# Air gap sensor SOPA



**FESTO**

# Characteristics

- Communication interface IO-Link®
- Operating pressure 4... 7 bar
- Detection range 20... 200 µm
- Analogue output 1... 5 V, 0... 10 V or 4... 20 mA
- Switching outputs 2x PNP, 2x NPN, PNP/NPN switchable
- 2-colour LCD display
- Integrated blow-out function
- Teachable distance threshold values
- Sensing of the entire distance value via IO-Link or analogue output

General information:
- Lightweight, compact and highly precise, this pneumatic solution is particularly impressive thanks to its integrative capabilities: SOPA is equipped with a controller module, compressed air control, measuring air shut-off and blow-off function, as well as up to 4 measuring modules. In summary: the attractively priced solution for minimal tolerances.

Precise:
- The air gap sensor SOPA senses exactly in the µm range whether the workpiece is lying flat or resting against the work surface before clamping and whether the machining tool is exactly aligned with the spindle. The solution for two-stage workpiece machining with different surface qualities. Alternatively, the distance value can be transmitted to the controller via IO-Link or the analogue output. Parameters can therefore be changed even when the system is running. This means, for example, that it is easy and straightforward to adjust the switching points when workpieces change during the process.
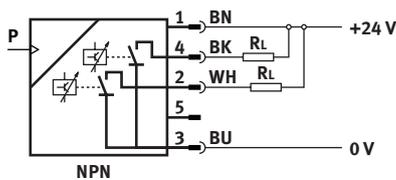
Easy to operate:
- Lightweight, compact and easy to use: Through parameterisation with IO-Link, teach-in or numerical setting with 3-button operation. Extremely simple installation and commissioning thanks to virtually unregulated compressed air included, as well as the integrated blow-off function without additional peripherals. All settings that have been carried out on one IO-Link measuring module (master) can be transferred (replication) to identical measuring modules (device).
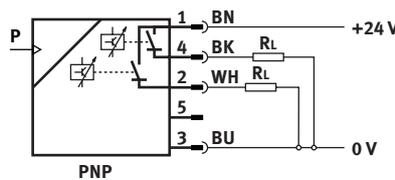
Safe and flexible:
- The multicolour LCD display ensures maximum safety by clearly visualising the operating status. The selectable measuring points 1... 4 and other functions make the application highly flexible. In the menu, a four-digit security code can be chosen and freely configured. This prevents unauthorised changes to device parameters.

| [2N] | 2x NPN |
|------|--------|



| [2P] | 2x PNP |
|------|--------|



| [PNLK] | PNP/NPN/IO-Link |
|--------|-----------------|

# Characteristics

## Electrical output 2
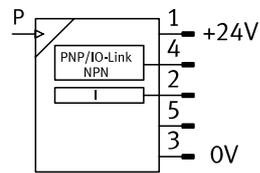
| [_] | None |
|---|---|

| [A] | 4 … 20 mA |
|---|---|



| [VB] | 0 … 10 V or 1 … 5 V |
|---|---|
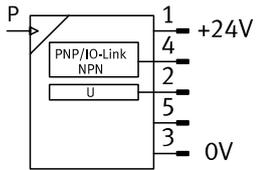


## Ordering data - modular system



Configurable product
This product and all its product options can be ordered online via the configurator.

# Type code

| 001 | Series | |
|---|---|---|
| **SOPA** | Air gap sensor for contact and distance monitoring with LCD display | |

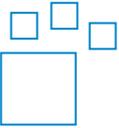| 002 | Modules | |
|---|---|---|
| **CM1** | Control module with a sensor module | |
| **CM2** | Control module with two sensor modules, pneumatically linked | |
| **CM3** | Control module with three sensor modules, pneumatically linked | |
| **CM4** | Control module with four sensor modules, pneumatically linked | |
| **M1** | Sensor module | |

| 003 | Manual override control module | |
|---|---|---|
| | None | |
| **H** | With | |

| 004 | Sensing range | |
|---|---|---|
| **R1** | 20 … 200 µm | |

| 005 | Type of mounting | |
|---|---|---|
| **H** | H-rail mounting | |
| **W** | Wall mounting | |

