



Füllstand



Druck



Durchfluss



Temperatur



Flüssigkeits-
analyse



Registrierung



Systeme
Komponenten



Services



Solutions

Technical information

Deltapilot S FMB70

Hydrostatic Level Measurement

Pressure sensor with the CONTITE™ measuring cell,
condensate proofed and long-term stable; Communication via
HART, PROFIBUS PA or FOUNDATION Fieldbus



Application

The hydrostatic pressure sensor is used for the following measuring tasks:

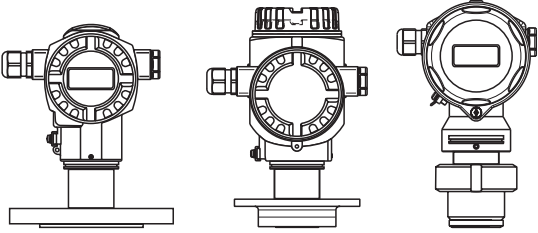
- Hydrostatic pressure measurement in liquids and paste media in all areas of process engineering, process measuring technology, pharmaceuticals and the food industries
- Level, volume or mass measurements in liquids

Your benefits

- Very good reproducibility and long-term stability
- Hermetically sealed CONTITE™ measuring cell:
 - condensate and climatic proofed
 - Maximum linearity (better than 0.1 % of the set measuring range)
 - High reference accuracy: $\pm 0.1\%$
 - Minimum temperature effects (better than 0.1%/10 K).
- HistoROM®/M-DAT memory module
- Function-monitored from the measuring cell to the electronics
- Quick commissioning thanks to quick setup menus
- Easy and safe menu-guided operation on-site, via 4 to 20 mA with HART, via PROFIBUS PA or via FOUNDATION Fieldbus
- Extensive diagnostic functions



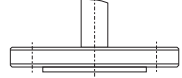
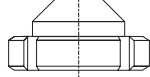
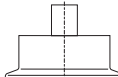
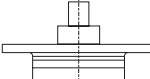
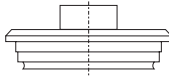
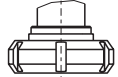
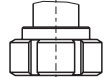

