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 II 1 G Ex ia IIC T4 Ga
SEV 12 ATEX 0138	Ex ia IIC T4 GaX
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)

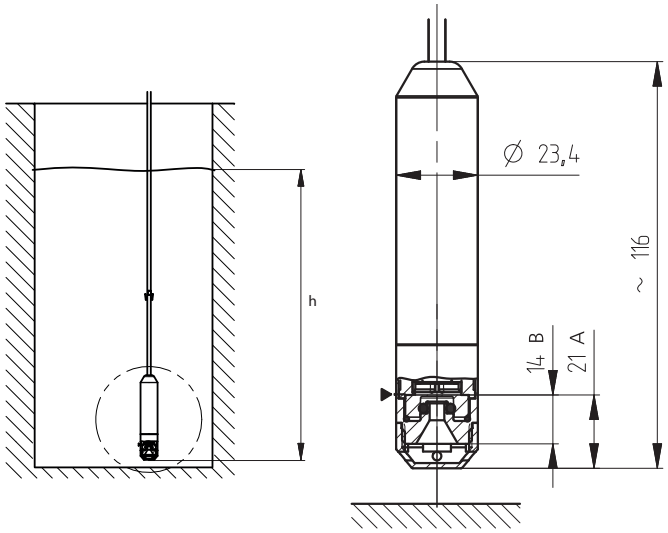
Parameter		Unit	
Max. deviation at compensated temperature range at -10 ... +60 °C [3]		% fs	± 0.5
Resolution [4]		% fs	0.1
Long term stability acc. IEC EN 60770-1	max.	% fs	± 0.25

[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

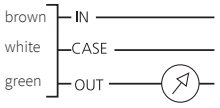
					1	2	3	4	5	6	7	8	9	10
				712.	X	X	X	X	X	X	X	X	X	X
Pressure mode	Absolute				8									
	Relative				9									
	Absolute with higher accuracy				C				1,2					
	Relative with higher accuracy				D				1,2					
Pressure range [1]			Pmax.											
	0.0 ... 0.3 bar	relative pressure	4.5 bar		9	1	3							
	0.0 ... 1.0 bar	relative pressure	4.5 bar		9,D	1	1							
	0.0 ... 1.6 bar	relative pressure	6.0 bar		9,D	1	2							
	0.0 ... 2.5 bar	relative pressure	9.0 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 ❶ P_{BARO} = 1060 mbar (high pressure on sea level) 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.: W0... + 2bar/OUT0...10V)													W

Dimensions in mm / Electrical connections

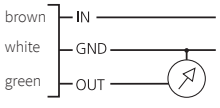


h - Fluid level
► - Measurement reference height
A - Distance from protection cover to the position of measuring diaphragm
B - distance from beginning of thread to the position of measuring diaphragm (versions without protection cover)

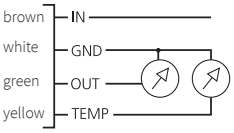
4 ... 20 mA



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

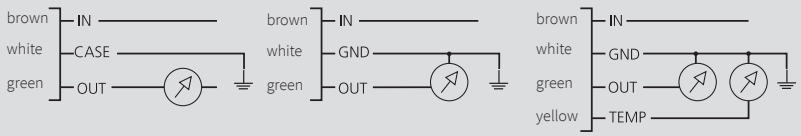


ratiom. 10 ... 90% with temperature



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 1MΩ resistor to the level transmitter housing. The GND conductor of level transmitter must be connected to the equipotential bonding system of the plant.

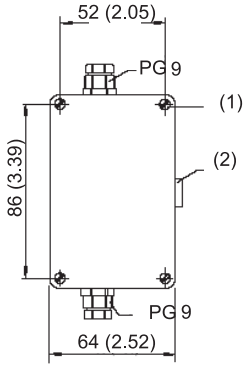


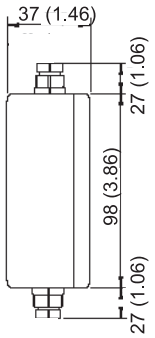
[1] Other pressure range on request

[2] Other cable length on request

Accessories *(supplied loose)*	Order number
Cable hanger	118026
Connection box	118027
Test adapter	118028
Protection cover (pack of 10)	118067
Humidity protection element (pack of 10)	118068
Additional weight	118093
Calibration certificate	104551

