

# Pressure Measurement

## Transmitters for basic requirements

### SITRANS P MPS (submersible sensor) Transmitter for hydrostatic level

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#### Overview



SITRANS P MPS pressure transmitters are submersible sensors for hydrostatic level measurements.

The SITRANS P MPS 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 P MPS pressure transmitters are used in the following branches for example:

- Oil and gas industries
- Shipbuilding
- Water supply
- For use in pressureless/open tanks and wells

#### Design

SITRANS P MPS pressure transmitters have a front-flush piezo-resistive sensor with stainless steel diaphragm.

These pressure transmitters are equipped with an electronic circuit fitted together with the sensor in a stainless steel housing. The cable also contains a strength cord and vent pipe.

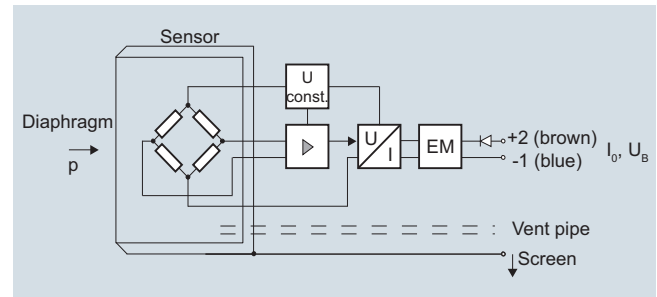
The diaphragm is protected against external influences by a protective cap.

The sensor, electronic circuit and cable are sealed in a common housing of small dimensions.

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

#### Function

SITRANS P MPS pressure transmitters are for measuring the liquid levels in wells, tanks, channels and dams.



SITRANS P MPS pressure transmitter, mode of operation and wiring diagram

On one side of the sensor, the diaphragm 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 in the connection cable.

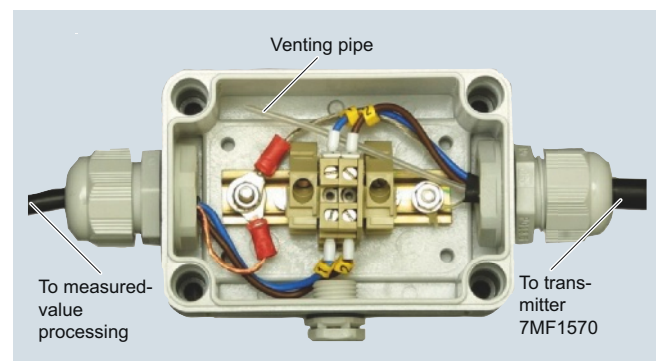
The hydrostatic pressure of the liquid column acts on the sensor diaphragm, and transmits the pressure to the piezo-resistive bridge in the sensor.

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 cable of the 7MF1570 transmitter must always be connected in the supplied junction box. 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.

#### Integration



Junction box 7MF1570-8AA, opened

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Measuring point setup, in principle

#### Technical specifications

##### SITRANS P MPS pressure measurement transmitter (submersible sensor)

###### Mode of operation

Measuring principle	piezo-resistive
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###### Input

Measured variable	Hydrostatic level
Measuring range	Maximum operating pressure
• 0 ... 2 mH <sub>2</sub> O (0 ... 6 ftH <sub>2</sub> O)	• 1.4 bar (20.3 psi) (corresponds to 14 mH <sub>2</sub> O (42 ftH <sub>2</sub> O))
• 0 ... 4 mH <sub>2</sub> O (0 ... 12 ftH <sub>2</sub> O)	• 1.4 bar (20.3 psi) (corresponds to 14 mH <sub>2</sub> O (42 ftH <sub>2</sub> O))
• 0 ... 5 mH <sub>2</sub> O (0 ... 15 ftH <sub>2</sub> O)	• 1.4 bar (20.3 psi) (corresponds to 14 mH <sub>2</sub> O (42 ftH <sub>2</sub> O))
• 0 ... 6 mH <sub>2</sub> O (0 ... 18 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 ... 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)	• 6.0 bar (87psi) (corresponds to 50 mH <sub>2</sub> O (150 ftH <sub>2</sub> O))

###### Output

Output signal	4 ... 20 mA
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###### Measuring accuracy

	Acc. to IEC 60770-1
Error in measurement at limit setting incl. hysteresis and reproducibility	0.3 % of full-scale value (typical)

###### Influence of ambient temperature

Zero and span	
• 1 ... 6 mH <sub>2</sub> O (3 ... 18 ftH <sub>2</sub> O)	0.45 %/10 K of full-scale value
• ≥ 6 mH <sub>2</sub> O (≥ 18 ftH <sub>2</sub> O)	0.3 %/10 K of full-scale value

