713

Level sensing pressure transmitter
Operating instructions

Huba Control

General Notes

Dear customer,

for reasons of clarity the instructions does not contain detailed information about all types of products and cannot take into account every conceivable case of installation, operation or maintenance.

If you require further information or should problems occur which are not sufficiently explained in the instructions, you can consult our homepage www.hubacontrol.com to obtain the necessary information.

May we also draw your attention to the fact that the contents of the operating instructions are not part of a previous or existing agreement, approval or legal relationship or an amendment thereof. All obligations of the Huba Control AG result from the contract of purchase which also contains the full and solely valid warranty agreement. These contractual warranty conditions are neither extended nor restricted by the contents of the operating instructions.

⚠ CAUTION

Intrinsically safe devices lose their license as soon as they are operated on circuits which do not meet the requirements of the examination certificate valid in your country. The device may be operated with high pressure and corrosive media. Therefore serious injuries and/or considerable material damage cannot be ruled out in the event of improper handling of the device.

⚠ The equipment may only be used for the purposes specified in this operating instructions.

Construction

The level sensor consists of a ceramic measuring cell (relative and absolute pressure) with an amplified electronic and is adjusted in the requested pressure range. The sensor, the electronic and the connection cable are hermetically encapsulated in a stainless steel case. The measuring diaphragm is protected from outside influences by a protection cover. A venting pipe is included in the connection cable with humidity protection element for the relative version. The wide temperature range of the level sensor is compensated.

Mode of operation

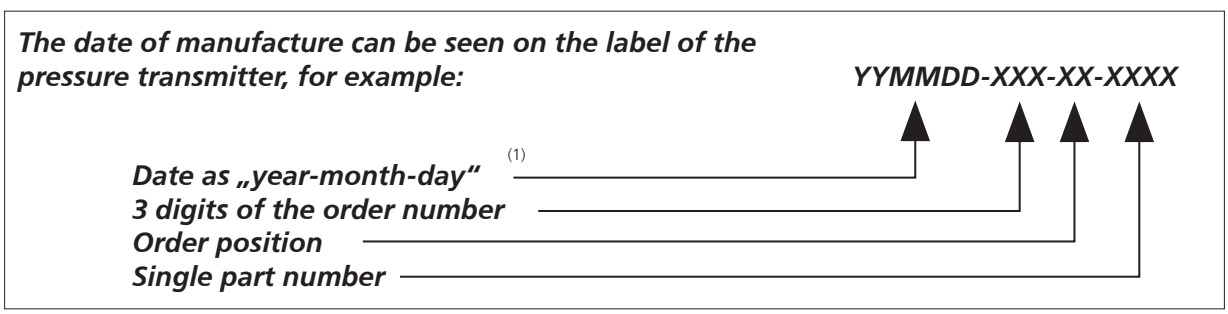
The pressure of the medium acts on the keramic sensor which is deflected to transmit the pressure to the piezo-resistive bridge in the measuring sensor. The output signal of the sensor is fed to an electronic circuit which converts it into a standard voltage and current output. The hydrostatic pressure which is proportional to the submersion depth acts on the diaphragm of the sensor. This pressure is compared with the atmospheric pressure (at relative pressure).

Field of application

The level sensor type 713 is generally used for hydrostatic level measurement. All liquids specified in the data sheet are suitable for this sensor (no solids and frozen media). For further media the user is responsible to check the compatibility with the parts in contact with the medium.

Serial number setup

The date of manufacture can be seen on the label of the pressure transmitter, for example:



(1) YYMMDD - example 100912

Instructions for mounting

Qualified Personnel

are persons familiar with the insallation, assembly, commisioning and operation of the product and who have the appropriate qualifications for their activities such as:

