

Standard, High-End and High-End Flush-Mounted Pressure Sensors BSP-B... /-V...



EU Directive 2004/108/EC (EMC Directive) and EMC Law
Generic Standards: EN 61000-6-4 (Emission), EN 61000-6-2 (Noise Immunity)
Emission testing: RF Emission EN 55011 Group 1, Class A and B

Scope

This guide is valid for the following pressure sensors:

- BSP Bxxx-...
- BSP Vxxx-...



Intended use

The pressure sensor was developed to monitor the pressure of gases or fluids compatible with stainless steel, ceramics and fluoroelastomers. Pressure sensors are suited to different types of application depending on the device and mechanical connection.

The pressure sensor is installed in a machine or integrated into a system. Flawless function in accordance with the specifications in the technical data is ensured only when using original BALLUFF accessories, and use of any other components will void the warranty.

Modifications to the sensor or non-approved use are not permitted and will result in loss of warranty and void any liability claims against the manufacturer.

Safety instructions



Before commissioning, read the user's guide carefully!
These sensors must not be used in applications in which the safety of persons is dependent on the function of the device (not a safety component acc. to EU Machinery Directive).

Installation and startup are to be performed only by trained specialists.

The **operator** is responsible for ensuring that local safety regulations are observed.

In particular, the operator must take measures to ensure that a defect in the object detection system will not result in hazards to persons or equipment.

If defects or non-clearable faults in the sensor occur, take it out of service and secure against unauthorized use.

Downloading the user's guide

The user's guide can also be found on the internet at www.balluff.com.

Installation



Attention!

The pressure sensor may not be exposed to high temperatures or rapid increases in pressure that extend beyond specific limits (see Technical Data for limit values).

Do not touch the sensitive membrane of the flush-mounted sensor: it can tear or become deformed.

- Always depressurize and disconnect pressure sensors from the power supply before mounting!
- Observe the following when mounting outdoors or in a damp environment:

Select a mounting location that allows splash and condensation water to drain away. Fluids must not be allowed to accumulate on sealing surfaces!

Connect the device to the power supply immediately after mounting to prevent moisture from entering the connector. Otherwise fit a suitable protective cap to prevent the ingress of moisture. The degree of protection specified on the data sheet only applies if the device is connected!

If there is a danger of damage from lightning strikes or excess voltage, mount an overvoltage protection between the power supply unit or switching cabinet and the device.

- On hydraulic systems, position the device so that the pressure connection faces upwards (depressurization).
- If the device is mounted on a steam pipeline, install a cooling section.
- Mount the device in a location protected from direct sunlight. Sunlight can damage or affect the functional capability of the device.
- When installing devices with a relative reference in the housing (no borehole next to the electrical connection), make sure that the relative reference required for the measurement is protected against dirt and moisture. If the device is exposed to fluids, the relative reference blocks the air pressure compensator. Accurate measurements are not possible when this happens, and the device may be damaged.
- No mechanical tension should be placed on the pressure connection during installation as this may displace the characteristic curve. This applies in particular to extremely small pressure ranges and devices with a plastic pressure connection.

Standard, High-End and High-End Flush-Mounted Pressure Sensors BSP-B... /-V...

Installation

Important notes for installation of flush-mounted sensors:



Caution!

Handle the unprotected membrane with the utmost care: it can be easily damaged.

- Do not remove the packaging and protective cap until shortly before installation, so that the membrane remains undamaged. Retain the protective cap.
- After disassembly, place the protective cap back over the membranes immediately.
- Do not use force when installing the sensor, so as not to cause damage to the device or the system.

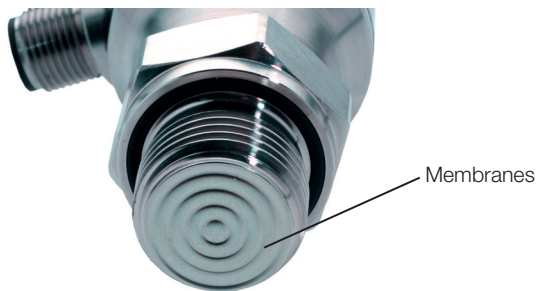


Fig. 1: Unprotected membrane of the flush-mounted sensor

Installation of connections according to DIN 3852

Make sure that:

- the sealing surface on the relevant part is perfectly clean and free of residues,
 - the O-ring seated in the slot provided is undamaged.
1. Screw the device into the mounting thread with one hand.
Secure devices to the steel pressure connection using a spanner flat. Observe the following torques:

Torques	Connection according to EN 3852	Connection according to EN 837	Connection NPT
1/4"	approx. 5 Nm	approx. 20 Nm	approx. 30 Nm
1/2"	approx. 10 Nm	approx. 50 Nm	approx. 70 Nm