| 006 | Pneumatic connection | |
|---|---|---|
| **Q6** | Push-in connector 6 mm | |

| 007 | Electrical output 1 | |
|---|---|---|
| **2N** | 2x NPN | |
| **2P** | 2x PNP | |
| **PNLK** | PNP/NPN/IO-Link | |

| 008 | Electrical output 2 | |
|---|---|---|
| | None | |
| **A** | 4 … 20 mA | |
| **VB** | 0 … 10 V or 1 … 5 V | |

| 009 | Electrical connection | |
|---|---|---|
| **M12** | Plug M12, A-coded | |

| 010 | Electrical accessories | |
|---|---|---|
| | None | |
| **E1** | Straight socket, cable 2.5 m | |
| **E2** | Straight socket, cable 5 m | |
| **E3** | Angled socket, cable 2.5 m | |
| **E4** | Angled socket, cable 5 m | |

# Datasheet

**General technical data**

| Approval | RCM trademark, c UL us - Recognized (OL) |
|---|---|
| CE mark (see declaration of conformity) | To EU EMC Directive, In accordance with EU RoHS Directive |
| UKCA marking (see declaration of conformity) | To UK instructions for EMC, To UK RoHS instructions |
| KC mark | KC-EMV |
| Note on materials | RoHS-compliant |

**Input signal, measuring element**

| Measuring principle | Pneumatic |
|---|---|
| Detected variable | Distance |
| Sensing range | 20 ... 200 µm |
| Operating pressure | 4 ... 7 bar |
| Supply pressure | 0.8 ... 1.6 bar |
| Operating medium | Compressed air to ISO 8573-1:2010 [7:4:4] |
| Note on operating and pilot medium | Lubricated operation possible (in which case lubricated operation will always be required) |
| Ambient temperature | 0 ... 50°C |

**General output**

| Repetition accuracy in ± µm | 2.5 µm |
|---|---|

**Switching output**

| Switching output | 2xNPN, 2xPNP |
|---|---|
| Switching function | Window comparator, Threshold value with variable hysteresis |
| Switching element function | N/C or N/O contact, switchable |
| Max. output current | 100 mA |

**Analogue output**

| Analogue output [1] | 0 - 10 V | 4 - 20 mA |
|---|---|---|
| Starting value of distance characteristic | 0 µm | |
| End value of distance characteristic | 300 µm | |
| Rise time | 22 ms | |
| Max. load resistance current output | – | 500 Ohm |
| Min. load resistance voltage output | 20 kOhm | – |

1) The analogue output can be switched from 1 to 5 V.

**Output, additional data**

| Short circuit current rating | yes |
|---|---|

# Datasheet

| Communication interface | |
|---|---|
| Protocol | IO-Link® |
| IO-Link, Protocol version | Device V 1.1 |
| IO-Link, Profile | Smart sensor profile |
| IO-Link, Function classes | Process data variable (PDV), Identification, Diagnostics, Teach channel, Switching signal channel (SSC) |
| IO-Link, communication mode | COM2 (38.4 kBaud) |
| IO-Link, SIO-Mode support | Yes |
| IO-Link, Port class | A |
| IO-Link, Process data length IN | 2 bytes |
| IO-Link, Process data length OUT | 0 bytes |
| IO-Link, Process data content IN | 1-bit SSC (supply pressure monitoring), 10-bit PDV (distance), 2-bit SSC (distance monitoring) |
| IO-Link, Service data IN | 14-bit supply pressure |
| IO-Link, Min. cycle time | 3 ms |
| IO-Link, Data storage required | 0.5 |

| Electronics | | | | |
|---|---|---|---|---|
| Electrical output 1 | 2x NPN [2N] | 2x PNP [2P] | PNP/NPN/IO-Link [PNLK] | |
| Electrical output 2 | None [_] | | 4 … 20 mA [A] | 0 … 10 V or 1 … 5 V [VB] |
| Operational voltage range DC | 15 … 30 V | | 20 … 30 V | |
| Max. current consumption | 250 mA | | 170 mA | 150 mA |
| Reverse polarity protection | For all electrical connections | | | |

