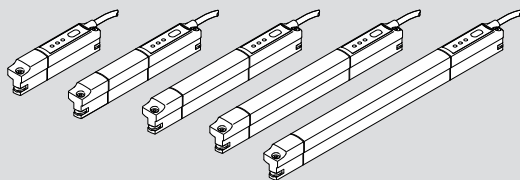


SDAT-MHS-...-SA

Position transmitter



FESTO

Operating instructions



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2021-09g
[8151097]

Translation of the original instructions

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1 About this document

1.1 Applicable Documents



All available documents for the product → www.festo.com/sp.

2 Safety

2.1 General safety instructions

- Only use the product in its original condition without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- The product may generate high frequency interference, which may require interference suppression measures in residential areas.

2.2 Intended use

The position transmitter is intended for contactless detection of the piston position of magnetic proximity sensing drives and grippers.

- Use the position transmitter only for suitable Festo drives and grippers.
- Do not place magnetic objects in the immediate vicinity of the position transmitter.

2.3 Training of qualified personnel

Work on the product may only be carried out by qualified personnel who can evaluate the work and detect dangers. The qualified personnel have skills and experience in dealing with electropneumatic (open-loop) control technology.

2.4 UL/CSA certification

In combination with the UL inspection mark on the product, the information in this section must also be observed in order to comply with the certification conditions of Underwriters Laboratories Inc. (UL) for USA and Canada.

UL approval information	
Product category code	NRKH, NRKH7
File number	E232949
Considered standards	UL 60947-1, UL 60947-5-2, CSA C22.2 No. 60947-1, CSA C22.2 No. 60947-5-2
UL mark	 US LISTED Ind. Cont. EQ. (Industrial Control Equipment) 2MD1

Tab. 1: UL/CSA approval information

- Technical data and environmental conditions may be subject to change in order to comply with Underwriters Laboratories Inc. (UL) certification requirements for the USA and Canada. → 10.4 Technical data for UL/CSA certification
- Only for connection to a NEC/CEC Class 2 supply.
- The device shall be supplied from an isolating transformer having a secondary listed fuse rated 1 A.

3 Additional information

- Contact the regional Festo contact if you have technical problems → www.festo.com.
- Accessories and spare parts → www.festo.com/catalogue.

4 Product overview

4.1 Design

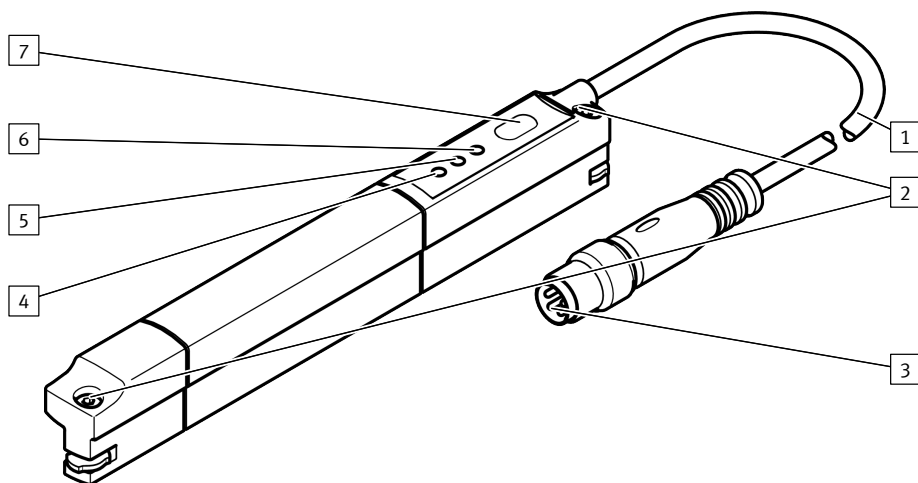


Fig. 1: Design of SDAT-MHS

- | | |
|-----------------------------|--|
| 1 Connecting cable | 5 Green LED: ready status display |
| 2 Retaining screws | 6 Yellow LED: switching status display |
| 3 M8 plug, rotatable | 7 Operating key |
| 4 Red LED: status indicator | |

4.2 Function

The position transmitter detects the magnetic field of the piston magnet and continuously senses the piston movement in the sensing range.

The following output signals are available:

- analogue current signal: 4 ... 20 mA
- programmable switching output: 24 V
- IO-Link communication mode → 4.2.4 IO-Link operating mode

4.2.1 Analogue output

The analogue output provides an output signal 4 ... 20 mA.

- The output signal is proportional to the path of the piston stroke in the sensing range.
- The output signal can be scaled.
- The direction of increase of the analogue output signal can be inverted.
- The analogue output signal in the switching output operating mode is made available parallel and independent of the position value output of the switching output.
- The analogue output is switched off in the IO-Link operating mode.

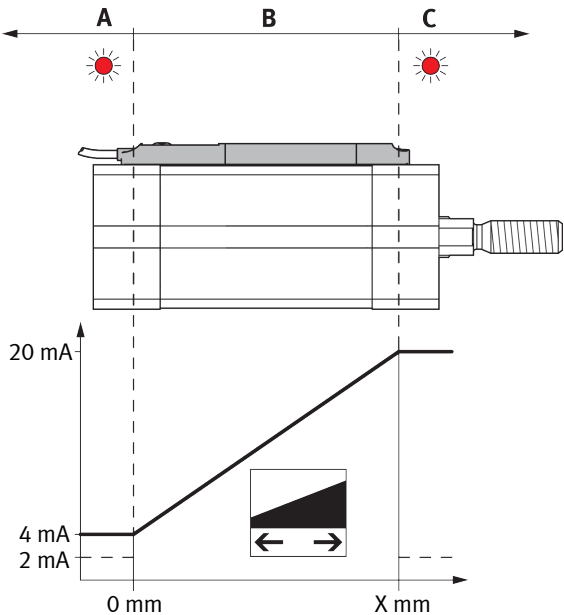


Fig. 2: Characteristic curve of the analogue output

X = maximum length of the sensing range

Signal	Description	Range ¹⁾
0 mA	– IO-Link operation – Error, e.g. cable break, parameter error	–
2 mA	– Piston is outside the sensing range after switching on the operating voltage	A, C

Signal	Description	Range ¹⁾
4 mA	– The piston has left the sensing range in the direction of the falling output current	A
> 4 mA ... < 20 mA	– Piston is within the sensing range	B
20 mA	– The piston has left the sensing range in the direction of the rising output current	C

1) Range Fig. 2, range A and C: red LED on

Tab. 2: Output signal of the analogue output



The analogue output is switched off during active IO-Link communication. The output current is 0 mA.

