Level sensing relative and absolute pressure transmitter type 712

Pressure range
0 ... 0.3 - 3 bar

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.

- 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
Sealing material	FPM, EPDM (for drinking water)

Electrical overview

	Output	Power supply	Load	Current consumption
2 wire	4 ... 20 mA	10 ... 30 VDC	$< \frac{Power\ supply\ -\ 7\ V}{0.02\ A}$ [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
Drinking water verification certificate for plastic parts	UBA guidance (KTW and elastomer)
	W270
	WRAS

Ex-protection

IECEx SEV 12.0006	Ex ia IIC T4 Ga
SEV 12 ATEX 0138	II 1 G Ex 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
Thermal characteristic [5], [6]	% fs/10K	± 0.2
Long term stability acc. IEC EN 60770-1 max.	% fs	± 0.25

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

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

[1] Ex-protection to attention!
[4] pressure range 0.3 bar < 0.2 % fs

[2] non-congealing media
[5] at -20 ... +80 °C

[3] incl. zero point, full scale, linearity, hysteresis and repeatability
[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]											
	0.0 ... 0.3 bar relative pressure Pmax. 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							
	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)

Max measurable level (for water depending on the locations weather)

		1	2	3	4	5	6	7	8	9	10
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				
	Cable 5 m						1				
	Cable 10 m						2				
	Cable 15 m						3				
	Cable 20 m						4				
	Cable 30 m						5				
Protection cover	without protection cover							2	0		
	with protection cover							2	1		
Ex-protection	without ex-protection									0	
	with ex-protection									4	
Pressure range variation (optional)	Indicate W and state range on order (e.g.: W0... + 2bar/OUT0...10V)										W

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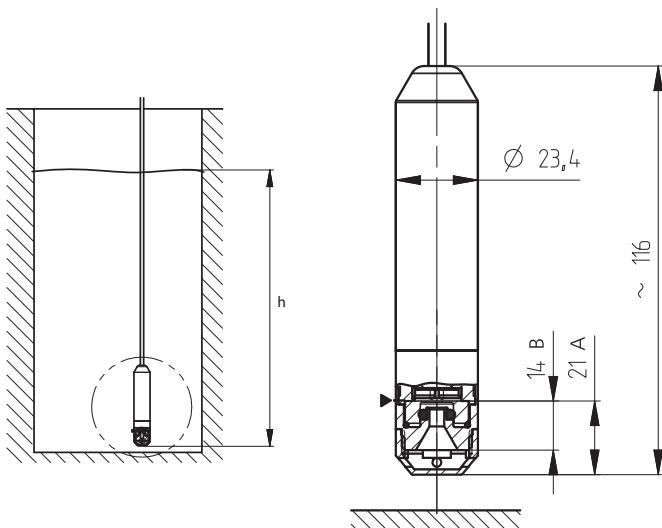
h - Fluid level
► - Measurement reference height
A - Distance from protection cover to the position of measuring diaphragm
B - distance from beginning of thread to the position of measuring diaphragm (versions without protection cover)

Ø 23.4
~ 116
14 B
21 A

4 ... 20 mA
brown — IN
white — CASE
green — OUT

ratiom. 10 ... 90%, 0 ... 10 V
brown — IN
white — GND
green — OUT

ratiom. 10 ... 90% with temperature
brown — IN
white — GND
green — OUT
yellow — TEMP
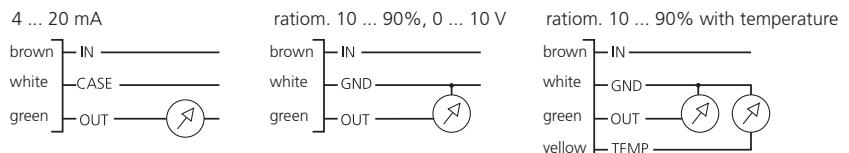
Device design with explosion protection: 4 ... 20 mA
The grounding connection is conductively connected to the level transmitter housing. The ground conductor of level transmitter must be connected to the equipotential bonding system of the plant.

brown — IN
white — CASE
green — OUT

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.

brown — IN
white — GND
green — OUT

brown — IN
white — GND
green — OUT
yellow — TEMP
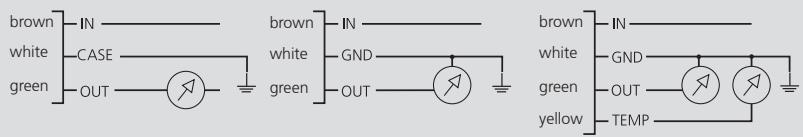
[1] Other pressure range on request

[2] Other cable length on request

| Accessories	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

52 (2.05) 37 (1.46)
PG 9
86 (3.39)
27 (1.06)
98 (3.86)
27 (1.06)
PG 9
64 (2.52)

