

Pressure Transmitter LHC-M51, PPC-M51

Process Pressure Measurement

Pressure transmitter with ceramic and metallic sensors, with analog electronics or communication via HART or PROFIBUS PA



Application

- Absolute pressure and gauge pressure measurement in gases, steams or liquids in all areas of process engineering and process measurement technology
- Level, volume or mass measurements in liquids
- High process temperature up to 130 °C (266 °F), for a maximum of 60 minutes 150 °C (302 °F)
- High pressure up to 400 bar (6000 psi)
- International usage thanks to a wide range of approvals

Your benefits

- Very good reproducibility and long-term stability
- High reference accuracy: up to $\pm 0.15\%$, as PLATINUM version: $\pm 0.075\%$
- Turn down up to 100:1
- End-to-end modularity for differential pressure, hydrostatics and pressure
 - replaceable display
 - universal electronics
- Easy commissioning without the need for an operating tool
- Easy and safe menu-guided operation
 - on-site via display module
 - via 4 mA to 20 mA with HART
 - via PROFIBUS PA
- Device versions compliant with ASME-BPE
- Used for process pressure monitoring up to SIL2, certified to IEC 61508 Edition 2.0 and IEC 61511 by TÜV NORD

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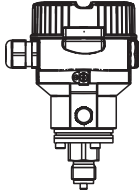
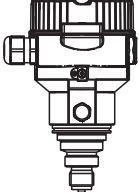
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Function and System Design

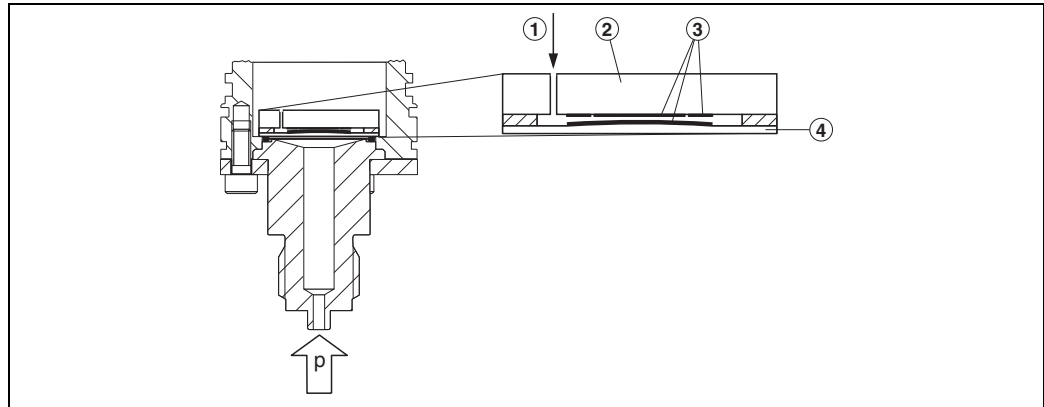
Device selection

	PPC-M51 	LHC-M51 
	With capacitive measuring cell and ceramic process isolating diaphragm	With piezoresistive measuring cell and metallic welded process isolating diaphragm
Field of application	<ul style="list-style-type: none"> Gauge pressure and absolute pressure Level 	
Process connections	<ul style="list-style-type: none"> Thread EN flanges DN 25 – DN 80 ANSI flanges 1 in to 4 in JIS flanges 50 A to 100 A Flush-mounted hygienic connections 	<ul style="list-style-type: none"> Thread EN flanges DN 25 to DN 80 ANSI flanges 1 in to 4 in JIS flanges 25 A to 100 A Prepared for diaphragm seal mount Flush-mounted hygienic connections
Measuring ranges	From -100/0 mbar to 100 mbar (-1.5/0 psi to 1.5 psi) to -1/0 bar to 40 bar (-15/0 psi to 600 psi)	From -400/0 mbar to 400 mbar (-6/0 psi to 6 psi) to -1/0 bar to 400 bar (-15/0 psi to 6000 psi)
OPL ¹	max. 60 bar (900 psi)	max. 600 bar (9000 psi)
Process temperature range	-40 °C .to +130 °C (-40 °F to +266 °F), for a maximum of 60 minutes: +150 °C (+302 °F)	
Ambient temperature range	<ul style="list-style-type: none"> Without LCD display: -40 °C to +85°C (-40 °F to +185 °F) With LCD display: -20 °C to +70°C (-4 °F to +158°F) (extended temperature application range (-40 °C to 85°C (-40 °F to 185°F)) with restrictions in optical properties such as display speed and contrast) Separate housing: -20 °C to +60°C (-4 °F to +140°F) 	
Reference accuracy	<ul style="list-style-type: none"> Up to ±0.15 % of the set span PLATINUM version: up to ±0.075 % of the set span 	
Supply voltage	<ul style="list-style-type: none"> 11.5 V DC to 45 V DC (versions with plug-in connection 35 V DC) For intrinsically safe device versions: 11.5 V DC to 30 V DC 	
Output	4 mA to 20 mA, 4 mA to 20 mA with superimposed HART protocol or PROFIBUS PA	
Options	<ul style="list-style-type: none"> LHC-M51: NACE-compliant materials PPC-M51, LHC-M51: inspection certificate 2.2 or 3.1 or other certificates 3A approval and EHEDG approval Specific firmware versions Initial device settings Separate housing Broad range of accessories 	
Specialties	<ul style="list-style-type: none"> Metal-free measurement with PVDF connection Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops 	<ul style="list-style-type: none"> Process connections with minimum oil volume Gas-tight, elastomer-free

¹ OPL: over pressure limit; depends on the lowest-rated element, with regard to pressure, of the selected components

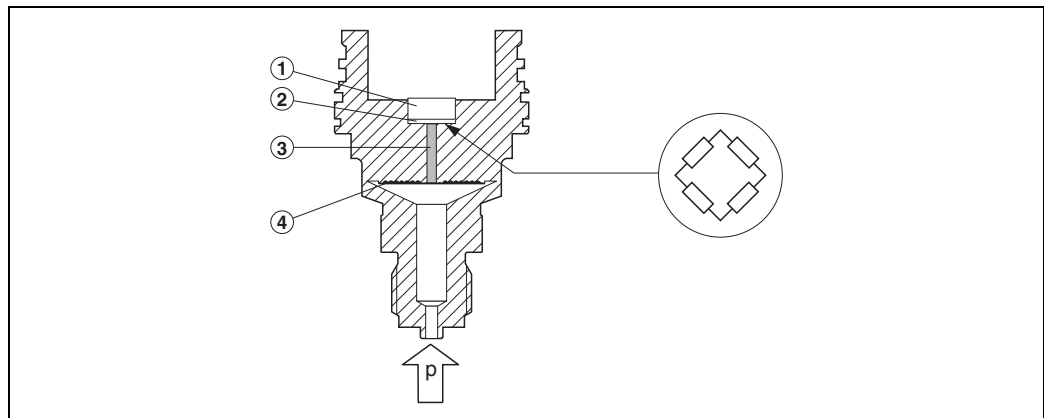
Measuring principle

Ceramic process isolating diaphragm used in PPC-M51



- 1 Air pressure (gauge pressure sensors)
- 2 Ceramic substrate
- 3 Electrodes
- 4 Ceramic process isolating diaphragm

Metallic process isolating diaphragm used in LHC-M51



- 1 Silicon measuring element, substrate
- 2 Wheatstone bridge
- 3 Channel with fill fluid
- 4 Metallic process isolating diaphragm

Ceramic process isolating diaphragm used in PPC-M51

The ceramic sensor is a dry sensor, i. e. the process pressure acts directly on the robust ceramic process isolating diaphragm and deflects it. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm. The measuring range is determined by the thickness of the ceramic process isolating diaphragm.

Advantages:

- Guaranteed overload resistance up to 40 times the nominal pressure
- Thanks to ultrapure 99.9% ceramic
 - extremely high chemical stability, comparable with Alloy C
 - less relaxation
 - high mechanical stability
- Can be used in absolute vacuum
- Outstanding surface finish, $R_a \leq 0,3 \mu\text{m}$ (11,8 μin)

Metallic process isolating diaphragm used in LHC-M51

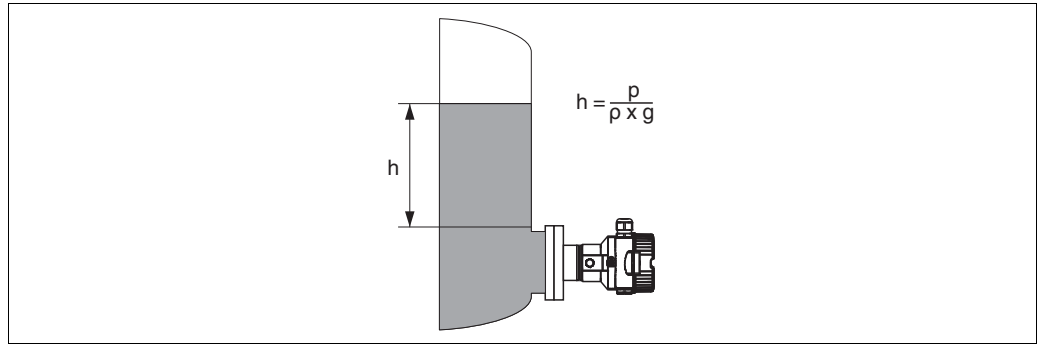
The operating pressure deflects the process isolating diaphragm and a fill fluid transfers the pressure to a resistance bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:

- Can be used for process pressure up to 400 bar (6000 psi)
- High long-term stability
- Guaranteed overload resistance up to 4 times the nominal pressure
- Significantly less thermal effect compared to diaphragm seal systems

Level measurement (level, volume and mass)

Function and design

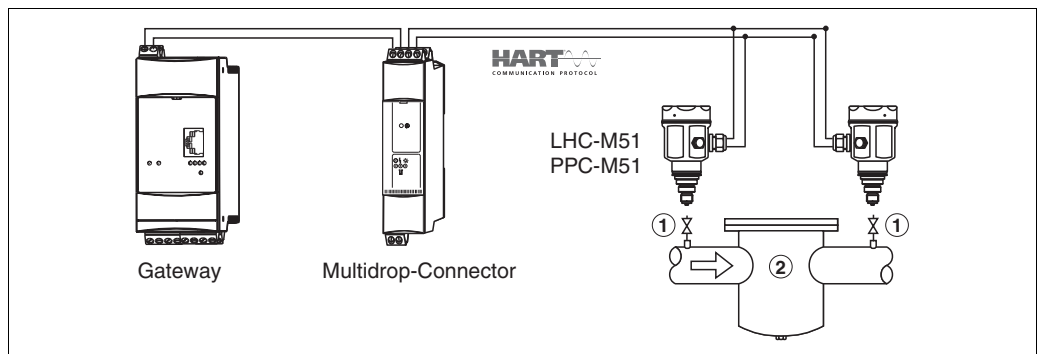


Level measurement
 h Height (level)
 p Pressure
 r Density of the medium
 g Gravitation constant

Your benefits

- Choice of different level measuring modes in the device software
- Volume and mass measurements in any tank shapes by means of a freely programmable characteristic curve
- Choice of diverse level units
- Has a wide range of uses, even in the following cases
 - in the event of foam formation
 - in tanks with agitators or screen fittings
 - in the event of liquid gases

Electrical differential pressure measurement with gauge pressure sensors



1 Shut-off valves
 2 e. g. filter

In the example given, two pressure transmitters (each with a gauge pressure sensor) are interconnected. The pressure difference can thus be measured using two independent pressure transmitters.



WARNING If using intrinsically safe devices, strict compliance with the rules for interconnecting intrinsically safe circuits as stipulated in IEC60079-14 (proof of intrinsic safety) is mandatory.

System integration (except analog electronics)

The device can be fitted with a tag name and a preset bus address, see → 65 ff "Ordering Information" feature "Identification" version "O" and "P".

