

# OMRON

## Model ZW-SQR50

Sensor Head for Fiber Coaxial Displacement Sensor

### INSTRUCTION SHEET

Thank you for selecting OMRON product. This sheet primarily describes precautions required in installing and operating the product. Before operating the product, read the sheet thoroughly to acquire sufficient knowledge of the product. For your convenience, keep the sheet at your disposal.

#### TRACEABILITY INFORMATION:

Importer in EU:  
Omron Europe B.V.  
Wegalaan 67-69,  
NL-2132 JD Hoofddorp  
The Netherlands

Manufacturer:  
OMRON Corporation,  
Shiokoji Horikawa, Shimogyo-ku,  
Kyoto. 600-8530 JAPAN

The following notice applies only to products that carry the CE mark:

Notice:  
This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.



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### PRECAUTIONS ON SAFETY

#### ●Meanings of Signal Words



**WARNING**

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally, there may be significant property damage.



**CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

#### ●Alert Statements in This Sheet



**WARNING**

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



### PRECAUTIONS FOR SAFE USE

Please observe the following precautions for safe use of the products.

1. Installation Environment
    - Do not use the product in environments where it can be exposed to inflammable/explosive gas.
    - To secure the safety of operation and maintenance, do not install the product close to high-voltage devices and power devices.
  2. Power Supply and Wiring
    - For details on power supply and wiring, refer to PRECAUTIONS FOR SAFE USE on the Instruction Sheet of the dedicated Sensor Controller (ZW-5000□).
    - Tighten the mounting screw to the torque specified in this instruction sheet.
    - Always turn off the power of the main unit before taking the following actions. Not doing so may result in malfunction.
      - Connecting or wiring the cable
      - Mounting or removing the connector
      - Mounting or removing the Calibration ROM
    - Handling the fiber cable
- Using the product without observing the following might damage the fiber cable.
- Use the fiber cable with the bending radius of at least 20 mm.
  - Avoid stress being applied to the root of the fiber connector due to bending.
  - Do not forcibly pull the fiber cable.
  - Do not step on or put a heavy object on the fiber cable.
  - Avoid applying torsional stress on the fiber cable.
  - When connecting the fiber connector, do not forcibly push it or apply torsional stress to it.
3. Others
    - Do not look into the light injection port directly.
    - Do not use in safety circuits for atomic energy or that are critical for human life.
    - Do not attempt to disassemble, deform by pressure, incinerate, repair, or modify this product.
    - When disposing of the product, treat as industrial waste.
    - Connect the Sensor Head to the dedicated Sensor Controller (ZW-5000□). Use of other devices may result in fire, explosion, malfunction or failure.
    - If you notice an abnormal condition such as a strange odor, extreme heating of the unit, or smoke, immediately stop using the product, turn off the power, and consult your dealer.
    - Do not drop or impose shock on the product.
    - Ensure that all components which have locking mechanisms are locked before using the product.
    - Do not cut the fiber cable. An injury may result due to the cutting area of the glass. In addition, the Sensor may fail to work properly if the cable is cut.
  4. Regulations and standards
    - EN61326-1
    - Electromagnetic environment : Industrial electromagnetic environment (EN/IEC 61326-1 Table 2)
    - The following condition is applied to the immunity test of this product: While receiving electromagnetic interference, the voltage/current output might vary within ±3% of full scale.
    - EMC Directive No.2014/30/EU

### PRECAUTIONS FOR CORRECT USE

Observe the following to prevent failure, malfunctioning, and adverse effects on performance and the device.