Scaling of the analogue signal

The analogue output signal is assigned by default to the complete sensing range. If only a part of the sensing range is to be used, the analogue value output can be scaled to the sensing range in use. The resolution and the repetition accuracy are not improved by scaling.

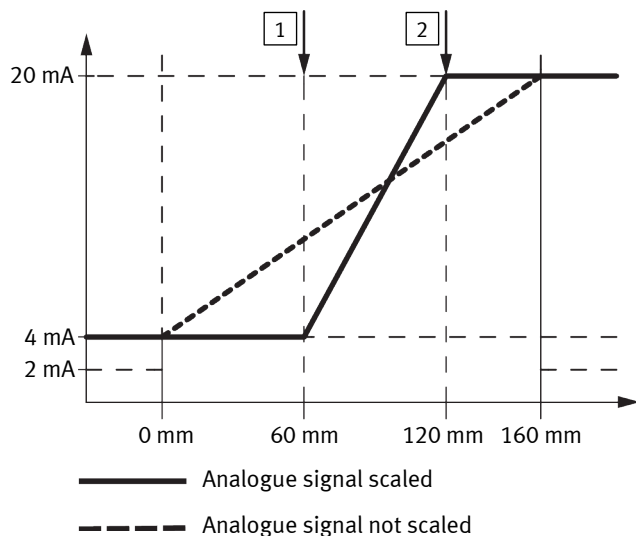


Fig. 3: Scaling of the analogue signal using the SDAT-MHS-M160 as an example

1 Teach-in point 1

2 Teach-in point 2

4.2.2 Switching functions and switching logic

4.2.2.1 Window comparator

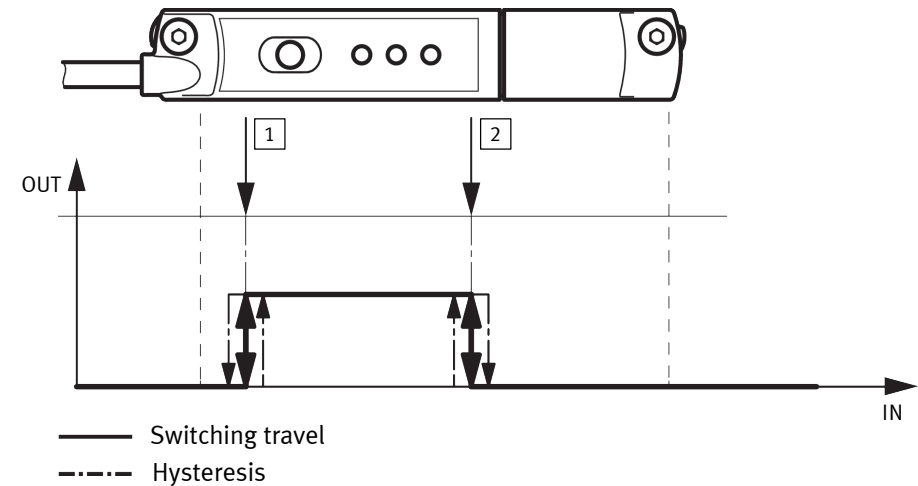


Fig. 4: Window comparator

1 Teach-in point 1

2 Teach-in point 2

Teach-in points 1 and 2 are linked to the window comparator function.

- The position of the teach points determines the window width.
- Hysteresis is not selectable or preset.

4.2.2.2 Proximity switch

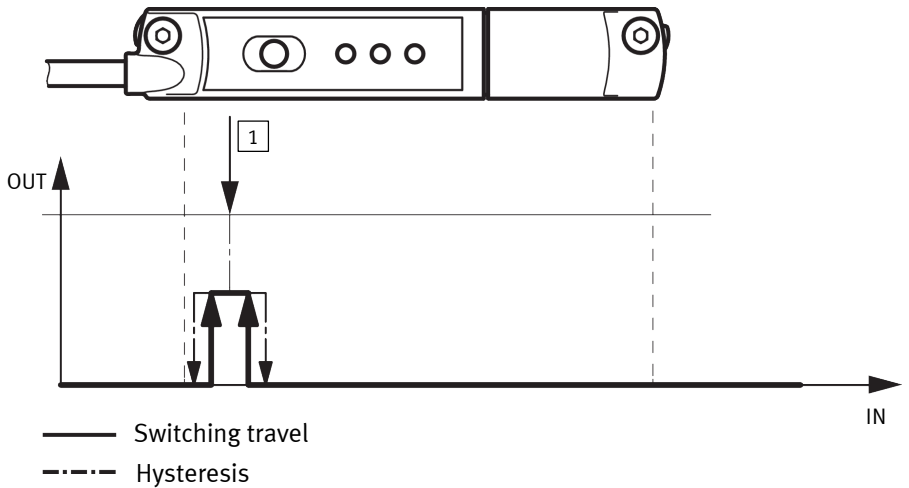


Fig. 5: Proximity switch

1 Teach-in point

The proximity switch function consists of a switching path and hysteresis. Hysteresis serves to suppress switching signals in the event of fluctuations around the switching point.

- The teach-in value is the centre of the switching path.
- The switching path and the hysteresis are not adjustable. Values for the switching path and the hysteresis are stored that correspond to a typical electronic proximity switch on a typical drive.