Communication protocol

- 4 mA to 20 mA without communication protocol (analog electronics)
- 4 mA to 20 mA with HART communication protocol
- PROFIBUS PA
 - Die Pepperl+Fuchs devices meet the requirements of the FISCO model.
 - Due to the low current consumption of $11 \text{ mA} \pm 1 \text{ mA}$, the following number of devices can be operated on one bus segment if installing as per FISCO:
 - up to 8 pressure transmitters for Ex ia, CSA IS and FM IS applications
 - up to 31 pressure transmitters for all other applications, e. g. in non-hazardous areas, Ex nA, etc.

Further information on PROFIBUS PA can be found in the PNO Guideline.

Input

Measured variable

- Analog electronics: Absolute pressure and gauge pressure
- HART electronics: Absolute pressure and gauge pressure, from which level (level, volume or mass) is derived

Measuring range

PPC-M51 – with ceramic process isolating diaphragm for gauge pressure

Nominal value	Range limit		Smallest calibratable span (preset at the factory ¹)	MWP ²	OPL ³	Vacuum resistance	Version in the order code ⁴
	lower (LRL) [bar (psi)]	upper (URL) [bar (psi)]					
100 mbar (1.5 psi)	-0.1 (-1.5)	+0.1 (+1.5)	0.01 (0.15)	2.7 (40.5)	4 (60)	0.7 (10.5)	R1A
250 mbar (3.75 psi)	-0.25 (-3.75)	+0.25 (+3.75)	0.01 (0.15)	3.3 (49.5)	5 (75)	0.5 (7.5)	R1C
400 mbar (6 psi)	-0.4 (-6)	+0.4 (+6)	0.02 (0.3)	5.3 (79.5)	8 (120)	0	R1D
1 bar (15 psi)	-1 (-15)	+1 (+15)	0.05 (1)	6.7 (100.5)	10 (150)	0	R2A
2 bar (30 psi)	-1 (-15)	+2 (+30)	0.1 (1.5)	12 (180)	18 (270)	0	R2C
4 bar (60 psi)	-1 (-15)	+4 (+60)	0.2 (3)	16.7 (250.5)	25 (375)	0	R2D
10 bar (150 psi)	-1 (-15)	+10 (+150)	0.5 (7.5)	26.7 (400.5)	40 (600)	0	R3A
40 bar (600 psi)	-1 (-15)	+40 (+600)	2 (30)	40 (600)	60 (900)	0	R3D

PPC-M51 – with ceramic process isolating diaphragm for absolute pressure

Nominal value	Range limit		Smallest calibratable span (preset at the factory ¹)	MWP ²	OPL ³	Vacuum resistance	Version in the order code ⁴
	lower (LRL) [bar (psi)]	upper (URL) [bar (psi)]					
100 mbar (15 psi)	0	+0.1 (+1.5)	0.01 (0.15)	2.7 (40.5)	4 (60)	0	A1A
250 mbar (3.75 psi)	0	+0.25 (+3.75)	0.01 (0.15)	3.3 (49.5)	5 (75)	0	A1C
400 mbar (6 psi)	0	+0.4 (+6)	0.02 (0.3)	5.3 (79.5)	8 (120)	0	A1D
1 bar (15 psi)	0	+1 (+15)	0.05 (1)	6.7 (100.5)	10 (150)	0	A2A
2 bar (30 psi)	0	+2 (+30)	0.1 (1.5)	12 (180)	18 (270)	0	A2C
4 bar (60 psi)	0	+4 (+60)	0.2 (3)	16.7 (250.5)	25 (375)	0	A2D
10 bar (150 psi)	0	+10 (+150)	0.5 (7.5)	26.7 (400.5)	40 (600)	0	A3A
40 bar (600 psi)	0	+40 (+600)	2 (30)	40 (600)	60 (900)	0	A3D

¹ Recommended turn down: max 10:1. Factory calibration turn down: max 20:1, higher on request or configurable in the device.

² The MWP (maximum working pressure) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i. e. the process connection (→ 32 ff) has to be taken into consideration in addition to the measuring cell (→ see table above). Pay attention to the pressure-temperature dependence also. For the appropriate standards and other information, see → 31, "Pressure specifications" section.

³ OPL: over pressure limit depends on the lowest-rated element, with regard to pressure, of the selected components

⁴ Version in the order code → see also → 65 ff, feature "Sensor range"

LHC-M51 – with metallic process isolating diaphragm for gauge pressure

Nominal value	Range limit		Smallest calibratable span (preset at the factory ¹)	MWP ²	OPL ³	Vacuum resistance ⁴ Silicone oil/ Inert oil [bar _{abs} (psi _{abs})]	Version in the order code ⁵
	lower (LRL) [bar (psi)]	upper (URL) [bar (psi)]					
400 mbar (6 psi)	-0.4 (-6)	+0.4 (+6)	0.02 (0.3)	4 (60)	6 (90)	0.01/0.04 (0.15/0.6)	R1D
1 bar (15 psi)	-1 (-15)	+1 (+15)	0.05 (1)	6.7 (100)	10 (150)		R2A
2 bar (30 psi)	-1 (-15)	+2 (+30)	0.1 (1.5)	13.3 (200)	20 (300)		R2C
4 bar (60 psi)	-1 (-15)	+4 (+60)	0.2 (3)	18.7 (280.5)	28 (420)		R2D
10 bar (150 psi)	-1 (-15)	+10 (+150)	0.5 (7.5)	26.7 (400.5)	40 (600)		R3A
40 bar (600 psi)	-1 (-15)	+40 (+600)	2 (30)	100 (1500)	160 (2400)		R3D
100 bar (1500 psi)	-1 (-15)	+100 (+1500)	5 (75)	100 (1500)	400 (6000)		R4A
400 bar (6000 psi)	-1 (-15)	+400 (+6000)	20 (300)	400 (6000)	600 (9000)		R4D

LHC-M51 – with metallic process isolating diaphragm for absolute pressure

Nominal value	Range limit		Smallest calibratable span (preset at the factory ¹)	MWP ²	OPL ³	Vacuum resistance ⁴ Silicone oil/ Inert oil [bar _{abs} (psi _{abs})]	Version in the order code ⁵
	lower (LRL) [bar (psi)]	upper (URL) [bar (psi)]					
400 mbar (6 psi)	0	+0.4 (+6)	0.02 (0.3)	4 (60)	6 (90)	0.01/0.04 (0.15/0.6)	A1D
1 bar (15 psi)	0	+1 (+15)	0.05 (1)	6.7 (100)	10 (150)		A2A
2 bar (30 psi)	0	+2 (+30)	0.1 (1.5)	13.3 (200)	20 (300)		A2C
4 bar (60 psi)	0	+4 (+60)	0.2 (3)	18.7 (280.5)	28 (420)		A2D
10 bar (150 psi)	0	+10 (+150)	0.5 (7.5)	26.7 (400.5)	40 (600)		A3A
40 bar (600 psi)	0	+40 (+600)	2 (30)	100 (1500)	160 (2400)		A3D
100 bar (1500 psi)	0	+100 (+1500)	5 (75)	100 (1500)	400 (6000)		A4A
400 bar (6000 psi)	0	+400 (+6000)	20 (300)	400 (6000)	600 (9000)		A4D

¹ Recommended turn down: max 10:1. Factory calibration turn down: max 20:1, higher on request or configurable in the device.

² The MWP (maximum working pressure) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i. e. the process connection (→ 32 ff) has to be taken into consideration in addition to the measuring cell (→ see table above). Pay attention to the pressure-temperature dependence also. For the appropriate standards and other information, see → 31, "Pressure specifications" section.

³ OPL: over pressure limit depends on the lowest-rated element, with regard to pressure, of the selected components

⁴ The vacuum resistance applies to the measuring cell at reference conditions.

⁵ Version in the order code → see also → 65 ff, feature "Sensor range"

Explanation of terms

Explanation of terms: turn down (TD), set span and span based on zero point

Case 1:

- $| \text{Lower range value (LRV)} | \leq | \text{Upper range value (URV)} |$

Example:

- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 0.5 bar (7.5 psi)
- Nominal value (URL) = 1 bar (15 psi)

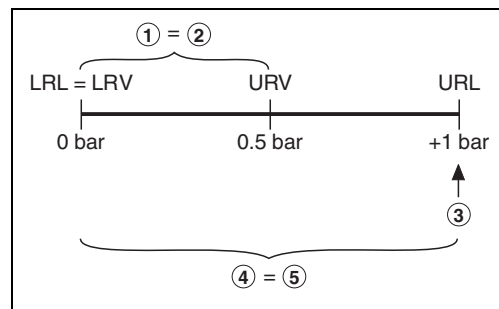
Turn down:

- $\text{TD} = \text{URL} / | \text{URV} | = 2:1$

Set span:

- $\text{URV} - \text{LRV} = 0.5 \text{ bar (7.5 psi)}$

This span is based on the zero point.



Example: 1 bar (15 psi) measuring cell

Case 2:

- $| \text{Lower range value (LRV)} | \leq | \text{Upper range value (URV)} |$

Example:

- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 0.5 bar (7.5 psi)
- Nominal value (URL) = 1 bar (15 psi)

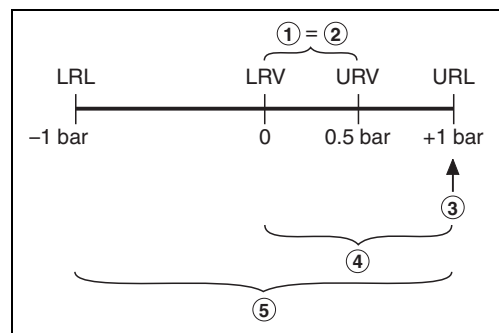
Turn down:

- $\text{TD} = \text{URL} / | \text{URV} | = 2:1$

Set span:

- $\text{URV} - \text{LRV} = 0.5 \text{ bar (7.5 psi)}$

This span is based on the zero point.



Example: 1 bar (15 psi) measuring cell

Case 3:

- $| \text{Lower range value (LRV)} | \geq | \text{Upper range value (URV)} |$

Example:

- Lower range value (LRV) = -0.6 bar (-9 psi)
- Upper range value (URV) = 0 bar
- Nominal value (URL) = 1 bar (15 psi)

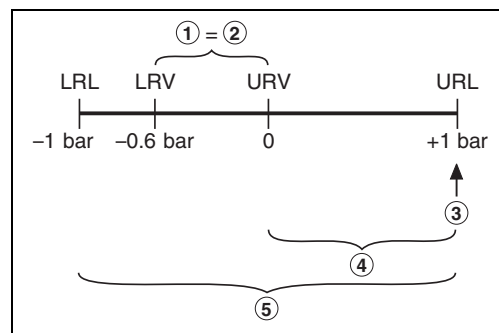
Turn down:

- $\text{TD} = \text{URL} / | \text{LRV} | = 1.67:1$

Set span:

- $\text{URV} - \text{LRV} = 0.6 \text{ bar (9 psi)}$

This span is based on the zero point.



