Transmitter-PM36

Intelligent pressure transmitter with diaphragm seal

Screw-in and flange couplings

Temperature separator

from 100 mbar up to 400 bar

Self monitoring

Local display and adjustment

Multiple overload

Explosion protection ATEX 100

Analogue, Smart or BUS- function

PROFILE

The transmitter PM36 measures gauge- and absolute pressure in gases, vapours and liquids and can be used in nearly all areas of process engineering. The transmitter works on the two-wire principle and features a polysilicon-measuring element. Gauge and absolute pressures from 100 mbar up to 400 bar respectively, are converted into a standard pressure proportional 4...20 mA signal.
The BUS version uses digital communication for the signal.
The digital version can be equipped with a local display comprising digital display and bargraph whereas the analogue version allows only a bargraph display.
The applied technology ensures reliable and simple operation.

DESCRIPTION

The transmitter comprises the measuring cell, the process coupling with the diaphragm seal and the electronics housing. Connecting terminals are accessible in a separate compartment after opening the lid.

The process pressure acts onto a metallic isolating diaphragm. Via the filling fluid (Silicone oil or Inert oil) the pressure is transferred to the Polysilicon-sensor with the piezo-resistive bridge. The output signal of the bridge is being processed. According to the process requirements the isolating diaphragm is either flush mounted or is located inside the process coupling.

The analogue-electronic is an economic, fast and simple version of transmitter PM36. Zero and span can be adjusted locally by means of two potentiometers. With dip switches coarse setting of span with a spread of 1:1 up to 10:1 is possible. The required pressure signals must be provided as reference.
The analogue electronics features adjustment of Zero with ± 10 % within the cell limits.

Digital-electronics provides widespread operating and adjustment facilities with the corresponding hand-held terminal or via PC engineering. It realises precise signal processing and monitors the transmitter function from sensor to output function. Local operation is performed by means of push buttons and the pluggable display. The required pressure signals must be provided as reference and will be stored via push button operation.
Based upon the used measuring cell a turn down of 10:1 is possible.

The transmitter monitoring function generates an alarm if any fault is being detected. The alarm acts onto the analogue output signal and can be set in its function.

TECHNICAL DATA

INPUT

Absolute and gauge pressure in gases, vapours, liquids.
Polisilicon cell for ranges up to 400 bar

GAUGE PRESSURE

Cell		Measuring limits	Min. Span	Overload
Type	[bar]	[bar]	[bar]	[bar]
3H	1	0...1	0,1	4
3M	4	0...4	0,4	16
3P	10	0...10	1	40
3S	40*	0...40	4	160
3U	100*	0...100	10	400
3Z	400*	0...400	40	600
7H	± 1	-1...+1	0,2	4
7M	-1...4	-1...+4	0,5	16
7P	-1...10	-1...+10	1,0	40

*)Absolute pressure sensors

ABSOLUTE PRESSURE

Cell		Measuring limits	Min. Span	Overload
Type	[bar]	[bar]	[bar]	[bar]
4H	1	0...1	0,1	4
4M	4	0...4	0,4	16
4P	10	0...10	1	40
4S	40	0...40	4	160
4U	100	0...100	10	400
4Z	400	0...400	40	600

Minimum pressure: 10 mbar absolute

PROCESSMEDIA

Liquids, gases, vapour (aggressive or corrosive with suitable material).

