EN

BD SENSORS® pressure measurement

Operating Manual

standard with XMP
optionally for x|act:

Precision Pressure Transmitter in IS-Areas

AX2-x|act ci, AX2-x|act i, AX2-XMP ci a AX2-XMP i
AX7-XMP ci, AX7-XMP i

www.bdsensors.com

BA_XACT-XMP_EX_E_SRO

–

Headquarter Eastern Europe
BD SENSORS s.r.o.
Hradišťská 817
CZ - 687 08 Buchlovice
Czech Republic
Tel.: +420 572 411 011
Fax: +420 572 411 497

Headquarter Western Europe / International
BD SENSORS GmbH
BD-Sensors-Str. 1
D - 95199 Thierstein
Germany
Tel.: +49 (0) 92 53 / 98 11-0
Fax: +49 (0) 92 53 / 98 11-11

Russia
BD SENSORS RUS
39a, Varshavskoe shosse
RU - Moscow 117105
Russia
Tel: +7 (0) 9 59 81 / 09 63
Fax: +7 (0) 9 57 95 / 07 21

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

1. General information
2. Product identification
3. Mechanical installation
4. HART® communication
5. Special regulations for IS-areas
6. Electrical Installation
7. Initial start-up
8. Operation
9. Error handling
10. Placing out of service
11. Maintenance
12. Service / Repair
13. Disposal
14. Warranty conditions
15. 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 DIN EN 60079-14) as well as the occupational safety provisions.
The device was constructed acc. to standards EN IEC 60079-0:2018, EN 60079-11, EN 60079-26.
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. However, errors may have occurred. 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

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.

1.5 Intended use

- The **precision pressure transmitters x|act ci and x|act i** has been specially designed for food industry, pharmacy and biotechnology. They are configurable via display and operating module as standard.
- The **precisions pressure transmitters XMP ci and XMP i** are intended for applications in process industry, chemical and petrochemical industry. They offer HART®-communication as standard.
- The device is intended for converting the physical parameter of pressure into an electric signal. It has to be used only for this purpose, considering the following information.
- The above listed pressure transmitters have, according to the type, been developed for applications in overpressure and vacuum as well as for absolute pressure measurement.
- 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 Ⓔx-symbol.
- It is the operator's responsibility to check and verify the suitability of the device for the intended application. In addition it has to be ensured, that the medium is compatible with the media wetted parts. 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!
- The technical data listed in the current data sheet are engaging and must be complied with. If the data sheet is not available, please order or download it from our homepage. (http://www.bdsensors.com/products/download/datasheets)

⚠ WARNING! Danger through improper usage!

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

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

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

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

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

1.6 Safety technical maximum values

1.6.1 Intrinsically safe version

AX2-XMP i / AX2- XMP ci and AX2-x|act i / AX2-x|act ci
IBExU05ATEX1105 X
permissible temperatures for environment:
application in zone 0 (p_{atm} 0.8 bar up to 1.1 bar):
-20 ... 60 °C
application in zone 1 and 2: -40 ... 70 °C
supply and signal circuit:
U_i = 28 V, I_i = 98 mA, P_i = 680 mW, $C_i \approx 0$ nF, $L_i \approx 0$ µH
plus cable inductivity 1 µH/m and cable capacity 160 pF/m (for cable by factory)
the supply connections have an inner capacity of max. 33 nF to the housing

☞ NOTE - The limit values are valid only for the devices with own-sure circuits!

1.6.2. Special conditions for safe use

- 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 from -40 °C to +70 °C have to be observed.
- At pressure transmitter with the marking category ½ equipment, the sensor diaphragm serves as partition wall and has to be protected against mechanical damages.
- The isolation of the intrinsically circuit opposite the case is because of leakage flows in the blocking capacitors from the EMV-boards limited.

1.6.3 Flameproof enclosure

AX7-XMP ci and AX7-XMP i
for aluminum die cast case:
IBExU 12 ATEX 1073 X
zone 1: II 2G Ex db IIC T5 Gb
permissible temperatures: -20 ... 70 °C

☞ NOTE – The use of the devices with flameproof enclosure is not allowed in the areas of dust!

1.6.4. Special conditions for safe use

- The pressure transmitters type AX7-XMP i, AX7-XMP ci and AX7-XMD can be used in an ambient temperature range from -20°C up to +70 °C.
- The cable entry (M20x1.5) supplied by the manufacturer may be used only for fixed installation. The operating company has to ensure an appropriate clamping.