Example: 1 bar (15 psi) measuring cell

- 1 Set span
- 2 Span based on zero point
- 3 Nominal value i upper range limit (URL)
- 4 Nominal measuring range
- 5 Sensor measuring range
- LRL Lower range limit
- URL Upper range limit
- LRV Lower range value
- URV Upper range value

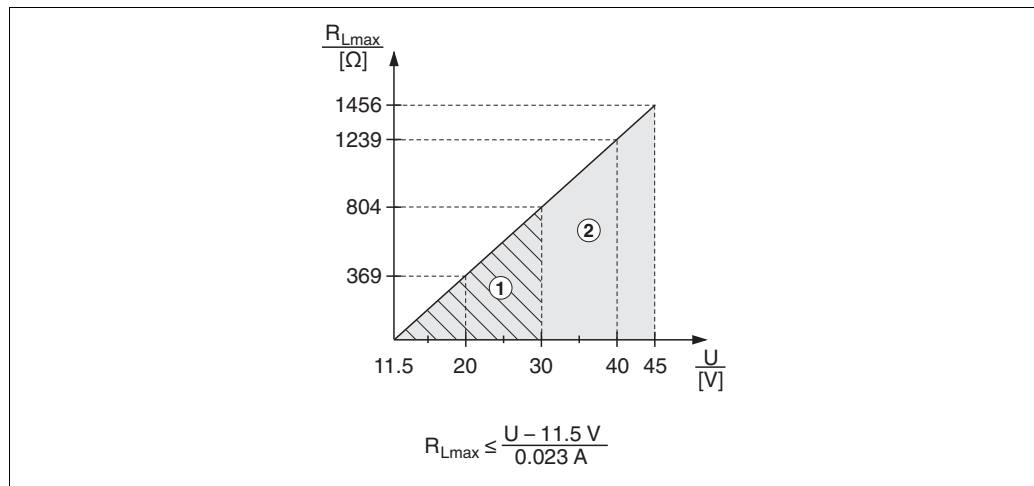
Output

Output signal	<ul style="list-style-type: none"> • 4 mA to 20 mA analog, 2-wire • 4 mA to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire • Digital communication signal PROFIBUS PA (Profile 3.02)
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Signal range	4 mA .to 20 mA Analog, 4 mA to 20 mA HART: 3,8 mA to 20,5 mA
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Signal on alarm	<p>As per NAMUR NE43</p> <ul style="list-style-type: none"> • 4 mA to 20 mA Analog: <ul style="list-style-type: none"> – Signal overshoot: > 20.5 mA – Signal undershoot: < 3.8 mA – Min Alarm (3.6 mA) • 4 mA to 20 mA HART <p>Options:</p> <ul style="list-style-type: none"> – Max. alarm: can be set from 21 mA to 23 mA (factory setting: 22 mA) – Hold measured value: last measured value is held – Min. alarm: 3.6 mA • PROFIBUS PA: can be set in the Analog Input block, <p>Options: Last Valid Out Value (factory setting), Fail-safe Value, Status Bad</p>
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Load 4 mA to 20 mA Analog and 4 mA to 20 mA HART



Load diagram

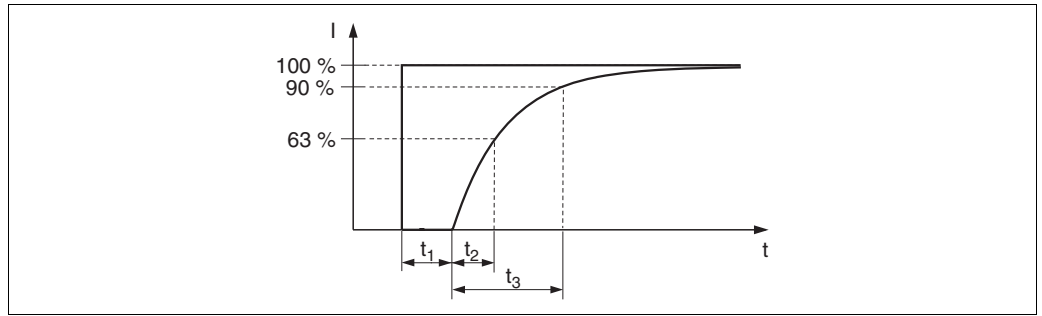
- 1 Power supply 11.5 V DC to 30 V DC for intrinsically safe device versions
 - 2 Power supply 11.5 V DC to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified device versions
- R_{Lmax} Maximum load resistance
 U Supply voltage



When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

Resolution	<ul style="list-style-type: none"> • Current output: 1 μA • Display HART: can be set (factory setting: presentation of the maximum accuracy of the transmitter)
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Dead time, Time constant



Presentation of the dead time and the time constant

Dynamic behavior: current output (analog electronics)

	Type	Dead time (t_1) [ms]	Time constant T63 (= t_2) [ms]	Time constant T90 (= t_3) [ms]
max.	PPC-M51	60	40	50
max.	LHC-M51	40	40	50

Dynamic behavior: current output (HART electronics)

	Type	Dead time (t_1) [ms]	Time constant T63 (= t_2) [ms]	Time constant T90 (= t_3) [ms]
max.	PPC-M51	50	85	200
max.	LHC-M51	70	80	185

Dynamic behavior: digital output (HART electronics)

	Type	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	PPC-M51	210	295	360
max.		1010	1095	1160
min.	LHC-M51	210	285	345
max.		1010	1085	1145

Reading cycle

- Acyclic: max. 3/s, typical 1/s (depends on command # and number of preambles)
- Cyclic (Burst): max. 3/s, typical 2/s

The pressure transmitter commands the BURST MODE function for cyclic value transmission via the HART communication protocol.

Cycle time (Update time)

Cyclic (Burst): min. 300 ms

Response time

- Acyclic: min. 330 ms, typical 590 ms (depends on command # and number of preambles)
- Cyclic (Burst): min. 160 ms, typical 350 ms (depends on command # and number of preambles)

Dynamic behavior: PROFIBUS PA

	Type	Dead time (t ₁) [ms]	Dead time (t ₁) [ms] + Time constant T63 (= t ₂) [ms]	Dead time (t ₁) [ms] + Time constant T90 (= t ₃) [ms]
min.	PPC-M51	85	170	235
max.		1185	1270	1335
min.	LHC-M51	85	160	220
max.		1185	1260	1320

Reading cycle

- Cyclic: max. 30/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 25/s

Cycle time (update time)

min. 100 ms

The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time.

Response time

- Cyclic: approx. 8 ms to 13 ms (depends on Min. Slave Interval)
- Acyclic: approx. 23 ms to 35 ms (depends on Min. Slave Interval)

Damping

A damping affects all outputs (output signal, display).

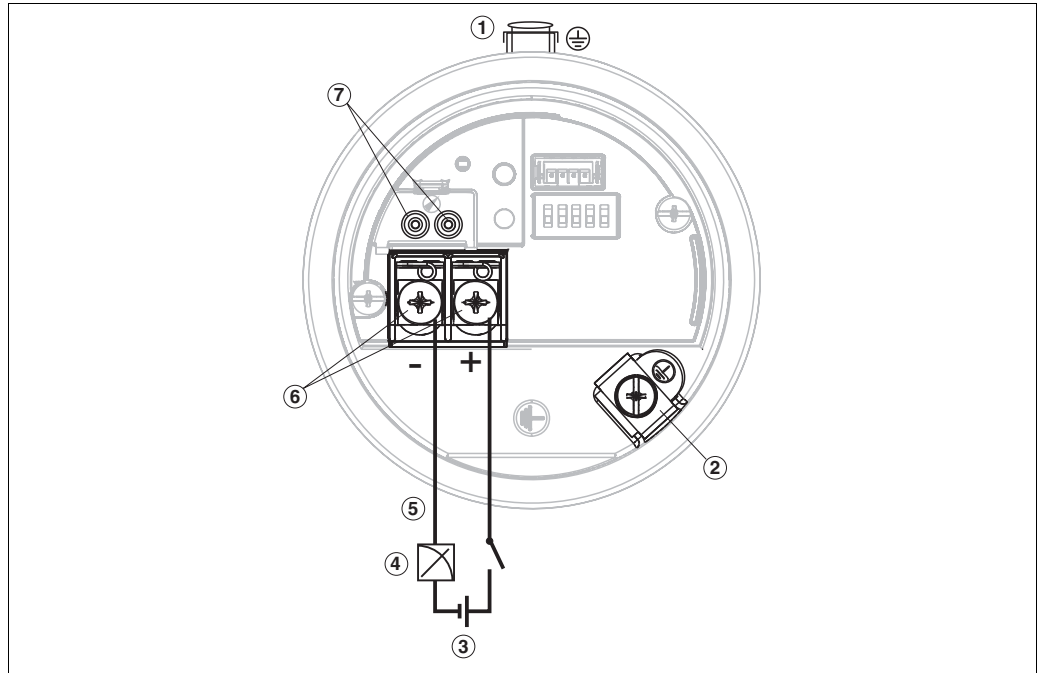
- Via on-site display, handheld terminal or PC with operating program, continuous from 0 s to 999 s
- Via DIP-switch on the electronic insert, switch position "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

Power Supply

Electrical connection



- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings (→ 73, "Safety instructions" and "Installation/Control Drawings" sections).
- According to IEC/EN61010 a suitable disconnecter has to be installed for the device.
- HART: An overvoltage protection for the non-hazardous area, ATEX II 2 (1) Ex ia IIC and IEC Ex ia can be ordered as an option (→ 65 ff "Ordering Information" section).
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply.



Electrical connection

- 1 External grounding terminal
- 2 Internal grounding terminal
- 3 Supply voltage → 18
- 4 4 mA to 20 mA for HART devices
- 5 For HART devices: With a handheld terminal, all the parameters can be configured anywhere along the bus line via menu operation.
- 6 Terminals
- 7 For HART devices: test terminals, see section "Taking 4 mA to 20 mA test signal"

4 mA to 20 mA Analog, 4 mA to 20 mA HART

Taking 4 mA to 20 mA test signal

A 4 mA to 20 mA test signal may be measured via the test terminals without interrupting the measurement.

PROFIBUS PA

For further information on the network structure and grounding, and for further bus system components such as bus cables, see the relevant documentation, e. g. the PNO Guideline.

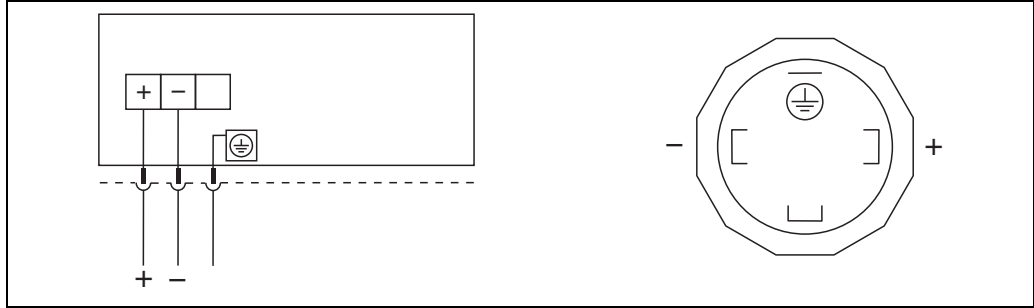
Cable specifications:

Use a twisted, shielded two-wire cable, preferably cable type A



For further information on the cable specifications, see PNO Guideline 2.092 and "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

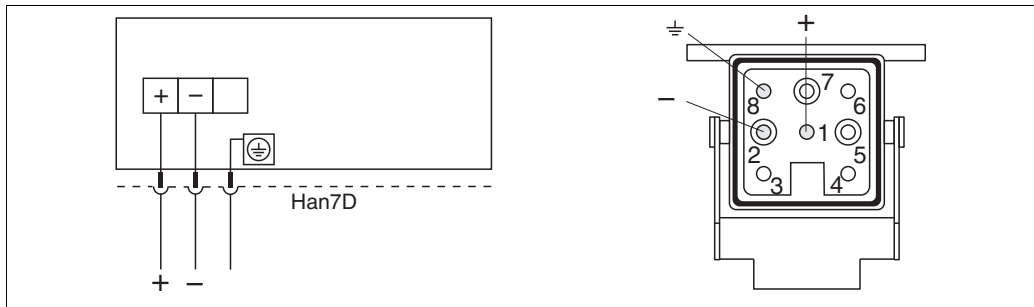
Devices with valve connector



Left electrical connection for devices with a valve connector
Right view of the connector at the device

Material: PA 6.6

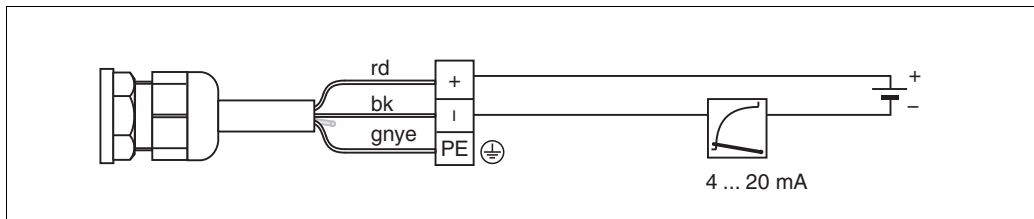
Devices with Harting plug Han7D



Left electrical connection for devices with Harting plug Han7D
Right view of the plug connector at the device

