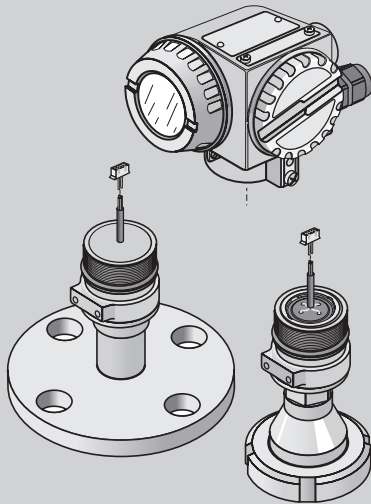




Transmitter-PM4DM with isolating diaphragm



Selfmonitoring

Local display and adjustment

Wide variety of process couplings

Also for hygienic conditions

Explosion protected EEx ia IIC

SMART function and communication

PROFILE

The pressure transmitter PM4DM works on the two wire principle and, depending on the measuring range, it features a ceramic or polysilicon measuring element. Gauge pressures from 5* mbar up to 400 bar, and absolute pressures from 20* mbar up to 400 bar are converted into a standard pressure proportional 4...20 mA signal. The pressure itself is transferred from the isolating diaphragm via the internal filling liquid onto the measuring cell, ensuring that the process coupling is performing its function according to the process conditions.

Microprocessor technology ensures reliable and simple operation. Remote operation via the supply leads is possible for FSK protocol HART

DESCRIPTION

Transmitter PM4DM comprises the measuring cell, the process flange with isolating diaphragm and the electronics housing. The connecting terminals are in a separate compartment. An ASIC in the sensor module stores all the sensor-specific data, so that exchange or replacement of the electronics becomes quite simple. The flat sealing diaphragm is welded or brazed into a ring carrier. Depending on the respective positions of sealing diaphragm it can be supplied also with a capillary tube.

Pressure transfer is achieved by different types of oil, which are sealed under vacuum into the system.

Process flanges, wetted by the process media are made of

- Stainless steel 316 L

Material of diaphragm is available in

- Stainless steel 316 L
- PTFE foil on Stainless steel
- Hastelloy C
- Tantalum

Process flanges itself are also available for hygienic conditions according to

- DIN 11851
- Clamp
- SMS
- Others

for standard flanges according to

- DIN 2501 raised face type D
- ANSI B 16.5 with raised face

for threaded flanges

- G thread
- NPT thread

An optional LCD indicator with integrated bargraph is very useful for on-site adjustment and display.

If the mounting position makes access to the terminal compartment difficult, or the display cannot be viewed easily, the entire transmitter can be rotated up to 320 degree.

Microprocessor controlled electronics convert the pressure signal into a high precision output signal, and provides comprehensive monitoring functions. The self monitoring feature of the measuring cell ensures exceptional operating safety and reliability for industrial processes.

Electronics and connecting terminals are housed in separate hermetic compartments. This ensures that the electronics are protected from aggressive environments when the terminal compartment is opened.

Span start (zero) and span are adjustable on-site by means of four push buttons. Remote adjustment is possible by using the „HART“ protocol.

A turn-down ratio of 100 : 1 is possible within the range of each measuring cell*).

If an internal fault is detected, the self-monitoring function generates an alarm which drives the output signal into a pre-defined condition (upscale, downscale or no effect)

*) depending from flange and isolating diaphragm

TECHNICAL DATA

INPUT

CERAMICAL CELL UP TO 40 BAR

Gauge pressure

Cell type	Measuring limits [bar]	Smallest span	Max. Overload
0.4 bar	-1/+04	depending	10 bar
2 bar	-1/+2	from	20 bar
10 bar	-1/+10	flange	40 bar
40 bar	-1/+40	dimensions	60 bar

Absolute pressure

Cell type	Measuring limits [bar]	Smallest span	Max. Overload
0.4 bar	0/+04	depending	10 bar
2 bar	0/+2	from	20 bar
10 bar	0/+10	flange	40 bar
40 bar	0/+40	dimensions	60 bar

