



Operating Manual

Electronic Pressure Switch DS 2XX for IS-areas

AX4-DS 200, AX4-DS 200 P, AX4-DS 201,
AX4-DS 201 P, AX4-DS 202, AX4-DS 210,
AX4-DS 217



AX4-DS 200

www.bdsensors.cz

BA_DS2XX_EX_E_SRO

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

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

Russia
BD SENSORS RUS
39a, Varshavskoe shosse
RU - Moscow 117105
Russia
Tel.: +7 (0) 95-380 1683
Fax: +7 (0) 95-380 1681

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	ASIA
• Belgium	• India
• Denmark	• Iran
• Finland	• Israel
• France	• Japan
• Great Britain	• Kazakhstan
• Greece	• Malaysia
• Italy	• Singapore
• Lithuania	• Taiwan
• Luxembourg	• Thailand
• Netherlands	• Vietnam
• Norway	
• Poland	
• Portugal	
	AFRICA
	• Egypt
	• South Africa
	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

1. General information
2. Product identification
3. Mechanical installation
4. Special regulations for IS-Areas
5. Electrical Installation
6. Initial start-up
7. Operation
8. Placing out of service
9. Maintenance
10. Service / Repair
11. Disposal
12. Warranty conditions
13. 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!

For the installation, maintenance and cleaning of the device, you must absolutely observe the relevant regulations and stipulations on explosion protection (VDE 0160, VDE 0165 or EN 60079-14) as well as the occupational safety provisions. The device was constructed acc. to standards EN60079-0:2018, EN60079-11:2012, EN 60079-26:2015.

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

The device is intended for converting the physical parameter of pressure into an electric signal. The current system pressure is shown in a 4-digit LED-display. The electronic pressure switch DS 2XX has been developed, according to the type for applications, for absolute, vacuum and overpressure measurement. Depending on the device and the mechanical connection it is suitable for various areas of use. The device has to be used only for this purpose, considering the following information.

Devices with 3-A and / or EHEDG certified process connection have been developed especially for applications in food and pharmaceutical industry. The process connection is hygienic and can be sterilized.

Permissible measuring and cleaning media are gases or liquids, which are compatible with the media wetted parts of the device - according to data sheet) and your system. This must be ensured for the application.

- This operating manual applies to devices with explosion protection approval and is intended for the use in IS-areas. A device has an explosion protection approval if this has been specified in the purchase order and confirmed in our order confirmation. In addition, the manufacturing label contains the Ⓢ-symbol.

- It is the operator's responsibility to check and verify the suitability of the device for the intended application. If any doubts remain, please contact our sales department in order to ensure proper usage. BD SENSORS is not liable for any incorrect selections and their effects!

- Permissible media are gases or liquids, which are compatible with the media wetted parts described in the data sheet. In addition it has to be ensured, that this medium is compatible with the media wetted parts.

- The technical data listed in the current data sheet are engaging. If the data sheet is not available, please order or download it from our homepage. (<http://www.bdsensors.com>)

⚠ WARNING! – Danger through improper usage!

⚠ - Only use the device in permissible media and in accordance with its in-tended use.

⚠ - Do not use the device as a ladder or climbing aid.

⚠ - The device must not be altered or modified in any way.

⚠ - BDSENSORS is not liable for damage caused by improper or incorrect use.

1.6 Limitation of liability and warranty

Failure to observe the instructions or technical regulations, improper use and use not as intended, and alteration of or damage to the device will result in the forfeiture of warranty and liability claims.

1.7 Safe handling

NOTE - Do not use any force when installing the device to prevent damage of the device and the plant!

NOTE - Treat the device with care both in the packed and unpacked condition!

NOTE - Do not throw or drop the device!

NOTE - Excessive dust accumulation and complete coverage with dust must be prevented!

NOTE - The device is state-of-the-art and is operationally reliable. Residual hazards may originate from the device if it is used or operated improperly.

NOTE - Never use the display as a mounting / dismounting aid, otherwise the device may be irreparably damaged. For mounting or dismounting the device, only use the hexagon on the pressure port.