Material: CuZn

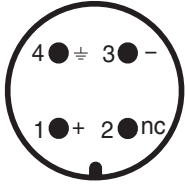
Connecting the cable version



rd = red, bk = black, gnye = green-yellow

Devices with M12 plug

PIN assignment for M12 connector

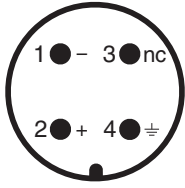
 <p style="text-align: right; font-size: small;">P0011175</p>	PIN	Meaning
	1	Signal +
	2	not assigned
	3	Signal -
	4	Earth

Pepperl+Fuchs offers the following accessories for devices with an M12 plug:

- Plug-in jack M 12x1, straight
 - Material: body PA; coupling nut CuZn, nickel-plated
 - Degree of protection (fully locked): IP66/67
- Plug-in jack M 12x1, elbowed
 - Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
 - Degree of protection (fully locked): IP66/67
- Cable 4x0.34 mm² (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
 - Material: body PUR; coupling nut CuSn/Ni; cable PVC
 - Degree of protection (fully locked): IP66/67

Devices with 7/8 in plug

PIN assignment for 7/8 in connector

 <p style="text-align: right; font-size: small;">P0011176</p>	PIN	Meaning
	1	Signal -
	2	Signal +
	3	Shield
	4	not assigned

- External thread: 7/8-16 UNC
 - Material: housing/body CuZn, nickel-plated
 - Protection: IP66/68

Cable gland

Approval	Type	Clamping area
Standard, II1/2G Ex ia, IS	Plastic M20x1.5	5 mm to 10 mm (0.2 in to 0.39 in)
ATEX II1/2D, II1/2GD Ex ia, II3G Ex nA	Metal M20x1.5 (Ex e)	7 mm to 10.5 mm (0.28 in to 0.41 in)

Terminals

For wire cross-sections 0,5 mm² to 2,5 mm² (20 AWG to 14 AWG)

Supply voltage



- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas (→ [73](#), "Safety instructions" and "Installation/Control Drawings" sections).

4 mA to 20 mA, 4 mA to 20 mA HART

Type of protection	Supply voltage
• Intrinsically safe	11,5 V DC to 30 V DC
• Other types of protection • Devices without certificate	11,5 V DC to 45 V DC (versions with plug-in connection 35 V DC)

PROFIBUS PA

- Version for non-hazardous areas: 9 V DC to 32 V DC

Start-up current HART

12 mA or 22 mA (selectable)

Current consumption

PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Cable entry

→ [65 ff](#) "Ordering Information", feature "Electrical connection".

Cable specification

- Pepperl+Fuchs recommends using twisted, shielded two-wire cables.
- Terminals for wire cross-sections 0.5 mm² to 2.5 mm² (20 AWG to 14 AWG)
- Cable outer diameter: 5 mm to 9 mm (0.2 in to 0.35 in) depends on the used cable gland (→ [17](#))

Residual ripple

No influence on 4 mA to 20 mA signal up to ±5 % residual ripple within the permitted voltage range [according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)]

Influence of power supply

≤ 0.001 % des URL/1 V

Performance Characteristics – General

Reference operating conditions

- As per IEC 60770
- Ambient temperature T_a = constant, in the range of: +21°C to +33°C (+70°F to +91°F)
- Humidity φ = constant, in the range of: 5 % to 80 % RH
- Ambient pressure p_a = constant, in the range of: 860 mbar to 1060 mbar (12.47 psi to 15.37 psi)
- Position of the measuring cell: constant, in range: ±1° horizontally
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Span based on zero point
- Material of the process isolating diaphragm PPC-M51: Al₂O₃ (aluminum-oxide ceramic)
- Material of the process isolating diaphragm LHC-M51: AISI 316L
- Filling oil LHC-M51: silicone oil
- Supply voltage: 24 V DC ± 3 V DC
- Load with HART: 250 Ω
- acc. to IEC 60770

Uncertainty of measurement for small absolute pressure ranges

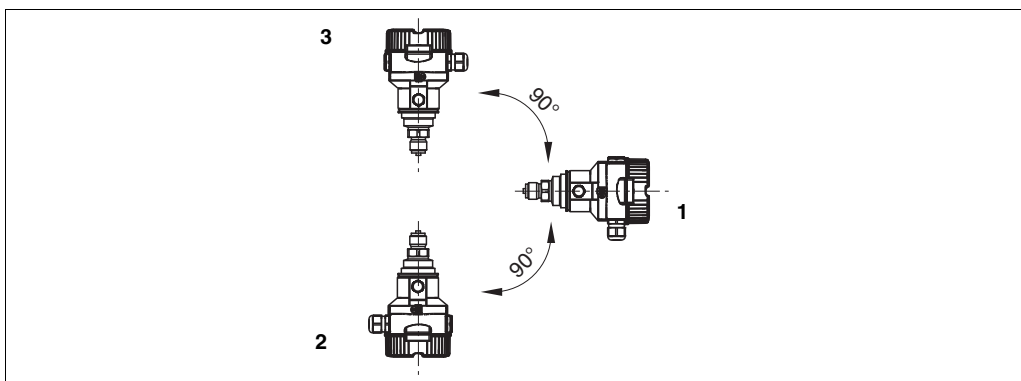
- The smallest expanded uncertainty of measurement that can be returned by our standards is:
- 0.4 % of the measured value in the range of 1mbar to 30 mbar
 - 1 % of the measured value in the range < 1 mbar.

Long-term stability

PPC-M51	Measuring range	Long-term stability of URL/1 year
With thread or flange	≤ 1 bar (15 psi)	±0.2 %
	> 1 bar (15 psi)	±0.1 %
With hygienic process connection	≤ 1 bar (15 psi)	±0.35 %
	> 1 bar (15 psi)	±0.2 %

LHC-M51	Long-term stability of URL/1 year
Measuring range	
≤ 1 bar (15 psi)	±0.25 %
> 1 bar to 10 bar (15 psi to 150 psi)	±0.1 %
40 bar (600 psi)	±0.1 %
100 bar (1500 psi)	±0.1 %
400 bar (6000 psi)	±0.1 %

Influence of orientation



Measuring error in mbar (psi)

	1 Axis of the diaphragm perpendicular	2 Diaphragm points up	3 Diaphragm points down
PPC-M51	Calibration position, no measuring error	< +0.2 mbar (0.003 psi)	< -0.2 mbar (0.003 psi)
LHC-M51 with process connections 1/2 in thread and silicone oil		< +4 mbar (0.06 psi)	< -4 mbar (0.06 psi)
LHC-M51 with process connections > thread 1/2 in and flanges		< +10 mbar (0.145 psi) This value is doubled for inert oil.	< -10 mbar (0.145 psi) This value is doubled for inert oil.

i Position-dependent zero point shift can be corrected at the device.
→ 25, "General installation instructions" section.

Warm-up period

- 4 mA to 20 mA Analog: ≤ 1.5 s
- 4 mA to 20 mA HART: ≤ 5 s
- PROFIBUS PA: ≤ 8 s

Performance Characteristics – Ceramic Process Isolating Diaphragm

Reference accuracy – PPC-M51

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770. The data refer to the calibrated span.

Gauge pressure sensors		
Measuring cell	Standard reference accuracy	Platinum reference accuracy
100 mbar (1.5 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = 0.20 % 	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = ±0.075 % TD > 10:1 to TD 20:1 = ±0.0075 x TD
250 mbar (3.75 psi), 400 mbar (6 psi), 1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = 0.20 % 	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = ±0.075 % TD > 10:1 to TD 20:1 = ±0.1 %
40 bar (600 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = 0.20 % 	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = ±0.075 % TD > 10:1 to TD 20:1 = ±0.0075 x TD

Absolute pressure sensors		
Measuring cell	Standard reference accuracy	Platinum reference accuracy
100 mbar (1.5 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = ±0.0015 x TD 	<ul style="list-style-type: none"> TD 1:1 to TD 5:1 = ±0.075 % TD > 5:1 to TD 20:1 = ±0.015 x TD
250 mbar (3.75 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = 0.20 % 	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = ±0.075 % TD > 10:1 to TD 13:1 = ±0.1 %
400 mbar (6 psi), 1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = 0.20 % 	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = ±0.075 % TD > 10:1 to TD 20:1 = ±0.1 %
40 bar (600 psi)	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = 0.15 % TD > 10:1 to TD 20:1 = 0.20 % 	<ul style="list-style-type: none"> TD 1:1 to ≤ TD 10:1 = ±0.075 % TD > 10:1 to TD 20:1 = ±0.0075 x TD

Total performance – PPC-M51

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility as well as the thermal change in the zero point. All specifications apply to the temperature range -10 °C to +60°C (+14 °F to +140°F) and Turndown 1:1.

Signal output	Measuring cell	% URL
HART, PROFIBUS PA	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±0.575
	1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.5
Analog (4 mA to 20 mA)	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±0.775
	1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.7

Total error – PPC-M51

The total error comprises the long-term stability and the total performance. All specifications apply to the temperature range -10 °C to +60°C (+14 °F to +140°F) and Turndown 1:1.

	Signal output	Measuring cell	% URL
			1 year
PPC-M51 with thread or flange	HART, PROFIBUS PA	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±0.55
		1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.47
	Analog (4 mA to 20 mA)	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±0.75
		1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.67
PPC-M51 with hygienic process connection	HART, PROFIBUS PA	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±0.925
		1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.7
	Analog (4 mA to 20 mA)	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±1.125
		1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.9

Thermal change in the zero output and the output span – PPC-M51

PPC-M51 with thread or flange

Signal output	Measuring cell	% of the calibrated measuring span		
		-40 °C to -20 °C (-40 °F to -4 °F)	-10 °C to +60 °C (+14 °F to +140 °F)	-20 °C to +100 °C (-4 °F to +212 °F)
HART, PROFIBUS PA	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±(0.6 + 0.45 x TD)	±0.2 + 0.275 x TD	±(0.4 + 0.425 x TD)
	1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.5 + 0.35 x TD	±0.1 + 0.15 x TD	±(0.225 + 0.525 x TD)
Analog (4 mA to 20 mA)	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±(0.6 + 0.45 x TD)	±0.4 + 0.275 x TD	±0.7 + 0.425 x TD
	1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±0.5 + 0.35 x TD	±0.3 + 0.15 x TD	±0.525 + 0.525 x TD

PPC-M51 with hygienic process connection

Signal output	Measuring cell	% of the calibrated measuring span	
		-10 °C to +60 °C (+14 °F to +140 °F)	-20 °C to +130 °C (-4 °F to +266 °F)
HART, PROFIBUS PA	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±(0.4 + 0.275 x TD)	±(0.7 + 0.425 x TD)
	1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±(0.3 + 0.15 x TD)	±(0.525 + 0.525 x TD)
Analog (4 mA to 20 mA)	100 mbar (1.5 psi), 250 mbar (3.75 psi), 400 mbar (6 psi)	±(0.4 + 0.275 x TD)	±(0.7 + 0.425 x TD)
	1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	±(0.3 + 0.15 x TD)	±(0.525 + 0.525 x TD)

Performance Characteristics – Metallic Process Isolating Diaphragm

Reference accuracy – LHC-M51

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770. The data refer to the calibrated span.

