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OEM Level sensing pressure transmitter
Operating instructions

Huba Control

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Safety Guidelines

These instructions contains notices intended to ensure personal safety, as well as to protect the products and connected equipment against damage. These notices are highlighted by the symbols shown below and graded according to severity by the following texts.

⚠ DANGER

This warning signifies an imminent danger.
Injuries or even death can arise from failing the warnings.

⚠ CAUTION

This warning signifies a potential danger.
Injuries or even death can arise from failing the warnings.

⚠ ATTENTION

This warning signifies a potential dangerous situation,
which can lead to medium or light injuries.

⚠ Only trained qualified personnel shall execute this work.

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General Notes

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NOTE

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 your local Siemens branch 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 Siemens 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.

The contents reflect the technical state at the time of going to print. Subject to technical modifications in the course of further development.

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.

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Qualified Personnel

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Are persons familiar with the installation, assembly, commissioning 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.

- for devices with explosion protection: training or instruction or authorization to be allowed to work on electrical circuits for potentially explosive systems.

- 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.

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

YYMMDD-XXX-XX-XXX

Date as „year-month-day“ (1)
3 digits of the order number
Order position
Single part number

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(1) YYMMDD - example 100912

DANGER

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Application in hazardous area (Ex) with current output 4 ... 20 mA)

The operation is acceptable into the intrinsically safe circuits only, with the following maximum values:

Power supply	**Ui 30 V**
Current	**Ii 100 mA**
Power dissipation	**Pi 750 mW**

Consider the following data:
The length of the cable, which conveys the input/output signal, must be taken in consideration because of its internal inductivity and capacity:

Internal capacitance	**Ci = 0 nF + 0.08 nF/m**
Internal inductance	**Li = 0 µH + 1.0 µH/m**

Mark in accordance acc. RL 94/9/EG (Ex) II 1 G
Protection type mark Ex ia IIC T4 Ga

The maximum allowable operating temperature T_a is from -20 to +80 C. For the applications as Category-1- apparatus the maximum allowable operating temperature should be maximum +60 C. The transmitter can be used in open tanks, channels etc.
For the applications as **Category-1- apparatus group IIC** is not allowed the critical electrostatic charging over the protection cap surface.
The valid standards and rules should to be considered during the installation of devices.

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DANGER

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Application in hazardous area with ratiom. output 10 ... 90%)

The operation is acceptable into the intrinsically safe circuits only, with the following maximum values:

Power supply	**Ui 15 V**
Current	**Ii 200 mA**
Power dissipation	**Pi 750 mW**

Consider the following data:
The length of the cable, which conveys the input/output signal, must be taken in consideration because of its internal inductivity and capacity:

Internal capacitance	**Ci = 0.5 nF + 0.08 nF/m**
Internal inductance	**Li = 0 µH + 1.0 µH/m**

Mark in accordance acc. RL 94/9/EG II 1 G
Protection type mark Ex ia IIC T4 Ga

The maximum allowable operating temperature Ta is from -20 to +80 C. For the applications as Category-1- apparatus the maximum allowable operating temperature should be maximum +60 C. The transmitter can be used in open tanks, channels etc.
For the applications as **Category-1- apparatus group IIC** is not allowed the critical electrostatic charging over the protection cap surface.
The valid standards and rules should to be considered during the installation of devices.

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Construction

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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 for the relative version. The sensor, the electronic and the connection cable are placed in a hermetic encapsulated small case.
The wide temperature range of the level sensor is compensated.

