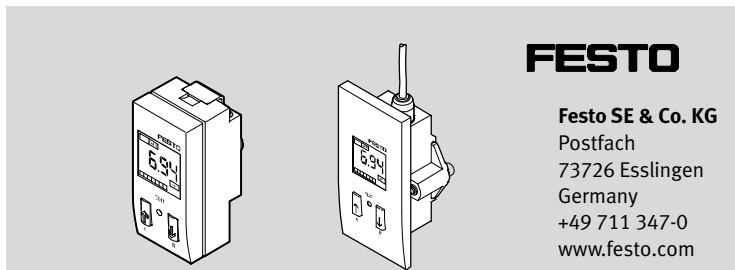


Pressure sensor SDE1-...



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Operating instructions

8048045
1511h
[8048047]

Original: de

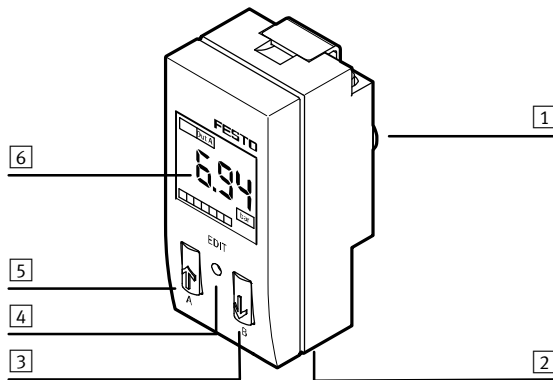


Pressure sensor SDE1 English

1 Product description

The operating instructions describe the entire function range. The function range is limited, depending on the product variant.

1.1 Structure



- | | |
|--|---------------|
| 1 Pneumatic connection
(design type-dependent) | 3 B key |
| 2 Electrical connection
(design type-dependent) | 4 Edit button |
| | 5 A key |
| | 6 Display |

Fig. 1

1.2 Characteristics

Characteristic	Value	Description
Type	SDE1	Pressure sensor
Pressure measuring range	-V1, -B2, -D2, -D6, -D10	→ 11 Technical data
Accuracy	-G2	Accuracy 2 %
Pneumatic connection and mounting	-R18 ¹⁾	Male thread R $\frac{1}{8}$
	-R14 ¹⁾	Male thread R $\frac{3}{4}$
	-MS4	For adapting to MS4-series service units
	-MS6	For adapting to MS6-series service units
	-H18	Relative pressure, female thread G $\frac{1}{8}$, H-rail mounting
	-W18	Relative pressure, female thread G $\frac{1}{8}$, wall or surface mounting
	-FQ4	Push-in connector QS-4, front panel mounting
	-HQ4	Push-in connector QS-4, H-rail mounting
Display	-WQ4	Push-in connector QS-4, wall or surface mounting
	-C	LCD display with backlighting
	-L	Illuminated LCD display

Characteristic	Code	Type designation
Electrical output	-P1	1 switching output PNP
	-P2	2 switching outputs PNP
	-PU	1 switching output PNP and 0...10 V analogue
	-PI	1 switching output PNP and 4...20 mA analogue
	-Z1	2 switching outputs PNP and 4...20 mA analogue
	-N1	1 switching output NPN
	-N2	2 switching outputs NPN
	-NI	1 switching output NPN and 0...10 V analogue
Electrical connection	-M8	M8 plug connector
	-M12	M12 plug connector
Electrical accessories	-G	Straight socket, cable 2.5 m
	-G5	Straight socket, 5 m cable
	-W	Angled plug socket, 2.5 m
	-W5	Angled plug socket, 5 m cable

1) For example, for mounting on an MS- or D-series service unit

Fig. 2

2 Security

Intended use

The pressure sensor SDE1 is intended for monitoring pressure in piping or terminals.

General safety information

- The product may only be used in its original status without unauthorised modifications.
- Only use the product if it is in an excellent technical status.
- The product is intended for use in industrial environments. Measures may need to be implemented in residential areas for radio interference suppression.
- Take into consideration the operating conditions at the location of use.
- Observe the specifications on the rating plate.
- Comply with all applicable national and international regulations.