1. Installation site
  - Do not install in the following locations:
    - Locations where the ambient temperature exceeds the rated temperature range.
    - Locations subject to sudden temperature changes (where condensation will form).
    - Locations where the relative humidity is below or above 35 to 85% RH.
    - Locations where there are corrosive or flammable gases.
    - Locations where there is dust, salt, or iron powder.
    - Locations where the device will be subject to direct vibration or shock.
    - Locations where there is strong scattered light (laser light, arc welding light, ultraviolet light, etc.)
    - Locations exposed to direct sunlight or next to a heater.
    - Locations where there is splashing or spraying of water, oil, or chemicals.
    - Locations where there is a strong electrical or magnetic field.
2. Power and cable connections
  - When using a commercially available switching regulator, make sure that the Frame ground terminal is grounded.
  - If there are surges on your power line, connect a surge absorber as appropriate for your conditions of use.
  - Before turning on the power after the wiring is completed, verify that the power is correct, that there are no incorrect connections such as a shorted load circuit, and that the load current is suitable. Incorrect wiring may cause damage and failures.
  - Use the product with the specified voltage. Applying a voltage or AC voltage that exceed the rating may result in burning or explosion of circuit components.
  - To extend the fiber cable between the Sensor Head and Sensor Controller, an optional extension fiber cable (ZW-XF50□□R) must be used.
  - Use the Sensor Head and Calibration ROM of the same serial number. Operation will fail if those with different serial numbers are used.
  - When the fiber cable is not connected, be sure to attach the provided protective caps to the connectors of fiber cable. Leaving the product without the protective caps may result in malfunction caused by adhesion of a foreign material.
  - When connecting the sensor head at initial startup after factory shipment, or connecting another type of the sensor head to the Sensor Controller at previous startup, be sure to initialize the setup with the sensor head connected to the Sensor Controller.
3. Warming Up
  - After turning on the power supply, allow the Sensor Controller to stand for at least 30 minutes before use. The circuits are unstable immediately after the power supply is turned on and attempting measurement may result in inconsistent measurement values.
4. Maintenance
  - Do not use thinner, benzene, acetone or kerosene to clean the Sensor Head, fiber cable or Sensor Controller. If considerable foreign matter or dust collects on the Sensor Head, fiber cable, or receiver/emitter of the Sensor Controller, use a blower brush (for camera lenses) to blow off the foreign matter. Avoid blowing it off with your breath. For a small amount of foreign matter or dust, gently wipe with a soft cloth. Do not wipe hard. If the receiver/emitter is damaged, malfunction or measurement error may result.
  - Do not touch the end face of the fiber cable of the sensor head. It may result in deterioration in performance. If the end face touches anything or becomes unclean, wipe off the dirt with option product ZW-XCL, the commercially available dedicated fiber cleaner, or a dry soft cloth. Do not use a cloth containing alcohol. Doing so may cause adhesion of contamination again.
  - To clean the fiber connector of the Sensor Controller, use option product ZW-XCL.
  - If inserting/extracting the sensor head frequently, use of the repeatedly usable commercially available dedicated fiber cleaner is recommended.

Product name	Model No.	Manufacturer
OPTIPOP R1	ATC-RE-01	NTT Advanced Technology Corporation

Contact

(Request for an Estimate)

URL [http://www.ntt-at.com/product/optical\\_cleaner/Distributors.html](http://www.ntt-at.com/product/optical_cleaner/Distributors.html)

(Request for Information)

Company NTT Advanced Technology Corporation

Address Muza Kawasaki Central Tower, 1310

Omiya-cho Saiwai-ku, Kawasaki-shi,

Kanagawa, 212-0014, Japan

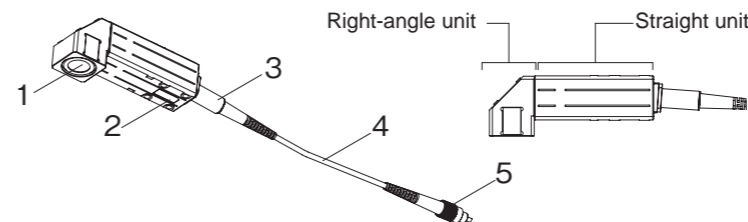
TEL +81 44 589 5894

URL [http://www.ntt-at.com/product/optical\\_cleaner/](http://www.ntt-at.com/product/optical_cleaner/)