4.2.2.3 Hysteresis comparator

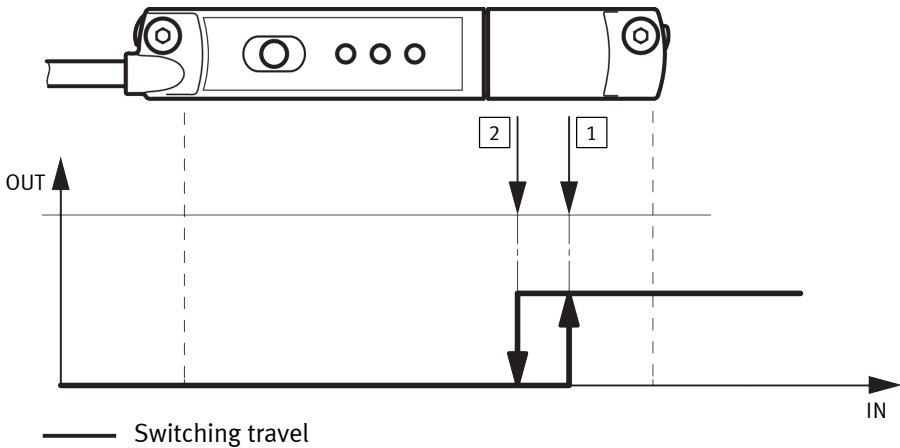


Fig. 6: Hysteresis comparator

1 Teach-in point 1

2 Teach-in point 2

Teach-in points 1 and 2 are linked to the hysteresis comparator function.

- Teach-in point 1 (ON) is the switch-on point, teach-in point 2 (OFF) is the reset point.
- Teach-in point 2 establishes the size of the hysteresis.

4.2.2.4 Switching logic

The switching logic normally open (NO) is set as the default. If the switching logic normally closed (NC) is selected, the function of the switching output is inverted.

4.2.3 Switching output operating mode (SIO)

If the IO-Link/switching output is operated as a switching output, only 1 binary channel can be programmed. The switching output operating mode must be programmed actively via the Set-up mode → 6.2 Setting Set-up mode.

- The window comparator, the proximity switch or the hysteresis comparator function are programmable.
- The normally closed (NC) or the normally open (NO) switching logic can be selected.
- Programming via the IO-Link protocol (channel BDC1) or the operating key on the device.
- Display switching output ON: the yellow LED is on.
- Output signal 24 V DC (PNP).



Even if the analogue output has been scaled, the switching output can still be programmed over the entire sensing range.

4.2.4 IO-Link operating mode

Programmed switching signals and the continuous position values (digitally coded analogue values) are transferred in the IO-Link operating mode.

- Proximity switches, window comparators or hysteresis comparators can be programmed separately on 4 binary channels.
- The continuous position values are always transferred parallel and independently of the position value output of the binary channels.
- Every channel can be set to be normally closed (NC) or normally open (NO).
- The data transfer is serially and digitally coded in the IO-Link protocol.
- Process data: 12 bit for position data and 4 bit for binary channels → 10 Technical data.
- Unshielded standard cables up to 20 m in length can be used.
- The device description file IODD for every device length → www.festo.com/sp.
- Parameters and function in accordance with Smart-Sensor profile.
- The optional block parameterisation and Data Storage functions are supported.
- IO-Link operation display: the green LED flashes.
- The direction of the process data values (PDV) can be inverted.

The PDVs are minimum (standard) or maximum (inverted) and end of the sensor cable.

5 Mounting

5.1 Electrical installation

⚠ WARNING

Risk of injury due to electric shock.

- For the electrical power supply, use only PELV circuits in accordance with IEC 60204-1/EN 60204-1 (Protective Extra-Low Voltage, PELV).
- Observe the general requirements of IEC 60204-1/EN 60204-1 for PELV circuits.
- Only use voltage sources that ensure a reliable electric separation from the mains network in accordance with IEC 60204-1/EN 60204-1.

1. Switch off the operating voltage.
2. Connect the M8 plug to the connecting cable of the higher-order controller.
 - Max. tightening torque for the union nut of the plug: 0.3 Nm.

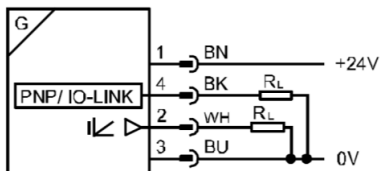


Fig. 7: Circuit diagram

Pin	Allocation	Plug
1	Operating voltage +24 V DC	
2	Analogue output 4 ... 20 mA	

Pin	Allocation	Plug
3	0 V	
4	IO-Link/switching output (C/Q line)	

Tab. 3: Pin allocation of plug connection

5.2 Mechanical installation

Any mounting position can be used.

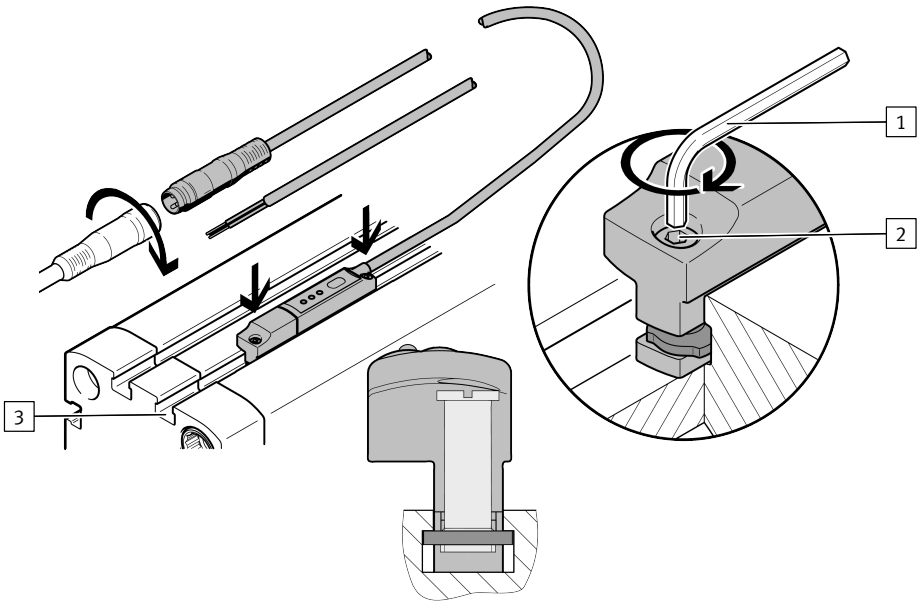


Fig. 8: Mechanical installation

- 1

Hexagon socket spanner
- 2

Retaining screw
- 3

T-slot

1. Push the position transmitter into the T-slot of the drive.
2. Move the piston to an end position of the application.
3. Push the position transmitter in the direction of the piston until the red LED goes out.
4. Hand-tighten the retaining screw.
 - Max. tightening torque: 0.5 Nm
 - Tool: internal hexagon socket key (size 1.5 mm).

