



OPTIBAR PM 3050 Technical Datasheet

Compact pressure transmitter with metallic diaphragm

HART
COMMUNICATION PROTOCOL



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1.1 Compact pressure transmitter

With its industry standard process connections the **OPTIBAR PM 3050** is universally used for general purpose pressure applications with analog 2-wire output and digital HART[®] communication. The transmitter features a compact stainless steel housing, easy setup options, superb accuracy and rapid response times as well as long term stability.

These features are made possible by using sensors which are extremely stable across a wide range of temperatures and pressure conditions. Additional digital compensation reduces the temperature dependence on the pressure measurement.

A variety of front flush and hygienic process connections with 3A / EHEDG approval are provided in addition to standard threaded and flanged connections as well as diaphragm seal assembly with OPTIBAR DSP series.

The measuring cell itself is a fully welded stainless steel construction (1.4435 / 316L). Especially for small measuring ranges, high overload factors ensure that the pressure transmitter is resistant to pressure spikes.

The protection category IP66/67 (NEMA 4X) or IP66/68 (NEMA 4X/6P) depends on the selection of the electrical cable gland.

Internally located push buttons make it possible to easily set the offset correction, zero point and measuring range for quick start-up. Alternatively, an optional LCD display enables simple and intuitive setup of all configuration parameters via 4 push buttons.



- ① Stainless steel lid
- ② Display unit (optional)
- ③ Stainless steel housing
- ④ Venting element
- ⑤ Cable entry
- ⑥ Grounding screw
- ⑦ Process connection with built-in pressure cell

Highlights

- Measuring accuracy $\pm 0.1\%$
- Measuring ranges relative pressure: (-100) 0...+100 mbar up to (-1) 0...+100 bar / (-1.5) 0...+1.5 psi up to (-15) 0...+1500 psi.
- Measuring ranges absolute pressure: 0...400 mbar up to 0...40 bar / 0...6 psi up to 0...580 psi
- High overload factors especially for small measuring ranges
- Temperature rating -40...150°C / -40...302°F
- Variety of front flush and hygienic process connections with 3A / EHEDG approval
- Standard threaded and flanged connections
- Suitable for diaphragm seal assembly with OPTIBAR DSP series
- Fully welded stainless steel diaphragm (316L / 1.4435)
- Compact and robust stainless steel housing (316L / 1.4404)
- 2-wire 4...20 mA output with fully implemented HART 7.5 communication
- Easily programmable for a wide range of applications
- Optional LCD display with intuitive user concept
- Internal push buttons for quick parameter set up
- Optional ATEX / IECEx approval intrinsically safe

Industries

- Food and beverage
- Water and wastewater
- Environmental technology
- Power generation
- Iron and Steel
- General process technology
- Plant construction and engineering
- Hydraulic and pneumatic systems

Applications

- Absolute and gauge pressure measurement of gases, vapours and liquids
- Hydrostatic level measurement in containers
- Monitoring of supply pressure in pipelines
- Dry-run protection of delivery pumps
- Pressure monitoring of compressors

1.2 Options and variants

Blind version

- Extremely robust design
- Start-up using internal push button
- Compact dimensions



Version with LCD display

- Easy setup of all configuration parameters via display.
- Simple and intuitive handling using 4 push buttons



Process connection variants

The following process connection variants are available:

- Threaded process connections
- Hygienic process connections
- Diaphragm seal assembly OPTIBAR DSP series with flanged process connection



1.3 Measuring principle

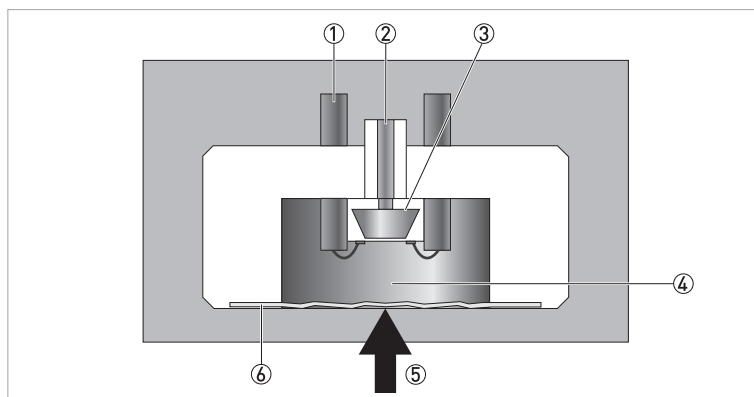


Figure 1-1: Piezoresistive measuring principle for pressure measurement

- ① Signal cables of measuring bridge
- ② Ventilation (only with gauge pressure transmitters)
- ③ Sensor with piezoresistive elements
- ④ Fill fluid
- ⑤ Process pressure "P"
- ⑥ Metallic diaphragm

The process pressure is transmitted from the metallic diaphragm ⑥ via the fill fluid behind it ④ directly to the measuring cell. The embedded piezoresistive measuring elements on the sensor with piezoresistive elements ③ experience a corresponding strain which is then converted via a Wheatstone Bridge circuit to a voltage proportional to the applied process pressure.

Absolute pressure, gauge pressure and vacuum can be measured using this measuring principle.

Available measurement configurations

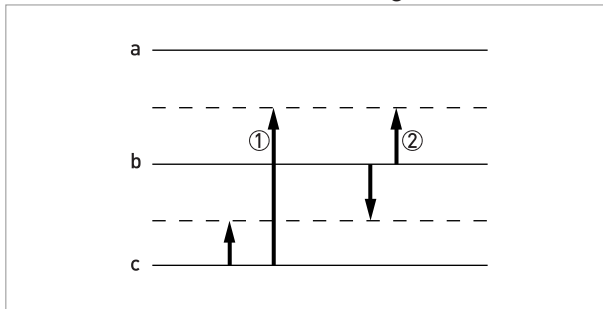


Figure 1-2: Available measurement configurations

a: P_e = Effective pressure [2 bar]

b: P_{amb} = Ambient pressure [1.013 bar]

c: P_0 = Vacuum [0 bar]

① Absolute pressure [1.513 bara]

② Gauge pressure [0.5 barg]

Absolute pressure

During the production process, the sensor is evacuated on the negative side of the measuring cell and then sealed and referenced against a vacuum.

The pressure transmitter now measures the absolute pressure ① compared to a "zero" pressure in an empty space (vacuum).

Gauge pressure

The back of the sensor is open to the atmosphere via air ventilation. The device is thus automatically referenced to the continuously changing ambient air pressure, indicating the gauge pressure ② in the process compared to the respective atmospheric pressure.

2.1 Technical data

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

Measuring system

Measuring principle	Metallic diaphragm with piezoresistive measuring cell
Application range	Measurement of absolute and gauge pressure of gases, vapours and liquids.
Measuring range	Relative pressure: (-100) 0...+100 mbar up to (-1) 0...+100 bar / (-1,5) 0...+1.5 psi up to (-15) 0...+1500 psi
	Absolute pressure: 0...400 mbar up to 0...40 bar / 0...6 psi up to 0...580 psi
Display and user interface	
Display on signal converter	<ul style="list-style-type: none"> • Dot-matrix display 32 x 20 mm / 1.26 x 0.79" • Display infinitely rotatable by 350° • Ambient temperatures below -20°C / -4°F may affect the readability of the display
Display function	<ul style="list-style-type: none"> • Display of measured value or derived measured value such as filling height • Warning and diagnostic information • All parameters are accessible via the operating menu
Operating and display languages	German, English, Spanish and French
Operating	Local operation via 4 softkeys on the display and adjustment module
Remote control	<ul style="list-style-type: none"> • PACTware™ via GenericHART® • HART® Handheld Communicator from Emerson Process

Measuring accuracy

Reference conditions acc. to DIN 61298-1	<ul style="list-style-type: none"> • Ambient temperature (constant): +15...+25°C / +59...+77°F • Relative humidity (constant): 45...75% • Ambient pressure (constant): 860...1060 mbar / 12.5...15.4 psi • Measuring accuracy according to IEC 61298-2 (terminal based) • Curve characteristic: linear • Vertical mounting position, measuring diaphragm pointing down • Effect of mounting position < 0.2 mbar/20 Pa [0.003 psig] • Deviation at current output due to strong, high-frequency electromagnetic fields within the scope of EN 61326 		
Reference accuracy acc. to DIN EN 60770	Includes the non-linearity, hysteresis and repeatability under reference conditions. Applies to the digital interfaces as well as for the analogue 4...20 mA current output. [% of the calibrated span]		
	Accuracy class	0.10%	0.20%
	TD of 1:1 to 5:1	< ± 0.1%	< ± 0.2%
	TD > 5:1	< ± 0.025% + 0.015% x TD	< ± 0.05% + 0.03% x TD