1.7 Package contents

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

- precision pressure transmitter
- protective cap
- for mechanical pressure ports DIN 3852: o-ring (premounted)
- this operating manual
- for optional SIL2 version: safety data sheet

1.8 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.

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.

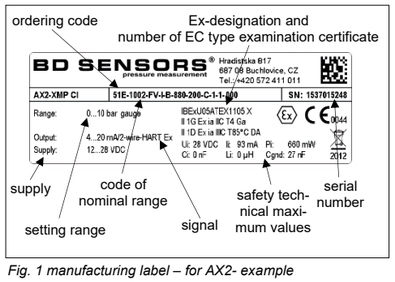


Fig. 1 manufacturing label – for AX2- example

! 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 and must absolutely be complied with. 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.)
- 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!
- When installing the device, at least the ingress protection IP 20 must be realised.

! 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.

! Provide a cooling line when using the device in steam piping and clarify the material compatibility.

! The measuring point must be designed in such a way that cavitation and pressure surges are avoided.

! 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!

! 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 device with cable outlet, 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!

☞ When installing the device to the pressurized system, the operator has to ensure the correct sealing.

☞ Check the intended resp. delivered seal for compatibility with the medium. If there is no compatibility, take a suitable seal.

☞ Take note that no assembly stress occurs at the pressure port, since this may cause a shifting of the characteristic curve. 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.

3.2 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

- 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.
- Screw the device into the corresponding thread by hand.
- Devices with a spanner flat have to be tightened with an open-end wrench (wrench size of steel: G1/2": approx. 10 Nm; G1": approx. 20 Nm; G1 1/2": approx. 25 Nm; wrench size of plastic: max. 3 Nm).

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.
- Screw the device into the corresponding thread by hand.
- Tighten it with a wrench (for G1/2": approx. 50 Nm).

3.5 Installation steps for NPT connections

- Use a suitable seal, corresponding to the medium and the pressure input (e. g. a PTFE-strip).
- Screw the device into the corresponding thread by hand.
- Tighten it with a wrench (for 1/2" NPT: approx. 70 Nm).

3.6 Installation steps for G1" cone

- Screw the device into the corresponding thread by hand. (metallic sealing)
- Tighten the devices with an open-end wrench ($P_N < 10$ bar: 30 Nm; $P_N \geq 10$ bar: 60 Nm).

3.7 Installation steps for dairy pipe connections

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

EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:
- ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH
- Center the dairy pipe connection in the counterpart.
- Screw the cup nut onto the mounting part.
- Then tighten it with a hook wrench.

3.8 Installation steps for Clamp and Varivent® connections

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

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.
- Note, that P40 can only be used for tank flanges.
- for Varivent□ connections: EPDM-O-ring which is FDA-listed
- Center 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.

3.9 Installation steps for DRD and connecting flanges

- Use a suitable seal corresponding to the medium and pressure input. (e. g. a fiber gasket).
- Put the seal between connecting flange and counter flange.
- Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.

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 and operating module (standard with x|act, optionally for XMP)

The display and operating module is continuously rotatable so that clear readability is guaranteed even in unusual installation positions. To change the position go ahead as follows:

- Screw off the metal cap by hand.
- Turn the display and operating module carefully into the desired position by hand. The module is equipped with a rotational limiter.
- Before screwing on the cap again, the o-ring and sealing surfaces of the housing have to be checked for damage and if necessary have to be changed!
- Afterwards screw the metal cap on by hand and make sure that the housing is firmly locked again.

⚠ WARNING! It is prohibited to open and configure the devices in the presence of explosion hazards. Therefore it is recommended to position the display and operating module together with the mechanical installation.

! Pay attention that no moisture can enter the device. Moreover, the seals and the sealing surfaces should not get dirty, as this may cause a reduction of the degree of protection depending on the case of application or place of installation. This can lead to a breakdown of the devices or to irreparable damages on the device.

3.11 Conditions for devices with 3-A symbol and / or EHEDG certificate

! 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 transmitter with little dead space, as well as definition / verification / validation of a suitable cleaning process

! - defining adequate service intervals

4. HART® communication (standard with XMP, optional for x|act)

⚠ DANGER! It is prohibited to interrupt the intrinsically safe circuit in the presence of explosion hazards in order to loop in a HART® communication interface (HART®-communicator or HART®-modem).

The analogue output signal is overridden by an additional signal according to the HART®-specification. The device can be configured via a HART®-communication device. Therefore we suggest our programming kit CIS 150 (available as accessory).