POLYSILICON CELL FROM 40 BAR UP TO 400 BAR

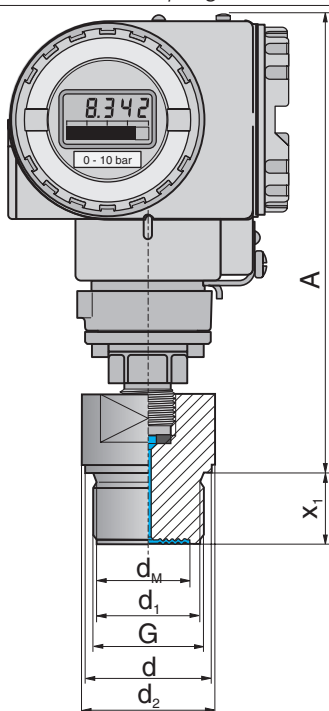
Gauge pressure

Cell type	Measuring limits [bar]	Smallest span	Max. Overload
100 bar	-1/+100	1bar	400 bar
400 bar	-1/+400	4bar	600 bar

Absolute pressure

Cell type	Measuring limits [bar]	Smallest span	Max. Overload
100 bar	0/+100	1 bar	400 bar
400 bar	0/+400	4 bar	600 bar

Fig. 1 Threaded coupling



Filling media

Filling media	Medium temperature at $50 \text{ m}_{\text{bar}} \leq p_{\text{abs}} \leq 1 \text{ bar}$	Medium temperature at $p_{\text{abs}} \geq 1 \text{ bar}$	Remarks
Silicone oil	- 40 up to + 180 °C	- 10 up to + 200 °C	Standard
High-temperature oil	- 10 up to + 200 °C	- 10 up to + 350 °C	
Halocarbon	- 40 up to + 80 °C	- 40 up to + 175 °C	For Oxygen, inert
Fluorolube	- 40 up to + 80 °C	- 40 up to + 175 °C	For Oxygen, inert
Voltalef	- 40 up to + 80 °C	- 40 up to + 175 °C	For Oxygen, inert
Glycerine	-----	+ 15 up to + 200 °C	Food & beverages
Vegetable oil	- 10 up to + 120 °C	- 10 up to + 200 °C	Food & beverages

FILLING MEDIA FOR SEALING DIAPHRAGM

Selecting 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.

Minimum pressure 10 mbar absolute

PROCESS MEDIA

Liquids and gases (aggressive or corrosive with suitable material selection)

MATERIALS

Diaphragm

- Stainless steel 316 L
- PTFE foil on stainless steel
- Hastelloy C
- Tantalum

Process coupling

- Stainless steel 316 L

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 of the diaphragm seal is determined by the diameter of the diaphragm.
- Large diameter of diaphragm results in smaller temperature effect.
- Small spans require large diameter to minimize temperature effects.
- The larger the diameter of the diaphragm, the larger permissible process temperature range.

TEMPERATURE EFFECTS

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

- The temperature coefficient given in the technical specification applies to glycerine calibrated at 20 °C.
- These values are to be doubled for other filling fluids.
- The total temperature coefficient T_k is the result of adding T_k of the transmitter to that of the isolating diaphragm.

Table 1 Threaded coupling with isolating diaphragm

Threaded process coupling							Isolating diaphragm				
Thread		Ø	Ø	Ø	Depth	Spanner width	Ø diaphragm	Temp. coeff.	Min. span	Total height	Total weight
	PN bar	d1 mm	d mm	d2 mm	x1 mm	SW mm	dM mm	Tk mbar/10K		A mm	
G 1 A	400	29	39	SW	21	41	27	20	≥ 10	175	1.6
G 1 ½ A	400	42	54.5	58	30	41	38	6	≥ 0.4	177	2.3
G 2 A	400	56	68	78	30	60	44	3	≥ 0.1	182	3.3
NPT 1 in	400			SW	28	41	23	20	≥ 10	180	1.9
NPT 1 ½ in	400			52	30	46	32	12	≥ 0.4	178	2.3
NPT 2 in	400			78	30	65	36	6	≥ 0.1	178	3.2