Gauge pressure sensors/absolute pressure sensors

Measuring cell	LHC-M51 without capillary	
	Standard reference accuracy	Platinum reference accuracy ¹
400 mbar (6 psi)	<ul style="list-style-type: none"> • TD 1:1 = ±0.15 % • TD > 1:1 to TD > 20:1 = ±0.15 % x TD 	Not available
	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 = ±0.3 % • TD > 1:1 to TD 10:1 = ±0.3 % x TD 	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 = ±0.2 % • TD > 1:1 to TD 10:1 = ±0.2 % x TD
1 bar (15 psi)	<ul style="list-style-type: none"> • TD 1:1 to TD 5:1 = ±0.15 % • TD > 5:1 to TD > 20:1 = ±0.03 % x TD 	<ul style="list-style-type: none"> • TD 1:1 to TD 2.5:1 = ±0.075 % • TD > 2.5:1 to TD > 20:1 = ±0.03 % x TD
	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 = ±0.3 % • TD > 1:1 to TD 10:1 = ±0.3 % x TD 	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 = ±0.2 % • TD > 1:1 to TD 10:1 = ±0.2 % x TD
2 bar (30 psi)	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.15 % • TD > 10:1 to TD > 20:1 = ±0.015 % x TD 	<ul style="list-style-type: none"> • TD 1:1 to TD 5:1 = ±0.075 % • TD > 5:1 to TD > 20:1 = ±0.015 % x TD
	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 to TD ≤ 5:1: 0.15 % • TD > 5:1 to TD ≤ 10:1: 0.2 % 	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 to TD ≤ 5:1: 0.075 % • TD > 5:1 to TD ≤ 10:1: 0.1 %
4 bar (60 psi)	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.15 % • TD > 10:1 to TD 20:1 = ±0.20 % 	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.075 % • TD 10:1 to TD 20:1 = ±0.0075 % x TD
	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 to TD ≤ 10:1: 0.15 % • TD > 10:1 to TD 20:1: ±0.2 % 	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 to TD ≤ 10:1: 0.075 % • TD > 5:1 to TD 20:1: ±0.1 %
10 bar (150 psi), 40 bar (600 psi)	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.15 % • TD > 10:1 to TD 20:1 = ±0.20 % 	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.075 % • TD 10:1 to TD 20:1 = ±0.1 %
	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 to TD ≤ 10:1: 0.15 % • TD > 10:1 to TD 20:1: ±0.2 % 	with hygienic process connection: <ul style="list-style-type: none"> • TD 1:1 to TD ≤ 10:1: 0.075 % • TD > 5:1 to TD 20:1: ±0.1 %
100 bar (1500 psi)	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.15 % • TD > 10:1 to TD 20:1 = ±0.20 % 	<ul style="list-style-type: none"> • TD 1:1 to TD 10:1 = ±0.075 % • TD 10:1 to TD 20:1 = ±0.0075 % x TD
400 bar (6000 psi)	<ul style="list-style-type: none"> • TD 1:1 to TD 5:1 = ±0.15 % • TD > 5:1 to TD 20:1 = ±(0.03 % x TD) 	<ul style="list-style-type: none"> • TD 1:1 to TD 5:1 = ±0.15 % • TD > 5:1 to TD 20:1 = ±(0.03 % x TD)

¹ only LHC-M51 with direct diaphragm seal mounting

Total performance – LHC-M51

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility as well as the thermal change in the zero point. All specifications apply to the temperature range -10 °C to +60°C (+14 °F to +140°F) and Turndown 1:1.

Signal output	Messzelle	LHC-M51	LHC-M51 with hygienic process connection	LHC-M51 with gold/rhodium-coated process isolating diaphragm
		% of URL		
HART, PROFIBUS PA	400 mbar (6 psi)	±0.34	±0.34	±1.25
	1 bar (15 psi)		±0.25	±0.75
	2 bar (30 psi)		±0.25	±0.45
	4 bar (60 psi)	±0.30	±0.25	±0.3
	10 bar (150 psi), 40 bar (600 psi)	±0.25	±0.25	±0.25
	100 bar (1500 psi)	±0.25	–	±0.25
	400 bar (6000 psi)	±0.4	–	±0.4
Analog (4 mA to 20 mA)	400 mbar (6 psi)	±0.34	±0.54	±1.25
	1 bar (15 psi)		±0.54	±0.75
	2 bar (30 psi)		±0.45	±0.45
	4 bar (60 psi)	±0.30	±0.45	±0.3
	10 bar (150 psi), 40 bar (600 psi)	±0.25	±0.45	±0.25
	100 bar (1500 psi)	±0.25	–	±0.25
	400 bar (6000 psi)	±0.4	–	±0.4

Total error – LHC-M51

The total error comprises the long-term stability and the total performance. All specifications apply to the temperature range -10 °C to +60°C (+14 °F to +140°F) and Turndown 1:1.

Signal output	Measuring cell	% of URL/year
HART, PROFIBUS PA	400 mbar (6 psi)	±0.59
	≥ 1 bar to 40 bar (15 psi to 600 psi)	±0.35
	≥ 40 bar to 100 bar (600 psi to 1500 psi)	±0.35
	400 bar (6000 psi)	±0.5
Analog (4 mA to 20 mA)	400 mbar (6 psi)	±0.79
	≥ 1 bar to 40 bar (15 psi to 600 psi)	±0.55
	≥ 40 bar to 100 bar (600 psi to 1500 psi)	±0.55
	400 bar (6000 psi)	±0.5

Thermal change in the zero output and the output span – LHC-M51

LHC-M51 (basic device)

Measuring cell	-10 °C to +60 °C (+14 °F to +140 °F)	-40 °C to -10 °C, +60 °C to +85 °C (-40 °F to +14 °F, +140 °F to +185 °F)
	% of the calibrated measuring span	
400 mbar (6 psi), 1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi), 100 bar (1500 psi)	±(0.34 + 0.15 x TD)	±(0.4 + 0.25 x TD)
400 bar (6000 psi)	±(0.3 + 0.35 x TD)	±(0.3 + 0.7 x TD)

LHC-M51 with hygienic process connection

Signal output	Measuring range	-10 °C to +60 °C (+14 °F to +140 °F)	-40 °C to -10 °C, +60 °C to +125 °C (-40 °F to +14 °F, +140 °F to +257 °F)
		% of the calibrated measuring span	
HART, PROFIBUS PA	Clamp 1/2 in/400 mbar (6 psi)	$\pm(0.1 + 0.4 \times \text{TD})$	$\pm(0.8 + 1.5 \times \text{TD})$
	400 mbar (6 psi), 1 bar (15 psi)	$\pm(0.1 + 0.25 \times \text{TD})$	$\pm(0.1 + 1.1 \times \text{TD})$
	2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	$\pm(0.1 + 0.2 \times \text{TD})$	$\pm(0.1 + 0.5 \times \text{TD})$
Analog (4 mA to 20 mA)	Clamp 1/2 in/400 mbar (6 psi)	$\pm(0.3 + 0.4 \times \text{TD})$	$\pm(1.1 + 1.5 \times \text{TD})$
	400 mbar (6 psi), 1 bar (15 psi)	$\pm(0.3 + 0.25 \times \text{TD})$	$\pm(0.4 + 1.1 \times \text{TD})$
	2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi)	$\pm(0.3 + 0.2 \times \text{TD})$	$\pm(0.4 + 0.5 \times \text{TD})$

Operating conditions (installation)

General installation instructions

- The position-dependent zero point shift can be corrected:
 - directly at the device via operating keys on the electronic insert
 - directly at the device via operating keys on the display (except analog electronics)
 - via digital communication if the cover is not open (except analog electronics)



In hazardous areas, comply strictly with the safety instructions when the housing cover is closed and open.

- Pepperl+Fuchs offers a mounting bracket for installing the device on pipes or walls. See also → 25, "Wall and pipe mounting" section.
- Use flushing rings for flange and cell diaphragm seals if medium buildup or clogging can be expected at the diaphragm seal connection. The flushing ring can be inserted between the process connection and the diaphragm seal. Thanks to the two lateral flushing bore holes, material buildup in front of the process isolating diaphragm can be rinsed away and the pressure chamber can be ventilated.
- To guarantee the leak-tightness of the transmitter, Pepperl+Fuchs recommends that only genuine cable glands be used (also available as spare parts).

Measuring arrangement for devices without diaphragm seal – PPC-M51, LHC-M51

Pressure transmitters without diaphragm seals are mounted as per the norms for a manometer (DIN EN 837-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.

Pressure measurement in gases

- Mount pressure transmitter with shutoff device above the tapping point so that any condensate can flow into the process.

Pressure measurement in steams

- Mount pressure transmitter with siphon above the tapping point.
- Fill the siphon with liquid before commissioning.
The siphon reduces the temperature to almost the ambient temperature.

Pressure measurement in liquids

- Mount pressure transmitter with shutoff device below or at the same level as the tapping point.

Level measurement

- Mount pressure transmitter below the lowest measuring point (zero point of the measurement).
- Do not mount the device at the following positions: In the filling curtain, in the tank outlet or at a point in the container which could be affected by pressure pulses from an agitator or a pump.
- The calibration and functional test can be carried out more easily if you mount the device downstream of a shutoff device.

Wall and pipe mounting

For installing the device on pipes or walls, Pepperl+Fuchs provides a mounting bracket which is included in the scope of supply or can be ordered as a separate accessory.

For the dimensions, see → 49.

"Separate housing" version

With the "separate housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This version allows for trouble-free measurement:

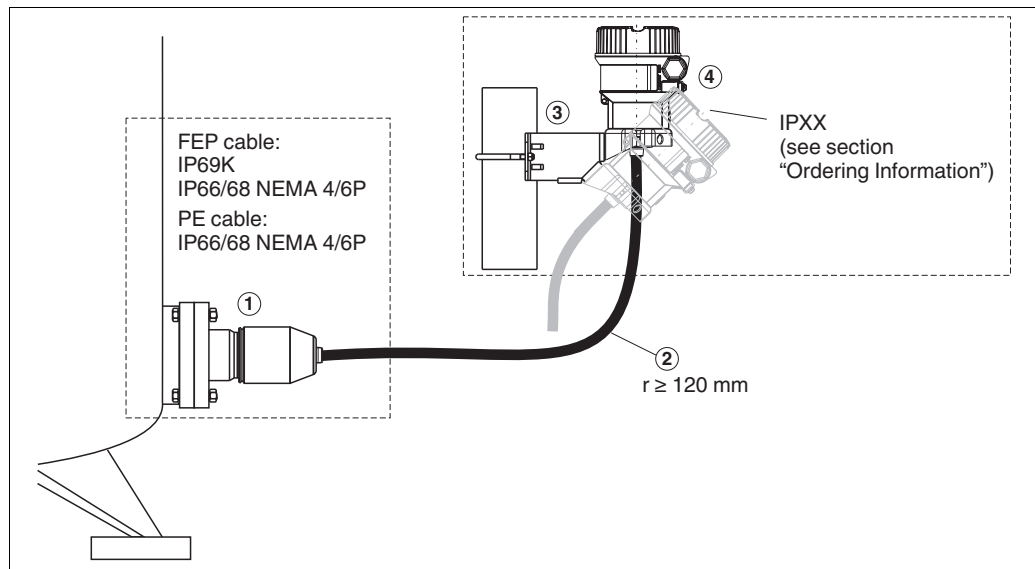
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If extreme cleaning of the measuring point is required
- If the measuring point is exposed to vibrations
- For space-saving installations

You can choose between different cable versions:

- PE (2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft))
- FEP (5 m (16 ft)).

→ 65 ff "Ordering Information", feature "Separate housing"

For the dimensions, → 49.



- 1 Process connection with sensor
- 2 Cable, both ends are fitted with a socket
- 3 Mounting bracket provided, suitable for pipe and wall mounting (for pipes from 1-1/4 in up to 2 in diameter)
- 4 Housing with electronic insert

In the case of the "separate housing" version, the sensor is delivered with the process connection and cable ready mounted. The housing and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing and the sensor.

