



2 Channel Process Display PA 450



www.bdsensors.de

Headquarters

BD SENSORS GmbH
BD-Sensors-Str. 1
D - 95199 Thierstein
Germany
Tel.: +49 (0) 9235-9811-0
Fax: +49 (0) 9235-9811-11

Eastern Europe

BD SENSORS s.r.o.
Hradištská 817
CZ - 687 08 Buchovice
Czech Republic
Tel.: +42 (0) 572-4110 11
Fax: +42 (0) 572-4114 97

Russia

BD SENSORS RUS
39a, Varshavskoe shosse
RU - Moscow 117105

China

BD SENSORS China Co, Ltd.
Room B, 2nd Floor, Building 10,
No. 1188 Lianhang Rd.
201112 Shanghai,
China
Tel.: +86 (0) 21-51600 190
Fax: +86 (0) 21-33600 613

further agencies in

EUROPE

- Belgium
- Denmark
- Finland
- France
- Great Britain
- Greece
- Italy
- Lithuania
- Luxemburg
- Netherlands
- Norway
- Poland
- Portugal

- Romania
- Sweden
- Switzerland
- Slovakia
- Spain
- Turkey
- UK
- Ukraine
- Africa
- Egypt
- South Africa

ASIA

- India
- Iran
- Israel
- Japan
- Kazakhstan
- Malaysia
- Singapore
- Taiwan
- Thailand
- Vietnam

AUSTRALIA

The addresses of our distribution partners are listed on our homepage www.bdsensors.com. It is possible to download data sheets, operating manuals, ordering codes and certificates, as well.

Table of contents

- General information
- Product identification
- Mounting
- Dimensions
- Operation
- Removal from service
- Maintenance
- Return
- Disposal
- Warranty conditions
- Declaration of conformity / CE

1. General information

1.1 Information on the operating manual

This operating manual contains important information on proper usage of the device. Read this operating manual carefully before installing and starting up the pressure measuring device.

Adhere to the safety notes and operating instructions which are given in the operating manual. Additionally applicable regulations regarding occupational safety, accident prevention as well as national installation standards and engineering rules must be complied with!

This operating manual is part of the device, must be kept nearest its location, always accessible to all employees.

This operating manual is copyrighted. The contents of this operating manual reflect the version available at the time of printing. It has been issued to our best knowledge. BD SENSORS is not liable for any incorrect statements and their effects.

– Technical modifications reserved –

1.2 Symbols used

DANGER! – dangerous situation, which may result in death or serious injuries

WARNING! – potentially dangerous situation, which may result in death or serious injuries

CAUTION! – potentially dangerous situation, which may result in minor injuries

CAUTION! – potentially dangerous situation, which may result in physical damage

NOTE – tips and information to ensure a failure-free operation

1.3 Target group

WARNING! To avoid operator hazards and damages of the device, the following instructions have to be worked out by qualified technical personnel.

1.4 Limitation of liability

By non-observance of the operating manual, inappropriate use, modification or damage, no liability is assumed and warranty claims will be excluded.

1.5 Intended use

For differential pressure, a combination of two differential pressure transmitters with same input range is used, which are connected to the terminal housing PA 450. In addition, the connection of an acoustic signal sensor is possible.

The differential pressure is shown on the 4-digit LED display. The software has features such as access control, display configuration and switching output. The set parameters are stored in an EEPROM and are retained even when power fails.

All media are compatible with the media-wetted parts described in the data sheet and can be measured.

Use your differential pressure transmitter according to the above mentioned area of application! Moreover, a compatibility with the medium should be guaranteed!

With improper use, change or damage of the device no liability is assumed and warranty claims are excluded.

WARNING! – Danger through improper use!

1.6 Package contents

Please verify that all listed parts are undamaged included in the delivery and check for consistency specified in your order:

- two pressure transmitters
- terminal housing PA 450
- power supply unit
- operating manual

2. Product identification

The device can be identified by its manufacturing label. It provides the most important data. By the ordering code the product can be clearly identified. The programme version of the firmware, (e. g. P07) will appear for about 1 second in the display after starting up the device. Please hold it ready for inquiry calls.