Effect of ambient or medium temperature	Temperature effect on zero and span in relation to the set measuring span. Applies to the digital interface HART® as well as for the analogue 4...20 mA current output. [% of the calibrated span]		
	Threaded process connections with recessed diaphragm		
	In combination with OPTIBAR DS diaphragm seals, additional effects have to be considered		
	Measuring range	-10...+60°C / +14...+140°F	-40...+85°C / -40...+185°F
	400 mbar / 6 psi	< ± 0.12% + 0.12% x TD	< ± 0.15% + 0.15% x TD
	1 bar / 15 psi		
	4 bar / 60 psi		
	10 bar / 150 psi		
	40 bar / 600 psi		
	100 bar / 1500 psi		
	Threaded process connections with front flush diaphragm		
	Measuring range	-10...+60°C / +14...+140°F	-40...+85°C / -40...+185°F
	400 mbar / 6 psi	G1": < ± 0.12% + 0.12% x TD	G1": < ± 0.15% + 0.15% x TD
	1 bar / 15 psi	G1": < ± 0.12% + 0.12% x TD G1/2": < ± 0.12% + 0.2% x TD	G1": < ± 0.15% + 0.15% x TD G1/2": < ± 0.15% + 0.3% x TD
	4 bar / 60 psi	< ± 0.12% + 0.12% x TD	< ± 0.15% + 0.15% x TD
	10 bar / 150 psi		
	40 bar / 600 psi		
	Hygienic and front flush process connections 1", DN25		
	Measuring range	-10...+60°C / +14...+140°F	-40...+85°C / -40...+185°F
	400 mbar / 6 psi	< ± 0.12% + 0.6% x TD	< ± 0.15% + 0.8 x TD
1 bar / 15 psi			
4 bar / 60 psi	< ± 0.12% + 0.3% x TD	< ± 0.15% + 0.4 x TD	
10 bar / 150 psi			
40 bar / 600 psi			
Hygienic and front flush process connections			
Measuring range	-10...+60°C / +14...+140°F	-40...+85°C / -40...+185°F	
400 mbar / 6 psi	< ± 0.12% + 0.4% x TD	< ± 0.15% + 0.5 x TD	
1 bar / 15 psi			
4 bar / 60 psi	< ± 0.12% + 0.2% x TD	< ± 0.15% + 0.25 x TD	
10 bar / 150 psi			
40 bar / 600 psi			
Effect of mounting position	A position-dependent zero offset can be corrected. Factory calibration with process diaphragm pointing downwards.		
	≤0.1 mbar per 10° inclination		
Long-term stability acc. to DIN 16086 and IEC 60770-1	Applies to the digital interface HART® as well as for the analogue 4...20 mA current output. [% of URL]		
	<± 0.1% x TD within 1 year		
Ambient temperature effect on analogue current output	<± 0.1% of URL, within -40...+85°C / -40...+212°F		

Total performance	The total performance includes the non-linearity, hysteresis and repeatability with the effects of ambient and process temperature on zero and span. This statement shows an excerpt of all possible combinations for the temperature range of -40...+85°C (-40...+185°F), a turn-down of 1:1 and the accuracy class of 0.1% with 4...20 mA HART output. [% of calibrated span]		
	Measuring range	Threaded recessed process connections	Hygienic and front-flush process connection
	400 mbar / 6 psi	<± 0.32	<± 0.66
	1 bar / 15 psi	<± 0.32	<± 0.41
	4 bar / 60 psi	<± 0.32	<± 0.41
	10 bar / 150 psi	<± 0.32	<± 0.41
	40 bar / 600 psi	<± 0.32	<± 0.41

Operating conditions

Version	Ambient temp.	Process temp.	Storage and transport temperature
Standard (without cooling fins)	-40...+85°C / -40...+185°F	-40...+105°C / -40...+221°F	-40...+85°C / -40...+185°F
Front-flush with cooling fins		-40...+150°C / -40...+302°F	
With OPTIBAR DS diaphragm seals		-70...+400°C / -94...+752°F	

Further operating conditions

Protection category according to IEC 529 / EN 60529	Single chamber Housing, IP66 / IP67, NEMA 6P (depends on electrical connection)
Vibration	
Reference conditions	Stainless steel, single chamber housing, process connection thread G1/2" EN 837-1
Vibration resistance acc. to EN 60068-2-6	4 g at 5...200 Hz
Shock resistant according to EN 60068-2-27	100 g, 6 ms (mechanical shock)

Materials

Wetted parts	
Process connection	316L / 1.4404
Diaphragm	316L / 1.4435
Fill fluid	Recessed process connection: Silicone oil Front-flush process connection: Synthetic oil FDA compliant
Gasket for process connection (included)	DU - Thread G1/2 EN837-1: NBR fiber-glass bonded (C-4400)

Non-wetted parts	
Housing	316L / 1.4404
Lid sealing ring	EPDM
Housing lid	316L / 1.4404
Sight glass	Makrolon
Grounding screw	316L / 1.4404
Cable gland	Plastic (polyamide) black; nickel-plated brass; 316 / 1.4305

Process connection

Type	<ul style="list-style-type: none"> • Threaded connections • EN Flanges DN 25 - 100 • ANSI Flanges 1"...3" • Prepared for Diaphragm Seal (only process connection DL - Thread ANSI 1/2"NPT-F) • Front-flush hygienic connections
Tightening torques	
Maximum tightening torques for the process connection	
Thread G1/2 EN837-1 (male)	30 Nm / 22 ft lb

Electrical connection

Mechanical			
Cable gland	Type	Ingress Protection	Cable diameter
	A - M16 x 1.5 plastic	IP66/67 NEMA 4X	4.5...10 mm / 0.18...0.39"
	E - M16 x 1.5 nickel plated brass	IP66/67 NEMA 4X	4.5...10 mm / 0.18...0.39"
	X - M16 x 1.5 316L	IP66/68 NEMA 4X / 6P	4...11 mm / 0.16...0.43"
	C - M12 4-pin quick disconnect	IP66/67 NEMA 4X	n/a
Wire cross-section	Solid wire with cords: 0.34 mm...2.5 mm ² / AWG 22...14		
	Cord with wire end sleeve: 0.34 mm...1.5 mm ² / AWG 22...16		
Electrical			
Operating voltage	Non-Ex device: 12...45 VDC		
Reverse polarity protection	Integrated		
Permissible residual ripple	for U_n 12 VDC ($12 < U_B < 14$ VDC) $\leq 0.7 V_{eff}$ (16...400 Hz)		
Load	$R_{L, max} = (U_B - 12) / 22$ mA		
Potential connection in device	Electronics: not electrically isolated		
	Ground terminal: galvanically connected with process connection		
Over voltage category	III		
Protection class	II		

Inputs / outputs

Output signal	
Output signal	4...20 mA / HART® version 7.5 3.8...20.5 mA (factory setting acc. to NAMUR recommendation)
Signal resolution	0.3 μ A
Error signal of current output (adjustable)	High alarm \geq 21 mA Low Alarm \leq 3.6 mA
Max. output current	24 mA
Boot-up current	\leq 5 mA for 15 ms after switching on, then \leq 3.6 mA
Damping	0.0 seconds: no damping
	0.5 seconds: with digital filter + PT1 element
	from 1.0 second: 63% of the input measurement from 1...30 seconds can be set in 1 second increments.
Boot-up time first measurement value	3.5 seconds

Approvals and certificates

CE	The device complies with the legal requirements of the EU directive. The manufacturer confirms compliance with these regulations by affixing the CE marking.
Electromagnetic compatibility (EMC)	EMC conformity for EN 61326-1:2013 and EN 61326-2-3:2013
NAMUR	NE 21 - Electromagnetic compatibility of equipment NE 43 - Signal level for the failure information of digital transmitters NE 53 - Compatibility of field devices and display/adjustment components NE 107 - Self-monitoring and diagnosis of field devices
Classification according to Pressure Equipment Directive (PED 2004/108/EC)	For gases of fluid group 1 and liquids of fluid group 1, the requirements are fulfilled according to article 4, paragraph 3 (sound engineering practice).
RoHS	The device complies with the Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment
Suitable for hygienic applications	This device was developed for hygienic applications. Especially marked aseptic process connections wetted materials comply with all requirements of the FDA, 3-A Sanitary Standard No. 74-xx and EHEDG. A special marking 3-A and/or EHEDG on the device will confirm this. Further requirements and also restrictions are described in the supplementary instructions.
AD2000	The pressure retaining material 316L (1.4404/1.4435) complies with the AD2000 W2 and W10 guidelines.
Manufacturer Declarations	Depending on the specific configuration of the device, the following documents are available if ordered: FDA conformity, Regulation (EC) 2023/2006 (GMP), Regulation (EC) 1935/2005 (Food contact materials), TSE-free (Transmissible Spongiform Encephalopathies) - free of animal content

2.2 Pressure ranges

Adjustment

Adjustment range of the zero / span adjustment in relation to the nominal range

- Zero (-10...+95%)
- Span (5...+120%)
- Difference between zero and span: max. 120% of the nominal range

Recommended maximum Turn Down (TD): 10:1 (limited to 20:1)

Nominal ranges and overload capacity in bar/kPa

This information is provided as an overview and refers to the measuring cell. Limitations due to the material and design of the process connection as well as the type of pressure selected are possible. The information given on the nameplate applies.

Gauge pressure

Nominal range	Max. working pressure (MWP)	Minimum pressure resistance ①
0...+0.1 bar / 0...+10 kPa	+2.5 bar / +250 kPa	-0.8 bar / -80 kPa
0...+0.4 bar / 0...+40 kPa	+4 bar / +400 kPa	-0.8 bar / -80 kPa
0...+1 bar / 0...+100 kPa	+5 bar / +500 kPa	-1 bar / -100 kPa
0...+4 bar / 0...+400 kPa	+20 bar / +2000 kPa	-1 bar / -100 kPa
0...+10 bar / 0...+1000 kPa	+40 bar / +4000 kPa	-1 bar / -100 kPa
0...+40 bar / 0...+4000 kPa	+100 bar / +10 MPa	-1 bar / -100 kPa
0...+100 bar / 0...+10000 kPa	+300 bar / +30 MPa	-1 bar / -100 kPa
-0.4...+0.4 bar / -40...+40 kPa	+4 bar / +400 kPa	-0.8 bar / -80 kPa
-1...0 bar / -100...0 kPa	+5 bar / +500 kPa	-1 bar / -100 kPa
-1...+1 bar / -100...+100 kPa	+5 bar / +500 kPa	-1 bar / -100 kPa
-1...+4 bar / -100...+400 kPa	+20 bar / +2000 kPa	-1 bar / -100 kPa
-1...+10 bar / -100...+1000 kPa	+40 bar / +4000 kPa	-1 bar / -100 kPa
-1...+40 bar / -100...+4000 kPa	+100 bar / +10 MPa	-1 bar / -100 kPa

Table 2-1: Overview gauge pressure

Absolute pressure

Nominal range	Max. working pressure (MWP)	Minimum pressure resistance ①
0...0.4 bar / 0...+40 kPa	+4 bar / +400 kPa	-1 bar / -100 kPa
0...+1 bar / 0...+100 kPa	+5 bar / +500 kPa	-1 bar / -100 kPa
0...+4 bar / 0...+400 kPa	+20 bar / +2000 kPa	-1 bar / -100 kPa
0...+10 bar / 0...+1000 kPa	+40 bar / +4000 kPa	-1 bar / -100 kPa
0...+40 bar / 0...+4000 kPa	+100 bar / +10 MPa	-1 bar / -100 kPa

Table 2-2: Overview absolute pressure

① The minimum pressure resistance of the measuring cell is applicable under reference conditions only.

