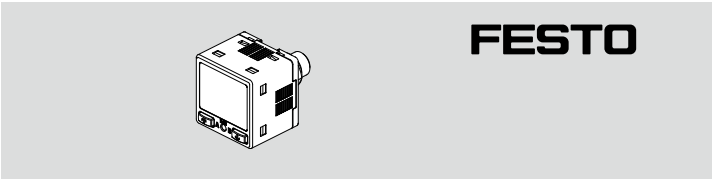


Pressure sensor
SPAB-...



Operating instructions

Original: en

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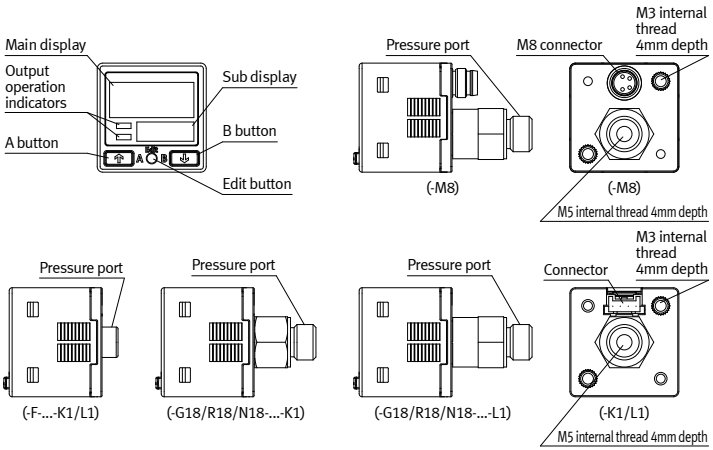
1310 en/de

Please note
Avoid stress loading on the connecting cable. If the cable is subjected to excessive stress, fasten it if necessary with the aid of cable clips or similar strain relief.

Warning
Use only power units which guarantee reliable electrical isolation of the operating voltage as per IEC/EN 60204-1. Observe also the general requirements for PELV power circuits as per IEC/EN 60204-1.

Warning
Depending on the functioning of the machine/system, the manipulation of signal states can cause serious injury to human beings and damage to property. Note that if the switching behaviour of the outputs is modified in the EDIT mode, the new status will be effective immediately. Activate the password protection (security code) in order to prevent unintentional modification by unauthorized third parties. (see EDIT mode under section 8)

1. Operating elements, ports and variants



Features	Type designation	
Pressure range	-B2R-... (-1... +1 bar)	-P10R-... (0... 10 bar)
Pressure type	Relative pressure	
Pneumatic connection	-G18-... (M5 internal- and G1/8" external thread)	
	-R18-... (M5 internal- and R1/8" external thread)	
	-N18-... (M5 internal- and NPT1/8" external thread)	
	-F-... (M5 internal thread and for adapter plate) ¹⁾	
Electrical output	-2P-... (2 digital outputs PNP)	
	-2N-... (2 digital outputs NPN)	
	-PB-... (1 digital output PNP, 1 analog output 1...5V/4...20mA/external input)	
	-NB-... (1 digital output PNP, 1 analog output 1...5V/4...20mA/external input)	
Electrical connection	-K1 (cable 2.5m)	
	-M8 (Plug M8)	
	-L1 (Plug design L1)	

Note 1) This variant may not be used without mounting accessories → Chapter 5, mounting.

2. Function and application

The SPAB-... has been designed for monitoring changes in pressure in the compressed air system or terminal devices.

