

Operating Manual

Hammer Union Pressure Transmitters for IS-areas

DX18 HU 300, DX18 HU 400



DX18 HU 300



DX18 HU 400:
HART
COMMUNICATION FOUNDATION

READ THOROUGHLY BEFORE USING THE DEVICE KEEP FOR FUTURE REFERENCE

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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

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

Download this by accessing www.bdsensors.com or request it by e-mail or phone: info@bdsensors.de phone: +49 (0) 92 35 / 98 11 0

The IS versions of our products are variants of the standard products.

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 (VDE 0160, 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:

EN60079-0:2012
EN60079-11:2012
EN60079-26:2007

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 will result in death or serious injury.
	- Possible danger! - Non-compliance may result in death or serious injury.
	- Hazardous situation! - Non-compliance may result in 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 devices are used to convert the physical parameter of pressure into an electric signal.

The pressure transmitter HU 300 has been especially developed for extreme operating conditions in the petrochemical industry (on- and offshore sites).

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 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 | phone: +49 (0) 92 35 / 98 11 0
BD|SENSORS assumes no liability for any wrong selection and the consequences thereof!

Permissible media are gases or liquids, which are compatible with the media wetted parts described in the data sheet.

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.com>

	Danger through incorrect use - In order to avoid accidents, use the device only in accordance with its intended use.
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1.4 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.

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

NOTE - Do not throw or drop the device!

NOTE - Excessive dust accumulation (over 5 mm) 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.

1.6 Safety-Related Maximum Values

The supply connections have an inner capacity of max. 27 nF to the housing.

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

DX18 HU 300

U_i = 28 V; I_i = 100 mA; P_i = 700 mW; C_i ≤ 1 nF; L_i ≤ 5 µH;
plus cable inductivities 1 µH/m and
cable capacities 150 pF/m (for cable by factory)

DX18 HU 400

U_i = 28 V; I_i = 93 mA; P_i = 660 mW; C_i ≤ 0 nF; L_i ≤ 0 µH

1.7 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:

- Hammer Union pressure transmitter
- this operating manual

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.

Type designation	Ordering code	Serial number

Fig. 1: Manufacturing label

NOTE - The manufacturing label must not be removed!

The marking for devices with explosion-protection approval has to include following information:

EC-type examination certificate IBExU08ATEX1127 X

Designation:

DX18 HU 300: II 1/2G Ex ia IIC T4 Ga/Gb
DX18 HU 400: II 1G Ex ia IIC T4 Ga

3. Mounting

3.1 Mounting and Safety Instructions

	Danger of death from explosion, airborne parts, leaking fluid, electric shock - Always mount the device in a depressurized and de-energized condition! - Do not install the device while there is a risk of explosion.
	Danger of death from improper installation - Installation must be performed only by appropriately qualified persons who have read and understood the user manual.

NOTE - The technical data listed in the EC-type examination certificate are binding. Download this by accessing www.bdsensors.com or request it by e-mail or phone: 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 - Make sure that an equipotential bonding is in place for the entire course of the line, both in-side and outside the intrinsic area.

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.

NOTE - Do not mount the device in a pneumatic flow rate!

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.

NOTE - In hydraulic systems, position the device in such a way that the pressure port points upward (ventilation).

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 - Do not remove the packaging or protective caps of the device until shortly before the mounting procedure. Protective caps must be kept! Dispose of the packaging properly!

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.

3.2 Mounting Steps for WECO®-Anschlüsse

	Danger of injury - Due to wrong installation - Mount the pressure port according to the manufacturer's specifications of your WECO® connection.
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4. Electrical Connection

4.1 Connection and Safety Instructions

	Danger of death from electric shock or explosion - Explosion hazard if the operating voltage is too high (max. 28 V _{DC}) or for DX18 HU 400 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! (according data sheet EC-type examination certificate)
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- ✓ The limit values listed in the EC-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).

- ✓ The devices connecting cable has been installed tightly and is fixed by the appropriate fastening material.

NOTE - for devices with cable outlet

- When routing the cable, following bending radiuses have to be complied with:

cable without ventilation tube:

static installation: 5-fold cable diameter
dynamic application: 10-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 air 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.

- 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).

NOTE - for DX18 HU 400 with field housing:

- The terminal clamps are situated under the metal cap. To install the device electrically, the cap must be screwed off. The connection must be made such that the isolation distances according to standard are observed and that loosening of the connecting lines is impossible.
 - It must be ensured that the external diameter of the cable used is within the permissible clamping range (code 880: Ø 5 ... 14 mm). Moreover you have to ensure that it lies in the cable gland firmly and cleftlessly!
 - Before the cap is screwed on again, the O-ring and the sealing surface on the housing have to be checked for damages and if necessary to be changed! Afterwards screw the metal cap on by hand and make sure that the field housing is firmly locked again.
- NOTE** - Use a shielded and twisted multicore cable for the electrical connection.

4.2 Conditions for the IS-area

Danger generated by electrostatic charging

	Danger of death from explosion - Explosion hazard due to spark formation from electrostatic charging of plastic components. - For devices with cable outlet, the cable must be installed tightly. - Do not clean the device and, if applicable, the connection cable, in a dry state! Use a moist cloth, for example.
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The following warning sign is affixed on devices with plastic components.

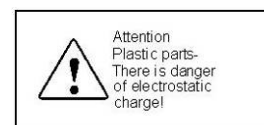


Fig. 2: Warning sign

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 or 2 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.

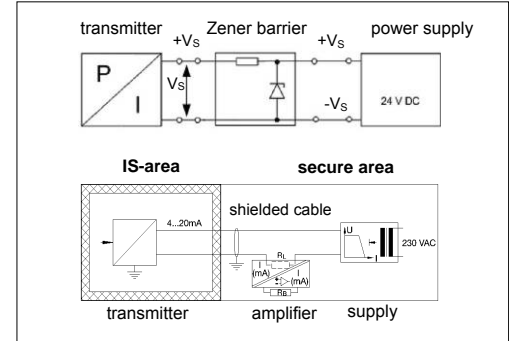


Fig. 3 circuit diagrams

NOTE - Observe item (17) of the type-examination certificate which specifies special conditions for intrinsically safe operation.

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.

	Danger of death from explosion - Operation of intrinsically safe devices as zone-0 equipment only with ungrounded and galvanically isolated power supply.
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Functional selection criteria for Zener barriers and galvanic power supply

The minimum supply voltage V_{Smin} 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.

Test criteria for the selection of the Zener barrier

In order not to fall below V_{Smin} , 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.

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

NOTE for HU 400 – 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.

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:

$$\text{- maximum supply voltage: } V_{Sup\ max} = 24\ V * 1.05 = 25.2\ V$$

$$\text{- minimum supply voltage: } V_{Sup\ min} = 24\ V * 0.95 = 22.8\ V$$

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

$$\text{- voltage drop at the barrier (with full conduction): } V_{ab\ barrier} = 295\ \Omega * 0.02\ A = 5.9\ V$$

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

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

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. 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.