Fig.2 DIN flanged isolating diaphragm

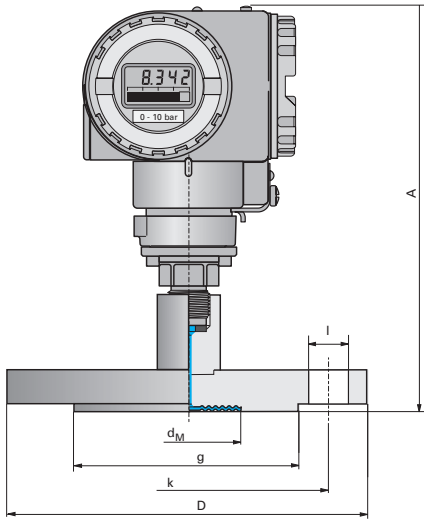


Table 2 DIN flanged isolating diaphragm

DIN flanged process coupling							Bolt holes				
Flange		∅	Thick-ness	Raised face ∅	∅ diaphragm	Temp. coeff.	Number	∅	Pitch ∅	Total height	Total weight
DN	PN	D	b	g	dM	Tk		l	k	A	
	bar	mm	mm	mm	mm	mbar/10K		mm	mm	mm	kg
50	10/40	165	20	102	46	3	4	18	125	200	3.72
80	10/40	200	20	138	70	2	8	18	160	204	6.23
25	64/160	140	-	68	28	20	4	18	100	204	2.9
25	250	150	-	68	28	20	4	22	105	204	5.45
25	400	180	-	68	28	20	4	26	130	204	11.4
50	64	180	20	102	46	3	4	22	135	204	6.26
50	100/160	195	20	102	46	3	4	26	145	204	16.9
50	250	200	20	102	46	3	8	26	150	204	12.9

Fig. 3 ANSI flanged isolating diaphragm

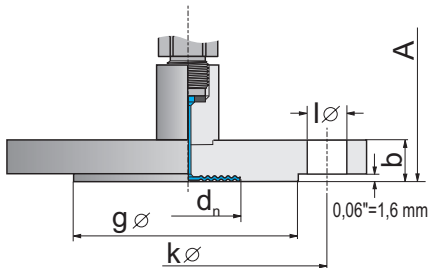


Table 3 ANSI flanged isolating diaphragm

ANSI flanged process coupling							Bolt holes				
Pipe		∅	Thick-ness	Raised face ∅	∅ diaphragm	Temp. coeff.	Number	∅	Pitch ∅	Total height	Total weight
DN	PN	D	b	g	dM	Tk		l	k	A	
in	lb/sq.in	in	in	in	in	psi/10°F		in	in	in	pounds
2	150	6	3/4	3.62	1.81	0.008	4	3/4	4 3/4	7.87	9.2
2	300	6 1/2	0.88	3.62	1.81	0.008	8	3/4	5	7.87	9.9
3	150	7 1/2	0.94	5	-	0.005	4	3/4	6	7.87	13.8
3	300	8 1/4	1.12	5	-	0.005	8	0.88	6,62	7.87	17.9
1	400/600	4.88	0.69	2	1.1	0.05	4	3/4	3 1/2	7.87	6.4
1	900/1500	5.88	1.12	2	1.1	0.05	4	3/4	4	7.87	10.8
1	2500	6 1/4	1.38	2	1.1	0.05	4	3/4	4 1/4	7.87	13.8
2	400/600	6 1/2	1	3.62	1.81	0.008	8	3/4	5	7.87	12
2	900/1500	8 1/2	1.5	3.62	1.81	0.008	8	1	6 1/2	7.87	25.1
2	2500	9 1/4	2	3.62	1.81	0.008	8	1.12	6 3/4	7.87	37.3

Fig. 4 Flange to DIN 11851 (hygienic)