2.3 Dimensions and weights

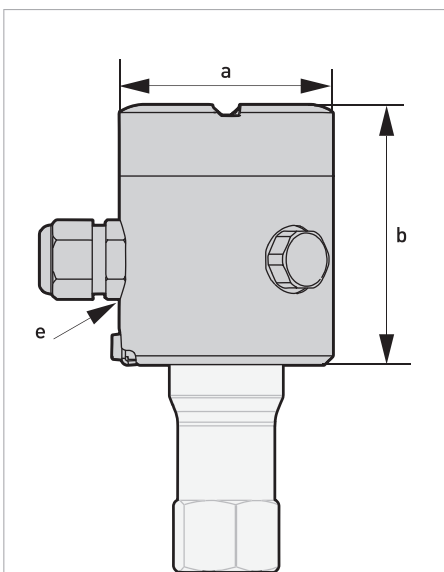


Figure 2-1: Dimension of the enclosure

Dimension	Blind Version		Version with display	
	mm	inch	mm	inch
a	64	2.52	64	2.52
b	65	2.8	73	3.1
e	M16 x 1.5			

Table 2-3: Dimension in mm / inch

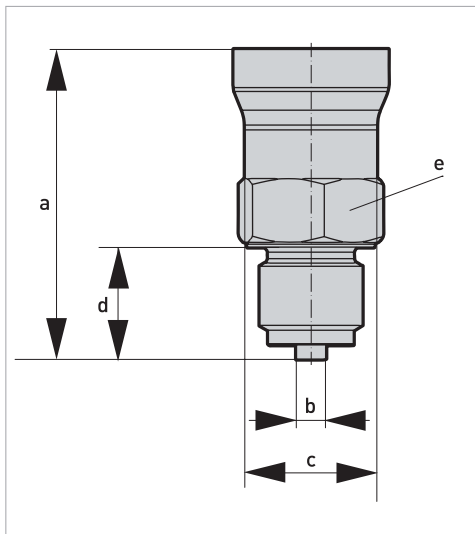


Figure 2-2: Thread ISO 228 G1/2 EN837-1

Dimension	mm	inch
a	56	2.56
b	Ø 6	Ø 0.24
c	Ø 26	Ø 1.02
d	23	0.91
e	SW 27	

Table 2-4: Dimension in mm / inch

Code	Designation	Material	Approvals
DU	Thread ISO228 G1/2"; EN837-1	316L	-

Table 2-5: Order information

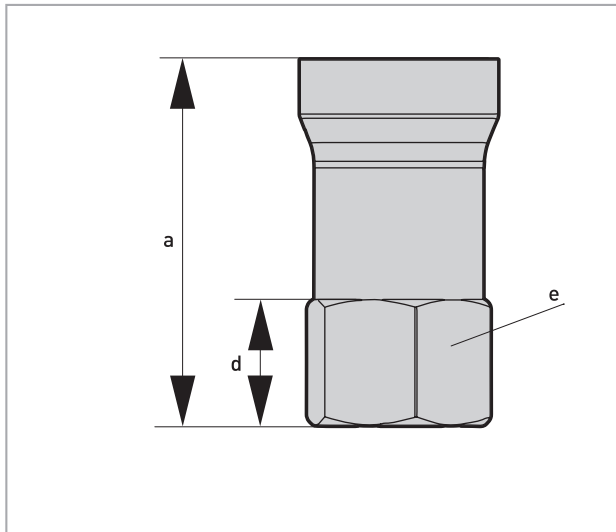


Figure 2-3: Thread ANSI 1/2" NPT female

Dimension	mm	inch
a	59	2.332
d	19	0.75
e	SW 27	

Table 2-6: Dimension in mm / inch

Code	Designation	Material	Approvals
DL	Thread ISO228 1/2" NPT-F	316L	-

Table 2-7: Order information

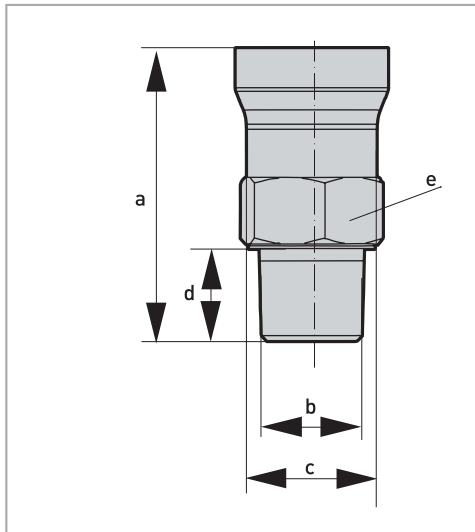


Figure 2-4: Thread ANSI 1/2" NPT male

Dimension	mm	inch
a	62	2.44
c	Ø 26	Ø 1.02
d	19	0.75
e	SW 27	

Table 2-8: Dimension in mm / inch

Code	Designation	Material	Approvals
LY	Thread ISO228 1/2" NPT-M	316L	-

Table 2-9: Order information

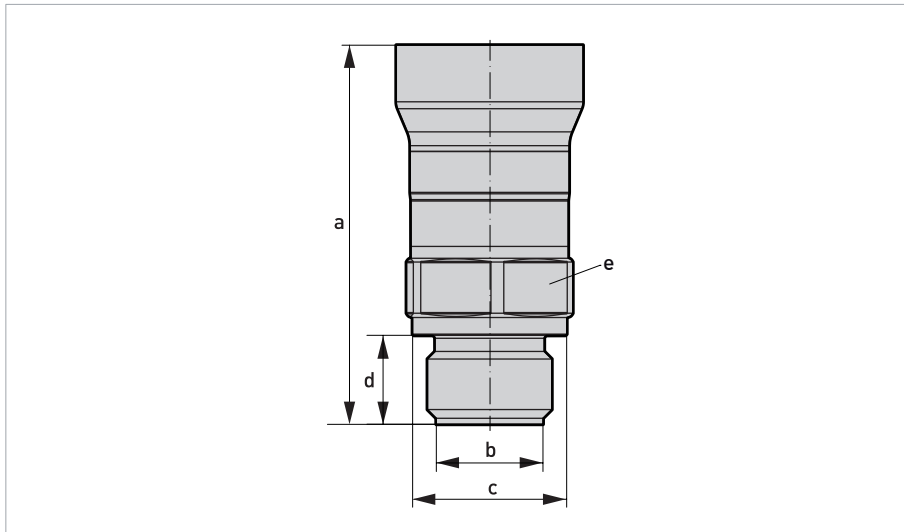


Figure 2-5: Thread ISO 228 / DIN 3852 front flush

Dimension	G1/2"		G1"	
	mm	inch	mm	inch
a	64	2.52	68	2.67
b	Ø 18	Ø 0.71	Ø 28	Ø 1.1
c	Ø 26	Ø 1.02	Ø 26	Ø 1.02
d	15	0.59	19	0.75
e	SW 27		SW 44	

Table 2-10: Dimension in mm / inch

Code	Designation	Material	Approvals
C3	Thread ISO228 G1/2" front-flush DIN3852	316L	-
C5	Thread ISO228 G1" front-flush DIN3852	316L	-

Table 2-11: Order information

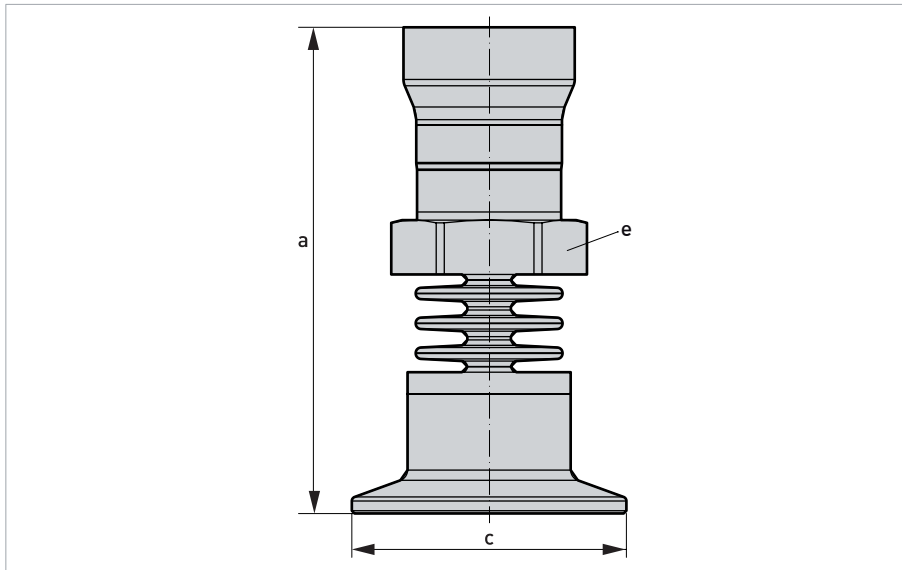


Figure 2-6: Clamp DIN 32676 / ISO 2852

Dimensions	DN25		DN40		DN50	
	mm	inch	mm	inch	mm	inch
a	89.5	3.52	89.5	3.52	89.5	3.52
c	Ø 50.5	Ø 1.99	Ø 50.5	Ø 1.99	Ø 64	Ø 2.52
e	SW 32		SW 32		SW 32	