1.8 Safety technical maximum values AX 14 - DS 2XX

Permissible temperatures for environment: -25 ... 70 °C
U_i = 28 V, I_i = 93 mA, P_i = 660 mW, C_i ≈ 0 nF, L_i ≈ 0 μH plus cable inductivities 1 μH/m and cable capacities 100 pF/m (for cable by factory)

1.9 Scope of delivery

Check that all parts listed in the scope of delivery are included free of damage, and have been delivered according to your purchase order:

1.10 UL approval (for devices with UL Marking)

The UL approval was effected by applying the US standards, which also conform to the applicable Canadian standards on safety.

Observe the following points so that the device meets the requirements of the UL approval:

- only indoor usage
- maximum operating voltage: according to data sheet
- The device must be operated via a supply with energy limitation (acc. to UL 61010) or an NEC Class 2 energy supply.

1.11 Safety technical maximum values

AX4-DS 2XX: IBExU06ATEX1049 X
Permissible temperatures for environment: -25 ... 70 °C
U_i = 28 V, I_i = 93 mA, P_i = 660 mW, C_i ≈ 0 nF, L_i ≈ 0 μH plus cable inductivities 1 μH/m and cable capacities 100 pF/m (for cable by factory)

1.11.1. Special conditions for safe use

- No energy may be supply from the outside into the active switching exits.
- The equipment designed with connector have to be installed in such a way that the Degree of protection IP20 always will be kept.
- The safety and assembly notes contained in the operating instructions and the ambient temperature range -25 °C to +70 °C have to be observed.

1.12 Package contents

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

- electronic pressure switch, series DS 2XX
- for mechanical pressure ports DIN 3852: o-ring (pre-assembled)
- this 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.

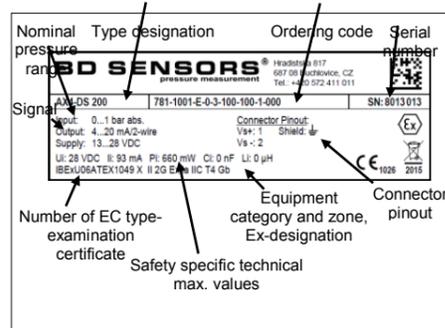


Fig. 1 manufacturing label- example

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

3. Mechanical installation

3.1 Mounting and safety instructions

⚠ 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!

⚠ DANGER! Caused by the explosion hazard following instructions have to be complied with:

- The technical data listed in the EC type-examination certificate are engaging. If the certificate is not available, please order or download it

from our homepage:

<http://www.bdsensors.com>

- Working on supplied (active) parts, except for intrinsically safe circuits, is principally prohibited during an explosion hazard.
- Make sure that an equipotential bonding is in place for the entire course of the line, both inside and outside the intrinsic area.
- In case of increased danger of lightning strike or damage by overvoltage, a stronger lightning protection should be planned.
- Observe the limiting values specified in the EC type-examination certificate. (Capacitance and inductance of the connection cable are not included in the values.)
- The measuring point must be designed in such a way that cavitation and pressure surges are avoided.
- Make sure that the entire interconnection of intrinsically safe components remains intrinsically safe. The operator is responsible for the intrinsic safety of the overall system (installation of intrinsic parts).
- Do not mount the device in a pneumatic flow rate!
- Excessive dust deposits (over 5 mm) and a complete dust covering must be avoided!
- The external circuit must prevent an external power-inflow to the contacts. Suitable signal separating devices which fulfil this demand have to be used.

Oxygen

⚠ DANGER! Explosion hazard, with devices for oxygen applications, when used improperly. To ensure a usage without danger, the following points must be adhered to:

- Make sure, your device has been ordered and delivered as a special version for oxygen applications. You can check the manufacturing label (see figure 1). If the ordering code ends with "007", then the device is suitable for oxygen applications.
- At time of delivery the device is packed into a plastic bag in order to prevent it from impurity. Please observe the indication label "Device for oxygen, unpack only directly before assembling". Also, avoid any skin contacts during unpacking and assembly, in order to prevent greasy residues on the device.
- During installation, the respective explosion protection regulations have to be met.
- Note the entire design requirements meet the standard demand of BAM (DIN 19247).
- For oxygen applications over 25 bar are recommended pressure transmitter without seals.
- Transmitters with o-rings of 70 EPDM 281: permissible maximum values: 15 bar/ 60° C and 10 bar/ 60 up to 90° C.
- Transmitters with o-rings of FKM Vi 567: permissible maximum values: 15 bar/ 60° C.