Fig. 2: Electrical connection and process connection

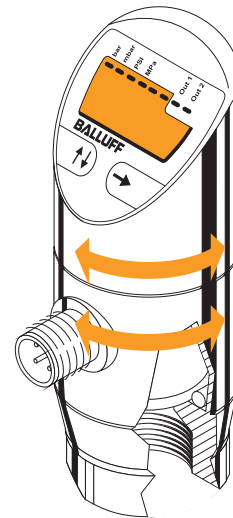


Fig. 3: Display and connection housing rotates 320°

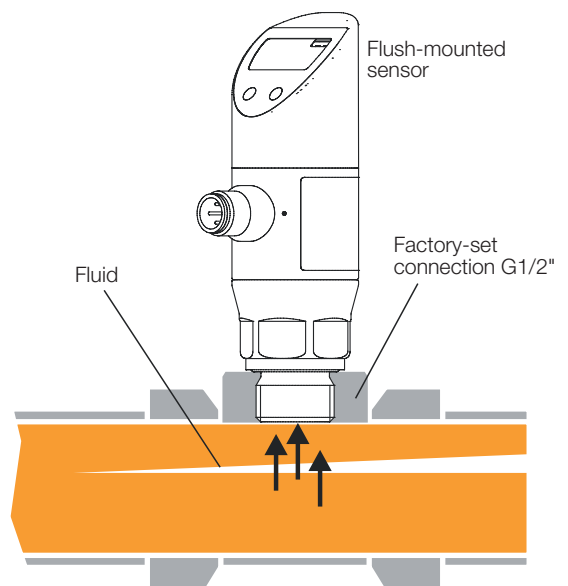


Fig. 4: Process connection for the flush-mounted sensor (G1/2" in accordance with EN 3852)

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Installation (continued)

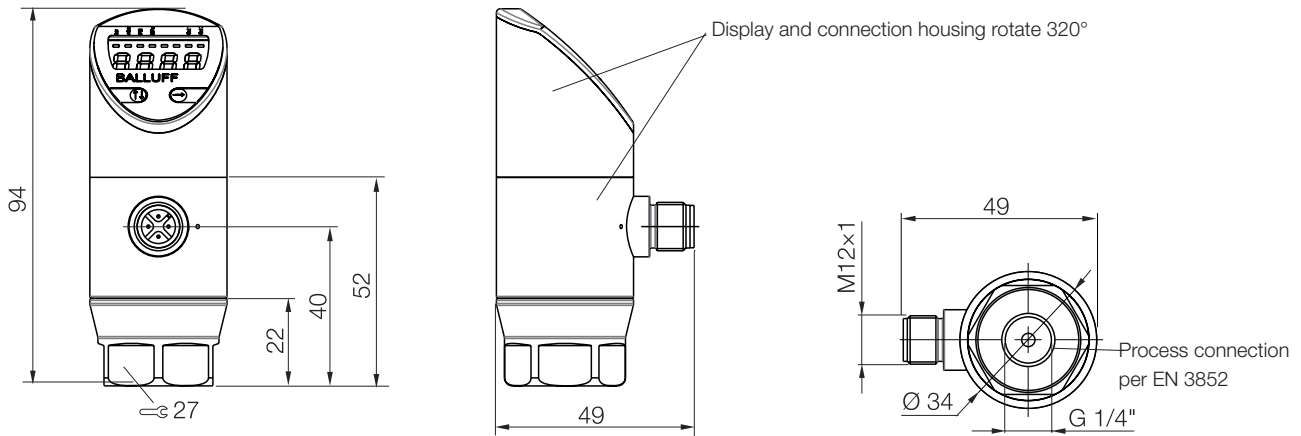


Fig. 5: Dimensioned drawing of standard and high-end pressure sensors, not flush-mounted