Table 2-12: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
AV	Clamp DN25 (1") ISO2852 / DIN32676	PN40	316L	3A, EHEDG
AT	Clamp DN38 (1 1/2") ISO2852 / DN40 DIN32676	PN40	316L	3A, EHEDG
AR	Clamp DN40-51 (2") ISO2852 / DN50 DIN32676	PN40	316L	3A, EHEDG

Table 2-13: Order information

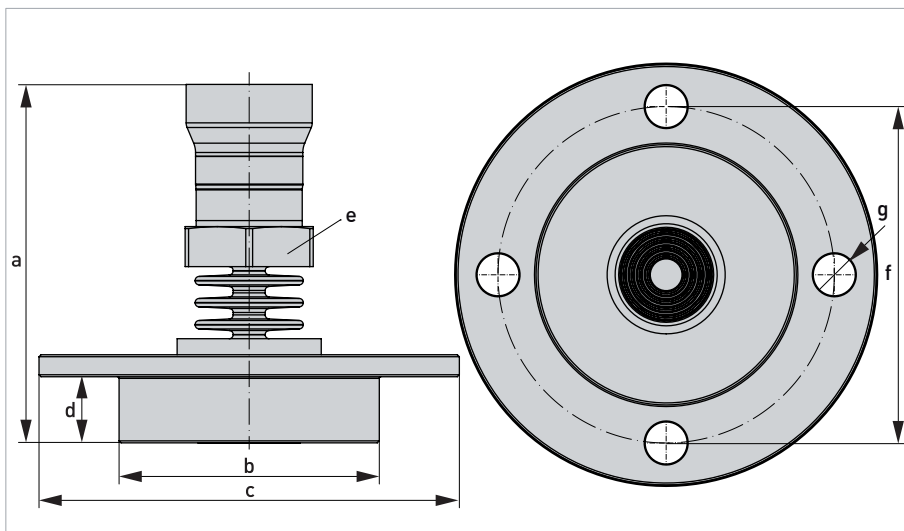


Figure 2-7: DRD flange

Dimension	DN65	
	mm	inch
a	89.5	3.52
b	Ø 65	Ø 2.56
c	Ø 105	Ø 4.13
d	16.5	0.65
e	SW 32	
f	Ø 84	Ø 3.31
g	4x Ø 10.5	Ø 0.41

Table 2-14: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
AA	DRD DN50	PN40	316L	-

Table 2-15: Order information

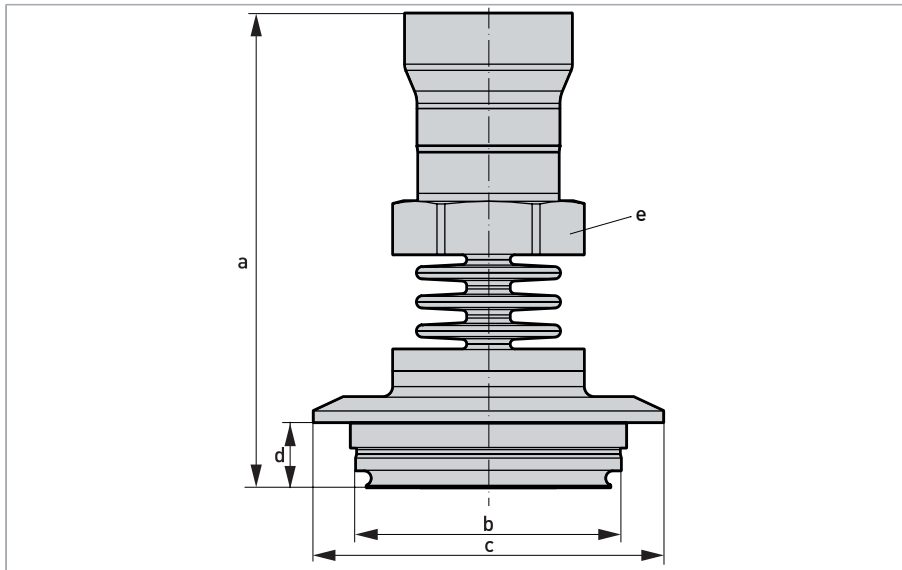


Figure 2-8: Varivent

Dimension	Varivent F		Varivent N	
	mm	inch	mm	inch
a	89.5	3.52	89.5	3.52
b	Ø 50	Ø 1.97	Ø 68	Ø 2.68
c	Ø 66	Ø 2.6	Ø 84	Ø 3.31
d	12.3	0.48	12.3	0.48
e	SW 32		SW 32	

Table 2-16: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
FS	Varivent F DN25-32	PN40	316L	3A, EHEDG
FR	Varivent N DN40-162	PN40	316L	3A, EHEDG

Table 2-17: Order information

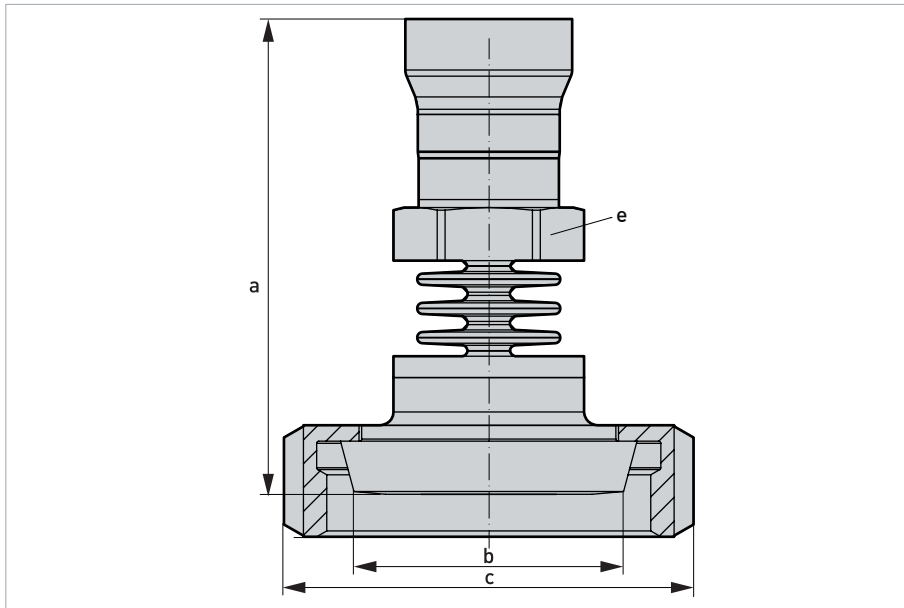


Figure 2-9: Collar connection DIN 11851

Dimension	DN25		DN40		DN50	
	mm	inch	mm	inch	mm	inch
a	89.5	3.52	89.5	3.52	89.5	3.52
b	∅ 38.9	∅ 1.53	∅ 50.9	∅ 2	∅ 62.9	∅ 2.48
c	∅ 63	∅ 2.48	∅ 78	∅ 3.07	∅ 92	∅ 3.62
e	SW 32		SW 32		SW 32	

Table 2-18: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
E5	DIN11851 DN25	PN40	316L	3A, EHEDG
EZ	DIN11851 DN40	PN40	316L	3A, EHEDG
NB	DIN11851 DN50	PN25	316L	3A, EHEDG

Table 2-19: Order information

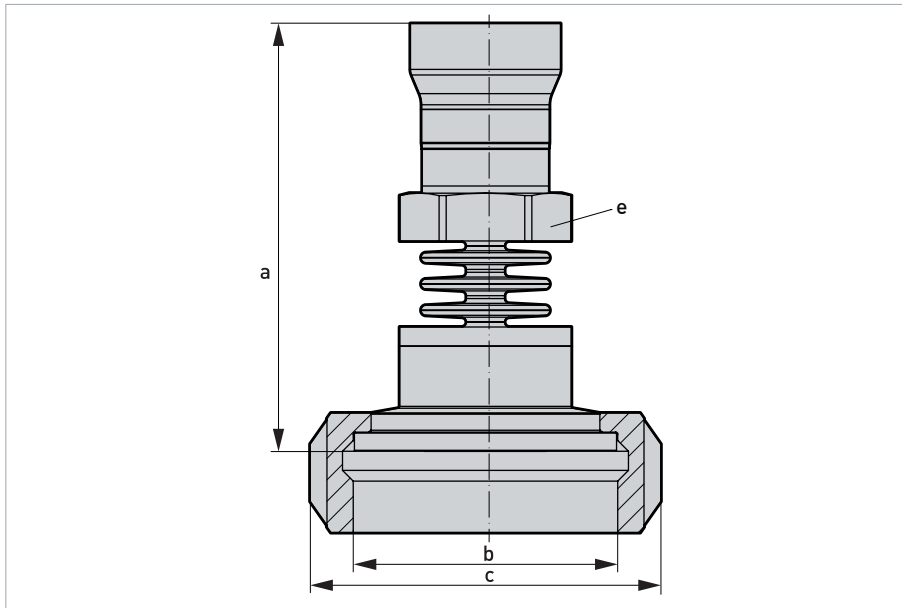


Figure 2-10: SMS SS1145

Dimension	1"		1 1/2"		2"	
	mm	inch	mm	inch	mm	inch
a	89.5	3.52	89.5	3.52	89.5	3.52
b	Ø 35.5	Ø 1.4	Ø 55	Ø 2.17	Ø 65	Ø 2.56
c	Ø 51	Ø 2.01	Ø 74	Ø 2.91	Ø 84	Ø 3.31
e	SW 32		SW 32		SW 32	