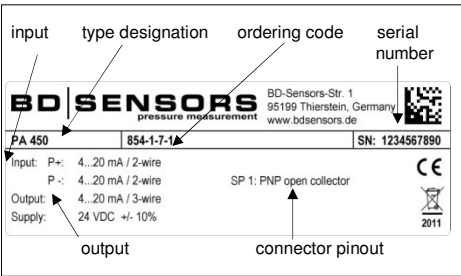


Fig. 1 manufacturing label

! The manufacturing label must not be removed from the device!

3. Mounting

3.1 General notes

WARNING! Install the device only when depressurized and currentless!

WARNING! This device may only be installed by qualified technical personnel who has read and understood the operating manual!

The difference pressure transmitter must be used within the specifications! (see attached technical data).

Treat this highly sensitive electronic measuring instrument in packed as well as in unpacked condition carefully!

The device may not be thrown!

Remove packaging and if necessary protective cap of the device, only shortly before mounting to exclude a damage of the diaphragm!

A provided protective cap must be kept!

After the demounting, this protective cap must be attached again over the diaphragm.

Treat an unprotected diaphragm extremely carefully; it can be easily damaged.

Do not use any force during the installation of the device!

3.2 Special notes

Take note that no inadmissibly high mechanical stresses occur at the pressure port as a result of the installation, since this may cause a shifting of the characteristic curve or to the damage. This is especially important for very small pressure ranges as well as for devices with a pressure port made of plastic.

In hydraulic systems, position the device in such a way that the pressure port points upward (ventilation).

Provide a cooling line when using the device in steam piping.

3.3 Mounting steps in general

Take the device carefully from the packaging.

Then go ahead as detailed in the specific instructions below.

The terminal housing and the acoustic warning sensor have to be fixed on a suitable location via two appropriate fastening screws.

3.4 Mounting steps according DIN 3852

DO NOT USE ANY ADDITIONAL SEALING MATERIALS, LIKE YARN, HEMP OR TEFLON TAPE!

Check to ensure the proper groove fitting of the o-ring and additionally to ensure no damage to the o-ring. (o-ring is included)

Ensure that the sealing surface of the taking part is perfectly smooth and clean. (R_z 3.2)

Screw the device into the corresponding thread by hand.

If you have a device with a knurled ring, the transmitter has to be screwed in by hand only.

Devices with a spanner flat have to be fully tightened with an open-end Devices with a spanner flat have to be tightened with an open-end wrench (G1/4": approx. 5 Nm; G1/2": approx. 10 Nm; G3/4": approx. 15 Nm; G1": approx. 20 Nm; G1 1/2": approx. 25 Nm; wrench size of plastic: max. 3Nm).

The indicated tightening torques must not be exceeded!

3.5 Mounting steps according to EN 837

Use a suitable seal, corresponding to the medium and the pressure input (e. g. a copper gasket). (seal is not included)

Ensure that the sealing surface of the taking part is perfectly smooth and clean. (R_z 6.3)

Screw the device into the corresponding thread by hand.

Tighten it with a wrench (for G1/4": approx. 20 Nm; for G1/2": approx. 50 Nm).

The indicated tightening torques must not be exceeded!

3.6 Mounting steps for NPT

Use a suitable seal (e. g. a PTFE-strip).

Screw the device into the corresponding thread by hand.

Tighten it with a wrench (for 1/4" NPT: approx. 30 Nm; for 1/2" NPT: approx. 70 Nm).

The indicated tightening torques must not be exceeded!

3.7 Mounting steps for dairy pipe connections

Check to ensure that the O-ring fits properly into the intended groove in the mounting part.

Center the dairy pipe connection in the counter-part.

Screw the cup nut onto the mounting part.

Then tighten it with a hook wrench.

3.8 Mounting steps for Clamp connections

Use a suitable seal corresponding to the medium and the pressure input.

Put the seal onto the corresponding mounting part.

Center the Clamp connection on the fitting counterpart with seal.

Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions.

3.9 Electric installation

Open the housing cover.

Connect pressure transmitters, signal sensors and power supply to the terminal housing using the following table by inserting the corresponding supply leads through the cable gland, so that the lead wire can be easily connected to the corresponding terminal blocks.

Afterwards fix the cable fitting by hand. Make sure that the cable is strain-relieved.

Then screw the housing cover.

Note that the transmitter, which is used to detect higher pressure, must be connected to input "P1".

