

# 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  $\frac{3}{4}$  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  $\text{Al}_2\text{O}_3$  99.6%
- Continuous level measurement
- Suitable for drinking water
- Available with integrated temperature measurement
- Applicable in  $\frac{3}{4}$  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 <sup>1)</sup> Storage -20 ... +80 °C -40 ... +80 °C
Overload	acc. order code selection table

### Materials in contact with medium

Case	Stainless steel 1.4404 / AISI 316L
Sensor	Ceramic Al <sub>2</sub> O <sub>3</sub> (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	< $\frac{\text{power supply} - 10 \text{ V}}{0.02 \text{ A}}$ [Ohm]	< 23 mA
	3 wire	ration. 10 ... 90%	5 VDC ±10%	> 10 kOhm / < 100 nF	< 3 mA
	4 wire	Pressure ration. 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 <sup>2)</sup> (one wire interface)	3 wire	Pressure 3000 ... 11000 Digits	5 VDC ±10%		< 3 mA
	(with temperature)	Temperature acc. page 5	5 VDC ±10%		< 3 mA
Polarity reversal protection	Short circuit proof and protected against polarity reversal.				
Overvoltage protection			4 ... 20 mA / 0 ... 10 V	36 VDC	
Electric strength towards case			ration. 10 ... 90 %	6 VDC	500 VDC

### Dynamic response

Response time	< 2 ms
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### Runtime

Time starts at the moment of application of minimal supply voltage	< 10 ms
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### Electrical connection

Cable PE-HD 2 ... 175 m <sup>3)</sup>	Protection standard IP 68	Protection class III
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### 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
Drinking water approval	ACS WRAS
EAC	
UL	ANSI/UL 61010-1 acc. E325110
Shock acc. IEC 60068-2-27	25 g, 6 ms, half sine wave, all 3 directions
Vibration nach IEC 60068-2-6	1 g, 2 ... 2000 Hz with amplitude ±15 mm, 1 Octave/min. all 3 directions

### Weight

Without cable	~ 120 g
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### Packaging

Single packaging	
Multiple packaging	

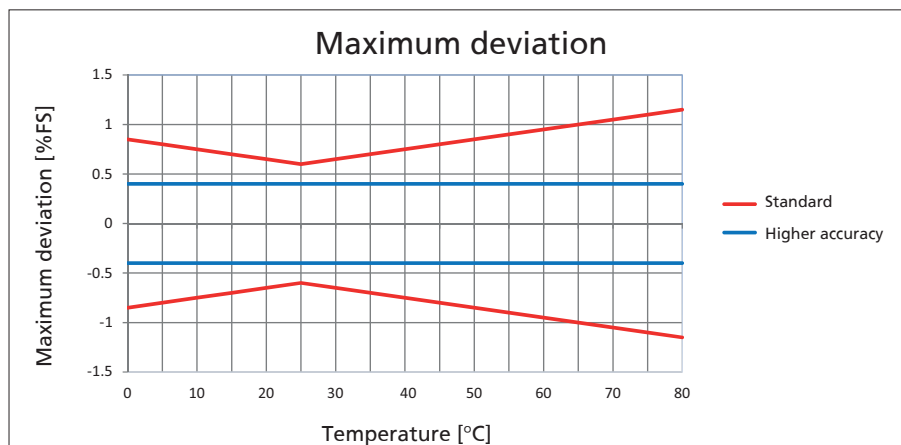
## Accuracy

### Standard

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

### Higher accuracy

Parameter	Unit	
Max. deviation <sup>4), 5)</sup>	% fs	± 0.4
Resolution	% fs	0.1
Long term stability acc. IEC EN 60770-1	max. % fs	± 0.25