Table 2-20: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
FC	SMS 1"	PN25	316L	-
FA	SMS 1 1/2"	PN25	316L	-
FB	SMS 2"	PN25	316L	-

Table 2-21: Order information

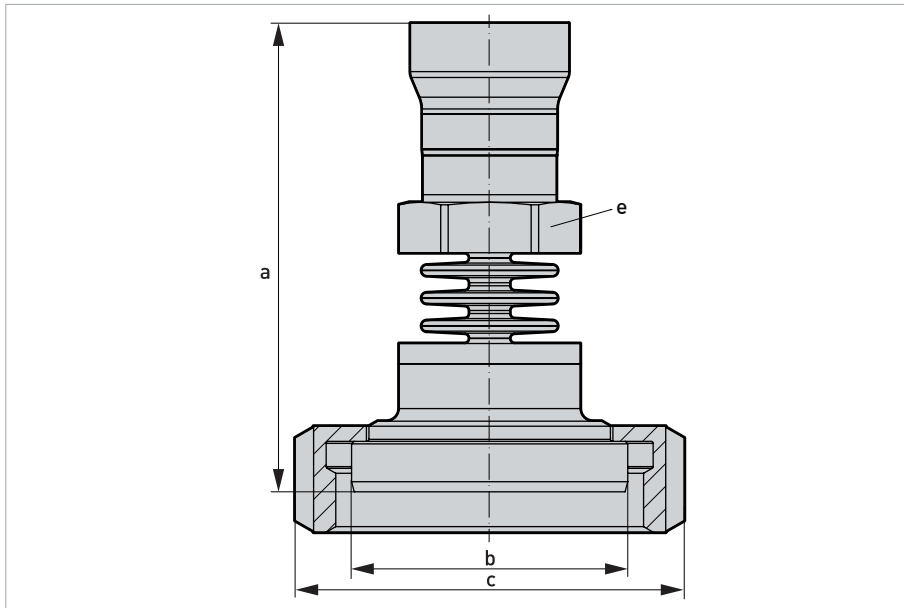


Figure 2-11: Collar connection DIN 11864-1 Form A

Dimension	DN25		DN40		DN50	
	mm	inch	mm	inch	mm	inch
a	93	3.66	93	3.66	93	3.66
b	Ø 42.9	Ø 1.69	Ø 54.9	Ø 2.16	Ø 66.9	Ø 2.63
c	Ø 63	Ø 2.48	Ø 78	Ø 3.07	Ø 92	Ø 3.62
e	SW 32		SW 32		SW 32	

Table 2-22: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
V1	Collar Connection DIN11864-1 Form A	PN40	316L	3A, EHEDG
E2	Collar Connection DIN11864-1 Form A	PN40	316L	3A, EHEDG
E3	Collar Connection DIN11864-1 Form A	PN40	316L	3A, EHEDG

Table 2-23: Order information

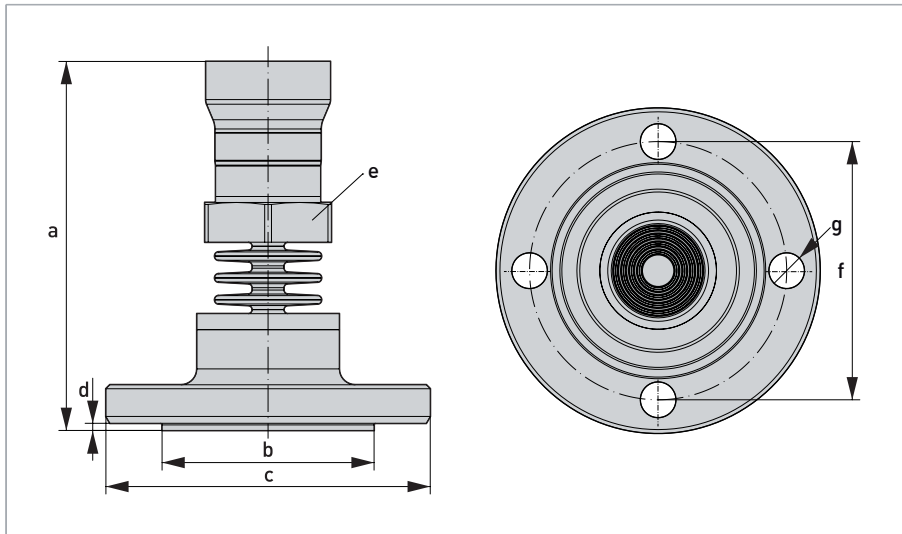


Figure 2-12: Collar flange DIN 11864-2 Form A

Dimension	DN40		DN50	
	mm	inch	mm	inch
a	93	3.66	93	3.66
b	Ø 53.6	Ø 2.11	Ø 65.6	Ø 2.58
c	Ø 82	Ø 3.23	Ø 94	Ø 3.7
d	1.8	0.07	1.8	0.07
e	SW 32		SW 32	
f	Ø 65	Ø 2.56	Ø 77	Ø 3.03
g	4x Ø 9	4x Ø 0.35	4x Ø 9	4x Ø 0.35

Table 2-24: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
AC	Collar Flange DN40 DIN11864-2 Form A	PN25	316L	3A, EHEDG
AD	Collar Flange DN50 DIN11864-2 Form A	PN16	316L	3A, EHEDG

Table 2-25: Order information

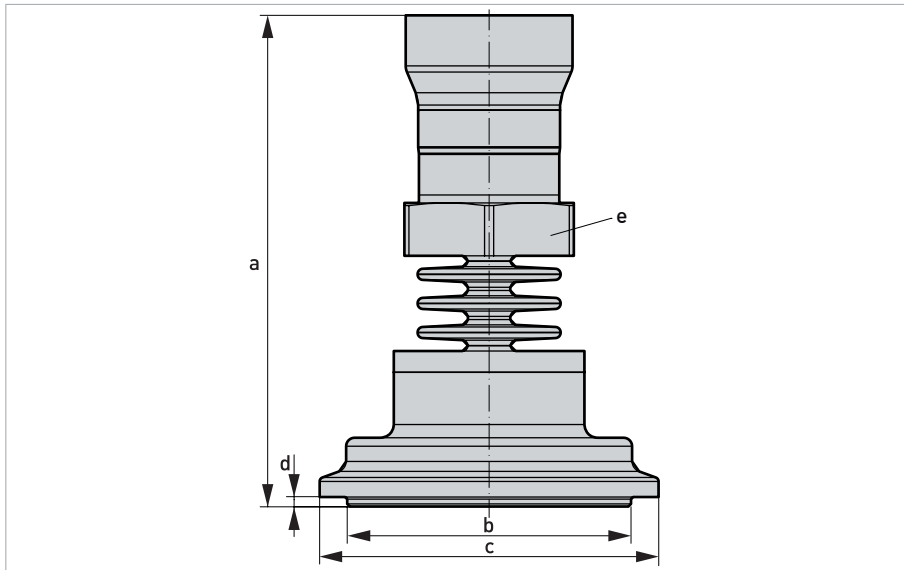


Figure 2-13: Collar clamp DIN 11864-3 Form A

Dimension	DN40		DN50	
	mm	inch	mm	inch
a	93	3.66	93	3.66
b	Ø 53.6	Ø 2.11	Ø 65.6	Ø 2.58
c	Ø 64	Ø 2.52	Ø 77.5	Ø 3.05
d	1.8	0.07	1.8	0.07
e	SW 32		SW 32	

Table 2-26: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
TW	Collar clamp DN40 11864-3 Form A	PN25	316L	3A, EHEDG
T1	Collar clamp DN40 11864-3 Form A	PN25	316L	3A, EHEDG

Table 2-27: Order information

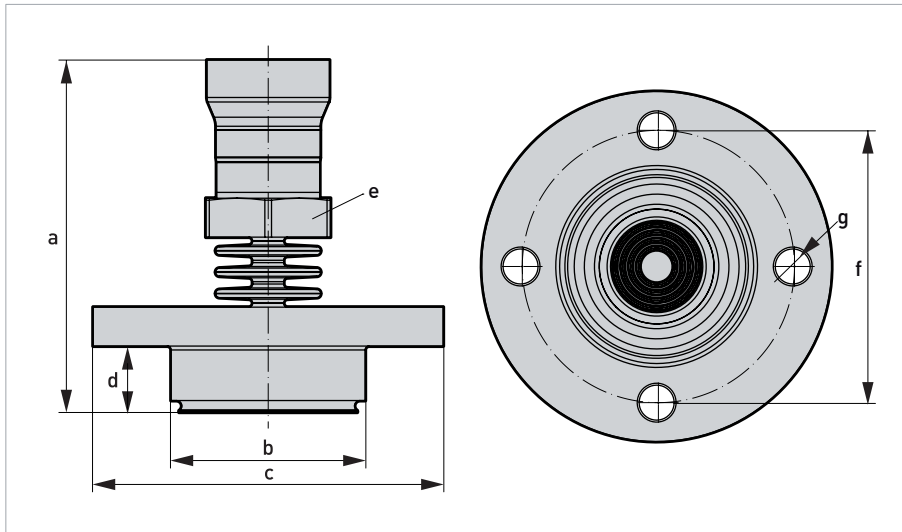


Figure 2-14: Neumo Biocontrol

Dimension	DN25		DN50		DN65	
	mm	inch	mm	inch	mm	inch
a	89.5	3.52	90.5	3.56	90.5	3.56
b	Ø 30.4	Ø 1.2	Ø 49.9	Ø 1.96	Ø 68	Ø 2.68
c	Ø 64	Ø 2.52	Ø 90	3.54	Ø 120	4.72
d	11	0.43	17	0.67	17	0.67
e	SW 32		SW 32		SW 32	
f	Ø 50	Ø 1.97	Ø 70	Ø 2.76	Ø 95	3.74
g	4x Ø 7	4x Ø 0.28	4x Ø 9	4x Ø 0.35	4x Ø 11	4x Ø 0.43

