

## Operating manual

Pressure transmitters for IS-areas

AX12-x|act ci, AX12-x|act i, AX12-XMP ci and AX12-XMP i  
AX17-XMP ci and AX17-XMP i



**READ THOROUGHLY BEFORE USING THE DEVICE**  
**KEEP FOR FUTURE REFERENCE**

ID: BA\_xact-XMP\_EX\_E | Version: 07.2021.0

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## 1. General and safety-related information on this operating manual

This operating manual enables safe and proper handling of the product, and forms part of the device. It should be kept in close proximity to the place of use, accessible for staff members at any time.

All persons entrusted with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the device must have read and understood the operating manual and in particular the safety-related information.

**The following documents are an important part of the operating manual:**

- data sheet
- type-examination certificate
- Supplementary sheet to operating manual (ZUSATZ\_BA\_X-GERÄTE)

For specific data on the individual device, please refer to the respective data sheet.

Download these by accessing [www.bdsensors.de](http://www.bdsensors.de) or request them: [info@bdsensors.de](mailto:info@bdsensors.de) | phone: +49 (0) 92 35 / 98 11 0

The explosion-proof versions of our products are variants of the standard products.

**Example:**

Standard: x|act i → IS-version: AX12-x|act i

In addition, the applicable accident prevention regulations, safety requirements, and country-specific installation standards as well as the accepted engineering standards must be observed.

For the installation, maintenance and cleaning of the device, the relevant regulations and provisions on explosion protection (VDE0160, VDE 0165 and/or EN 60079-14) as well as the accident prevention regulations must absolutely be observed. The device was designed by applying the following standards:

AX12: EN60079-0:2012+A11:2013  
EN60079-11:2012  
EN60079-26:2015

AX17: EN IEC 60079-0:2018  
EN60079-1:2014

### 1.1 Symbols used

	- Type and source of danger - Measures to avoid the danger
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Warning word	Meaning
	- Imminent danger! - Non-compliance <b>will result in</b> death or serious injury.
	- Possible danger! - Non-compliance <b>may result in</b> death or serious injury.
	- Hazardous situation! - Non-compliance <b>may result in</b> minor or moderate injury.

**NOTE** - draws attention to a possibly hazardous situation that may result in property damage in case of non-compliance.

- ✓ Precondition of an action

### 1.2 Staff qualification

**Qualified persons** are persons that are familiar with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the product and have the appropriate qualification for their activity.

This includes persons that meet at least one of the following three requirements:

- They know the safety concepts of metrology and automation technology and are familiar therewith as project staff.
- They are operating staff of the measuring and automation systems and have been instructed in the handling of the systems. They are familiar with the operation of the devices and technologies described in this documentation.
- They are commissioning specialists or are employed in the service department and have completed training that qualifies them for the repair of the system. In addition, they are authorized to put into operation, to ground, and to mark circuits and devices according to the safety engineering standards.

All work with this product must be carried out by qualified persons!

### 1.3 Intended use

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.

A device has an explosion-protection approval if this was specified in the purchase order and confirmed in our order acknowledgement. In addition, the manufacturing label includes a sign.

The user must check whether the device is suited for the selected use. In case of doubt, please contact our sales department ([info@bdsensors.de](mailto:info@bdsensors.de), phone: +49 (0) 92 35 98 11 0). BDSENSORS assumes no liability for any wrong selection and the consequences thereof!

The technical data listed in the current data sheet are engaging and must absolutely be complied with. If the data sheet is not available, please order or download it from our homepage: <http://www.bdsensors.de>

### 1.4 Incorrect use

	<b>Danger through incorrect use</b> - 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. - BDSENSORS is not liable for damage caused by improper or incorrect use.
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### 1.5 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.