- If the fiber cable is plugged in/out or extended, perform calibration of the Sensor Head. For details on Sensor Head calibration, refer to the User's Manual.
5. Sensing Object For Sensor Head
    - Depending on the material/shape of the object, the object cannot be measured or can be measured but accuracy is poor: Transparent objects, objects with a low reflective sensor ratio, objects smaller than the spot diameter, objects with a large curvature, excessively inclined objects, objects with thin film on the surface, etc.
  6. Effects of surrounding lightings
    - Avoid installing the product at a location where the emitter/receiver of the Sensor Head is exposed to strong lighting. If the workpiece has reflective surface, malfunction of the product may occur due to light reflection. Prevent it by covering the lighting.
  7. Influence of air current
    - Measured values may vary due to slow air current around the Sensor Head. In such case, put a cover around the Sensor Head.
  8. Operation beyond the measurement range
    - As this sensor is sensitive, malfunction may occur beyond the measurement range. In such case, shorten the exposure to light or raise the level of the background removal.
  9. Right-angle unit
    - If you make an excessive force or impact to right-angle unit (The part contains Emitter/receiver of "Part Names and Functions"), It may develop into a gap between right-angle unit and straight-unit (The part attaches serial No. of "Part Names and Functions"). As a result, it may have a problem with measurement quality. Please be careful not to make excessive force or impact to right-angle unit.
  10. Coverage of fixing support
    - Fixing support of component replacement by fiber breaking, lens damage and so on is not accepted.
  11. Firmware
    - When using this product, the firmware of the Sensor Controller must be Ver.2.110 or later. For details on version upgrade, refer to the user's manual.

### Part Names and Functions

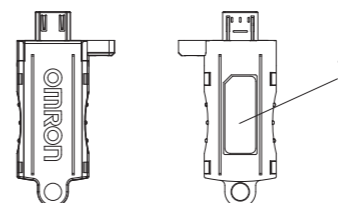
#### ● Sensor Head



No.	Name	Function
1	Emitter/receiver	Emits/receives light.
2	Serial No.	A serial number. Only the combination of the Sensor Head and Calibration ROM with the same serial number is valid.
3	Fiber joint	A joint of the Sensor Head and fiber cable. (Do not remove. Otherwise, repair will be needed.)
4	Fiber cable	A fiber that exchanges optical signals with the Sensor Controller.
5	Fiber connector	A connector that connects the Sensor Controller and fiber cable.

#### ● Calibration ROM

The dedicated ROM for the Sensor Head. It is included in the Sensor Head. Use it by connecting to the Sensor Controller.



No.	Name	Function
1	Serial No.	A serial number. Only the combination of the Calibration ROM and Sensor Head with the same serial number is valid.

### Specifications

Item	Specifications		
	ZW-SQR5007	ZW-SQR5020	ZW-SQR5040
Applicable Sensor Controller	ZW-5000□		
Sensor head type	Square Right-angle type		
Measuring center distance	7 mm	20 mm	40 mm
Measuring range	±0.3 mm	±1 mm	±6 mm
Static resolution *1	0.01 μm (0.005 μm)	0.02 μm (0.01 μm)	0.08 μm (0.04 μm)
Linearity *2	±1.1 μm	±1.6 μm	±9.3 μm
Spot diameter *3	Near Center Far	20 μm dia. 18 μm dia. 20 μm dia.	45 μm dia. 40 μm dia. 45 μm dia.
Measurement cycle *4	80 μs to 1600 μs		
Operating ambient illumination	Object surface illumination: 10000 Lx max. (incandescent light)		
Ambient temperature range	Operating: 0 to 50°C, Storage: -15 to +60°C (with no icing or condensation)		
Ambient humidity range	Operating and storage: 35% to 85%RH (with no condensation)		
Degree of protection	IP40 (IEC60529)		
Vibration resistance (destructive)	10 to 150 Hz, 0.35-mm half amplitude 80 min each in X, Y, and Z directions		
Shock resistance (destructive)	150m/s <sup>2</sup> 3 times each in six directions (up/down, left/right, forward/backward)		
Temperature characteristic *5	0.6 μm/°C	1.5 μm/°C	4.8 μm/°C
Safety of LED	Risk Group 1 (IEC 62471)		
Material	Body: Aluminum die-cast Fiber cable coating: PVC Calibration ROM: PC		
Fiber cable length	0.3 m, 2 m (Flex resistance cable)		
Fiber cable minimum bending radius	20 mm		
Insulation resistance (Calibration ROM)	Between case and all terminals: 20 MΩ (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. 125g 2m: Approx. 130g		
Accessories	Calibration ROM fixing screw (M2×5mm:1 piece), Fiber protective cap (1 piece), Strap (1 piece), Instruction Sheet (This Instruction Sheet), Precautions		

\*1 An actual figure when measured an OMRON-standard mirror surface object with average count of 4096 times at the measuring center distance.

