

## Pressure Measurement

Single-range transmitters for general applications

### SITRANS LH100 Transmitter for hydrostatic level

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#### Overview



The pressure transmitter SITRANS LH100 is a submersible sensor for hydrostatic level measurement.

The pressure transmitter measures the liquid levels in tanks, containers, channels and dams. The SITRANS LH100 pressure transmitters are available for various measuring ranges and with explosion protection as an option.

A junction box and a cable hanger are available as accessories for simple installation.

#### Benefits

- Compact design
- Simple installation
- Small error in measurement (0.3 %)
- Degree of protection IP68

#### Application

SITRANS LH100 pressure transmitters are used in the following branches, for example:

- Shipbuilding
- Water/waste water supply
- For use in unpressurized/open vessels and wells

#### Design

The pressure transmitter has a built-in ceramic sensor which is equipped with a Wheatstone resistance bridge.

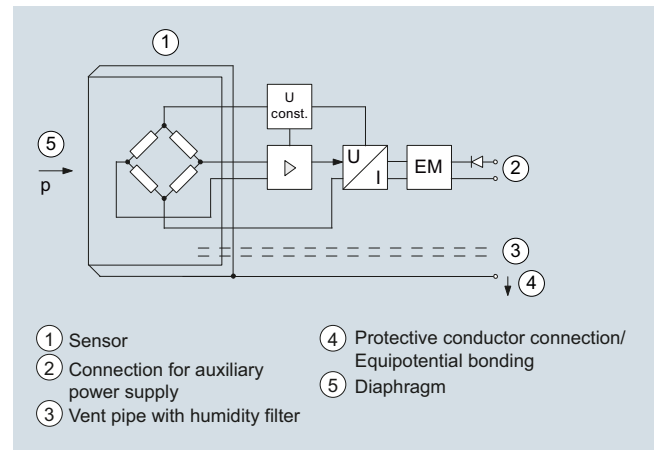
These pressure transmitters are equipped with an electronic circuit fitted together with the sensor in a stainless steel housing. In addition, the connecting cable contains a vent pipe which is equipped with a humidity filter to prevent the build-up of condensation.

The diaphragm is protected against external influences by a protective cap.

The sensor, the electronics and the connecting cable are housed in an enclosure with small dimensions.

The pressure transmitter is temperature-compensated for a wide temperature range.

#### Function



SITRANS LH100 pressure transmitter, mode of operation and connection diagram

On one side of the sensor (1), the diaphragm (5) is exposed to the hydrostatic pressure which is proportional to the submersion depth. This pressure is compared with atmospheric pressure. Pressure compensation is carried out using the vent pipe (3) in the connecting cable. The vent pipe is equipped with a humidity filter which prevents the build-up of condensation in the vent pipe.

The hydrostatic pressure of the liquid column acts on the diaphragm of the sensor and transmits the pressure to the Wheatstone resistance bridge in the sensor.

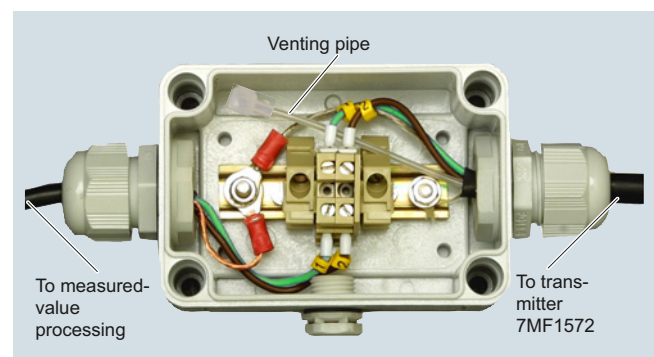
The output voltage of the sensor is applied to the electronic circuit where it is converted into an output current of 4 to 20 mA.

The protective conductor connection/equipotential bonding (4) is connected to the enclosure.

#### Integration

It is generally recommended that the connecting cable of the SITRANS LH100 transmitter is connected to the junction box, which can be ordered separately, and secured with the cable hanger, also available separately. The junction box has to be installed near the measuring point.