### 1.6 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.

### 1.7 Safety-related maximum values

#### 1.7.1 Intrinsically safe versions

AX 12-XMP ci / AX12-XMP i / AX 12-x|act ci / AX12-x|act i

Permissible temperatures for environment:

application in zone 0 ( $p_{atm}$  0.8 bar to 1.1 bar): -20 ... 60 °C  
application in zone 1 and 2: -40 ... 70 °C

Supply and signal circuit:

$U_i = 28 \text{ V}$ ,  $I_i = 98 \text{ mA}$ ,  $P_i = 680 \text{ mW}$ ,  $C_i \approx 0 \text{ nF}$ ,  $L_i \approx 0 \mu\text{H}$   
plus cable inductance 1  $\mu\text{H/m}$  and cable capacity 160 pF/m (for cable by factory)

The supply connections have an inner capacity to the housing of max. 27 nF for stainless steel field housing / max. 33 nF for aluminium die cast case.

**NOTE** - The limit values only apply for devices with intrinsically safe circuits.

#### 1.7.2 Flameproof enclosure (only with aluminium die cast housing)

AX 17-XMP ci and AX 17-XMP i

Operating temperature range: -20 ... 70 °C

**NOTE** - The use of devices with flameproof enclosure is not appropriate in areas of dust!

### 1.8 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:

- Pressure transmitter, protective cap
- for mech. connections to DIN 3852: O-ring (remounted)
- operating manual
- supplementary sheet / structure of the menu system
- for optional SIL2 version: safety data sheet

### 1.9 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 a NEC Class 2 energy supply.

## 2. Product identification

The device can be identified by means of the manufacturing label with order code. The most important data can be gathered therefrom.

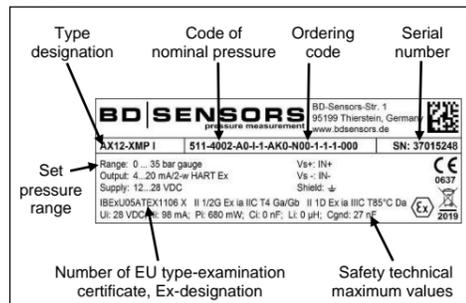


Fig. 1 Example of manufacturing label

**NOTE** - The manufacturing label must not be removed!

The marking for devices with explosion-protection approval must include the following information:

#### AX 12:

EU-type examination certificate **IBExU05ATEX1106 X**

Marking: **II 1G Ex ia IIC T4 Ga or  
II 1/2G Ex ia IIC T4 Ga/Gb or  
II 2G Ex ia IIB T4 Gb  
II 1D Ex ia IIIC T85°C Da**

#### AX 17:

EU-type examination certificate **IBExU12ATEX1045 X**

Marking: **II 2G Ex db IIC T5 Gb**

## 3. Mounting

### 3.1 Mounting and safety instructions

	<b>Danger of death from explosion, airborne parts, leaking fluid, electric shock</b> - Always mount the device in a depressurized and de-energized condition! - Do not install the device while there is a risk of explosion.
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**NOTE** - Do not remove the packaging or protective caps of the device until shortly before the mounting procedure, to exclude any damage to the diaphragm and the threads! Protective caps must be kept! Dispose of the packaging properly!

**NOTE** - The technical data listed in the EU type-examination certificate are binding. Download these by accessing [www.bdsensors.de](http://www.bdsensors.de) or request them by e-mail or phone: [info@bdsensors.de](mailto:info@bdsensors.de) | phone: +49 (0) 92 35 98 11 0

**NOTE** - Make sure that the entire interconnection of intrinsically safe components remains intrinsically safe. The owner-operator is responsible for the intrinsic safety of the overall system (entire circuitry).

**NOTE** - If there is increased risk of damage to the device by lightning strike or overvoltage, increased lightning protection must additionally be provided!

**NOTE** - Treat any unprotected diaphragm with utmost care; this can be damaged very easily.

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

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

**NOTE** - When installing the device, avoid high mechanical stresses on the pressure port! This will result in a shift of the characteristic curve or to damage, in case of very small pressure ranges and devices with a pressure connection/port made of plastic.