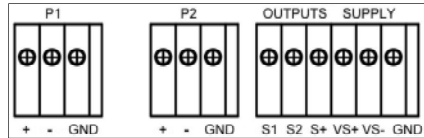


Fig. 2 Pin configuration

designation	terminal block	electrical connections (cable colours of BD SENSORS trans- mitters)	has to be connected with
+	P1 / P2	supply +	positive connecting of transmitter
-		0 V	negative connecting of transmitter
GND		ground clamp (yellow / green)	cable shield of transmitter
S1	OUTPUTS	switch output 1	i.e. digital input SPS/PLC
S2		switch output 2	i.e. digital input SPS/PLC
S+		analogue / 3-wire	positive analogue input
VS-	SUPPLY	0 V	negative signal connection of analogue or digital input
VS +	SUPPLY	supply +	pos. signal line of power supply unit
VS -		0 V	neg. signal line of power supply unit
GND		ground clamp	cable shield of supply line

Prevent the damage or removal of the PTFE filter which is fixed over the end of the air tube on devices with cable outlet and integrated air tube.

An exception is the modification of the cable. If this is required, you must add a PTFE filter element to the cable end. Otherwise, moisture can enter via relative reference in the pressure transmitter. This may lead to malfunction and irreparable damages. Suitable filter assemblies can be ordered from BD SENSORS. Proceed as follows for mounting the PTFE filter assembly:

- Put the plastic tube with the bonded PTFE filter at the end of the air hose.
- Pull the shrinking hose over the inserted tube and the air hose so that the shrinking tubing is approximately centered on the filter assembly.
- Bend back the connecting leads and make sure, that they are not damaged by the subsequent usage of the shrinking hose.

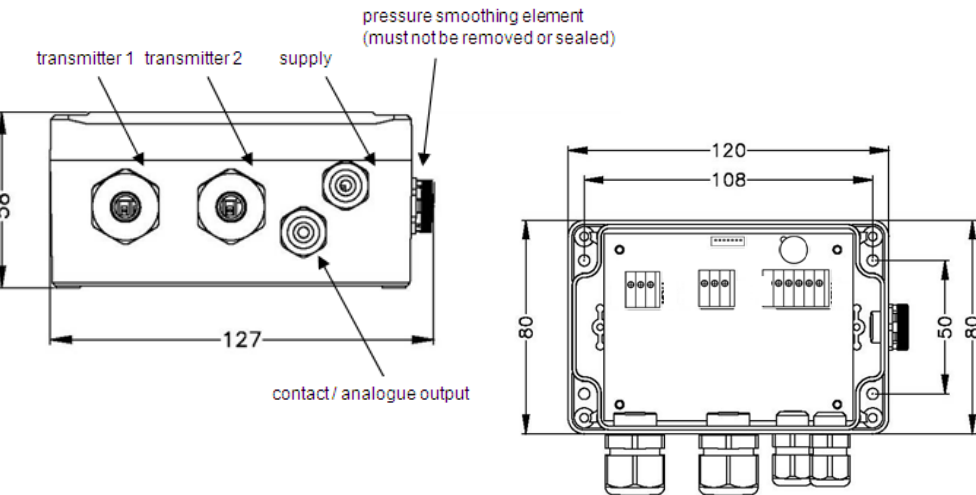
Heat the shrinking tube by using a heat gun. The temperature has to be between 90 °C and 110 °C, so that the tube begins to shrink. Keep this temperature until the tube closely surrounds the filter assembly and air hose. Then you have to stop the heat input immediately.

There can be damages at the air hose or the connecting cables by using a heat gun. To avoid this, you should heat the shrinking tube just as long as necessary.



Fig. 3 PTFE filter

4. Dimensions



5. Operation

5.1 Operating and display elements

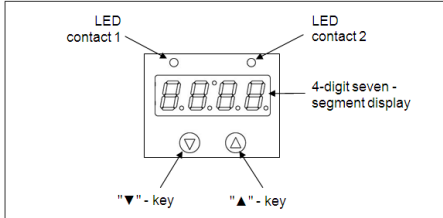


Fig. 4 Operating foil

The terminal housing has for displaying the active switching outputs for switching output 1 a green LED and for switching output 2 (optionally) a yellow LED. If one of these LED's is activated, the respective switch point is reached and the switch output is active.