<b>Long-term stability</b>	
Zero and span	
• 1 ... 6 mH <sub>2</sub> O (3 ... 18 ftH <sub>2</sub> O)	0.25 % of full-scale value/year
• ≥ 6 mH <sub>2</sub> O (≥ 18 ftH <sub>2</sub> O)	0.2 % of full-scale value/year
<b>Rated conditions</b>	
Ambient conditions	
• Process temperature	-10 ... +80 °C (14 ... 176 °F)
• Storage temperature	-40 ... +100 °C (-40 ... +212 °F)
Degree of prot. to DIN EN 60529	IP68
<b>Design</b>	
Weight	
• Pressure transmitter	≈ 0.4 kg (≈ 0.88 lb)
• Cable	0.08 kg/m (≈ 0.054 lb/ft)
Electrical connection	
Cable with 2 conductors with screen and vent pipe, strength cord (max. 300 N (67.44 lbf))	
Material	
• Seal diaphragm	Stainl. steel, mat. no. 1.4571/316Ti
• Enclosure	Stainl. steel, mat. no. 1.4571/316Ti
• Gasket	Viton
• Connecting cable	Either PE/HFFR sheath (non-halogen) or FEP sheath
<b>Power supply</b>	
Terminal voltage on pressure transmitter $U_B$	10 ... 36 V DC 0 ... 30 V DC for transmitter with intrinsic safety explosion protection
<b>Certificates and approvals</b>	
Germanischer Lloyd (GL)	GL 75360-09 HH
Bureau Veritas (BV)	BV 27101/A0 BV
Det Norske Veritas (DNV)	DNV A-12553
Drinking water approval (ACS)	ACS 11 ACC NY 014
Drinking water approval (WRAS)	WRAS 1111055
GOST	GOST-R, GOST FR.C.30.004.A/42376/1 und PPC 00-04 1505
The transmitter is not subject to the pressure equipment directive (PED 97/23/EC)	
Explosion protection	
• Intrinsic safety "i"	SEV 10 ATEX 0149
- Marking	II 1 G Ex ia IIC T4 Ga
<b>Junction box</b>	
<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 M20 x 1.5
Enclosure material	polycarbonate
Vent pipe for atmospheric pressure	
Screw for cable strength cord	
<b>Rated conditions</b>	
Degree of prot. to DIN EN 60529	IP65
<b>Cable hanger</b>	
<b>Application</b>	for mounting the transmitter
<b>Design</b>	
Weight	0.16 kg (0.35 lb)
Material	Galvanized steel, polyamide