Disposal

- Observe the local specifications for environmentally friendly disposal.

Range of applications and certifications

In combination with the UL mark on the product, the information included in this section is also applicable for compliance with the certification requirements of Underwriters Laboratories Inc. (UL) for USA and Canada. Observe the following English-language remarks from UL:

UL approval information	
Product category code	NRNT2 (USA) NRNT8 (Canada)
File number	E253738
Considered standards	UL 508, 17th edition, C22.2 No. 14-95
UL mark	

Fig. 3

Only for connection to an NEC/CEC Class 2 supply.

Raccorder uniquement a un circuit NEC/CEC Classe 2.

Technical data	
Max. surrounding air temperature	50 °C / 122 °F

Fig. 4

This device is intended to be used with a Class 2 power source or Class 2 transformer in accordance with UL1310 or UL1585.

As an alternative, an LV/C (Limited Voltage/Current) power source with one of the following properties can be used:

- This device shall be used with a suitable isolating source such that the maximum open circuit voltage potential available to the product is not more than 30 V DC and the current is limited to a value not exceeding 8 amperes measured after 1 minute of operation.
- This device shall be used with a suitable isolating source in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 3.3 A and be installed in the 30 V DC power supply to the device in order to limit the available current.

Note that, when more than one power supply or isolating device is used, connection in parallel is not permitted.

3 Function and application

The pressure sensor SDE1 converts pneumatic pressure values into electrical signals. Measurements are carried out using a piezoresistive sensor element with a following electronic evaluation unit. Depending on the type, interfacing to the higher-level systems is provided by 1 or 2 switching outputs and an analogue output. Depending on the type and application, the differential pressure or relative pressure is measured.

The switching outputs can be configured as normally closed or normally open contacts. The switching points can be determined as threshold value or window comparator.

3.1 Operating statuses

Operating status	Function
RUN mode	- Basic status after the operating voltage is switched on - Display of the current measured value
SHOW mode	- Display of the current settings
EDIT mode	- Setting or modification of parameters
TEACH mode	- Acceptance of the current measured value to determine switching points

Fig. 5

3.2 Switching functions

Threshold value comparator for monitoring of a pressure threshold

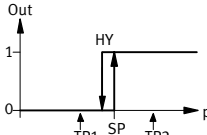
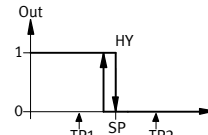
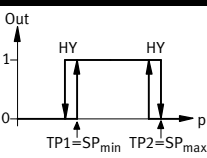
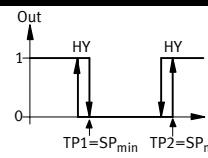
Function	NO (normally open)	NC (normally closed)
Switching function: - 1 switching point (SP)		
TEACH mode: - 2 teach-in points (TP1, TP2) - $SP = \frac{1}{2} (TP1 + TP2)$		

Fig. 6

Window comparator for monitoring of a pressure range

Function	NO (normally open)	NC (normally closed)
Switching function: - 2 switching points (SP_{min} , SP_{max})		
TEACH mode ¹ : - 2 teach-in points (TP1, TP2) - $TP1 = SP_{min}$, $TP2 = SP_{max}$		

1) SP_{min} = smaller pressure/vacuum value, SP_{max} = larger pressure/vacuum value, dependent on the Teach sequence

Fig. 7

4 Installation

i Installation to be carried out only by qualified personnel in accordance with the operating instructions.

- Remove all transport packaging. The material used in the packaging has been specifically chosen for its recyclability.
- Install the sensor so that condensation from the compressed air lines cannot collect in it.

