EMERSON SM6 Aventics Distance Measuring Sensor Instruction Manual

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Contents

About this documentation

Read this documentation completely, especially chapter g 2. Safety before working with the product.
These instructions contain important information on the safe and appropriate assembly, operation, and maintenance of the product and how to remedy simple malfunctions yourself.

1.1 Documentation validity

This documentation applies to distance measuring sensors, series SM6. This documentation is intended for: System owners, system planning engineers, machine manufacturers, installers

1.2 Additional documentation

Apart from this documentation, you will not receive any further documentation on the product or on the system or machine in which the product is installed. However, observe the following related documents:

- Manufacturer’s system documentation Additionally, always observe the following regulations:
- General, statutory, and other binding laws of the European and national laws.
- Applicable regulations for accident prevention and environmental protection.

1.3 Presentation of information

1.3.1 Warnings

Warnings of personal injury and damage to property are highlighted in this documentation. The measures described to avoid these hazards must be followed.

Display as a highlighted box

Warnings that are displayed in the form of highlighted boxes have the following structure:

 **SIGNAL WORD**

Hazard type and source

Consequences of non-observance

- Precautions

Presentation with the highlighted signal word

Instructions and lists often contain warnings that are integrated into the text. Inline warnings are introduced with a bold signal word:

CAUTION! Do not exceed permissible bending radii.

Meaning of the signal words

Signal word	Meaning
Danger	Immediate danger to the life and health of persons. Failure to observe these notices will result in se h.
Notice	Possibility of damage to property or malfunction. Failure to observe these notices may result in dam personal injury.

1.3.2 Symbols

 Recommendation for the optimum use of our products. Observe this information to ensure the smoothest possible operation.

Safety

2.1 About this chapter

The product has been manufactured according to the accepted rules of current technology. Even so, there is a danger of injury and damage to equipment if the following hapter and safety instructions of this documentation are not followed.

- Read this chapter and this documentation completely before working with the product.
- Keep this documentation in a location where it is accessible to all users at all times.
- Always include the operating instructions when you pass the product onto third parties.

2.2 Intended use
The product is an electrical system component.
The product was manufactured for the following applications:

- The product is intended for professional use and not for private use.
- The product is exclusively intended to be installed in an end product (such as a machine or system) or to be assembled with other components to form an end product.

Application area and location
The product is designed only for use in the following areas:

- Industrial sector
- Only use with AVENTICS actuators with T-slot.
- Only use the product indoors.

INFO: If the product is to be used in a different area: Obtain an individual license from the relevant authorities or inspection center.
Notes

- The product must first be installed in the machine/system for which the product is intended. The product may only then be commissioned.
- Observe the technical data and the specified operating conditions and performance limits.
- Intended use also includes having read and understood these instructions in full, in particular the section on g 2. safety.

2.3 Improper use
Any use other than that described in the section “Intended use” is considered improper and is not permitted.
AVENTICS GmbH is not liable for any damages resulting from improper use. The operator alone bears the risks of improper use of the product.
2.4 Obligations of the operator
Compliance with regulations

- Observe the regulations for accident prevention and environmental protection.
- Comply with the national safety rules and regulations.

Basic regulations for the use

- Only use the product if it is in perfect working order.
- Follow all the instructions on the product.
- Observe all specifications in the documentation.
- Ensure that the conditions for use meet the requirements for safe use of the product.

2.4.1 Identifications and warning signs on the product
As an owner, ensure that identifications and warning signs on the product are clearly legible.
2.4.2 Commissioning

The product is installed in an end product (such as a machine or system) or to be assembled with other components to form an end product. Do not commission the product until it has been determined that the end product meets the country-specific provisions, safety regulations, and standards for the application.

2.4.3 Personnel

The owner must ensure that the following prerequisites are complied with:

- Only operating personnel who meet the qualification requirements are used (see section g 2.5. Personnel qualifications).
- The operating personnel has read and understood this documentation before working with the product. The operating personnel is regularly trained and informed about the hazards at work.
- Persons who assemble, operate, disassemble, or maintain products must not consume any alcohol, drugs, or pharmaceuticals that may affect their ability to respond.