The display of the measuring value as well as configuring the single parameters occurs menu-steered via a 4-digit seven-segment display. The functions are regulated by three front-sided push buttons:

- **"▲" – button:** with this button you move in the menu system forward or you raise the display value
- **"▼" – button:** with this button you move in the menu system backward or you reduce display value.
- **Both buttons at the same time:** if you press both buttons at the same time, you can change between display mode and configuration mode and confirm a menu point or an adjusted value.

You can raise the adjustment speed by pushing the respective button ("▲" or "▼") longer than 5 seconds.

5.2 Configuration

The menu system is closed in itself, so you can flip forward and backward to reach the desired setting point. All settings are stored permanently in an EEPROM and are available therefore also after separation of the supply. The menu system and the menu points were formed as simply as possible. In the following, every single menu point is described in detail by which an easy and quick configuration of your device is possible. The grey menus are available only with two switch outputs or analogue output.

Please keep exactly to the descriptions and note that changes become effective in the adjustable parameters (switch-on point, switch-off point etc.) only after activation of both buttons and after leaving the menu point.

5.3 Password system

The terminal box is provided with an access protection, so that the menu system can be served only by the authorized person.

- If you activate the password, the complete menu system is closed.
- If the access protection is lifted by the password, the complete menu is released.
- ☞ You can activate the password by menu "PAon" or "PAof" and deactivate.
- ☞ You can change the password by special menu 4.
- ☞ In case that the password was lost, there is a possibility, to re-set. This is possible, by loading factory settings with the help of special menu 3.

5.4 Unit

The unit of the shown measuring value is already fixed at the time of order.

5.5 Configuration example of analogue output (optionally)

With the help of the menus ZP and EP the analogue output can be configured (if available). In the following, the function of these menus should be made clear in an example:

We assume that someone has a differential pressure transmitter with a nominal pressure range 0... 6 bar, which is connected to P1. The analogue signal amounts to 4 ... 20 mA / 3-wire and was configured in the menu 26 "SiAn" on "P1".

The following signal behavior is factory-set:

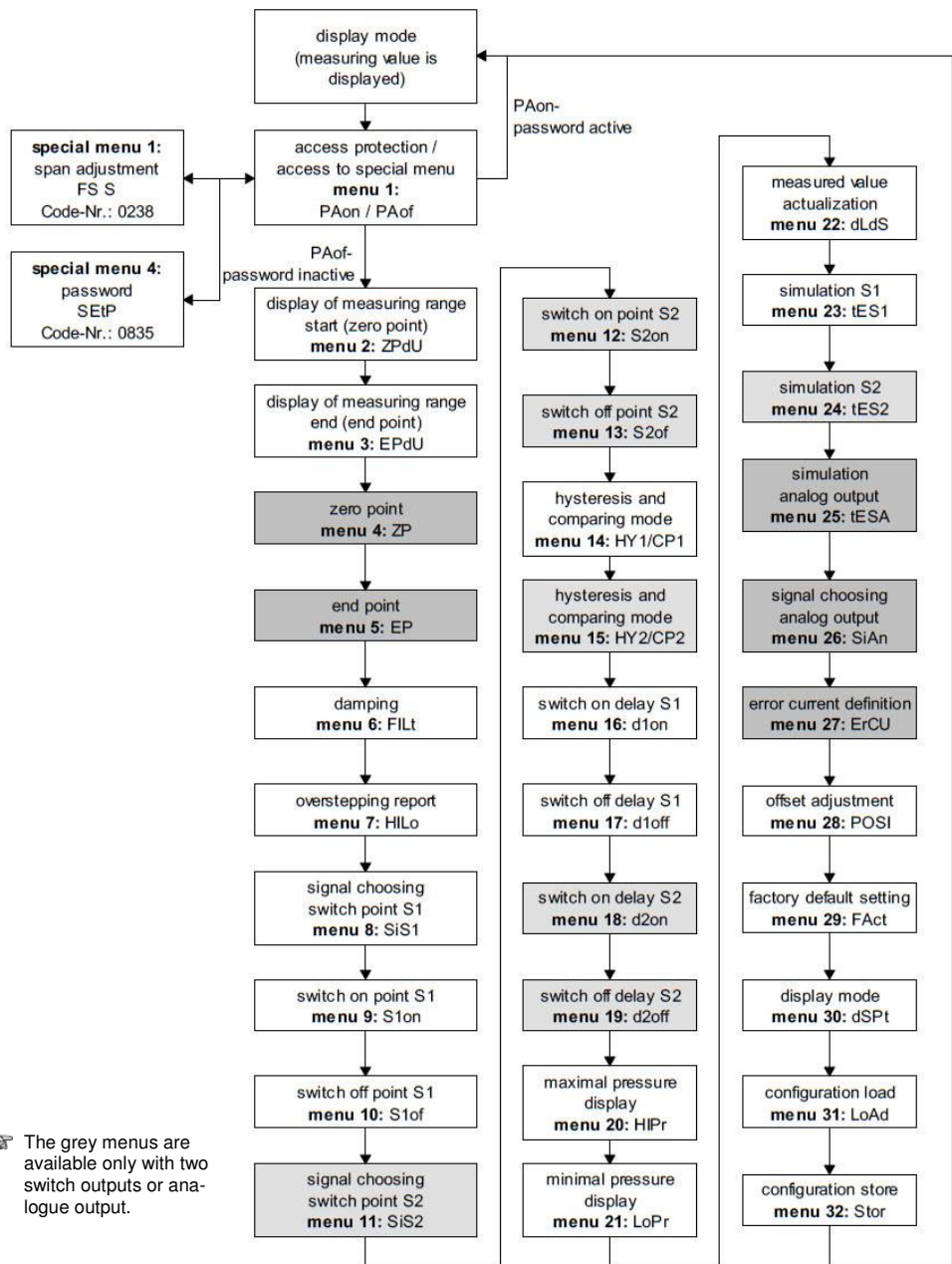
0 bar = 4.00 mA 3 bar = 12.00 mA 6 bar = 20 mA