Function and system design

Device selection

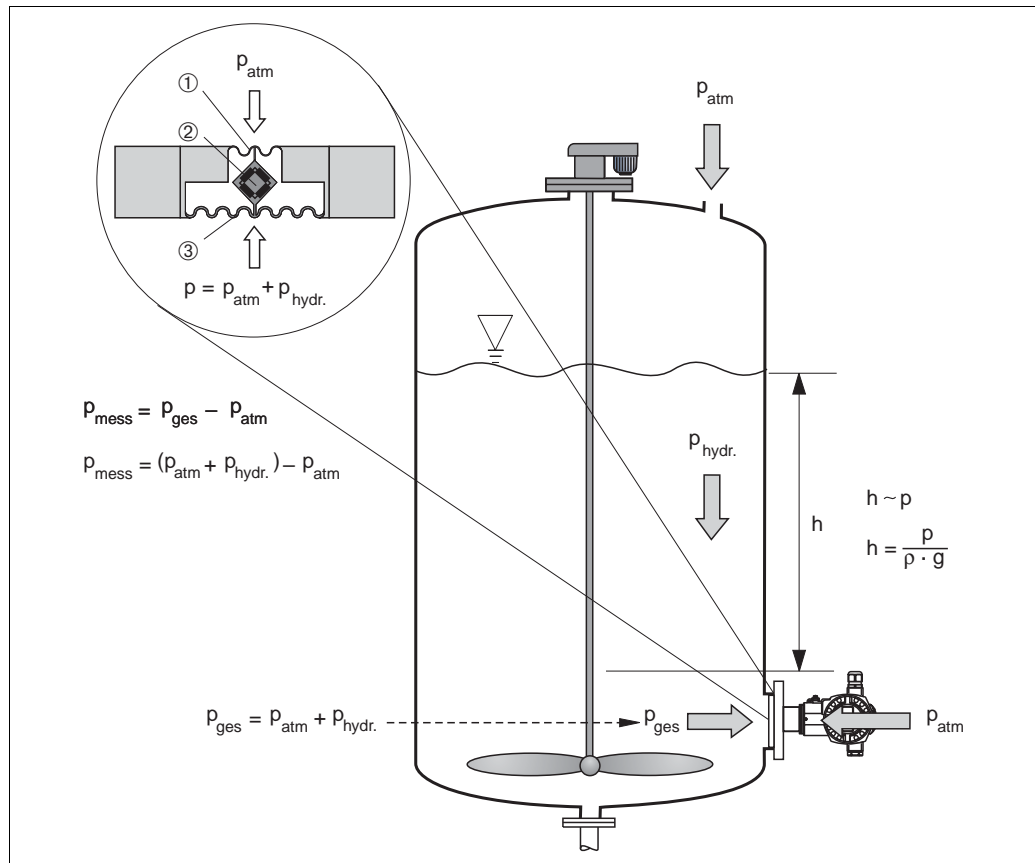
Deltapilot S	FMB70
	 <p style="text-align: right; font-size: small;">P01-FMB70xxx-14-xx-xx-xx-000</p>
Field of application	<ul style="list-style-type: none"> - Level measurement - Hydrostatic pressure measurement
Industries	Food, pharmaceutical, environment (fresh water and wastewater), chemical
Process connections	<ul style="list-style-type: none"> - Thread - Flanges - Flush-mounted hygienic connections
Process connection material	<ul style="list-style-type: none"> - AISI 316L/1.4435 - Alloy C276/2.4819
Measuring ranges	from -100 to +100 mbar to -900 to +10000 mbar
OPL ¹	max. 27 bar
Process temperature range	-10 to +100°C/+14 to +212°F (+135°C/+275°F short term, for no more than 30 minutes)
Ambient temperature range	-40 to +85°C (-40 to +185°F)
Reference accuracy	±0.1%
Supply voltage	<ul style="list-style-type: none"> - 4 to 20 mA HART: 10.5 to 45 V DC, EEx ia: 10.5 to 30 V DC - PROFIBUS PA: 9 to 32 V DC - FOUNDATION Fieldbus: 9 to 32 V DC
Output	4 to 20 mA with overlaid HART protocol, PROFIBUS PA or FOUNDATION Fieldbus
Options	<ul style="list-style-type: none"> - Gold-rhodium coated diaphragm - 3.1 Inspection certificate - 3A and EHEDG approval
Specialties	<ul style="list-style-type: none"> - Absolutely resistant to condensate thanks to hermetically sealed CONTITE™ cell - Maximum flexibility thanks to modular design

1) OPL: Over Pressure Limit; depends on the weakest link in terms of pressure of the selected components

Overview of process connections on FMB70

Design	Connection	Version	Standard	Approval	Nominal diameter	Nominal pressure/Class
Thread	G	 P01-PMP75xxx-03-xx-xx-xx-005	ISO 228	—	G 1 1/2 A	40 bar
	NPT	 P01-PMP75xxx-03-xx-xx-xx-006	ANSI	—	1 1/2 MNPT	40 bar
Flange	EN/DIN flange	 P01-PMP75xxx-03-xx-xx-xx-001	EN 1092-1/ DIN 2527	—	– DN 40 – DN 50 – DN 80 – DN 100	PN 10/16
	ANSI flange		ANSI B 16.5	—	– 1 1/2" – 2" – 3" – 4"	150 lbs
	JIS flange	B 2220	—	– 25 A – 50 A – 80 A – 100A	10 K	
Hygienic connections	Taper adapter with coupling nut	 P01-FMD78xxx-03-xx-xx-xx-003	DIN 11851	– EHEDG – 3A	– DN 40 – DN 50	PN 25
	Clamp	 P01-FMD78xxx-03-xx-xx-xx-005	ISO 2852	– EHEDG – 3A	– DN 51 (2")	Dependent on the clamp used
	DRD	 P01-FMD78xxx-03-xx-xx-xx-006		– 3 A	d = 65 mm	PN 25
	Varivent	 P01-FMD78xxx-03-xx-xx-xx-007		– EHEDG – 3 A	Type N for DN 40 – DN 162 pipes	PN 40
	SMS	 P01-FMB70xxx-03-xx-xx-xx-001		– EHEDG – 3A	2"	PN 25
	IDF	 P01-FMB70xxx-03-xx-xx-xx-002		– EHEDG – 3 A	2"	PN 25
	– Universal process adapter – Universal process adapter with 6" extension	 P01-FMB70xxx-03-xx-xx-xx-000		– EHEDG – 3A	d = 43.5 mm	PN 10