Degree of protection for the process connection and sensor with the use of

- FEP cable:
 - IP69K
 - IP66 NEMA 4/6P
 - IP68 (1.83 mH₂O for 24 h) NEMA 4/6P
- PE cable:
 - IP66 NEMA 4/6P
 - IP68 (1.83 mH₂O for 24 h) NEMA 4/6P

Technical data of the PE and FEP cable:

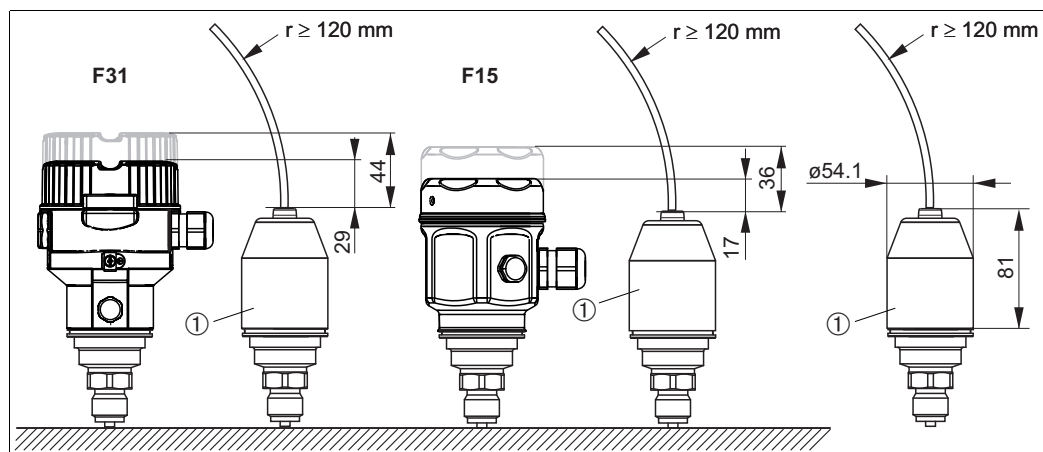
- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101 lbf)
- Resistance to UV light

Use in hazardous area:

- Intrinsically safe installations (Ex ia/IS)
- FM/CSA IS: for Div.1 installation only

Reduction in installation height

If the separate housing is used, the mounting height of the process connection is reduced compared to the dimensions of the standard version (see graphic).



Oxygen applications


Oxygen and other gases can react explosively to oils, grease and plastics. As a result, the following are some of the precautions that must be taken:

- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
- Depending on the materials used, a certain maximum temperature and maximum pressure must not be exceeded for oxygen applications.

The devices suitable for gaseous oxygen applications are listed in the following table with the specification p_{\max} .

Ordering code for devices ¹ , cleaned for oxygen applications	p_{\max} for oxygen applications	T_{\max} for oxygen applications
PPC-M51 – devices with sensors, nominal value < 10 bar (150 psi)	Over pressure limit (OPL) of sensor ^{2, 3}	60 °C (140 °F)
PPC-M51 – devices with sensors, nominal value ≥ 10 bar (150 psi)	40 bar (600 psi)	60 °C (140 °F)
LHC-M51	Depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of sensor ³ , process connection (1.5 x PN) or fill fluid (160 bar (2320 psi))	85 °C (185 °F)

¹ Only device, not accessory or enclosed accessory.

² →  65 ff "Ordering Information", feature "Sensor range"


³ PPC-M51 with PVDF thread or PVDF flange $p_{\max} = 15$ bar (225 psi)

PWIS cleaning

Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops.


Ultrapure gas applications

Pepperl+Fuchs also provides devices which have been cleaned of oil and grease for special applications, such as for ultrapure gas. No special restrictions regarding the process conditions apply to these devices.

→  65 ff "Ordering Information", feature "Service", version "F".

Applications with hydrogen

With regard to materials in which hydrogen formation takes place, hydrogen atoms can diffuse through the metallic process isolating diaphragm. This can result in incorrect measurement results. Pepperl+Fuchs offers process isolating diaphragms with a gold/rhodium coating for such instances.

→  65 ff "Ordering Information", feature "Material of the process isolating diaphragm", version "A".

Operating Conditions (Environment)

Ambient temperature range

Version	
Without LCD display	-40 °C to +85 °C (-40 °F to +185 °F)
With LCD display ¹	-20 °C to +70 °C (-4 °F to +158 °F)
With M12 plug, elbowed	-25 °C to +85 °C (-13 °F to +185 °F)
With separate housing	-20 °C to +60 °C (-4 °F to +140 °F) (installation without insulation)

¹ Extended temperature application range (-40 °C to +85 °C (-40 °F to +185 °F)) with restrictions in optical properties such as display speed and contrast



For devices for use in hazardous areas, see Safety Instructions, Installation or Control Drawing. (→ 73 ff, "Safety instructions" and "Installation/Control Drawings" sections).

Storage temperature range

Version	
Without LCD display	-40 °C to +90 °C (-40 °F to +194 °F)
With LCD display	-40 °C to +85 °C (-40 °F to +185 °F)
With M12 plug, elbowed	-25 °C to +85 °C (-13 °F to +185 °F)
With separate housing	-40 °C to +60 °C (-40 °F to +140 °F)

Degree of protection

- 65 ff "Ordering Information", feature "Electrical connection".
- Separate housing (→ 25)

Climate class

Class 4K4H (air temperature: -20 °C to 55°C (-4 °F to +131°F), relative humidity: 4 % to 100 %) satisfied as per DIN EN 60721-3-4 (condensation possible).

Vibration resistance

Device/accessory	Test standard	Vibration resistance
Devices without mounting bracket	GL VI-7-2 <ul style="list-style-type: none"> Part 7: Guidelines for the Performance of Type Approvals Chapter 2: Test Requirements for Electrical/Electronic Equipment and Systems 	guaranteed for 5 Hz to 25 Hz: ±1.6 mm (0.06 in); 25 Hz to 100 Hz: 4 g in all 3 planes
	IEC 61298-3 IEC 60068-2-6	guaranteed for 10 Hz to 60 Hz: ±0.35 mm (0.01 in); 60 Hz to 2000 Hz: 2 g in all 3 planes
Devices with mounting bracket	IEC 61298-3 IEC 60068-2-6	guaranteed for 10 Hz to 60 Hz: ±0.15 mm (0.01 in); 60 Hz to 500 Hz: 2 g in all 3 planes



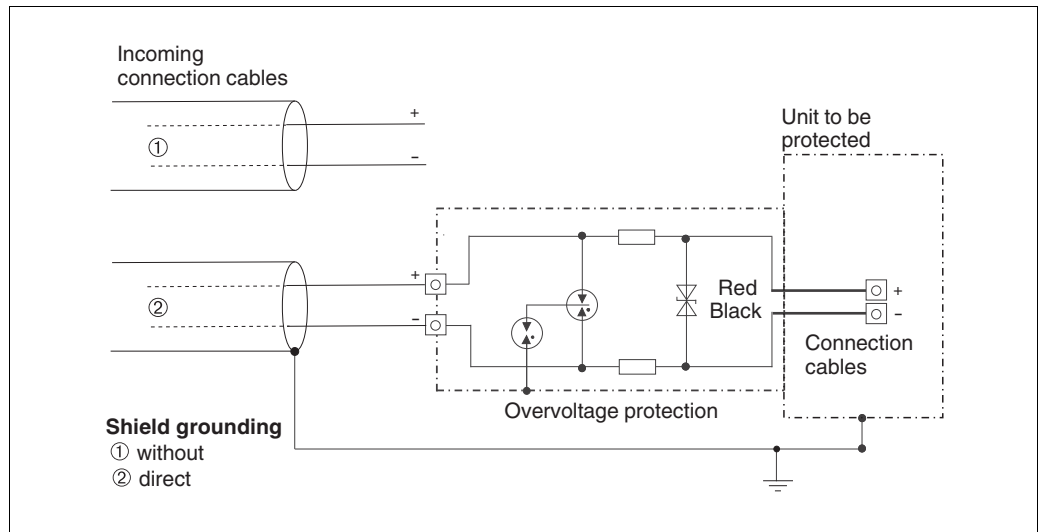
For high-vibration applications, a device with a separate housing can be used. We recommend a suitable bracket for mounting (see "Wall and pipe mounting" section on → 25)

Electromagnetic compatibility

- Electromagnetic compatibility as per all the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE21). Details can be found in the Declaration of Conformity (in the download area of "www.pepperl-fuchs.com").
- Maximum deviation: < 0.5 % of span

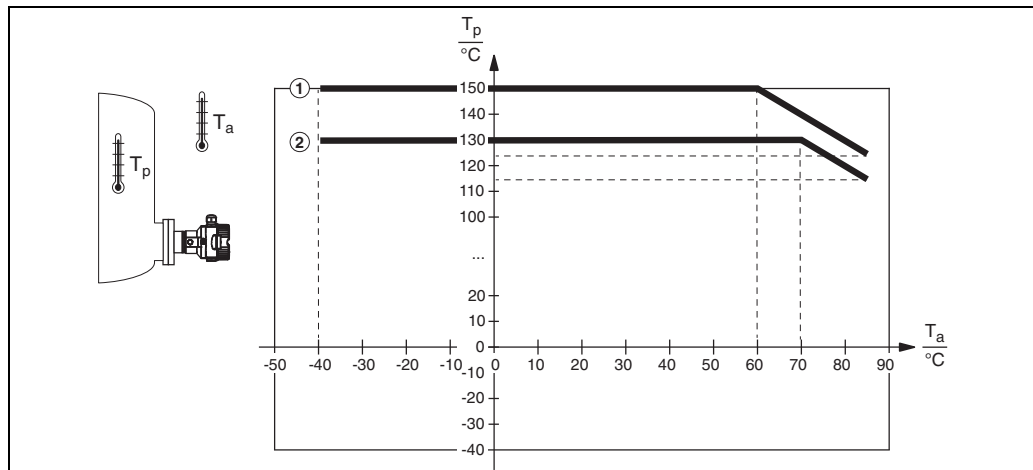
Overvoltage protection (optional)

The device can be fitted with overvoltage protection. The overvoltage protection is mounted at the factory on the housing thread (M20x1.5) for the cable gland and is approx. 70 mm (2.76 in) in length (take additional length into account when installing). The device is connected as illustrated in the following graphic.



Operating Conditions (Process)

Process temperature range PPC-M51



T_a = Ambient temperature; T_p = Process temperature; 1, 2 and 3 see following chapter.

Process temperature limits

PPC-M51 (with ceramic process isolating diaphragm)

- 3: -40 °C to +100 °C (-40 °F to +212 °F) for threaded process connections or flange process connections
- 2: -40 °C to +130 °C (-40 °F to +266 °F) for hygienic process connections
- 1: For a maximum of 60 minutes: +150 °C (+302 °F)
- Observe the process temperature range of the seal. See also the following table.

Version for feature "Seal material" in the order code	Seal	Notes	Process temperature range	
			Thread or flange	Hygienic process connection
A	FKM Viton	–	-20 °C to +100 °C (-4 °F to +212 °F)	–
A	FKM Viton	cleaned for O ₂ application	-5 °C to +60 °C (+23 °F to +140 °F)	–
B	FKM Viton	FDA ¹ , 3A Class I, USP Class VI	-5 °C to +100 °C (+23 °F to +212 °F)	-5 °C to +150 °C (+23 °F to +302 °F)
F	NBR	FDA ¹	-10 °C to +100 °C (-14 °F to +212 °F)	–
H	NBR, low temperature	–	-40 °C to +100 °C (-40 °F to +212 °F)	–
G	HNBR	FDA ¹ , 3A Class I, KTW, AFNOR, BAM	-25 °C to +100 °C (-13 °F to +212 °F)	-20 °C to +125 °C (-4 °F to +257 °F)
J	EPDM 70	FDA ¹	-40 °C to +100 °C (-40 °F to +212 °F)	–
K	EPDM 291	FDA ¹ , 3A Class II, USP Class VI, DVGW, KTW, W270, WRAS, ACS, NSF61	–	-15 °C to +150 °C (+5 °F to +302 °F)
L	FFKM Kalrez 6375	–	+5 °C to +100 °C (+41 °F to +212 °F)	–
M	FFKM Kalrez 7075	–	+5 °C to +100 °C (+41 °F to +212 °F)	–
N	FFKM Kalrez 6221	FDA ¹ , USP Class VI	-5 °C to +100 °C (+23 °F to +212 °F)	-5 °C to +150 °C (+23 °F to +302 °F)
P	Fluoroprene XP40	FDA ¹ , USP Class VI, 3A Class I	+5 °C to +100 °C (+41 °F to +212 °F)	+5 °C to +150 °C (+41 °F to +302 °F)
S	VMQ Silicone	FDA ¹	-35 °C to +85 °C (-31 °F to +185 °F)	-20 °C to +85 °C (-4 °F to +185 °F)

¹ Suitable for foods FDA 21 CFR 177.2600

Applications with jumps in temperature

Extreme jumps in temperature can result in temporary measuring errors. Temperature compensation takes effect after several minutes. Internal temperature compensation is faster the smaller the jump in temperature and the longer the time interval involved.