! Handle this high-sensitive electronic precision measuring device with care, both in packed and unpacked condition!

! There are no modifications/changes to be made on the device.

! Do not throw the package/device!

! To avoid damaging the diaphragm, remove packaging and protective cap directly before starting assembly. The delivered protective cap has to be stored!

! Place the protective cap on the pressure port again immediately after disassembling.

! Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.

! Do not use any force when installing the device to prevent damage of the device and the plant!

! The display and the plastic housing are equipped with rotational limiters. Please do only rotate the display or the housing within the limit.

! For installations outdoor and in damp areas following these instructions:

- To prevent moisture admission in the plug the device should be installed electrically after mounting, at once. Otherwise a moisture admission has to be blocked e.g. by using a suitable protection cap. (The ingress protection in the data sheet is valid for the connected device.)

- Choose an assembly position, which allows the flow-off of splashed water and condensation. Avoid permanent fluid at sealing surfaces!

- When using a cable gland device, turn the outgoing cable downwards. If the cable has to be turned upwards, then point it downward so the moisture can drain.

- Install the device in such a way that it is protected from direct solar irradiation. Direct solar irradiation can lead to the permissible operating temperature being overstepped in the worst case. This is prohibited for applications in IS-areas!

! For devices with gauge reference in the housing (small hole next to the electrical connection), install the device in such a way, that the gauge reference is protected from dirt and moisture. Should the device be exposed to

fluid admission, the functionality will be blocked by the gauge reference. An exact measurement in this condition is not possible. Furthermore this can lead to damages on the device.

! The permissible tightening torque depends on the conditions on site (material and geometry of the mounting point). The specified tightening torques for the pressure switch must not be exceeded!

🔧 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.

🔧 If the device is installed with the pressure connection up, it has to be made sure that no liquid drain off at the case. Humidity and dirt can block the relative cover in the case and it could lead to malfunctions through this. Dust and dirt must be removed from the edge of the thread connection of the electrical connection if required.

3.2 General installation steps

- Carefully remove the pressure measuring device from the package and dispose of the package properly.
- Go ahead as detailed in the specific instructions below.

3.3 Installation steps for 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.
- Ensure that the sealing surface of the taking part is perfectly smooth and clean. (Rz 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 wrench (wrench size of steel: 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. 3 Nm).
- The indicated tightening torques must not be exceeded!

3.4 Installation steps for EN 837

- Use a suitable seal, corresponding to the medium and the pressure input (e. g. a cooper gasket).
- Ensure that the sealing surface of the taking part is perfectly smooth and clean. (Rz 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!

G1/4" EN 837	p ≤ 600 bar	Counterpart has to be of steel according to DIN 17440 with strength R _{e0.2} ≥ 190 N/mm ²
G1/2" EN 837	p ≤ 1000 bar	
G1/4" EN 837	p > 600 bar, p ≤ 1000 bar	Counterpart has to be of steel according to DIN 17440 with strength R _{e0.2} ≥ 260 N/mm ²
G1/2" EN 837	p > 1000 bar, p ≤ 1600 bar	

NOTE - Please refer to data sheet or contact sales department at BD SENSORS regarding max. permitted pressure of device.

3.5 Installation 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!

3.6 Installation steps for dairy pipe

- Check to ensure that the O-ring fits properly into the intended groove in the mounting part.
- Centre the dairy pipe connection in the counterpart.
- Screw the cup nut onto the mounting part.
- Then tighten it with a hook wrench.

Chapter "3.10 have been noticed.

EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:

- ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH

3.7 Installation steps for Clamp and Varivent®

- Use a suitable seal corresponding to the medium and the pressure input.
- Put the seal onto the corresponding mounting part.

- Centre the Clamp or Varivent® 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.

EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:

- for Clamp connections: T-ring seal from Combifit International B.V.
- for Varivent® connections: EPDM-O-ring which is FDA-listed
- Note, that P40 can only be used for tank flanges.

3.8 Mounting steps for G1" cone connection

- 1 Screw the device into the mating thread byhand (seal produced metallicly)
- 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure switch: p_N < 10 bar: 30 Nm; p_N ≥ 10 bar: 60 Nm

3.9. Conditions for devices with 3-A symbol

The device or its connecting piece must be installed in such a way that the surfaces are self-draining (permissible installation position 273° ... 87°).

