

Instruction Manual

Absolute Contact-type Displacement Sensor SA-S□10, SA-S□10/03N

Thank you for purchasing a Citizen absolute contact-type displacement sensor. Read this instruction manual before use and use this unit properly. After reading this instruction manual, keep it where the user can find it easily. Also make sure the prescribed performance is ensured before use.

1. General

This product is a high-accuracy contact-type displacement sensor that detects the absolute position of the spindle optically and outputs it with high resolution. In combination with the separately-sold SA Series controllers, this product serves as a length-measuring system.

Note that this product is not compatible with conventional IPD Series counters. In contrast to the existing IPD Series that count pulses, it does not skip values. Another feature is that it does not forget the position when the power is switched off, so there is no need to calibrate it with a master when the power is switched on. It is also equipped with a 3-color status indicator lamp that makes it possible to recognize pass/fail judgment results and errors at a glance. As for the structure, two bearings are arranged at top and bottom, giving high resistance to vibration and shock in a slim form.

2. Specifications

Model	SA-S110 SA-S110/03N	SA-S510 SA-S510/03N
Position detection method	Optical absolute linear encoder method	
Measuring range	10mm	
Resolution	0.1 μm	0.5 μm
Indication accuracy (P-P) ¹	1 μm or less	1 μm or less
Measuring force ²	1.65 N or less (SA-S□10) 0.35 N or less (SA-S□10/03N)	
Mechanical response speed ¹	5 Hz (SA-S□10) 2 Hz (SA-S□10/03N)	
Ingress protection rating ³	Equivalent to IP67	
Mass	Approx. 80 g	
Operating temperature/ humidity range	-10°C to 55°C 35 to 80%RH (with no condensation or icing)	
Storage temperature/ humidity range	-20 to 60°C 35 to 80%RH	
Vibration resistance	10 to 500 Hz, double amplitude 3 mm (Max. 20 G) 2 hours in each of X, Y and Z directions	
Shock resistance	1960 mm/sec ² (200 G)	
Grounding method	Capacitor grounding	
Cable	Sold separately as option	
Measuring probe	Ceramic sphere 1/8 inch	
Rubber bellows ⁴	Material NBR	

¹ The value in the specifications is with an ambient temperature of 20°C.

² This is the value when the measuring probe is pressed in 10 mm while pointing straight downward.

For SA-S□10/03N, the value is that without the rubber bellows fitted.

³ This only applies when the rubber bellows are fitted correctly and there is no damage, etc.

⁴ SA-S□10/03N is not fitted with rubber bellows.

3. Cable Options (Sold Separately)

Part name	Corresponding controller	Model name
Straight connector cable	SA-CD Series	SA-CD-SH□M
	SA-SD Series	SA-SD-SH□M
Angle connector cable	SA-CD Series	SA-CD-SHL□M
	SA-SD Series	SA-SD-SHL□M

The □ in the model name is where the cable length is inserted. The standard lengths are 2, 5, and 10 meters.

For example, if the cable length is 2 m, the model name is SA-CD-SH2M.

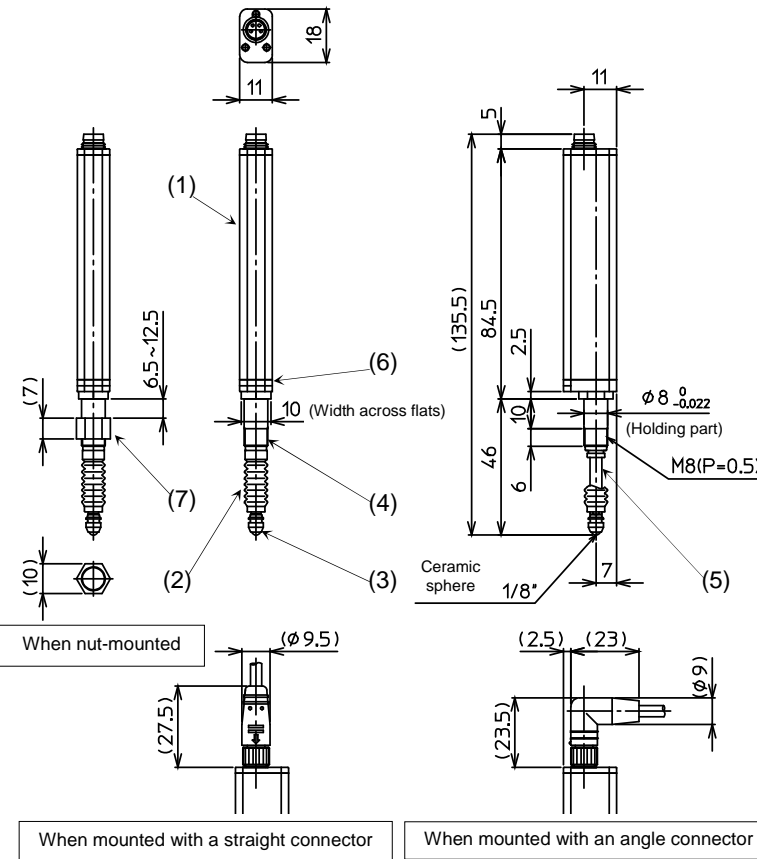
4. Other Options (Purchased Separately)