**NOTE** - In hydraulic systems, arrange the device such that the pressure port points upwards. (venting)

**NOTE** - If the device is installed with the pressure port pointing upwards, ensure that no liquid drains off on the device. This could result in humidity and dirt blocking the gauge reference in the housing and could lead to malfunctions. If necessary, dust and dirt must be removed from the edge of the screwed joint of the electrical connection.

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

#### NOTES – for mounting outdoors or in a moist environment:

- Please note that your application does not show a dew point, which causes condensation and can damage the pressure transmitter. There are specially protected pressure transmitters for these operating conditions. Please contact us in such case.
- Connect the device electrically straightaway after mounting or prevent moisture penetration, e.g. by a suitable protective cap. (The ingress protection specified in the data sheet applies to the connected device.)
- Select the mounting position such that splashed and condensed water can drain off. Stationary liquid on sealing surfaces must be excluded!
- If the device has a cable outlet, the outgoing cable must be routed downwards. If the cable needs to be routed upwards, this must be done in an initially downward curve.
- Mount the device such that it is protected from direct solar radiation. In the most unfavourable case, direct solar radiation leads to the exceeding of the permissible operating temperature. This must be excluded if the device is used in any explosion-hazardous area!
- A device with gauge reference in the housing (small hole next to the electrical connection) must be mounted such that the gauge reference is protected against dirt and humidity. If the transducer is exposed to liquid admission, the gauge reference will be blocked, and the equalization of air pressure will be prevented. In this condition, a precise measurement is impossible and damage to the transducer may occur.

#### 3.2 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 standard
- 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

#### 3.3 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.)

#### 3.4 Mounting steps for connections according to DIN 3852

**NOTE** -Do not use any additional sealing material such as tow, hemp or Teflon tape!

- ✓ The O-ring is undamaged and seated in the designated groove.
  - ✓ The sealing face of the mating component has a flawless surface. (R<sub>z</sub> 3.2)
- 1 Screw the device into the mating thread by hand. Devices equipped with a knurled ring: only tighten by hand

- 3 Devices with a wrench flat must be tightened using a suitable open-end wrench. Permissible tightening torques for pressure transmitter:

- Wrench flat made of steel:  
G1/2": approx. 10 Nm  
G1": approx. 20 Nm  
G1 1/2": approx. 25 Nm
- Wrench flat made of plastic: max. 3 Nm

#### 3.5 Mounting steps for connections according to EN 837

- ✓ A suitable seal for the measured fluid and the pressure to be measured is available. (e.g. a copper seal)
  - The sealing face of the mating component has a flawless surface. (R<sub>z</sub> 6.3)
- 1 Screw the device into the mating thread by hand.
  - 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:  
Process connection made of steel: G1/2": approx. 50 Nm

#### 3.6 Mounting steps for NPT connections

- ✓ Suitable fluid-compatible sealing material, e.g. PTFE tape, is available.
- 1 Screw the device into the mating thread by hand
  - 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:  
1/2" NPT: approx. 70 Nm

#### 3.7 Mounting steps for G1" cone connection

- 1 Screw the device into the mating thread by hand (seal produced metallically)
- 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:  
 $p_N < 10 \text{ bar}$ : 30 Nm;  $p_N \geq 10 \text{ bar}$ : 60 Nm

#### 3.8 Mounting steps for dairy pipe connections

- ✓ The O-ring is undamaged and seated in the designated groove.
  - ✓ Chapter "3.2 and/or 3.3" have been noticed. EHEDG conformity is only ensured in combination with an approved seal for codes M73, M75, M76. This is e.g.: ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH
- 1 Centre the dairy pipe connection in the counterpart.
  - 2 Screw the cup nut onto the mounting part.
  - 3 Then tighten it using a hook wrench.