Numerical values in the figure of ( ) indicate the actual values measured with the average count of 16,384 times.

When connecting the Export Trade Control Order compatible Sensor Controller (ZW-5000T), the minimum resolution is 0.25 μm regardless of the sensor head or setup condition

\*2 Set OMRON standard mirror-surface object as the material: Error to the ideal straight line measured using a mirror surface

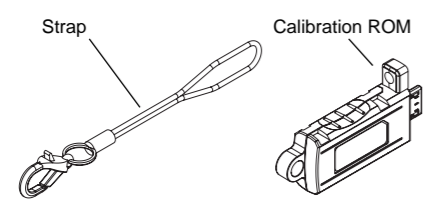
\*3 Actual figure defined at 1/e<sup>2</sup> (13.5%) of the peak light intensity of the measured wavelength

\*4 When the fiber cable for extension more than 5m were connected, the setting range of the measuring period (Exposure time) varies. For details, refer to "Setting Measurement Cycle" in the user's manual.

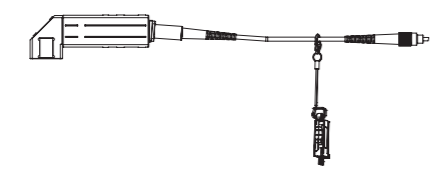
\*5 Actual value of the variation of the measured value at the measurement center distance when both the sensor head and object are fixed to an aluminum jig and the sensor head and the Sensor Controller are put in the environment of the same temperature.

## Attach the strap to the calibration ROM

(1) Attach the accessory strap to the calibration ROM.



(2) Mount the calibration ROM on the sensor head.

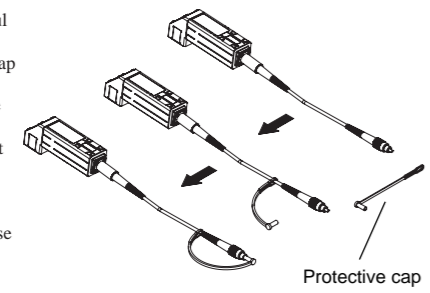


## Attaching the fiber cable to the protection cap

Attach the accessory strap to the protection cap.

### Important

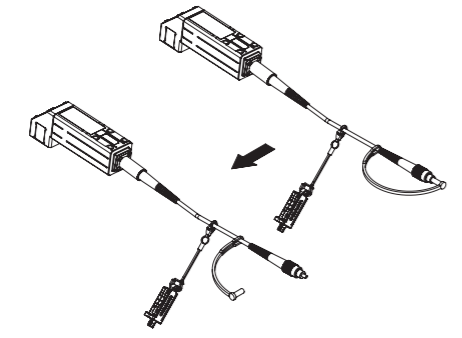
- If attaching the protection cap, be careful with the cable bear and so on when routing the cable via it. The protection cap could be trapped by the cable bear.
- When removing the fiber cable from the Sensor Controller, be sure to attach the accessory protection cap. Otherwise, dirt attaches to the end face, causing performance deterioration.
- If not attaching the protection cap to the fiber cable, be sure to save the cap in case it is lost.



