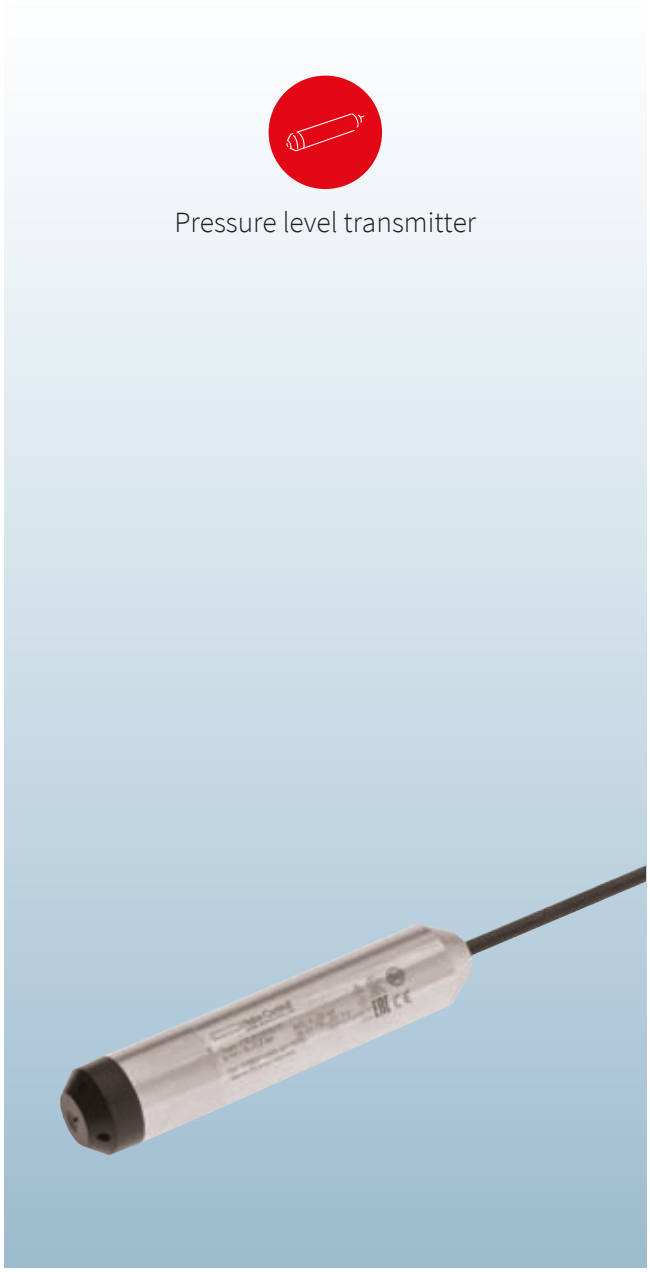
Pressure level transmitter



Huba Control

# Level sensing relative and absolute pressure transmitter

## Type 712

The level sensing pressure transmitter Type 712 is manufactured using an relative or absolute pressure measuring cell with an adjusted and amplified sensor signal and is available with various cable lengths from 2 to 30 meters. The Type 712 offers Ex protection as well as versions with integrated temperature measurement.

In addition to voltage and current outputs the Type 712 is available with ratiometric outputs.

## Pressure range

**0 ... 0.3 - 3 bar**

+ Suitable for drinking water
+ Intrinsically safe execution with voltage- and current output
+ Suitable for fitting in 1-inch pipe
+ With integrated temperature measurement

## Technical overview

| | | |
|---|---|---|
| **Pressure range** | | |
| Relative | | 0.0 ... 0.3 – 2.5 bar |
| Absolute | | 0.8 ... 1.4 – 3.0 bar |
| **Operating conditions** | | |
| Medium | | Fuel oil, ultra-light [1] SN 181 160-2 |
| | | Fuel oil, heavy [1] SN 181 160-2 |
| | | Diesel oil [1] |
| | | Benzine [1] |
| | | Drinking water (with EPDM O-ring) |
| Temperature | Medium and ambient [2] | -20 ... +80 °C |
| | Storage | -40 ... +80 °C |
| Overload | | 3x fs; max. 3 bar at 0.3 bar version |
| **Materials in contact with medium** | | |
| Case | | Stainless steel 1.4404 / AISI 316L |
| Sensor | | Ceramic $Al_2O_3$ |
| Cable | | PE-HD |
| Protection cover | | PPE, PA6 |
| Sealing material | | FPM, EPDM (for drinking water) |