For further information please contact your local Pepperl+Fuchs Sales Center.

LHC-M51 (with metallic process isolating diaphragm)

Description	Temperature operating range
Process connections with internal process isolating diaphragm	-40 °C to +125 °C (-40 °F to +257 °F)
Process connections with flush-mounted process isolating diaphragm, G1A, G1-1/2A, G2A, 1NPT, 1-1/2NPT, 2NPT, M44x1.25, EN/DIN, ANSI and JIS flanges	-40 °C to +100 °C (-40 °F to +212 °F)
Process connections with flush-mounted process isolating diaphragm, G1/2A, M20x1.5	-20 °C to +85 °C (-4 °F to +185 °F)
Hygienic process connections	-40 °C to +130 °C (-40 °F to +266 °F) For a maximum of 60 minutes: +150 °C (+302 °F)

Pressure specifications

- The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure. See the following sections:
 - 9, "Measuring range" section
 - "Mechanical Construction" chapter.

The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (68 °F), or 100 °F (38 °C) for ANSI flanges, and may be applied to the device for an unlimited time. Observe temperature dependency of the MWP.

- The pressure values permitted at higher temperatures can be found in the following standards:
 - EN 1092-1: 2001 Tab. 18¹
 - ASME B 16.5a – 1998 Tab. 2-2.2 F316
 - ASME B 16.5a – 1998 Tab. 2.3.8 N10276
 - JIS B 2220.
- The test pressure corresponds to the over pressure limit of the device (over pressure limit $OPL = 1.5 \times MWP$ ²) and may be applied for only a limited time period in order to avoid permanent damage.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- In the case of sensor range and process connection combinations where the OPL (over pressure limit) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value ($1.5 \times PN$; $PN = MWP$).
- In oxygen applications, the values for " p_{max} and T_{max} for oxygen applications" as per → 27, "Oxygen applications" section may not be exceeded.
- Avoid steam hammering! Steam hammering can cause zero point drift.

Recommendation:

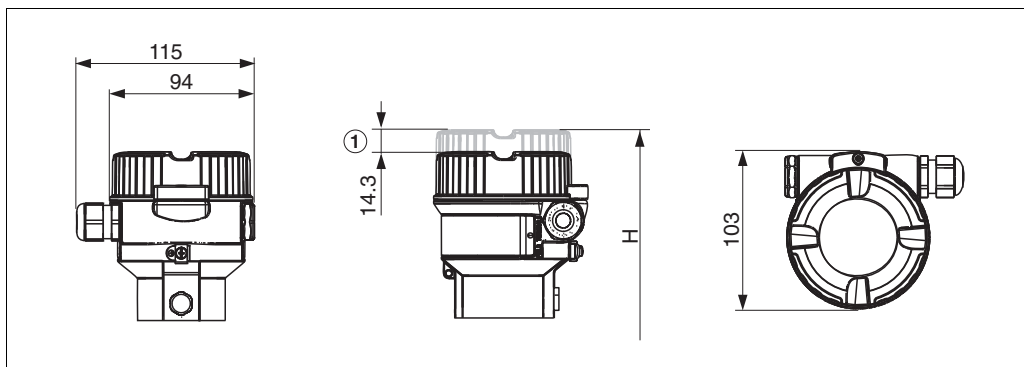
Residue (such as condensation or drops of water) can remain at the process isolating diaphragm after CIP cleaning and lead to local steam hammering if immediately steam is introduced. In practice, drying the process isolating diaphragm (e. g. by blowing off excess moisture) has proven to be a successful way of avoiding steam hammering.

¹ With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

² The equation does not apply for LHC-M51 with a 40 bar (600 psi) or a 100 bar (1500 psi) measuring cell.

Mechanical Construction

F31 aluminum housing dimensions (I, J)

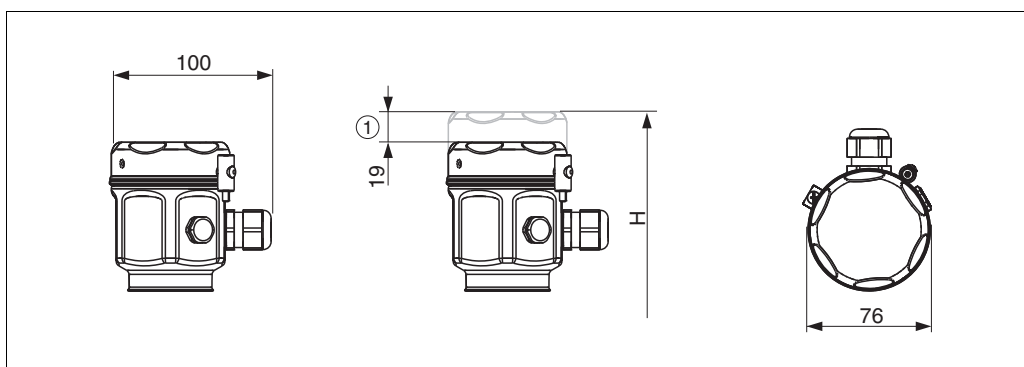


Front view, left-hand side view, top view

1 The cover with viewing window is 15 mm (0.59 in) higher than the cover without viewing window.

→ For installation height H for housing with viewing window, see the specific process connection. Housing weight → 49.

F15 stainless steel housing dimensions (Q, R, S, hygienic)



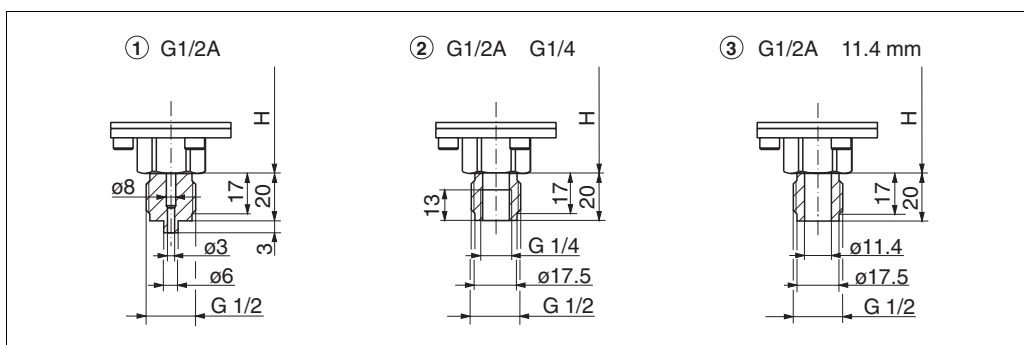
Front view, top view.

1 The cover with viewing window is 19 mm (0.75 in) higher than the cover without viewing window.

→ For installation height H for housing with viewing window, see the specific process connection. Housing weight → 49.

Process connections PPC-M51 (with ceramic process isolating diaphragm)

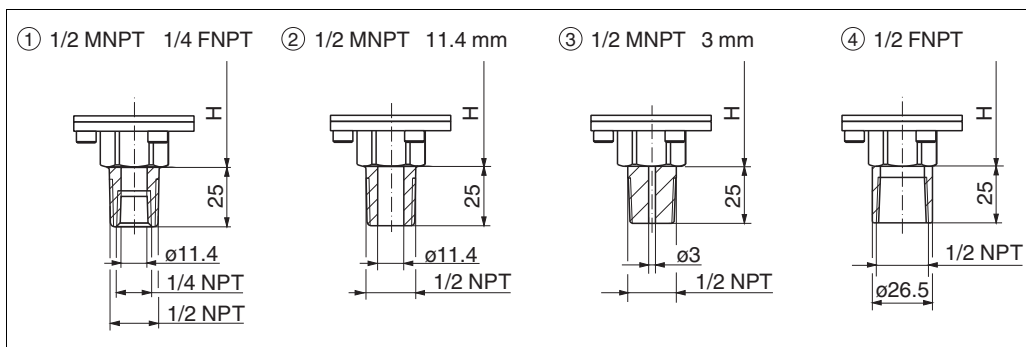
Thread, internal process isolating diaphragm



Process connections PPC-M51, thread ISO 228

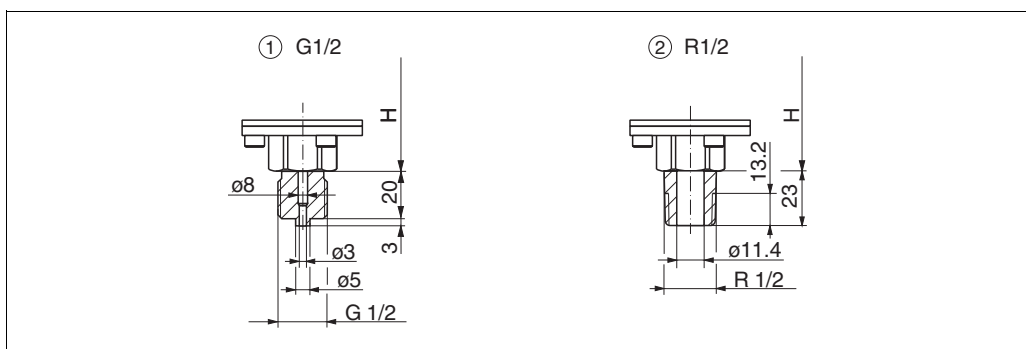
Installation height H → 33.

- Thread ISO 228 G1/2 A EN 837;
Material version G11: AISI 316L, version G1C: Alloy C276
Version G1V: PVDF (max.: 15 bar (217,5 psi), -10 °C to +60 °C (+14 °F to +140 °F)),
Version G1V mount version with a mounting bracket only (→ 25); weight: 0.63 kg (1.39 lbs)
- Thread ISO 228 G1/2A G1/4 (female);
Material version G14: AISI 316L, version G13: Alloy C276; weight: 0.63 kg (1.39 lbs)
- Thread ISO 228 G1/2A hole 11.4 mm (0.45 in);
Material version G1M: AISI 316L, version G1N: Alloy C276; weight: 0.63 kg (1.39 lbs)



Process connections PPC-M51, thread ANSI
Installation height H → 33.

- 1 Thread ANSI 1/2MNPT 1/4FNPT;
Material version RLJ: AISI 316L, version RLC: Alloy C276; weight: 0.63 kg (1.39 lbs)
- 2 Thread ANSI 1/2MNPT hole 11.4 mm (0.45 in);
Material version RKJ: AISI 316L; version RKC: Alloy C276; weight: 0.63 kg (1.39 lbs)
- 3 Thread ANSI 1/2MNPT hole 3 mm (0.12 in);
Material version RJF: PVDF (max.: 15 bar (225) psi, -10 °C to +60 °C (+14 °F to +140 °F)) mount version with a mounting bracket only (→ 25); weight: 0.63 kg (1.39 lbs)
- 4 Thread ANSI 1/2FNPT
Material version R1J: AISI 316L, version R1C: Alloy C276; weight: 0.63 kg (1.39 lbs)



Process connections PPC-M51, thread JIS
Installation height H → 33.

