

Hammer Union Pressure Transmitter HU 300 for IS-areas



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1. General information

1.1 Information on the operating manual

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

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

For the installation, maintenance and cleaning of the device, you must absolutely observe the relevant regulations and stipulations on explosion protection (VDE 0160, VDE 0165 or EN 60079-14) as well as the occupational safety provisions. The device was constructed acc. to standards EN60079-0:2006, EN60079-11:2007 and EN60079-26:2004.

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

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

1.5 Intended use

- This operating manual applies to devices with explosion protection approval and is intended for the use in IS-areas. A device has an explosion protection approval if this has been specified in the purchase order and confirmed in our order confirmation. In addition, the manufacturing label contains the -symbol.
- It is the operator's responsibility to check and verify the suitability of the device for the intended application. 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!
- Permissible media are gases or liquids (no solids and frozen media), specified in the data sheet. In addition it has to be ensured, that this medium is compatible with the media wetted parts.
- The technical data listed in the current data sheet are engaging 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!

1.6 Safety technical maximum values

EC-type examination certificate: IBExU08ATEX1127 X

Device: DX18 HU 300

The marking: II 1/2G Ex ia IIC T4

permissible temperatures for environment
zone 0 (p_{atm} 0.8 bar up to 1.1 bar): -20 ... 60 °C
zone 1: -25 ... 70 °C

$U_i = 28 \text{ V}$; $I_i = 100 \text{ mA}$; $P_i = 700 \text{ mW}$; $C_i \leq 1 \text{ nF}$;
 $L_i \leq 5 \mu\text{H}$; plus cable inductivities 1 μH/m and cable capacities 150 pF/m (for mounted cable cap. by factory), the supply connections have an inner capacity of max. 27 nF to the housing.

1.7 Package contents

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

- Pressure Transmitter
- 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.

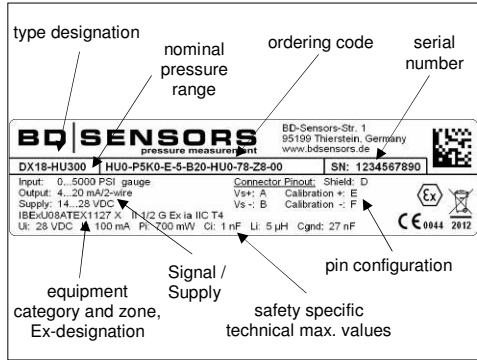


Fig. 1 manufacturing label

! 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/products/download/certificates>
 - 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!
 - It is prohibited to open a device with field housings in the presence of explosion hazards.

! 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!

! Maybe connector protection.

! 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!

! For devices with gauge reference in the housing (small hole next to the electrical connection), install the device in such a way, that the gauge reference is protected from dirt and moisture. Should the device be exposed to fluid admission, the functionality will be blocked by the gauge reference. An exact measurement in this condition is not possible. Furthermore this can lead to damages on the device.

- For gauge pressure measurements in humid surroundings (rain, splash-water, etc.), we recommend as electrical connection a cable gland (IP 67) or a cable outlet (IP 68) with vented cable. It is also possible to have the device re-equipped at BD SENSORS to these connections.
- 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 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.

Cable installation:

The device's connecting cable has to be installed tightly and has to be fixed by the appropriate fastening material.

4. Special regulations for IS-areas

4.1 Overvoltage protection

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

4.2 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.

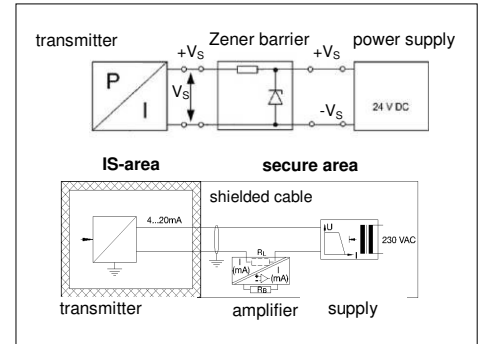


Fig. 2 circuit diagrams

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

4.3 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. Then the operating voltage is applied to the transmitter and, depending on the pressure, a particular signal current will flow.