Make sure that the welding socket is mounted flush inside the tank.

The user is responsible for: the correct size of the seal and the choice of an elastomeric sealing material that complies with the 3-A and / or EHEDG standard(s)

an easy to clean installation position of the pressure switch with little dead space, as well as definition / verification / validation of a suitable cleaning process

3.10 Conditions for devices with EHEDG certificate

Install the device according to the requirements given in EHEDG Guidelines 8, 10 and 37. That is to mount the device in a self-draining orientation. The device should be installed flush to the process area. If mounting in a T-piece, the ratio between the depth of the upstand (L) and the diameter (D) of the upstand shall be L/D < 1. If welded adapters are used, the food contact surface must be smooth, and the welding has to be done according to EHEDG Guideline 9 and 35. Suitable pipe couplings and process connections must be applied according to the EHEDG Position Paper. (List the available ones.)

3.11 Positioning of the display module

The display module is rotatable so that clear readability is guaranteed even on unusual installation positions. The display module can be turned as shown below.

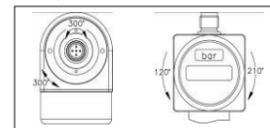


Fig. 2 display module

4. Special regulations for IS-Areas

4.1 Protection against electrostatic charge hazards

The devices partially consist of chargeable plastic components. A potential electrostatic charge presents the danger of spark generation and ignition. An electrostatic charge must therefore be absolutely prevented.

🔧 Generally, a shielded cable must be used.

🔧 Avoid friction on the plastic surfaces!

🔧 Do not clean the device dry! Use, for example, a damp cloth.

4.2 Overvoltage protection

If the pressure switch is used as electrical equipment of category 1 G or 2 G, a suitable overvoltage protection device must be connected in series (attend the valid regulations for operating safety as well as EN60079-14).

4.3 Schematic circuit design

The operation of an intrinsically safe device in intrinsic safe areas requires special care when selecting the necessary Zener barrier or transmitter repeater devices to be able to use the device's characteristics to the full extent. The following diagram shows a typical arrangement of power supply, Zener barrier and pressure switch.

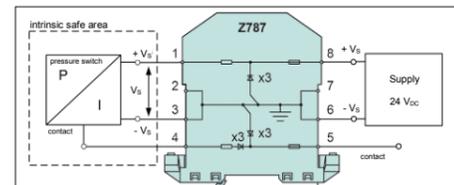


Fig. 3 Circuit diagram

4.4 Exemplary circuit description

The supply voltage of e. g. 24 V_{DC} provided by the power supply is led across the Zener barrier. The Zener barrier contains series resistances and Zener diodes as protective components. Subsequently, the operating voltage is applied

to the pressure switch and, depending on the pressure, a particular signal current will flow.

4.5 Functional selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage $V_{S \min}$ of the pressure switch must not fall short since a correct function of the device can otherwise not be guaranteed. The minimum supply voltage has been defined in the respective product-specific data sheet under "Analogue output (optionally) / Supply".

When using a galvanically insulated amplifier with a linear bonding, please attend that the terminal voltage of the device will decrease like it does with a Zener barrier. Furthermore, it has to be attended that the supply of the pressure switch will also decrease with an optionally used signal amplifier.

4.6 Test criteria for the selection of the Zener barrier

In order not to fall below $V_{S \min}$ it is important to verify which minimum supply voltage is available at full level control of the pressure switch.

The technical data of the barrier will usually provide you with the information needed for the selection of the Zener barrier. However, the value can also be calculated. If a minimum supply of 16 V is assumed, then – according to Ohm's law – a particular voltage drop will result on the series resistance of the Zener barrier. If, for a pressure switch with PNP contact, the contact is also activated, the additional current flowing from the contact to the load resistor will also flow through the Zener barrier or the output of a transmitter repeater. The higher the load current, the lower the available minimum operating voltage. In the diagram shown, the maximum current can be calculated from the voltage difference ($V_{ab \text{ Barrier max}}$) between input and output of the Zener barrier divided by the series resistance of the Zener barrier. The maximum signal current must be subtracted from this value. If the available residual current is smaller than the current required at the contact, either a different barrier or a higher supply voltage before the barrier should be chosen.

