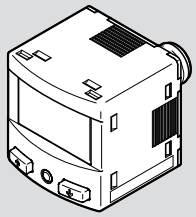
# SPAN-B

## Pressure sensor



Festo SE & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany
+49 711 347-0

www.festo.com

Operating instruction

8185234
2023-08b
[8185236]

8185234



## 1 Applicable documents

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

## 2 Safety

### 2.1 Safety instructions

- Only use the product in its original condition without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe the identifications on the product.
- Before working on the product, switch off the compressed air supply and lock it to prevent it from being switched on again.
- Only use media in accordance with the specifications ➔ Technical data.

### 2.2 Intended use

The sensor monitors the pressure of compressed air and inert gases in the piping system.

### 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/CSA approval information | |
|---|---|
| Product category code | QUYX, QUYX7 |
| File number | E322346 |
| Considered standards | UL 61010-1<br>CAN/CSA C22.2 No. 61010-1 |
| UL mark | c UL us LISTED |

Tab. 1: UL/CSA certification information

- The unit shall be supplied by a power source which fulfils the requirements on a limited-energy circuit in accordance to IEC/EN/UL/CSA 61010-1 or on a Limited Power Source (LPS) in accordance to IEC/EN/UL/CSA 60950-1 or IEC/EN/UL/CSA 62368-1 or a Class 2 circuit in accordance to NEC or CEC.

## 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 Product design

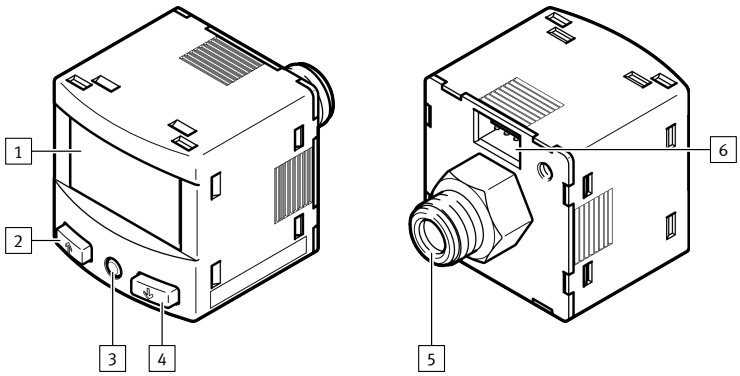
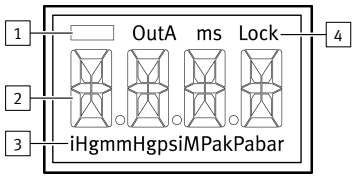



Fig. 1: Product design

| | | | |
|---|---|---|---|
| 1 | Status indicator | 4 | [B] key |
| 2 | [A] key | 5 | Pneumatic port |
| 3 | [Edit] key | 6 | Electrical connection |

### 4.2 Display components




| | |
|---|---|
| 1 | Switching status indication |
| 2 | Main display/alternating display |
| 3 | Pressure units |
| 4 | Status information |

Fig. 2: Status indicator

| Example for display | Meaning |
|---|---|
| Output display | |
| 'OutA' | Switching output OutA selected |
| ■ 'OutA' | Switching output OutA set |
| Status information/signal indicator | |
| 'Lock' | Security code activated ➔ 7.3.1 Entering security code |
| 'SPEC' | Special menu selected ➔ SPEC parameter menu |