#### 3.9 Mounting steps for Clamp and Varivent® connections

- ✓ A suitable seal for the measured fluid and the pressure to be measured is available.
  - ✓ Chapter "3.2 and/or 3.3" have been noticed. EHEDG conformity is only ensured in combination with an approved seal. This is e.g.: for Clamp connections - codes C61, C62, C63: T-ring seal from Combifit International B.V. for Varivent® connections - codes P40, P41: EPDM-O-ring which is FDA-listed Note, that P40 can only be used for tank flanges.
- 1 Place the seal onto the corresponding mounting part.
  - 2 Centre the clamp connection or Varivent® connection above the counterpart with seal.
  - 3 Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions.

#### 3.10 Mounting steps for DRD and flange connections

- ✓ A suitable seal for the measured fluid and the pressure to be measured is available. (e.g. a fiber seal)
- 1 Put the seal between connecting flange and counter flange
  - 2 Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.

#### 3.11 Orientation of the display and operating module (standard with x|act, optional for XMP)

	<b>Danger of death from explosion</b> - Do not open the housing while an explosion hazard exists!
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The display and operating module can be rotated continuously so as to guarantee easy readability even in unusual mounting positions. Proceed as follows to change the position:

- Unscrew the metal cap by hand.
- Rotate the display and operating module carefully by hand into the desired position. The module is equipped with a turning 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.

**NOTE** - Ensure that moisture cannot enter the device! The seals and sealing surfaces must not get dirty, as (depending on application and location) fouling can cause a reduced degree of protection and therefore lead to device failure or irreparable damage to the device.

## 4. Electrical connection

### 4.1 Connection and safety instructions

	<b>Danger of death from electric shock or explosion</b> - Explosion hazard if the operating voltage is too high (max. 28 V <sub>DC</sub> ) or by opening the field housing while an explosion hazard exists. - Always mount the device in a depressurized and de-energized condition! - Do not install the device while there is a risk of explosion. - Operate the device only within the specification! (data sheet)
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- ✓ The limit values listed in the EU type-examination certificate are observed. (Capacity and inductance of the connection cable are not included in the values.)
- ✓ The supply corresponds to protection class III (protective insulation).

**NOTE** - For devices with connection terminals, the connection must be made such that the isolation distances according to standard are observed and that loosening of the connecting lines is impossible.

**NOTE** - Use a shielded and twisted multicore cable for the electrical connection.

**NOTE** - for devices with cable outlet

- When routing the cable, 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

- In case of devices with cable outlet and integrated ventilation tube, the PTFE filter located at the cable end on the ventilation tube must neither be damaged nor removed! Route the end of the cable into an area or suitable connection box which is as dry as possible and free from aggressive gases, in order to prevent any damage.

**NOTE** - The cover for the connection terminals and display can only be opened if a safety lock, grub screw with hexagon socket, has been removed. The screw is located on the right-hand side below the cover. After affixing the cover for the display and connection terminals, the safety lock must be screwed in again. Greasing of the threads is not necessary for this.

**NOTE** - In order to electrically connect the device with connection terminals, the cover must be screwed off. If the device has a display and operating module, this should be pulled out carefully. During installation, place it next to the housing such that the wires are not under stress. Afterwards, insert it again carefully and ensure that the connection wires are not twisted or pinched. Before the cover is screwed on again, the O-ring and sealing surface on the housing must be checked for damage and, if necessary, replaced! Then screw on the cover by hand and make sure that the field housing is tightly closed again.

**NOTE** - The cable entry on devices with flameproof enclosures only suitable for permanent installation!

**NOTE** - For devices with flameproof enclosure, a M20x1.5 cable gland HSK-M-Ex-d / Metr. is prescribed; this is already pre-mounted.