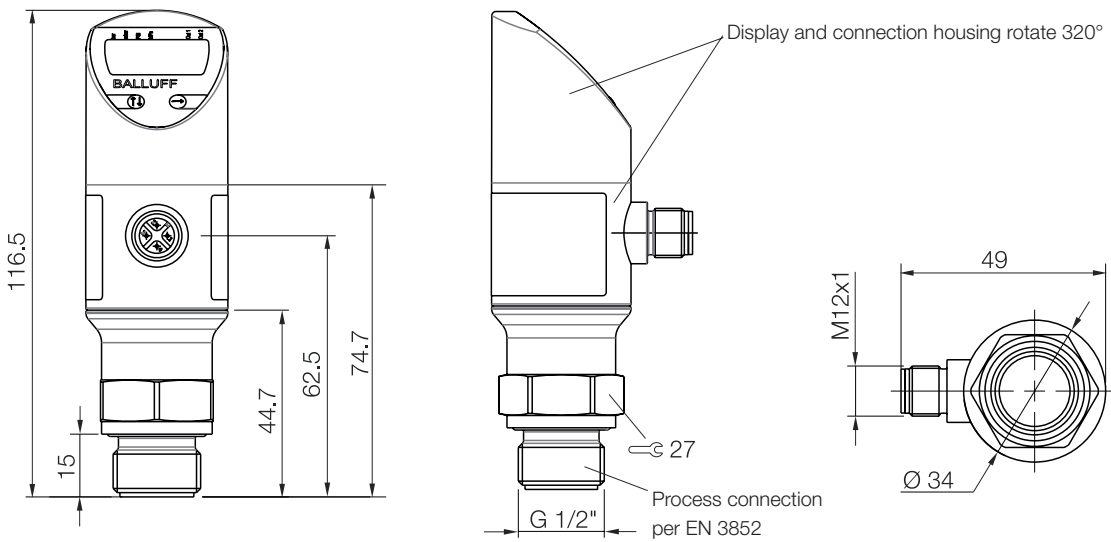


Fig. 6: Dimensioned drawing of flush-mounted pressure sensors, up to 50 bar

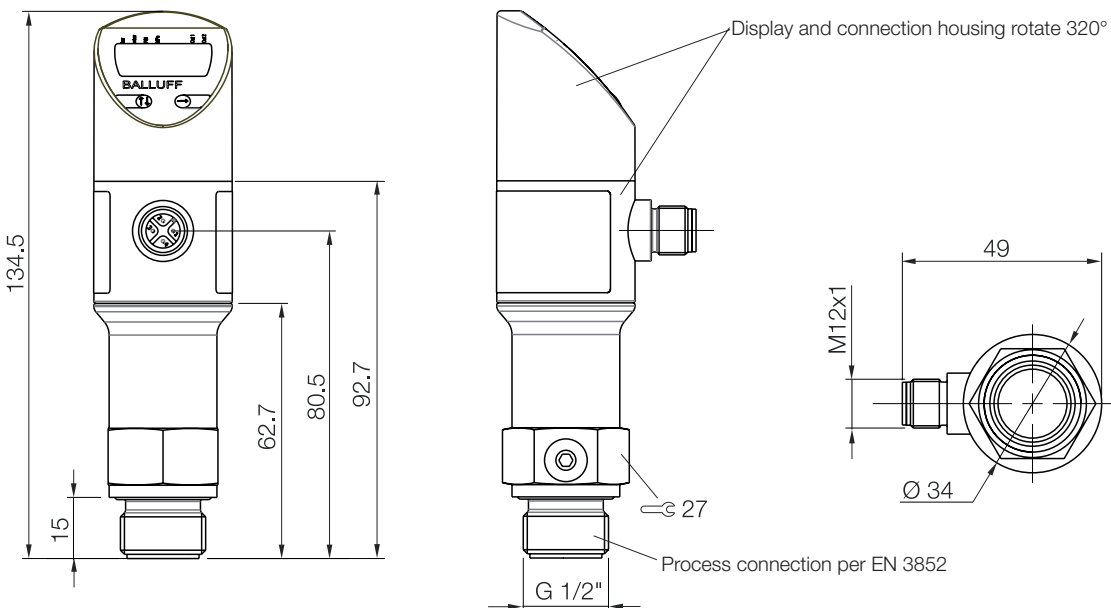


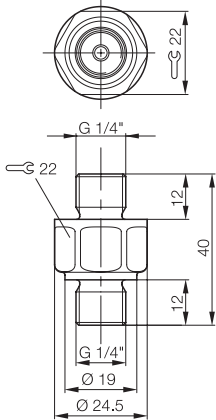
Fig. 7: Dimensioned drawing of flush-mounted pressure sensors, 100 bar or higher

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Installation (continued)

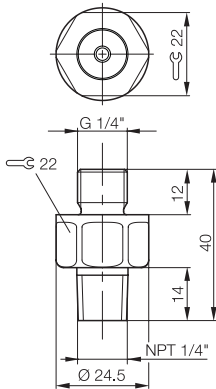
Adapter for process connection G 1/4"

BSP pressure sensors can be adapted to different process connections using adapters (accessories) available as an optional extra. The adapters must be ordered separately. Adapters for other process connections are available on request.