Tab. 2: Display functions

| Example for main display | Example for alternating display | Meaning |
|---|---|---|
| Measured value indicator and unit in RUN mode | | |
| '–0.53' | 'bar' | Measured value indicator and unit |
| Menu for switching output OutA | | |
| ⌋‾ | 'Fctn' | Threshold value comparator |
| ⌋⌊ | 'Fctn' | Window comparator |
| '1.80' | 'SP' | Switching point value |
| '2.45' | 'SP.Lo' | Value of lower switching point |
| '6.45' | 'SP.Hi' | Value of upper switching point |
| '0.50' | 'HY' | Hysteresis value |
| 'N/O' | 'LOGC' | Switching behaviour:<br>'NO' = N/O contact, 'NC' = N/C contact |
| 'PNP' | 'Out' | Switchover of the switching outputs between PNP and NPN |
| 'bLUE' | 'COLR' | Display colour:<br>'bLUE' = blue, colour change function deactivated<br>'R.ON' = red when switching output set<br>'R.OFF' = red when the switching output not set<br>Note: the red colour change appears with some malfunctions regardless of the 'COLR' settings |
| Extreme values, SHOW mode only | | |
| '1.64' | 'MIN' | Minimum measured pressure since switch-on or the last reset |
| '8.50' | 'MAX' | Maximum measured pressure since switch-on or the last reset |
| Menu for device settings (SPEC) | | |
| '16' | 'Filt'/'ms' | Value of the filter time constant for the pressure measurement signal |
| 'bar' | 'Unit' | Unit for the pressure indicator |
| 'OFF' | 'Z.Adj' | 'OFF' = zero point synchronisation deactivated, zero range suppression activated<br>'ON' = offset correction for measured value display and switching points possible |
| '40' | 'Eco'/'s' | Economy mode: time after which the display backlighting is switched off |

| Example for main display | Example for alternating display | Meaning |
|---|---|---|
| 'OFF' | 'Code'/'Lock' | Activation and specification of the security code |
| 'OFF' | 'MASt' | Activation of the IO-Link master function for replication of parameters |

Tab. 3: Display functions

### 4.3 Function

#### 4.3.1 Functional principle

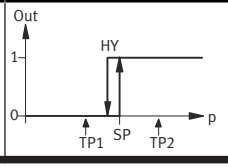
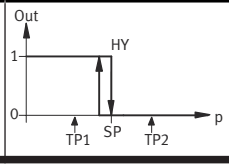
The sensor converts pneumatic pressure values (relative pressure) into electrical signals, which can be used for control or regulating functions. Measurements are carried out using a piezoresistive sensor element with a downstream electronic evaluation unit. The connection to the higher-level system is established via a switching output.
The switching output can be configured to monitor a threshold value or a pressure range. The PNP or NPN and the normally open (N/O) or normally closed (N/C) output can be optionally set in this process.

#### 4.3.2 Operating statuses

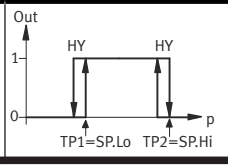
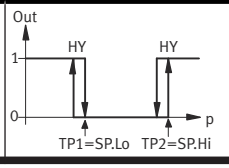
| Operating status | Function |
|---|---|
| RUN mode | – Basic status after the operating voltage is switched on<br>– Display of the current measured value |
| SHOW mode | – Display of the current settings |
| EDIT mode | – Setting or modification of parameters |
| TEACH mode | – Acceptance of the current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

Tab. 4: Operating statuses

#### 4.3.3 Switching functions

| Function | Normally open contact (N/O) | Normally closed (N/C contact) |
|---|---|---|
| Switching function:<br>– 1 switching point (SP)<br>TEACH mode:<br>– 2 teach points (TP1, TP2)<br>– SP = ½ (TP1+TP2) |  |  |

Tab. 5: Threshold value comparator for monitoring a pressure threshold _|¯

| Function | Normally open contact (N/O) | Normally closed (N/C contact) |
|---|---|---|
| Switching function:<br>– 2 switching points (SP.Lo, SP.Hi)<br>TEACH mode[1]:<br>– 2 teach points (TP1, TP2)<br>– TP1 = SP.Lo, TP2 = SP.Hi |  |  |

1) SP.Lo = lower pressure/vacuum value, SP.Hi = higher pressure/vacuum value, dependent on the teach sequence

Tab. 6: Window comparator for monitoring a pressure range _|¯|_

## 5 Assembly

### 5.1 Safety

**NOTICE**

**An unfavourable mounting position may impair the function of the product.**

- When selecting the mounting position, make sure that condensate from the compressed air lines cannot accumulate in the sensor.
- When selecting the mounting position, make sure that the sensor cannot heat up above the maximum permissible operating temperature. Provide options for convection.