6 Commissioning

6.1 Switch on the position transmitter

- Switch on the operating voltage.
 - ↳ The LEDs light depending on the position of the piston → Tab. 5 LED displays in normal operation.
 - ↳ The position transmitter is ready for operation.

Parameters	Factory setting
Switching function	None
Switching logic	Normally open contact (N/O)
Scaling	Total sensing range

Tab. 4: Factory settings of the position transmitter

6.2 Setting Set-up mode

- Press the operating key 3 times within 3 s.
 - ↳ Set-up mode active: the green LED and the yellow LED flash simultaneously.

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If, after entering the Set-up mode, programming is not completed within 60 s, the position transmitter automatically switches to the operating mode.

6.3 Scaling analogue signal

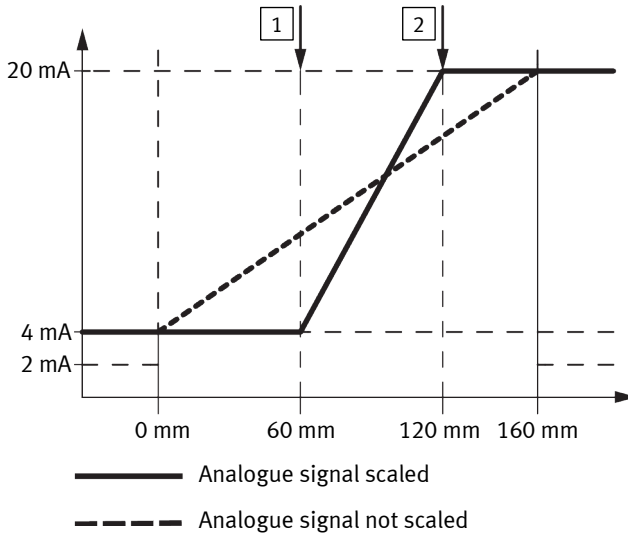


Fig. 9: Scaling the analogue signal using the SDAT-MHS-M160 as an example

- 1** Teach point 1 **2** Teach point 2

Requirement: the piston is in the sensing range (red LED off).

1. Switch to the Set-up mode .
2. Press the operating key 5 times in succession.
 - ✚ The analogue output can be scaled: the green LED flashes 5 times in quick succession within 2 s.
3. Move the piston to the starting point of the sensing range.
4. Press the operating key.
 - ✚ Teach point 1 is defined: the starting point of the sensing range at 4 mA.
 - ✚ The green LED continues flashing, the yellow LED flashes at 1 Hz.
5. Move the piston to the end point of the sensing range.
6. Press the operating key.
 - ✚ Teach point 2 is defined: the end point of the sensing range at 20 mA.
 - ✚ The position transmitter switches to the operating mode.



To invert the direction of increase of the analogue signal: set teach point 2 (20 mA) on the cylinder axis before teach point 1 (4 mA).

6.4 Program switching output

6.4.1 Set window comparator

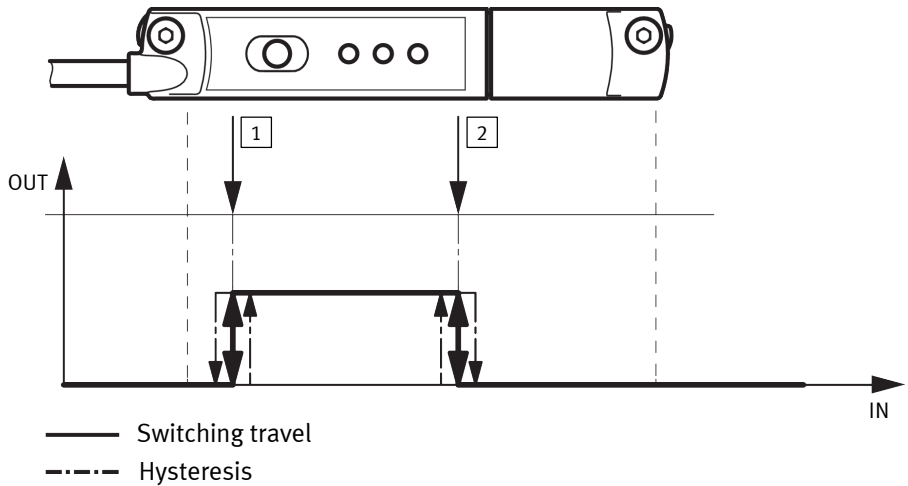


Fig. 10: Window comparator

1 Teach point 1

2 Teach point 2

Requirement: the piston is in the sensing range (red LED off).

1. Switch to the Set-up mode → 6.2 Setting Set-up mode.
2. Press the operating key once.
 - ↗ The green LED flashes once within 2 s.
3. Move the piston to the first switching point (teach point 1).
4. Press the operating key once.
 - ↗ Switching point 1 is set.
 - ↗ The green LED continues flashing, the yellow LED flashes at 1 Hz.
5. Move the piston to the second switching point (teach point 2).
6. Press the operating key once.
 - ↗ Switching point 2 is set.
 - ↗ The position transmitter switches to the operating mode.