**Electrical overview**

| | Output | Power supply | Load | Current consumption |
|---|---|---|---|---|
| 2 wire | 4 ... 20 mA | 10 ... 30 VDC | $< \frac{\text{Power supply} - 10\,V}{0.02\,A}$ [Ohm] | < 20 mA |
| 3 wire | 0 ... 10 V | 12 ... 30 VDC | >10 kOhm / < 100 nF | < 5 mA |
| | ratiom. 10 ... 90% | 5 VDC ±10% | > 5 kOhm / < 100 nF | < 3 mA |
| 4 wire (with temperature) | ratiom. 10 ... 90% | 5 VDC ±10% | > 5 kOhm / < 100 nF | < 3 mA |
| Polarity reversal protection | Short circuit proof and protected against polarity reversal. | | | |
| Overvoltage protection | | | 4 ... 20 mA / 0 ... 10 V | 36 VDC |
| | | | ratiom. 10 ... 90 % | 6 VDC |
| Electric strength towards case | | | | 500 VDC |
| Temperature output | | | | > 1 MOhm |

| | |
|---|---|
| **Dynamic response** | |
| Response time | < 2 ms |
| **Runtime** | |
| Time starts at the moment of application of minimal supply voltage | < 10 ms |

| | |
|---|---|
| **Electrical connection** | **Protection standard** |
| Cable PE-HD length 2, 5, 10, 15, 20, 30 m | IP 68 |

| | |
|---|---|
| **Test / Admissions** | |
| Electromagnetic compatibility | CE-conform acc. to EN 61326-2-3 |
| UL | ANSI/UL 61010-1 acc. to E325110 |
| Drinking water approval | ACS |
| | WRAS |
| Drinking water verification certificate for plastic parts | UBA guidance or KTW |
| | W270 |
| **Ex-protection** | |
| IECEx SEV 12.0006 | Ex ia IIC T4 GaX |
| SEV 12 ATEX 0138 | Ex II 1 G Ex ia IIC T4 Ga |
| UL Ex E521059 | Class I, Division 1, Groups A, B, C, D T4 |
| | Class I, Zone 0, AEx ia IIC T4 GA |
| **Weight** | |
| Without cable | ~ 200 g |
| **Packaging** | |
| Single packaging | |

## Accuracy

Standard

| Parameter | | Unit | |
|---|---|---|---|
| Max. deviation [3] at 25 °C | | % fs | ± 0.8 |
| Resolution [4] | | % fs | 0.1 |
| Long term stability acc. IEC EN 60770-1 | max. | % fs | ± 0.25 |
| Thermal characteristic [5], [6] | | % fs/10K | ± 0.2 |

Higher accuracy (only with ratiometric execution and pressure range ≥ 1 bar)

| Parameter | | Unit | |
|---|---|---|---|
| Max. deviation at compensated temperature range at -10 ... +60 °C [3] | | % fs | ± 0.5 |
| Resolution [4] | | % fs | 0.1 |
| Long term stability acc. IEC EN 60770-1 | max. | % fs | ± 0.25 |

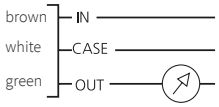
[1] Ex-protection to attention!
[2] non-congealing media
[3] incl. zero point, full scale, linearity, hysteresis and repeatability
[4] pressure range 0.3 bar < 0.2 % fs
[5] at -20 ... +80 °C
[6] 0.3 bar-type with output 4 ... 20 mA = ±0.5% fs/10K