Table 2-28: Dimension in mm / inch

Code	Designation	Pressure rating	Material	Approvals
FG	NEUMO Biocontrol DN25	PN16	316L	3A, EHEDG
FD	NEUMO Biocontrol DN50	PN16	316L	3A, EHEDG
FE	NEUMO Biocontrol DN65	PN16	316L	3A, EHEDG

Table 2-29: Order information

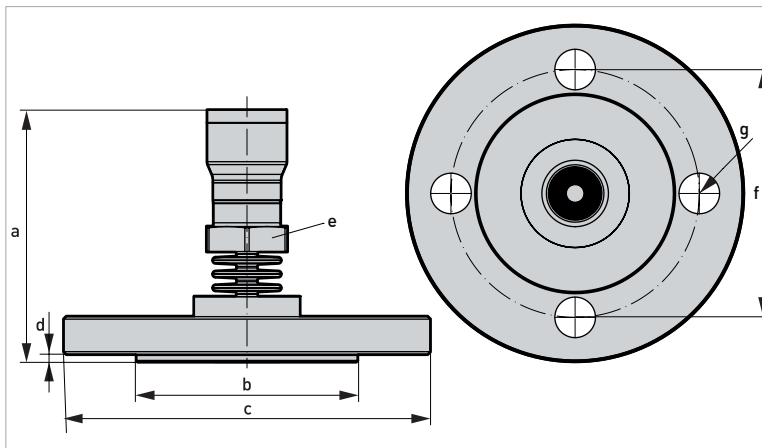


Figure 2-15: Flange EN1092-1 / DIN 2501

Dimension	DN25		DN40	
	mm	inch	mm	inch
a	100.5	3.96	100.5	3.96
b	Ø 68	Ø 2.68	Ø 80	Ø 3.15
c	Ø 115	Ø 4.53	Ø 150	Ø 5.91
d	2	0.08	3	0.12
e	SW 32		SW 32	
f	Ø 95	Ø 3.74	Ø 110	Ø 4.33
g	4x Ø 14	4x Ø 0.55	4x Ø 18	4x Ø 0.71

Table 2-30: Dimension in mm / inch

Dimension	DN50		DN80	
	mm	inch	mm	inch
a	100.5	3.96	100.5	3.96
b	Ø 102	Ø 4.02	Ø 138	Ø 5.43
c	Ø 165	Ø 6.5	Ø 200	Ø 7.87
d	3	0.12	3	0.12
e	SW 32		SW 32	
f	Ø 125	Ø 4.92	Ø 160	Ø 6.3
g	4x Ø 18	4x Ø 0.71	8x Ø 18	8x Ø 0.71

Table 2-31: Dimension in mm / inch

Code	Size	Nominal pressure	Form	Material	Approvals
N8	DN25	PN10-40	B1 (D)	316L	-
CR	DN40	PN10-40	B1 (D)	316L	-
CV	DN50	PN10-40	B1 (D)	316L	-
CH	DN80	PN10-40	B1 (D)	316L	-

Table 2-32: Order information

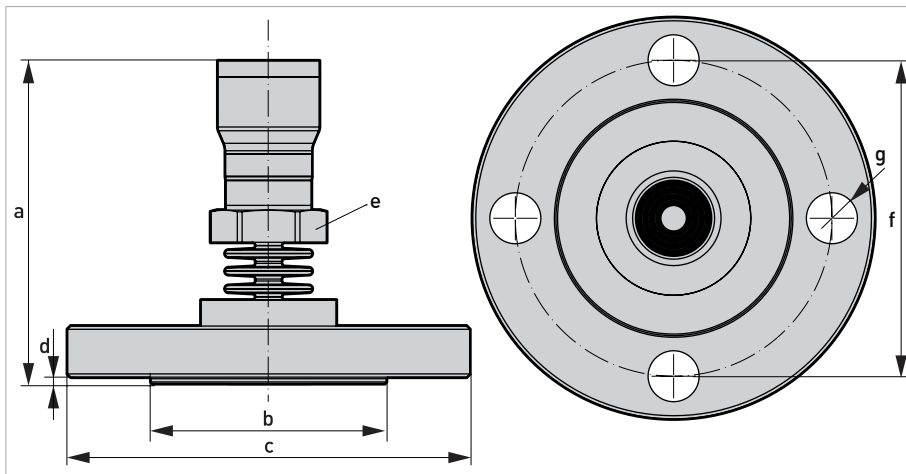


Figure 2-16: Flange ASME 16.5 (150 lbs)

Dimension	1"		1 1/2"	
	mm	inch	mm	inch
a	100.5	3.96	100.5	3.96
b	Ø 50.8	Ø 2	Ø 73.15	Ø 2.88
c	Ø 107.95	Ø 4.25	Ø 127	Ø 5
d	2	0.08	2	0.08
e	SW 32		SW 32	
f	Ø 79.25	Ø 3.12	Ø 98.55	Ø 3.88
g	4x Ø 15.875	4x Ø 0.625	4x Ø 15.875	4x Ø 0.625

Table 2-33: Dimension in mm / inch

Dimension	2"		3"	
	mm	inch	mm	inch
a	100.5	3.96	100.5	3.96
b	Ø 91.95	Ø 3.62	Ø 127	Ø 5
c	Ø 152.4	Ø 6	Ø 190.5	Ø 7.5
d	2	0.08	2	0.08
e	SW 32		SW 32	
f	Ø 120.65	Ø 4.75	Ø 152.4	Ø 6
g	4x Ø 19.05	4x Ø 0.75	4x Ø 19.05	4x Ø 0.75

Table 2-34: Dimension in mm / inch

Code	Size	Class	Form	Material	Approvals
BW	1"	150 lb	RF	316L	-
C1	1 1/2"	150 lb	RF	316L	-
CA	2"	150 lb	RF	316L	-
CB	3"	150 lb	RF	316L	-

Table 2-35: Order information

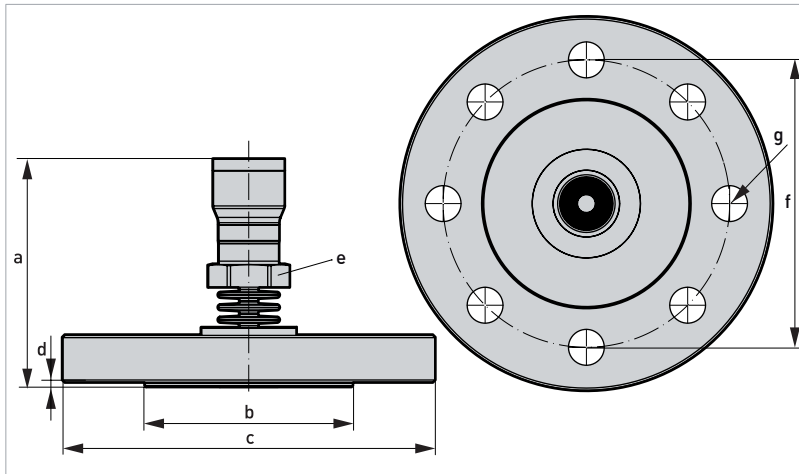


Figure 2-17: Flange ASME 16.5 (300 lbs)

Dimension	1"		2"	
	mm	inch	mm	inch
a	100.5	3.96	100.5	3.96
b	Ø 50.8	Ø 2	Ø 91.95	Ø 3.62
c	Ø 123.95	Ø 4.88	Ø 165.1	Ø 6.5
d	2	0.08	2	0.08
e	SW 32		SW 32	
f	Ø 88.9	Ø 3.5	Ø 127	Ø 5
g	4x Ø 19.05	4x Ø 0.75	8x Ø 19.05	8x Ø 0.75

Table 2-36: Dimension in mm / inch

Code	Size	Class	Form	Material	Approvals
Z3	1"	300 lb	RF	316L	-
BG	2"	300 lb	RF	316L	-

Table 2-37: Order information

2.4 Dynamic output behaviour

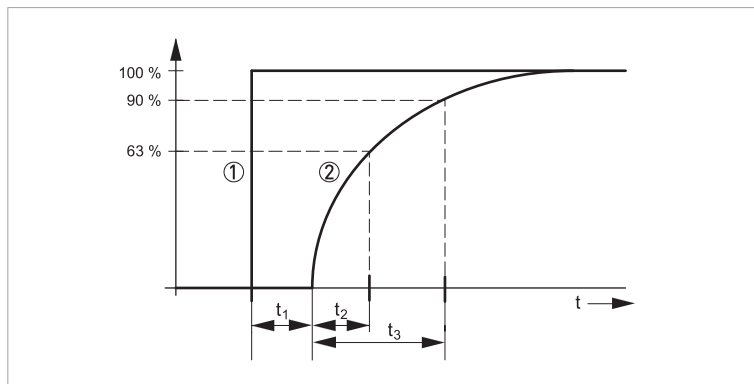


Figure 2-18: Behaviour at an abrupt change in the process variable.
 t_1 - dead time; t_2 - rise time t_{63} ; t_3 - rise time t_{90}

- ① Process variable
- ② Output signal

Analog Output with HART®

Dead time (t_1)	< 110 ms
Rise time T63 (t_2)	< 35 ms
Rise time T90 (t_3)	< 45 ms
Damping (63% of input variable)	1...30 seconds, adjustable

Analog Output with activated fast-mode

Dead time (t_1)	< 50 ms
Rise time T63 (t_2)	< 35 ms
Rise time T90 (t_3)	< 45 ms
Damping (63% of input variable)	0.1 seconds fixed value

These parameters depend on the fill fluid, temperature and, if applicable, the diaphragm seal.