6.4.2 Adjusting proximity switch

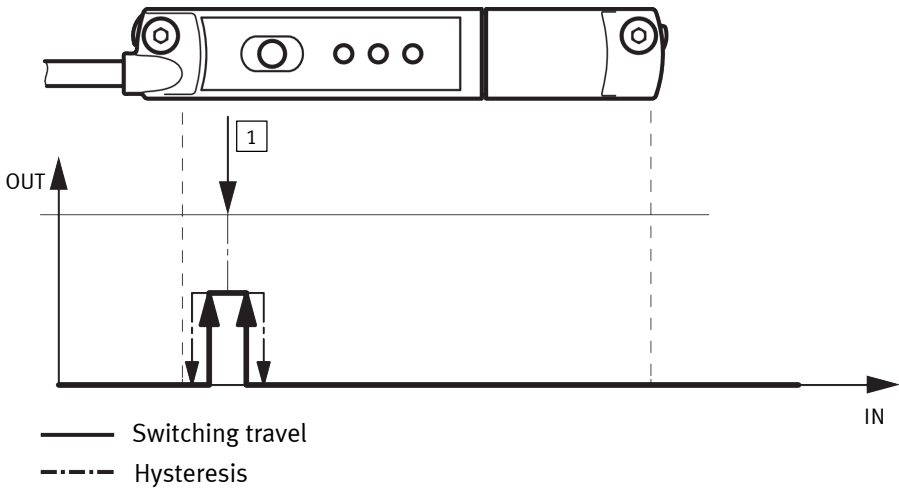


Fig. 11: Proximity switch

1 Teach point

Requirement: the piston is in the sensing range (red LED off).

1. Switch to the Set-up mode → 6.2 Setting Set-up mode.
2. Press the operating key twice.
 - ↳ The green LED flashes 2 times quickly within 2 s.
3. Move the piston to the first switching point (teach point 1).
4. Press the operating key once.
 - ↳ Switching point 1 is set.
 - ↳ The position transmitter switches to the operating mode.

6.4.3 Set hysteresis comparator

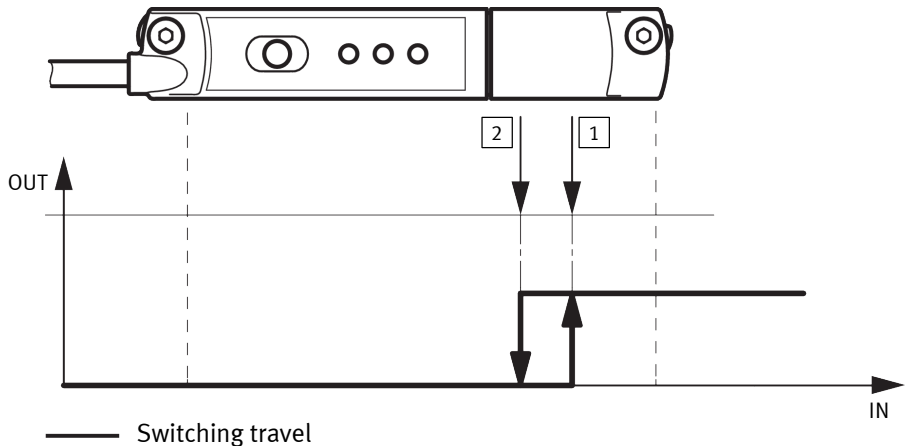


Fig. 12: Set hysteresis comparator

1 Teach point 1

2 Teach point 2

Requirement: the piston is in the sensing range (red LED off).

1. Switch to the Set-up mode → 6.2 Setting Set-up mode.
2. Press the operating key 3 times.
 - ☞ The green LED flashes 3 times quickly within 2 s.
3. Move the piston to the switch-on point (teach point 1).
4. Press the operating key once.
 - ☞ The switch-on point is established.
 - ☞ The green LED continues flashing, the yellow LED flashes at 1 Hz.
5. Move the piston to the reset point (teach point 2).
6. Press the operating key once.
 - ☞ The reset point is established.
 - ☞ The position transmitter switches to the operating mode.

6.4.4 Inverting switching logic

The switching logic can be inverted from N/C to N/O and vice versa.

1. Switch to the Set-up mode → 6.2 Setting Set-up mode.
2. Press the operating key 4 times.
 - ☞ The green LED flashes 4 times quickly within 2 s.
 - ☞ The yellow LED lights: the currently set switching logic is N/C. The yellow LED is off: the currently set switching logic is N/O.
3. Press the operating key once.
 - ☞ The switching logic is inverted.
 - The position transmitter switches to the operating mode.

6.4.5 Block/unblock operating key

In IO-Link mode, the operating key is always blocked.

In the switching output operating mode, the operating key is unlocked by default. However, in the IO-Link mode the operating key can be blocked for the switching output mode:

1. Start IO-Link communication.
2. Select key lock for switching output operating mode in the IO-Link parameter menu:
 - Device access block
 - Local user interface block

LED display with blocked operating key

- If the operating key is pressed, the green LED flashes for 3 s at 3 Hz.
- The yellow LED displays the current status of the switching output.
- The red LED only lights if the piston is outside the sensing range.

6.4.6 Programming IO-Link output

The IO-Link function cannot be set with the operating keys on the device. All settings for set-up, commissioning and parameterisation are made in the higher-level controller of the IO-Link master.

1. Upload the IODD device description file belonging to the device to the interpreter of the IO-Link master.
2. Connect the IO-Link/switching output to the IO-Link master.
3. Program the device → Operating instructions for the IO-Link master.



An error during commissioning is displayed on the user interface of the IO-Link master and the programming option is blocked.

7 Operation

7.1 Magnetic direction detection and magnetic direction correction

During initial commissioning or after a reset to factory settings, the position transmitter outputs the signals directly using the currently detected magnetic direction.

The magnetic direction detection and, with it, the signal curve are corrected during continuing operation in the following cases:

- The position transmitter was placed in operation in a position in which it was not possible to detect a correct magnetic direction, e.g. due to ferromagnetic materials near the sensor or within the drive or gripper.
- The position transmitter was rotated 180° in the slot after the magnetic direction was detected as stable.



Brief error signals may be detected at the sensor output if automatic correction of the magnetic direction detection is required → 8.2 General malfunctions.

7.2 LED displays in normal operation

LED display			Description
Yellow	Green	Red	
			Ready for operation: – Analogue output function or switching output operating mode. – Piston within the sensing range.
			Ready for operation: – IO-Link operating mode.
			Ready for operation: – Switching output switched. – Piston in the range of a programmed function.
			Status indicator: – Operating key blocked.
			Status indicator: – Piston outside the sensing range.

Tab. 5: LED displays in normal operation

Query configuration

The currently set configuration can be queried in the Set-up mode.