4.1 Mechanical

SDE1...-R14/-R18

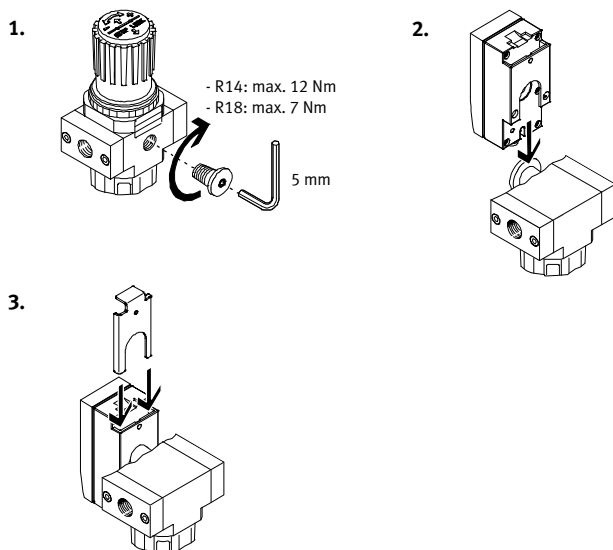


Fig. 8

SDE1...-H

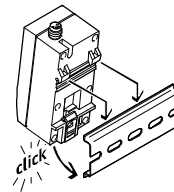


Fig. 9

SDE1...-W

- Wall mounting hole pattern → Fig. 32

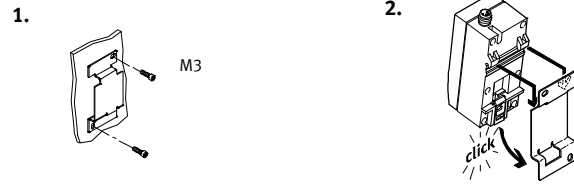


Fig. 10

SDE1...-FQ4

- Size of the front panel cut-out in mm → Fig. 11

1. Guide sensor from the front into the cut-out on the front panel.
2. Attach the clamping plate and press until the fastening slide clips in.

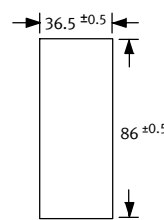


Fig. 11

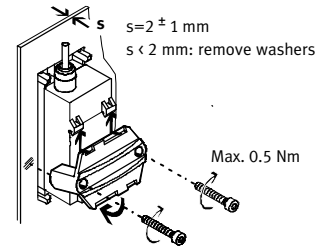


Fig. 12

4.2 Pneumatic

SDE1...-H18/-W18

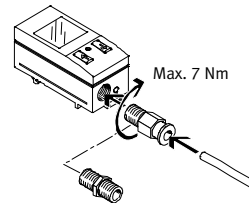


Fig. 13

SDE1...-HQ4/-WQ4/-FQ4

- Insert tube (outside diameter 4 mm) into the push-in fitting.
- Observe connection of p1 and p2 (relative pressure p1 / differential pressure p1 - p2).

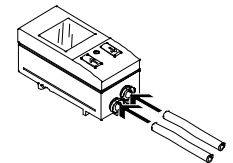


Fig. 14

4.3 Mechanical and pneumatic (SDE1...-MS4/-MS6)

The sensor can be mounted to the following MS-series devices:

- DE, DL, EE, EM1, FRM, LFR, LR, LRB

Mounting adapter

1. Seal either the trunion (a) or drill hole (b) with O-ring.
2. Push the mounting screws at the mounting brackets outwards and tighten.

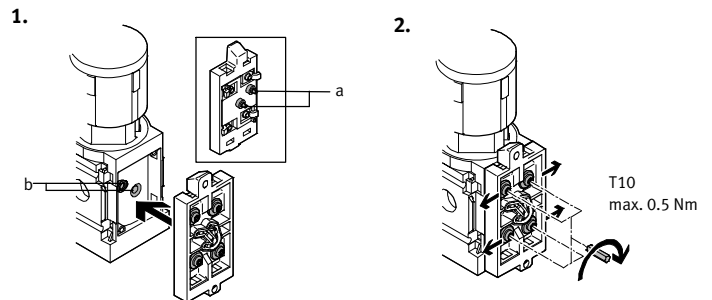


Fig. 15

Mounting sensor

The sensor can be rotated 180°.

- Check moulded seal (c) for proper seating.
- Make sure the sealing surfaces between the sensor and adapter are clean.