(1) Mounting hole
(2) Vent valve

(A) Measuring value process
(B) Vent pipe
(C) to the transmitter
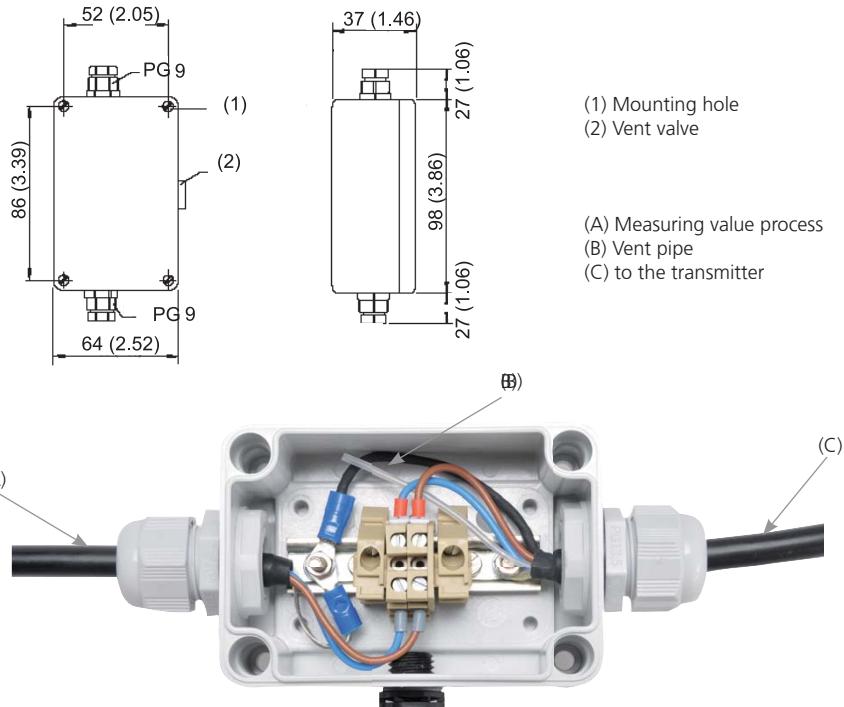
Additional weight
~200 g

90
Ø 2,5
Ø 23,4

Protection cover

29,5 10
Ø 40 ± 1
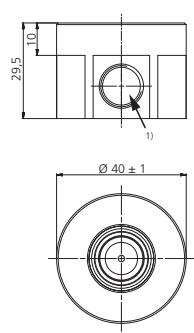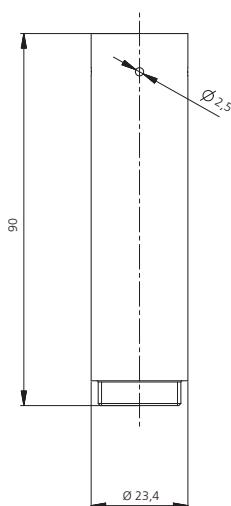
1) Inside thread Iso 228/1-G ¼ A

Cable hanger

190
48
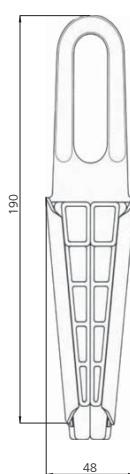
hot-dip galvanized steel –
PA6 glass fibre reinforced

Cable Ø 4.5 ... 6.5

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

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

T_{TEMP}	Temperature NTC [°C]	OUT T	Voltage NTC [V]
T_0	-273.15 [°C]	R	20'000 [Ω]
		U_{IN}	4.5 ... 5.5 [V]

a = 0.001204001
b = 0.000208775
c = 0.000000294

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

T_{TEMP} (°C) @ U_{IN} = 4.5 V
T_{TEMP} (°C) @ U_{IN} = 5.0 V
T_{TEMP} (°C) @ U_{IN} = 5.5 V

Max. error of the temperature output

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FOR FINE PRESSURE AND FLOW MEASUREMENT
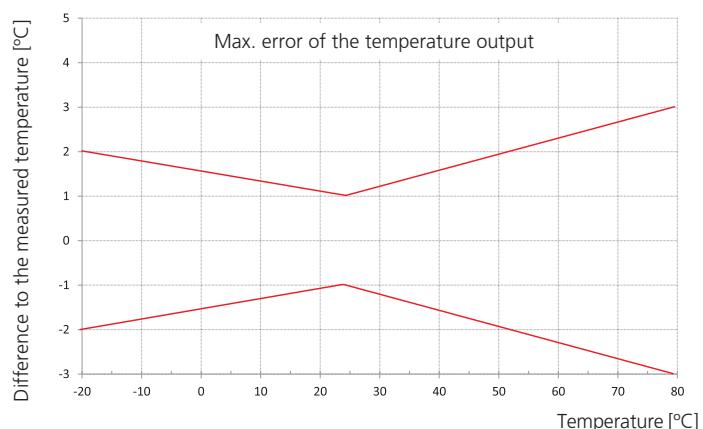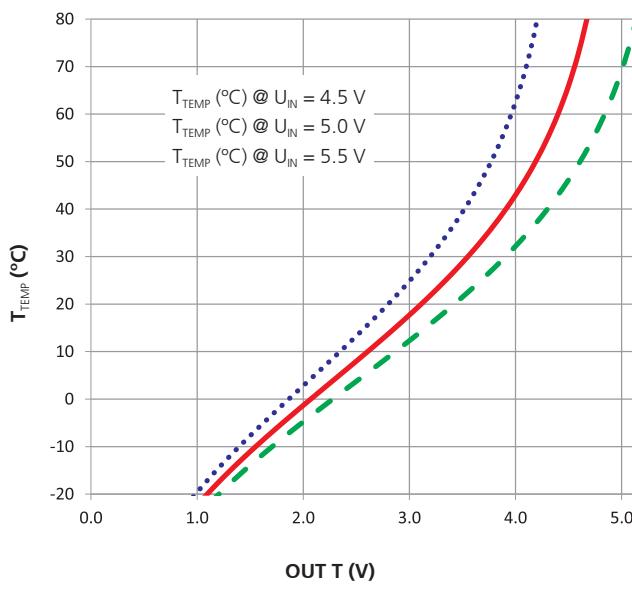
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