If the medium is anything other than water, it is also necessary to check compatibility with the specified materials of the transmitter.



Junction box 7MF1572-8AA, open, schematic diagram

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Measuring point setup, generally with junction box 7MF1572-8AA and 7MF1572-8AB cable hanger

#### Technical specifications

##### Pressure transmitter SITRANS LH100 (submersible sensor)

###### Mode of operation

Measuring principle piezo-resistive

###### Input

Measured variable Hydrostatic level

Measuring range

Measured variable	Max. permissible operating pressure
• 0 ... 3 mH <sub>2</sub> O (0 ... 9 ftH <sub>2</sub> O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH <sub>2</sub> O (45 ftH <sub>2</sub> O))
• 0 ... 4 mH <sub>2</sub> O (0 ... 12 ftH <sub>2</sub> O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH <sub>2</sub> O (45 ftH <sub>2</sub> O))
• 0 ... 5 mH <sub>2</sub> O (0 ... 15 ftH <sub>2</sub> O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH <sub>2</sub> O (45 ftH <sub>2</sub> O))
• 0 ... 6 mH <sub>2</sub> O (0 ... 18 ftH <sub>2</sub> O)	• 1.5 bar (21.8 psi) (corresponds to 15 mH <sub>2</sub> O (45 ftH <sub>2</sub> O))
• 0 ... 10 mH <sub>2</sub> O (0 ... 30 ftH <sub>2</sub> O)	• 3.0 bar (43.5 psi) (corresponds to 30 mH <sub>2</sub> O (90 ftH <sub>2</sub> O))
• 0 ... 20 mH <sub>2</sub> O (0 ... 60 ftH <sub>2</sub> O)	• 5.0 bar (72.5 psi) (corresponds to 50 mH <sub>2</sub> O (150 ftH <sub>2</sub> O))
• 0 ... 0.3 bar	• 1.5 bar
• 0 ... 0.4 bar	• 1.5 bar
• 0 ... 0.5 bar	• 1.5 bar
• 0 ... 0.6 bar	• 1.5 bar
• 0 ... 1 bar	• 3.0 bar
• 0 ... 2 bar	• 5.0 bar

###### Output

Output signal 4 ... 20 mA

###### Measuring accuracy

According to IEC 60770-1

Error in measurement at limit setting including hysteresis and reproducibility 0.3% of full-scale value (typical)

Measuring range

• 0 ... 3 mH <sub>2</sub> O (0 ... 9 ftH <sub>2</sub> O bzw. 0 ... 0.3 bar)	0.5 % of full-scale value (typical) 1.0% of full-scale value (maximum)
• For all other measuring ranges	0.3 % of full-scale value (typical) 0.6% of full-scale value (maximum)

###### Influence of ambient temperature

Measuring range

• 3 mH <sub>2</sub> O (9 ftH <sub>2</sub> O or 0.3 bar)	Zero and span 0.5 %/10 K of full-scale value
• 4 ... 6 mH <sub>2</sub> O (12 ... 18 ftH <sub>2</sub> O or 0.4...0.6 bar)	0.45 %/10 K of full-scale value
• > 6 mH <sub>2</sub> O (> 18 ftH <sub>2</sub> O or > 0.6 bar)	0.3 %/10 K of full-scale value

###### Long-term stability

Measuring range

• 3 mH <sub>2</sub> O (9 ftH <sub>2</sub> O or 0.3 bar)	Zero and span 0.4 % of full-scale value/year
• 4 ... 6 mH <sub>2</sub> O (12 ... 18 ftH <sub>2</sub> O or 0.4...0.6 bar)	0.25% of full-scale value/year
• > 6 mH <sub>2</sub> O (> 18 ftH <sub>2</sub> O or > 0.6 bar)	0.2 % of full-scale value/year

###### Rated conditions

Ambient conditions

- Process temperature -10 ... +80 °C (14 ... 176 °F)
- Storage temperature -40 ... +80 °C (-40 ... +176 °F)