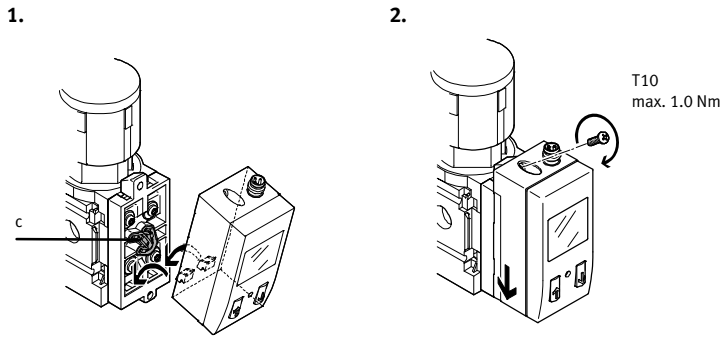


Fig. 16

4.4 Electrical



Warning

Use only power sources which guarantee reliable electrical isolation of the operating voltage in accordance with IEC/EN 60204-1. Consider also the general requirements for PELV circuits in accordance with IEC/EN 60204-1.

- Connect sensor.
- Maximum permissible cable length: 30 m
- Maximum tightening torque of plug connector: M8 = 0.3 Nm, M12 = 0.5 Nm

SDE1... (1 output)

Pin / wire colour	Allocation	
	3-pin M8	4-pin M12
1 / brown (BN)	Operating voltage +24 V	
2 / -	-	not connected
3 / blue (BU)	0 V	
4 / black (BK)	Switching output OutA	

Fig. 17

Circuit diagrams

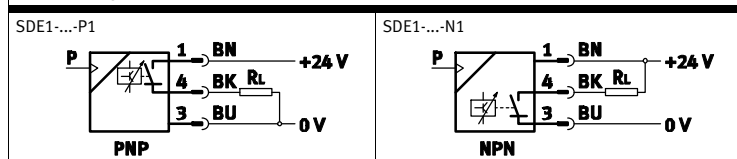


Fig. 18

SDE1... (2 or 3 outputs)

Pin / wire colour	Allocation		
	4-pin M8	4-pin M12	5-pin M12
1 / brown (BN)	Operating voltage +24 V		
2 / white (WH)	Switching output OutB or analogue output OutB	Switching output OutA	Switching output OutB
3 / blue (BU)	0 V		
4 / black (BK)	Switching output OutA	Switching output OutB or analogue output OutB	Switching output OutA
5 / grey (GY)	-	-	Analogue output OutC