When selecting the power supply, the maximum operating conditions according to the EC type-examination certificate must be observed. When assessing the power supply, please refer to their current data sheets to ensure that the entire interconnection of intrinsically safe components will remain intrinsically safe.

4.7 Calculation example for the selection of the Zener barrier

The nominal voltage of the power supply in front of the Zener barrier is $24 V_{DC} \pm 2\%$. This results in:

- greatest supply voltage:

$$V_{\text{Sup max}} = 24 \text{ V} * 1.02 = 24.48 \text{ V}$$

- smallest supply voltage:

$$V_{\text{Sup min}} = 24 \text{ V} * 0.98 = 23.52 \text{ V}$$

The minimum supply can be taken from the data sheet. It is for example 16 V.

The series resistance of the Zener barrier is listed with 295Ω . The maximum voltage drop at the Zener barrier may reach the following value:

$$V_{ab \text{ Barriere max}} = 23.52 \text{ V} - 16 \text{ V} = 7.52 \text{ V}$$

To ensure that this condition is observed, the maximum current may not exceed the following value:

$$I_{\text{max}} = 7.52 \text{ V} : 295 \Omega = 25.49 \text{ mA}$$

With pressure switches, the maximum current is made up of the sum of signal current and switching current. There are two approaches:

1. The measuring range of the pressure switch shall be utilized in the range 0...100 %. A maximum signal current of 20 mA is thereby generated. Based on the facts above, the available residual current through the contact is calculated as follows:

$$I_{\text{Rest 1}} = 25.49 \text{ mA} - 20 \text{ mA} = 5.49 \text{ mA}$$

2. The measuring range of a pressure switch at an analogue output of 4 ... 20 mA shall only be used in a specific range of e. g. 0 ... 70 %. This results in a maximum signal current:

$$I_{\text{Signal max}} = \Delta i * 0.7 + i_{\text{Offset}} = 16 \text{ mA} * 0.7 + 4 \text{ mA} = 15.2 \text{ mA}$$

$$\text{(with } \Delta i = 20 \text{ mA} - 4 \text{ mA and } i_{\text{Offset}} = 4 \text{ mA)}$$

The available residual current through the contact amounts to:

$$I_{\text{Rest 2}} = 25.49 \text{ mA} - 15.2 \text{ mA} = 10.29 \text{ mA}$$

Condition:

$$I_{\text{Rest}} \geq I_{\text{contact}}$$

The switching current (current through the contact) may not exceed the determined residual current since this will impair the functionality of the device.

The switching current must be determined separately by the user since it depends on the respective use case. The switching current can either be calculated or measured at the contact.

Please note that no line resistances have been listed in this calculation. However, these will lead to an additional voltage drop that must be taken into account.

5. Electrical Installation

WARNING! Install the device only when depressurized and currentless!

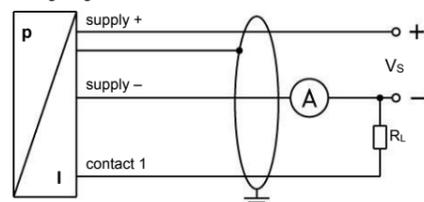
DANGER! Danger of explosion when surpassing the maximum supply of 28 V_{DC}!

Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the pin configuration and the respective wiring diagram shown in the data sheet.

Pin configuration

Electrical connections	M12x1 plastic (5-/8-pin)	M12x1 metal (5-pin)	ISO 4400	cable-colours (DIN 47100)
Supply +	1	1	1	wh (white)
Supply -	3	3	2	bn (brown)
Contact 1	4	4	3	gr (grey)
Shield	via pressure port	plug-housing/pressure port	ground pin	gn/ye (green/yellow)

Wiring diagram



For devices with cable gland as well as cable socket, you have to make sure that the external diameter of the used cable is within the allowed clamping range. Moreover you have to ensure that it lies in the cable gland firmly and cleflessly!

Please note for devices with ISO 4400 plug and cable socket, that the socket has to be mounted properly to ensure the ingress protection mentioned in the data sheet. Please check if the delivered seal is placed between plug and cable socket. After connecting the cable fasten the cable socket on the device by using the screw.