3.1 Intended use

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The pressure transmitter series **OPTIBAR** is designed and constructed to measure the absolute and gauge pressure of gases, vapours and liquids. The available measuring ranges and permitted maximum working pressures for each unit are indicated on the nameplate and described in the "Technical data" section. To observe the intended use, adhere to the following points:

- Observe the instructions in this document.
- Comply with the technical specifications (for details refer to *Technical limits* on page 33).
- Observe the permissible products (for details refer to *Permissible products* on page 33).
- Only qualified personnel may install and operate the device.
- Observe the generally accepted standards of good practice.

- *Any modification to the device, including drilling, sawing, trimming, welding and soldering of parts, or partially painting over or coating, is prohibited.*
- *Neither is it permitted to use the device as a climbing aid e.g. for installation purposes, as a holder for cables, pipes or other loads.*
- *The mounting or installation of parts is only permitted as described in this document, or insofar as it has been authorised by the manufacturer or a certified service partner.*

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

3.2 Technical limits

The device was constructed solely for use within the technical limits indicated on the nameplate and in the technical data. Applications outside of these limits are not permitted and could lead to significant risk of accident. For this reason, observe the following limits:

- Do not exceed the maximum working pressure (MWP).
- Do not exceed the indicated permissible operating temperature range.
- The permissible ambient temperatures given may not be exceeded or undershot.
- Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards process compatibility.

3.3 Permissible products

The device is designed to measure the pressure of vaporous, gaseous and liquid media. Device variants featuring recessed diaphragms are not suitable for the measurement of products containing solids or viscous and paste-like products. Prior to using any corrosive or abrasive products, the operator must check the resistance of all parts in contact with the product.

3.4 Installation specifications

Observe the relevant directives, ordinances, standards and accident prevention regulations (e.g. VDE/VDI 3512, DIN 19210, VBG, Elex V, etc.).

The accuracy of the measurement is only guaranteed if the transmitter and accompanying impulse line(s), if any, have been correctly installed. In addition, extreme ambient conditions including large fluctuations in temperature, vibrations and shocks should be kept as far away as possible from the measuring equipment.

3.5 Mounting

Do not screw in using the housing! Tightening this way can cause damage to the rotary mechanism on the housing.

For devices with threaded process connections, the hexagon should be tightened with a suitable wrench. For further information refer to *Dimensions and weights* on page 14.

- *Prior to installing the transmitter, it is essential to verify whether the version of the device on hand completely fulfils the technical and safety requirements of the measuring point. This applies in particular to the measuring range, overpressure resistance, temperature, explosion protection and operating voltage.*
- *Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards process compatibility.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to an electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*

3.5.1 Humidity

Use a suitable cable and tighten the cable gland in accordance with the recommended torque specifications. Protect the transmitter from penetrating moisture by dropping the cable down before the screw connection. Any liquids running along the cable will thus drip off before reaching the screw connection; refer to *Laying electrical cables correctly* on page 37. This is particularly important for unprotected installation outside or in rooms in which moisture is an issue (e.g. as a result of cleaning processes) or on cooled or heated containers.

3.5.2 Pressure connection via impulse line

Bear the following in mind when connecting the pressure connection via an impulse line:

- Select the shortest impulse line possible and lay without sharp bends.
- Avoid deposits and blockages in the impulse line. Accordingly, lay the impulse line so that such occurrences are impossible. Do not exceed a drop or rise of approx. 8% in the pipe.
- Ensure that the impulse line flows freely before the connection and rinse with compressed air or, even better, with the product itself.
- When measuring liquid, the impulse line must be completely purged of air.
- Run the impulse line so that trapped air (when measuring liquids) or condensate (when measuring gas) can flow back into the process line.
- Hot steam must not enter the process connection (the excess temperature will destroy the device). To avoid this situation, a suitable water trap (such as a U-tube filled with water prior to installation) can be installed upstream from the measuring device.
- Ensure that the connection is perfectly sealed!

3.6 Ventilating the pressure sensor

In the case of gauge pressure transmitters, mechanical reasons make it necessary to charge the reference side of the pressure sensor with atmospheric pressure.

For the IP66/67 (NEMA 4X) and IP66/68 (NEMA 4X / 6P) versions, a vented cable fitted with a capillary tube must be used. In the process, ensure that the capillary tubes are vented in a dry room protected from moisture and that no dust or moisture can penetrate the capillary tube opening.

4.1 Safety instructions

*All work on the electrical connections may only be carried out with the power disconnected.
Take note of the voltage data on the nameplate!*

Observe the national regulations for electrical installations!

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

*Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

*Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.*

4.2 Notes for electrical cables

The device must be grounded to a spot in accordance with regulations in order to protect personnel against electric shocks.

Cables may only be connected when the power is switched off! Since the transmitter has no switch-off elements, overcurrent protection devices, lightning protection and/or energy isolating devices need to be provided by the customer.

Metric thread M16 x 1.5 mm

The cable glands with metric threads are screwed in by the factory. They are sealed using plastic plugs to protect them during transport. Remove these plugs prior to establishing an electrical connection.

4.2.1 Requirements for signal cables provided by the customer

If the signal cable was not ordered, it is to be provided by the customer. The following requirements regarding the electrical values of the signal cable must be observed:

Specifications for standard signal cables

- 2 wire cable
- Casing colour: grey
- Colour of wires:
Pair 1: black / red; pair 2: green / white
- Test voltage: ≥ 500 VAC RMS (750 VDC)
- Temperature range: $-40\dots+105^{\circ}\text{C}$ / $-40\dots+221^{\circ}\text{F}$
- Capacity: ≤ 200 pF/m / 61 pF/ft
- Inductance: ≤ 0.7 $\mu\text{H}/\text{m}$ / 0.2 $\mu\text{H}/\text{ft}$

4.2.2 Laying electrical cables correctly

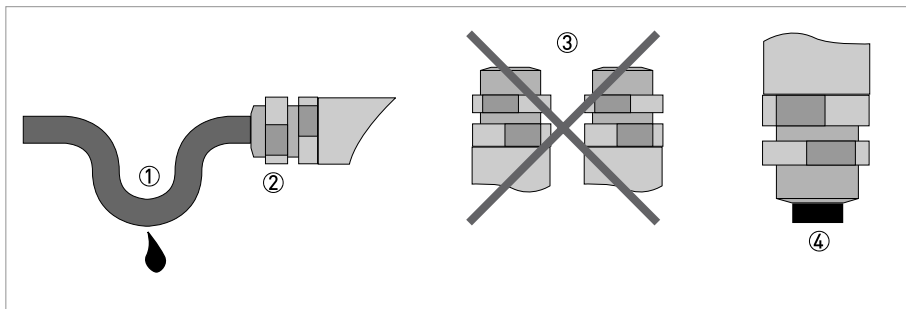


Figure 4-1: Protect housing from dust and water

- ① Lay the cable in a loop just before the housing.
- ② Tighten the screw connections of the cable entry.
- ③ Never mount the housing with the cable entries facing upwards.
- ④ Seal cable entries that are not needed with a plug.

4.2.3 Connection to the power supply

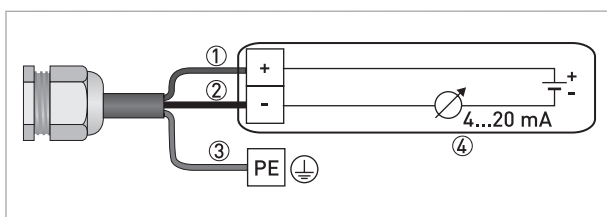


Figure 4-2: Connection to the feed unit

- ① Red
- ② Black
- ③ Green/yellow
- ④ Feed unit with load

4.3 Connection in the terminal compartment

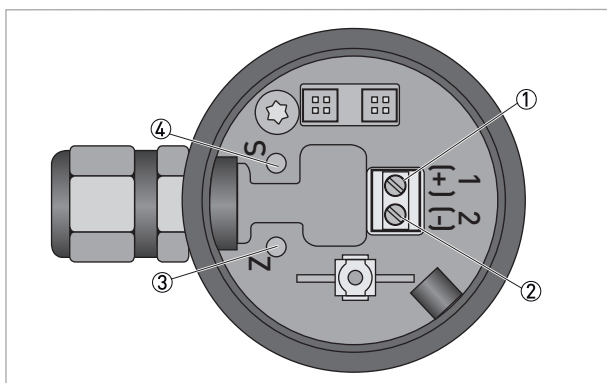


Figure 4-3: Connection in the terminal compartment

- ① (V_{in+}) signal terminals
- ② (V_{in-}) signal terminals
- ③ Push button Zero point (Zero)
- ④ Push button Span point (Span)

4.4 Grounding the measuring device

There should be no difference in potential between the pressure sensor and the housing or protective earth of the transmitter!

- The pressure sensor must be properly grounded.
- Do not use the grounding cable to connect any other electrical devices to ground at the same time.
- The pressure transmitter is connected to ground by means of a functional grounding conductor.
- In hazardous areas, grounding is used at the same time for equipotential bonding.

A ground terminal is provided on the outside of the housing to accommodate wire widths of up to 1.5 mm².