DANGER! 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.

4.4 Functional selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage $V_{S \text{ min}}$ 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 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.

4.5 Test criteria for the selection of the Zener barrier

In order not to fall below $V_{S \text{ min}}$, 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 should be chosen.

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 inter-connection of intrinsically safe components remains intrinsically safe.

4.6 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:
 $V_{S \text{ up max}} = 24 \text{ V} * 1.05 = 25.2 \text{ V}$

- smallest supply voltage:
 $V_{S \text{ up min}} = 24 \text{ V} * 0.95 = 22.8 \text{ V}$

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):
 $V_{\text{ab barrier}} = 295 \Omega * 0.02 \text{ A} = 5.9 \text{ V}$

- terminal voltage at the transmitter with Zener barrier:
 $V_{KI} = V_{S \text{ up min}} - V_{\text{ab Barriere}} = 22.8 \text{ V} - 5.9 \text{ V} = 16.9 \text{ V}$

- minimum supply voltage of the transmitter, (according to data sheet):
 $V_{KI \text{ min}} = 12 \text{ V}_{DC}$ (corresponding to $V_{S \text{ min}}$)

Condition:

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

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_{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! Install the device only when depressurized and currentless!

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

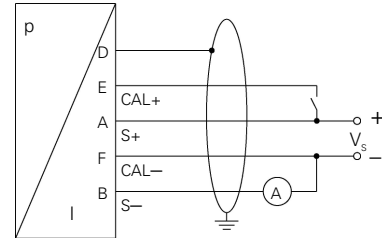
Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration:

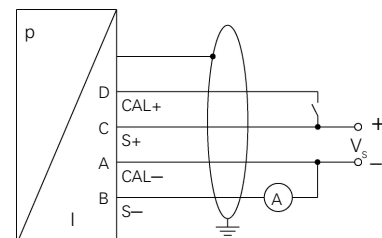
Electrical connections	MIL / Bendix (6-pin)	Glenair (4-pin)	cable colours (DIN 47100)
Supply +	pin A	pin C	wh (white)
Supply -	pin B	pin B	bn (brown)
Calibration +	pin E	pin D	pn (pink)
Calibration -	pin F	pin A	gr (grey)
Shield	cable shield/for 2-wire: pin D	plug housing	gn/ye (green / yellow)

wiring diagrams:

2-wire-system (current) MIL / Bendix



2-wire-system (current) Glenair



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

Obtaining an 80 % calibration signal:

For producing an 80 % calibration signal, please apply in pressureless mode a voltage of min. 5 V to the connections CAL+ and CAL-. The max. voltage has to be equated with the device's max. allowed operating voltage. By applying the voltage to CAL+ and CAL-, an additional current of 12.8 mA is issued, resulting in a total current of 16.8 mA. For Ex devices, it has to be observed that the same source of supply has to trigger the calibration signal and supply the signal circuit.

6. Initial start-up

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

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

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

7. 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.

8. Maintenance

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

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

9. Service / Repair

9.1 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.

9.2 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: returrn@bdsensors.de. 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.

10. 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!



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.

11. Warranty conditions

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

12. 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 ampere meter (signal input)	inspect the ampere meter (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 (caution: 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, thermal or chemically damaged cable	check the cable (a possible consequence of a damaged cable is pitting corrosion on the stainless steel housing); 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! 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!

