Huba Control

FOR FINE PRESSURE AND FLOW MEASUREMENT

Level sensing relative and absolute pressure transmitter type 713

Pressure range
0 ... 0.6 - 16 bar

The pressure level transmitter type 713 is used for continuous fluid level measurement of ground and drinking water. The compact design allows the transmitter to be used in applications with restricted access as small as ¾ inch i.d. pipe.

As well as a current output the pressure level transmitter type 713 has been enhanced with energy efficient ratiometric and digital outputs making it ideal for battery powered applications.

The pressure level sensor 713 is based upon the well proven ceramic technology developed by Huba Control over 20 years ago.

- Ceramic sensor Al_2O_3 99.6%
- Continuous level measurement
- Suitable for drinking water
- Available with integrated temperature measurement
- Applicable in ¾ inch pipes
- Excellent linearity and long term stability

Technical overview

Pressure range	
Relative	0 ... 0.6 - 16 bar
Absolute	0.8 ... 1.4 - 3 bar

Operating conditions		
Medium		Groundwater
		Drinking water (with EPDM O-ring)
Temperature	Medium and ambient [1]	-20 ... +80 °C
	Storage	-40 ... +80 °C
Overload		acc. order code selection table

Materials in contact with medium	
Case	Stainless steel 1.4404 / AISI 316L
Sensor	Ceramic Al_2O_3 (99.6%)
Cable	PE-HD
Protection cover	PPE
Sealing material	FPM, EPDM (for drinking water)

Electrical overview			Outout	Power supply	Load	Current consumption
Analogue	2 wire		4 ... 20 mA	10 ... 30 VDC	$< \frac{\text{power supply - 10 V}}{0.02\ \text{A}}$ [Ohm]	< 23 mA
	3 wire		ratiom. 10 ... 90%	5 VDC ±10%	> 10 kOhm / < 100 nF	< 3 mA
	4 wire	Pressure	ratiom. 10 ... 90%	5 VDC ±10%	> 10 kOhm / < 100 nF	< 3 mA
	(with temperature)	Temperature	acc. page 5	5 VDC ±10%	> 1 MOhm / < 100 nF	< 3 mA
Digital [2]	3 wire	Pressure	3000 ... 11000 Digits	5 VDC ±10%		< 3 mA
(one wire interface)	(with temperature)	Temperature	acc. page 5	5 VDC ±10%		< 3 mA
Polarity reversal protection	Short circuit proof and protected against polarity reversal.					

Dynamic response	
Response time	< 2 ms

Runtime	
Time starts at the moment of application of minimal supply voltage	< 10 ms

Electrical connection	Protection standard	Protection class
Cable PE-HD 2 ... 175 m [3]	IP 68	III

Test / Admissions	
Electromagnetic compatibility	CE-conform acc. to EN 61326-2-3
Drinking water verification certificate for plastic parts	UBA guidance (KTW and elastomer)
	DVGW process sheet W270
	WRAS
Drinking water approval	ACS
EAC	
UL	ANSI/UL 61010-1 acc. E325110
Shock acc. IEC 68-2-27	25 g, 6 ms, half sine wave, all 3 directions
Vibration nach IEC 68-2-6	1 g, 2 ... 2000 Hz with amplitude ±15 mm, 1 Octave/min. all 3 directions

Weight	
Without cable	~ 120 g

Packaging
Single packaging
Multiple packaging

Accuracy

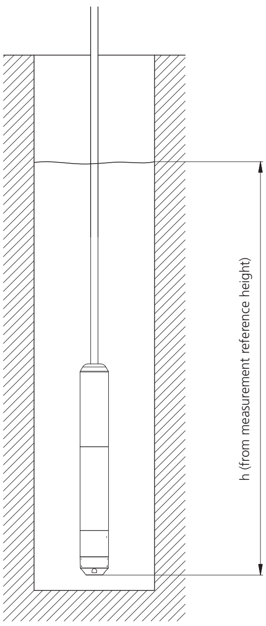
Parameter	Unit	
Max. deviation at 25 °C [4]	% fs	± 0.6
Resolution	% fs	0.1
Thermal characteristic [5]	% fs/10K	± 0.1
Long term stability acc. IEC EN 60770-1 max.	% fs	± 0.25