Fig. 19

Circuit diagrams

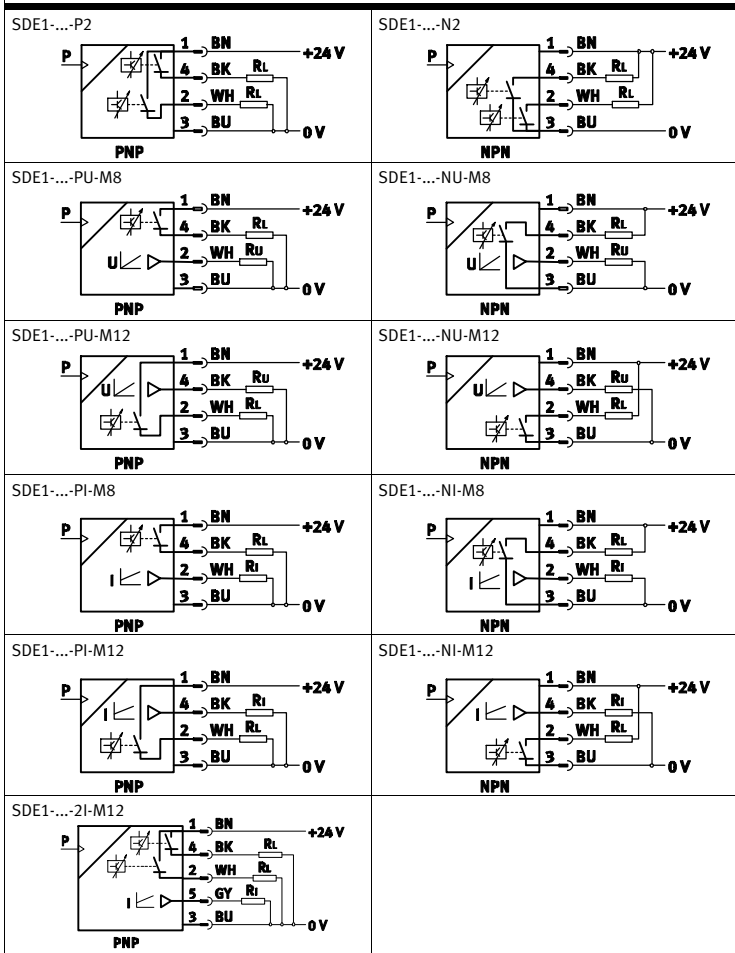


Fig. 20

5 Commissioning



Commissioning is to be carried out only by qualified personnel in accordance with the operating instructions.

5.1 Symbols on the display

The design of the display is type-dependent.

Type	SDE1...-C	SDE1...-L
Description	LCD display with backlighting	Illuminated LCD display
Display		

Fig. 21

Symbols on the display	Description
	Switching output OutA / switching output OutB
	Switching output set / not set
	Threshold value comparator
	Window comparator
[SP]	Switching point
[SP][min]	Lower switching point
[SP][max]	Upper switching point
[HY]	Hysteresis
[NO]	Contact (normally open)
[NC]	Contact (normally closed)
[min]	Minimum measured pressure since switch-on or the last reset
[max]	Maximum measured pressure since switch-on or the last reset

Symbols on the display		Description
SDE1-...-C	SDE1-...-L	
[lock]	[lock]	Security code active (blocked against unauthorized parameterisation)
	■■■■■□□□□□	Segments illuminated: Graphic display of the current measured value related to the maximum measured value of the measuring range
[min] [max]		Display flashes: Minimum/maximum value is reset.
-		Segments flash: Hysteresis value is displayed.
-		Segment 5 flashes: Value of switching point SP or SP.L is displayed.
-		Segment 8 flashes: Value of switching point SP.H is displayed.
-		Segment 1 flashes: Minimum value min or P.Lo is displayed.
-		Segment 10 flashes: Maximum value max or P.Hi is displayed.

Fig. 22

5.2 Switch on sensor (RUN mode)

- Switch on the operating voltage.
 - The current measured value is displayed. The sensor is in the basic status (RUN mode).

The basic status can be reached from other modes through:

- pressing Edit button for 3 seconds
- expiration of a monitoring time (Timeout)

5.3 Displaying parameters (SHOW mode)

Requirement: The sensor is ready for operation (RUN mode).

- Press the A-key for switching output OutA or the B-key for switching output OutB.
 - The first parameter is displayed.

The respective subsequent parameter can be displayed by pressing the A key or B key (menu structure → Fig. 23).

Menu structure for SHOW mode

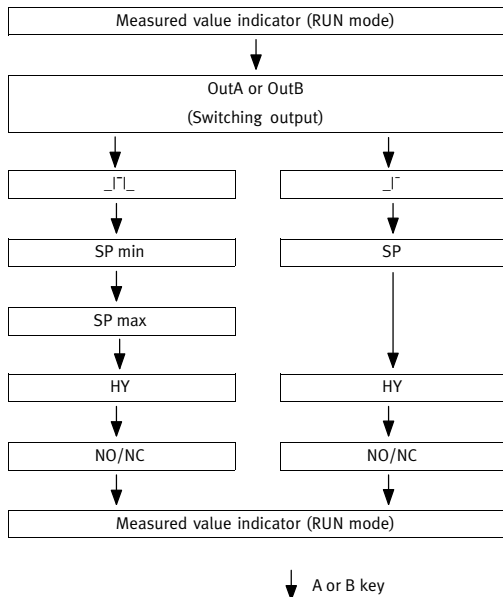


Fig. 23

5.4 Displaying minimum/maximum value

Requirement: The sensor is ready for operation (RUN mode).