2.4.4 Cleaning, maintenance, repair

The owner must ensure that the following prerequisites are complied with:

- Cleaning intervals are determined and complied with according to environmental stress factors at the operating site.
- No unauthorized repairs are attempted by employees of the operator if there is a malfunction.
- Only accessories and spare parts approved by the manufacturer are used to avoid injuries due to unsuitable spare parts.

2.5 Personnel qualifications

The work described in this document requires basic knowledge in the following areas, as well as knowledge of the appropriate technical terms:

- Pneumatics
- Electrics

The activities described in this documentation may only be carried out by the following persons:

- by a qualified person or
- by an instructed person under the direction and supervision of a qualified person

Definition of a qualified person

Qualified persons are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant conditions pertaining to the work to be done. Qualified persons must observe the rules relevant to the subject area.

2.6 Hazards

The following section gives you an overview of the basic hazards that arise when working with the product.

2.6.1 Notes on safety

To eliminate risks, observe the following instructions:

DANGER

High danger of injury or death

Non-compliance is very likely to result in serious injury or death.

- In the following, observe all specifications marked with “accident prevention”.

NOTICE
Material damage
Non-compliance can lead to material damage and malfunctions.

- In the following, observe all specifications marked with “material protection”.

2.6.2 Danger of injury
Trip hazard due to improperly laid cables and lines

- Lay the cables and lines so that no one can trip over them.

2.6.3 Material damage
Damage due to too high mechanical loads
The product can be damaged by too high mechanical loads.

- Never twist or bend the product, or mount it when it is under tension.
- Do not use the product as a handle or step.
- Do not position any objects on the product.

Scope of delivery

- 1x Sensor
- 1x Operating instructions
- 1 hexagon screwdriver wrench size 1.3

Transport and storage

4.1 Transporting the product
Hazards during transportation
To eliminate risks during transport, observe the following instructions:

- Proceed with caution and observe the information on the packaging when unloading and transporting the packaged product to the destination.
- Ensure that the product cannot fall down before the product is released from the mountings (accident prevention, material protection).
- Do not stand under suspended loads (accident prevention).
- Take steps to avoid damage when lifting the product (accident prevention, material protection).
- Heavy products and components must be carried by two people or by one person with lifting aids (accident prevention, material protection).
- Wear appropriate protective clothing (e.g. sturdy footwear).

4.2 Storing the product
Damage due to incorrect storage
Unfavorable storage conditions can result in corrosion and material deterioration.

- Comply with the limits: see section g 13. Technical data.

- Only store the product in locations that are dry, cool, and prevent corrosion.
- Avoid direct sunlight.
- Keep the product in the original or delivery packaging until the time of installation.
- Also, observe any additional storage information on the product packaging.

4.3 Returning the product
Proceed as follows to return the product:

1. If the product has already been mounted: Dismount the product (see section g 10. Dismounting).
2. Package the product in its original packaging. If the original packaging is no longer available: Select a suitable replacement packaging in consultation with EMERSON (contact details: see back cover).
3. If the product cannot be returned immediately: Observe the storage conditions (see section g 4. Transport and storage).
4. Return the product.

Product Description

5.1 Brief description
The SM6 is a non-contact analog position sensor whose output signal transfers the current position of the cylinder piston.
The SM6 distance measuring sensor is not a safety component in terms of the Machinery Directive.
5.2 Identification
Nameplate
Product identification
The ordered product is clearly identified by the material number. Check the material number to determine whether the delivered product matches the number on your order confirmation or delivery note.
The material number can be found in these locations:

- As a QR code on the cable flag.
- On the adhesive label on the packaging.