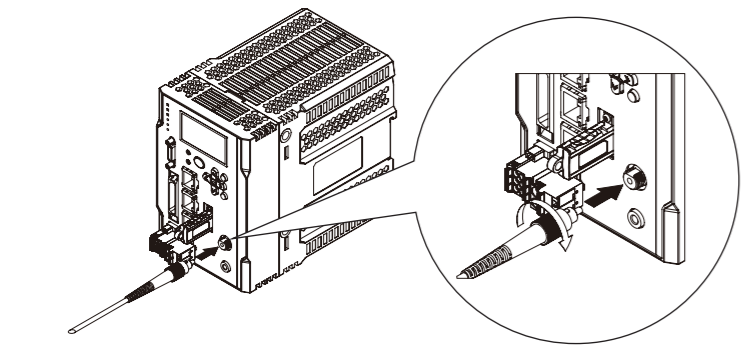
## Connecting the fiber cable with the calibration ROM

Connect the fiber cable of the Sensor Head to the fiber connector of the Sensor Controller.

(1) Remove the protective cap of the fiber cable.

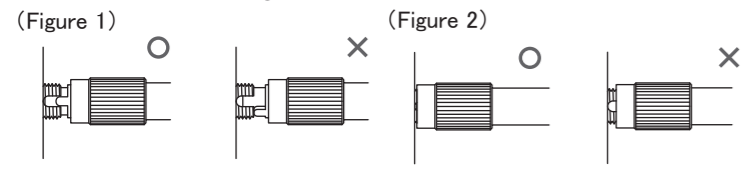


(2) Connect the fiber cable and calibration ROM with the Sensor Controller. Attach the fiber cable so that the projection of the fiber connector fits into the groove of the fiber adapter of the Sensor Controller. As pushing in the cable, turn the screwed region to the right.

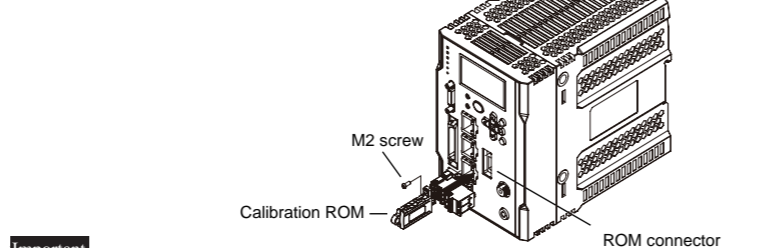


### Important

• If the device is in the "X" state as shown in Figures 1 and 2, light signal is not conveyed, so that the object cannot be measured correctly. Be sure to confirm that the device is in the state of "O."



(3) Secure the Calibration ROM with the provided M2 screw. Tightening torque: 0.15 N·m max.

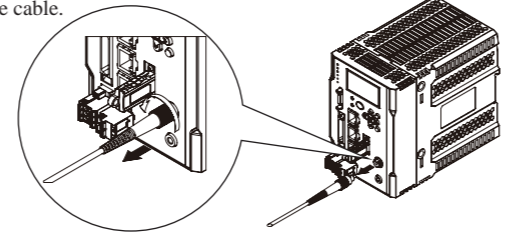


### Important

- Before pushing in or pulling out the calibration ROM, be sure to turn off the power of the Sensor Controller. Otherwise, a failure might be caused.
- Use the Sensor Controller as connecting with the calibration ROM at any time. Otherwise, an error is displayed on the main digital as "SYSERR" and the sub-digital "NO.ROM", so that measurement is not possible.
- Be sure to use the sensor head and calibration ROM in combination of the same serial number.
- Otherwise, the Sensor Controller does not operate correctly.

## Removal of the fiber cable

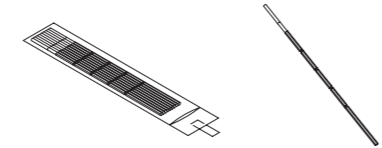
Turn the screwed region of the fiber cable to the left. When the screw is removed, pull out the cable.