- Press the A key and B key simultaneously.
 - The lowest pressure value since the last switch-on or reset is displayed.
- Press the A key and B key simultaneously.
 - The highest pressure value since the last switch-on or reset is displayed.
- Press the A key and B key simultaneously.
 - Switch to the RUN mode.

The following options exist for resetting from the minimum and maximum values:

- Press the A key and B key simultaneously for longer than 2 seconds.
- Switch off the operating voltage.

5.5 Configuring switching output (EDIT mode)



Note

Changing the switching behaviour of the switching outputs in the EDIT mode is effective immediately.



The process is the same for configuring the switching outputs for OutA and OutB. In the following, the process is described using the switching output OutA (menu structure → Fig. 24).

Requirement: The sensor is ready for operation (RUN mode).

- Press the Edit button.
 - If the security code is activated: [Lock] flashes.
- Enter security code set with A key or B key.
- Press the Edit button.
 - The parameter entry option is unblocked. [OutA] flashes.
- Press the Edit button.
 - [] or [] flashes.
- Select the switching function with the A key or B key.
- Press the Edit button.
 - The next adjustable parameter flashes.
- With A key or B key, select the parameter or value.
- Repeat points 6 and 7 until all parameters are set.
- Press the Edit button.
 - Switch to the RUN mode.

5.6 Set the display unit and security code (EDIT mode)

Requirement: The sensor is ready for operation (RUN mode).

- Press the Edit button.
 - If the security code is activated: [Lock] flashes.
- Enter security code set with A key or B key.
- Press the Edit button.
 - The parameter entry option is unblocked. [OutA] flashes.
- With the A key, select the unit bar.
 - [lock], [kPA], [psi] and [bar] flash.
- Press the Edit button.
 - The currently set unit flashes.
- Select the unit with the A key or B key.
- Press the Edit button.
 - [lock] flashes.
- Enter security code with A key or B key. With [0], the security code is deactivated.
- Press the Edit button.
 - Switch to the RUN mode.

5.7 Teach switching points (TEACH mode)

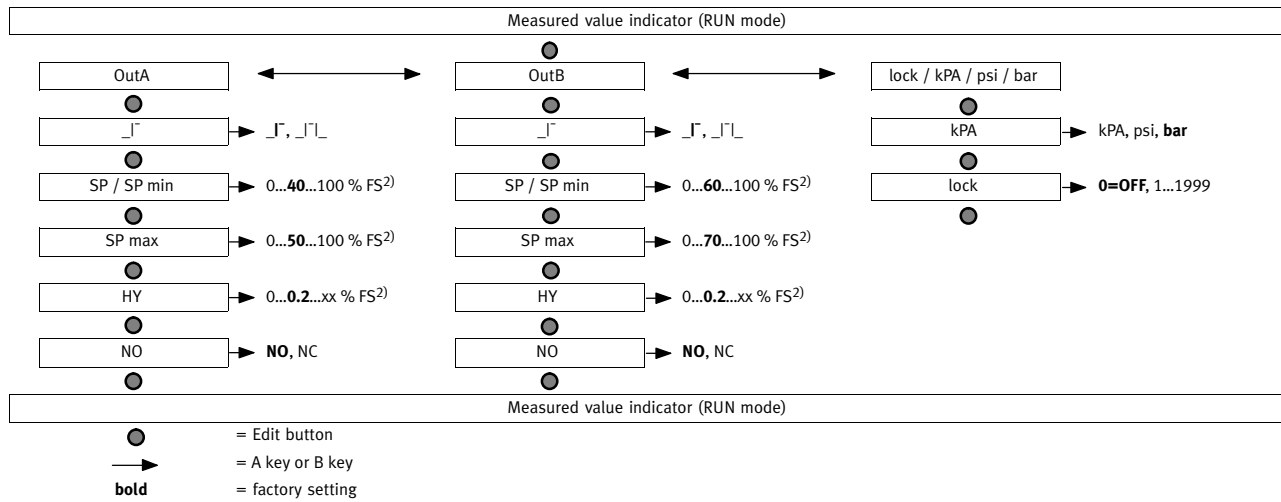


The process for teaching is the same for configuring the switching outputs for OutA and OutB. In the following, the process is described using the switching output OutA.