If someone changes the value in the menu ZP from 0 to 1 and the value in the menu EP from 6 to 5, the following signal behavior will appear:

1 bar = 4.00 mA 3 bar = 12.00 mA 5 bar = 20 mA

☞ The values of the menus ZP and EP are adjustable up to the relation 1:10 of the nominal pressure range.

5.7 Construction of the menu system



☞ The grey menus are available only with two switch outputs or analogue output.

Fig. 9 Menu system PA 450/3-wire Rev. P07

5.6 Hysteresis and comparing mode

To invert the respective modes, you have to exchange the values for the switch-on and switch-off points.

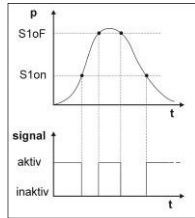


Fig. 5 compare mode inverted

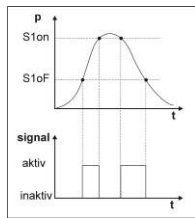


Fig. 6 compare mode

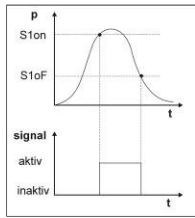


Fig. 7 hysteresis mode

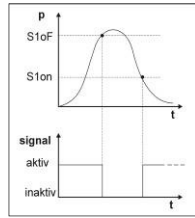


Fig. 8 hysteresis mode inverted

5.8 Menu list

PAon PAof	menu 1 – access protection PAon → password active → to deactivate: set password PAof → password inactive → to activate: set password ☞ default setting for the password is „0005“; modification of the password is described in special menu 2
2PdU	menu 2 – displaying of measuring range start defined by order; no input option
EPdU	menu 3 – displaying of measuring range end defined by order; no input option
ZP EP	menu 4 and 5 – set zero point / end point The configuration of the zero point causes a changing of the analogue output, whereas the display value remains unchanged. (zero and end point can be configured within the limits of the nominal pressure range, according to the manufacturing label)
FILt	menu 6 – setting of damping (filter) this function allows getting a constant display value although the measuring values may vary considerably; the time constant for a simulated low-pass filter can be set (0.3 up to 30 sec permissible)
HILO	menu 7 – activation of overstepping report set "on" or "off"
SiS1	menu 8 – signal choosing of switch output 1 P1", "P2" (the switch point reacts to the static pressure at the suitable input) or "DIFF" (difference pressure between P1 and P2)
S1on	menu 9 – setting of switch-on point (switch output 1) set value for activation of contact 1 (S1on)
S1of	menu 10 – setting of switch-off point (switch output 2) set value for deactivation of contact 1 (S1of)
SiS2	menu 11 – signal choosing of switch output 2 P1", "P2" or "DIFF"
S2on	menu 12 – setting of switch-on point (switch output 2) set value for activation of contact 2 (S2on)
S2of	menu 13 – setting of switch-off point (switch output 2) set value for deactivation of contact 2 (S2of)
HY 1 CP 1	menu 14 – selecting hysteresis or comparing mode (switch output 1) for switch output set 1 hysteresis mode (HY 1) or comparing mode (CP 1) ☞ compare "6.6 hysteresis and comparing mode"
HY 2 CP 2	menu 15 – selecting hysteresis or comparing mode (switch output 2) for switch output set 2 hysteresis mode (HY 2) or comparing mode (CP 2) ☞ compare "6.6 hysteresis and comparing mode"
d1on	menu 16 – setting of switch on delay (switch point 1) set the value of switch on delay after reaching contact 1 (d1on); (0 up to 100 sec permissible)
d1of	menu 17 – setting of switch off delay (switch point 1) set the value of switch off delay after reaching contact 1 (d1of); (0 up to 100 sec permissible)
d2on	menu 18 – setting of switch on delay (switch point 2) set the value of switch on delay after reaching contact 2 (d2on); (0 up to 100 sec permissible)
d2of	menu 19 – setting of switch off delay (switch point 2) set the value of switch off delay after reaching contact 2 (d2of); (0 up to 100 sec permissible)
HIPr LoPr	menu 20 and 21 – maximum / minimum value display view high pressure (HIPr) or low pressure (LoPr) during the measurement process (the value will not remain stored if the power supply is interrupted)
dLdS	menu 22 – measured value actualization (display) ☞ to erase: push both buttons again within one second set the length of the update cycles for the display (0.0 up to 10sec permissible)
tES1	menu 23 – simulation switch output 1 state of the switch point 1 can be simulated; with the buttons "▲" and "▼", the switch output 1 can be activated or be deactivated