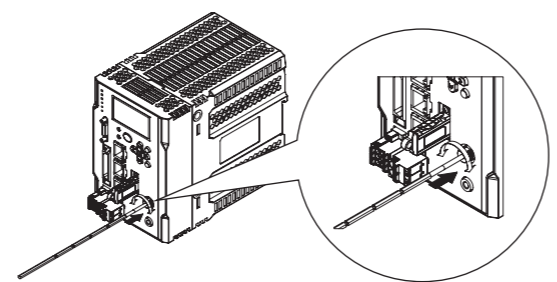
## The cleaning method by using ZW-XCL

(1) Pulling out the cleaner

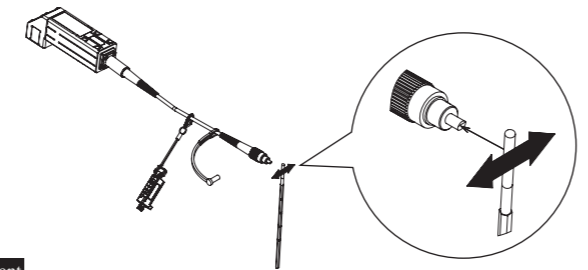
Pull out a cleaner from the bag so as not to make the tip portion of the cleaner dirty.



(2) Cleaning of the end face of the fiber connector of the Sensor Controller side  
Insert the cleaner tip (white end face) into the fiber connector or connection adapter. Then, rotate the tip in the same direction around three times as pushing it onto the side face and the end face of the optical connector. When clearing is over, pull out the cleaner from the fiber connector slowly. If the fiber cable is used with an extension cable connected, clean the connection adapter, too in the same way.



(3) Cleaning of the end face of the fiber connector of the sensor head side  
Remove the cap of the fiber connector, and wipe up and down the end face of the fiber around three times.