3. Conditions of use

Please note
Malfunctions will occur if the device is not used correctly. The sensor can be damaged. Make sure that the following specifications are always observed:

- This product has been developed/produced for industrial use only.
- Fitting and commissioning to be carried out by qualified personnel only in accordance with the operating instructions.
- Compare the maximum values specified in these operating instructions with your actual application (e.g. forces, torques, temperatures, voltages).
- Take care that the sensor does not come in contact with water, oil, grease, or organic solvents, such as, thinner, etc.
- Use a blunt pencil to press a key. Do not press the keys with pointed or sharp objects.
- SPAB is designed for use with air and non-corrosive gas. It cannot be used for liquid or corrosive gas.
- Please note the permitted pressure range.
- Take into consideration the ambient conditions at the location of use.
- Please comply with national and local safety laws and regulations.
- Remove all transport packing such as protective wax, foils (polyamide), caps (polyethylene), cardboard boxes (except for the sealing elements of the pneumatic connections).
- Use the product in its original state. Unauthorized modification is not permitted.

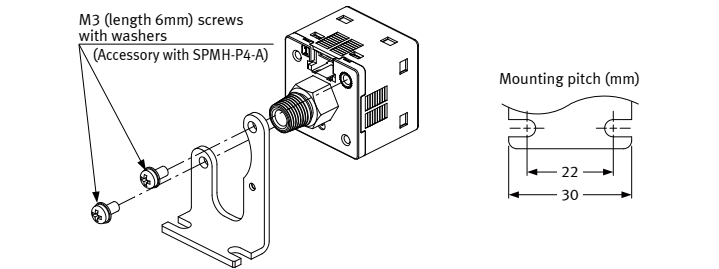
4. Pneumatic

When connecting a commercial coupler to the pressure port, attach a 14mm spanner (12mm for -R18-... or -N18-...) to the pressure port's hexagon section to fix the port, and then tighten with a tightening torque of 9.8Nm or less (M5 internal: 1Nm or less). The commercial coupler or pressure port section will be damaged if the tightening torque is excessive. Wrap sealing tape around the coupler when connecting to prevent leaks.

5. Mounting

- Wall mounting bracket SPAB (SAMH-P4-A)

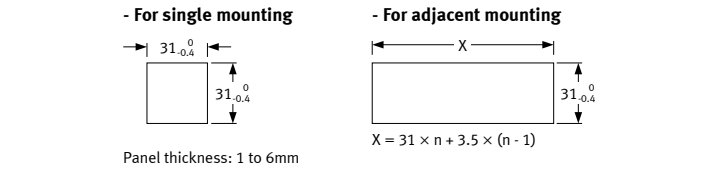
When mounting the sensor onto the wall mounting bracket, etc., the tightening torque should be 0.5Nm or less.



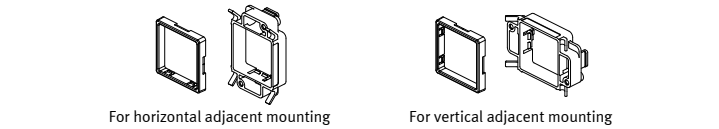
- Panel mounting bracket (SAMH-P4-F) / Front protection cover (SACC-P4-G)

1. Fit the front attachment on the front side of the sensor.
2. Insert to the panel, in the condition described in step 1.
3. Fit the rear attachment from the rear side of the sensor till it touches the panel.
4. Fit the front protection cover on the front attachment. (Only SACC-P4-G)

- Panel cut-out size (mm)



- Mounting direction of the front attachment differs depending on the mounting direction of the rear attachment.



- How to remove
Pull out the rear attachment while pushing the removing levers out.

Please note
- Take care that if the sensor is forcibly pulled, the sensor itself or the rear attachment may break.
- Rear attachment is not designed for frequent swaps.

- Electric Adapter (SASC-P4-A-M8-...)

Separate assembly manual (included with electric adapter).

- Adapter plate (SASF-P4-P-...)

Separate assembly manual (included with adapter plate).