Application

The Type 712 transmitter is used for hydrostatic measurement of liquid levels, e.g. in water supply, ship installations, in the oil and gas industry etc.
The calculation of the temperature related to the power supply with NTC resistance is as follows:

T_{TEMP}	Temperature NTC [°C]	U_{TEMP}	Voltage at NTC [V]
T_0	-273.15 [°C]	R	20 [kΩ]
T_{25}	25 [°C]	R_{25}	10 [kΩ]
ß	3750 [K]	U_{IN}	4.5 ... 5.5 [V]

$$T_{TEMP} = T_0 + 1 \Big/ \left(\frac{1}{T_{25} - T_0} + \frac{\ln\left[\frac{R}{R_{25}} \cdot \left(\frac{U_{IN}}{U_{TEMP}} - 1 \right) \right]}{\beta} \right)$$

CAUTION

Consider the chemical resistance of sensor, case, O-ring and connection cable with the media.

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Calculation of level

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

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

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

Legende:

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 or mA]
P_{BARO_EW}	maximum nominal pressure of barometer [Pa]	U_{BARO_EW}	maximum nominal signal of barometer [V or mA]

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Mode of operation

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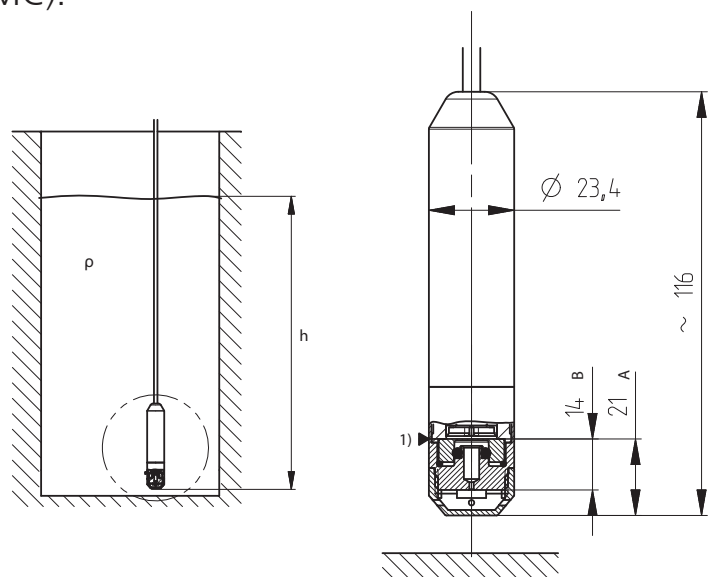
The pressure of the medium acts on the ceramic sensor which is deflected to transmit the pressure to the piezo-resistive bridge in the measuring sensor. Every sensor is compensated for changes in temperature and operates within a wide temperature range.
The output signal of the sensor is fed to an electronic 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 which acts on the other side of the sensor by means of the vent pipe in the connecting cable (at relative pressure).
The pressure level transmitter is supplied from a 10 V to 30 V DC source. Protective diodes at the input protect against reverse polarity or overvoltage. The transmitter complies with the regulations DIN EN 61 326 regarding the electromagnetic compatibility (EMC).

Installation

The level pressure transmitter 712 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.



ρ - density of media
h - Fluid level
1) - Measurement reference height
A - Distance from protection cover to the position of measuring diaphragm
B - distance from beginning of thread to the position of measuring diaphragm
(versions without protection cover)

Calibration

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

Maintenance

The level transmitter requires no maintenance.

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⚠ CAUTION

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).

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Technical overview

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Temperature	Medium	-20 ... +80 °C
	Storage	-40 ... +80 °C
Overload / rupture pressure		3 x fs

Output		Power supply	Load
4 ... 20 mA	Ex	10 ... 30 VDC	$\frac{\text{Power supply - 10 V}}{0.02\ \text{A}}$ [Ohm]
ratiom. 10 ... 90%	Ex	5 VDC ±10%	> 10 kOhm / < 100 nF
ratiom. 10 ... 90%	Ex	5 VDC ±10% wiht temp.	> 10 kOhm / < 100 nF
0 ... 10 V		12 ... 30 VDC	> 10 kOhm / < 100 nF

Polarity reversal protection	Short circuit proof and protected against polarity reversal. Each connection is protected against crossover up to max. supply voltage.
Protection standard	IP 68