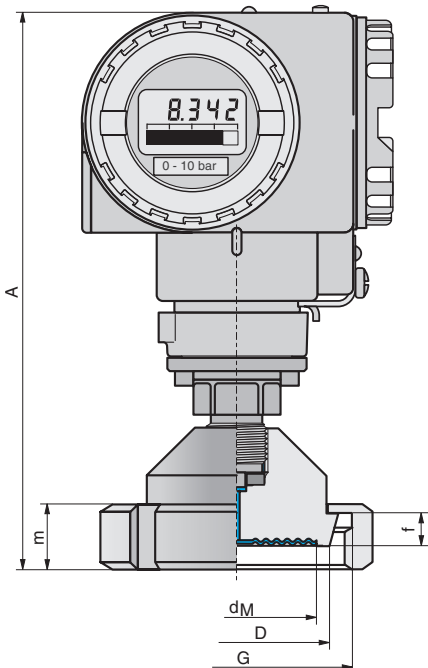


Table 4 Flange to DIN 11851 with isolating diaphragm (hygienic)

DIN 11851 flanged process coupling							Isolating diaphragm				
DN	PN	∅	Cone-height	Thread	Height	Height	∅ diaphragm	Temp. coeff.	Min. span	Total height	Total weight
	bar	D	f	G	k	m	dM	Tk	k	A	
		mm	mm	Rd	mm	mm	mm	mbar/10K	bar	mm	kg
25	40	44	10	52 x 1/6	21	21	26	20	≥ 6	175	1.6
32	40	50	10	58 x 1/6	30	21	32	12	≥ 2	177	2.3
40	40	56	11	65 x 1/6	30	21	38	6	≥ 0,4	182	3.3
50	40	68	11	78 x 1/6	28	25	46	3	≥ 0,1	180	3.9

OUTPUT

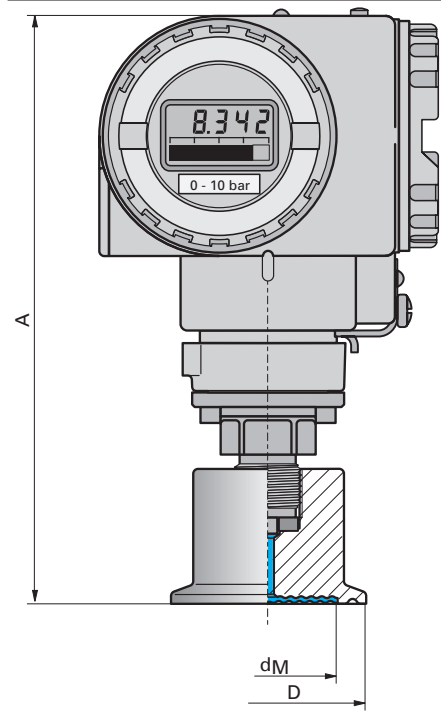
Standard signal: 4...20 mA
max. output current: 20.5 mA
Ripple: ≤ 0.25 % fsd
Characteristic: pressure proportional

CONFORMITY

(zero based to DIN 16 084)
 ≤ 0.1 % of set span up to TD 10:1
For TD 100:1 Conformity error

$$= \pm 0,1\% \times \frac{0,1 \times \text{no min al } \circ \text{value}}{\text{set } \circ \text{span}}$$

Fig 5 Hygienic flange, Tri-clamp

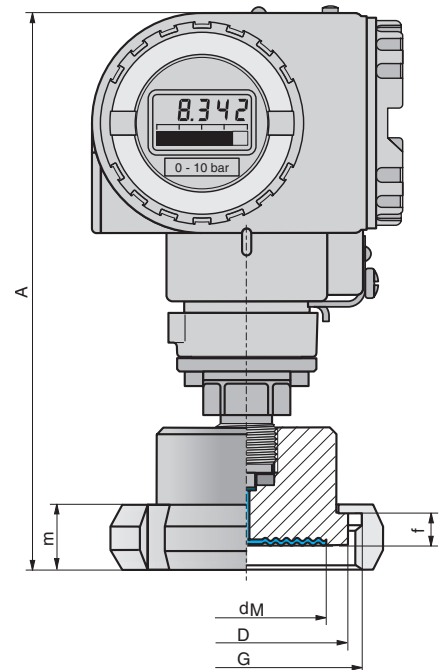


Max. load

$$R_{Load} = \frac{U_{Supply} - 11.5[V]}{0.02[V]} - R_{Lead} [\Omega]$$

Load effect: ≤ 0.01 % per 100 Ω

Fig 6 Hygienic flange SMS



DAMPING

Adjustable 0..16 s
(settling time for 63 % of final value)