Requirement: The sensor is ready for operation (RUN mode).

- Determine switching function
 - (→ 5.5 Configuring switching output (EDIT mode)).
- Create pressure value 1.
- Press the A key for the switching output OutA and also the Edit button.
 - With active security blocking: [lock] flashes.
- Enter security code set with A key or B key.
- Press the Edit button.
 - The parameter entry option is unblocked.
 - The current pressure value will then be adopted as the first teaching point (TP1). [OutA] flashes.
- Create pressure value 2.
- Press the A key for the switching output OutA and also the Edit button.
 - The current pressure value is adopted as the second teaching point (TP2).
 - Switch to the RUN mode.

Menu structure EDIT mode¹⁾



- 1) The menu structure is depicted completely. Some menu options or setting values are not applicable, depending on the selected switching function.
- 2) The values refer to the respective measuring range. The display takes place in the selected unit.

Fig. 24

6 Operation



Note

Property damage due to high temperatures.

Extreme pneumatic conditions (high cycle rate with large pressure amplitude) can heat the device over 80 °C.

- Select the operating conditions (in particular the ambient temperature, pressure amplitude, cycle rate, current consumption) such that the device does not heat up above the maximum permitted operating temperature.

Restore factory settings

Restoring the factory settings causes the current settings to be lost.

1. Switch off the operating voltage.
2. Keep the A key and B key pressed down simultaneously.
3. Switch on the operating voltage.
4. Additionally press the Edit button.
 - All parameters are reset to the factory settings.

7 Maintenance and care

1. Switch off the energy sources (operating voltage, compressed air).
2. Clean sensor with non-abrasive cleaning agents.

8 Disassembly

1. Switch off the energy sources (operating voltage, compressed air).
2. Allow the sensor to cool off.
3. Separate connections from the sensor.
4. Loosen the mountings → Fig. 25 to Fig. 28

SDE1-G2-MS

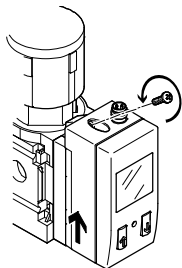


Fig. 25

SDE1-GS-R18/-R14

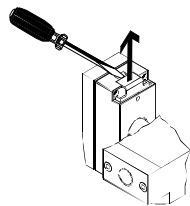


Fig. 26

SDE1-G2-H/-W

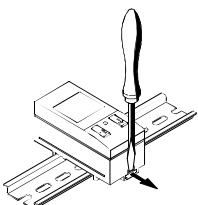


Fig. 27

SDE1-GS-FQ4

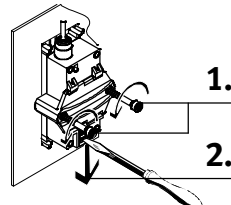


Fig. 28

9 Fault clearance

Malfunction	Possible cause	Remedy
No display	No operating voltage or impermissible operating voltage.	• Apply permissible operating voltage.
No display	Electrical connections swapped.	• Connect the device in accordance with the circuit diagram.
	Device defective.	• Replace device.
Incomplete display	Display defective.	• Replace device.
Incorrect pressure display	Pressure failure	• Eliminate pressure failure.
	Only with SDE1-...-Q4: Pneumatic connections swapped.	• Reconnect tubing to device (→ 4.2 Pneumatic).
Pressure indicator flashes.	Device is operated with impermissible medium.	• Replace device. Only operate with compressed air.
	Measuring range exceeded.	• Comply with the measuring range.
Switching output does not react in accordance with the settings.	Short circuit or overload at the output.	• Eliminate short circuit or overload.
	Incorrect switching point taught (e.g. at 0 bar)	• Repeat teaching.
	Device defective.	• Replace device.