| Electronics | | | |
|---|---|---|---|
| Electrical output 1 | 2x NPN [2N] | 2x PNP [2P] | PNP/NPN/IO-Link [PNLK] |
| Operational voltage range DC | 22.8 … 26.4 V | | |
| Max. current consumption | 350 … 1,100 mA | | 250 … 780 mA |
| Reverse polarity protection | For all electrical connections | | |

| Electromechanics | |
|---|---|
| Electrical connection 1, connection type | Plugs |
| Electrical connection 1, connector system | M12x1, A-coded to EN 61076-2-101 |
| Electrical connection 1, number of connections/cores | 5 |
| Electrical connection 1, type of mounting | Screw-type lock, Not rotatable |
| Electrical connection 1, compatible type of mounting | Compatible with rotatable screw-type lock |

| Mechanical components | | |
|---|---|---|
| Type of mounting | Either:, With through-hole, With H-rail, Via wall/surface bracket | Either:, With through-hole, With H-rail |
| Pneumatic connection | QS-6 | |
| Product weight | 510 g, 570 g, 630 g, 690 g | 60 g, 510 g, 570 g, 630 g, 690 g |
| Material housing | Anodised aluminium, PA-reinforced | |

| Display, operation | |
|---|---|
| Display type | Illuminated LCD, multi-colour |
| Setting options | IO-Link®, Teach-in, Via display and keys |
| Protection against tampering | Electronic interlock |

## Datasheet

| Immission, emission | |
|---|---|
| Degree of protection | IP65 |
| LABS (PWIS) conformity | VDMA24364-C1-L |
| Corrosion resistance class CRC [1] | 2 - Moderate corrosion stress |

1) More information www.festo.com/x/topic/crc

# Dimensions
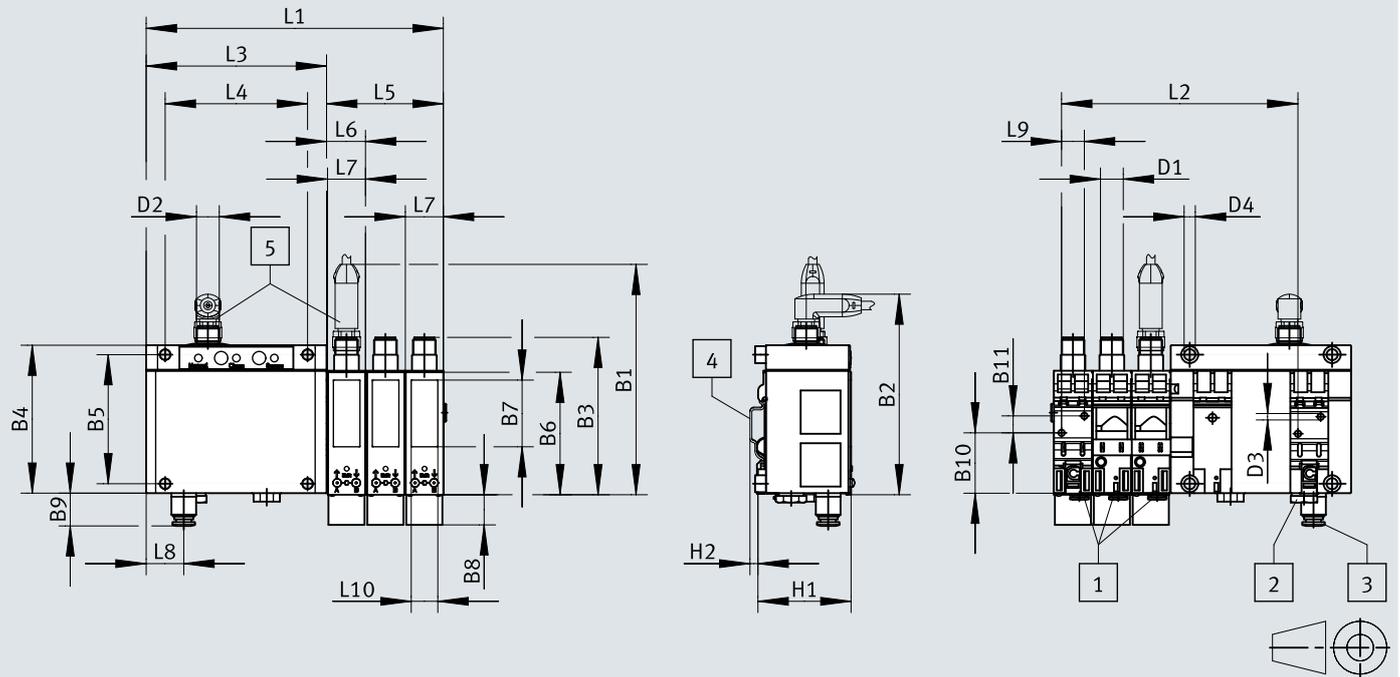
[1] Compressed air connection QS6 for measuring nozzle (output)
[2] Possible connection for differential pressure regulator
[3] Pressure port QS6 for supply pressure
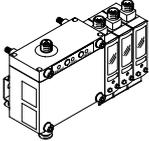[4] Surface adapter for wall mounting
[5] Optional connection socket for plug

| | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | D1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOPA-CM1H-... | | | | | | | | | | | | |
| SOPA-CM2H-... | | | | | | | | | | | | |
| SOPA-CM3H-... | 122 | 106 | 82,9 | 78,5 | 68,5 | 65 | 35,4 | 16,8 | 17,4 | 32 | 9 | M12x1 |
| SOPA-CM4H-... | | | | | | | | | | | | |
| SOPA-... | | | | | | | | | | | | |

| | D2 | D3 ∅ | D4 ∅ | H1 | H2 | L1 | L2 |
|---|---|---|---|---|---|---|---|
| SOPA-CM1H-... | | | | | | 115,5 | 83,5 |
| SOPA-CM2H-... | | | | | | 136 | 104 |
| SOPA-CM3H-... | M12x1 | 3,4 | 5,5 | 49 | 4,2 | 156,5 | 124,5 |
| SOPA-CM4H-... | | | | | | 177 | 145 |
| SOPA-... | | | | | | 95+(n x 20,5) | 83,5+(n–1) x 20,5 |

| | L3 | L4 | L5 | L6 | L7 | L8 | L9 | L10 |
|---|---|---|---|---|---|---|---|---|
| SOPA-CM1H-... | | | 20,5 | | | | | |
| SOPA-CM2H-... | | | 41 | | | | | |
| SOPA-CM3H-... | 95 | 75 | 61,5 | 20,5 | 20 | 19,8 | 12 | 14 |
| SOPA-CM4H-... | | | 82 | | | | | |
| SOPA-... | | | n x 20,5 | | | | | |

1)   n = number of sensor modules

# Ordering data

**Ordering information – Control module with sensor modules**

|  | Type of mounting [1] | Switching output | Part no. | Type |
|---|---|---|---|---|
|  | Either:, With through-hole, With H-rail, Via wall/surface bracket | 2xNPN | 552144 | **SOPA-CM3H-R1-WQ6-2N-M12** |
|  |  |  | 552145 | **SOPA-CM4H-R1-WQ6-2N-M12** |
|  |  |  | 552136 | **SOPA-CM3H-R1-HQ6-2N-M12** |
|  |  |  | 552137 | **SOPA-CM4H-R1-HQ6-2N-M12** |
|  |  |  | 552143 | **SOPA-CM2H-R1-WQ6-2N-M12** |
|  |  |  | 552135 | **SOPA-CM2H-R1-HQ6-2N-M12** |
|  |  |  | 552142 | **SOPA-CM1H-R1-WQ6-2N-M12** |
|  |  |  | 552134 | **SOPA-CM1H-R1-HQ6-2N-M12** |
|  |  | 2xPNP | 552139 | **SOPA-CM2H-R1-WQ6-2P-M12** |
|  |  |  | 552131 | **SOPA-CM2H-R1-HQ6-2P-M12** |
|  |  |  | 552138 | **SOPA-CM1H-R1-WQ6-2P-M12** |
|  |  |  | 552133 | **SOPA-CM4H-R1-HQ6-2P-M12** |
|  |  |  | 552130 | **SOPA-CM1H-R1-HQ6-2P-M12** |
|  |  |  | 552140 | **SOPA-CM3H-R1-WQ6-2P-M12** |
|  |  |  | 552132 | **SOPA-CM3H-R1-HQ6-2P-M12** |
|  |  |  | 552141 | **SOPA-CM4H-R1-WQ6-2P-M12** |

1) With wall/surface bracket, 2 adapter plates SXE3-W are included in the scope of delivery.