Measuring principle



Deltapilot S hydrostatic level measurement and measuring principle

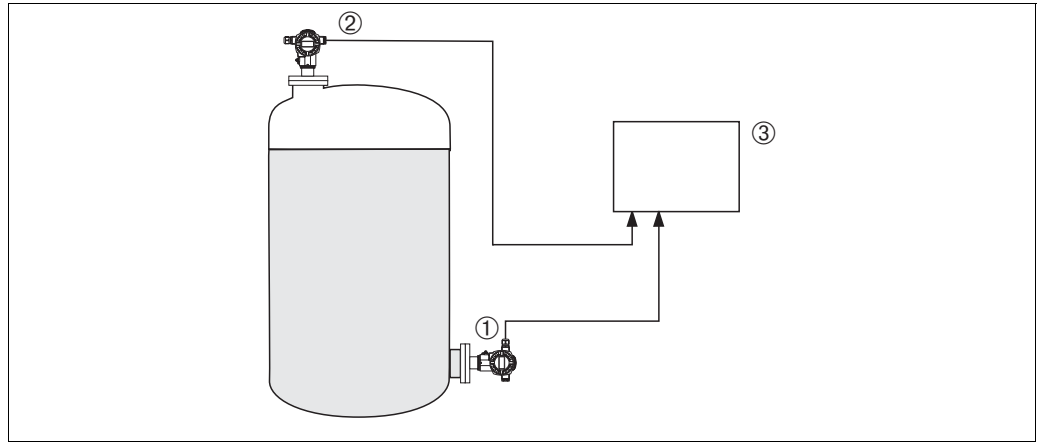
- 1 Measuring diaphragm
- 2 Measuring element
- 3 Process diaphragm (separating diaphragm)
- g Gravitational acceleration
- h Level height
- p_{tot} Total pressure = hydrostatic pressure + atmospheric pressure
- p_{atm} Atmospheric pressure
- $p_{hydr.}$ Hydrostatic pressure
- p_{meas} Measured pressure in the measuring cell = hydrostatic pressure
- ρ Density of fluid

Due to its weight, a liquid column creates hydrostatic pressure. If the density is constant, the hydrostatic pressure depends solely on the height h of the liquid column.

The CONTITE™ measuring cell which works on the principle of the gauge pressure sensor constitutes the core of Deltapilot S. In contrast to conventional gauge pressure sensors, the precision measuring element (2) in the CONTITE™ measuring cell is absolutely protected between the process diaphragm (3) and the measuring diaphragm (1). Thanks to this hermetic sealing of the measuring element, the CONTITE™ measuring cell is absolutely insensitive to condensate, condensation and aggressive gases. The pressure applied is transferred from the process diaphragm to the measuring element by means of an oil without any loss in pressure. Two temperature sensors are arranged between the process diaphragm and measuring element which measure the distribution of temperature in the cell. The electronics can compensate any measuring errors resulting from fluctuations in temperature with these measured temperature values.

Level measurement in closed tanks with pressure overlay

You can determine the differential pressure in tanks with pressure overlay using two Deltapilot S probes. The measured pressure values of the two probes are sent to a signal processing unit such as Endress+Hauser RMA or a PLC. The signal processing unit or PLC determines the difference in pressure and uses this to calculate the level and the density where necessary.