– Remove all transport packaging. The material used in the packaging has been specifically chosen for its recyclability.
– Avoid applying force to the sensor housing during mechanical and pneumatic assembly.

### 5.2 Direct mounting of sensor

– Product variants: SPAN-B-...-G18M, SPAN-B-...-R18M
• Seal the connection thread.

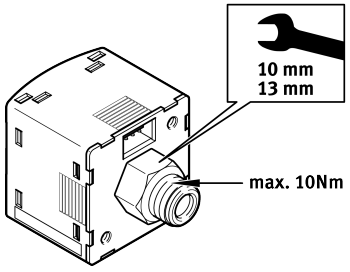



Fig. 3: Example with SPAN-B-...-G18M

### 5.3 Mounting sensor on mounting bracket

– Product variants: SPAN-B-...-G18FPM, SPAN-B-...-M5FAL
– Recommendation for SPAN-B-...-G18FPM: use a type OL-1/8 sealing ring on the pneumatic port.

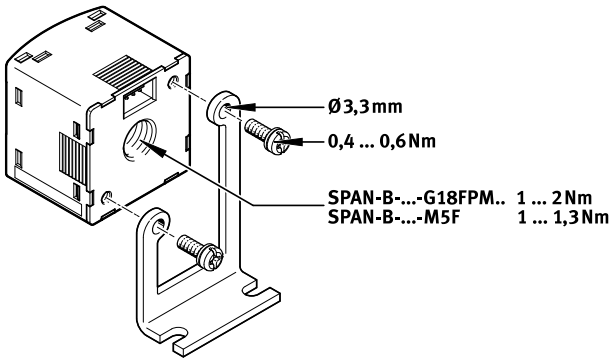



Fig. 4: Example with SPAN-B-...-G18FPM

### 5.4 Mounting sensor with panel frame

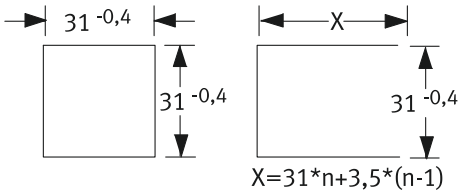



Fig. 5: Size of the front panel cut-out in mm

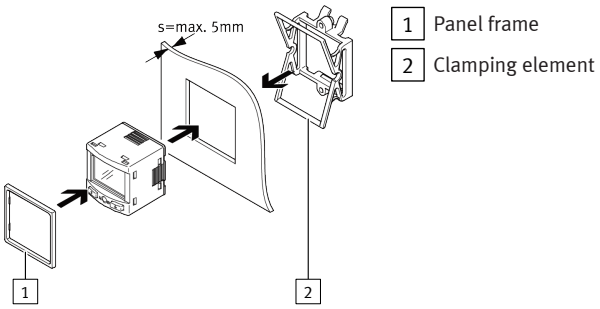



Fig. 6: Front panel mounting SAMH-PN-F

1. Fasten the panel frame to the sensor.
2. Insert the sensor into the cut-out on the front panel from the front.
3. Attach the clamping element and press until the clamping element clicks into place.

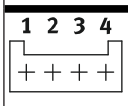
## 6 Installation

**⚠ WARNING**

**Risk of injury due to electric shock.**

- For the electric power supply, use only PELV circuits that ensure a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.

• Connect the sensor.
– Take the maximum permissible line length into account: 30 m.

| Plug L1 | Pin | Wire colour[1] | Allocation |
|---|---|---|---|
|  | 1 | Brown (BN) | Operating voltage +24 V DC |
| | 2 | Black (BK) | Switching output OutA |
| | 3 | White (WH) | – |
| | 4 | Blue (BU) | 0 V |

1) Colours apply for connecting cables NEBS-L1... or electrical adapter SASC-P4... with NEBU-M8...