Technical data: cable diameter Ø10 ... Ø14 mm, width across flats: 24 mm, continuous operating temperature: -60 ... 105 °C, certificate: II 2G 1D Ex d IIC

**NOTE** - 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).

**4.2 Conditions for the explosion-hazardous area**

**Danger generated by electrostatic charging**

 <b>DANGER</b>	<p><b>Danger of death from explosion</b></p> <ul style="list-style-type: none"> <li>- Explosion hazard due to spark formation from electrostatic charging of plastic components.</li> <li>- For devices with cable outlet, the cable must be installed tightly.</li> <li>- Do not clean the device and, if applicable, the connection cable, in a dry state! Use a moist cloth, for example.</li> </ul>
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The following warning sign is affixed on devices with plastic components.



Fig. 2 Warning sign

**NOTE** - The warning sign must not be removed from the device!

**Overvoltage protection**

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

**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 transmitter.

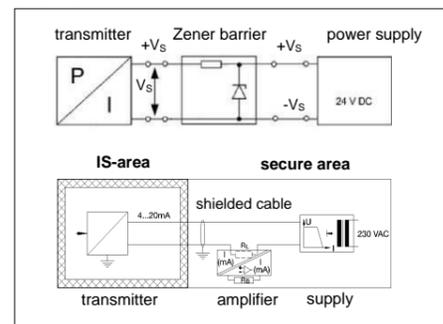


Fig. 3 Circuit diagrams

**NOTE** - Observe item (17) of the type-examination certificate! (special conditions for intrinsically safe operation)

**Exemplary circuit description**

The supply voltage of e.g. 24 V<sub>DC</sub> provided by the power supply is led across the Zener barrier. The Zener barrier contains series resistances and breakdown diodes as protective components. Subsequently, the operating voltage is applied to the device and, depending on the pressure, a particular signal current flows.

 <b>DANGER</b>	<p><b>Danger of death from explosion</b></p> <ul style="list-style-type: none"> <li>- Operation of intrinsically safe devices as zone-0 equipment only with ungrounded and galvanically isolated power supply.</li> </ul>
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**Selection criteria for Zener barriers and power supplies**

The minimum supply voltage V<sub>S min</sub> of the transmitter 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 isolated power supply with linear limitation, it must be taken into account that the terminal voltage of the device will decrease because of the linear limitation, as with a Zener barrier. Furthermore, account must be taken of the fact that a certain voltage drop will also occur on an optionally used signal isolation amplifier, whereby the operating voltage of the pressure transmitter will decrease additionally.

**Test criteria for the selection of the Zener barrier**

In order not to undercut U<sub>B min</sub> it is important to check which minimum supply voltage is available at full-level modulation of the device. The full-level modulation, that is, a maximum and nominal output signal (20 mA), is achieved 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 will result from the series resistance of the Zener barrier.

This voltage drop is subtracted by the voltage of the power supply and as a result, the terminal voltage is obtained which is applied on the transmitter at full level control. If this voltage is smaller than the minimum supply voltage, another barrier or a higher supply voltage should be chosen.

**NOTE** - When selecting the barrier or power supply, you must look out for any ballasts which are not suitable for HART® communication. Most manufacturers offer a device group specially developed for this application.

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

**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<sub>DC</sub> ± 5 %. This results in:

- maximum supply voltage: V<sub>Sup max</sub> = 24 V \* 1.05 = 25.2 V
- minimum supply voltage: V<sub>Sup min</sub> = 24 V \* 0.95 = 22.8 V

The series resistance of the Zener barrier is listed with 295 ohm. The following values must still be calculated:

- voltage drop at the barrier (with full conduction): V<sub>ab barrier</sub> = 295 Ω \* 0.02 A = 5.9 V
- terminal voltage at the transmitter with Zener barrier: V<sub>KI</sub> = V<sub>S up min</sub> - V<sub>ab Barrier</sub> = 22.8 V - 5.9 V = 16.9 V
- minimum supply voltage of the transmitter (according to data sheet): V<sub>KI min</sub> = 12 V<sub>DC</sub> (corresponding to V<sub>S min</sub>)

**Condition:**

$$V_{KI} \geq V_{KI \min}$$

**Result:**

The terminal voltage of the transmitter with Zener barrier lies at 16.9 V and is therefore higher than the minimum supply voltage of the transmitter which lies at 12 V<sub>DC</sub>. This means, the Zener barrier has been selected correctly regarding the supply voltage.