Part name	Model name
Rubber bellows ¹	M-137
Indicator bushing	M-150
Measuring probe (ceramic sphere) ²	F-201

¹ This is the rubber bellows for replacement. It is equipped as standard. (It is not equipped with SA-S□10/03N.)

² This is the replacement measuring probe. It is equipped as standard. Measuring probes other than the standard ceramic probes are available. Please contact the dealer you purchased this product or our Sales Department.

5. Dimensions and Part Names



When connecting the connector, engage it firmly and tighten the threaded part securely. (Recommended tightening torque: 0.2 to 0.3 N·m)
If it is tightened too weakly the protective structure will not be maintained, or it may loosen due to vibration.

- | | |
|-----------------------------|---------------------------|
| (1) Main unit | (5) Spindle |
| (2) Rubber bellows | (6) Status indicator lamp |
| (3) Measuring probe (F-201) | (7) Accessory nut |
| (4) Stem | |

6. Precautions for Use

NOTICE Observe the following precautions for the best performance of this product and use in good condition.

- Do not expose this unit to impact due to dropping etc. or excessive force. Doing so may cause damage or errors.
- Do not attempt to disassemble or reconstruct this unit.
- Do not use this unit under rapid temperature changes or condensation.
- Perform the following checks and inspections before use:
 - Make sure that the spindle moves smoothly.
 - Make sure that the measuring probe is not loose.
 - Make sure that a displayed value remains stable at the datum point using a block gage.
- Do not use this unit in the presence of an excessive magnetic field or electrical noise is present. Doing so may cause a malfunction or failure.
- Avoid applying excessive lateral force. It may cause deterioration in measuring accuracy and durability.
- There may be variation in measured values at the stroke end, so do not take the stroke end as the datum. Take a position where the probe is pushed in at least 0.1 mm from the stroke end as the datum.

8) Mount the sensor with the measuring probe pointing at 3 to 9 o'clock. If you wish to use it in another posture, please contact our Sales Department.

NOTICE

9) Mount the sensor at right angles to the surface subject to measurement. **Mounting it at another angle may cause measurement errors. It may also significantly shorten the service life.**

NOTICE

10) The mechanical response speed of this product is the value obtained when the spindle is moved at a constant speed with no shock, while the measuring probe is pointing straight downward. **If the spindle is subjected to excessive shock, errors may occur or the spindle may be damaged.**

NOTICE

11) **The rubber bellows are a functional part for dust and water proofing. Do not remove them.**

12) Take care not to damage the rubber bellows, such as by cutting. Also, replace the rubber bellows with new ones before damage occurs. Replace the rubber bellows in accordance with the replacement procedure described in this instruction manual "8. Maintenance". Improper replacement may deteriorate the dust and water resistance.

13) Take adequate measures to prevent damage (safety measures) should this product fail.

NOTICE

14) Secure the connection cable properly so that excessive force will not be applied to the sensor when in use.

If force is applied through the connection cable to the sensor, the accuracy may deteriorate, or the sensor may be damaged.

15) Avoid wiring the cable in parallel with high voltage cables or power lines. This may cause a malfunction.

NOTICE

16) While being set up, avoid overstroke (the spindle going beyond the stroke end). This could damage the sensor.

17) Note that the time taken to return to the stroke end may be extended depending on the mounting posture, spindle depression, and holding time.

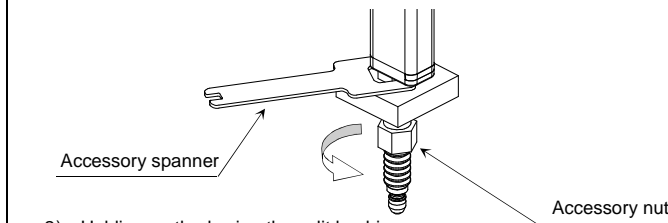
18) When disposing of this product, treat it appropriately as industrial waste.