<sup>1)</sup> non-congealing media

<sup>2)</sup> Application note one wire digital out

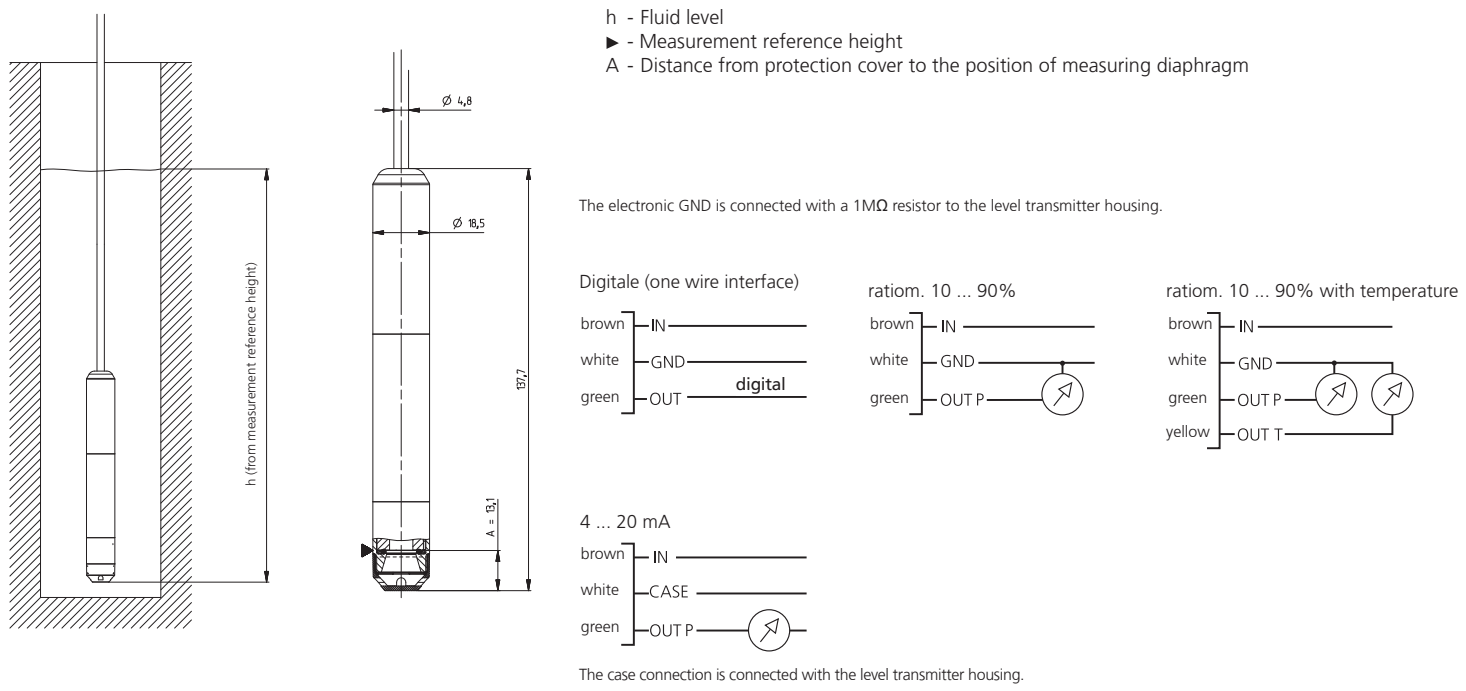
<sup>3)</sup> for digital output max. 60 m

<sup>4)</sup> incl. zero point, full scale, linearity, hysteresis and repeatability

<sup>4)</sup> at 0 ... +80 °C

			1	2	3	4	5	6	7	8	9	10	11	
<b>Order code selection table</b>			713. X X X X X X X X X X X X											
Pressure mode	Absolute		8											
	Relative		9											
	Absolute with higher accuracy		C											
	Relative with higher accuracy		D											
Pressure range <sup>1)</sup> (relative in bar)	0 ... 0.6 bar <b>overload</b>		9,D	1	0									
	0 ... 1.0 bar 4.8 bar		9,D	1	1									
	0 ... 1.6 bar 4.8 bar		9,D	1	2									
	0 ... 2.5 bar 7.5 bar		9,D	1	4									
	0 ... 4.0 bar 12.0 bar		9,D	1	5									
	0 ... 6.0 bar 18.0 bar		9,D	1	7									
	0 ... 10.0 bar 20.0 bar		9,D	3	0									
	0 ... 16.0 bar 20.0 bar		9,D	3	1									
Pressure range <sup>1)</sup> (absolute)	0.8 ... 1.4 bar 4.8 bar		8,C	1	1									
	0.8 ... 2.0 bar 6.0 bar		8,C	1	2									
	0.8 ... 3.0 bar 9.0 bar		8,C	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 <sup>2)</sup>	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

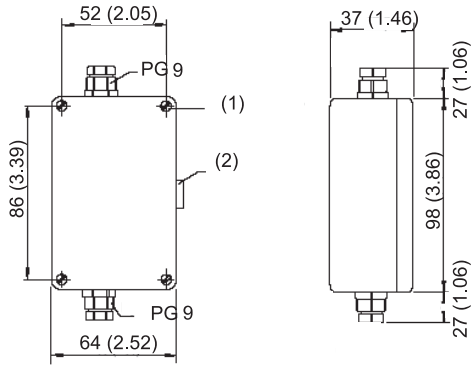
**Dimensions in mm / Electrical connections**



<sup>1)</sup> Other pressure range on request      <sup>2)</sup> Other cable length on request

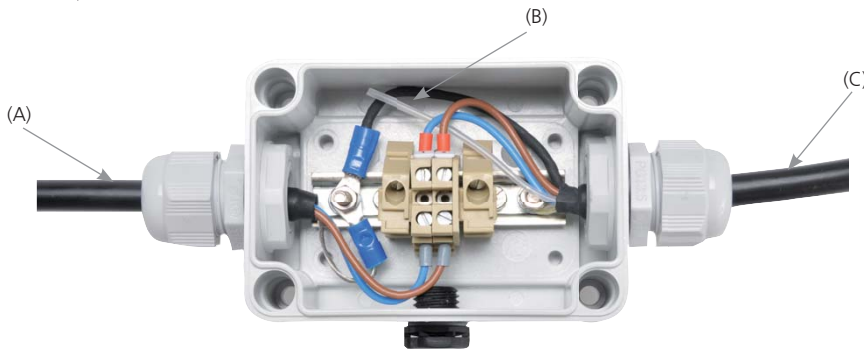
Cable hanger	118026
Connection box	118027
Humidity protection element (pack of 10)	118068
Calibration certificate	104551