5.3 Product overview
5.3.1 Standard components

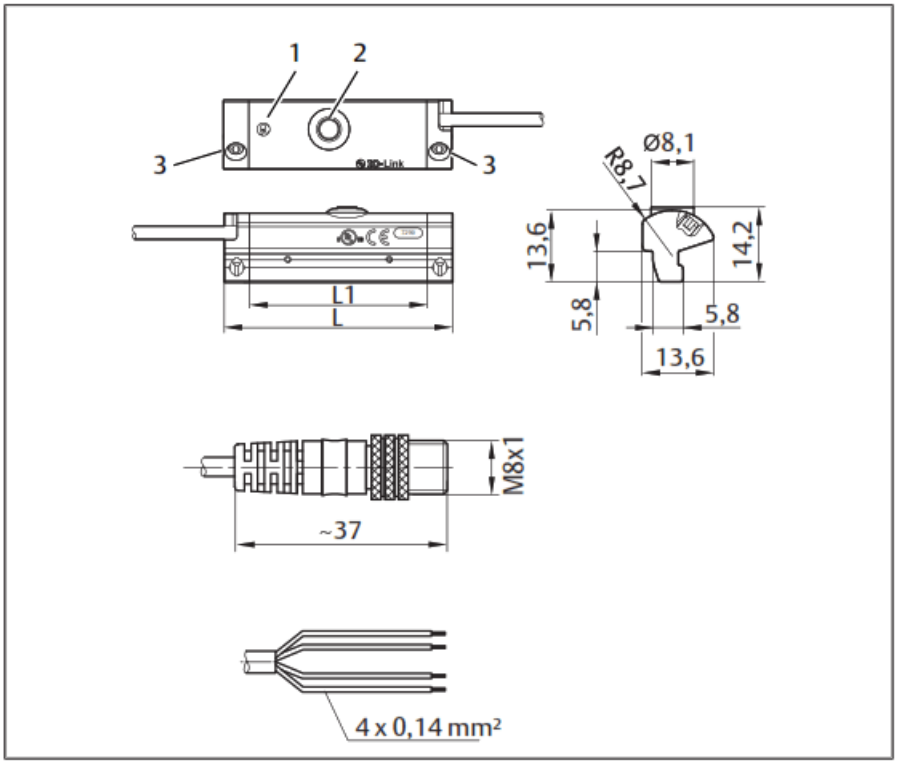

Fig. 1: Dimensions

1. Function indicator
2. Teach-in button
3. Mounting screw

Table 1: Dimensions: Overall length/distance measuring length

	L	L1
	(overall length)	(distance measuring length)
SM6-32	45	
SM6-64	77	
SM6-96	109	
SM6-128	141	
SM6-160	173	
SM6-192	205	
SM6-224	237	
SM6-256	269	

Table 2: Pin assignment: connection M8x1, 4-pin

Plug	Pin	Use	Cable (color)
M8x1	1	+ Vcc: 24 V DC supply	Brown
	2	Out 1: current signal	White
	3	GND: reference potential	Blue
	4	Out 2: voltage signal	Black

Table 3: Pin assignment: connection with free wire ends

Wire color	**Use**
Brown	+ Vcc: 24 V DC supply
White	Out 1: current signal
Blue	GND: reference potential
Black	Out 2: voltage signal

5.3.2 Function and application
The product is a non-contact analog position sensor. The sensor provides an output signal proportional to the cylinder stroke.
The magnet integrated in the cylinder piston generates a magnetic field. This magnetic field acts on the sensor elements that are arranged along the longitudinal axis of the distance measuring sensor. A special evaluation of the sensor signals determines the current position of the cylinder piston. For further information, see the Technical Information (MNR R412018764).
The measurement range is set to the entire measuring length of the respective sensor at the factory. The zero point and final value of the measurement range can be adjusted to the stroke to be measured via a teach-in button. The product can be used specifically for measuring a section of the entire cylinder stroke (partial stroke sensor).
If the magnetic piston leaves the sensor's measurement range, the output signal is frozen at the most recently measured value until the magnetic piston again enters the measurement range.
As analog output, a voltage and current signal is made available (see g Table 2 and g Table 3).
An in-range display supports the assembly of the distance measuring sensor: An LED lights up when the magnetic piston is within the measurement range.

Assembly and installation

Before you start with the installation: Familiarize yourself with the basic specifications for assembly as early as possible in advance: see sections g 6.1. Planning and g 6.2. Preparation.
6.1 Planning
In the following, you will read which basic requirements must be met so that you can successfully and safely assemble the product.
Do not carry out the preparation and installation steps until you have successfully completed the planning.
6.1.1 Basic requirements
The following specifications apply to the assembly of all products. Installation-specific requirements

- Observe the set-up regulations in the country of use.
- Assembly only by qualified personnel (see section g 2.5. Personnel qualifications).