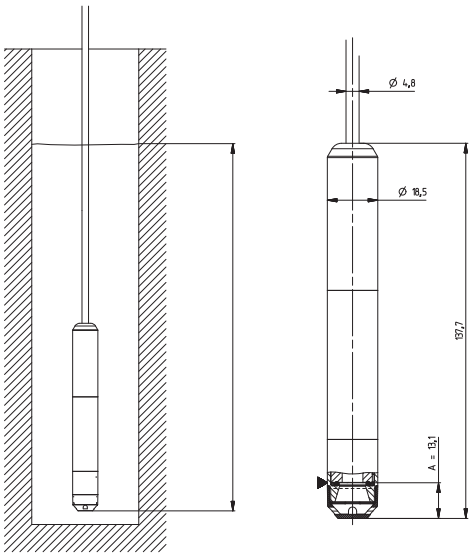
- training or instruction or authorization to operate and maintain devices/ systems according to the standard of safety technology for elecrical circuits, high pressures and corrosive as well as hazardous media.
- training or instruction according to the standards of safety engineering in the care and use of suitable safety equipment.

⚠ Only trained qualified personnel shall execute this work.

Modules which are sensitive to electrostatic charge may be destroyed by voltages which are far below the human level of perception. These voltages occur already when you touch a component or electrical connections of a module without first discharging yourself electrostatically. The damage incurred by a module as a result of an overvoltage is not usually immediately perceptible but only becomes noticeable after a long time in operation. Therefore, a suitable equipotential bonding must be guaranteed when repairing the device.

Installation

The level pressure transmitter 713 is installed hanging downwards on the cable. In moving media, the transmitter must be fixed to prevent measuring errors. This can be done with a guide tube. Make sure that the inlet openings on the protective cap of the level pressure transmitter are not soiled in order to guarantee perfect functioning.



h - Fluid level
▶ - Measurement reference height

Technische Änderungen vorbehalten I Technical data subject to change I Sous réserve de modifications techniques
Huba Control AG - Industriestrasse 17, CH-5436 Würenlos - Edition 08/2017 - 120311

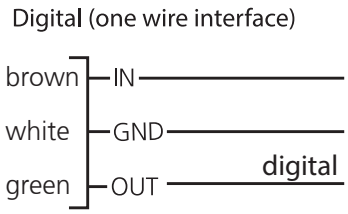
Operating conditions

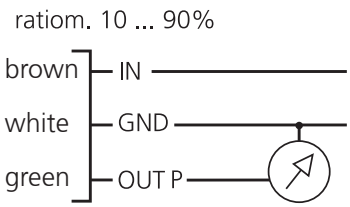
The following points should be noted particularly when using the device:

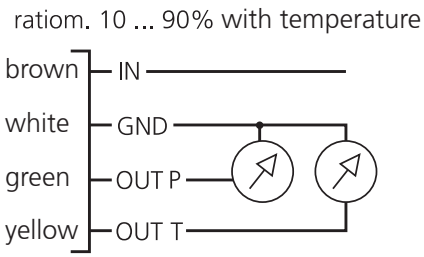
- The maximum permissible pressure pmax of the transmitter may not be exceeded.
- The temperature of the medium in contact with the transmitter may not exceed +80 °C.
- Avoid formation of ice on the process input of the transmitter because this could damage the diaphragm.
- Prevent soiling of the transmitter input.
- Avoid obstruction to the vent pipes in the special cable (influences the measuring accuracy).
- Consider the chemical resistance of sensor, case, O-ring and connection cable with the media.
- Connect the sensor to a low voltage power supply with safe separation (SELV).

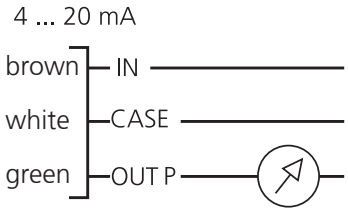
Electrical connections

The electronic GND is connected with a 1MΩ resistor to the level transmitter housing.









The case connection is connected with the level transmitter housing.

Communication interface version digital

https://www.hubacontrol.com/fileadmin/user_upload/domain1/Produkte/DE_EN_FR/713_app_note.pdf

Technical overview

Medium		Groundwater, drinking water
Temperature	Medium Storage	-20 ... +80 °C -40 ... +80 °C
Overload / rupture pressure	see Order code selection table in the data sheet	
Output 4 ... 20 mA ratiom. 10...90% Temperature output Digital version Digital 3000 ... 11000 digits	Power supply 10 ... 30 VDC 5 VDC ±10% 5 VDC ±10% 5 VDC ±10%	Load $\frac{\text{Power supply - 10 V}}{0.02\ \text{A}}$ [Ohm] > 10 kOhm / < 100 nF > 1 MOhm / < 100 nF
Polarity reversal	Short circuit proof and protected against polarity protection reversal. Each connection is protected against crossover up to max. supply voltage.	
Protection standard	IP 68, permanent immersion until max. over pressure (see Order code selection table in the data sheet)	
Protection class III		

Maintenance

The level transmitter requires no maintenance.