Fig. 29

10 Accessories

Accessories → www.festo.com/catalogue

11 Technical data

SDE1-		-V1	-B2	-D2	-D6	-D10
General information						
Certification	RCM Mark, c UL us - Recognized (OL) ¹⁾					
CE marking (→ Declaration of conformity)	In accordance with EU EMC directive					
Note on materials	Free of copper and PTFE RoHS compliant					
Input signal / measuring element						
Operating medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4], lubricated operation possible					
Temperature of medium	[°C]	0 ... +50				
Ambient temperature	[°C]	0 ... +50				
Output, general						
Accuracy	[% FS]	±2 at room temperature ±3 in the entire temperature range				
Repetition accuracy	[% FS]	± 0.3 (short time)				
Switching output						
Switch-on time	[ms]	Typical 5 / max. 10				
Switch-off time	[ms]	Typical 5 / max. 10				
Max. output current	[mA]	150				
Capacitive load maximum DC	[nF]	100				
Inductive protective circuit	Present					
Analogue output						
Analogue output	[V]	0 ... 10				
	[mA]	4 ... 20				
Minimum operating quality under influence of noise	[% FS]	Max. drift at analog output < 5				
Accuracy	[% FS]	± 3 at room temperature ±4 in the entire temperature range				
Max. load current of the voltage output	[mA]	5				
Max. load resistance of current output	[Ω]	300				
Output, additional data						
Protection against short circuit	Pulsed					
Electronics						
Operating voltage range DC	[V]	15 ... 30				
Idle current	[mA]	SDE1-...-C: Max. 35 (approx. 30 typ.) SDE1-...-L: Max. 45 (approx. 40 typ.)				
	[ms]	Max. 450 (with suppression of incorrect switch-on pulse)				
Protection against polarity reversal	For all electrical connections					
Mechanicals						
Mounting position	Any, avoid condensation gathering in the sensor					
Housing material	PA, POM reinforced					
Material of keys	PA					
Material of display	PC					
Display / operation						
Switching pressure setting range	bar	-0.020	-0.999	0.040	0.12	0.20
	
		-0.998	0.996	1.996	5.99	9.98
Hysteresis setting range	bar	0.000	0.000	0.000	0.00	0.00
	
		0.900	1.800	1.800	5.40	9.00
Immissions / emissions						
Storage temperature	[°C]	-20 ... +80				
Degree of protection (in accordance with EN 60529)	IP65					
Protection class (in accordance with DIN VDE 0106-1)	III					
Resistance to shocks (in accordance with EN 60068-2)	30 g acceleration with 11 ms duration (half-sine)					
Vibration resistance (in accordance with EN 60068-2)	10 ... 60 Hz: 0.35 mm / 60 ... 150 Hz: 5 g					

1) Front panel built-in devices SDE1-...-FQ4-... have no UL certification.

Fig. 30

SDE1-		-V1	-B2	-D2	-D6	-D10
Pressure measuring range	[bar]	0	-1	0		
Starting value	[MPa]	0	-0.1	0		
Pressure measuring range	[bar]	-1	1	2	6	10
Final value	[MPa]	-0.1	0.1	0.2	0.6	1
Overload range	[bar]	-1				
Initial value	[MPa]	-0.1				
Overload range	[bar]	5	5	6	16	20
Final value	[MPa]	0.5	0.5	0.6	1.6	2

Fig. 31

12 Hole pattern

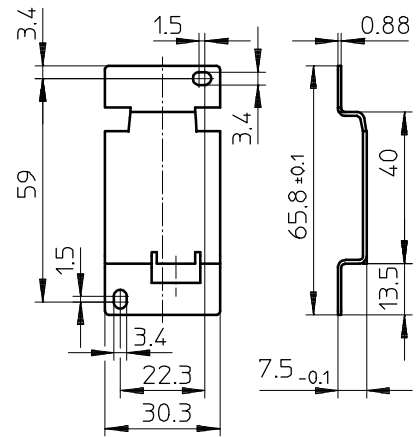


Fig. 32