**Ordering information – Individual sensor module**

|  | Type of mounting | Switching output | Part no. | Type |
|---|---|---|---|---|
|  | Either:, With through-hole, With H-rail | 2xNPN | 552147 | **SOPA-M1-R1-HQ6-2N-M12** |
|  |  | 2xPNP | 552146 | **SOPA-M1-R1-HQ6-2P-M12** |

**Ordering information – Control module with sensor modules, switchable**
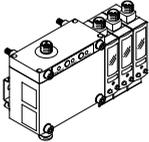
|  | Type of mounting | Switching output | Part no. | Type |
|---|---|---|---|---|
|  | Either:, With through-hole, With H-rail | PNP/NPN, switchable | 8093819 | **SOPA-CM1H-R1-HQ6-PNLK-A-M12** |
|  |  |  | 8093825 | **SOPA-CM4H-R1-HQ6-PNLK-A-M12** |
|  |  |  | 8093824 | **SOPA-CM4H-R1-HQ6-PNLK-VB-M12** |
|  |  |  | 8093821 | **SOPA-CM2H-R1-HQ6-PNLK-A-M12** |
|  |  |  | 8093820 | **SOPA-CM2H-R1-HQ6-PNLK-VB-M12** |
|  |  |  | 8093823 | **SOPA-CM3H-R1-HQ6-PNLK-A-M12** |
|  |  |  | 8093822 | **SOPA-CM3H-R1-HQ6-PNLK-VB-M12** |
|  |  |  | 8093818 | **SOPA-CM1H-R1-HQ6-PNLK-VB-M12** |

**Ordering information – Individual sensor module, switchable**

|  | Type of mounting | Switching output | Part no. | Type |
|---|---|---|---|---|
|  | Either:, With through-hole, With H-rail | PNP/NPN, switchable | 8093817 | **SOPA-M1-R1-HQ6-PNLK-A-M12** |
|  |  |  | 8093816 | **SOPA-M1-R1-HQ6-PNLK-VB-M12** |

**Ordering data – Modular product system**
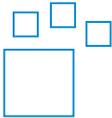
|  | Type of mounting | Switching output | Part no. | Type |
|---|---|---|---|---|
|  | Either:, With through-hole, With H-rail, Via wall/surface bracket | 2xNPN, 2xPNP, PNP/NPN, switchable | 549902 | **SOPA-...** |