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Selection and Ordering data		Article No.	Order code	Selection and Ordering data		Article No.	Order code
<b>SITRANS P MPS pressure transmitter for gauge pressure (submersible sensor)</b>		7MF1570-	A0	<b>SITRANS P MPS pressure transmitter for gauge pressure (submersible sensor)</b>		7MF1570-	A0
2-wire system				2-wire system			
Note: Junction box and cable hanger included in delivery				Note: Junction box and cable hanger included in delivery			
<b>With PE cable</b>				<b>With FEP cable</b>			
<b>Measuring range</b>	<b>Cable length L</b>			<b>Measuring range</b>	<b>Cable length L</b>		
0 ... 2 mH <sub>2</sub> O	10 m	▶▶	1C	0 ... 2 mH <sub>2</sub> O	10 m	▶▶	5C
0 ... 4 mH <sub>2</sub> O	10 m	▶▶	1D	0 ... 4 mH <sub>2</sub> O	10 m	▶▶	5D
0 ... 5 mH <sub>2</sub> O	25 m	▶▶	1B	0 ... 5 mH <sub>2</sub> O	25 m	▶▶	5B
0 ... 6 mH <sub>2</sub> O	25 m	▶▶	1E	0 ... 6 mH <sub>2</sub> O	25 m	▶▶	5E
0 ... 10 mH <sub>2</sub> O	25 m	▶▶	1F	0 ... 10 mH <sub>2</sub> O	25 m	▶▶	5F
0 ... 20 mH <sub>2</sub> O	25 m	▶▶	1G	0 ... 20 mH <sub>2</sub> O	25 m	▶▶	5G
0 ... 6 ftH <sub>2</sub> O	32 ft		1K	0 ... 6 ftH <sub>2</sub> O	32 ft		5K
0 ... 12 ftH <sub>2</sub> O	32 ft		1L	0 ... 12 ftH <sub>2</sub> O	32 ft		5L
0 ... 18 ftH <sub>2</sub> O	82 ft		1M	0 ... 18 ftH <sub>2</sub> O	82 ft		5M
0 ... 30 ftH <sub>2</sub> O	82 ft		1N	0 ... 30 ftH <sub>2</sub> O	82 ft		5N
0 ... 60 ftH <sub>2</sub> O	82 ft		1P	0 ... 60 ftH <sub>2</sub> O	82 ft		5P
Special cable length/Special measuring range <sup>1)</sup>			9A	H . .	Special cable length/Special measuring range <sup>1)</sup>		9A
Please add „-Z“ to Article No. and specify Order code and plain text.			Y01	+	Please add „-Z“ to Article No. and specify Order code and plain text.		Y01
Note: Indication of measuring range Y01 is always necessary.					Note: Indication of measuring range Y01 is always necessary.		
3 m			H1A		3 m		H5A
5 m			H1B		5 m		H5B
7 m			H1C		7 m		H5C
10 m			H1D		10 m		H5D
15 m			H1E		15 m		H5E
20 m			H1F		20 m		H5F
25 m			H1G		25 m		H5G
30 m			H1H		30 m		H5H
40 m			H1J		40 m		H5J
50 m			H1K		50 m		H5K
60 m			H1L		60 m		H5L
70 m			H1M		70 m		H5M
80 m			H1N		80 m		H5N
90 m			H1P		90 m		H5P
100 m			H1Q		100 m		H5Q
125 m			H1R		125 m		H5R
150 m			H1S		150 m		H5S
175 m			H1T		175 m		H5T
200 m			H1U		200 m		H5U
225 m			H1V		225 m		H5V
250 m			H1W		250 m		H5W
275 m			H1X		275 m		H5X
300 m			H2A		300 m		H6A
350 m			H2B		350 m		H6B
400 m			H2C		400 m		H6C
450 m			H2D		450 m		H6D
500 m			H2E		500 m		H6E
550 m			H2F		550 m		H6F
600 m			H2G		600 m		H6G
650 m			H2H		650 m		H6H
700 m			H2J		700 m		H6J
750 m			H2K		750 m		H2K
800 m			H2L		800 m		H6L
850 m			H2M		850 m		H6M
900 m			H2N		900 m		H6N
950 m			H2P		950 m		H6P
1000 m			H2Q		1000 m		H6Q

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#### Selection and Ordering data

Article No.	Order code
7MF1570 - A0	

**SITRANS P MPS pressure transmitter for gauge pressure (submersible sensor)**  
2-wire system  
Note: Junction box and cable hanger included in delivery

#### Explosion protection

• None	▶	1
• with type of protection "intrinsic safety" (Ex II 1 G Ex ia IIC T4)	▶	2

#### Approvals

• with drinking water approval to WRAS and ACS	6
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#### Further designs

Order code
<b>C11</b> Quality inspection certificate (factory calibration) to IEC 60770-2, add „-Z“ to Article No. and add Order code.
<b>Y01</b> Indication of measuring range (only at special cable lengths) in „... to ... mH <sub>2</sub> O“ or „... to ... ftH <sub>2</sub> O“

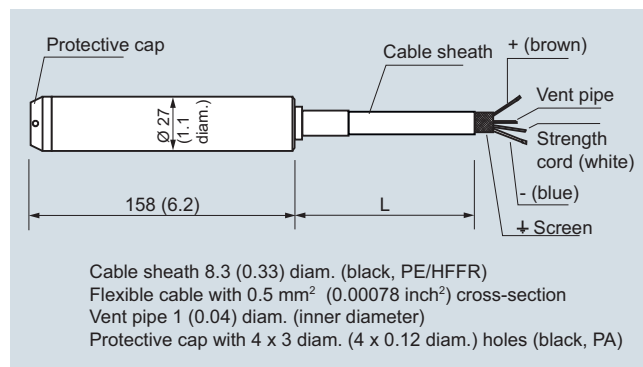
#### Accessories (as spare part)

Article No.
<b>7MF1570-8AA</b> Junction box for connecting the transmitter cable
<b>7MF1570-8AB</b> Cable hanger for attachment of transmitter