## Order code selection table

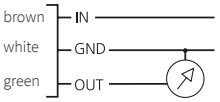
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Order code selection table** | | | | **712.** | X | X | X | X | X | X | X | X | X | X |
| **Pressure mode** | Absolute | | | | 8 | | | | | | | | | |
| | Relative | | | | 9 | | | | | | | | | |
| | Absolute with higher accuracy | | | | C | | | | 1,2 | | | | | |
| | Relative with higher accuracy | | | | D | | | | 1,2 | | | | | |
| **Pressure range** [1] | | | Pmax. | | | | | | | | | | | |
| | 0.0 ... 0.3 bar | relative pressure | 3.0 bar | | 9 | 1 | 3 | | | | | | | |
| | 0.0 ... 1.0 bar | relative pressure | 3.0 bar | | 9,D | 1 | 1 | | | | | | | |
| | 0.0 ... 1.6 bar | relative pressure | 4.8 bar | | 9,D | 1 | 2 | | | | | | | |
| | 0.0 ... 2.5 bar | relative pressure | 7.5 bar | | 9,D | 1 | 4 | | | | | | | |
| | | | | Max measurable level (for water depending on the locations weather) | | | | | | | | | | |
| | 0.8 ... 1.4 bar | absolute pressure | 4.5 bar | 3.5 ... 6.7 mWs | 8 | 1 | 1 | | | | | | | |
| | 0.8 ... 2.0 bar | absolute pressure | 6.0 bar | 9.6 ... 12.8 mWs | 8,C | 1 | 2 | | | | | | | |
| | 0.8 ... 3.0 bar | absolute pressure | 9.0 bar | 20.0 ... 23.0 mWs | 8,C | 1 | 4 | | | | | | | |
| | ▲ Full scale signal at these pressures ❶ ❷<br>❶ $P_{BARO}$ = 1060 mbar (high pressure on sea level)<br>❷ $P_{BARO}$ = 740 mbar (low pressure at 2000 meters above sea level) | | | | | | | | | | | | | |
| **Sealing material** | FPM | Fluoro-elastomer | | | | | | 0 | | | | | | |
| | EPDM | Ethylene propylene (for drinking water) | | | | | | 1 | | | | | | |
| **Output / power supply** | 4 ... 20 mA | 10 ... 30 VDC | | | | | | | 0 | | | | | |
| | ratiom. 10 ... 90% | 5 VDC ±10% | | | | | | | 1 | | | | | |
| | ratiom. 10 ... 90% | 5 VDC ±10% | (with temperature) | | | | | | 2 | | | | | |
| | 0 ... 10 V | 12 ... 30 VDC | | | | | | | 3 | | | | 0 | |
| **Electrical connection** [2] | Cable | 2 m | | | | | | | | 0 | | | | |
| | | 5 m | | | | | | | | 1 | | | | |
| | | 10 m | | | | | | | | 2 | | | | |
| | | 15 m | | | | | | | | 3 | | | | |
| | | 20 m | | | | | | | | 4 | | | | |
| | | 30 m | | | | | | | | 5 | | | | |
| **Protection cover** | without protection cover | | | | | | | | | | 2 | 0 | | |
| | with protection cover | | | | | | | | | | 2 | 1 | | |
| **Ex-protection** | without ex-protection (protection cover PPE) | | | | | | | | | | | | 0 | |
| | with ex-protection (protection cover PA6 without drinking water approval) | | | | | | | | | | | | 4 | |
| **Pressure range variation (optional)** | Indicate W and state range on order (e.g.: W 0 ... +2 bar/OUT 0 ... 10 V) | | | | | | | | | | | | | W |

## Electrical connections

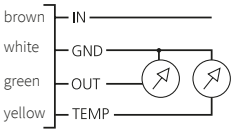
4 ... 20 mA




ratiom. 10 ... 90%, 0 ... 10 V



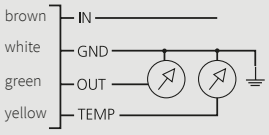

ratiom. 10 ... 90% with temperature



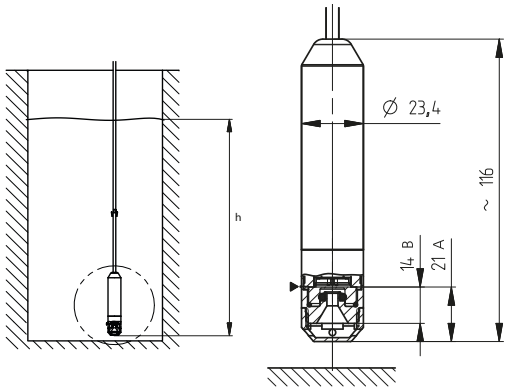

**Device design with explosion protection: 4 ... 20 mA**
The grounding connection is conductively connected to the level transmitter housing. The ground conductor of level transmitter must be connected to the equipotential bonding system of the plant.