**NOTE** - 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.

**4.3 Electrical Installation**

Connect the device electrically according to the information specified on the manufacturing label, the following table, and the wiring diagram.

**Pin configuration**

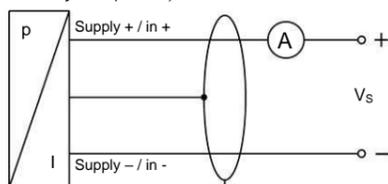
Electrical connections	M12x1 (4-pin)	cable colours (IEC 60757)
Supply +	1	WH (white)
Supply -	3	BN (brown)
Shield	plug housing	GYNE (green-yellow)

Connection terminals	die-cast aluminium housing: cross section 2.5 mm <sup>2</sup>	stainless steel field housing: cross section 1.5 mm <sup>2</sup>
Supply +	IN+	IN+
Supply -	IN-	IN-
Test <sup>1</sup>	Test	-
Shield		

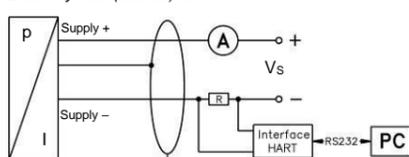
<sup>1</sup> By connecting an ammeter between Supply + and Test, the output signal can be checked without disconnecting the supply voltage.

**Wiring diagrams**

**2-wire system (current)**



**2-wire system (current) HART®**



**5. HART® communication**

**(standard on XMP, optional for x|act)**

 <b>DANGER</b>	<p><b>Danger of death from explosion</b></p> <ul style="list-style-type: none"> <li>- When interrupting the intrinsically safe circuit where an explosion hazard exists</li> <li>- Only interrupt the intrinsically safe circuit for looping-in a HART® communication interface (HART® Communicator or HART® Modem) when no explosion hazard is present.</li> </ul>
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An additional signal as per HART® specification is superimposed on the analogue output signal. The device may be configured by means of a HART® communication device. In this regard, we recommend the CIS 150 programming kit (available as accessory).

In order to ensure trouble-free operation, the following requirements must be taken into account:

Maximum cable length between measuring device and supply:

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

Wherein L<sub>max</sub>: maximum length of cable in [m]  
R<sub>V</sub>: resistance of cable together with load resistance in [Ω]  
C<sub>V</sub>: capacity of cable in [pF/m]

Resistance R:

$$R = \frac{U - 12}{0,024} \Omega$$

wherein U: supply in [V<sub>DC</sub>]

The resistance must be at least 240 Ω.

**6. Commissioning**

 <b>DANGER</b>	<p><b>Danger of death from explosion, airborne parts, leaking fluid, electric shock</b></p> <ul style="list-style-type: none"> <li>- Explosion hazard if the operating voltage is too high (max. 28 V<sub>DC</sub>)!</li> <li>- Operate the device only within the specification! (according to data sheet and EU type-examination certificate)</li> </ul>
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- ✓ The device has been installed properly
- ✓ The device does not have any visible defect

**7. Operation (standard with x|act, optional for XMP)**

Please note additionally the "Supplementary sheet to operating manual for x|act ci, x|act i, XMP ci, XMP i, XMD". It includes the structure of the menu system as well as the menu list and error messages.