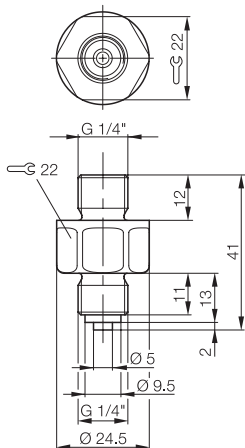
Adapter G 1/4"

Ordering code: BAM01KP
Stainless steel
Connection:
- Sensor end: G 1/4"
- Process end: G 1/4"
Torque approx. 5 Nm



Adapter NPT 1/4"

Ordering code: BAM01KT
Stainless steel
Connection:
- Sensor end: G 1/4"
- Process end: NPT 1/4"
Torque approx. 30 Nm



Adapter G 1/4" for attachment to pressure gauge

Ordering code: BAM01KR
Stainless steel
Connection:
- Sensor end: G 1/4"
- Process end: G 1/4"
Torque approx. 20 Nm

Electrical connections



Attention!

Always depressurize and disconnect pressure sensors from the power supply before establishing an electrical connection.

Establish the electrical connection to the device according to the specifications indicated on the type plate, the pin assignment table below and the wiring diagram.

Electrical connections	Sensors with switching output	Sensors with analog output
Supply +	1	1
Supply -	3	3
Signal +		2
Switching output 1	4	4
Switching output 2	2	
Shield	Connector housing	Connector housing

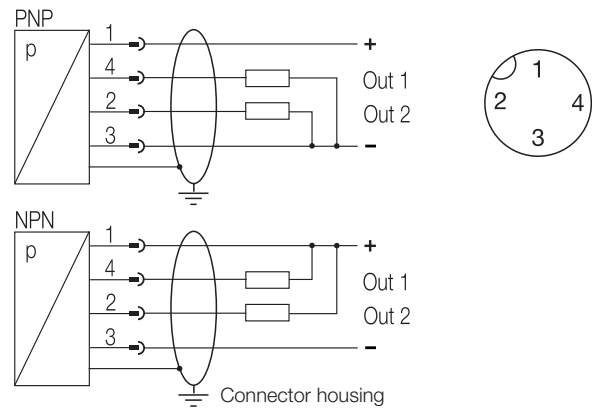


Fig. 8: Sensor diagram with 2 switching outputs

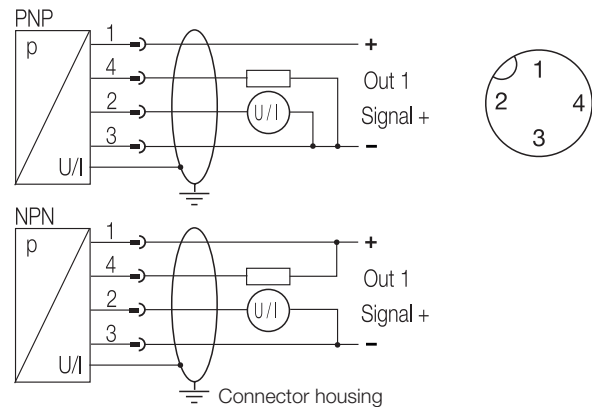
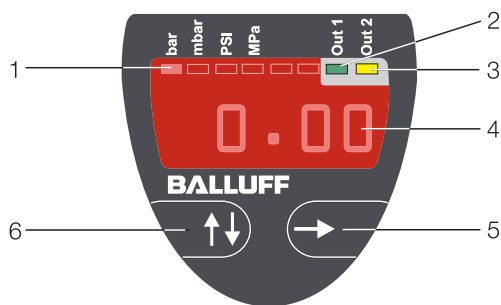


Fig. 9: Sensor diagram with analog output

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Indicators and operating elements



1. Four LEDs for indicating the unit
2. Green LED Out 1: status indicator for switching output 1
3. Yellow LED Out 2: status indicator for switching output 2
4. Seven-segment display for measured values and parameters
5. Button for navigating within a menu
6. Button for switching from menu to menu

LED status in normal mode		
Green LED	on	Switching point 1 reached, switching output active
	off	Switching point not reached
Yellow LED	on	Switching point 2 reached, switching output active
	off	Switching point not reached

Button functions		
	Press briefly	Scroll from menu 1 to menu 5, then return to display
	Press and hold	Increase parameter values quickly
		Select a menu item from a menu
		Accept selected parameters and return to the current menu item
	Press both buttons simultaneously	Return to the display

The pressure sensor is configured according to VDMA standards.

Adjustable hysteresis

The difference between the switching point (SP) and return point (RP) is known as a hysteresis. On electronic pressure switches, any hysteresis can be selected within the measuring range.