To ensure a trouble-free operation the following requirements should be fulfilled:

maximal cable length between device and power supply:

$$L_{max} = \frac{65 \cdot 10^6}{R_v \cdot C_v} - \frac{40 \cdot 10^3}{C_v}$$

whereas L_{max}: maximum length of cable in [m]
R_V: resistance of the cable together with the load resistance in [Ω]
C_V: capacity of the cable in [pF/m]

resistance R:

$$R = \frac{U - 12}{0.024}\ \Omega$$

whereas U: power supply in [V_{DC}]

The resistance must be at least 240 Ω.

5. Special regulations for IS-areas

5.1 Protection against electrostatic charge hazards

Different types of the device partially consist of chargeable plastic components. These are in particular coating of the housing as well as the plastic pressure port (optionally). 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.

The following warning sign is, if applicable, attached to the device. It points once more to the hazard of electrostatic charging.

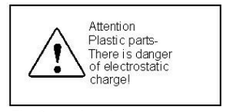


Fig. 2 warning sign

! The warning sign must not be removed from the device!

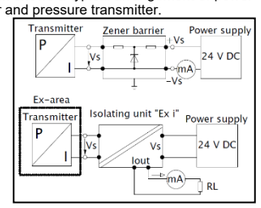
5.2 Overvoltage protection

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

5.3 Schematic circuit

The operation of an intrinsically safe transmitter in intrinsic safe areas requires special care when selecting the necessary Zener barrier or transmitter repeater devices to allow the utilization of the device's properties to the full extent.

The following diagram shows a typical arrangement of power supply, Zener barrier and pressure transmitter.



Please pay attention to item (17) of the type examination certificate, which stipulates special conditions for intrinsically safe operation.

5.4 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 device and, depending on the pressure a particular signal current will flow.

⚠ DANGER! When installing the intrinsically safe device as a zone-0-equipment, the supplying must be carried out by a power supply which must be galvanically insulated and which is not allowed to be grounded.

5.5 Functional selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage $V_{S\,min}$ of the device 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 "Output signal / 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 device will also decrease with an optionally used signal amplifier.

5.6 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 device. Full level control, i. e. a maximum or nominal output signal (20 mA), can be reached by applying the maximum physical input signal (pressure).

The technical data of the barrier will usually provide the information needed for the selection of the Zener barrier. However, the value can also be calculated. If a maximum signal current of 0.02 A is assumed, then – according to Ohm's law – a particular voltage drop results on the series resistance of the Zener barrier. This voltage drop is subtracted from the voltage of the power supply and as a result, the terminal voltage is obtained which is applied on the device at full level control. If this voltage is smaller than the minimum supply voltage, another barrier or a higher supply voltage should be chosen.

☞ Please pay attention when choosing the barrier or the transmitter repeater because some supplied devices / Zener barriers are not suitable for HART® communication. Most manufacturers offer a device group especially developed for this application.

☞ When selecting the ballasts, the maximum operating conditions according to the EC type-examination certificate must be observed. When assessing these, refer to their current data sheets to ensure that the entire interconnection of intrinsically safe components remains intrinsically safe.

6. Electrical Installation

⚠ WARNING! Install the device in currentless environments only!

⚠ WARNING! Install the connection for devices equipped with terminal clamps so that the separating spaces comply with the standard and the connecting lines cannot be loosened.

⚠ By devices with pressure flameproof enclosure a cable gland M20x1.5 with the name **HSK-M-Ex-d / metric** is prescribed. This is already premounted. Technical data: Cable diameter Ø 10... Ø 14 mm, key width: 24 mm, long-term permissible temperature:-60... 105 °C, certificate: II 2G Ex db IIC T5 Gb.

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

☞ NOTE – The cap for the connection clamps and display can be opened only if a locking protection, headless screw with inside hexagonal, remove became. The screw is on the right side below the cap. After attach of the cap for display and for the connection clamps, the locking protection must be screwed again purely. Besides, the lubrication of the thread ways is not necessary.

☞ NOTE - The cable gland by devices with flameproof enclosure is suitable only for the firm transfer!

Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration x|act:

Electrical connections	M12x1 (4-pin)	cable colours (DIN 47100)
Supply +	1	wh (white)
Supply –	3	bn (brown)
Shield	plug housing	gn/ye (green / yellow)

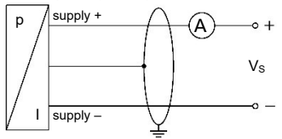
Pin configuration XMP:

Terminal clamps	aluminium die cast case: terminal clamps clamp section: 2.5 mm²	stainless steel field housing: clamp section: 1.5 mm²
Supply +	IN+	IN+
Supply –	IN–	IN–
Test [1]	Test	-
Shield	⏚	⏚

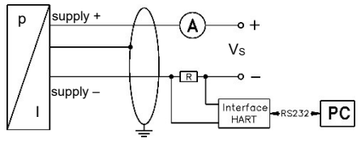
[1] by connecting an ampere meter between the terminals Supply + and Test, the output signal can be measured without disconnecting the power supply

Wiring diagrams:

2-wire-system (current)



2-wire-system (current) HART®



! For the installation of a device with cable outlet following bending radiuses 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.

! To install a device with terminal clamps, the cap has to be screwed off. If the device is equipped with a display and operating module, this has to be pulled out carefully. Put it as long as installing the device non-tensioned next to the housing. Next insert it again carefully and ensure that the cords are not turned or squeezed. Before screwing on the cap again, the o-ring and sealing surfaces of the housing have to be checked for damage and if necessary to be changed! Afterwards screw the metal cap on by hand and make sure that the field housing is firmly locked again.

! 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 label).

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

7. 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)!

8. Operation (standard with x|act, optionally for XMP)8.1 Display and operating module

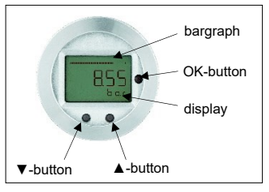


Fig. 4 touch pad

A bargraph is shown in the display, indicating the current pressure input as percentage of the specified pressure range. The indication of the measured value as well as the configuration of the individual parameters occurs through a menu via the display. The individual functions can be set with the help of three miniature push buttons located under the metal cap. For devices of the XMP series with aluminium die cast case, additionally the possibility is given to operate via three push buttons (accessible from above). This is especially an advantage in IS-areas, caused by the fact that the device can be configured in situ without opening the operating and display module. Therefore the metal plate (on the top side of the device), has to be folded backwards after loosening the right screw. The definition of the three buttons is: ▼, OK, ▲ (starting at the left side).

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 a Flash EPROM and therefore available even after disconnecting from the supply voltage.

⚠ WARNING! It is prohibited to open and configure the devices in the presence of explosion hazards. After configuration it must be ensured that the device is completely closed again outside the explosion hazard area.

! Pay attention that no moisture can enter the device during configuration. Moreover, the seals and the sealing surfaces should not get dirty, as this may cause a reduction of the degree of protection depending on the case of application or place of installation. This can lead to a breakdown of the device or to irreparable damages on the device. Right after configuration, the metal cap has to be screwed on again.

- 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.

8.2 Structure of the menu system

See arranged supplementary sheet (supplementary sheet / structure of the menu system). This supplementary sheet should only be used with this operating manual.

8.3 Menu list

- **▲-button:** with this button you move forward in the menu system or increase the displayed value; it will also lead you to the operating mode (beginning with menu item "1 DISPLAY")
- **▼-button:** with this button you move back in the menu system or decrease the displayed value; it will also lead you to the operating mode (beginning with menu item "5 SERVICE")
- **OK-button:** with this button menu items and set values have to be confirmed

execution of configuration:

- set the desired menu item by pushing the ▲- or ▼-button
- activate the set menu item by pushing the OK-button
- 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 the OK-buttony

10. Placing out of service

⚠ 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.

11. Maintenance

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

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/ pressure 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 diaphragm/seal(s) and signal shift. A periodical replacement of the seal(s) may be necessary.

Depending on the measuring medium, however, the diaphragm may be polluted or coated with deposit. If the medium is known for such tendencies, the user has to set appropriate cleaning intervals. 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 therefore the chapter "Repair" below.

! An incorrect cleaning can cause irreparable damages on the diaphragm. Never use spiky objects or pressured air for cleaning the diaphragm.

12. Service / Repair

12.1 Recalibration

During the life-time of a transmitter, the value of offset and span 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.

12.2 Return

Before every return of your device, whether for recalibration, decalcification, modifications or repair, it is necessary to contact us to ensure a fast handling of your request. Please inform us by sending an email to: sale@bdsensors.cz. Include the number of devices sent and request a RMA. Then clean the device and pack it shatterproof before send it to BD SENSORS indicating the RMA.