Connection box

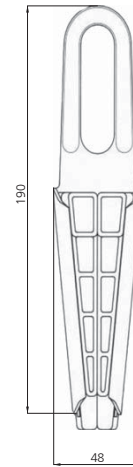


- (1) Mounting hole
- (2) Vent valve

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

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

$$P_{TS} = \frac{U_{TS} - 0.1 \cdot U_{IN}}{0.8 \cdot U_{IN}} \cdot (P_{TS\_EW} - P_{TS\_NP}) + P_{TS\_NP}$$

$$P_{Baro} = \frac{U_{Baro} - 0.1 \cdot U_{IN}}{0.8 \cdot U_{IN}} \cdot (P_{Baro\_EW} - P_{Baro\_NP}) + P_{Baro\_NP}$$
 Using a second level sensor as barometric air pressure sensor

Legend:

h	level [m]	$\rho$	density of media [kg/m <sup>3</sup> ]
		g	acceleration of fall 9.80665 [m/s <sup>2</sup> ]
$\Delta p$	measured relative pressure [Pa]	$U_{TS}$	signal on level sensor output [V or mA]
$P_{TS}$	measured pressure of level sensor [Pa]	$U_{Baro}$	Signal on barometer output [V or mA]
$P_{Baro}$	measured pressure of barometer [Pa]		
$P_{TS\_NP}$	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]

ration. 10 ... 90%

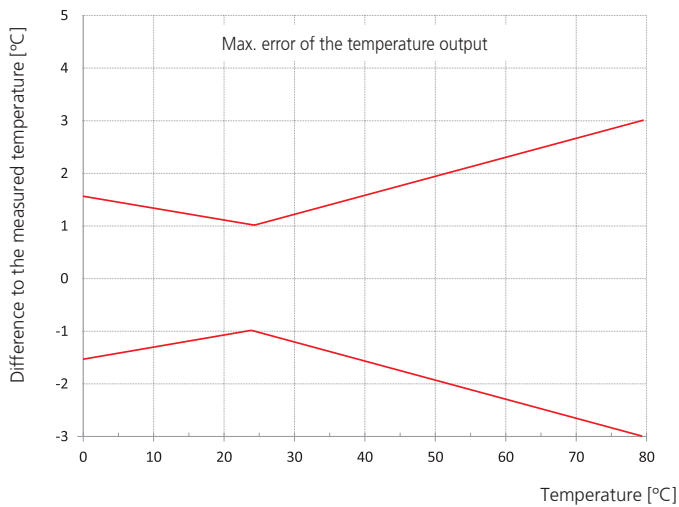
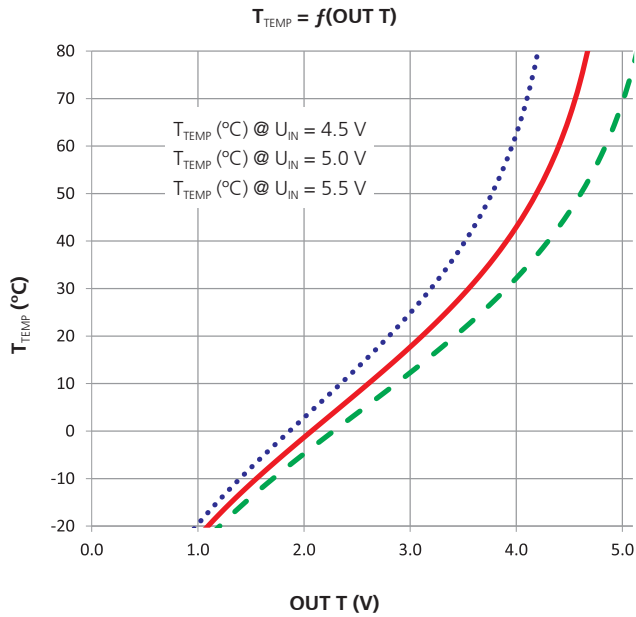
Digital

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

$$T_{TEMP} = \left( \frac{T_{Dig}}{255} \cdot 200^\circ\text{C} \right) - 50^\circ\text{C}$$

$T_{TEMP}$	Sensor temperature [°C]	OUT T	sensor signal [V]
$T_0$	-273.15 [°C]	R	20'000 [Ω]
a	0.001204001	$U_{IN}$	power supply 5V ±10%
b	0.000208775		
c	0.000000294		

$T_{TEMP}$	Sensor temperature [°C]
$T_{Dig}$	digital value (0 ... 255 digits)
Max. error ±3 °C (bei 0 ... 80 °C)	



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