- Switch to the Set-up mode → 6.2 Setting Set-up mode.
- Press the operating key 6 times.
 - The yellow, green and red LEDs flash cyclically according to the current configuration → Tab. 6 Status indicators in the Set-up mode.
- To terminate the query, press the operating key once.
 - The position transmitter switches to the operating mode.

If the operating key is not pressed, the device automatically switches to the operating mode after 60 s.

LED display	Description
Green	Function
No display	Deactivated
flashes once	Window comparator

LED display	Description
2 flashes	Proximity switch function
3 flashes	Hysteresis comparator
Yellow	Switching logic
flashes once	Normally closed (N/C contact)
2 flashes	Normally open contact (N/O)
Red	Scaling
flashes once	User-configured
2 flashes	Total sensing range

Tab. 6: Status indicators in the Set-up mode

7.3 **Reset position transmitter to factory setting**

- 1. Switch to the Set-up mode ➔ 6.2 Setting Set-up mode.
- 2. Press the operating key 10 times.
 - ↳ The yellow, green and red LEDs flash at 1 Hz.
- 3. Press the operating key.
 - ↳ The position transmitter is reset to the factory settings.
 - ↳ The position transmitter switches to the operating mode.

7.4 Analogue output and switching function operation

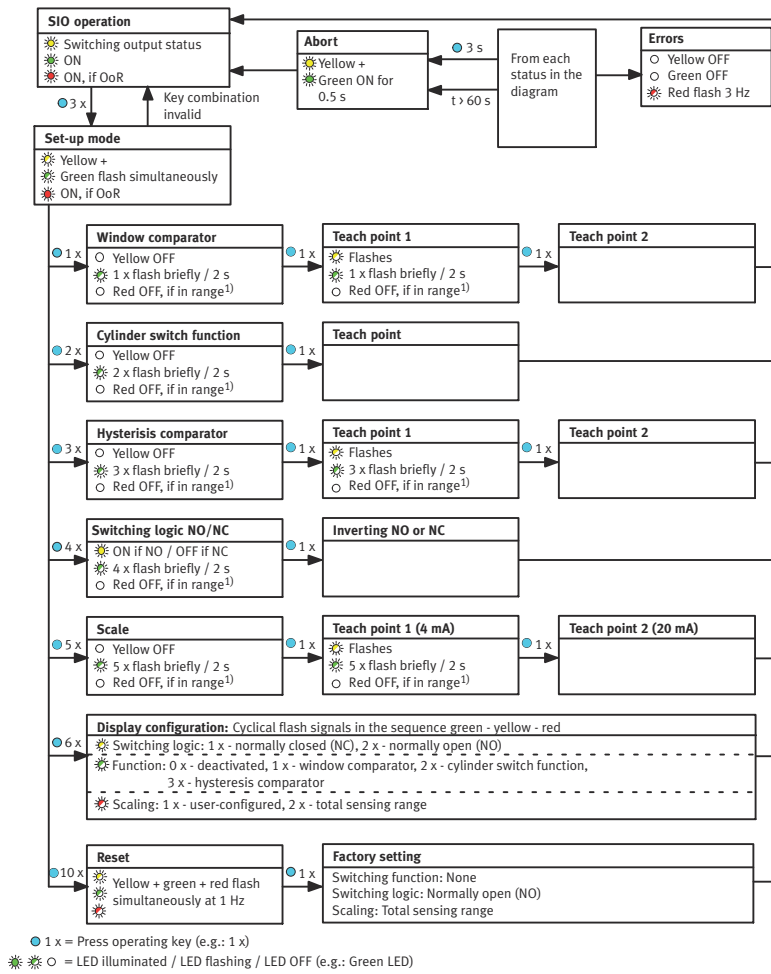
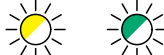


Fig. 13: Settings using the operating key (menu structure)

8 Malfunctions

8.1 Diagnostics via LED

LED display			Possible cause	Remedy
Yellow	Green	Red		
 All LEDs are off.			Fault in power supply.	Connect power supply.
			Fault in connecting cable.	Replace connecting cable.
			Device is faulty.	Replace device.
 Yellow LED is off. Green LED is off. Red LED is flashing.			Hardware error.	Switch power supply on/off. Replace device.
 Yellow LED flashes at 3 Hz.			Short circuit or overload at the switching output.	Eliminate short circuit or overload.
			Parameter error.	Reset device to factory setting ➔ 7.3 Reset position transmitter to factory setting.
 Yellow LED flashes at 3 Hz Green LED flashing at 1 Hz			Communication error in IO-Link mode.	Check IO-Link master. Restart communication. Check C/Q line.

Tab. 7: LED displays in case of malfunctions

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If the device detects an error during IO-Link operation, a status message is output at the IO-Link master. The IO-Link/switching output is not blocked.

8.2 General malfunctions

Malfunction	Cause	Remedy
Incorrect or unexpected signals at the analogue output or with the IO-Link process data.	Drive is not suitable.	Use a suitable drive.
	Device is faulty.	Replace device.
	No power supply or impermissible operating voltage.	Maintain operating voltage range.
	Short circuit or overload at the switching output.	Eliminate short circuit or overload.

Malfunction	Cause	Remedy
Incorrect or unexpected signals at the analogue output or with the IO-Link process data.	Magnetic object in the immediate vicinity of the position transmitter.	Do not place magnetic objects in the immediate vicinity of the position transmitter.
	Sensor or drive was rotated 180° after initial commissioning.	Reset to factory setting using the operating key or via IO-Link.
	Incorrect or unexpected signals during initial commissioning on grippers or in attachments with ferromagnetic components.	On initial commissioning, move gripper jaws or piston within the sensing range, e.g. to both end positions.
Switching output does not switch in accordance with the settings.	Short circuit or overload at the switching output.	Eliminate short circuit or overload.
	Device is faulty.	Replace device.
Settings cannot be edited.	Access protection is active.	Unblock operating key (only possible via IO-Link).

Tab. 8: Possible malfunctions

9 Disassembly

1. Switch off the power supply.
2. Disconnect connections from the position transmitter.
3. Unscrew the retaining screws → Fig. 8.
4. Remove the position transmitter from the T-slot of the drive.