Materials	
Sensor	Ceramic Al_2O_3 (96%)
Case	Stainless steel 1.4404 / AISI 316L
Cable	PE
Protection cover	PPE
Sealing material	FPM, EPDM

Test / Admissions	
Electromagnetic compatibility	CE-conform acc. EN 61326-2-3
Drinking water approval	WRAS / ACS
Ex-protection [1]	Ex II 1G Ex ia IIC T4 Ga

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[1] Max. cable length is 500 m

Electrical connections

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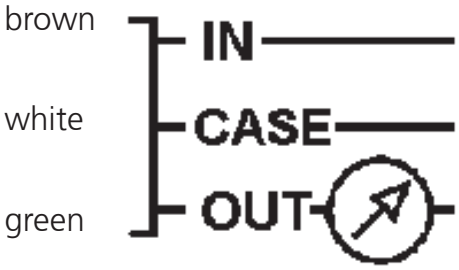
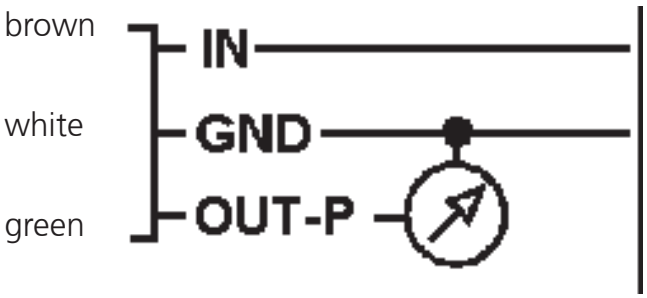
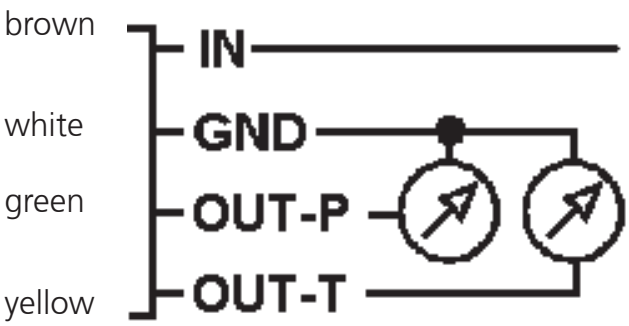
2 wire 4 ... 20 mA



3 wire ratiom. 10 ... 90%
0 ... 10 V



4 wire ratiom. 10 ... 90%



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Huba Control

Huba Control AG – Headquarters Schweiz
Industriestrasse 17, 5436 Würenlos
Telefon +41 (0) 56 436 82 00
Telefax +41 (0) 56 436 82 82
info.ch@hubacontrol.com

Huba Control AG – Niederlassung Deutschland
Schlattgrabenstrasse 24, 72141 Walddorfhäslach
Telefon +49 (0) 7127 23 93 00
Telefax +49 (0) 7127 23 93 20
info.de@hubacontrol.com

Huba Control SA – Succursale France
Rue Lavoisier, Technopôle Forbach-Sud
57602 Forbach Cedex
Téléphone +33 (0) 387 847 300
Télécopieur +33 (0) 387 847 301
info.fr@hubacontrol.com

Huba Control AG – Vestiging Nederland
Hamseweg 20A, 3828 AD Hoogland
Telefoon +31 (0) 33 433 03 66
Telefax +31 (0) 33 433 03 77
info.nl@hubacontrol.com

Huba Control AG – Branch Office United Kingdom
Unit 13 Berkshire House
County Park Business Centre
Shrivenham Road
Swindon - Wiltshire SN1 2NR
Phone +44 (0) 1993 776667
Fax +44 (0) 1993 776671
info.uk@hubacontrol.com

ww.sensor-ic.com/ TEL: 0755-83376489 FAX:0755-8337618