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/products/download/certificates>.
 Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

14. EC-type examination certificate

<p style="text-align: center;">IBExU Institut für Sicherheitstechnik GmbH An-Institut der TU Bergakademie Freiberg</p> <p>[1] EC-TYPE EXAMINATION CERTIFICATE according to Directive 94/9/EC, Annex III</p> <p style="text-align: center;">(Translation)</p> <p>[2] Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres, Directive 94/9/EC</p> <p>[3] EC-Type Examination Certificate Number: IBExU08ATEX1127 X</p> <p>[4] Equipment: Pressure measuring Device type DX18 HU 300</p> <p>[5] Manufacturer: BD SENSORS GmbH</p> <p>[6] Address: BD-Sensors-Str. 1 95199 Thierstein GERMANY</p> <p>[7] This equipment mentioned under [4] and any acceptable variation thereto are specified in the schedule to this EC-Type Examination Certificate.</p> <p>[8] IBExU Institut für Sicherheitstechnik GmbH, NOTIFIED BODY number 0637 in accordance with article 9 of the Council Directive 94/9/EC of 23rd March 1994, certifies that the under [4] mentioned equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive. The examination and test results are recorded in confidential test report IB-08-3-293 of 21st November 2008.</p> <p>[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-0:2006, EN 60079-11:2007 and EN 60079-26:2004.</p> <p>[10] If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified under [17] in the schedule to this EC-Type Examination Certificate.</p> <p>[11] This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this directive apply to the manufacture and supply of this equipment.</p> <p>[12] The marking of the equipment mentioned in [4] shall include the following: II 1/2G Ex ia IIC T4</p> <p>IBExU Institut für Sicherheitstechnik GmbH Fuchsmühlentweg 7 - 09599 Freiberg, Germany ☎ +49 (0) 3731 3805-0 - 📠 +49 (0) 3731 23650</p> <p>Authorized for certifications Explosion protection -  - S881 - (ID no. 0637)</p> <p>Freiberg, 24th November 2008</p> <p>By order  (Dr. Lösch)</p> <p>Schedule</p> <p style="text-align: right;">Page 1 of 2 IBExU08ATEX1127 X</p>	<p style="text-align: center;">IBExU Institut für Sicherheitstechnik GmbH An-Institut der TU Bergakademie Freiberg</p> <p>[13] Schedule</p> <p>[14] to the EC-TYPE EXAMINATION CERTIFICATE IBExU08ATEX1127 X</p> <p>[15] Description of equipment The pressure measuring device DX18 HU 300 describes a pressure transmitter in the high-grade steel enclosure with process tap. The equipment can be used in the separating wall any divided each other zone 0 and 1. As power supply specified intrinsically safe power supplies of the category "ia" have to be used.</p> <p>Category 1/2 equipment The process connection of the pressure measurement device may be employed in zone 0 (temperature from -20 °C to +60 °C, pressure from 0.8 bar to 1.1 bar). The electrical connection is set up in zone 1.</p> <p>Technical Data</p> <table border="0"> <tr> <td>Ambient temperature range</td> <td>-25 °C to +70 °C</td> </tr> <tr> <td>Supply electric circuit</td> <td>in type of protection Intrinsic Safety Ex ia IIC</td> </tr> <tr> <td>(VS+ and VS-)</td> <td>U_i 28 V DC</td> </tr> <tr> <td></td> <td>I_i 100 mA</td> </tr> <tr> <td></td> <td>P_i 700 mW</td> </tr> <tr> <td></td> <td>C_i 1 nF</td> </tr> <tr> <td></td> <td>L_i 5 µH</td> </tr> </table> <p>effective inner capacity effective inner inductivity</p> <p>Calibrate input (Cal+ and Cal-)</p> <table border="0"> <tr> <td></td> <td>in type of protection Intrinsic Safety Ex ia IIC</td> </tr> <tr> <td></td> <td>U_i 28 V DC</td> </tr> <tr> <td></td> <td>I_i 100 mA</td> </tr> <tr> <td></td> <td>P_i 700 mW</td> </tr> <tr> <td></td> <td>C_i 1 nF</td> </tr> <tr> <td></td> <td>L_i 5 µH</td> </tr> </table> <p>effective inner capacity effective inner inductivity</p> <p>The supply connections have an inner capacity of max. 27 nF opposite the housing.