Hysteresis function: the hysteresis keeps the switching status of the outputs stable, even if the system pressure fluctuates either side of the setpoint value. The output is activated when the system pressure rises and the relevant switching point (SP) is reached. The output is deactivated when the pressure decreases again and the return point (RP) is reached.

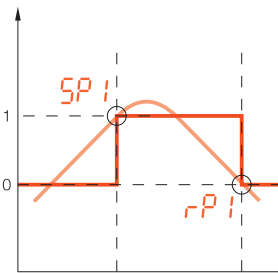


Fig. 10: Hysteresis function

Adjustable window

The output function is activated when the measured value falls between the preset switching and return point.

Window function: the range between a defined lower pressure limit and a defined upper limit is known as a window. A switching operation is initiated as soon as the upper or lower limit of the programmed pressure range is exceeded.

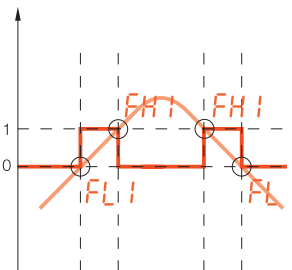


Fig. 11: Window function

Adjustable delay time

Delay times can reliably filter out undesired pressure peaks that occur momentarily. The status of the switching output does not change immediately after the switching event occurs, but only once a preselected delay time of 0...50 s has elapsed. If the switching event no longer exists by the time the delay has elapsed, the switching output does not change.

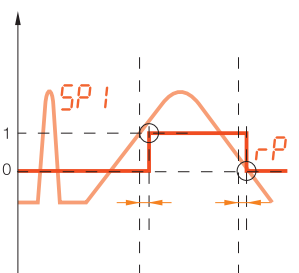
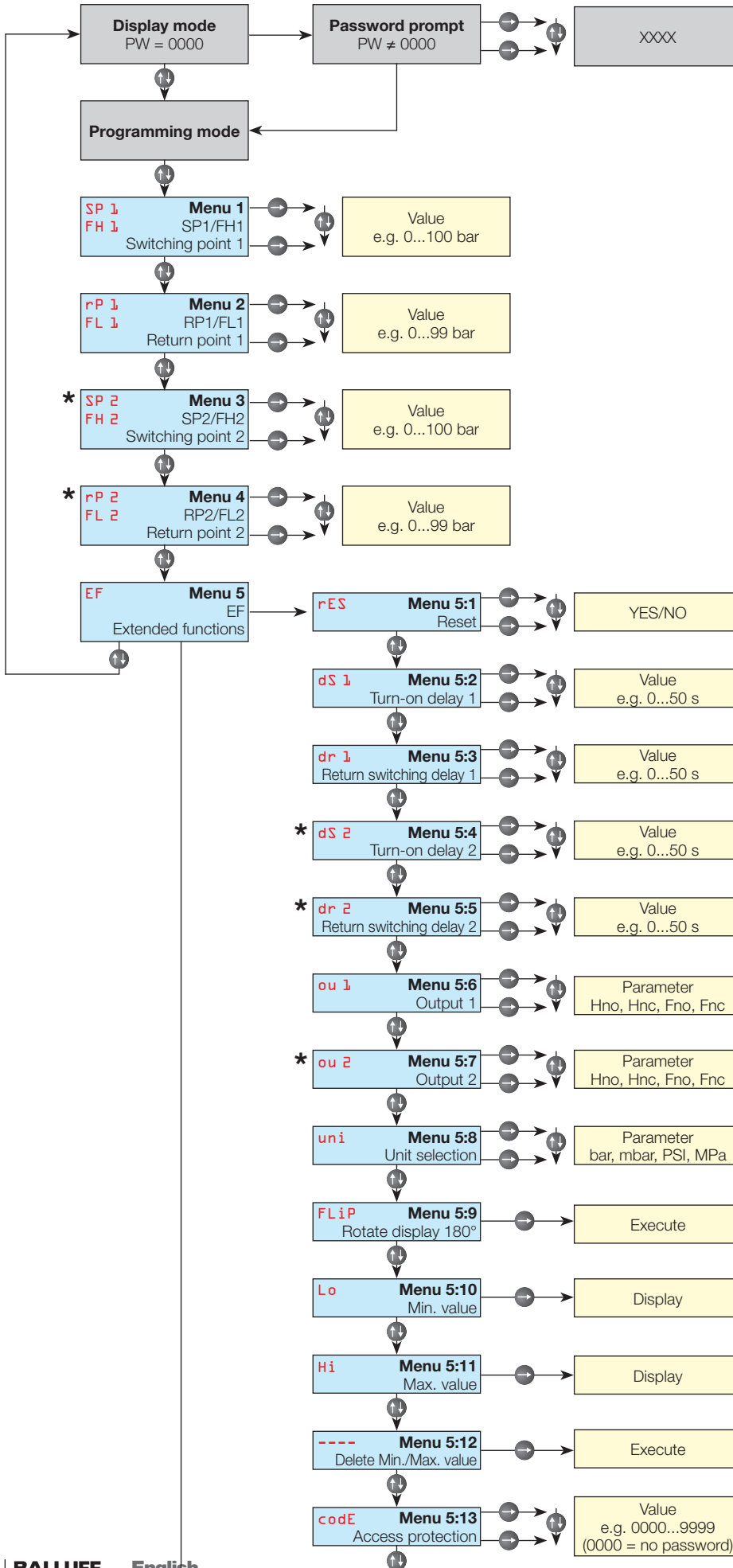