Undamped delay for T₉₀: 150 ms

Table 5 Tri-clamp hygienic flange with isolating diaphragm

Tri-clamp flanged process coupling			Isolating diaphragm				
DN	PN	∅ D	∅ diaphragm dM	Temp. coeff. Tk	Min. span k	Total height A	Total weight
in	bar	mm	mm	mbar/10K	bar	mm	kg
1 ½	40	50.5	32	12	≥ 0.4	177	1.4
2	40	64	46	3	≥ 0.1	187	1.6

DISPLAY

4 digit LDC display of pressure, and LCD bargraph with 28 segments for output signal.

OPERATION

Local operation is performed by means of four keys protected by a cover plate for adjustment of zero and span and for balancing any offset due to the mounting position. Damping can be set with the rotary switch accessible after removing the lid for the electronic compartment. Remote operation is possible by using the HART protocol facilities.

EXPLOSION PROTECTION

Protection type: EEx ia IIC T4, zone 1

Certificate of conformity

KEMA Nr. Ex 95.C.3881

Installation

Transmitter in zone 1 hazardous area

ENVIRONMENTAL CONDITIONS

Permissible temperatures

For operation: -40... + 85 °C
For storage: -40.... +100 °C

Table 6 Hygienic flange with isolating diaphragm to SMS

SMS flanged process coupling							Isolating diaphragm				
DN	PN	∅ D	Insert-height f	Thread G	Height k	Height m	∅ diaphragm dM	Temp. coeff. Tk	Min. span k	Total height A	Total weight
in	bar	mm	mm	Rd	mm	mm	mm	mbar/10K	bar	mm	kg
1	40	35.5	3.5	40 x 1/6	20	15.5	23	30	≥ 6	204	1.4
1 ½	40	55	4	60 x 1/6	25	21	32	12	≥ 0.4	204	1.8
2	40	65	4	70 x 1/6	260	21	46	3	≥ 0.1	204	2.0

POWER SUPPLY

Supply voltage

11.5 ... 45 VDC
11.5...30 VDC for intrinsic safety

Voltage effect

≤ 0.1 % between 12 and 36 VDC

Ripple

no effect for U_{pp} ≤ 0.5 % at 24 VDC

Temperature effects^{1,2)}

Temperature Coefficient Tk in % / 10 K		
Span start	Span	Ambient temperature
±0,02 %	±0,02 %	-10 ... + 60 °C
±0,05 %	±0,05 %	-40 ... -10 °C
±0,05 %	±0,05 %	+60 ... +85 °C

MAX. PROCESS TEMPERATURE

without temperature isolator: ≤130 °C,
limited to heating-up of electronics.

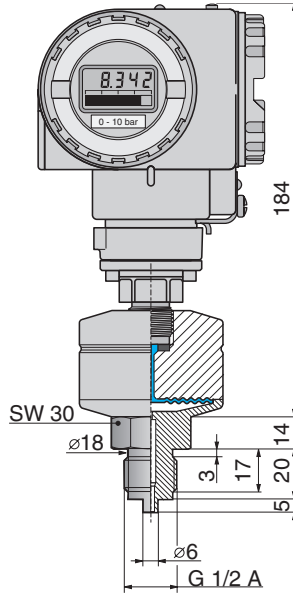
with temperature isolator: ≥ 130 °C
for Ex limited to + 70 °C = T4

¹⁾ referred to nominal span of the cell.
Referred to adjusted span:
-10...+60 °C: ±0,1% *TD +0,1%,