**Device design with explosion protection: ratiom. 10 ... 90%**
The electronic GND is connected with a 1MΩΩ resistor to the level transmitter housing. The GND conductor of level transmitter must be connected to the equipotential bonding system of the plant.





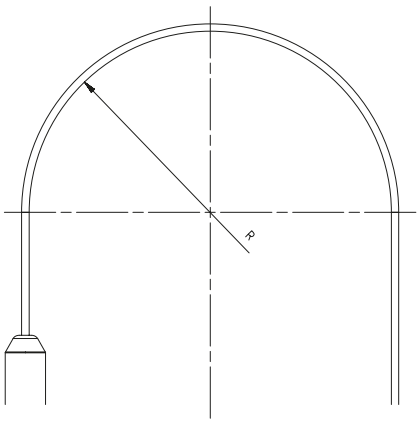

## Dimensions in mm




h - Fluid level
► - 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)

[1] Other pressure range on request

[2] Other cable length on request




**Bend radius**

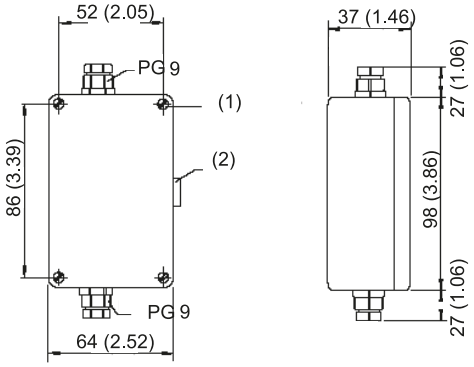
| Cable material | fixed | flexible | Temperature range for fixed installation |
|---|---|---|---|
| PE | ≥ 30 mm | ≥ 50 mm | -40°C ... +80°C |

**Important:** The cable must NOT:

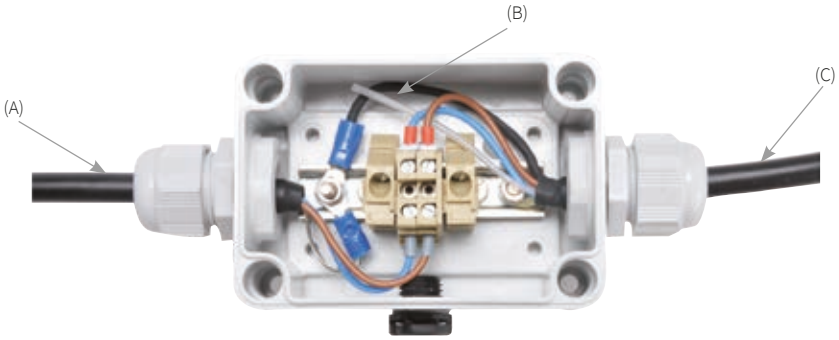
1. Be bent smaller than the bending radius.
   The individual wires on the inside are compressed, the individual wires on the outside are stretched and break off.
2. Be guided around sharp-edged corners.
   In addition to the risk of individual wires being torn off, there is also the risk of the isolation being worn through by e.g. vibration. Use cable bushings, corrugated pipes, edge protection, etc. to protect the cable when drilling holes.

| **Accessories** *(supplied loose)* | **Order number** |
|---|---|
| Cable hanger | 118026 |
| Connection box (not suitable for output/feeding ratiometric with temp. (4-L)) | 118027 |
| Test adapter | 118028 |
| Protection cover (pack of 10) | 118067 |
| Humidity protection element (pack of 10) | 118068 |
| Additional weight | 118093 |
| Calibration certificate | 104551 |