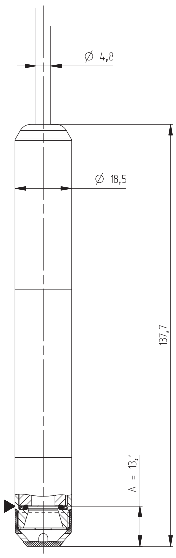
[1] non-congealing media
[2] Application note one wire digital out
[3] for digital output max. 60 m
[4] incl. zero point, full scale, linearity, hysteresis and repeatability
[5] at 0 ... +80 °C

Order code selection table

				1	2	3	4	5	6	7	8	9	10	11
				713. X	X	X	X	X	X	X	X	X	X	X
Pressure range [1] (relative)		overload												
	0 ... 0.6 bar	4.8 bar		9	1	0								
	0 ... 1.0 bar	4.8 bar		9	1	1								
	0 ... 1.6 bar	4.8 bar		9	1	2								
	0 ... 2.5 bar	7.5 bar		9	1	4								
	0 ... 4.0 bar	12.0 bar		9	1	5								
	0 ... 6.0 bar	18.0 bar		9	1	7								
	0 ... 10.0 bar	20.0 bar		9	3	0								
	0 ... 16.0 bar	20.0 bar		9	3	1								
Pressure range [1] (absolute)	0.8 ... 1.4 bar	4.8 bar		8	1	1								
	0.8 ... 2.0 bar	6.0 bar		8	1	2								
	0.8 ... 3.0 bar	9.0 bar		8	1	4								
Sealing material	FPM	Fluoro-elastomer					0							
	EPDM	Ethylene propylene (for drinking water)					1							
Outout / power supply	4 ... 20 mA	10 ... 30 VDC	2 wire (with housing connection)					0						
	ratiom. 10 ... 90%	5 VDC ±10%	3 wire					1						
	ratiom. 10 ... 90%	5 VDC ±10%	4 wire (with temperature)					2						
	3000 ... 11000 Digits	5 VDC ±10%	3 wire (one wire interface, with temperature)					3						
Electrical connection [2]	Cable	2 m							0	0	1	1		
		3 m							0	1	1	1		
		5 m							0	2	1	1		
		7 m							0	3	1	1		
		10 m							0	4	1	1		
		15 m							0	5	1	1		
		20 m							0	6	1	1		
		25 m							0	7	1	1		
		30 m							0	8	1	1		
		40 m							0	9	1	1		
		50 m							1	0	1	1		
		60 m							1	1	1	1		
		70 m						0,1,2	1	2	1	1		
		80 m						0,1,2	1	3	1	1		
		90 m						0,1,2	1	4	1	1		
		100 m						0,1,2	1	5	1	1		
		125 m						0,1,2	1	6	1	1		
		150 m						0,1,2	1	7	1	1		
		175 m						0,1,2	1	8	1	1		
Admissions	without drinking water approval												0	
	with drinking water approval						1				1		1	
Pressure range variation (optional)	Indicate W and state range on order (e.g.: W0... + 2bar/OUT4...20mA)													W

Dimensions in mm / Electrical connections

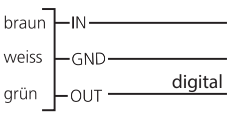




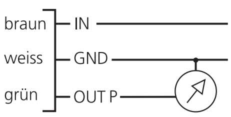
h - Fluid level
▶ - Measurement reference height
A - Distance from protection cover to the position of measuring diaphragm

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

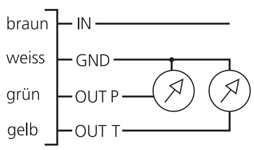
Digital (one wire interface)



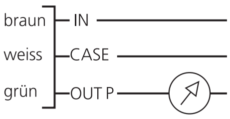
ratiom. 10 ... 90%



ratiom. 10 ... 90% mit Temperatur



4 ... 20 mA



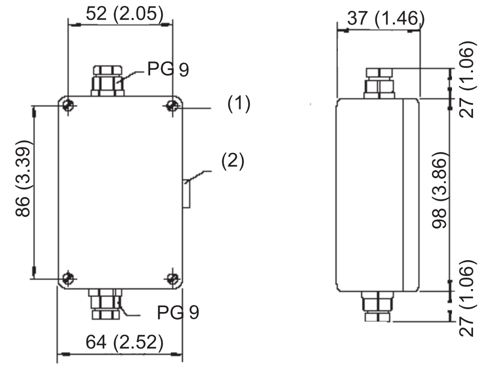
The case connection is connected with the level transmitter housing.