Tab. 7: Pin allocation

**Circuit diagram SPAN-B-...-PN**

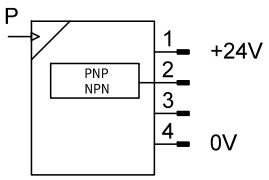



Fig. 7: Circuit diagram

## 7 Commissioning

### 7.1 Switching on the sensor in RUN mode

The basic state of the sensor is the RUN mode. The current measured value is displayed.

The basic state can be reached from other modes:
– Press and hold the [Edit] key for 3 seconds.
– After expiration of a monitoring period (timeout).

## 7.2 Displaying parameters in SHOW mode

Requirement: the sensor is ready for operation and is in RUN mode.

**Switching output OutA**

1. Press the [A] key.
   - The first parameter set is displayed.
   - 'Fctn' flashes.
2. Press the [A] key to display each of the following parameters .

**SPEC parameter menu**

1. Press the [B] key.
   - The first parameter set is displayed.
   - 'Filt' flashes.
2. Press the [B] key to display each of the following parameters.
3. The minimum and maximum values are displayed at the end. Press the [Edit] key to reset the values.

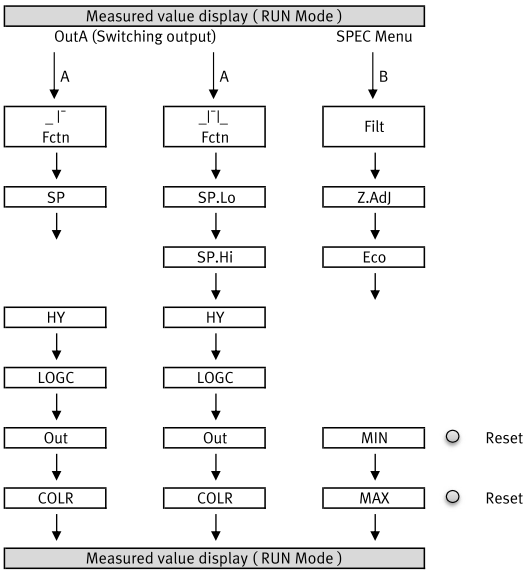



Fig. 8: SHOW mode

| Legend | Meaning |
|---|---|
| MIN, MAX | Parameter is displayed without timeout |
| ○ | [Edit] key |
| ↓ | [A] key, [B] key |

Tab. 8: Legend

## 7.3 Setting parameters in EDIT mode

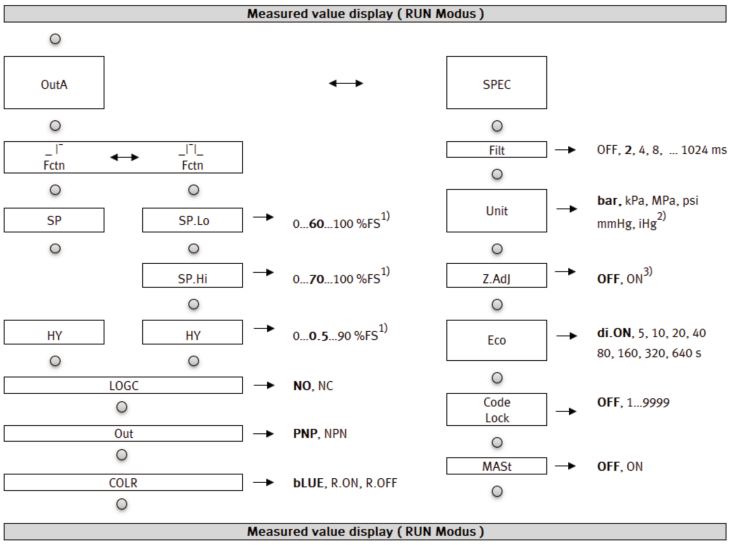



Fig. 9: EDIT mode

| Legend | Meaning |
|---|---|
| ○ | [Edit] key |
| → | [A] key, [B] key |
| Value in bold | Factory setting |
| 1) | The values refer to the relevant measuring range and the selected unit |
| 2) | Dependent on the selected measuring range |
| 3) | SPAN-B-B2/-B11... : factory setting = ON<br>SPAN-B-V1... : factory setting = OFF |