Ambient conditions

- Only use the product in non-aggressive industrial atmospheres (explosion protection). Only then can explosion protection be guaranteed.
- Comply with the limits (accident prevention, material protection). Limits: see section g 13. Technical data.
- If the ambient air contains aggressive substances: Get in touch with our contact address to determine whether use of the product is still possible (contact data: see back cover).
- Let the product acclimatize for a few hours before installation. Otherwise, water may condense in the housing.

Accessibility

Install the product in the system part so that the following connections and operating parts are always accessible or have enough room:

- Electrical connections
- Pneumatic connections
- Cable and tubing

6.1.2 Notes on safety
To eliminate risks during assembly, observe the notes on safety: see section 2.6.1. Notes on safety.
6.1.3 Installation conditions
The installation conditions include the specifications that apply specifically to the product family that your product belongs to.
General requirements

- Make sure that the product is installed in a manner that protects it from all types of mechanical loads.
- Install the product in an area protected from UV radiation.

Product-specific requirements

- Mounting orientation: see section g 13. Technical data.
- Use a power source in compliance with IEC/DIN EN 60204-1.
- Avoid ferritic components in the immediate vicinity of the product. Strong external magnetic fields (e.g. welding devices) or ferromagnetic addon parts located in the area of the proximity switch could possibly impair the product function.

6.1.4 Required accessories, materials, and tools Mounting material
If you use AVENTICS mounting material, see the online catalog for the relevant data. Important information for assembly:

- Dimensions
- Tightening torques: Observe the values in the online catalog.

If no information is given on tightening torques or you use your own mounting material, the generally recognized rules of technology apply to assembly.

Tool

- 1 hexagon screwdriver wrench size 1.3

Accessory parts
Depending on the chosen configuration and the application, additional components are required to integrate the product into the system and the system's control.

6.2 Preparation
6.2.1 Notes

- Do not carry out any work on the system during preparation (accident prevention).

6.2.2 Unpacking and checking the product

1. Unpacking the product.
2. Check the material number to see if the product matches your order. The material number can be found on the housing of the product.
3. Check the product for transport and storage damage. Do not install a damaged product. Return damaged products together with the delivery documents (address: see back cover).
4. Prepare required accessories, materials, and tools.

6.2.3 Implementing safety measures Procedure
All work has to be prepared as follows:

1. Close off dangerous areas (accident prevention).
2. Make sure the system or system part is not under pressure or voltage (accident prevention).
3. Protect the system against being restarted (accident prevention).
4. Allow the product and adjacent system parts to cool down (accident prevention).
5. Wear protective clothing (accident prevention).

6.3 Installation
6.3.1 Assembling the distance measuring sensor

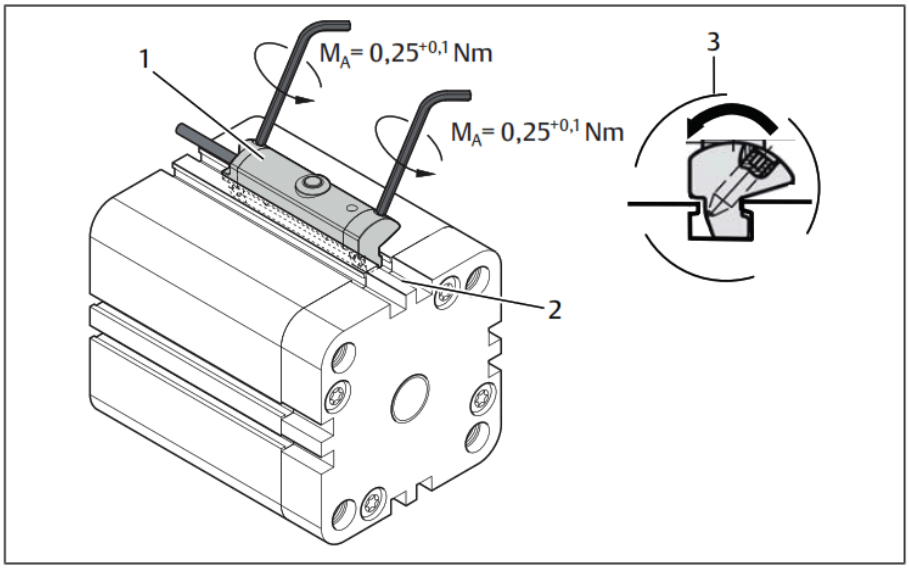

Fig. 2: Assembling the SM6 distance measuring sensor

1. Sensor
2. T-slot
3. Detailed view: assembly position

Procedure

1. Insert the sensor (1) into the T-slot (2) from above using a light swivel motion (3) and fix it with the hexagon screwdriver.
2. Connect the sensor to a suitable power supply (see section g 13. Technical data and the following figures).
   The sensor has both an analog voltage output (0 … 10 V) and a current output (4 … 20 mA).
   The sensor only activates the output that is switched.