10 Technical data

10.1 General

SDAT-MHS-...	50	80	100	125	160	
Conformity	➔ www.festo.com/sp					
Note on materials	halogen-free					
Input signal/measuring element						
Sensing range ¹⁾	[mm]	50	80	100	125	160
Signal processing						
Sampling interval typ.	[ms]	1				
Max. traverse velocity	[m/s]	3				

SDAT-MHS-...		50	80	100	125	160
Output, general						
Resolution of travel	[mm]	0.05				
Switching output						
Switching output		PNP				
Repetition accuracy of switching point	[mm]	0.1				
Hysteresis	[mm]	≤ 0.3				
Analogue output						
Analogue output	[mA]	4 ... 20				
Sensitivity	[mA/mm]	0.32	0.20	0.16	0.13	0.10
Typical linearity error	[mm]	±0.25				
Repetition accuracy	[mm]	0.1				
Max. load resistance of current output	[Ω]	500				
Electronics						
Operating voltage DC	[V]	15 ... 30				
Typical signal running time	[ms]	< 2				
Electromechanics						
Cable length	[m]	0.3				
Conductor nominal cross section	[mm²]	0.1				
Mechanical system						
Max. tightening torque	[Nm]	0.5				
Information on materials – housing		PA-reinforced, polyester, high-alloy stainless steel, nickel-plated brass				
Immission/emission						
Ambient temperature	[°C]	-25 ... +70				
Ambient temperature with flexible cable installation	[°C]	-20 ... +70				
Degree of protection (to EN 60529)	IP65/IP68 Condition with IP68: test duration 24 h					

1) Type-dependent

Tab. 9: Technical data SDAT-MHS

10.2 IO-Link

SDAT-MHS-...	50	80	100	125	160
Protocol version	Device V1.1				
Profile	Smart Sensor Profile				
Function classes	0x8000:Identification 0x8001:Binary Data Channel 0x8002:Process Data Variable 0x8003:Diagnosis 0x8004:Teach Channel				
Communication mode	COM3 (230.4 kbaud)				
Process data length IN	2 byte				
Port class	A, 4-pin				
Device ID	0x000001	0x000002	0x000003	0x000004	0x000005

Tab. 10: Physical layer

Process data record: 2 bytes																
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Process data	Process Data Variable (PDV) ➔ Tab. 12 Range of values of the process data variables (PDV) for the device lengths ➔ Process data with use of IODD												BDC4 ¹⁾	BDC3 ¹⁾	BDC2 ¹⁾	BDC1 ¹⁾
Data	Position												switch 4	switch 3	switch 2	switch 1
Type	Unsigned Integer												Boolean			

1) BDC = binary data channel (BinaryDataChannel)

Tab. 11: Process data content

Raw data

Device length	Nominal sensing range [mm]	PDV min. OoR ¹⁾	PDV minimum value of nominal sensing range	PDV maximum value of nominal sensing range	PDV max. OoR ²⁾	PDV OoR after Power ON ³⁾
M50	0 ... 50	0	21	1044	1064	4095
M80	0 ... 80	0	21	1659	1679	4095
M100	0 ... 100	0	21	2068	2088	4095

Device length	Nominal sensing range [mm]	PDV min. OoR ¹⁾	PDV minimum value of nominal sensing range	PDV maximum value of nominal sensing range	PDV max. OoR ²⁾	PDV OoR after Power ON ³⁾
M125	0 ... 125	0	21	2580	2600	4095
M160	0 ... 160	0	21	3297	3317	4095

1) Min OoR (out of range): minimum value of the sensing range

2) Max OoR (out of range): maximum value of the sensing range

3) OoR after Power ON: outside the sensing range when operating voltage is applied

Tab. 12: Range of values of the process data variables (PDV) for the device lengths

Process data with use of IODD

Device length	Nominal sensing range [mm]	PDV min. OoR ¹⁾	PDV minimum value of nominal sensing range	PDV maximum value of nominal sensing range	PDV max. OoR ²⁾	PDV OoR after Power ON ³⁾
M50	0 ... 50	0	103	5099	5196	19999
M80	0 ... 80	0	103	8102	8200	19999
M100	0 ... 100	0	103	10100	10198	19999
M125	0 ... 125	0	103	12600	12698	19999
M160	0 ... 160	0	103	16102	16200	19999

1) Min OoR (out of range): minimum value of the sensing range

2) Max OoR (out of range): maximum value of the sensing range

3) OoR after Power ON: outside the sensing range when operating voltage is applied

Tab. 13: Range of values of the process data variables with use of IODD for the device lengths

Index	Su bin de x	Name	Default value (example M50)	Access ¹⁾			Length	Format
				U	M	S		
0x0002	0	System Command	→ Tab. 15 System commands	—	W	W	1 byte	Unsigned Integer
0x000C	0	Device Access Locks ²⁾	0 = unlocked 1 = locked	R	R/W	R/W	2 byte	Record
0x0010	0	Vendor Name	Festo SE & Co. KG	R	R	R	64 byte	String
0x0011	0	Vendor Text	http:// www.festo.com	R	R	R	64 byte	String
0x0012	0	Product Name	SDAT-MHSM50-1L- SA-E-0.3-M8	R	R	R	64 byte	String
0x0013	0	Product ID ³⁾	1531265	R	R	R	64 byte	String

Index	Subindex	Name	Default value (example M50)	Access ¹⁾			Length	Format
				U	M	S		
0x0014	0	Product Text	Position transmitter	R	R	R	64 byte	String
0x0015	0	Serial-Number	12345678901	R	R	R	16 byte	String
0x0016	0	Hardware Revision	REVxy	R	R	R	64 byte	String
0x0017	0	Firmware Revision	REVxy	R	R	R	64 byte	String
0x0018	0	Application Specific Tag ⁴⁾	***	R/W	R/W	R/W	32 byte	String
0x0028	0	Process Data Input	→ Tab. 11 Process data content	R	R	R	2 byte	Record

1) Authorisation group U = user, M = maintenance, S = specialist; access W = write, R = read, R/W = read and write, – = no access

2) Bit 0: lock parameter write access; Bit1: lock data storage; Bit3: lock local user interface (operating key)