Tab. 9: Legend

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Changes to the switching behaviour in EDIT mode are effective immediately.

### 7.3.1 Entering security code

Requirement: the sensor is ready for operation and is in RUN mode.

1. Press the [Edit] key.
   - The EDIT mode is active.
   - If the security code is activated, the parameter entry option is blocked: 'Lock' flashes.
2. Enter the security code with the [A] or [B] key.
3. Press the Edit key.
   - 'OutA' flashes.
   - The parameter entry option is unblocked.

### 7.3.2 Configuring the switching output

Requirement: the sensor is ready for operation and is in RUN mode.

**Setting threshold value comparator _I¯ and window comparator _I¯I_**

1. Press the [Edit] key.
   - 'OutA' flashes.
2. Press the [Edit] key.
   - 'Fctn' flashes.
3. Select _I¯ or _I¯I_ with the [A] or [B] key.
4. Press the [Edit] key.
   - The set value is saved.
   - The next adjustable parameter is shown.
5. Set the parameter with the [A] or [B] key.
6. Repeat items 4 and 5 until all parameters are set.
7. Press the [Edit] key.
   - The RUN mode is active.

### 7.3.3 Changing device settings

Requirement: the sensor is ready for operation and is in RUN mode.

1. Briefly press the [Edit] key.
   - 'OutA' flashes.
2. Select the SPEC menu with the [A] or [B] key.
   - 'SPEC' flashes.
3. Press the [Edit] key.
   - 'Filt' flashes.
4. Set the parameter with the [A] or [B] key.
5. Press the [Edit] key.
   - The set value is saved.
   - The next adjustable parameter is shown.
6. Repeat items 4 and 5 until all parameters are set.
7. Press the [Edit] key.
   - The RUN mode is active.

### 7.3.4 Replicating parameters

Requirements:
– The previously configured sensor (master sensor) is ready for operation and is in RUN mode.
– The switching output on the device sensor is configured to PNP and is in an unswitched status; the 'OutA' indicator is off.
– The master sensor and device sensor are identical with reference to the parameters, i.e. they have the same device ID.
– The master sensor is connected to the device sensor and the power supply.

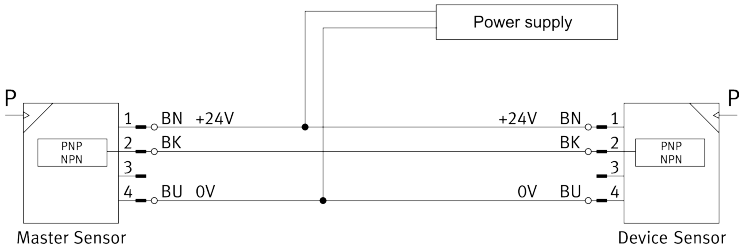


Fig. 10: Terminal allocation

1. Select the SPEC menu from the device settings on the master sensor.
2. Press the [Edit] key repeatedly until 'MASt' appears.
3. Select 'ON' with the [A] or [B] key.
4. Press the [Edit] key.
   - 'REPL'/'RedY' appears.
5. Press the [A] or [B] key.
   - 'REPL'/'RUN' appears briefly.
   - The parameters are transmitted to the device sensor. 'REPL'/'RedY' appears.
   - If an error occurs, an error message appears ➔ 9 Fault clearance.