**8. Maintenance**

 <b>DANGER</b>	<p><b>Danger of death from airborne parts, leaking fluids, electric shock</b></p> <ul style="list-style-type: none"> <li>- Always service the device in a depressurized and de-energized condition!</li> </ul>
 <b>WARNING</b>	<p><b>Danger of injury from aggressive fluids or pollutants</b></p> <ul style="list-style-type: none"> <li>- Depending on the measured medium, this may constitute a danger to the operator.</li> <li>- Wear suitable protective clothing e.g. gloves, safety goggles.</li> </ul>

If necessary, clean the housing of the device using a moist cloth and a non-aggressive cleaning solution.

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.

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.

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.

If the diaphragm is calcified, it is recommended to send the device to BDI SENSORS for decalcification. Please note the chapter "Service / repair" below.

**NOTE** - Wrong cleaning or improper touch may cause an irreparable damage on the diaphragm. Therefore, never use pointed objects or pressured air for cleaning the diaphragm.

**9. Troubleshooting**

 <b>DANGER</b>	<p><b>Danger of death from airborne parts, leaking fluids, electric shock</b></p> <ul style="list-style-type: none"> <li>- If malfunctions cannot be resolved, put the device out of service (proceed according to chapter 8 up to 10)</li> </ul>
 <b>DANGER</b>	<p><b>Danger of death from explosion</b></p> <ul style="list-style-type: none"> <li>- As a matter of principle, work on energized parts, except for intrinsically safe circuits, is prohibited while there is an explosion hazard.</li> </ul>

In case of malfunction, it must be checked whether the device has been correctly installed mechanically and electrically. Use the following table to analyse the cause and resolve the malfunction, if possible.

Fault: display does not work	
Possible cause	Fault detection / remedy
Connected incorrectly	inspect the connections
Line break	inspect all connecting lines
Defective energy supply	inspect the power supply and the applied supply voltage at the transmitter

Fault: no output signal	
Possible cause	Fault detection / remedy
Connected incorrectly	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

Fault: analogue output signal too low	
Possible cause	Fault detection / remedy
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

Fault: small shift of the output signal	
Possible cause	Fault detection / remedy
Diaphragm is highly polluted	cleaning using a non-aggressive cleaning solution and brush or sponge
Diaphragm is calcified or coated with deposit	<b>recommendation:</b> send the device to BD SENSORS for decalcification or cleaning

Fault: large shift of the output signal	
Possible cause	Fault detection / remedy
Diaphragm of sensor is damaged (caused by overpressure or mechanically)	checking of diaphragm; when damaged, send the device to BDI SENSORS for repair

Fault: measured value (display and analogue output) deviates from the nominal value	
Possible cause	Fault detection / remedy
High pressure / pressure peaks	recalibration or replacement of the pressure port by BD SENSORS is required
Mechanical damage to diaphragm	

Fault: constant output signal at 4 mA	
Possible cause	Fault detection / remedy
Wrong ID number	make sure that the set value under menu item "ID" is "0000"

**10. Removal from service**

 <b>DANGER</b>	<p><b>Danger of death from airborne parts, leaking fluids, electric shock</b></p> <ul style="list-style-type: none"> <li>- Disassemble the device in a depressurized and de-energized condition!</li> </ul>
 <b>WARNING</b>	<p><b>Danger of injury from aggressive media or pollutants</b></p> <ul style="list-style-type: none"> <li>- Depending on the measured medium, this may constitute a danger to the operator.</li> <li>- Wear suitable protective clothing e.g. gloves, goggles.</li> </ul>

**NOTE** - After dismantling, mechanical connections must be fitted with protective caps.

**11. Service / repair**

Information on service / repair:

- www.bdsensors.de
- info@bdsensors.de
- Service phone: +49 (0) 92 35 98 11 0

**11.1 Recalibration**

The offset value or range value may shift during the life of the device. In this case, a deviating signal value in relation to the set lower or upper measuring range value is output. If one of these two phenomena occur after extended use, a recalibration in the factory is recommended. Please note the chapter "Service/Repair" about this.