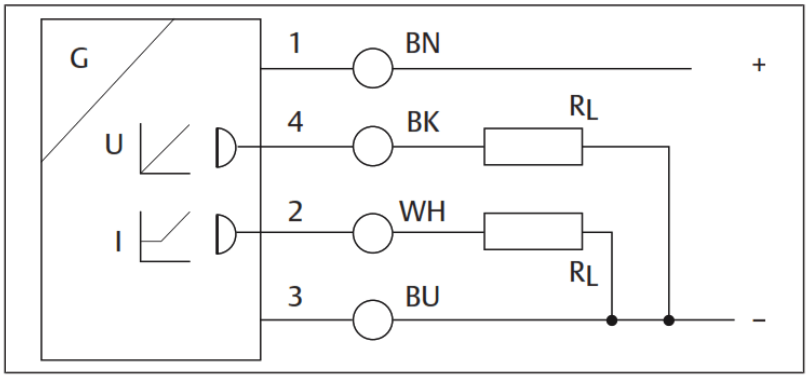

Fig. 3: Plug assignment

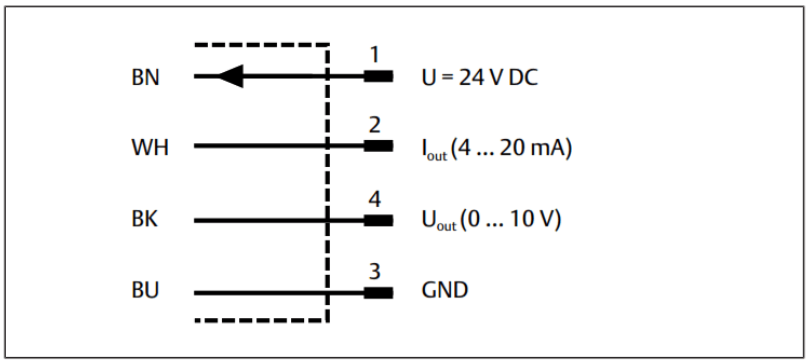

Fig. 4: Cable wires

   During assembly, the axial orientation of the sensor can be supported by the range display. The LED flashes or lights up when the magnetic piston is in the distance measuring sensor's permissible measurement range.
3. Move the sensor in an axial direction until it records the entire stroke range to be measured.
4. Fix the sensor in the adjusted position by tightening the two mounting screws equally.
   Tightening torque MA = 0.25 + 0.1 Nm
5. Check whether the sensor records the stroke range to be measured: In-range display (LED) must light up.
6. If the in-range display does not light up: Re-align the axial orientation of the sensor.
   INFO: An exact axial alignment is a prerequisite for all further steps.

Commissioning

Follow the steps below to carry out commissioning.

7.1 Basic requirements

Personnel qualifications Commissioning only by qualified personnel (see section g 2.5. Personnel qualifications).

Limits

- Comply with the limits (accident prevention, material protection). Limits: see section g 13. Technical data.

7.2 Notes on safety
To eliminate risks during commissioning, observe the notes on safety: see section g 2.6.1. Notes on safety.
7.3 Preparation General requirements

- Ensure that the system is in a defined state before switching it on (danger of accidents). If the system is not in a defined state, switching on the pneumatics can lead to uncontrolled movements of the actuators.
- Only commission the product after it has been completely assembled as well as correctly connected, and after it has been properly tested.

7.4 Step-by-step commissioning
If you have carried out and completed all preparation work, you can commission the system.
Optional: Adjusting the measurement range (see section g 7.4.1. Adjusting the measurement range).
7.4.1 Adjusting the measurement range

- The maximum permissible measurement range is set as standard. The measurement range is only adjusted via the teaching-in process.
- If the magnetic piston is outside of the measurement range during the adjustment process, this is indicated by an increased flashing frequency and the teach-in process is aborted.
- A teach-in process that is not completed successfully is aborted after 90 s (timeout). The most recently set measurement range is maintained.

