EN

BD SENSORS® pressure measurement

Operating Manual

LMK 458 / LMK

Hydrostatic Probe DX14 LMK 457, DX14A LMK 458
DX14B LMK 487; DX15A LMK 458H

LMK 458

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

1. General information

1.1 Information on the operating manual

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 and EN 60079-14) as well as the occupational safety provisions.
The device was constructed acc. to standards:

DX4: EN IEC 60079-0:2018,
EN 60079-11:2012, EN 60079-26:2015

DX4A: EN IEC 60079-0:2018,
EN 60079-11:2012, EN 60079-26:2015

DX4B: EN IEC 60079-0:2018,
EN 60079-11:2012

DX5A: EN IEC 60079-0:2018,
EN 60079-11:2012

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

– Technical modifications reserved –

1.2 Symbols used

Warning term	- Nature and source of danger - Measures to prevent danger

Warning term	Meaning
DANGER	Immediate danger! Failure to observe **will result** in death or serious injury.
WARNING	Possible danger! Failure to observe **may result** in death or serious injury.
CAUTION	Dangerous situation! Failure to observe **may result** in slight or moderate injury.

☞ NOTE – Tips and information for the user in order to ensure trouble-free operation.

1.3 Qualification of personnel

Installation, commissioning, operation, maintenance, decommissioning and disposal may be carried out only by appropriately qualified specialist personnel.

Work on electrical components must be performed only by a qualified electrician and in accordance with the applicable regulations and guidelines.

1.4 Limitation of liability and warranty

Failure to observe the instructions or technical regulations, improper use and use not as intended, alteration of or damage to the device as well as incorrect installation of signal connections or ground potential connections will result in the forfeiture of warranty and liability claims.

1.5 Intended use

- The hydrostatic probes have been designed especially for shipbuilding and offshore applications with rough environmental and operation conditions. The probes are suitable for level measurement of fluids or pasty media (no solids and frozen media) in open tanks, containers, or reservoirs. As medium all fluids can be used which are compatible with the materials of housing, sealing and cable. Based on a rugged and reliable capacitive ceramic sensor the probe is qualified for measuring small filling heights with high accuracy. Typical areas of use are ballast tanks, fuel and oil tanks as well as service and waste water tanks. The probes as standard complies with the requirements of Det Norske Veritas (DNV). The certificates are available for download on our homepage: http:// www.bdsensors.com
- 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. 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 hydrostatic probe has to be used according to the area of application specified above! 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 of death through incorrect use** - In order to avoid accidents, use the device only in accordance with its intended use.

1.6 Safety technical maximum values

supply and signal circuit:

DX4 LMK 457:

U_i = 28 V, I_i = 93 mA, P_i = 660 mW, C_i = 74.8 nF, L_i = 0 µH plus cable inductivities 1 µH/m and cable capacities 160 pF/m (for cable by factory)

DX4A LMK 458

U_i = 28 V; I_i = 93 mA; P_i = 660 mW; C_i = 105 nF; L_i = 0 µH; 140 nF opposite GND; plus cable inductivities 1 µH/m and cable capacities 160 pF/m (for cable by factory)

application in zone 0 (p_{atm} 0.8 bar up to 1.1 bar): -20 ... 60 °C
application in zone 1 and higher: -25 ... 70 °C

DX4B-LMK 487:

U_i = 28 V; I_i = 93 mA; P_i = 660 mW; C_i = 49,2 nF, L_i = 0 µH; the supply connections have an inner capacity of max. 100 nF to the housing factory)

1.6.1. Specific conditions of use

- For hydrostatic probes made of titanium impact and friction sparks are to be avoided by contact with other bodies and objects.
- The equipment designed with connector have to be installed in such a way that the degree of protection IP 20 is always kept.
- The safety and assembly instructions contained in the operating instruction and the ambient temperature range -25 °C ≤ Ta ≤ +65 °C have to be taken into account.
- The device may be operated in explosive atmospheres which requires equipment of Category 1 only when there are atmospheric conditions (temperature of -20 °C to +60 °C, pressure of 0.8 bar to 1.1 bar).

