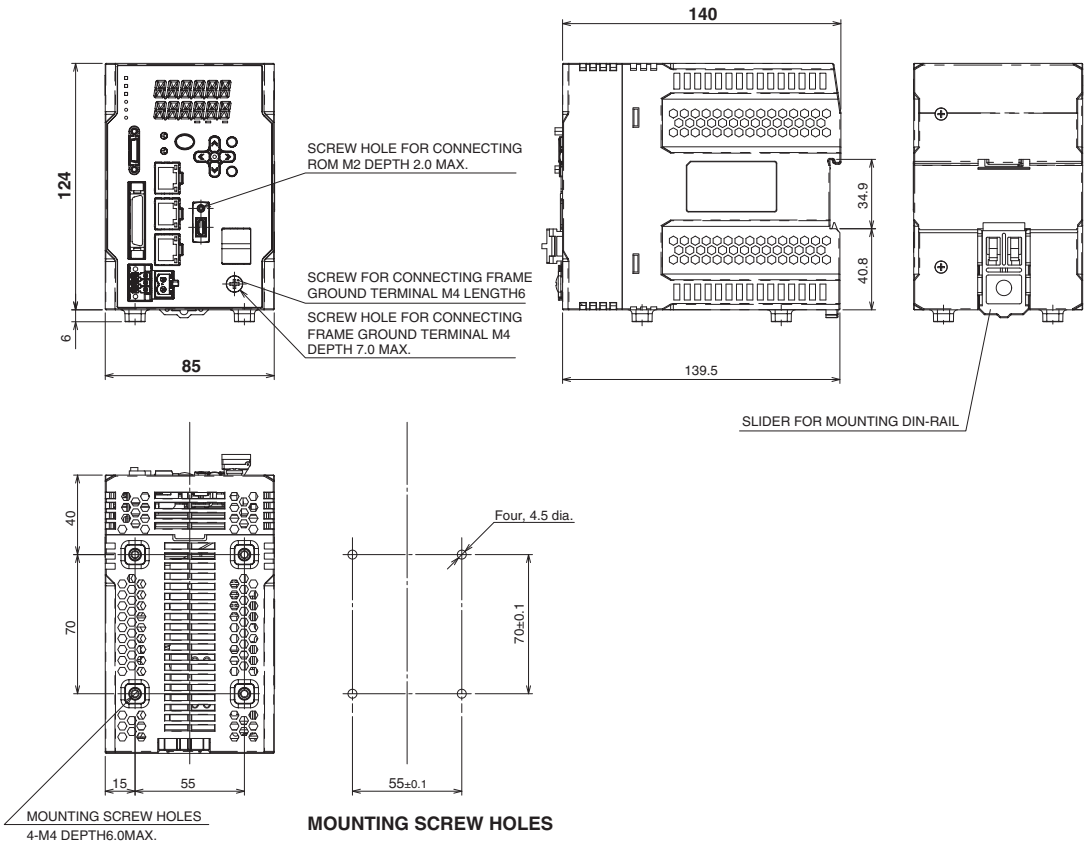
✻2. Each dimension is as follows.

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



Controller

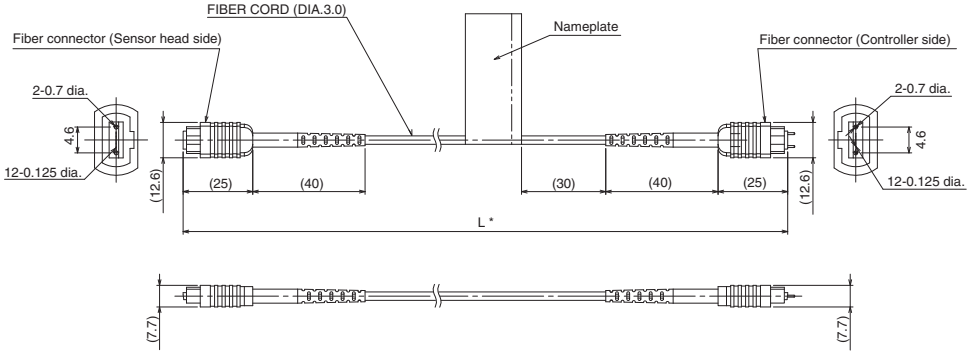
ZW-7000T



MOUNTING SCREW HOLES

Extension Fiber Cable

ZW-XF7002R/-XF7005R



✻ 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

Related Manuals

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

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