Degree of protection according to IEC 60529 IP68

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#### SITRANS LH100 Transmitter for hydrostatic level

##### Design

Weight	
• Pressure transmitter	≈ 0.2 kg (≈ 0.44 lb)
• Cable; maximum cable length 100 m (330 ft)	0.025 kg/m (≈ 0.015 lb/ft)
Electrical connection	Cable with 3 conductors, vent pipe and integrated humidity filter
Material	
• Seal diaphragm	Al <sub>2</sub> O <sub>3</sub> ceramic, 96%
• Enclosure	Stainless steel, mat. no. 1.4404/316L FPM (standard)
• Gasket	EPDM (optional)
• Connecting cable	PE-HD (standard) PE-LD (in the case of versions with EPDM seal, suitable for drinking water)

##### Auxiliary power

Terminal voltage on pressure transmitter $U_B$	10 ... 33 V DC 10 ... 30 V DC for transmitter with intrinsic safety explosion protection
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##### Certificates and approvals

Drinking water approval (ACS)	Applied for
Drinking water approval (WRAS)	1403525
EAC	№ TC RU C-DE.ГБ05.В.00732 ОС НАННО «ЦСВЭ»
Underwriters Laboratories (UL)	2014-11-17 - E344532
The transmitter is not subject to the pressure equipment directive (PED 2014/68/EU)	
Explosion protection	
• Intrinsic safety "i"	IECEX SEV 14.0003 SEV 14 ATEX 0109
- Marking	II 1 G Ex ia IIC T4 Ga

##### Junction box

<b>Application</b>	for connecting the transmitter cable
<b>Design</b>	
Weight	0.2 kg (0.44 lb)
Electrical connection	2 x 3-way (28 to 18 AWG)
Cable entry	2 x Pg 9
Enclosure material	polycarbonate
Vent pipe for atmospheric pressure	
<b>Rated conditions</b>	
Degree of protection according to IEC 60529	IP65

##### Cable hanger

<b>Application</b>	for mounting the transmitter
<b>Design</b>	
Weight	0.16 kg (0.35 lb)
Material	Galvanized steel, polyamide

**Pressure Measurement**

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**SITRANS LH100 Transmitter for hydrostatic level**

Selection and ordering data	Article No.	Order code
<b>Pressure transmitter</b> <b>SITRANS LH100 (submersible sensor)</b>  For measurement of the hydrostatic level through submersion, two-wire system, 4...20 mA, enclosure material mat. no. 1.4404 (316L), measuring cell Al <sub>2</sub> O <sub>3</sub> ceramic, with permanently mounted PE cable  ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	7MF1572-	A
<b>Measuring range Cable length</b> 0 ... 3 mH <sub>2</sub> O <sup>1)</sup> 10 m 0 ... 4 mH <sub>2</sub> O 10 m 0 ... 5 mH <sub>2</sub> O 10 m 0 ... 6 mH <sub>2</sub> O 10 m 0 ... 10 mH <sub>2</sub> O 20 m 0 ... 20 mH <sub>2</sub> O 30 m  0 ... 9 ftH <sub>2</sub> O <sup>1)</sup> 33 ft 0 ... 12 ftH <sub>2</sub> O 33 ft 0 ... 15 ftH <sub>2</sub> O 33 ft 0 ... 18 ftH <sub>2</sub> O 33 ft 0 ... 30 ftH <sub>2</sub> O 66 ft 0 ... 60 ftH <sub>2</sub> O 98 ft  0 ... 0.3 bar <sup>1)</sup> 10 m 0 ... 0.4 bar 10 m 0 ... 0.5 bar 10 m 0 ... 0.6 bar 10 m 0 ... 1 bar 20 m 0 ... 2 bar 30 m  Special versions: Measuring ranges for special versions between 0 ... 3 mH <sub>2</sub> O and 0 ... 30 mH <sub>2</sub> O or 0 ... 9 ftH <sub>2</sub> O and 0 ... 100 ftH <sub>2</sub> O or 0 ... 0.3 bar and 0 ... 3 bar possible.  Special cable length/Special measuring range Please add „-Z“ to Article No. and specify Order code and plain text. Note: Indication of measuring range Y0T is always necessary.  For evaluation of the maximum possible cable length following data have to be regarded: Transmitter: C <sub>i</sub> = 0 µF, L <sub>i</sub> = 0 µH Cable: C <sub>k</sub> = 0.19 nF per meter cable L <sub>k</sub> = 1.5 µH per meter cable  The maximum permitted data of the transmitter's power supply have to be considered!  3 m (10 ft) 5 m (16 ft) 7 m (23 ft) 10 m (33 ft) 15 m (49 ft)  20 m (66 ft) 25 m (82 ft) 30 m (98 ft) 40 m (131 ft) 50 m (164 ft)  60 m (198 ft) <sup>1)</sup> 70 m (231 ft) <sup>1)</sup> 80 m (264 ft) <sup>1)</sup> 90 m (297 ft) <sup>1)</sup> 100 m (330 ft) <sup>1)</sup>	9A	1 C 1 D 1 E 1 F 1 H 1 K  2 C 2 D 2 E 2 F 2 H 2 K  3 C 3 D 3 E 3 F 3 H 3 K  H . . + Y 0 T