DX5A LMK 458H:

U_i = 28 V; I_i = 93 mA; P_i = 660 mW; C_i = 94,6 nF; L_i = 0 µH; 110 nF opposite GND; plus cable inductivities 1 µH/m and cable capacities 160 pF/m (for cable by factory)

1.6.2. Specific conditions of use

- The ambient temperature range is fixed from -25 °C to + 70°C.
- The safety and assembly notes contained in the operating instructions have to be observed.
- For devises made of titanium impact and friction sparks are to be avoided by contact with other bodies and objects.

permissible temperatures for environment:

DX14 LMK 457:
application in zone 0 (p_{atm} 0.8 bar up to 1.1 bar): -20 ... 60 °C
application in zone 1 and higher: -25 ... 70 °C
application in zone 20: -20 ... 80°C

DX14A LMK 458, DX15A LMK 458H:
application in zone 0 (p_{atm} 0.8 bar up to 1.1 bar): -20 ... 60 °C
application in zone 1 and higher: -25 ... 70 °C

DX14B-LMK 487
application in zone 0:
(p_{atm} 0.8 bar up to 1.1 bar): -20 ... 60 °C
application in zone 1: -25 ... 65 °C

1.7 Package contents

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

- hydrostatic probe
- 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.

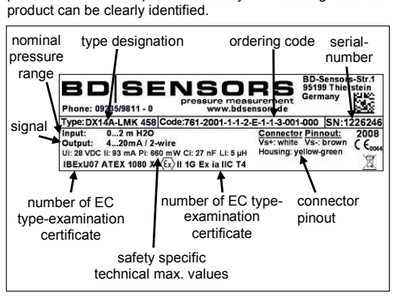


Fig. 1 manufacturing label- example

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

3. Mechanical installation

3.1 Mounting and safety instructions

DANGER	**Danger of death from electric shock or explosion** - Disconnect the device from the power supply. - Install equipotential bonding along the entire length of the line, both inside and outside the explosion hazard area. - Do not install the device while there is a risk of explosion.
WARNING	**Danger of injury from media escaping under pressure** - Install in an unpressurised state. Depressurise the system.

- 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)
- 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!
- The probe must be installed in such a way that rubbing or impact of the sensor head (sensor element), e. g. against a tank wall, is prevented. It is also important to consider the operating conditions such as flow conditions. This applies especially to probes with cable outlet and devices with a pipe extension with a length of more than 2.8 m
- Excessive dust deposits (over 5 mm) and a complete dust covering must be avoided for screw-in and flange versions!

☞ 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!

☞ When placing the probe into operation or after maintenance work, the probe has to be submerged slowly into the medium! A rough immersion into the medium can damage or destroy the diaphragm.

☞ For installations outdoor and in damp areas following these instructions for screw-in and flange versions:

- Choose an assembly position, which allows the flow-off of splashed water and condensation.
- 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!

☞ Take note for screw-in and flange transmitter 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 demage.

☞ 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.

3.3 Installation steps for probe

- Install the device according to your demands.

☞ Usually, the probe is delivered without mounting accessories. But BD SENSORS offers different accessories on request e.g. mounting clamp, terminal clamp or mounting flange.

☞ Do not use freely suspended probes with an FEP cable if effects due to highly charging processes are expected.

3.4 Installation steps for flange transmitter

- Please ensure that the mounting thread is clean and free of damage.
- Check to ensure that the O-ring fits properly in the groove.
- Screw in the mounting thread of the transmitter in the transmitter flange.
- Next, tighten it by an open-end wrench. (approx. 25 Nm)
- Install the flange according to your demands.

☞ If a new transmitter flange is needed, it can be ordered from BD SENSORS.

3.5 Installation steps for screw-in transmitter

- Please ensure that the mounting thread is clean and free of damage.
- Check to ensure that the O-ring fits properly in the groove.
- Ensure that the sealing surface of the taking part e.g. welding socket is perfectly smooth and clean.
- Screw the device in the corresponding thread by hand.
- Next, tighten it by an open-end wrench

G3/4": approx. 15; Nm G1": approx. 20; Nm G1 1/2": approx. 25 Nm

3.6 Removing the protection cap (for probe)

For the protection of the diaphragm, some of the probes have a plugged-on protection cap. If the device shall be used in high-viscosity media such as sludge, a removal of the cap before start-up is necessary. Thus, the sensor becomes flush and the medium will attain quickly to the diaphragm.