Calibration

The transmitter has been calibrated to the measuring range at the factory and not have to be re-calibrated.

Calculation of level

General level with relative pressure sensor: $$h = \frac{\Delta p}{\rho \cdot g}$$

General level with absolute pressure sensor: $$h = \frac{P_{TS} - P_{Baro}}{\rho \cdot g}$$

which $$P_{TS} = \frac{U_{TS} - U_{TS\_NP}}{U_{TS\_EW} - U_{TS\_NP}} \cdot \left(P_{TS\_EW} - P_{TS\_NP}\right) + P_{TS\_NP}$$

und $$P_{Baro} = \frac{U_{Baro} - U_{Baro\_NP}}{U_{Baro\_EW} - U_{Baro\_NP}} \cdot \left(P_{Baro\_EW} - P_{Baro\_NP}\right) + P_{Baro\_NP}$$

Using a second level sensor as barometric air pressure sensor

For level sensor with current output use nominal signal values for I_{TS} ... instead of variables U_{TS} ... (resp. I_{Baro} ... instead of U_{Baro} ...)

Simplification of formula for level sensor with ratiometric output:

$$P_{TS} = \frac{U_{TS} - 0.1 \cdot U_{IN}}{0.8 \cdot U_{IN}} \cdot \left(P_{TS\_EW} - P_{TS\_NP}\right) + P_{TS\_NP}$$

$$P_{Baro} = \frac{U_{Baro} - 0.1 \cdot U_{IN}}{0.8 \cdot U_{IN}} \cdot \left(P_{Baro\_EW} - P_{Baro\_NP}\right) + P_{Baro\_NP}$$

Using a second level sensor as barometric air pressure sensor

Legend:

h	level [m]	ρ	density of media [kg/m³]
g	acceleration of fall 9.80665 [m/s²]	Δp	measured relative pressure [Pa]
P_{TS}	measured pressure of level sensor [Pa]	U_{TS}	signal on level sensor output [V or mA]
P_{BARO}	measured pressure of barometer [Pa]	U_{BARO}	Signal on barometer output [V or mA]
P_{TS_NP}	minimal nominal pressure of level sensor [Pa]	U_{TS_NP}	minimal nominal signal of level sensor [V or mA]
P_{TS_EW}	maximum nominal pressure of level sensor [Pa]	U_{TS_EW}	maximum nominal signal of level sensor [V or mA]
P_{BARO_NP}	minimal nominal pressure of barometer [Pa]	U_{BARO_NP}	minimal nominal signal of barometer [V oder mA]
P_{BARO_EW}	maximum nominal pressure of barometer[Pa]	U_{BARO_EW}	maximum nominal signal of barometer [V or mA]

Specification temperature output

ratiom. 10 ... 90%

$$T_{TEMP} = T_0 + 1 \Big/ \left(a + b \cdot \ln\left(R \cdot \left[\frac{U_{IN}}{OUT\,T} - 1 \right] \right) + c \cdot \ln\left(R \cdot \left[\frac{U_{IN}}{OUT\,T} - 1 \right] \right)^3 \right)$$

T_{TEMP}	Sensor temperature [°C]	OUT T	Sensor signal [V]
T_0	-273.15 [°C]	R	20'000 [Ω]
		U_{IN}	power supply 5V ±10%

a 0.001204001
b 0.000208775
c 0.000000294

Digital

$$T_{TEMP} = \left(\frac{T_{Dig}}{255} * 200°C \right) - 50°C$$

T_{TEMP}	Sensor temperature [°C]
T_{Dig}	digital value (0 ... 255 digits)

Huba Control

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