**11.2 Return**

 <b>WARNING</b>	<p><b>Danger of injury from aggressive media or pollutants</b></p> <ul style="list-style-type: none"> <li>- Depending on the measured medium, this may constitute a danger to the operator.</li> <li>- Wear suitable protective clothing e.g. gloves, goggles.</li> </ul>
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For every return shipment, whether for recalibration, decalcification, alteration or repair, the device must be cleaned thoroughly and packed in a break-proof manner. A return declaration with a detailed fault description must be added to the defective device. If your device has come into contact with pollutants, a declaration of decontamination is additionally required. Appropriate templates can be found on our homepage. Download these by accessing www.bdsensors.de or request them by e-mail or phone: info@bdsensors.de | phone: +49 (0) 92 35 98 11 0

In case of doubt regarding the fluid used, devices without a declaration of decontamination will only be examined after receipt of an appropriate declaration.

**12. Disposal**

 <b>WARNING</b>	<p><b>Danger of injury from aggressive media or pollutants</b></p> <ul style="list-style-type: none"> <li>- Depending on the measured medium, this may constitute a danger to the operator.</li> <li>- Wear suitable protective clothing e.g. gloves, goggles.</li> </ul>
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The device must be disposed of according to the European Directive 2012/19/EU (waste electrical and electronic equipment). Waste equipment must not be disposed of in household waste!

**NOTE** - Dispose of the device properly!

**13. Warranty terms**

The warranty terms are subject to the legal warranty period of 24 months, valid from the date of delivery. If the device is used improperly, modified or damaged, we will rule out any warranty claim. A damaged diaphragm will not be accepted as a warranty case. Likewise, there shall be no entitlement to services or parts provided under warranty if the defects have arisen due to normal wear and tear.

**14. Declaration of conformity / CE**

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

	
<b>EU-Konformitätserklärung</b> EC Declaration of Conformity	
<p>BD SENSORS GmbH erklärt hiermit in allerer Verantwortung, dass die Produkte BDI SENSORS GmbH declares on its own responsibility that the products</p> <p>mit den aufgeführten Richtlinien und Normen Übereinstimmen. fulfil the below mentioned requirements and standards.</p> <p>2014/34/EU (EMC) EN 61326-1:2013 2011/65/EU (RoHS)</p> <p>Für Geräte mit EU-Zulassung: For devices with CE approval:</p> <p>2014/34/EU (ATEX) AX12-x act i; AX12-x act i; AX12-XMD; AX12-XMP ci; AX12-XMP i AX17-XMD; AX17-XMP ci; AX17-XMP i IBExU05ATEX1106 X EN 60079-0:2012; A11:2013, EN 60079-11:2012, EN 60079-26:2015 IBExU12ATEX1045 X EN IEC 60079-0:2018, EN 60079-1:2014</p> <p>Benannte Stelle / Kennnummer Notified Body / identification number: IBExU Institut für Sicherheitstechnik GmbH / 0637</p> <p>IBExU19ATEX0013 EN ISO IEC 80079-34:2012 Benannte Stelle / Kennnummer Notified Body / identification number: IBExU Institut für Sicherheitstechnik GmbH / 0637</p> <p>In Erfüllung der Druckgeräterichtlinie 2014/68/EU und als Ergebnis des darin geforderten Konformitätsbewertungsverfahrens wird folgendes Modul gewählt: In conformity to the Pressure Equipment Directive 2014/68/EU and as result of therein demanded conformity assessment procedure the following module has been chosen:</p> <p>Für Geräte mit maximal zulässigem Überdruck &gt; 200 bar: Bewertungsverfahren Modul A For devices with maximum permissible overpressure &gt; 200 bar: Assessment procedure Module A</p> <p>Thierstein, 2020-06-25</p> <p> D. Sarvenko Leiter Konstruktion/ Mechanical Design Manager</p> <p> M. Maßen Leiter Elektronikentwicklung/ Electronics Design Manager</p>	