Fig. 12: Delay function

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Menu



Operating instructions

1. Open menu 1 by pressing the button.
2. Press the button to display the values for switching point 1. The selected value flashes.
3. Press the button to select a value. Press the button to confirm the selected value and return to menu 1.
4. Press the button to open the next menu and adjust the value as described under points 2 and 3.
5. Open menu 5 by pressing the button.
6. Press the button to open the first submenu 5:1 and adjust the value as described under points 2 and 3.

Note

If no buttons are pressed for 60 seconds, the program returns to the display without saving the modified value.

Legend

* Menus marked with an asterisk do not appear if the sensor has an analog output.

Standard, High-End and High-End Flush-Mounted Pressure Sensors BSP-B... /-V...

Menu functions for sensors with 2 switching points

First menu level	
SP 1 FH 1	Menu 1 – Setting for switching point 1 Setting for the relevant value from which switching point 1 is activated. If the window function in menu 5:6 is activated, the value for switching point 1 represents the upper pressure limit in the window (FH).
rP 1 FL 1	Menu 2 – Setting for return point 1 Setting for the relevant value from which return point 1 is activated. If the window function in menu 5:6 is activated, the return value for switching point 1 represents the lower pressure limit in the window (FL).
SP 2 FH 2	Menu 3* – Setting for switching point 2 Setting for the relevant value from which switching point 2 is activated. If the window function in menu 5:7 is activated, the value for switching point 2 represents the upper pressure limit in the window.
rP 2 FL 2	Menu 4* – Setting for return point 2 Setting for the relevant value from which return point 2 is activated. If the window function in menu 5:7 is activated, the return value for switching point 2 represents the lower pressure limit in the window.
EF	Menu 5 – Extended functions
Second menu level	
rES	Menu 5:1 – Reset Restores all adjustable parameters to their default settings and deletes the Min. and Max. values
dS 1	Menu 5:2 – Switching delay time 1 Setting for the value of switching delay time 1, which starts after switching point 1 is reached (time range 0...50 seconds)
dr 1	Menu 5:3 – Return switching delay time 1 Setting for the value of return switching delay time 1, which starts after return point 1 is reached (time range 0...50 seconds)
dS 2	Menu 5:4* – Switching delay time 2 Setting for the value of switching delay time 2, which starts after switching point 2 is reached (time range 0...50 seconds)
dr 2	Menu 5:5* – Return switching delay time 2 Setting for the value of return switching delay time 2, which starts after return point 2 is reached (time range 0...50 seconds)
ou 1	Menu 5:6 – Output 1 Switching function of the switching output: Hno = Hysteresis function, NO contact Hnc = Hysteresis function, NC contact Fno = Window function, NO contact Fnc = Window function, NC contact

Menu functions (continued)

Second menu level (continued)	
ou 2	Menu 5:7* – Output 2 Switching function of the switching output: Hno = Hysteresis function, NO contact Hnc = Hysteresis function, NC contact Fno = Window function, NO contact Fnc = Window function, NC contact
uni	Menu 5:8 Change units Selection of physical unit of measurement for displayed and preset pressure values: bAr = bar, nnBa = mbar, PSi = PSI, mPA = MPa
FLiP	Menu 5:9 – Rotate display Rotate the display 180°
Lo	Menu 5:10 - Min. value Display of minimum pressure attained during the measurement (the value is lost when the power supply is interrupted)
Hi	Menu 5:11 - Max. value Display of maximum pressure attained during the measurement (the value is lost when the power supply is interrupted)
---	Menu 5:12 – Deletion of Min and Max values The display confirms that the process for deleting the values has started
codE	Menu 5:13 – Access protection Setting the password for protecting access to the menu 0000 = no password 0000...9999 adjustable

Legend

* Menus marked with an asterisk do not appear if the sensor has an analog output.