PROCESS TEMPERATURE

Without isolator up to + 100 °C

Fig. 1 DIN-/ANSI flange

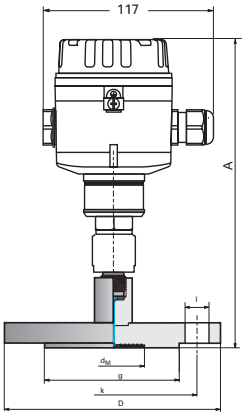
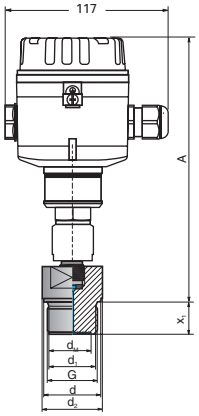


Fig. 2 Screw-in G and NPT



Temperature isolator G ½ A; ½ NPT

Type	PN	T_C amb.	T_C process	Range min	Mounting effect	Add. weight
		mbar/10K		bar	mbar	kg
G 1/2A	160	+1	+2	0,1	7	1,2
½-NPT				0,1	7	

Fig. 3 Temp-Isolator G ½ A (max. 150 °C)

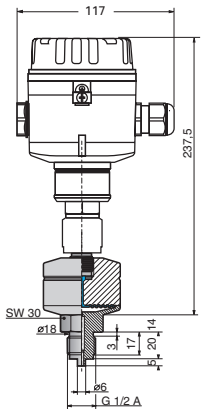
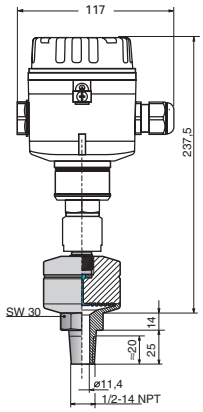


Fig. 4 Temp-Isolator ½ NPT (max. 150 °C)



Dimensions DIN flange

DN	PN	D	b	d_2	d_M	Bolt hole	g_2	k	T_C Silicone oil *) ambient /process		Effect of mounting	A_{max}	Weight total
	bar	mm	mm	mm	mm		mm	mm	mbar/10K		mbar	mm	kg
25	64/160	140		68	28	4	18	100	+8	+8	11	255	2,5
50	10/40	165	20	102	46			125	+1	+2	10		3,3
80	10/40	200	20	138	70	8		160	+1	+2	11	259	5,8

Dimensions ANSI flange (inch)

DN	PN	D	b	d_2	d_M	Bolt hole	g_2	k	T_C Silicone oil *) ambient/process		Effect of mounting	A_{max}	Weight total
inch	lbs	in	in	in	in		in	in	mbar/10K		mbar	mm	kg
1	400/600	140	0.69	2.00	28	4	0.75	3.50	+8	+8	10	250.5	2.5
2	300	165	0.88	3.62	46	8		5.00	+1	+2	10	257.5	4.1
3		200	1.12	5.00	70		0.88	6.62	+1	+2	11	259	7.7

Dimensions screw-in coupling G and NPT

	PN	d1	d	d_2	x_1	SW	d_M	T_C Silicone oil *) ambient/process		Min. span	Effect of mounting	A_{max}	Weight total
Inch	bar	mm	mm	mm	mm	mm	mm	mbar/10K		bar	mbar	mm	kg
G1½	400	44	55	58	30	41	38	+2	+4	from 2	11	232,5	1,9
G 2		56	68	78		60	46	+1	+2	from 0,4		237,5	2,9
1½ NPT		-	-	52		46	32	+5	+5	from 4		233.5	1,9
2 NPT		-	-	78		65	36	+3	+4	from 1			2,8

Filling fluid for sealing diaphragm

Filling fluid	Medium temp. at 50 mbar ≤ p_{abs} ≤ 1 bar	Medium temp. at p_{abs} ≥ 1 bar	Max. hight-difference at p_{abs} ≥ 1 bar	T_C- correct.-factor	Remarks
Silicone oil	-40 bis 180 °C	-40 bis +250 °C	max. 7m	1	Standard
Vegetable oil	-10 bis +120 °C	-40 bis +200°C	max. 7m	1,05	Food and beverage
Glycerine	-	+15 bis +200 °C	max. 4m	0,64	Food and beverage
High temp. oil	-10...+200 °C	-10...+350 °C	max. 7m	0,72	

WETTED MATERIALS

Diaphragm

- Stainless Steel 316 L (1.4435)
- others on request

Flanges

- Stainless Steel 316 L (1.4435)

Filling media for sealing diaphragm

Selection of the filling liquid for the isolating diaphragm depends from pressure and temperature conditions of the process. Second criteria is the immunity of the filling liquid with the process. Details see list above.