6. If an additional sensor is to be parameterised, connect the additional sensor and repeat step 5.
7. Press the [Edit] key.
   ↳ The RUN mode is active.

### 7.3.5 Activate zero range hiding

Requirement: the sensor is ready for operation and is in RUN mode.
1. Press the [Edit] key.
   ↳ 'OutA' flashes.
2. Select the SPEC menu with the [A] or [B] key.
   ↳ 'SPEC' flashes.
3. Press the [Edit] key until 'Z.Adj' flashes.
   ↳ 'Z.Adj' flashes.
4. Set the parameter to 'OFF' with the [A] or the [B] key.
5. Press the [Edit] key.
   ↳ The set value is saved.
   ↳ Zero range hiding is activated.
   ↳ The zero point synchronisation is deactivated.

## 7.4 Running zero point synchronisation

Requirement:
- the sensor is ready for operation and is in RUN mode.
- 'Z.Adj' 'ON' is set, factory setting with bipolar variants.
- The measured value is in the range 0 bar ± 3% FS.

1. Press and hold the [A] and [B] keys.
2. Also press the [Edit] key.
   ↳ If 'OK' appears: the zero point synchronisation was successful.
   ↳ 'FAIL' appears: the zero point synchronisation was not successful. Check requirements.

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If 'Z.AdJ' 'OFF' is set for a later time, the sensor takes the factory-set calibration values.

## 7.5 Teach-in switching points in TEACH mode

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There is no timeout in the TEACH mode. The sensor switches to the RUN mode only after the entire teach-in process is completed.

Requirement:
- the sensor is ready for operation and is in RUN mode.
- If the security code is activated, the parameter entry option is blocked: 'Lock' flashes.
  - Enter security code ➔ 7.3.1 Entering security code.

1. Define a switching function in EDIT mode ➔ 7.3.2 Configuring the switching output.
2. Create pressure value 1.
3. Press the [A] and the [EDIT] keys simultaneously.
   ↳ The current pressure value will then be set as the first teach-in point (TP1).
   't-IN' flashes.
4. Create pressure value 2.
5. Press the [A] and the [EDIT] keys simultaneously.
   ↳ The current pressure value is set as the second teach-in point (TP2).
   ↳ The RUN mode is active.

## 7.6 Restoring factory settings

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Restoring the factory settings will delete the current settings.

1. Switch off the operating voltage.
2. Press and hold the [A] and [B] keys.
3. Switch on the operating voltage.
4. Also press the [Edit] key.
   ↳ 'Rsto PARM' appears.
   ↳ All parameters are reset to the factory settings.

# 8 Operation

**NOTICE**

**Property damage due to high temperatures.**
Extreme pneumatic conditions can heat the sensor to over 80 °C.
- Select the operating conditions so the sensor does not heat above the maximum permissible operating temperature.

# 9 Fault clearance

| Malfunction | Cause | Remedy |
|---|---|---|
| No display | No operating voltage or unreliable operating voltage | – Apply permissible operating voltage |
| | Electrical connections swapped | – Connect the device in accordance with the circuit diagram |
| | Device faulty | – Replace device |
| Indicator or switching output does not respond in accordance with the settings | Short circuit or overload at output | – Eliminate short circuit/overload |
| | Incorrect switching point set | – Repeat teach-in |
| | Device faulty | – Replace device |
| | Parameter incorrect | – Reset to factory settings |
| 'Er01'/'FAIL' display[1] | Device faulty | – Replace device |
| 'Err10'/'OVER' display | Measuring range exceeded | – Hold measuring range |
| 'Er21'/'SHRT' display[2] | Short circuit at OutA | – Eliminate the short circuit |
| 'Err'/'BUSY' display | OutA is switched active | – Check device settings ➔ 7.3.4 Replicating parameters |
| 'Err'/'ID' display | Device ID error, replication function failed | – Use sensors with the same type (same device ID) for replicating |
| 'Err'/'COMM' display | Communication error | – Check wiring |

1) Display flashes red
2) Display is red

Tab. 10: Fault clearance

# 10 Removal

1. Switch off the operating voltage and the compressed air.
2. Disconnect the electrical and pneumatic connections from the sensor.
3. Release the fasteners and remove the sensor.