Adjusting the measurement range as described below is optional.

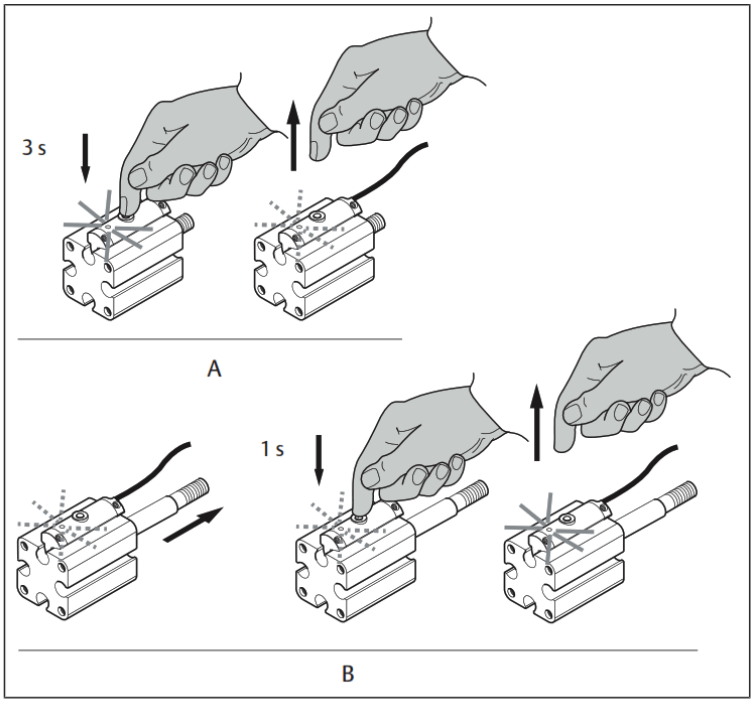

Fig. 5: Teaching in zero point (A) / teaching in end point (B)

Procedure

1. Move the magnetic piston to the position for the zero point.

2. Check if LED lights up (magnetic piston is in the measurement range).
3. Press and hold the teach-in button until the LED flashes (t = 3 s).
4. To save the zero point: release the button. (Flashing LED indicates that the endpoint still has to be set.)
5. Move the magnetic piston to the position for the endpoint.
6. Briefly press and hold the teach-in button (t = 1 s).
7. To save the endpoint: release the button.
   ⇒If the LED lights up, measurement range adjustment is completed.

Operation

8.1 Basic requirements

The following points must be observed during operation.

General requirements

- Do not touch the product or any connected parts during operation (accident prevention).
- Never switch off, modify or bypass safety devices.

Limits

- Comply with the limits (accident prevention, material protection). Limits: see section g 13. Technical data.
- Make sure that there are no ferromagnetic sources near the product (material protection).

Service

- Carry out service work in the designated time intervals: see section g 9. Service.

In case of malfunctions during operation

- In case of a malfunction that presents an immediate danger for employees or systems: Switch off the product.
- Carry out analysis and troubleshooting of malfunctions according to the following specifications: see section g 12. Troubleshooting.
- If a malfunction cannot be remedied: Inform customer service. Contact data: see back cover.