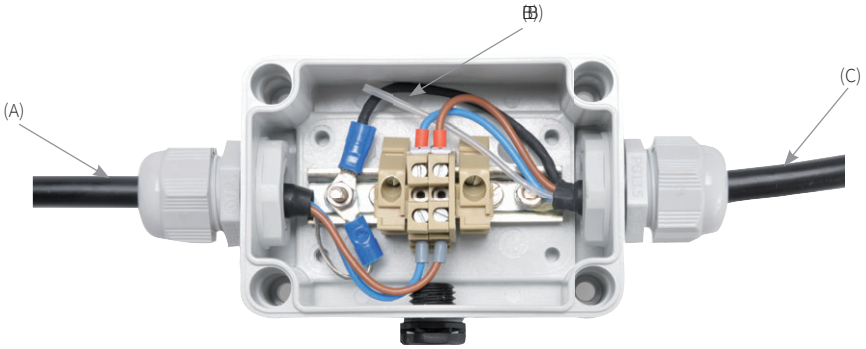
Connection box





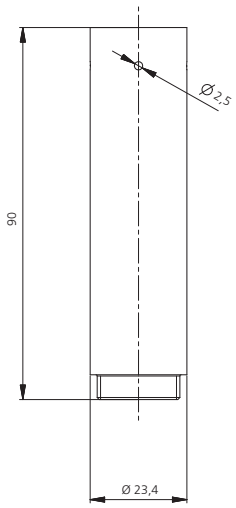
(1) Mounting hole
(2) Vent valve

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

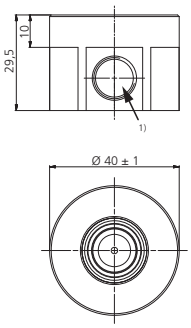


Additional weight

~200 g

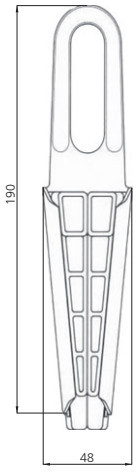


Test adapter



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

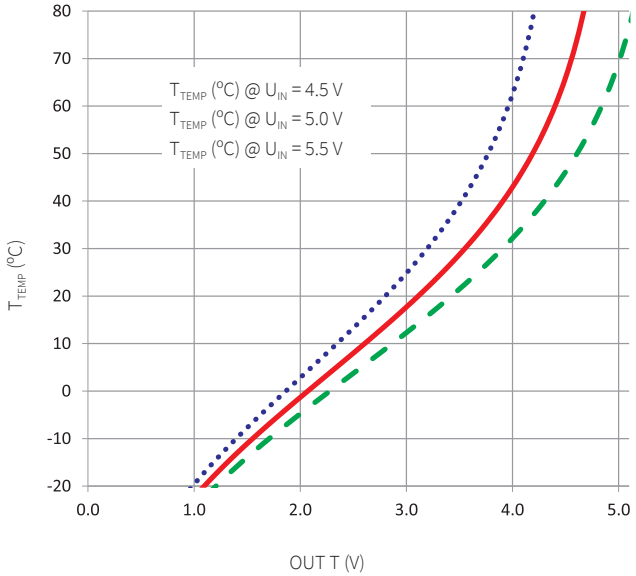
$$T_{TEMP} = T_0 + 1 \Big/ \left(a + b \cdot \ln\left(R \cdot \left[\frac{U_{IN}}{OUT\,T} - 1\right]\right) + c \cdot \ln\left(R \cdot \left[\frac{U_{IN}}{OUT\,T} - 1\right]\right)^3\right)$$

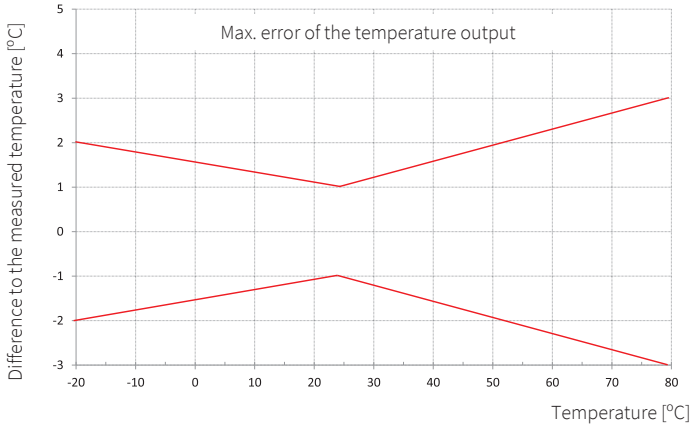
a = 0.001204001
b = 0.000208775
c = 0.000000294

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]

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





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