Malfunction	Possible cause	Error detection / corrective
display does not work	falsely connected	inspect the connections
	line break	inspect all connecting lines of the device (including the connector plugs)
	defective energy supply	inspect the power supply and the applied supply voltage at the transmitter
no output signal	wrong connected	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
	defective amperemeter (signal input)	inspect the amperemeter (fine-wire fuse) or the analogue input of the PLC
analogue output signal too low	load resistance too high	verify the value of the load resistance
	supply voltage too low	verify the output voltage of the power supply
	defective energy supply	inspect the power supply and the applied supply voltage at the device
small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge; incorrect cleaning can cause irreparable damages on diaphragm or seals
	diaphragm is calcified or coated with deposit	if possible it is recommended to send the device to BD SENSORS for decalcification or cleaning
large shift of output signal	diaphragm is damaged (caused by overpressure or manually)	check the diaphragm; if it is damaged, please send the device to BD SENSORS for repair
measured value (display and analogue output) deviates from the nominal value	high pressure / pressure peaks	a recalibrated or replaced of the pressure port by BD SENSORS is necessary
	mechanical damage to diaphragm	
constant output signal at 4 mA	wrong ID-number	ensure in the menu item "ID" that the set value for the ID-number is "0000"

13. Disposal

The device must be disposed according to the European Directives 2012/19/EU and 16/2022 coll. (on waste electrical and electronic equipment). Waste of electrical and electronic equipment may not be disposed by domestic refuse!

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.

14. 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 of 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.

15. Declaration of conformity / CE

the EC declaration of conformity, which is available online at: http://www.bdsensors.cz., Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

If you detect an error, please try to eliminate it by using this table or send the device to our service address for repair.

⚠ DANGER! Working on supplied (active) parts, except for intrinsically safe circuits, is principally prohibited during an explosion hazard. Additionally, the operator is obligated to observe the information concerning operation and maintenance work on the warning signs possibly affixed to the device.

! Improper action and opening can damage the device. Therefore repairs on the device may only be executed by the manufacturer!

Error handling

PASSED PARAMETER TOO SMALL	set value is too high (e. g. damping > 100)
PASSED PARAMETER TOO LARGE	set value is too low (e. g. damping < 0)
LOOP CURRENT NOT ACTIVE	set value of the "offset" is too high
APPLIED PROCESS TOO LOW	set value of the "offset" is too low
APPLIED PROCESS TOO HIGH	set value of "span" is too high
LOWER RANGE VALUE TOO HIGH	set value of "span" is too low
LOWER RANGE VALUE TOO LOW	"offset" or "span" out of range
UPPER RANGE VALUE TOO HIGH	set value of the "span" is too low
UPPER RANGE VALUE TOO LOW	wrong password
SPAN TOO SMALL	ID number out of range

Addition

☞ If a parameter is configurable by a value, each digit may be configured separately. That means after activating such a menu item (e. g. "2.3.1 OFFSET") by pushing the OK-button, the first digit of the currently set value will start to blink. Now scroll up or down to the desired digit via the ▼- or ▲-button and confirm it with the OK-button. After that, the next digit will start to blink. Configure it in the same way. In the menu items "2.3.1 OFFSET" and "2.3.2 FINALVAL", the decimal point will then start to blink and it is also possible to change its position by using the ▼- or ▲-button. By confirming the position with the OK-button, the total value will be stored if permissible. If the value is out of range, an error message (e. g. Error 03) will appear in the display and the set value will **not** be stored. If you intend to set a negative value, the first digit has to be configured with the ▼-button.