Smallest span

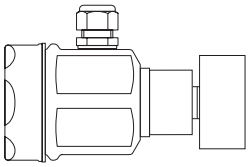
Based upon the thermal expansion of the filling liquid, isolating diaphragms cause an additional temperature effect with the measurement.
Following points should be considered for selection:

- The nominal width determes the diameter of the diaphragm.
- Large diameter of diaphragm results in a smaller temperature effect.
- Small spans require large diameter to minimize temperature effects.
- The larger the diameter of the diaphragm, the larger permissable process temperature range.

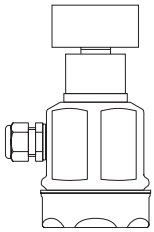
POSITION EFFECTS

(See also diaphragm seal tabels)
The transmitter calibration is based upon the limit point methode according to DIN 16086. Depending on the orientation of the device, there might be a slight shift in the measuring value. Diaphragm seals do have also a zero shift depending on the orientation of the transmitter.

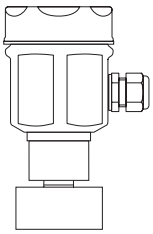
- neutral calibration position



- max. positive zero shift

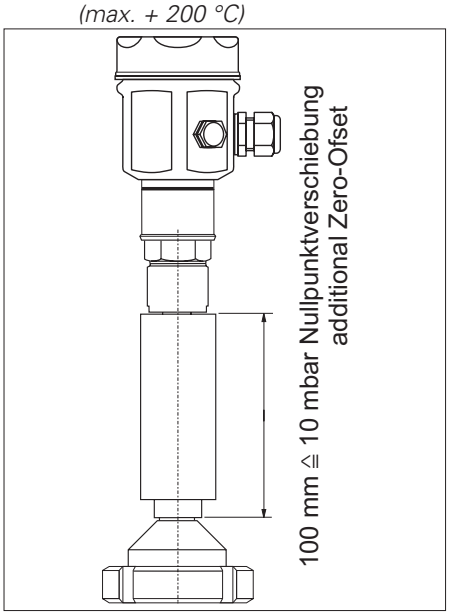


- max. negative zero shift



This zero shift due to the position can be compensated for up to +/- 10 %. (Not possible with negative span start and analogue electronics)
The max. effect of mounting position is given in the tables for all diaphragms on the page before.
The values given are for silicone oil. For other oils it varies according to the density of the oil in use.

Fig. 5 Temperature separator 100 mm (max. + 200 °C)



TEMPERATURE EFFECTS

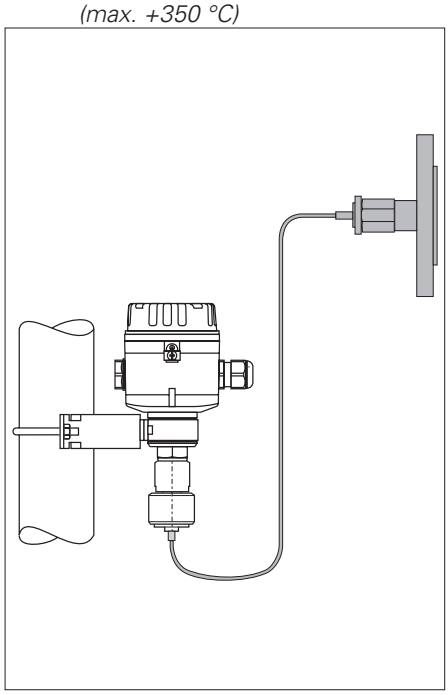
Main temperature effect depends mainly from the process temperature adjacent to the sealing diaphragm.