19) Do not use this product outside its specification range. This could cause product failure.

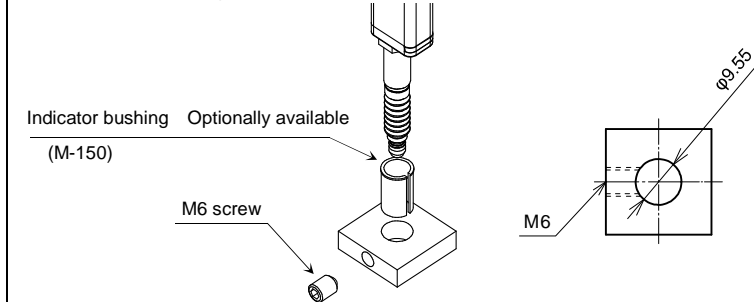
7. Mounting Method (Recommended)

When mounting a standard-type sensor on a unit or in a holder, hold it either with the nut provided as an accessory, or use a split bushing.

- Holding method using the nut
The plate thickness for mounting with the nut is 6.5 to 12.5 mm. Be sure to tighten the nut with the tool provided as an accessory engaged on the hexagonal section at the base of the spindle. The tightening torque shall be less than 12.5 N·m. After fully tightening the nut, make sure that the spindle moves smoothly.



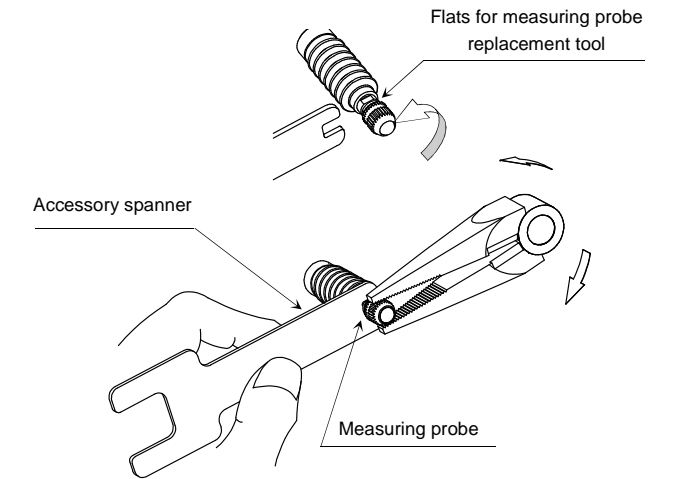
- Holding method using the split bushing
When installing with a split bushing or CITIZEN indicator bushing (M-150), tighten an M6 screw with a torque of 0.5 N·m or less. Be sure to clamp the holding part. At this time, avoid using the screw to directly clamp the holding part.



8. Maintenance

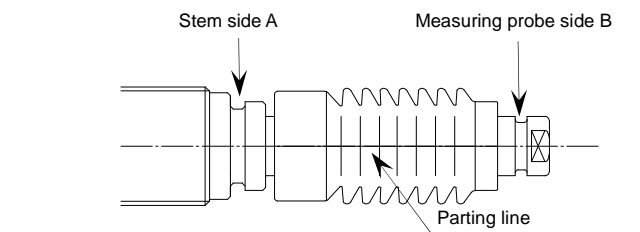
<Replacement method of the measuring probe>
As shown in the figure below, replace the measuring probe while engaging the spanner provided as an accessory across the flats of the spindle that are for this purpose.

Do not remove the measuring probe with the main unit secured. If the measuring probe is replaced while securing the body of the product, the rotational force is transmitted through the spindle to the inside of the product, and the photoelectric converter attached to the spindle may malfunction and cause damage to the sensor.



<Replacement method of the rubber bellows>

- Removal
Remove the measuring probe in accordance with the above procedure. Detach the rubber bellows at groove A located at the stem side first and then at groove B located at the measuring probe side.
- Installation
Before installing the rubber bellows, wipe the spindle with anhydrous alcohol. Insert the rubber bellows to the middle of the stem and measuring probe (See the figure below). Attach the rubber bellows to groove A located at the stem side first and then to groove B located at the measuring probe. When attaching the rubber bellows, take care not to smear the spindle. Failure to do so may cause a malfunction. If the spindle happens to become soiled, wipe it clean with absolute alcohol. After the installation, check the parting line (a line generated on a mold parting surface) for twisting. Twisted parting lines may interfere with the performance. After installing the rubber bellows, install the measuring probe by following the procedure.



This product qualifies for a CE marking. Specifications are subject to change without notice due to improvements. <Inquiry> For further information on this product, please contact the dealer you purchased this product or our Sales Department.

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