	Display
1 DIPLAY	
1.1 P_{max}	**Maximum pressure display (high pressure)** The maximum pressure applied during measuring is shown in the display.
1.2 P_{min}	**Minimum pressure display (low pressure)** The minimum pressure applied during measuring is shown in the display.
1.3 T_{max}	**Maximum temperature display (high temperature)** The minimum temperature during measuring is shown in the display.
1.4 T_{min}	**Minimum pressure display (high pressure)** The maximum pressure applied during measuring is shown in the display.
1.5 CLEAR	Use to clear the values 1.1-1.4 (P_{max}, P_{min}, T_{max}, T_{min})
1.6 INFO	**Setting of the display** meaning of the permissible numbers: "1": 1. line: measured pressure 2. line: set pressure unit "2": 1. line: output signal 2. line: mA "3": 1. line: measured temperature 2. line: °C "4": 1. line: measured pressure 2. line: changes between set pressure unit / output signal in mA "5": 1. line: measured pressure 2. line: changes between set pressure unit / measured temperature in °C "6": 1. line: measured pressure 2. line: changes between set pressure unit / output signal in mA / measured temperature in °C
2 CALIB	**Calibration**
2.1 ZERO	**Offset correction** By choosing the submenu 2.1 with the OK-button, „CONFIRM" appears in the display. By pushing the OK-button for at least 2 seconds, the correction is carried out and „CONFIRM" disappears in the display.
2.2 CAL REF	**Calibration reference**
2.2.1 OFFSET	**Offset calibration** After feeding and adoption of reference value, choose the submenu 2.2.1 with the OK-button, „CONFIRM" appears in the display. By pushing the OK-button for at least 2 seconds, the calibration is carried out and „CONFIRM" disappears in the display.
2.2.2 FINALVAL	**Final value calibration** After feeding and adoption of reference value, choose the submenu 2.2.2 with the OK-button, „CONFIRM" appears in the display. By pushing the OK-button for at least 2 seconds, the calibration is carried out and „CONFIRM" disappears in the display.
2.3 ADJUST	**Adjust**
2.3.1 OFFSET	**Setting of the initial value of the measuring range** With button▲ and ▼ you can set a initial value of measuring range. The value of new range is max. 1:10 of original measuring range.
2.3.2 FINALVAL	**Setting of the terminal value of the measuring range** With button▲ and ▼ you can a terminal value of measuring range. The value of new range is max. 1:10 of original measuring range.
2.3.3 Z-CORR	**Resetting the offset** By choosing the submenu 2.3.3 with the OK-button, „CONFIRM" appears in the display. By pushing the OK-button for at least 2 seconds, the resetting is carried out and „CONFIRM" disappears in the display.
3 SIGNAL	**Signal**
3.1 FUNKTION	Function selection e.g. "LINEAR" (linear function)
3.2 DENSITY	Input the density [kg/m³]. The unit will be changed to [mFs]
3.3 DAMP	**Setting of the damping** permissible range: from 0 up to 100 sec
3.4 SIMULAT	Free input of output signal [mA] for simulation of plant conditions (from 3,8 ... 21,6 mA)
4 SETTINGS	Settings
4.1 DISPLAY	Extension of display
4.1.1 UNIT P	**Setting of the pressure unit** permissible units: bar, mbar, g/cm², kg/cm², Pa, kPa, Torr, atm, mmWS (mm H20), mmHg, PSI ☞ a conversation of all pressure related parameters is carried out automatically
4.1.2 UNIT T	**Setting of the temperature unit** Switching between the unit [°C] and [°F]
4.2 HART-ID	**HART-ID (only for HART®- devices with multidrop-mode to adjust)** HART-ID (only with HART® - to put to devices in the multi drop mode) Put the desired ID No. (between "0 and 15") and confirm this with the OK-button. A configuration of this number is only necessary if you liked to pursue the device in the multi drop mode (connection of several HART® devices). If the ID No. on "0" is put, the multi drop mode is deactivated and the pressure transmitter works in the analogous mode.
4.3 USER-L	**Configuration of the access protection** For security reasons, it is necessary to enter the password before configuring the access protection. Confirm it with the OK-button. The default setting for the password is "0000". meaning of the permissible numbers: "0": the complete menu system is unlocked "1": following menus are unlocked: 1 DISPLAY, 3 SIGNAL, 4.3 USER-L "2": following menus are unlocked: 1 DISPLAY, 4.3 USER-L
4.4 PASSW	**Configuration of the password** For security reasons, it is necessary to enter the current password before the configuration of the new one. Confirm with the OK-button. The default setting for the password is "0000". Then set the new password and confirm with the OK-button. ☞ A master password has been permanently implemented in case the password has been lost. BD SESNSORS will forward it to you on request, in case you have forgotten your password.
4.5 LANGUAGE	Choosing of user language [DE] or [EN]
5 SERVICE	**Service**
5.1 FACTORY	To restore to factory settings
5.2 ERR CURR	**Error current limits** Setting of the error current limit value: 21,6 mA or 3,8 mA
5.3 TYPE	**Displaying of the type of device**
5.4 SER-NO	**Displaying of the serial number**
5.5 VERS	**Displaying of the program version**

When several HART ® devices are used on the same wire, the short address of each device is entered here.If the address is 0, only one device is on the line, and the current output is 4…20 mA.If the address is 1…15, several devices may be connected to the network, and the output current of the devices is 4 mA. If multiple devices are connected to the same network, each device must have a unique address, and the address may not be 0.FACTORY DEFAULT: 0