Selection and ordering data	Article No.	Order code
<b>Pressure transmitter</b> <b>SITRANS LH100 (submersible sensor)</b>  For measurement of the hydrostatic level through submersion, two-wire system, 4...20 mA, enclosure material mat. no. 1.4404 (316L), measuring cell Al <sub>2</sub> O <sub>3</sub> ceramic, with permanently mounted PE cable  <b>Sealing material between sensor and enclosure</b> • FPM (Standard) • EPDM (for drinking water applications)	7MF1572-	A
<b>Explosion protection</b> • without • With ATEX II1 G Ex ia IIC T4 Ga and IECEx Ex ia IIC T4 Ga		0 1
<b>Additional versions</b>  Quality Inspection Certificate (5-point characteristic curve test) according to IEC 60770-2, add "-Z" to article no. and add order code.  Indication of measuring range (only at special cable lengths) in " ... to ... mH <sub>2</sub> O" or " ... to ... ftH <sub>2</sub> O" or " ... to ... bar"	Order code	C11  Y01
<b>Accessories/spare parts</b>  <b>Junction box</b> for connecting the transmitter cable  <b>Cable hanger</b> for securing the pressure transmitter  <b>Protective caps as spare parts (10-pack)</b>  <b>Humidity filters as spare parts (10-pack)</b>	Article No.	7MF1572-8AA  7MF1572-8AB  7MF1572-8AD  7MF1572-8AE

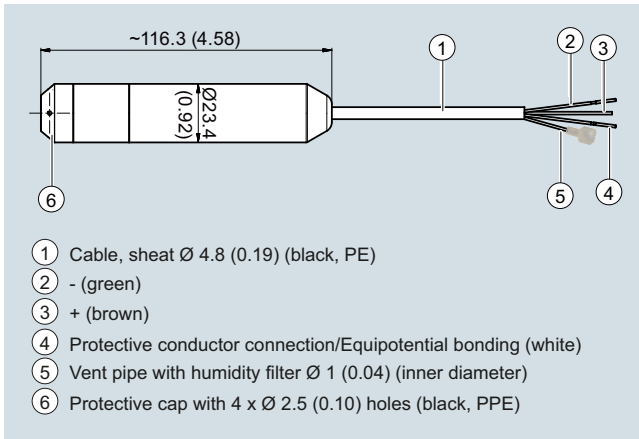
1) Approvals pending.