☞ If it is necessary for your application to remove the protection cap, this has to be done with utmost care. To prevent a damage of the diaphragm, please follow the instructions below:

Removal by hand

- Hold the probe in a way that the protection cap points upwards.
- Hold the probe with one hand on the sensor section (1).
- Remove the protection cap (2) with the other hand.

Removal with a tool (recommended)

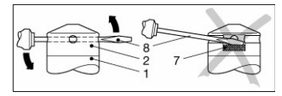


Fig.2 removal of protection cap

- Hold the probe in a way that the protection cap points upwards.
- Slide a small tool such as a screwdriver (8) straight through two opposite drill holes in the protective cap (2).
- Lever it off by moving up the handle of the screwdriver.

☞ Make sure that the sensor (7) under the protection cap will not be damaged!

4. Special regulations for IS-areas

4.1 Protection against electrostatic charge hazards

Different types of the device partially consist of chargeable plastic components. These are, in particular, the carrying and connection cables, terminal boxes as well as housing enclosures. 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 probe. It points once more to the hazard of electrostatic charging.

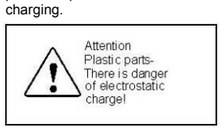


Fig. 3 warning sign

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

4.2 Hit or friction sparks device in titanium

DANGER	**Danger of death from explosion** - Danger on hydrostatic probes out of titanium caused by hit or friction sparks by contact with other bodies or objects - avoid commuting or swinging of the probes

4.3 Overvoltage protection

If the probe 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).

4.3 Schematic circuit

The operation of an intrinsically safe probe 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 probe.

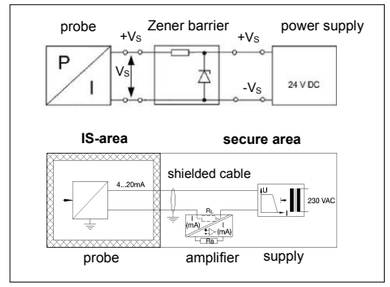


Fig. 4 Circuit diagrams

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

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 breakdown diodes as protective components. Subsequently, the operating voltage is applied to the transmitter and, depending on the pressure, a particular signal current flows.

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

4.5 Selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage $V_{S\ min}$ of the transmitter must not fall short. 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 linear bonding, note that the terminal voltage of the transmitter will decrease like it does with a Zener barrier. Furthermore, you have to note that the supply will additionally 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 transmitter. The 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 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 have to be chosen.

☞ When selecting the supplied devices / Zener barrier, 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.

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} ± 5%. This results in:

- greatest supply voltage: $V_{Sup\ max}$ = 24 V * 1.05 = 25.2 V
- smallest supply voltage: $V_{Sup\ min}$ = 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:
  $V_{ab\ barrier}$ = 295 Ω * 0.02 A = 5.9 V (with full conduction)
- Terminal voltage at the transmitter with Zener barrier:
  $V_{KI} = V_{Sup\ min} – V_{ab\ barrier}$ = 22.8 V – 5.9 V = 16.9 V
- Minimum supply voltage of the transmitter (according to data sheet):
  $V_{KI\ min}$ = 12 V_{DC} (corresponding to $V_{B\ min}$)

Condition:

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

Result:

The terminal voltage of the probe with Zener barrier lies at 16.9 V and is therefore higher than the minimum supply voltage of the probe which lies at 12 V_{DC}. This means, the Zener barrier has been selected correctly regarding the supply voltage.

☞ 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	**Danger of death from electric shock** - Switch off the power supply before installing the device!
DANGER	**Danger of death from explosion** - Riskof explosion if the operating voltage is too high (max. 28V_{DC})! - Connect the device as described in the user manual

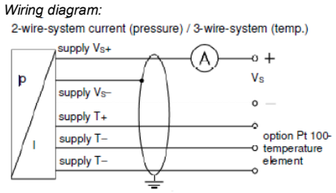
Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration:

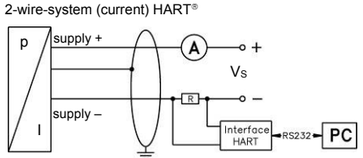
Electrical connection	cable colours (IEC 60575)
Supply +	WH (white)
Supply □	BN (brown)
Supply T+ (with Pt 100)	YE (yellow)
Supply T– (with Pt 100)	GY (grey)
Supply T– (with Pt 100)	PK (pink)
Shield	gnye (green-yellow)

Wiring diagram:

2-wire-system current (pressure) / 3-wire-system (temp.)