For the installation of a device with cable outlet following bending radii have to be complied with: cable without ventilation tube:

static installation : 8-fold cable diameter
dynamic application: 12-fold cable diameter

cable with ventilation tube:

static installation : 10-fold cable diameter
dynamic application: 20-fold cable diameter

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.

For a clear identification, the intrinsically safe cables are marked with light blue shrink tubing (over the cable insulation). If the cable has to be modified (e. g. shortened) and the marking at the cable end has been lost in the process, it must be restored (for example, by marking it again with light blue shrink tubing or an appropriate identification sign).

For the electrical connection a shielded and twisted multicore cable has to be used.

When using the pressure switch in combination with a transmitter repeater with linear limit, the supply of the device could fall below the minimum when completely conducting the transmitter part. Please compare the specification of your transmitter repeater with the current data sheet of the pressure switch.

6. Initial start-up

WARNING! Before start-up, the user has to check for proper installation and for any visible defects.

WARNING! The device can be started and operated by authorized personnel only, who have read and understood the operating manual!

WARNING! The device has to be used within the technical specifications, only (compare the data in the data sheet and the EC type-examination certificate)!

7. Operation

7.1 Operating and display elements

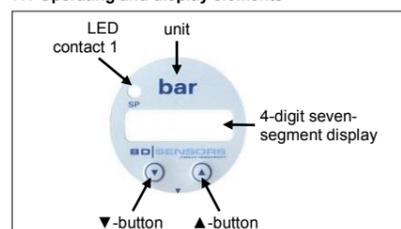


Fig. 4 touchpad

The device has, according to the order max. one LED which is allocated to the contact. The LED will light up when the set point has been reached and the contact is active. The display of the measured value as well as the configuration of the individual parameters occurs menu-driven via the seven-segment display.

7.2 Configuration

The menu system is a closed system allowing you to scroll both forward and backward through the individual set-up menus to navigate to the desired setting item. All settings are permanently stored in an EEPROM and therefore available again even after disconnecting from the supply voltage. The structure of the menu system is the same for all types of devices, regardless of the number of contacts. However, they only differ by the number of menus. Following figure and the menu list shows all possible menus.

7.4. Description of hysteresis and compare mode

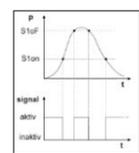


Fig. 5 compare mode

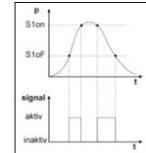


Fig. 6 compare mode inverted

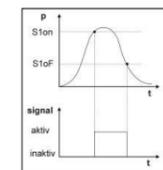


Fig. 7 hysteresis mode inverted

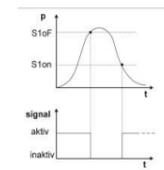


Fig. 8 hysteresis mode

- ▲-button: move in the menu system (forward) or increase the displayed value; it will also lead you to the operating mode (beginning with menu 1)
- ▼-button: move in the menu system (backward) or decrease the displayed value; it will also lead you to the operating mode (beginning with the last menu)
- both buttons simultaneously: confirm the menu items and set values
- ☞ to increase the counting speed, when setting the values: keeping the respective button pushed for more than 5 seconds

Execution of configuration:

- set the desired menu item by pushing the ▲- or ▼-button
- activate the set menu item by pushing both buttons simultaneously
- set the desired value or select one of the offered settings by using the ▲- or ▼-button
- store/confirm the set value/selected setting and exit the menu by pushing both buttons simultaneously