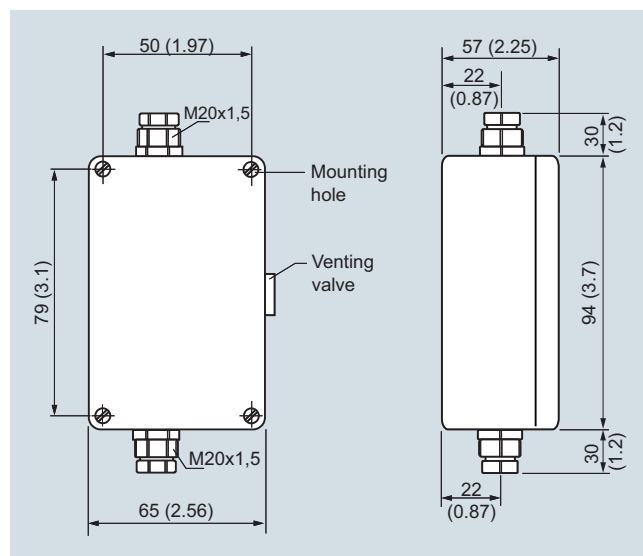
- ▶ Available ex stock
- ◆ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ◆. For details see page 9/5 in the appendix. Power supply units see Chap. 7 "Supplementary Components".

1) Special measuring ranges of between 0 ... 1 mH<sub>2</sub>O (0 ... 3 ftH<sub>2</sub>O) and 0 ... 200 mH<sub>2</sub>O (0 ... 656 ftH<sub>2</sub>O) and special cable lengths of up to 1000 m (3281 ft) are possible. With Ex versions the max. custom cable length is 50 m (150 ft). The length of free hanging cable should not exceed 375 m (1230 ft).  
Note: Due to mounting reasons it has to be considered that the cable always must be longer than the height of the liquid column to be measured.

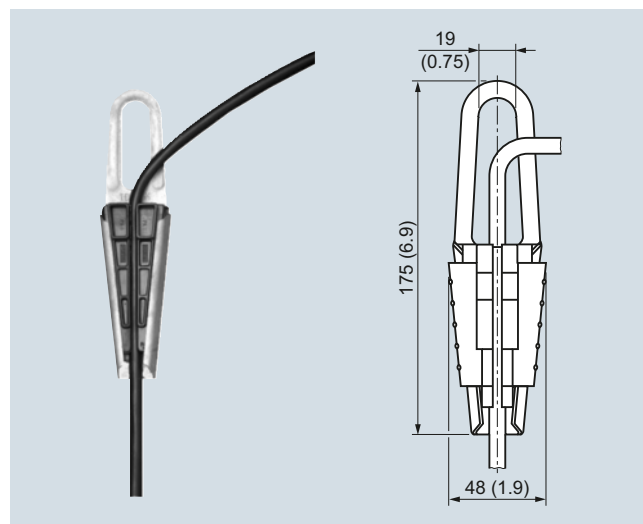
#### Dimensional drawings



SITRANS P MPS pressure transmitters, dimensions in mm (inch)



Junction box, dimensions in mm (inch)



Cable hanger, dimensions in mm (inch)

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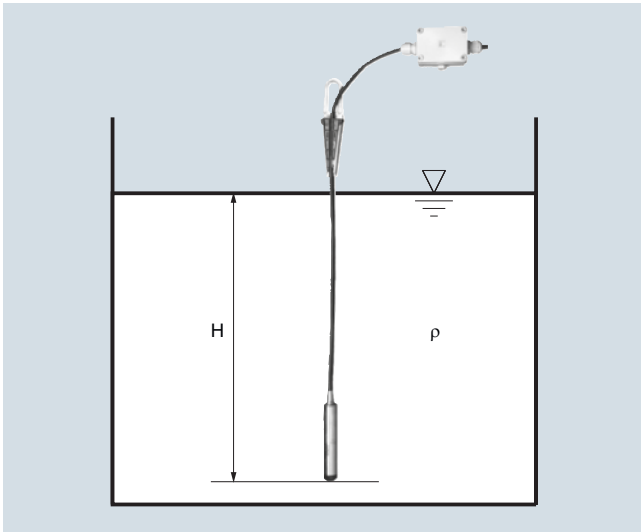
## Transmitters for basic requirements

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Transmitter for hydrostatic level

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### More information

**Determination of the measuring range in case of media with a density  $\neq 1000 \text{ kg/m}^3$  (medium  $\neq$  water)**



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: Diesel fuel,  $\rho = 850 \text{ kg/m}^3$

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

Start-of-scale: 0 m

Maximum level: 6.2 m

Cable length: 7 m, FEP cable

Calculation:

$$p = 850 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2 \times 6.2 \text{ m}$$

$$p = 51698.7 \text{ N/m}^2$$

$$p = 517 \text{ mbar}$$

Transmitter to be ordered:

**7MF1570-9AA02-Z, H5C + Y01**

**Y01:** 0 ... 517 mbar