6. Electrical installation

(-K1) / (-L1)

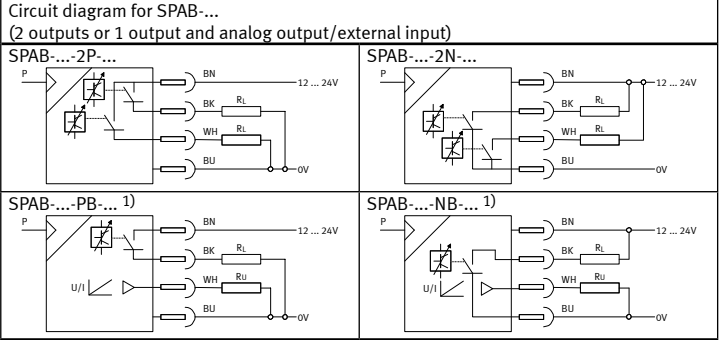
Pin/cable colors	Assignment	Connector
1 / brown (BN)	12 ... 24V DC power supply	
2 / black (BK)	Digital output A	
3 / white (WH)	Digital output B	
4 / blue (BU)	0V	

- Disconnection method
Pressing the release lever of the connector, pull out the connector.

Please note
The force which can be applied to the cable is 10N or less. Do not pull by holding the cable, as this can result in cable disconnection.

(-M8)

Pin/cable colors	Assignment	Plug
1 / brown (BN)	12 ... 24V DC power supply	
2 / white (WH)	Digital output B	
3 / blue (BU)	0V	
4 / black (BK)	Digital output A	



Note 1) The circuit diagram with -PB-... and -NB-... show the use of the analog output.

7. Accessories

Designation	Type	Designation	Type
Connecting cable (only ...-K1, -L1)	2.5m NEBS-L1G4-K-2.5-LE4 5m NEBS-L1G4-K-5-LE4	Adapter plate (only -F-...)	R1/8 SASF-P4-P-R18 G1/8 SASF-P4-P-G18
Connecting cable (only ...-M8)	NEBU-M8G4-... NEBU-M8W4-...		NPT1/8 SASF-P4-P-N18 M5 SASF-P4-P-M5
Wall mounting bracket	SAMH-P4-A	Electric Adapter (only...-L1)	SASC-P4-A-M8-A
Panel mounting bracket	SAMH-P4-F		SASC-P4-A-M8-S
Front protection cover	SACC-P4-G		

8. Preparing for Commissioning

- Switching points (SP..) and hysteresis (HY)
Define the desired switching behaviour of the digital outputs.

	Threshold value comparator	Window comparator
Normally open (NO)		
Normally close (NC)		

- RUN mode

Shows the measured value and the signal status of the digital outputs. Main display color is changed depending on output A. 4 kind of colors can be selected by using EDIT mode as follows. Red when ON/Green when ON/Always Red/Always Green Sub display is always indicated in Green. Output operation indicators always light up in Yellow.

- EDIT mode

The EDIT mode enables the following settings.

- Output setting
 - Switching behaviour selection (threshold value comparator or window comparator)
 - Switching points selection
 - Hysteresis selection
 - Switching characteristic (normally open/close) selection
 - Analog voltage output/Analog current output/Auto-reference input/Remote zero-adjustment

Notes 1) Only -2P-.../-2N-...
2) Only -PB-.../-NB-...

- SPEC setting
 - Unit of measurement selection [bar, kPa, MPa¹⁾, psi, mmHg²⁾, inchHg²⁾, inchH₂O²⁾, kgf/cm²⁾
 - Delay timer selection (0, 2.5, 5, 10, 25, 50, 100, 250, 500, 1,000, 5,000 msec)
 - Main display color selection (Red when ON/Green when ON/Always Red/Always Green)
 - Sub display selection (unit or switching point)
 - Security code lock setting (1...9999)
 - Copy function
- Notes 1) Only -P10R-... 2) Only -B2R-...