2-wire-system (current) HART®



☞ A minimum static bending radius has to be complied with. For static installation use the 10-fold cable diameter, for dynamic applications use the 20-fold 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 probes, the cable shield must be connected to earth potential. Use the appropriate grounding clamps for this. Pay attention to a low-impedance connection. Avoid potential differences (earth potential) between measuring and connection points, because this can lead to a defect in the probe. To avoid this, use a suitable connection technology or suitable equipotential bonding.

☞ For a 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.

☞ If a transition is desired from a probe cable with gauge tube to a cable without gauge tube, we recommend our terminal box KL 1 or KL 2.

☞ Usually, the required cable is included in the scope of delivery. If it is although necessary to connect an existing or special cable, the total resistance will increase. For applications, where this additional resistance of the connecting cable could cause problems, this cable has to be checked with the following calculation.

$$R_L = \frac{\rho \cdot 2 \cdot l}{A}$$

with R_L: resistance of connecting cable in Ω
ρ: specific resistance in Ω mm²/m
l: cable length in m
A: cross section of conductor in mm²

$$V_{tot} = (R_{L1} + R_{L2} + \ldots + R_{load}) \cdot 0.02\,A$$

with V_{tot}: total voltage drop
R_{load}: load resistance (to be taken out of the current data sheet)

following condition has to be fulfilled:

$$V_S > V_{tot} + V_{S\,min}$$

with V_S: planned supply voltage
$V_{S\,min}$: minimal supply voltage (to be taken out of the current data sheet)

6. Characteristics

6.1 HART® communication (in H-devices)

DANGER	**Danger of death from explosion** - The intrinsically safe circuit for connecting a HART® communications interface (HART® communicator or HART® modem) may be broken only if there is no risk of an explosion.

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). It consists of HART®-modem, connecting cables as well as configuration software and allows a simple and time-saving configuration of all parameters. (The software is compatible with all Windows®-systems from Windows 98 and higher.)

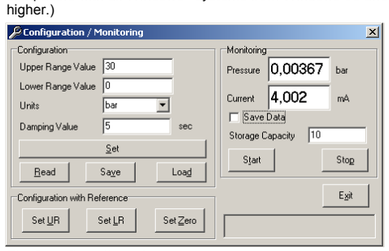


Fig. 6 configurationsoftware

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.

6.2 Accuracy 0.1 % FSO

Devices with an accuracy of 0.1 % FSO have microcontrolled electronics for processing and improving the signal. As a matter of principle, the processing takes more time than for analogue sensors, which have only an amplifier. Due to this longer response time, the output signal follows the measured value discontinuously. For relatively stable measuring values, this characteristic is secondary. Please compare the specification for the response time in the data sheet.

7. Initial start-up

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

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

☞ 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. Placing out of service

WARNING	**Danger of injury from media escaping under pressure.** - Disassemble in an unpressurised state. - Depressurise the system
CAUTION	**Danger of injury from aggressive media.** - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing, e.g. gloves, goggles.

9. Maintenance

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 without supply.

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 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.

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

10. Service / Repair

10.1 Recalibration

During the life-time of a probe, 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.

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.

Caution	**Danger of injury from pollutants** - If the device has come into contact with pollutants, wear suitable protective clothing, e.g. gloves, goggles, when cleaning it.

11. Disposal

The device must be disposed according to the European Directives 2002/96/EG and 2003/108/EG (on waste electrical and electronic equipment) Waste of electrical and electronic equipment may not be disposed by domestic refuse!

☞ 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.

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 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.

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.

If the transmitter contains the separate Pt100 temperature sensor, the following ratings of the intrinsic safety Ex ia IIC must be taken into account:

	Ui	**30 V DC**
	Ii	**54 mA**
	Pi	**405 mW**
Effective inner capacity	**Ci**	**negligible**
Effective inner inductivity	**Li**	**negligible**

15. Error handling

Malfunction	Possible cause	Error detection / corrective
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
wrong or no output signal	manually, thermical or chemically damaged cable	check the cable; a possible consequence of a damaged cable is pitting corrosion on the stainless steel housing; if you determine this please return the device to BD SENSORS for repair

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	**Danger of death from explosion** - 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..