tES2	menu 24 – simulation switch output 2 state of the switch point 2 can be simulated; with the buttons "▲" and "▼", the switch output 2 can be activated or be deactivated
tESA	menu 25 – simulation analog output signal value of the analog output can be simulated; choice between "oi 4" (4 mA or 2 V), "oi12" (12 mA or 6 V) and "oi20" (20 mA or 10 V)
SiAn	menu 26 – signal choosing analog output assignment to the analog output the desired input signal; if "P1" or "P2" is put, the analog output follows the static pressure at the suitable input. With the setting "DIFA", "DIFB" and "DIFC" the analog output follows the calculated difference pressure from P1 and P2. With "DIFB" a movement of the analogous signal occurs, in addition, about 50% FSO upwards, with "DIFC" a differential signal with square-root extraction occurs
Si	menu 27 – error signal definition fixing the mistake signal, which is given with a device defect; choice between "OFF" (no mistake signal call sign), "C 0" (0 mA or 0 V), "C L0" (3.5 mA or 1.75 V) and "C HI" (23 mA or 11.5 V) ☞ an issue of the mistake signal only occurs if the menu 6 "HILO" on "on" was put
POSi	menu 28 – position correction / offset adjustment A position correction or an offset's comparison can be carried out only with availability of suitable reference source, in so far as the measuring value deviation lies within certain borders; confirm the menu point "POSi" by pressing both buttons. If the offset deviates from the environment pressure, it is necessary to connect the pressure reference, which corresponds to the measuring start value in P1. P2 must stay open! If you press afterwards again both buttons, the signal typically spent by the differential pressure transmitter, will be stored as an offset. Now in the display appears the adjusted measuring start value (Zero Point), although the sensor signal is shifted in the offset. ☞ Note that with available analog output, this remains untouched of the carried out change. Furthermore a movement of the span value (Full Scale) is also carried out at the same time, with the movement of the offset.
FAct	menu 29 – load of factory default setting With this menu carried out changes can be cancelled before. Please note that also the password will be put back.
dSPt	menu 30 – display mode assigning to the display value the desired input signal ("P1", "P2" or "DIFF")
LoAd	menu 31 – configuration load loading of stored device configurations (choice between number 1 to 5)
Stor	menu 32 – configuration store storing of device configurations (number 1 to 5 is available)
FS S	Special menu (to access a special menu, select the menu item „PAof" with the ▲- or ▼-button an confirm it; "1" appears in display) special menu 1 – span adjustment The menu serves for the correction of the display with divergent span. Necessarily, this comparison becomes, if the displayed measuring value differs from the enclosed pressure value. A span comparison can be carried out only with availability of suitable reference sources, provided that the measuring value divergence lies within certain borders. To the display correction with divergent span, you should put with the button "▲" or "▼" the number "0238". To confirm the setting, press both buttons at the same time. "FS S" appears in the display. Now it is necessary to connect the pressure reference, which corresponds to the measuring range end value, to P1. P2 must stay open! If you press afterwards again both buttons, the signal typically spent by the differential pressure transmitter will be stored as a span signal. In the display the adjusted measuring range end value (End Point) appears from this time, although the sensor signal is shifted in the span signal. ☞ Please note that the analogous output signal (with available analog output) remains untouched from this change.
SEtP	special menu 2 – password setting set "0835"; confirm by pressing both buttons, "SEtP" appears in display; put now with "▲" or "▼" - button your password. You can choose this freely (0... 9999; excluded are the code numbers 0238, 0247, 0729 and 0835). At last you could confirm your password by concurrent pressure of both buttons.