- SHOW mode

The SHOW mode shows the following settings and values. Setting for Output A (Output B)

- Unit of measurement
- Switching behaviour
- Switching points
- Hysteresis
- Switching characteristic

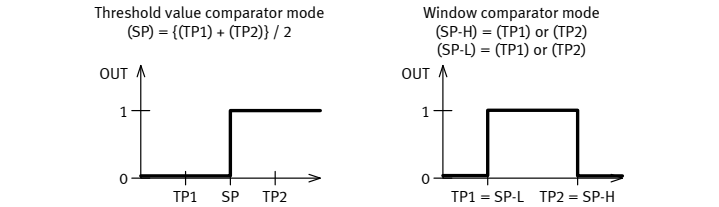
Setting for analog output/external input ¹⁾

- Adjustment value (when external input)

Note 1) Only -PB-.../-NB-...

- TEACH mode

Enables teaching of switching points within the maximum setting range.



Please note
TEACH mode is not possible when using external input.

- MIN/MAX mode

The MIN/MAX mode displays the lowest and highest pressure values up to the time of displaying.

- ZERO ADJUST mode

The ZERO ADJUST mode forcibly sets the pressure value to “zero” when the pressure port is opened.

- RESET mode

Return to default settings.

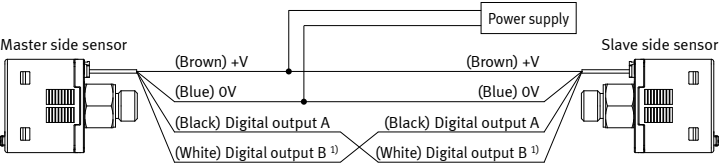
- COPY mode

The COPY mode can copy the settings of the master side sensor to the slave side sensor.

Please note
- Be sure to use the copy function between the identical models. This function cannot be used between different models.
- Only one sensor can be connected on slave side with a master side sensor for the copy function.
- Do not use the copy function other than the following wiring, as pulsed output generates when turning the power ON after setting the master side sensor to the copy ready state.

Setting procedure

1. Set the copy function of the master side sensor to copy ready state. (see EDIT mode under section 10)
2. Turn off the master side sensor.
3. Connect the master side sensor with the slave side sensor as shown below.



- Note 1) -PB-.../-NB-..., analog output/external input.
4. Turn on the master side sensor and the slave side sensor at the same time. ²⁾
 5. Set contents (16-bit coded) are shown in orange on the main display of the master side sensor and the copying starts.
 6. The same code explained above is shown in green on the main display of the slave side sensor, and “OK” is shown on the sub display (When copying is complete.)
 7. Turn off the power of the master side sensor and the slave side sensor and disconnect the wire.
- * If copying the setting to another sensor repeatedly, follow steps 3 to 7.

Note 2) Take care that if the power is not turned on at the same time, the setting contents may not be copied.

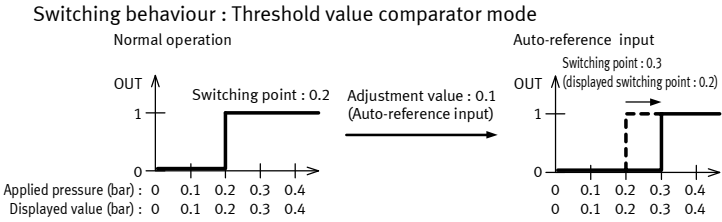
To cancel the setting copy mode of master side sensor

1. While the slave side sensor is disconnected, turn on the power of the master side sensor.
2. Press the mode selection key for approx. 3 seconds.

- External input (Only -PB-.../-NB-...)

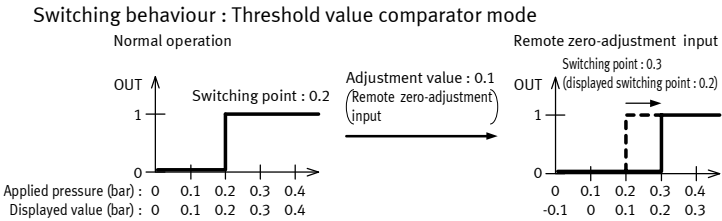
Please note
TEACH mode is not possible when using external input.