# 11 Technical data

| SPAN-B | | |
|---|---|---|
| Certificates, declaration of conformity | | ➔ www.festo.com/sp |
| Certification | | RCM Mark, c UL us - Listed (OL) |
| Input signal/measuring element | | |
| Operating medium | | Compressed air to ISO 8573-1:2010 [7:4:4], inert gases, lubricated operation possible |
| Temperature of medium | [°C] | 0 ... 50 |
| Ambient temperature | [°C] | 0 ... 50 |
| Output, general | | |
| Accuracy at room temperature | [% FS] | ± 1.5 |
| Accuracy in the operating temperature range | [% FS] | ± 3 |
| Repetition accuracy | [% FS] | ± 0.3, at 'Filt' = 'OFF' |
| Temperature coefficient | [% FS/K] | Typically ± 0.1 |
| Switching output | | |
| Switching output | | 1x PNP or 1x NPN, switchable |
| Switching function | | Threshold value comparator, window comparator |
| Switch-on time | [ms] | Max. 1 |
| Switch-off time | [ms] | Max. 1 |
| Max. output current | [mA] | 80 |
| Capacitive load maximum DC | [nF] | 100 |
| Voltage drop | [V] | Max. 2 |
| Pull-down resistor | | Integrated (PNP) |
| Pull-up resistor | | Not integrated (NPN) |
| Inductive protective circuit | | Present |
| Output, additional data | | |
| Short circuit current rating | | Yes |
| Overload protection | | Present |
| Electronics | | |
| Operating voltage range DC | [V] | 10.8 ... 30 |
| No-load current | [mA] | Max. 30 |
| Ready-state delay | [ms] | Typically 30 |
| Reverse polarity protection | | All connections against one other |
| Mechanics | | |
| Housing material | | PA-reinforced |
| Inspection window material | | PC |
| Keypad material | | TPE-O |
| Materials in contact with the media[1] | | FPM, NBR, PA reinforced, brass (nickel-plated) |
| Immission/Emission | | |
| Storage temperature | [°C] | –20 ... +80 |
| Max. permissible relative humidity | [% RH] | 85 |
| Degree of protection in accordance with EN 60529 | | IP40<br>The degree of protection is not UL-tested. |
| Protection class in accordance with DIN VDE 0106-1 | | III |
| Shock resistance in accordance with EN 60068-2 | | 30 g acceleration with 11 ms duration (half-sine) |

| SPAN-B | | |
|---|---|---|
| Vibration resistance in accordance with EN 60068-2 | | 10 … 60 Hz: 0.35 mm/<br>60 … 150 Hz: 5 g |
| Display, operation | | |
| Displayable units | | bar, kPa, MPa, psi, mmHg, inchHg |
| Threshold value setting range | [% FS] | 1 … 99 |
| Hysteresis setting range | [% FS] | 0 … 90 |

1) Depending on the variant

Tab. 11: Technical data

| SPAN-B | | -B2 | -B11 | -V1 |
|---|---|---|---|---|
| Pressure measuring range | [MPa] | –0.1 … 0.1 | –0.1 … 1 | 0 … –0.1 |
| | [bar] | –1 … 1 | –1 … 10 | 0 … –1 |
| | [psi] | –14.5 … 14.5 | –14.5 … 145 | 0 … –14.5 |
| Overload range | [MPa] | –0.1 … 0.5 | –0.1 … 1.5 | –0.1 … 0.5 |
| | [bar] | –1 … 5 | –1 … 15 | –1 … 5 |
| | [psi] | –14.5 … 72.5 | –14.5 … 217.5 | –14.5 … 72.5 |

Tab. 12: Pressure measuring range and overload range