Whereas $TD = \frac{\text{defindedCellSpan}}{\text{adjustedSpan}}$

²⁾ add Tk for isolating diaphragm

Fig. 6 Thermal isolator



RELATIVE HUMIDITY

100 %, no condensation

CLIMATIC CATEGORY

Class GPC to DIN 40 040

VIBRATION EFFECT

(For electronics only) No effect from mechanical vibrations with 4 mm stroke at 5...15 Hz, or 2g at 15...150 Hz, or 1 g at 150...2000 Hz

ELECTROMAGNETIC COMPATIBILITY

Meets EN 50 082-2 and EN 50 011. Tests according to IEC 801-1 to 801-6

GENERAL

Electronic housing

Die-cast aluminium AlSi12 with fully chromated surface, epoxy polyester coated

Housing protection type

IP 65 to IEC 529

Electrical connections

Screw terminals for 0.5...2.5 mm² via cable entry gland

Mounting position: not critical

Weight: depending from process coupling, see tables

Accessories: operating instructions 9499-040-43501

ACCESSORY

Mounting set, for version with capillary 9404-290-01201

ORDERING STRUCTURE

See next page!
Please use clear text for the specification. Final order numbers will be given in effect of orders.

Fig.7 connections

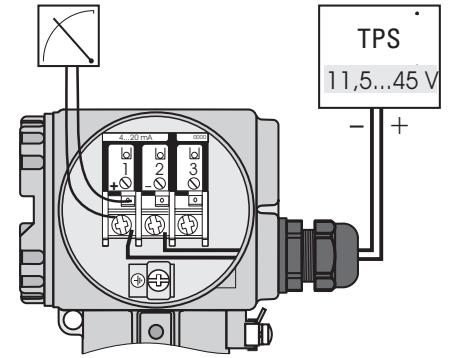
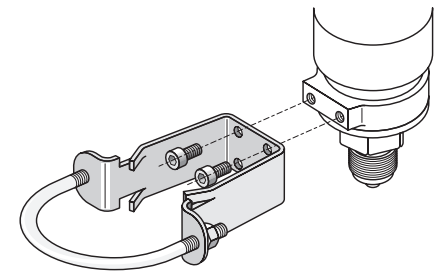


Fig.8 Mounting bracket



ORDERING STRUCTURE

9 4 0 4 2 1 9 1

Version with HART protocol

no display, non EEx 4
EEx ia IIC T4/T6 5
with LCD display, non EEx 6
with LCD display, EEx ia IIC T4/T6 7

**Missing codes will be given in effect of orders,
please select and use clear text**

Sensor, ceramic, gauge pressure

400 mbar, 2 bar, 10 bar, 40 bar

Sensor, Silicon, gauge pressure

100 bar, 400 bar

Sensor, ceramic, absolute pressure

400 mbar, 2 bar, 10 bar, 40 bar

Sensor, Silicon, absolute pressure

100 bar, 400 bar

Calibration / unit

Calibrated from 0...nominal value of cell
in mbar/bar, linear
in kPa/Mpa, linear
in mm H₂O, linear
in inch H₂O, linear
in kgf/cm², linear
in psi, linear

Span start, span, technical units in clear text

Filling liquid / temperature isolator

Silicon oil, none
Vegetable oil, none
Glycerine, none
High temperature oil, 100 mm isolator
High temperature oil, 1 m capillary
Silicone oil, 1 m capillary
Inert oil, for oxygene duty

Diaphragm material

SS 1.4435 (SS 316 L) or 1.4571 (SS 316 Ti)
Hastelloy C 276
Tantalum
PTFE laminate on 1.4435

Process flanges to

DIN 2501, ANSI B 16.5
Thread G / NPT
Hygienic DIN, clamp, SMS

Material flanges

DIN / ANSI flange, hygienic flange:
Stainless steel 1.4435 (SS 316 L)



Deutschland

PMA Prozess- und Maschinen- Automation GmbH
Miramstrasse 87, D-34123 Kassel

Tel./Fax: (0561) 505 - 1307/-1710
E-mail: mailbox@pma-online.de
Internet: http://www.pma-online.de

Your local distributor