- Auto-reference function
The auto-reference function corrects the switching point using the detected pressure value during auto-reference input as the adjustment value.
Switching point after auto-reference is “Adjustment value” + “Switching point”.
The auto-reference input is disregarded when a applied pressure exceeds the range of set pressure.



Adjustment value is cleared when the I/O setting of EDIT mode is changed or the power is turned ON again.

- Remote zero-adjustment function
The remote zero-adjustment function forcibly sets the displayed pressure value to “zero” when the external signal is input.
The remote zero-adjustment input is disregarded when a applied pressure exceeds the range of set pressure.



Adjustment value is cleared when the I/O setting of EDIT mode is changed or the power is turned ON again.

9. Fast commissioning with factory setting

- The SPAB-... is delivered with the following factory setting.

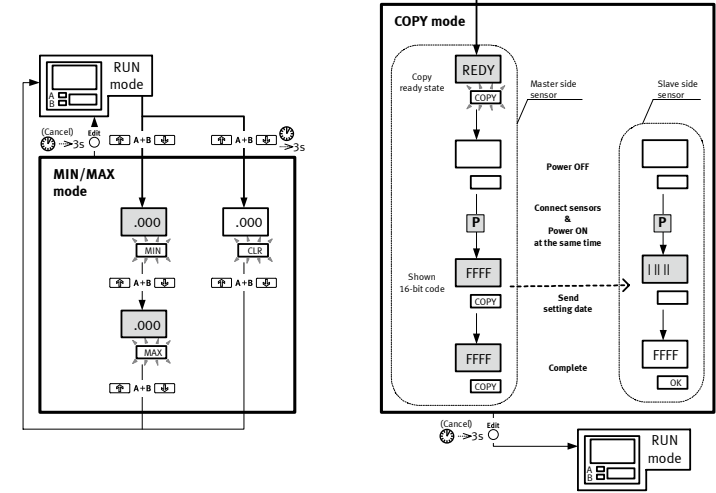
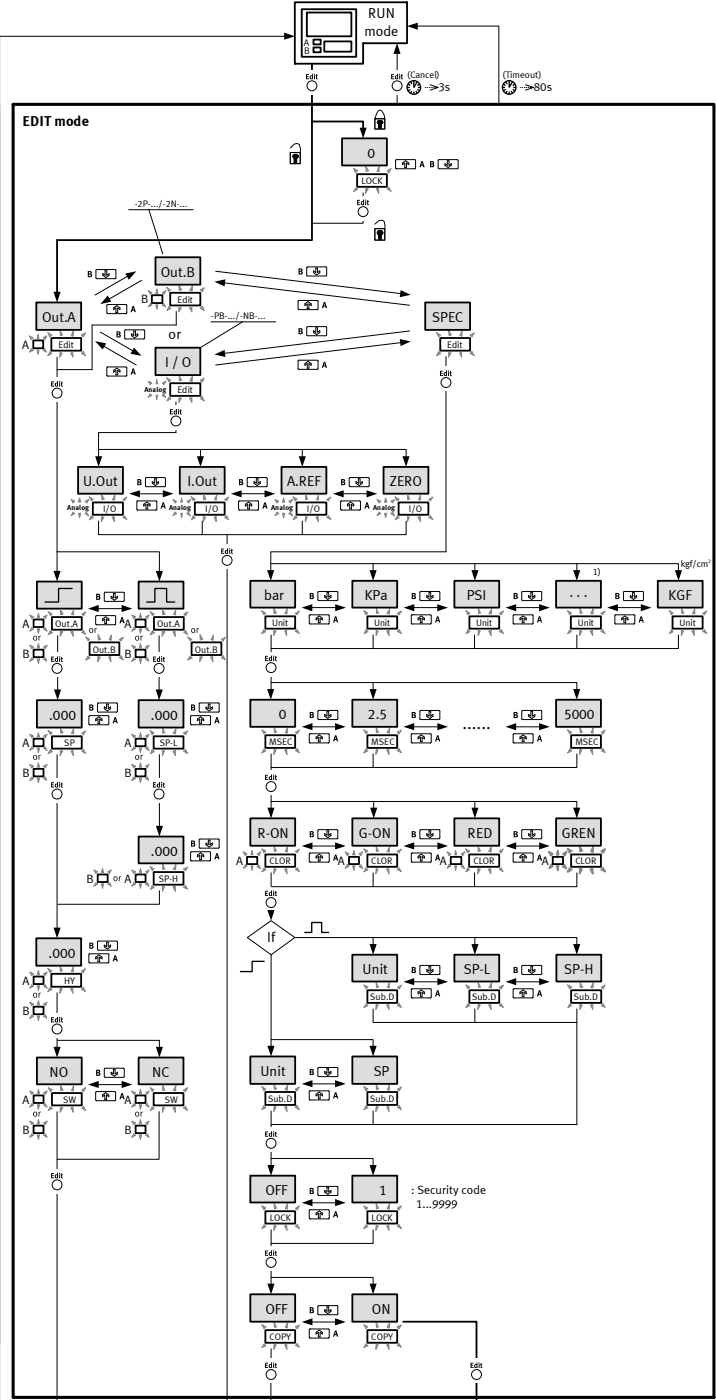
Item	-2P-.../-2N-...	-PB-.../-NB-...
Switching behaviour (Output A)	Threshold value comparator	
Switching behaviour (Output B)	Threshold value comparator	—
Analog output/external input	—	Analog voltage output
Switching characteristic (Output A)	NO (normally open)	
Switching characteristic (Output B)	NO (normally open)	—