- The temperature coefficient T_C given in the technical specification applies to Silicone oil calibrated at 20 °C.
- For other filling fluids these values are to be multiplied with the correction factor given in the table.

The total temperature coefficient T_C is the result of adding T_C of the single coeficients (transmitter, diaphragm seal as possibly capillary).

The T_C of the capillary is effected by the ambient temperature. T_C per meter for Silicone oil filling fluid: 0.5 mbar/10 K

Fig. 6 Mounting with capillary (max. +350 °C)



GUDELINES FOR MOUNTING WITH CAPILLARY

The transmitter generally should be mounted below the tapping point.
A maximum difference in height between the tapping point and the transmitter should not be exceeded, to avoid interruption in the fluid column in the capillary which leads to substantial damage of the diaphragm seal.

- Minimum bending radius of capillary tubing: 100 mm (4-in)
- In case of vaccum application the transmitter must be mounted below the pressure tapping point.
- For temperature effects see separate section.

OUTPUT

	Analogue	Smart[1)]
Signal	4...20 mA	4...20 mA, with super imposed communication protocol
Signal on alarm	> 20.5 mA or < 3.6 mA settable	settable to > 20.5 mA or < 3.6 mA or HOLD
Ripple		(HART), measured on 500 Ω 47...125 Hz U_{PP}=200 mV, Noise: 500 Hz up to 10 kHz U_{RMS} 2.2 mV (on 500 Ω)
Characteristic	Pressure proportional	
Conformity error incl. hysterisis and reproducibility (limit point method)	± 0.3 %	
Integration time (settable)	0s, 2 s	0s, 2s, via HART 0...40 s
Rise time	60 ms	220 ms
Response time	180 ms	600 ms
Warm-up time	200 ms	1 s
Long term drift	0.1 % (FS) / year	

Output BUS: Profibus PA

MAX. LOAD

$$R_{Load} = \frac{U_{Supply} - 11.5[V]}{0.023[V]} - R_{Lead}[\Omega]$$

[1)] Inverse output signal possible, specifiy span start and span end in clear text xxx9x

Fig. 7 Electrical connection analogue

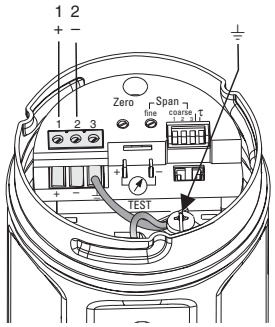
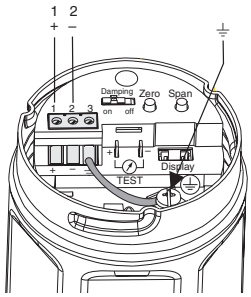


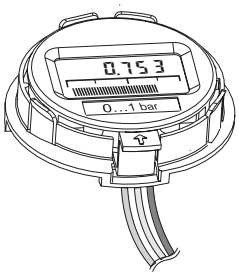
Fig. 8 Electrical connection digital



DISPLAY

Analogue signal via 28 segment LCD bargraph ≙ 0...100 %; with smart additionally 4 digit 7 segment display.

Fig. 8 Display smart



OPERATION

Analogue	Adjustment of zero and span via DIP switches and two potentiometer direct. Selection of damping.
Smart	Adjustment of zero and span by means of two push buttons direct. Setting of damping. Remote operation via HART protocol
BUS	Adjustment of zero and span by means of two push buttons direct. Setting ofAddress. Remote operation via digital protocol

SUPPLY

DIRECT CURRENT

11.5 ... 45 VDC
11.5 ... 30 VDC with EEx

Ripple of supply voltage

No effect for $U_{RMS} \leq \pm 5$ % within permissible range

Overvoltage category

II to DIN EN 61 010-1

EXPLOSION PROTECTION

Mode: ATEX 100, II 1 / 2 G, EEx ia IIC T6

Certificate of conformity

applied for

Mounting

Transmitter in hazarded area zone 1

ENVIRONMENTAL CONDITIONS

AMBIENT TEMPERATURES

For operation: -40... + 85 °C[1)]
For storage: -40.... +100 °C (with display +85 °C)

Temperature effect T_C*) for span start and span
(Referred to nominal value of cell)
*) But not exceeding error due to thermal effects.