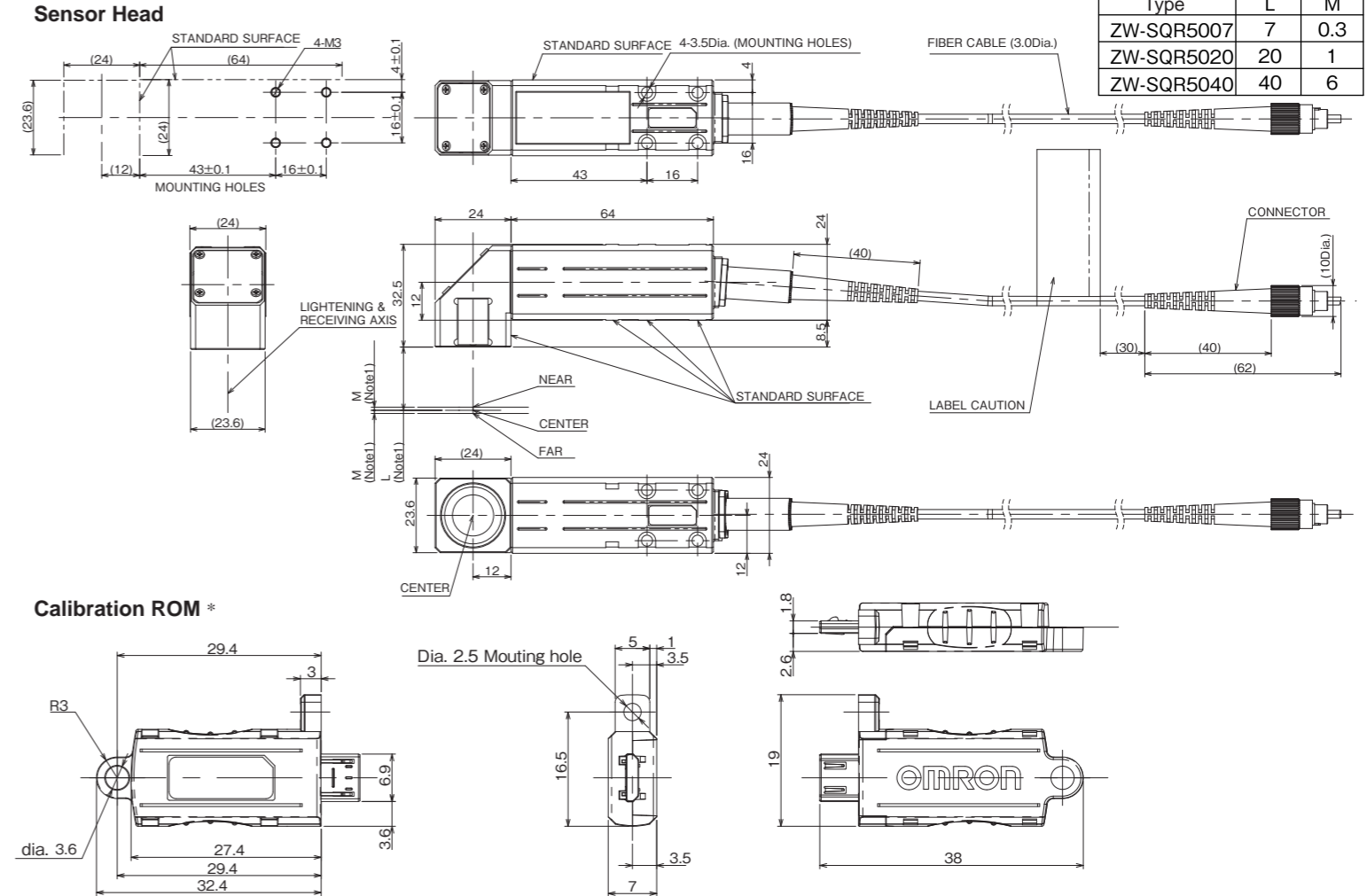
### Important

- The cleaner can only be used one time. Reusing the cleaner may result in dirt or scratches on the end surface, causing malfunctions or measurement errors. Discard after use.
- Be sure to clean the fiber cleaner with the cloth for the cleaning part (white end face).

## Relevant Manuals

Man. No.	Model	Manual name
Z362	ZW-8000□/7000□/5000□	Confocal Fiber Displacement Sensor ZW-8000/7000/5000 Series User's Manual
Z363	ZW-8000□/7000□/5000□	Confocal Fiber Displacement Sensor ZW-8000/7000/5000 Series User's Manual: Communication Settings
W504	SYSMAC-SE2□□□□	Sysmac Studio Version 1 Operation Manual

## Dimensions (Unit: mm)

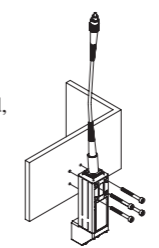


\* Included in the Sensor Head (ZW-SQR5007/SQR5020/SQR5040). Be sure to use the Sensor Head and Calibration ROM of the same serial numbers.

## Mounting of sensor heads

### Mounting

Match the distance of the sensor head and object to be measured, and fix four mounting holes with M3 screws. Torque : 0.54N · m

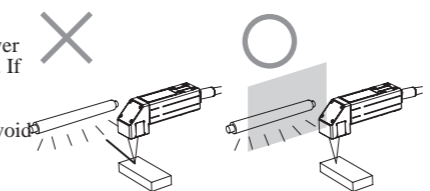


### Important

- For details on screw holes, refer to the dimensions.
- For an object such as mirror and wafer with high reflectivity, the measured value may be output at the short distance side that is outside of the measurement range. Therefore it is recommended that an installation and adjustment are performed while aiming for the spot position with the diffuse-reflection object used.

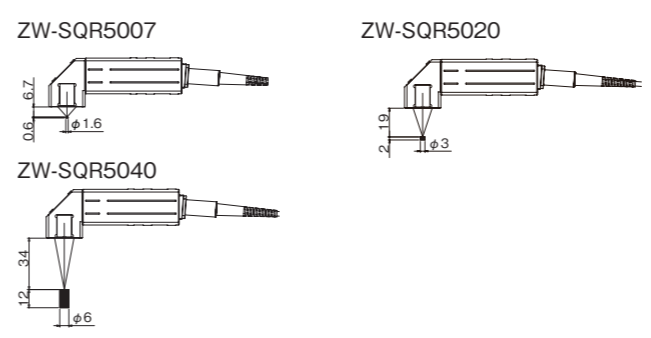
### Precautions on installation

Avoid installing the sensor head in locations where the emitter and receiver are exposed to high-intensity lighting. If the object has a reflective surface, the illumination light may be reflected, causing a malfunction. In that case, avoid the reflection of light by covering the illumination, etc.



### Mutual interference

When using two or more sensor heads adjacent to each other, mutual interference will not occur if the sensor spot of other sensor head is located outside of ■ shown on the figure below.



## Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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