5.9 Attachements for turning off the alarm

To turn off the alarm, the device has a special function. If the alarm is active, you can stop it by pushing both buttons simultaneously in display mode. That means that regardless of the existing of a alarm criterion (exceeding the limit value) one or all switching outputs and any attached devices are turned off (LED disappears, too).

After turning off the alarm criterion, the device is reset to normal state and the alarm is triggered if the limit value is exceeding again.

6. Removal from service

⚠ WARNING! The device must always be demounted in current- and pressureless condition.

⚠ WARNING! Depending on the medium, it may cause danger for the user. Comply therefore with adequate precautions for purification.

7. Maintenance

In principle, this device is maintenance-free. If desired, the housing of the device can be cleaned when switched off by using a damp cloth and non-aggressive cleaning solutions.

By certain media, however, the diaphragm may be polluted or coated with deposit. It is recommended to define corresponding service intervals for control. After placing the device out of service correctly, the diaphragm can usually be cleaned carefully with a non-aggressive cleaning solution and a soft brush or sponge. If the diaphragm is calcified, it is recommended to send the device to BD SENSORS for decalcification. Please read chapter "Repair" below.

☞ Never use pointed objects or pressured air for cleaning the diaphragm

☞ If the device has got into contact with pollutants, suitable precautions must be taken for the cleaning!

☞ A false cleaning of the device can cause an irreparable damage on the diaphragm

8. Return

Before every return of your device, whether for recalibration, decalcification, modifications or repair, it has to be cleaned carefully and packed shatter-proofed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required. Appropriate forms can be downloaded from our homepage www.bdsensors.com. Should you dispatch a device without a declaration of decontamination and if there are any doubts in our service department regarding the used medium, repair will not be started until an acceptable declaration is sent.

⚠ If the device came in contact with hazardous substances, certain precautions have to be complied with for purification!

9. Disposal

This device must be disposed according to the European Directives 2002/96/EC and 2003/108/EC (on waste electrical and electronic equipment). Electrical and electronic waste equipment may not be disposed with domestic waste!

⚠ WARNING! Depending on the measuring medium, deposit on the device may cause danger for the user and the environment. Comply with adequate precautions for purification and dispose of it properly.

10. Warranty conditions

The warranty conditions are subject to the legal warranty period of 24 months from the date of delivery. In case of improper use, modifications or damages to the device, we do not accept warranty claims. Damaged diaphragms will also not be accepted. Furthermore, defects due to normal wear are not subject to warranty services.

11. Declaration of conformity / CE

The delivered device fulfils all legal requirements. The applied directives, harmonised standards and documents are listed in the EC declaration of conformity, which is available online at <http://www.bdsensors.com>. Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.