	-G18-.../-F-...	-R18-...	-N18-...
Item	-B2R-...	-P10R-...	-B2R-...
Unit display	bar	kPa	MPa

10. Menu structure

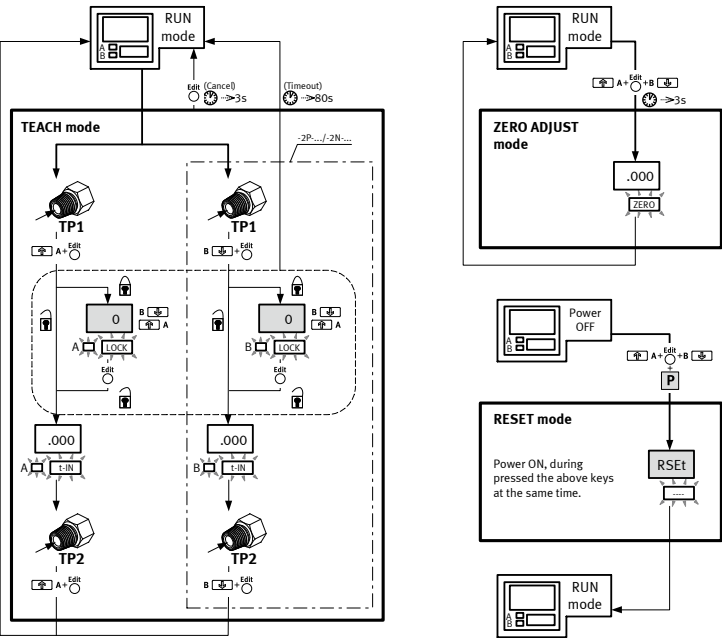
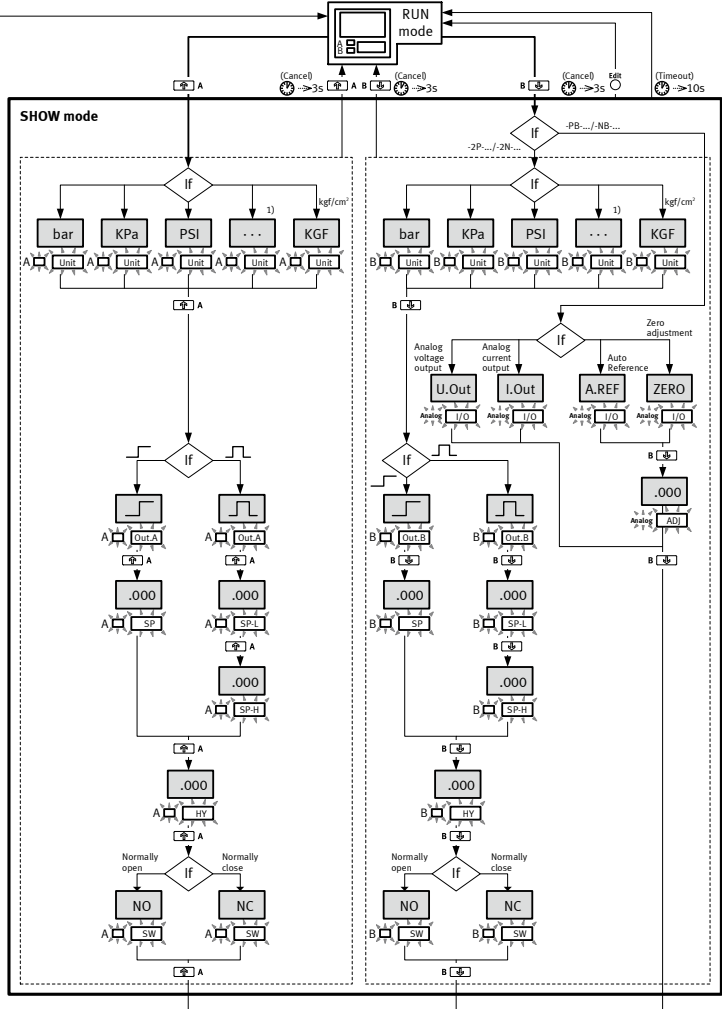
- Symbols for representing the menu structure

Symbol	Meaning
(Timeout) ⌚→80s	Automatically returns to the basic status (RUN mode) when the monitoring time has expired (here 80 seconds)
EDIT (Cancel) ⌚→3s	In order to return manually to the basic status (RUN mode), press Edit button for 3 seconds
TP1	Create pressure (for teaching the measured value-here TP1)
A	Symbol on the display flashes (here Out A)
🔒	Security code active (blocked against unauthorized programming)
🔓	Security code inactive
⬆️ A	Press button [here UP button (A)]
⬆️ A ⌚→3s	Press button [here UP button (A)] for 3 seconds
000 ⬆️ A	Press button [here UP button (A)] (set value)
🔗	Press Edit button
⬆️ A + 🔗	Press button [here UP button (A)] and Edit button simultaneously
⬆️ A + 🔽 B ⌚→3s	Press UP button (A) and DOWN button (B) for 3 seconds
⚡	Branching in the menu system
P	Power ON



Note 1) Additional units;

-P10R-...	-B2R-...
MPa	MPa
	MMHg
	inchHg
	inchH2O



11. Trouble-shooting

Fault	Possible cause	Remedy
No display	Supply voltage not applied or no permitted operating voltage	Switch on supply voltage / maintain permitted operating voltage range
	Electrical connections swapped (incorrect polarity)	Wire the SPAB-... as shown in the circuit diagram
	SPAB-... defective	Return SPAB-... to Festo
Incomplete display	Display defective	Return SPAB-... to Festo
Incorrect pressure display	SPAB-... operated with non-permitted medium	Replace the SPAB-... and operate only with compressed air
Outputs do not switch according to settings	Short circuit/overload at relevant output	Eliminate short-circuit/overload
	SPAB-... defective	Return SPAB-... to Festo
Setting cannot be edited (“LOCK” on the display)	Access protection active	Enter the security code (if forgotten, can use “RESET mode”)