Analogue		Smart	
-10...+60°C	-40...10 < > +60...85°C	-10...+60 °C	-40...10 < > +60...85°C
± 0.15 %/10 K	± 0.2 % / 10 K	± 0.08 %/10 K	± 0.1 % / 10 K

Thermal effect

Referred to set span

$$\pm\left(X\% \times TD + 0.3\%\right)$$

(TD = nominal value/set span)

Analogue		Smart	
-10...+60°C	-40...10 < > +60...85°C	-10...+60 °C	-40...10 < > +60...85°C
X = 0.3	X = 0.5	X = 0.2	X = 0.4

Climatic class

4K4H to DIN EN 60721-3

Vibrations

No effects with 4 mm stroke at 5...15 Hz,
or
2g at 15...150 Hz, or 1 g at 150...2000 Hz

ELECTROMAGNETIC COMPATIBILITY

Complies with EN 50 081-1 and EN 50 082-2 as also
NAMUR recommendation NE21:
effect < 0.5 %

GENERAL

ELECTRONIC HOUSING

Di-cast aluminim (AlSi12)
surface chromated, Epoxy coated
Cover seal: Silicone rubber
Type label: Stainless steel

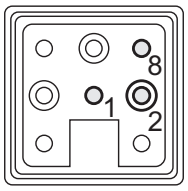
MODE OF PROTECTION

IP 66 / Nema 4 with cable gland
IP 68 / Nema 6P with fixed cable (1m WG for 24 h, respectively 1.8 m WG for 30 minutes).

ELECTRICAL CONNECTION

Screw terminals for 0.5...2.5 mm^2.
selectable via
Cable gland M20 x 1.5
Cable conduit for ½ NPT
or
Harting plug HAN 7

Fig. 7 Connection HARTING plug



1 = + (bl)
2 = - (bn)
8 = ⏚ (gn/ye)

or
Fixed cable 5m with reference air feed

Profibus connection via screw plug M12x1

[1)] protect against heat radiation

INSTALLATION CONDITIONS

Orientation as required,
orientation-dependent zero offset must be adjusted.

WEIGHT

approximately 1.6 kg plus diaphragm seal see corresponding table.

ACCESSORY

Instructions
Analogue electronics 9499-040-64511
Smart-electronics 9499-040-64311