[1] Other pressure range on request
[2] Other cable length on request

Accessories

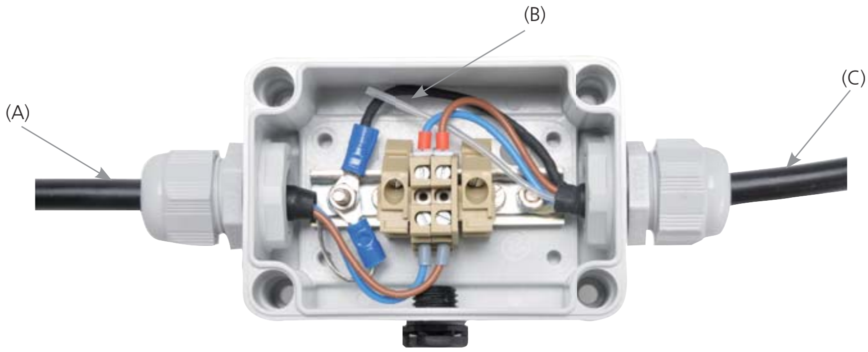
Accessories	Bestellnummer
Cable hanger	118026
Connection box	118027
Humidity protection element (pack of 10)	118068
Calibration certificate	104551

Connection box

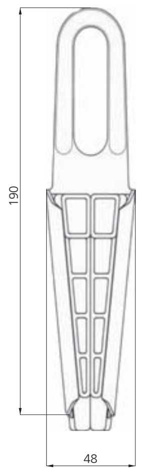


(1) Mounting hole
(2) Vent valve

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



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]

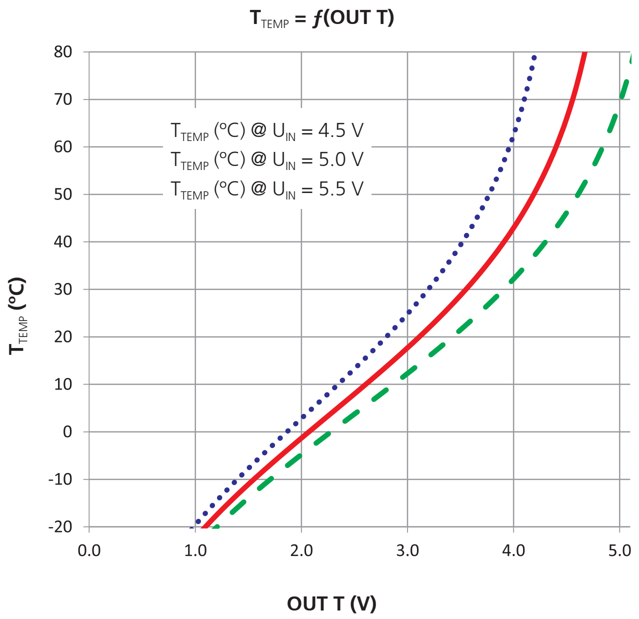
Specification temperature output

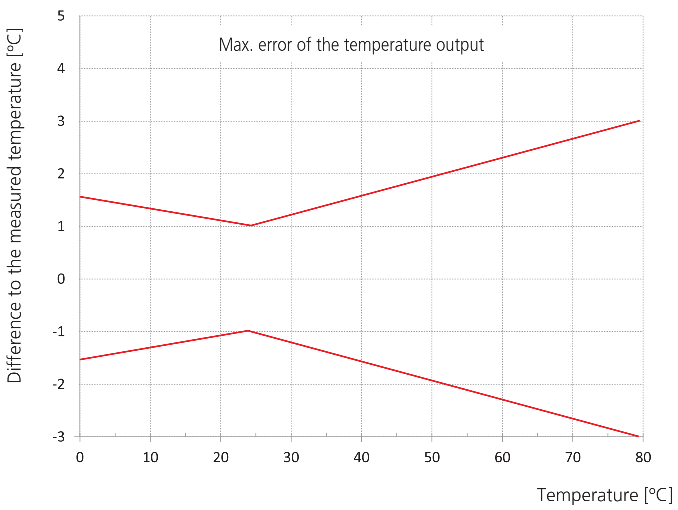
ratiom. 10 ... 90%

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

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)

Max. error ±3 °C (bei 0 ... 80 °C)

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