Error message	Description	Remedy
Er01	SPAB-... defective	Contact Festo
Er21 shrt	The load is short-circuited causing an overcurrent to flow	Turn off the power and check the load
Er40 ZERO	Pressure is applied during zero-point adjustment	Applied pressure at the pressure port should be brought to atmospheric pressure and zero-point adjustment should be done again
Er04 COPY	Communicator error (disconnection, faulty connection)	Check the wiring when using the copy function
Er39 COPY	Communicator error (incorrect model)	Make sure that the system is configured of the same models when using the copy function
1.000 1)	Measuring range exceeded (-B2R-...)	Observe permitted measuring range; after exceeding/not reaching permitted maximum values, replace SPAB-...
10.00 1)	Measuring range exceeded (-P10R-...)	
-1.000 1)	Value below measuring range (-B2R-...)	
0.00 1)	Value below measuring range (-P10R-...)	

1) 7-segment display flashes

12. Technical specifications

Type SPAB-	-B2R-...	-P10R-...
Applicable fluid	Filtered compressed air (40µm, non-lubricated), Non-corrosive gas	
Pressure type	Relative pressure	
Pressure range	[bar]	-1... +1
	[kPa]	-100... +100
	[MPa]	-
	[psi]	-14.5... +14.5
	[mmHg]	-750... +750
	[inchHg]	-29.5... +29.5
	[inchH2O]	-401... +401
Overload pressure	[bar]	Max. 5
	[kPa]	Max. 15
	[MPa]	Max. 15
	[psi]	Max. 15
	[mmHg]	Max. 15
	[inchHg]	Max. 15
	[inchH2O]	Max. 15
Supply voltage	[V DC]	12... 24 ±10% (permitted residual ripple max. 10%)
Idle current 1) 2)	[mA]	Max. 50
Ready-state delay	[s]	Max. 0.5
Max. permitted signal cable length	[m]	Max. 30
Display	Hysteresis	Min. 1 (psi: Min. 2) (variable)
	Repeatability 2)	Max. ±0.1
	Temperature characteristics 3)	Max. ±0.5
	Variable characteristics of supply voltage 2)	Max. ±0.25
	Total error	Max. ±1
	Permit switching current	Max. 100
	Applied voltage	Max. 30
Digital output	Residual voltage	Max. 2.0 (at 100mA of sink and source current)
	Response time	Max. 2.5
	Repeatability 2)	Max. ±0.1
	Temperature characteristics 3)	Max. ±0.5
	Variable characteristics of supply voltage 2)	Max. ±0.25
	Output range	1... 5V/4...20mA
	Zero point 2)	3V ± 5%FS/12mA ± 5%FS
Analog output	Span 2)	4V ± 5%FS/16mA ± 5%FS
	Linearity 2)	Max. ±1%FS
	Analog voltage output	Approx. 1k
	Output impedance	Max. 250
	Analog current output	Max. 250
	Repeatability 2)	Max. ±0.2
	Temperature characteristics 3)	Max. ±0.5
Protection class	Interference immunity	AS per EN 61000-6-2
	Interference emission	AS per EN 61000-6-4
	Vibration resistance 4)	3mm or 20G travel at 10... 500Hz
	Shock resistance	Approx. 10 G
Protection functions	Protection against short circuit	Pulsed
	Protection against polarity reversal	For all electrical connections
	Enclosure	PBT (with glass fiber)
	Display	Acrylic
	Pressure port	Stainless steel
	Mounting screw	Brass (nickel-plated)
	O-ring	HNBR
Materials	Switch	Silicon rubber
	1) Excluding the idle current of analog current output.	
	2) at T= 20°C	
	3) at T= -10... +50°C	
	4) 0.75mm or 5G travel at 10... 150Hz when SMHA-P4-F are used.	