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 4
dP	menu 2 – set decimal point position
ZP EP	menus 3 and 4 – set zero point / end point the device has been configured correctly before delivery, so a later setting of a 2-wire device is only necessary, if a differing displayed value is desired (e. g. 0 ... 100 %)
Filt	menu 5 – set damping 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 6 – exceeding message set "on" or "off"
S1on	menu 7 – set switch-on point set the values, for the activation of contact 1 (S1on)
S1of	menu 8 – set switch-off point set the values, for the deactivation of contact 1 (S1of)
HY 1 CP 1	menu 9 – select hysteresis or compare mode select hysteresis mode (HY 1) or compare mode (CP 1) ☞ compare "7.4 Description of hysteresis and compare mode"
d1on	menu 10 – set switch-on delay set the value of the switch-on delay after reaching contact 1 (d1on) (0 up to 100 sec permissible)
d1of	menu 11 – set switch-off delay set the value of the delay after reaching switch-off point 1 (d1of) (0 up to 100 sec permissible)
HIPr LoPr	menu 12 and 13 – maximum / minimum pressure 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) ☞ to erase: push both buttons again within one second
dLdS	menu 14 – measured value update (display) set the length of the update cycles for the display (0.0 up to 10 sec permissible)
FS S	special menus (to access a special menu, select the menu item "PAof" with the ▲- or ▼-button and confirm it; "1" appears in the display) special menu 1 – full scale compensation for full scale compensation, which is necessary if the indicated value for full scale differs from the real full scale value in the application: a compensation is only possible with a respective reference source, if the deviation of the measured value is within defined limits; set "0238"; confirm with both buttons; "FS S" will appear in the display; now it is necessary to place the device under pressure (the pressure must correspond to the end point of the pressure measuring range); push both buttons, to store the signal being emitted from the pressure switch as full scale; in the display the set end point will appear although the full scale is missing ☞ the analogue output signal (for devices with analogue output) is not affected by this change

7.3 Password system

To avoid a configuration by unauthorized persons, the possibility is given to lock the device by an access protection. More information is given in menu 1 of the menu list.

☞ Please follow the manual meticulously and remember that changes of the adjustable parameters (switch-on point, switch-off point, etc.) become only effective after pushing both buttons simultaneously and leaving the menu item.

WARNING! Disassemble the device only in current and pressure less condition! Check before disassembly, if it is necessary to drained off the media before dismantling!

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

9. Maintenance

DANGER! The operator is obligated to observe the information about operation and maintenance work on the warning signs possibly affixed to the device.

During the cleaning processes, note the compatibility of the cleaning media used in combination with the media-wetted materials of the pressure measuring devices. Permissible concentrations and temperatures must be observed. Verification/ validation by the user is essential.

Deposits or contamination may occur on the diaphragm/ pres-sure port in case of certain media. Depending on kind and quality of the process, suitable cyclical maintenance intervals must be specified by the operator. As part of this, regular checks must be carried out regarding corrosion, damage of dia-phragm/seal(s) and signal shift. A periodical replacement of the seal(s) may be necessary. In principle, this device is maintenance-free. If desired, the housing of the device can be cleaned using a damp cloth and non-aggressive cleaning solutions, in switched-off state.

With 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 note the chapter "Service/Repair" below.

A false cleaning of the device can cause irreparable damages on the diaphragm. Therefore never use pointed objects or pressured air for cleaning the diaphragm.

For EHEDG certified devices in tanks, the cleaning device must be positioned in such a way that the sensor is directly assessed and wetted for cleaning. The device has been developed for Cleaning in Place (CIP) applications and must not be dismantled for cleaning.

10. Service / Repair

10.1 Recalibration

During the life-time of the device, the offset or span value may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one of these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

10.2 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.

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

11. Disposal

The device has to be disposed of according to the European Directives 2002/96/EC and 2003/108/EC (on waste electrical and electronic equipment). It is prohibited to place electrical and electronic equipment in domestic refuse!



WARNING! Depending on the used 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.

of S	special menu 2 – offset compensation / position correction set "0247"; confirm menu item; if offset ≠ ambient pressure it is necessary to place the device under pressure (pressure reference has to corresponding to the zero point of the pressure measuring range); push both buttons to store the signal being emitted from the pressure switch as offset; in the display the set zero point will appear ☞ a position correction is necessary, if the installation position differs from the calibration position (otherwise this can cause a little deviation of the signal, which gives a wrong value indication) ☞ the analogue output signal (for devices with analogue output) is not affected by this change; when displacing the offset, the full scale will also be displaced
LoAd	special menu 3 – load defaults set "0729"; to load the defaults, push both buttons simultaneously ☞ any changes carried out will be reset (password will be set on "0005")
SEtP	special menu 4 – set password set "0835"; confirm with both buttons; "SEtP" appears in the display; set the password using the ▲- or ▼-button (0 ... 9999 are permissible, the code numbers 0238, 0247, 0729, 0835 are exempt); confirm the password by pushing both buttons simultaneously

Menu list

12. 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.

13. 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.

Structure of the system