Connection box

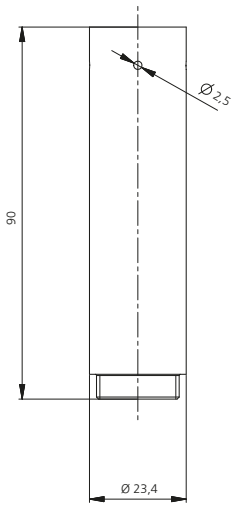



(1) Mounting hole
(2) Vent valve

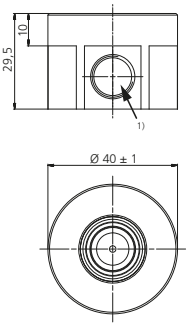



(A) Measuring value process
(B) Vent pipe
(C) to the transmitter

Additional weight
~200 g

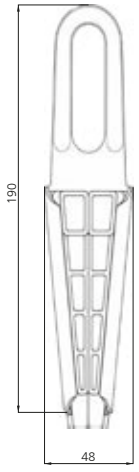



Test adapter




1) Inside thread Iso 228/1-G ¼ A

Cable hanger




hot-dip galvanized steel –
PA6 glass fibre reinforced

Cable Ø 4.5 ... 6.5

## 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

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

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

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 or mA] |
| $P_{BARO\_EW}$ | maximum nominal pressure of barometer [Pa] | $U_{BARO\_EW}$ | maximum nominal signal of barometer [V or mA] |

## Specification temperature output

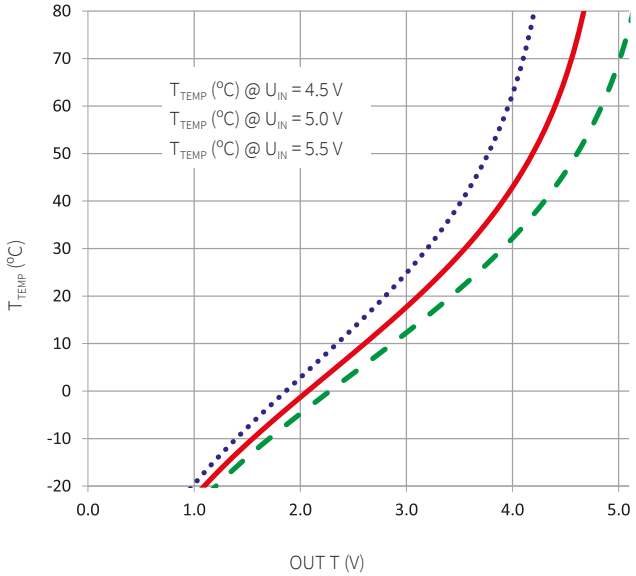
$$T_{TEMP} = T_0 + 1 \Big/ \left(a + b \cdot \ln\left(R \cdot \left[\frac{U_{IN}}{OUT\,T} - 1\right]\right) + c \cdot \ln\left(R \cdot \left[\frac{U_{IN}}{OUT\,T} - 1\right]\right)^3\right)$$

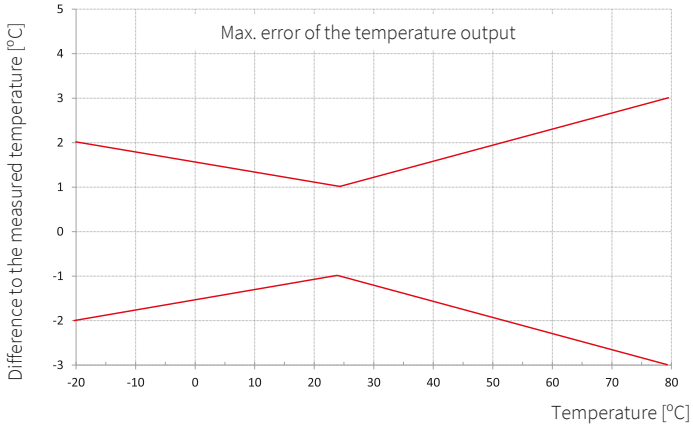
a = 0.001204001
b = 0.000208775
c = 0.000000294

| | |
|---|---|
| $T_{TEMP}$ | Temperature NTC [°C] |
| $T_0$ | -273.15 [°C] |

| | |
|---|---|
| OUT T | Voltage NTC [V] |
| R | 20'000 [Ω] |
| $U_{IN}$ | 4.5 ... 5.5 [V] |

$T_{TEMP} = f(OUT\,T)$



Huba Control

**Huba Control AG**
Industriestrasse 17
5436 Würenlos, Switzerland
Tel. +41 56 436 82 00
info.ch@hubacontrol.com

Consultancy in your area
hubacontrol.com/en/worldwide