3) Festo part number

4) Value defined by user

Tab. 14: Service data

Value	Access ¹⁾²⁾			Length	Format	Format
	U	M	S			
128	—	—	W	1 byte	Unsigned Integer	Reset Device
130	—	—	W			Restore Factory Settings
176	—	—	W			Reset Warnings
160	—	W	W			Teach SP1 BDC1 ³⁾
161	—	W	W			Teach SP2 BDC1 ³⁾
162	—	W	W			Teach SP1 BDC2 ³⁾
163	—	W	W			Teach SP2 BDC2 ³⁾
164	—	W	W			Teach SP1 BDC3 ³⁾
165	—	W	W			Teach SP2 BDC3 ³⁾
166	—	W	W			Teach SP1 BDC4 ³⁾
167	—	W	W			Teach SP2 BDC4 ³⁾

Value	Access ¹⁾²⁾			Length	Format	Format
	U	M	S			
168	—	W	W	1 byte	Unsigned Integer	Teach Scale Start analogue output
169	—	W	W			Teach Scale End analogue output

1) Authorisation group U = user, M = maintenance, S = specialist; access W = write, – = no access

2) If access = write, an attempted read access will return error code 0x8101.

3) Access also possible via the standard function class 0x8004 "Teach Channel" of the Smart Sensor Profile.

Tab. 15: System commands

Index	Sub-index	Name	Default value (example M50) ¹⁾	Access ²⁾			Length	Format ³⁾
				U	M	S		
BDC1								
0x003C	1	Setpoint SP1	175	R	R/W	R/W	2 byte	Unsigned Integer
	2	Setpoint SP2	250				2 byte	
0x003D	1	Switchpoint logic	0				1 byte	
	2	Switchpoint mode	0				1 byte	
	3	Switchpoint hysteresis	5				2 byte	
BDC2								
0x003E	1	Setpoint SP1	275	R	R/W	R/W	2 byte	Unsigned Integer
	2	Setpoint SP2	350				2 byte	
0x003F	1	Switchpoint logic	0				1 byte	
	2	Switchpoint mode	0				1 byte	
	3	Switchpoint hysteresis	5				2 byte	
Analogue current output								
0x3000	1	Scale Start	1	R	R/W	R/W	2 byte	Unsigned Integer
	2	Scale End	1063				2 byte	
PDV 0: normal, 1: inverted, not for analogue current output								
0x3010	0	PDV Invertierung	0	R	R/W	R/W	1 byte	Unsigned Integer
BDC3								

Index	Sub-index	Name	Default value (example M50) ¹⁾	Access ²⁾			Length	Format ³⁾
				U	M	S		
0x4000	1	Setpoint SP1	375	R	R/W	R/W	2 byte	Unsigned Integer
	2	Setpoint SP2	450				2 byte	
0x4001	1	Switchpoint logic	0				1 byte	
	2	Switchpoint mode	0				1 byte	
	3	Switchpoint hysteresis	5				2 byte	
BDC4								
0x4002	1	Setpoint SP1	475	R	R/W	R/W	2 byte	Unsigned Integer
	2	Setpoint SP2	550				2 byte	
0x4003	1	Switchpoint logic	0				1 byte	
	2	Switchpoint mode	0				1 byte	
	3	Switchpoint hysteresis	5				2 byte	

1) Raw data without use of IODD

2) Authorisation group U = user, M = maintenance, S = specialist; access R = read, R/W = read and write

3) Coding BDC1... BDC4 → Tab. Tab. Coding switching point parameters

Tab. 16: parameter

Name	Coding
Setpoint SP1/SP2 ¹⁾	12 bit position values
Switchpoint logic	0 = output signal not inverted; 1 = output signal inverted
Switchpoint mode	0 = deactivated; 1 = proximity switch, 2 = window comparator, 3 = hysteresis comparator
Switchpoint hysteresis	Fix: 5

1) Value range → Tab. Value range of the process data variables (PDV) for the device lengths

Tab. 17: Coding switch point parameter

Error code	Mode	Type	Comments
0x4000	(Dis)appear	Error	Temperature fault
0x5000	(Dis)appear	Error	Hardware defective
0x5111	(Dis)appear	Warning	Voltage too low
0x6320	(Dis)appear	Error	Parameter error

Error code	Mode	Type	Comments
0x8CA0	(Dis)appear	Error	Magnetic field too weak, unsuitable drive
0xFF91	(Dis)appear	Notification	Data Storage upload request

Tab. 18: Error Codes

10.3 I-Port

The IO-Link specification data generally apply → 10.2 IO-Link.
For information on the process data contents → Tab. 11 Process data content.

Index	Name	Default value	Access ¹⁾	Length
0x0040	Device attributes	0x00	R/W	1 byte
0x0041	Extended parameters	0x0000	R/W	2 byte
0x0042	Diagnosis parameter	0x0000	R	2 byte
0x0043	Device specific parameters	→ Tab. 20 Device-specific parameters	R/W	8 byte
0x00FE	I-Port Revision	0x0101	R/W	2 byte

1) Access R = read, R/W = read and write

Tab. 19: Additionally supported parameters in accordance with I-Port specification

Byte	1	2	3	4	5	6	7	8
IO-Link index	0x003C				0x003D			
Subindex	1		2		1	2	3	
Function ¹⁾	SP1		SP2		Logic	Mode	HY	
Byte	high	low	high	low	—	—	high	low
Default value	0x00	0xAF	0x00	0xFA	0x00	0x00	0x00	0x05

1) Coding parameter → Tab. Coding switching point parameters

Tab. 20: Device-specific parameters

10.4 Technical data for UL/CSA certification

Electrical and environmental ratings UL/CSA	
Input Voltage	Max. 30 V DC, Class 2
Input current	160 mA/max. 4.8 W
Analog output	4 ... 20 mA
Transistor output	Max. 30 V DC, 100 mA G.P.

Electrical and environmental ratings UL/CSA	
Maximum Ambient Temperature	70 °C/158 °F
NEMA enclosure type number (Enclosure Type Rating)	Type 1

Tab. 21: Electrical data and ambient conditions UL/CSA

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