ADDITIONAL ACCESSORIES

Bracket for wall or pipe mounting
9407-290-00051

Fig. 8 Mounting bracket

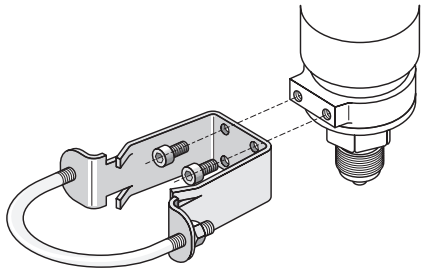


Fig. 12 Pipe mounting with capillary tube

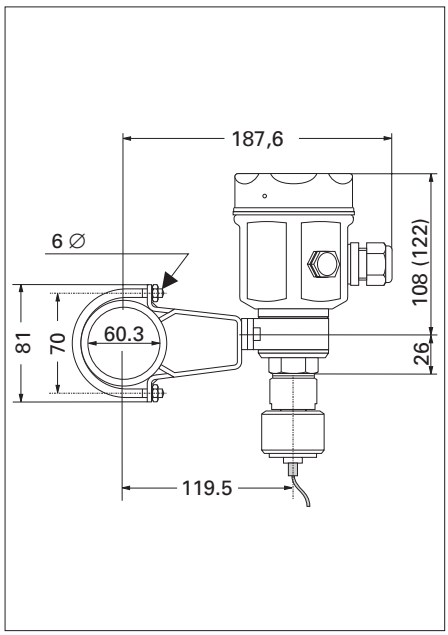
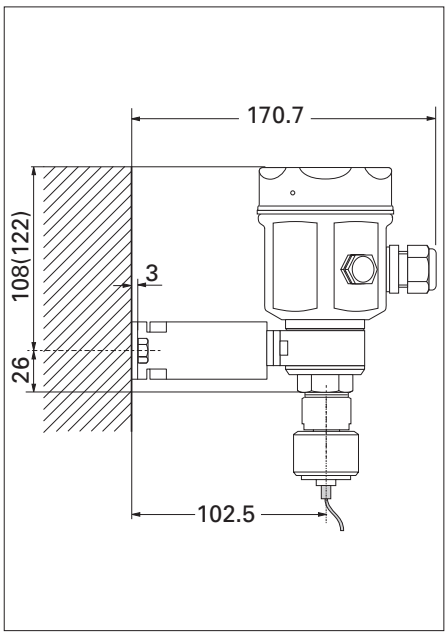
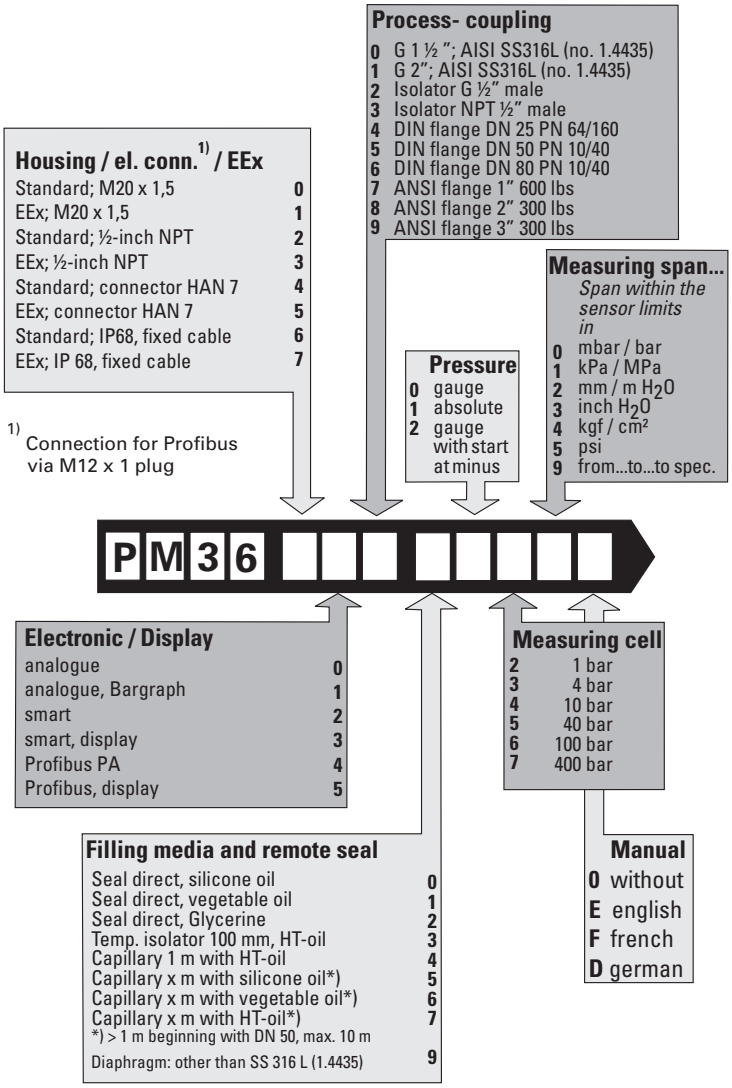


Fig. 13 Wall mounting with capillary tube



ORDERING STRUCTURE



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