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Overview of adjustable parameters

Menu item	Description	Factory settings	Own setting
Menu 1 SP1 / FH1	Switching point 1/ FH 1	80 % of the nominal pressure	
Menu 2 rP1 /FL1	Return point 1/ FL 1	75 % of the nominal pressure	
Menu 3 SP2 / FH2	Switching point 2/ FH 2	80 % of the nominal pressure	
Menu 4 rP2 /FL2	Return point 2/ FL 2	75 % of the nominal pressure	
Menu 5:2 dS1	Switching delay time 1	0 sec	
Menu 5:3 dr1	Return delay time 1	0 sec	
Menu 5:4 dS2	Switching delay time 1	0 sec	
Menu 5:5 dr2	Return delay time 1	0 sec	
Menu 5:6 ou1	Switching function Output 1	Hno	
Menu 5:7 ou2	Switching function Output 2	Hno	
Menu 5:8 uni	Units	bar	
Menu 5:13 code	Password	0000	

Maintenance



Incorrect cleaning can cause irreparable damage of the measuring cell.
Therefore never use pointed objects or compressed air to clean the membrane.

The device is maintenance-free in principle. If required, the housing can be cleaned with a damp cloth and mild cleaning solution provided the device is switched off. The membrane may become covered with deposits and contamination, depending on the measuring material. If the nature of the material is known, the operator must define appropriate cleaning intervals. When the device is decommissioned correctly, the membrane can be cleaned carefully with a mild cleaning solution and a soft brush or sponge.

Decommissioning



The measuring material may pose a risk to the operator. Therefore always take appropriate protective measures.

Always depressurize and disconnect the device from the power supply before removing, and check whether material must be drained first!

Disposal



Residual material on the device may pose a risk to the operator and a danger to the environment. Therefore always take appropriate protective measures and dispose of the device correctly.

The device must be disposed of according to European Directives 2002/96/EC and 2003/108/EC (Waste Electrical and Electronic Equipment). Equipment should be disposed of separately from domestic waste!

Standard, High-End and High-End Flush-Mounted Pressure Sensors BSP-B... /-V...

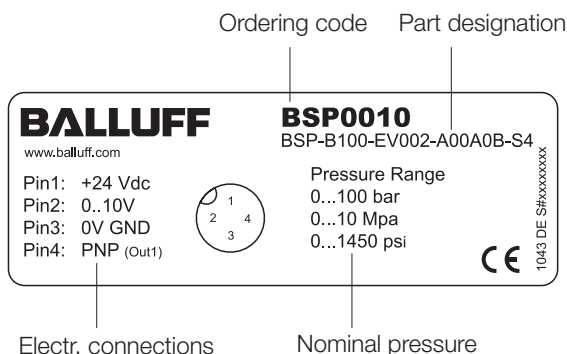
Technical data

Electrical data	
Operating voltage U _o	18...36 V DC
Output current max.	500 mA
No-load supply current I _o max.	≤ 50 mA
Reverse polarity protected	Yes
Short-circuit protected	Yes
Switching frequency f	200 Hz
Accuracy according to IEC 60770	≤ ±0.5 % FSO BFSL
Temperature error BSP Standard, High-End and Flush-Mounted 100 bar or higher	≤ ±0.3 % FSO/10 K
BSP flush-mounted up to 50 bar	≤ ±0,15 % FSO/10 K
Mechanical data	
Housing material Standard sensors High-end sensors	PA 6.6, stainless steel Stainless steel
Measuring cell material	Ceramic
Sealing ring material	Fluoroelastomer
Connection Connector	M12, 4-pin
Process connection BSP Standard, High-End BSP High-End Flush-Mounted	G 1/4", 1/4" NPT G 1/2" flush-mounted
Displays	
Function indicators	LEDs
Display	7-segment display
Ambient conditions	
Ambient temperature range BSP Standard sensors BSP High-end sensors	-25...+85 °C -40...+85 °C
Material temperature BSP Standard sensors BSP High-end sensors	-25...+125 °C -40...+125 °C
Degree of protection as per IEC 60529	IP 67 when connected