P01-FMB70xxx-15-xx-xx-xx-001

Level measurement in a closed tank with pressure overlay

- 1 Probe 1 measures the total pressure (hydrostatic pressure and top pressure)
- 2 Probe 2 measures the top pressure
- 3 The signal processing unit determines the difference in pressure and uses this to calculate the level

Note

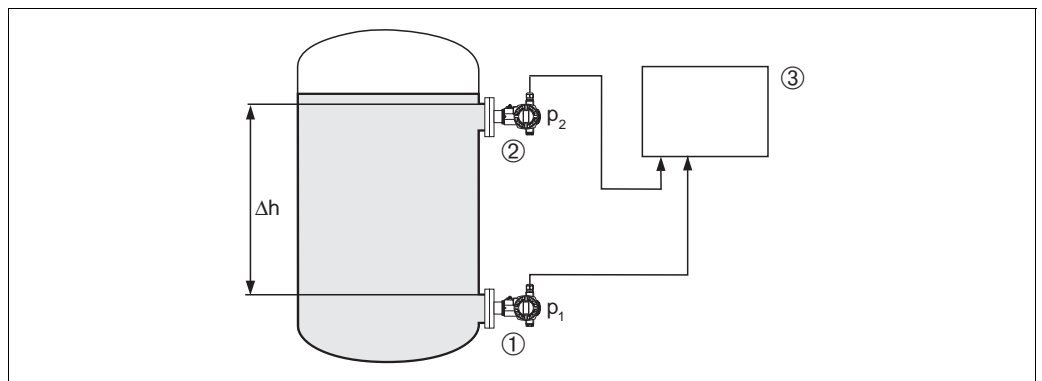
- When selecting the Deltapilot S probes, make sure you select large enough measuring ranges (→ see example).
- The measuring diaphragm of probe 2 must not be flooded. This generates additional hydrostatic pressure which distorts the measurement.
- The ratio of hydrostatic pressure to top pressure should be no more than 1:6.

Example:

- Max. hydrostatic pressure = 600 mbar
- Max. top pressure (probe 2) = 300 mbar
- Max. total pressure, measured with probe 1 = 300 mbar + 600 mbar = 900 mbar
⇒ Measuring cell to be selected: 0 to 1200 mbar
- Max. pressure, measured with probe 2: 300 mbar
⇒ Measuring cell to be selected: 0 to 400 mbar

Density measurement

You can measure the density in tanks with pressure overlay using two Deltapilot S probes and a signal processing unit or a PLC. The signal processing unit or the PLC calculates the density from the known distance Δh between the two probes and the two measured values p_1 and p_2 .



P01-FMB70xxx-15-xx-xx-xx-002

Level measurement in a closed tank with pressure overlay

- 1 Deltapilot S determines pressure measured value p_1
- 2 Deltapilot S determines pressure measured value p_2
- 3 Signal processing unit determines the density from the two measured values p_1 and p_2 and the distance Δh .

Communication protocol

- 4 to 20 mA with HART communication protocol
- PROFIBUS PA
 - The Endress+Hauser devices meet the FISCO model requirements.
 - Due to the low current consumption of $11\text{ mA} \pm 1\text{ mA}$, the following can be operated at one bus segment with installation as per FISCO:
 - Up to 9 Deltapilot S for EEx ia, CSA IS and FM IS applications
 - Up to 32 Deltapilot S for all other applications, e.g. in non-hazardous areas, EEx nA, etc.

Further information on PROFIBUS PA can be found in Operating instructions BA034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO guideline.
- FOUNDATION Fieldbus
 - The Endress+Hauser devices meet the FISCO model requirements.
 - Due to the low current consumption of $14\text{ mA} \pm 1\text{ mA}$, the following can be operated at one bus segment with installation as per FISCO:
 - Up to 7 Deltapilot S for EEx ia, CSA IS and FM IS applications
 - Up to 30 Deltapilot S for all other applications, e.g. in non-hazardous areas, EEx nA, etc.

Further information on FOUNDATION Fieldbus such as bus system component requirements are provided in Operating instructions BA013S "FOUNDATION Fieldbus Overview".

广州晋合水处理设备有限公司



地 址：广东省广州市海珠区工业大道333号华新园区7幢218

电 话：020-88191905

传 真：020-61139917

邮 编：510300

邮 箱：jinhewater@jinhewater.com

网 址：<http://www.jinhewater.com>

Endress+Hauser 
People for Process Automation