8.2 Checking the zero point and end point adjustment

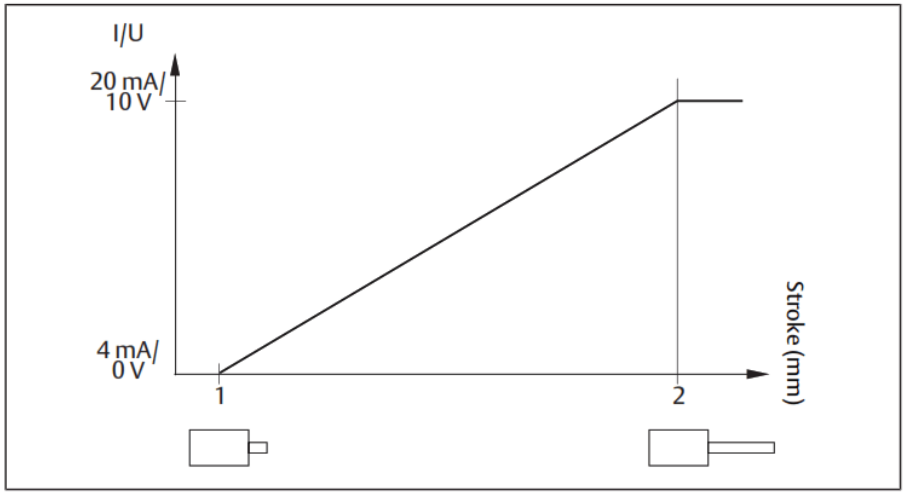

Fig. 6: Sensor characteristic curve (1: zero point; stroke = O / 2: end point; stroke

- After approaching the zero point, a value of U = approx. 0 V or I = approx. 4 mA is present at the corresponding output pin.
- After approaching the endpoint, a value of U = approx. 10 V or I = approx. 20 mA is present at the corresponding output pin.

In both positions, the LED must light up yellow. If the LED does not light up yellow, the measurement range must be re-adjusted. In this case, the sensor must be reset to factory settings. See section g

8.3. Resetting measurement range to factory settings.

Press and hold the teach-in button (t = 5 s) until the permanent LED signal is displayed.

⇒The sensor has been reset to the factory settings.

Service

The following operation-related activities are necessary to ensure the safe use of the product with minimal wear and tear:

- Inspection, see section g 9.2. Inspection
- Cleaning, see section g 9.3. Cleaning
- Maintenance, see section g 9.4. Maintenance

9.1 Notes on safety

To eliminate risks during service, observe the notes on safety: see section g 2.6.1. Notes on safety.

9.2 Inspection

During the inspection, check the product for damage and contamination at regular intervals.

9.2.1 General requirements

Use in normal ambient conditions

- Inspection interval: The product must be checked monthly.
- The operator is responsible for the inspection of the product and the overall system.

Use in aggressive ambient conditions includes, for example:

- High temperatures
- Heavy accumulation of dirt
- Proximity to grease-dissolving liquids or vapors Aggressive ambient conditions lead to further requirements for

inspection:

- Adapt the inspection interval for seals to the ambient conditions.
  NOTICE! Seals age faster under aggressive ambient conditions. Defective seals will lead to pneumatic leaks and non-compliance with the degree of protection. Inspect seals more frequently.
- Enter the adapted inspection intervals in the system-specific maintenance plan (accident prevention, material protection).

9.2.2 Procedure Preparation
All work has to be prepared as follows:

1. Close off dangerous areas (accident prevention).
2. Make sure the system or system part is not under pressure or voltage (accident prevention).
3. Protect the system against being restarted (accident prevention).
4. Allow the product and adjacent system parts to cool down (accident prevention).
5. Wear protective clothing (accident prevention).

Visual inspection
Visually inspect for integrity.
Detailed inspection

- Check identifications and warnings on the product: Labels and identifications must be legible (accident prevention, material protection). Replace hard-to-read labels or identification immediately.
- Check the seals.
- Check to make sure that all fittings are properly connected.
- Check the safety devices on the system.
- Check the product functions.

9.3 Cleaning
9.3.1 General requirements
Cleaning intervals

- The system owner specifies the cleaning intervals in line with the ambient conditions at the operating site.
- Observe the information in the system documentation. Aids
- Only clean the product with damp cloths.
- Only use water for cleaning and a mild detergent, if necessary (material protection).

Notes
Penetrating fluids destroy seals and cause damage to the product.
9.3.2 Procedure Preparation
All work has to be prepared as follows:

1. Close off dangerous areas (accident prevention).
2. Make sure the system or system part is not under pressure or voltage (accident prevention).
3. Protect the system against being restarted (accident prevention).
4. Allow the product and adjacent system parts to cool down (accident prevention).

5. Wear protective clothing (accident prevention).
6. Close all openings with suitable safety devices so that no cleaning agent can enter the system.

Cleaning

1. Remove all dust deposits from the product and the adjacent system parts.
2. If necessary, remove other production-related deposits from the product and the adjacent system parts.