Pressure data	BSP not flush-mounted	BSP flush- mounted
	Rel. nominal pressure	
Sensor -1...2 bar	2 bar	2 bar
Sensor -1...10 bar	10 bar	10 bar
Sensor 0...2 bar	2 bar	2 bar
Sensor 0...5 bar	5 bar	5 bar
Sensor 0...10 bar	10 bar	10 bar
Sensor 0...20 bar	20 bar	20 bar
Sensor 0...50 bar	50 bar	50 bar
Sensor 0...100 bar	100 bar	100 bar
Sensor 0...250 bar	250 bar	250 bar
Sensor 0...400 bar	400 bar	400 bar
Sensor 0...600 bar	600 bar	600 bar
Overload pressure		
Sensor -1...2 bar	4 bar	10 bar
Sensor -1...10 bar	20 bar	40 bar
Sensor 0...2 bar	4 bar	10 bar
Sensor 0...5 bar	10 bar	20 bar
Sensor 0...10 bar	20 bar	40 bar
Sensor 0...20 bar	40 bar	80 bar
Sensor 0...50 bar	100 bar	105 bar
Sensor 0...100 bar	200 bar	200 bar
Sensor 0...250 bar	400 bar	400 bar
Sensor 0...400 bar	650 bar	650 bar
Sensor 0...600 bar	750 bar	750 bar
Cracking pressure		
Sensor -1...2 bar	10 bar	15 bar
Sensor -1...10 bar	35 bar	50 bar
Sensor 0...2 bar	10 bar	15 bar
Sensor 0...5 bar	15 bar	25 bar
Sensor 0...10 bar	35 bar	50 bar
Sensor 0...20 bar	75 bar	120 bar
Sensor 0...50 bar	150 bar	210 bar
Sensor 0...100 bar	200 bar	300 bar
Sensor 0...250 bar	450 bar	625 bar
Sensor 0...400 bar	700 bar	1000 bar
Sensor 0...600 bar	800 bar	1200 bar
Permitted vacuum	vacuum proof	

Your pressure sensor type

The type plate contains the exact designation and most important technical data so that the device can be identified clearly.



Standard, High-End and High-End Flush-Mounted Pressure Sensors BSP-B... /-V...

Type code for pressure sensors with analog outputs

BSP - B010 - E V 002 - A 03 A 0 B - S4 - T

Physical unit

M = Millibar
W = Millibar, vacuum (from -1 bar)
B = Bar
V = Bar, vacuum (from -1 Bar)
K = Kilobar

Max. pressure range (value correlates with phys. unit)

001 = 1
010 = 10
100 = 100
999 = 999

Process connection and housing

E = Internal thread 1/4"
G = Internal thread 1/4" NPT
I = External thread G1/2" flush-mounted

Seal/sealing system (see BHS code)

V = Viton sealing ring (ISO: FKM, DIN: FPM)

Housing type

002 = 1st generation D34x-90. Stainless steel pressure connection, display in PA6, rotates 320°, process connection opposite display, el. connection on side
003 = 1st generation D34x-90. Stainless steel pressure connection, stainless steel display, rotates 320°, process connection opposite display, el. connection on side

Interface to PLC

A = Analog data (actual value + switching point)

Output function/output technology

00 = 1 x PNP, NO/NC selection, 1 x 0...10 V
01 = 1 x NPN, NO/NC selection, 1 x 0...10 V
02 = 1 x PNP, NO/NC selection, 1 x 4...20 mA
03 = 1 x NPN, NO/NC selection, 1 x 4...20 mA

Variant/options

A = Basic variant

Subversions based on main version

0 = Basic variant

Operating elements

B = Display, 2 buttons

Connector system

S4 = M12, 4-pin

Special characteristics or design (optional)

Z = General special design
T = Temperature-resistant

Standard, High-End and High-End Flush-Mounted Pressure Sensors BSP-B... /-V...

Type code for pressure sensors with digital outputs

BSP - B010 - E V 002 - D 00 A 0 B - S4 - Z

Physical unit

M = Millibar
W = Millibar, vacuum (from -1 bar)
B = Bar
V = Bar, vacuum (from -1 Bar)
K = Kilobar

Max. pressure range (value correlates with phys. unit)

001 = 1
010 = 10
100 = 100
999 = 999

Process connection and housing

E = Internal thread 1/4"
G = Internal thread 1/4" NPT
I = External thread G1/2" flush-mounted

Seal/sealing system (see BHS code)

N = Sealing ring NBR
V = Viton sealing ring (ISO: FKM, DIN: FPM)

Housing type

002 = 1st generation D34x~90. Stainless steel pressure connection, display in PA6, rotates 320°, process connection opposite display, el. connection on side
003 = 1st generation D34x~90. Stainless steel pressure connection, stainless steel display, rotates 320°, process connection opposite display, el. connection on side

Interface to PLC

D = Digital data (switching points only)

Parameter data map

00 = 2 x PNP, NO/NC selection
01 = 2 x NPN, NO/NC selection

Variant/options

A = Basic variant

Subversions based on main version

0 = Basic variant

Operating elements

B = Display, 2 buttons

Connector system

S4 = M12, 4-pin

Special characteristics or design (optional)

Z = General special design
T = Temperature-resistant



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