</p> <p>[16] Test report The test results are recorded in the test report IB-08-3-293. The test documents are part of the test report and listed there.</p> <p>Summary of the Test Result: The pressure measuring device DX18 HU 300 fulfills the requirements of type of protection intrinsically safety 'ia' on an electrical component for Equipment Group II Category 1/2G, Explosion Group IIC and temperature class T4.</p> <p>[17] Special conditions The safety and assembly notes contained in the operating instructions and the ambient temperature range -25 °C ≤ T_a ≤ +70 °C have to be observed.</p> <p>[18] Essential Health and Safety Requirements Confirmed by norms (see [9]).</p> <p>By order  (Dr. Lösch)</p> <p style="text-align: right;">Freiberg, 24th November 2008</p> <p style="text-align: right;">Page 2 of 2 IBExU08ATEX1127 X</p>	Ambient temperature range	-25 °C to +70 °C	Supply electric circuit	in type of protection Intrinsic Safety Ex ia IIC	(VS+ and VS-)	U _i 28 V DC		I _i 100 mA		P _i 700 mW		C _i 1 nF		L _i 5 µH		in type of protection Intrinsic Safety Ex ia IIC		U _i 28 V DC		I _i 100 mA		P _i 700 mW		C _i 1 nF		L _i 5 µH	<p style="text-align: center;">IBExU Institut für Sicherheitstechnik GmbH An-Institut der TU Bergakademie Freiberg</p> <p>[1] 1st Addition to EC-TYPE EXAMINATION CERTIFICATE IBExU08ATEX1127 X according to Directive 94/9/EC, Annex III</p> <p style="text-align: center;">- Translation -</p> <p>[2] Equipment: Pressure Measuring Device Type DX18 HU300</p> <p>[3] Manufacturer: BD SENSORS GmbH</p> <p>[4] Address: BD-Sensors-Str. 1 95199 Thierstein GERMANY</p> <p>[5] Addition / Modification The additions/modifications of the pressure measuring device DX18 HU300 compared with the already certified equipment concern the production of an additional device type with a permanently connected cable and an additional EMC-board. All other parts relevant for the explosion protection remain unchanged. The effective inner inductivities and capacities of these device increase by the cable inductivities of 1 µH/m and the cable capacities of 150 pF/m.</p> <p>[6] Test Report The proof of the explosion protection of the equipment stated under [2] is documented in the test report IB-09-3-208 of 3 August 2009. The test documents are part of the test report.</p> <p>[7] Test Result IBExU certifies that the equipment stated under [2] fulfils the Essential Health and Safety Requirements given in Annex II of the Directive 94/9/EC by compliance with EN 60079-0:2006, EN 60079-11:2007 and EN 60079-26:2004. The equipment stated under [2] fulfils the requirements of explosion protection for electrical equipment in type of protection Intrinsic Safety 'ia', Explosion Group IIC, Temperature Class T4 for Equipment Group II, Category 1/2G. The marking of the equipment stated under [2] shall include unchanged the following: II 1/2G Ex ia IIC T4</p> <p style="text-align: center;">This addition is only valid in combination with the EC-Type Examination Certificate IBExU08ATEX1127 X of 24 November 2008.</p> <p>IBExU Institut für Sicherheitstechnik GmbH Fuchsmühlentweg 7 - 09599 Freiberg, Germany ☎ +49 (0) 3731 3805-0 - 📠 +49 (0) 3731 23650</p> <p>Authorized for certifications - Explosion protection -  - S881 - (Identification No. 0637)</p> <p>Freiberg, 3 August 2009</p> <p>By order  (Dr. Wagner)</p> <p style="text-align: right;">Page 1 of 1 1st Addition to IBExU08ATEX1127 X</p>
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 The pressure transmitters HU 300 fulfil the requirements of directive 94/9/EG. The certificates are available for download on our homepage: <http://www.bdsensors.com/download/certificates>.