9.4 Maintenance
In normal ambient conditions, the product is maintenance-free.
Notes

• Observe the maintenance plan for the overall system: Further maintenance tasks may result from the maintenance plan for the overall system and the maintenance intervals specified therein.

9.5 After service
After completion of the service work, carry out the following steps:

1. Remove all tools and devices from the work area.
2. Remove all installed barriers and notices.
3. Clean the work area, mop up any liquids and remove work materials.
4. Log any service work in the respective plan.

If no damage has been detected and the operator has not reported any malfunctions, the product can be reconnected to the power supply and put back into operation.

Dismounting

Disassembly is only required if the product has to be exchanged, installed in a different location or disposed off.
10.1 Basic requirements

- Make sure that there is sufficient space.
- Secure larger product or system parts so that they cannot fall down or topple (accident prevention).
- Do not stand under suspended loads (accident prevention).
- Make sure that the environment is not contaminated with grease or lubricants during disassembly (material protection).

10.2 Notes on safety
To eliminate risks during disassembly, observe the notes on safety: see section g 2.6.1. Notes on safety.
10.3 Preparation

1. Close off dangerous areas (accident prevention).
2. Make sure the system or system part is not under pressure or voltage (accident prevention).
   DANGER! Slowly exhaust the system to avoid uncontrolled movements of the system components.
3. Protect the system against being restarted (accident prevention).
4. Allow the product and adjacent system parts to cool down (accident prevention).
5. Wear protective clothing (accident prevention).

Disposal

Improper disposal of the product and packaging will lead to pollution of the environment. Furthermore, the materials can no longer be recycled.
⇒Dispose of the product and the packaging in accordance with the applicable national regulations.

Troubleshooting

If you cannot remedy a malfunction, get in touch with our contact address (contact data: see back cover).
12.1 Basic requirements
General requirements for repair

- Never dismantle or convert the product (accident prevention, material protection).
- Do not carry out any unauthorized repair attempts (accident prevention, material protection). Permissible spare parts and reconditioning kits
- Only use spare parts and reconditioning kits from the online catalog (accident prevention, material protection).

12.2 Notes on safety
To eliminate risks during troubleshooting, observe the notes on safety: see section g 2.6.1. Notes on safety.
12.3 Procedure
Step 1: Check the system
⇒In case of malfunctions, first check the system or the system part where the product is installed. Check the following items:

- Are all connections connected to the product?
- Does the operating voltage comply with the requirements? See section g 13. Technical data.
- Does the operating pressure comply with the requirements? See section g 13. Technical data.

Step 2: Check the product

Technical data

This section contains an excerpt of the most important technical data. Further technical data can be found in the online catalog.
General

Specifications	
Distance measurement range	32, 64, 96, 128, 160, 192, 224 or 256 mm
Housing material	SAN, PA fiberglass reinforced
Ambient temperature	–20 … +70 °C
Degree of protection	IP67
Permissible shock load	30 g, 11 ms
Permissible vibration load	10 to 55 Hz, 1 mm

Performance data

Specifications	
Sampling interval	1 ms
Resolution at 25 °C	0.05 mm
Linearity error	0.3 mm
Repeatability	0.1 mm
Traversing speed	3 m/s

Electrics

Specifications	
DC operating voltage	15 … 30 V
Residual ripple	≤ 10 %

Specifications

Electrical interface	2 m PUR, plug M8x1
Analog current output	4 … 20 mA
Analog voltage output	0 … 10 V
Overload resistance	Yes
Short circuit resistance	Yes
Reverse polarity protec tion	Yes
Max. load resistance, current output	500 Ω
Min. load resistance, voltage output	2.5 kΩ
Quiescent current without load	25 mA
LED display	Yellow

The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The given information does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.
An example configuration is depicted on the title page. The delivered product may thus vary from that in the illustration.
Translation of the original operating instructions. The original operating instructions were created in the German language.

Import into the United Kingdom is done by:

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Fluid Control & Pneumatics UK Ltd
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Documents / Resources

	EMERSON SM6 Aventics Distance Measuring Sensor [pdf] Instruction Manual SM6, Aventics Distance Measuring Sensor, Distance Measuring Sensor, Measuring Sensor, S M6, Sensor

References

- AVENTICS – Smart, reliable solutions for pneumatic automation | Emerson US
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