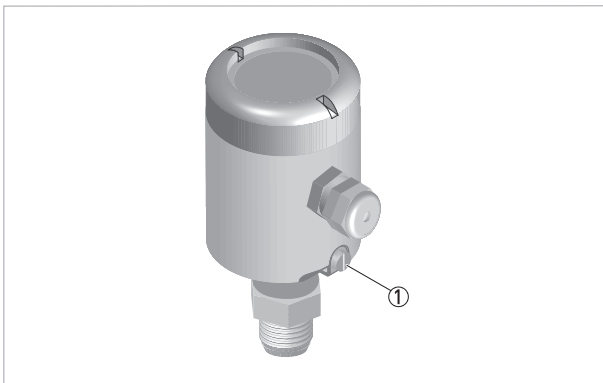


Figure 4-4: Position of the ground terminal on the housing

① Ground terminal

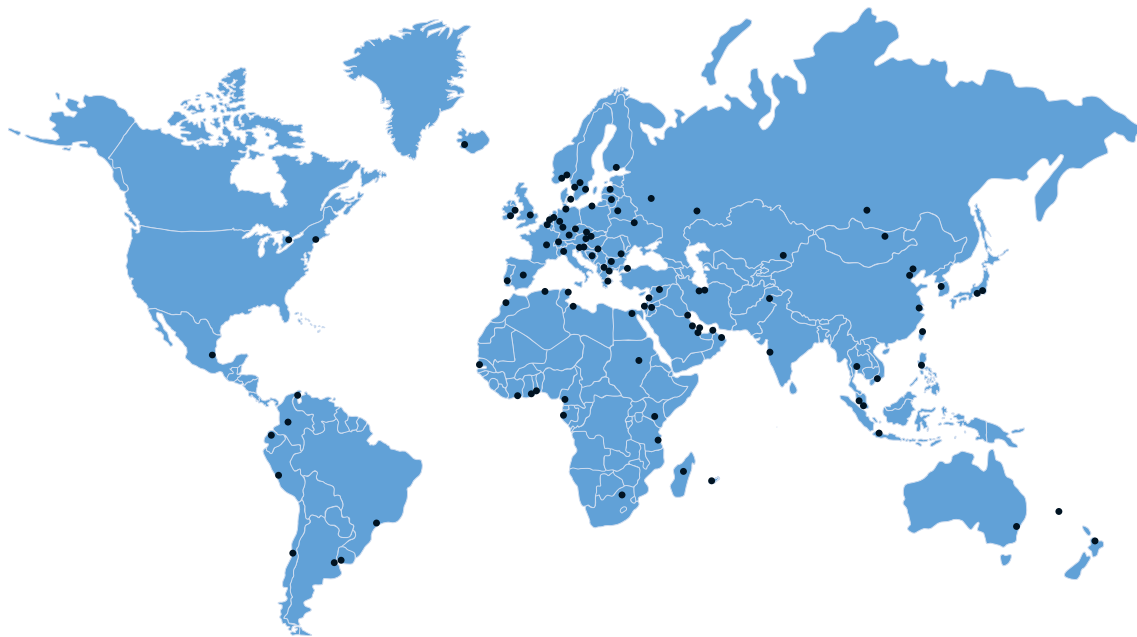
5.1 Order code

The characters of the order code highlighted in light grey describe the standard.

Sensor		Version	
VGKB	4	AX	Ex-free Europe
		AC	ATEX II 1G,1/2G,2G Ex ia IIC T6
		WX	Ex-free International
		WC	IEC Ex ia IIC T6 Ga, Ga/Gb, Gb
		Process Connection / Material	
		DU	Thread ISO228 G1/2"; EN837-1; 316L; Tmax: 105°C; Fill fluid: S
		DL	Thread ANSI 1/2"NPT-F; 316L; Tmax: 105°C; Fill fluid: S
		LY	Thread ANSI 1/2"NPT; 316L; Tmax: 105°C; Fill fluid: S
		C3	Thread ISO228 G1/2" front-flush; DIN3852; 316L; Tmax: 105°C; Fill fluid: S
		C5	Thread ISO228 G1" front-flush; DIN3852; 316L; Tmax: 105°C; Fill fluid: S
		AV	Clamp DN25 (1") PN16; DIN32676 / ISO2852; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		AT	Clamp DN40 (1 1/2") PN16; DIN32676 / ISO2852; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		AR	Clamp DN50 (2") PN16; DIN32676 / ISO2852; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		TW	Clamp DN40; 11864-3 Form A; 316L;3-A; Tmax: 150°C; Fill fluid: F
		T1	Clamp DN50; 11864-3 Form A; 316L;3-A; Tmax: 150°C; Fill fluid: F
		FS	Varivent F DN25-32; PN40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		FR	Varivent N DN40-162; PN40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		E5	DIN11851; DN25 PN40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		EZ	DIN11851; DN40 PN40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		NB	DIN11851; DN50 PN25; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		FC	SMS 1" PN25; 316L; Tmax: 150°C; Fill fluid: F
		FA	SMS 1 1/2" PN25; 316L; Tmax: 150°C; Fill fluid: F
		FB	SMS 2" PN25; 316L; Tmax: 150°C; Fill fluid: F
		V1	Collar Connection DIN11864-1 Form A; DN25 PN 40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		E2	Collar Connection DIN11864-1 Form A; DN40 PN 40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		E3	Collar Connection DIN11864-1 Form A; DN50 PN 40; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		AC	Collar Flange DIN11864-2 Form A; DN40 PN25; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		AD	Collar Flange DIN11864-2 Form A; DN50 PN16; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		AA	DRD DN65 PN40; 316L; Tmax: 150°C; Fill fluid: F
		FG	NEUMO Biocontrol DN25 PN16; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		FD	NEUMO Biocontrol DN50 PN16; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		FE	NEUMO Biocontrol DN65 PN16; 316L; 3-A; Tmax: 150°C; Fill fluid: F
		N8	Flange DN25 PN10-40 Form B1; EN1092-1; 316L; Tmax: 150°C; Fill fluid: F

CR	Flange DN40 PN10-40 Form B1; EN1092-1; 316L; Tmax: 150°C; Fill fluid: F	
CV	Flange DN50 PN10-40 Form B1; EN1092-1; 316L; Tmax: 150°C; Fill fluid: F	
CH	Flange DN80 PN10-40 Form B1; EN1092-1; 316L; Tmax: 150°C; Fill fluid: F	
BW	Flange 1" 150lb RF; ASME B16.5; 316L; Tmax: 150°C; Fill fluid: F	
C1	Flange 1 1/2" 150lb RF; ASME B16.5; 316L; Tmax: 150°C; Fill fluid: F	
CA	Flange 2" 150lb RF; ASME B16.5; 316L; Tmax: 150°C; Fill fluid: F	
CB	Flange 3" 150lb RF; ASME B16.5; 316L; Tmax: 150°C; Fill fluid: F	
Z3	Flange 1" 300lb RF; ASME B16.5; 316L; Tmax: 150°C; Fill fluid: F	
BG	Flange 2" 300lb RF; ASME B16.5; 316L; Tmax: 150°C; Fill fluid: F	
	Diaphragm Material / Fill fluid	
S	316L (1.4435); Silicon oil	
F	316L (1.4435); FDA listed food grade oil	
	Sealing / Process temperature	
S	without; -40...105°C / -40...221°F	
E	without; -40...150°C / -40...302°F	
1	FKM; -20...105°C / -4...221°F	
	Pressure	
A	Absolute	
R	Gauge	
	Measuring range	Max. Working Pressure (MWP)
B	0...100 mbar / 0...10 kPa / 0...1.4 psi	2.5 bar / 250 kPa / 35 psi
C	0...400 mbar / 0...40 kPa / 0...5.8 psi	4 bar / 400 kPa / 58 psi
D	0...1.0 bar / 0...100 kPa / 0...14 psi	5 bar / 500 kPa / 72 psi
E	0...4.0 bar / 0...400 kPa / 0...58 psi	20 bar / 2 MPa / 290 psi
G	0...10 bar / 0...1 MPa / 0...145 psi	40 bar / 4 MPa / 580 psi
K	0...40 bar / 0...4 MPa / 0...580 psi	100 bar / 10 MPa / 1450 psi
L	0...100 bar / 0...10 MPa / 0...1450 psi	300 bar / 30 MPa / 4400 psi
5	-400...400 mbar / - 40...40 kPa / - 5.8...5.8 psi	4 bar / 400 kPa / 58 psi

T	-1...0 bar / - 100...0 kPa / - 14.5...0 psi	5 bar / 500 kPa / 72 psi
U	-1...1 bar / - 100...100 kPa / - 14...14 psi	5 bar / 500 kPa / 72 psi
V	-1...4 bar / - 100...400 kPa / - 14...58 psi	20 bar / 2 MPa / 290 psi
W	-1...10 bar / - 100...1 MPa / - 14...145 psi	40 bar / 4 MPa / 580 psi
1	-1...40 bar / - 0.1...4 MPa / - 14...750 psi	100 bar / 1 MPa / 1450 psi
Adjustment		
0	Nominal range %	
1	Nominal range mbar	
2	Nominal range bar	
3	Nominal range psi	
4	Nominal range Pa	
5	Nominal range kPa	
6	Nominal range MPa	
7	Nominal range mmH2O	
8	Nominal range inH2O	
A	Nominal range mmHG	
B	Nominal range inHG	
Y	Customer specific adjustment pressure	
Accuracy class		
E	0.1%	
S	0.2%	
Electronics		
H	2-wire 4...20 mA / HART®	
Housing		
S	316L; 1-Chamber	
Electrical connection / Material		
A	M16x1.5; Plastic (PA); black; 4.5-10 mm	
E	M16x1.5; Brass nickle-plated; 4.5-10 mm	
X	M16x1.5; 316; 4.5-11 mm; IP67/68 (0.2 bar)	
C	M16x1.5; Plug M12 x 1 A; IP67	
Display and Adjustment Modul		
X	without, adjustment buttons on electronics	
A	mounted, adjustment buttons on electronics and display	



KROHNE – Process instrumentation and measurement solutions

- Flow
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