# Peripherals

## Peripherals overview
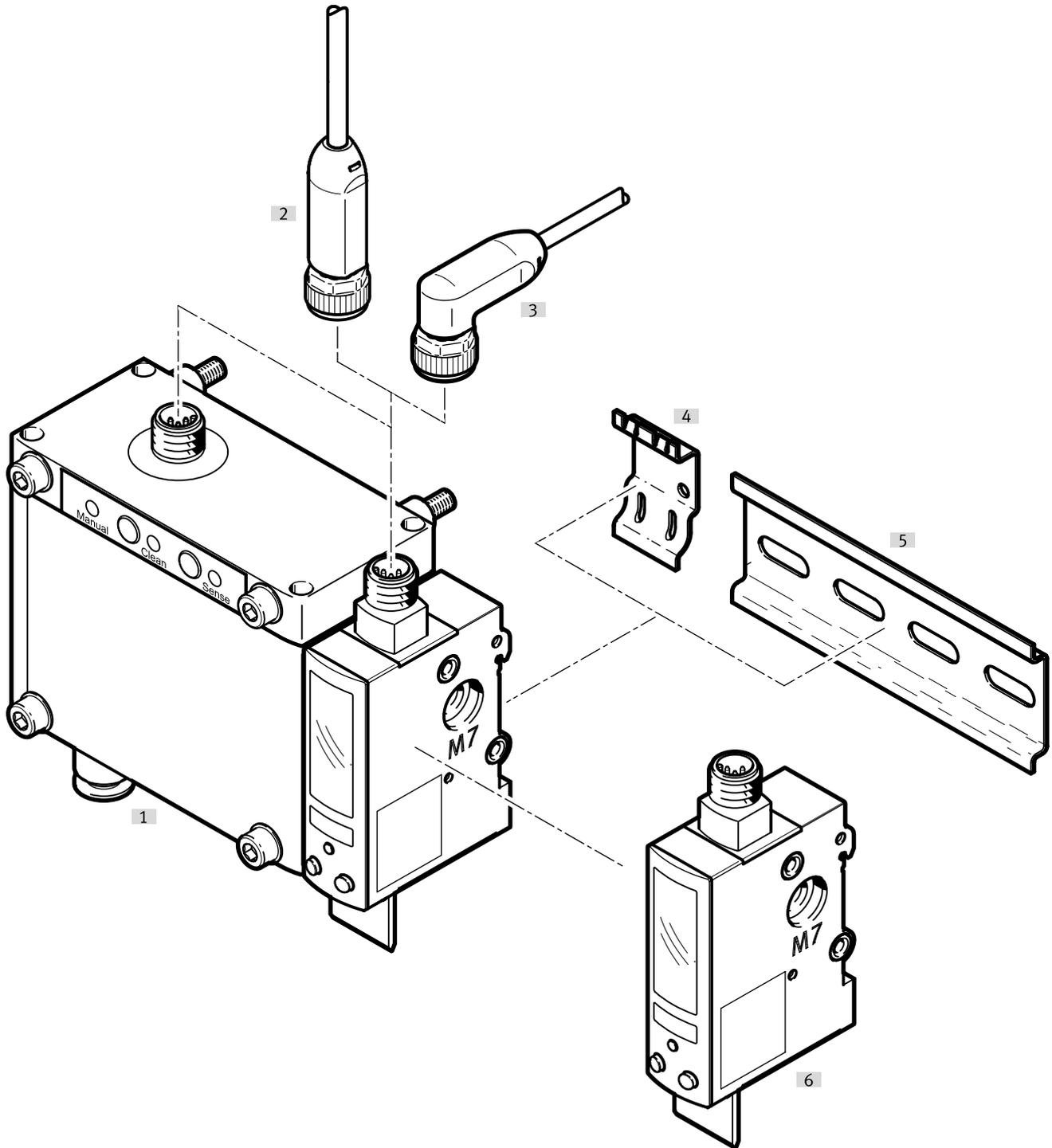


| Accessories | | | → Link |
|---|---|---|---|
| | Type/order code | Description | |
| [1] | Control module | with one sensor module SOPA-CM1-... | ⊘ sopa |
| [2] | Connecting cables NEBA | Straight socket | 11 |
| [3] | Connecting cables NEBA | Angled socket | 11 |
| [4] | Adapter plate | SXE3-W (2 pieces for SOPA- ... -W- ... included in the scope of delivery) | 11 |
| [5] | DIN mounting rail | To DIN EN 60715 | ⊘ – |
| [6] | Sensor module | Individual sensor module | ⊘ sopa |
| [7] | Label holder | SXE3 (included in the scope of delivery) | ⊘ – |

## Accessories

**Adapter plate**

|  | Type of mounting | LABS (PWIS) conformity | Note on materials | Part no. | Type |
|---|---|---|---|---|---|
|  | With through-hole | VDMA24364-B1/B2-L | RoHS-compliant | **540214** | **SXE3-W** |
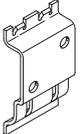
**Connecting cable NEBA-M12, straight socket**

|  | Cable structure | Cable length | Product weight | Part no. | Type |
|---|---|---|---|---|---|
|  | 4 x 0.25 mm² | 2.5 m | 72 g | **8078239** | **NEBA-M12G5-U-2.5-N-LE4** |
|  |  | 5 m | 134 g | **8078240** | **NEBA-M12G5-U-5-N-LE4** |

**Connecting cable NEBA-M12, angled socket**

|  | Cable structure | Cable length | Product weight | Part no. | Type |
|---|---|---|---|---|---|
|  | 4 x 0.25 mm² | 2.5 m | 73 g | **8078248** | **NEBA-M12W5-U-2.5-N-LE4** |
|  |  | 5 m | 135 g | **8078249** | **NEBA-M12W5-U-5-N-LE4** |