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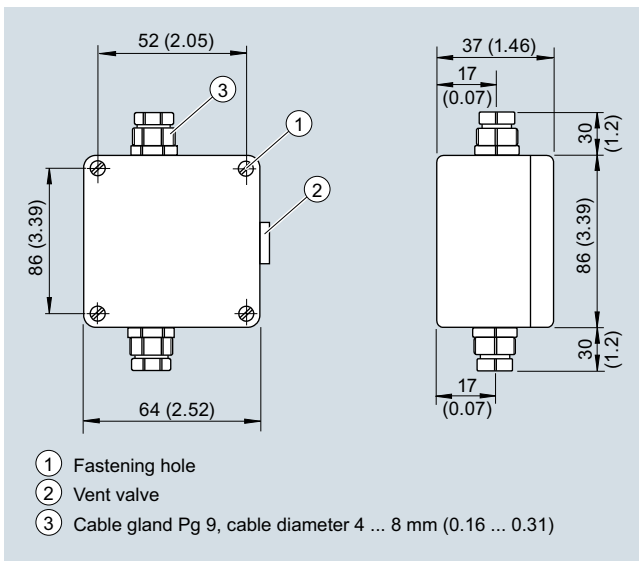
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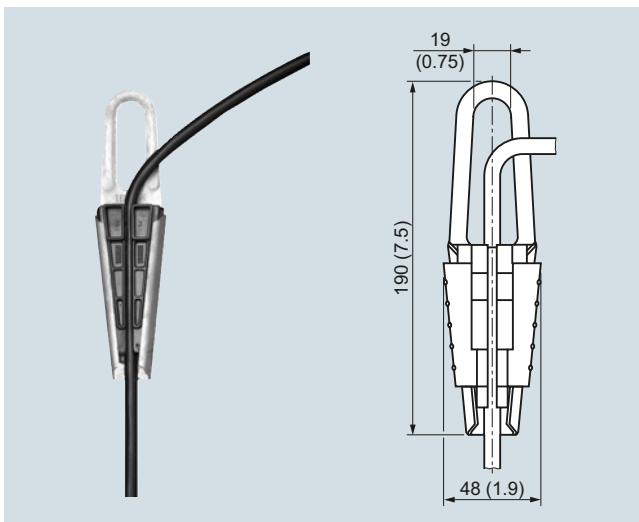
#### Dimensional drawings



SITRANS LH100 pressure transmitter, dimensions in mm (inch)



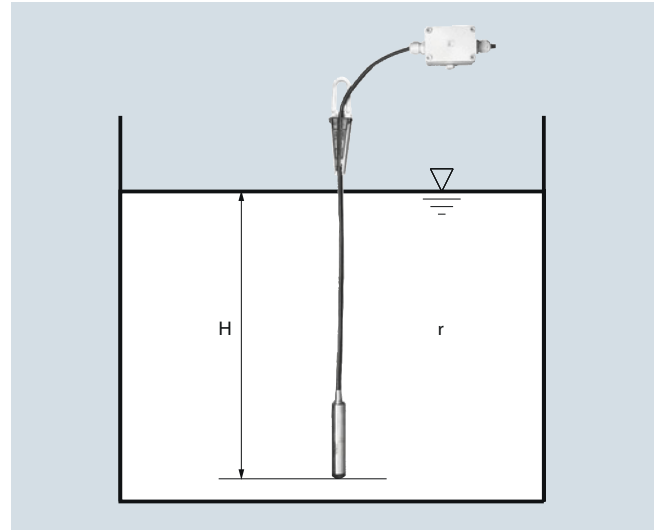
Junction box, dimensions in mm (inch)



Cable hanger, dimensions in mm (inch)

#### More information

##### Establishing the measuring range for water as process medium



Calculation of the measuring range:

$$p = \rho \times g \times H$$

with:

$\rho$  = density of medium

$g$  = local acceleration due to gravity

$H$  = maximum level

Example:

Medium: Water,  $\rho = 1\,000 \text{ kg/m}^3$

Acceleration due to gravity:  $9.81 \text{ m/s}^2$

Start-of-scale: 0 m

Maximum level: 6.0 m

Cable length: 10 m

Calculation:

$$p = 1\,000 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2 \times 6.0 \text{ m}$$

$$p = 58\,860 \text{ N/m}^2$$

$$p = 589 \text{ mbar}$$

Transmitter to be ordered:

**7MF1572-1FA10**

Plus, if required, junction box 7MF1572-8AA and cable hanger 7MF1572-8AB