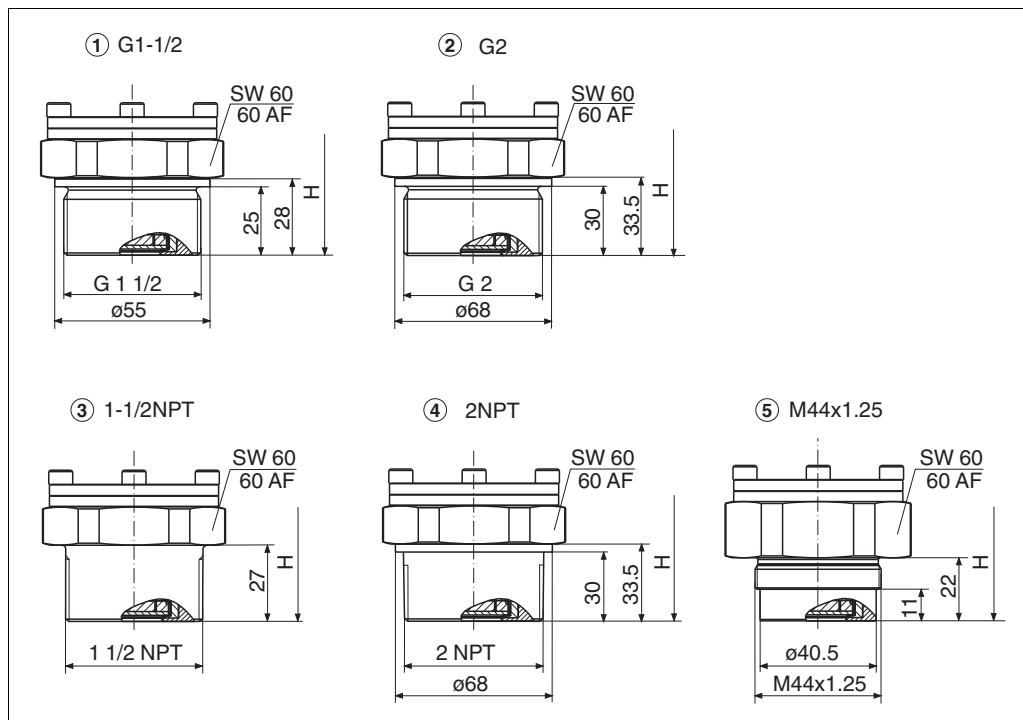
- 1 Version J31: thread JIS B0202 G1/2 (male), Material: AISI 316L; weight: 0.63 kg (1.39 lbs)
- 2 Version J32: thread JIS B0203 R1/2 (male), Material: AISI 316L; weight: 0.63 kg (1.39 lbs)

Installation height H for devices with threaded connection and internal process isolating diaphragm

	F31 housing (I, J)	F15 housing (Q, R, S)
Height H	154 mm (6.06 in)	146 mm (5.75 in)

Process connections PPC-M51 (with ceramic process isolating diaphragm) – continued

Thread, flush-mounted process isolating diaphragm



Process connections PPC-M51,
Installation height H see table below.

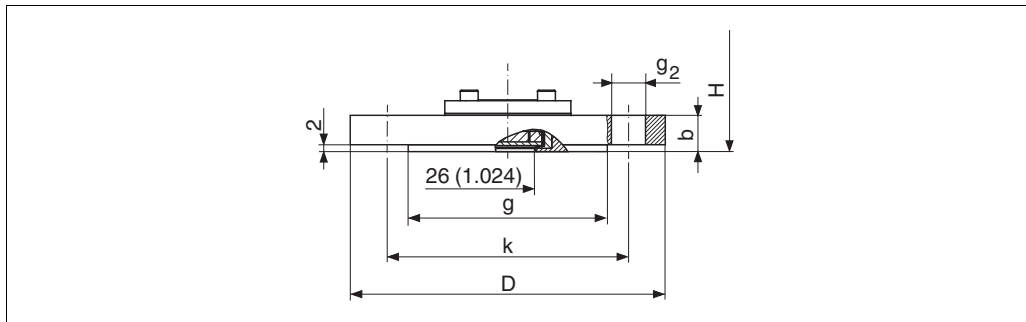
- 1 Thread ISO 228 G1-1/2A;
Material version G51: AISI 316L; weight: 0.63 kg (1.39 lbs)
- 2 Thread ISO 228 G2A;
Material version G61: AISI 316L; weight: 0.63 kg (1.39 lbs)
- 3 Thread ANSI 1-1/2MNPT;
Material version N51: AISI 316L; weight: 0.63 kg (1.39 lbs)
- 4 Thread ANSI 2MNPT;
Material version N61: AISI 316L; weight: 0.63 kg (1.39 lbs)
- 5 Thread DIN 13 M 44x1,25;
Material version G44: AISI 316L; weight: 0.63 kg (1.39 lbs)

Installation height H for devices with threaded connection and flush-mounted process isolating diaphragm

	F31 housing (I, J)	F15 housing (Q, R, S)
Height H	201 mm (7.91 in)	193 mm (7.6 in)

Process connections
 PPC-M51 (with ceramic
 process isolating
 diaphragm) – continued

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527



Process connections PPC-M51, EN/DIN flange with raised face (flush-mounted process isolating diaphragm)
 Installation height H → 37.

Version	Flange							Boltholes			
	Material	Nominal Diameter	Nominal pressure	Shape ¹	Diameter	Thickness	Raised face	Quantity	Diameter	Hole circle	Flange weight ²
					D [mm]	b [mm]	g [mm]		g ₂ [mm]	k [mm]	
F45	AISI 316L	DN25	PN10-40	B1 (D)	115	18	68	4	14	85	1.4
F55	AISI 316L	DN32	PN10-40	B1 (D)	140	18	78	4	18	100	2.0
F65	AISI 316L	DN40	PN10-40	B1 (D)	150	18	88	4	18	110	2.4
F6H	ECTFE ⁴	DN40	PN10-40	B1 (D)	150	21	88	4	18	110	2.6
F75	AISI 316L	DN50	PN10-40	B1 (D)	165	20	102	4	18	125	3.2
F72	PVDF ³	DN50	PN10-16	B1 (D)	165	18	102	4	18	125	2.9
F7H	ECTFE ⁴	DN50	PN25-40	B1 (D)	165	20	102	4	18	125	3.2
F95	AISI 316L	DN80	PN10-40	B1 (D)	200	24	138	8	18	160	5.5
F9H	ECTFE ⁴	DN80	PN25-40	B1 (D)	200	24	138	8	18	160	5.5

¹ Designation as per DIN 2527 in brackets

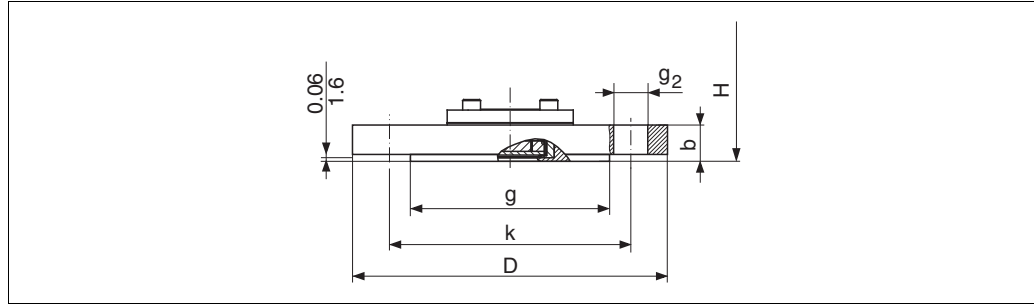
² Housing weight → 49

³ OPL.: 15 bar (225 psi), Process temperature range: -10 °C to +60 °C (+14 °F to +140 °F)

⁴ ECTFE coating on AISI 316L (1.4404). When operating in hazardous areas, avoid electrostatic charging of the plastic surfaces.

**Process connections
PPC-M51 (with ceramic
process isolating
diaphragm) – continued**

ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF



Process connections PPC-M51, ANSI flange with raised face RF (flush-mounted process isolating diaphragm)
Installation height H → 37.

Version	Flange						Boltholes			Flange weight ¹ [kg]
	Material	Nominal diameter [in]	Class [lb./sq.in]	Diameter D [in]/[mm]	Thickness b [in]/[mm]	Raised face g [in]/[mm]	Quantity	Diameter g ₂ [in]/[mm]	Hole circle k [in]/[mm]	
A31	AISI 316/316L ²	1	150	4.25/108	0.56/14.2	2/50.8	4	0.62/15.7	3.12/79.2	0.9
A32	AISI 316/316L ²	1	300	4.88/123.9	0.69/17.2	2/50.8	4	0.75/19	3.5/88.9	1.4
A51	AISI 316/316L ²	1-1/2	150	5/127	0.69/17.5	2.88/73.2	4	0.62/15.7	3.88/98.6	1.0
A52	AISI 316/316L ²	1-1/2	300	6.12/155.4	0.81/20.6	2.88/73.2	4	0.88/22.4	4.5/114.3	2.6
A61	AISI 316/316L ²	2	150	6/152.4	0.75/19.1	3.62/91.9	4	0.75/19.1	4.75/120.7	2.4
A6H	ECTFE ³	2	150	6/152.4	0.75/19.1	3.62/91.9	4	0.75/19.1	4.75/120.7	2.4
A6V	PVDF ⁴	2	150	6/152.4	0.75/19.1	3.62/91.9	4	0.75/19.1	4.75/120.7	0.5
A62	AISI 316/316L ²	2	300	6.5/165.1	0.88/22.4	3.62/91.9	8	0.75/19.1	5/127	3.2
A81	AISI 316/316L ²	3	150	7.5/190.5	0.94/23.9	5/127	4	0.75/19.1	6/152.4	4.9
A8H	ECTFE ³	3	150	7.5/190.5	0.94/23.9	5/127	4	0.75/19.1	6/152.4	4.9
A8V	PVDF ⁴	3	150	7.5/190.5	0.94/23.9	5/127	4	0.75/19.1	6/152.4	0.9
A82	AISI 316/316L ²	3	300	8.25/209.5	1.12/28.6	5/127	8	0.88/22.4	6.62/168.1	6.8
A91	AISI 316/316L ²	4	150	9/228.6	0.94/23.9	6.19/157.2	8	0.75/19.1	7.5/190.5	7.1
A9H	ECTFE ³	4	150	9/228.6	0.94/23.9	6.19/157.2	8	0.75/19.1	7.5/190.5	7.1
A92	AISI 316/316L ²	4	300	10/254	1.25/31.8	6.19/157.2	8	0.88/22.4	7.88/200.2	11.6

¹ Housing weight → 49

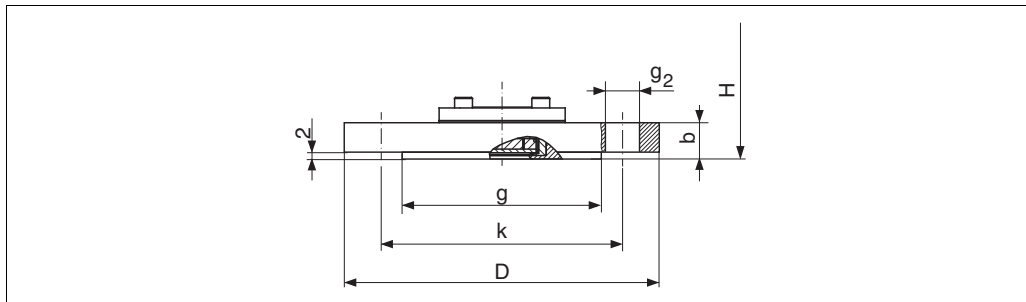
² Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)

³ ECTFE coating on AISI 316L (1.4404). When operating in hazardous areas, avoid electrostatic charging of the plastic surfaces.

⁴ OPL.: 15 bar (225 psi), Process temperature range: -10 °C to +60 °C (+14 °F to +140 °F)

Process connections
PPC-M51 (with ceramic
process isolating
diaphragm) – continued

JIS flanges, connection dimensions as per JIS B 2220 BL, raised face RF



Process connections PPC-M51, JIS flange with raised face RF (flush-mounted process isolating diaphragm), material: AISI 316L
Installation height H see table below.

Version	Flange					Boltholes			Flange weight ¹ [kg]
	Nominal diameter	Nominal pressure	Diameter D [mm]	Thickness b [mm]	Raised face g [mm]	Quantity	Diameter g ₂ [mm]	Hole circle k [mm]	
J16	50A	10 K	155	16	96	4	19	120	2.0
J17	80A	10 K	185	18	127	8	19	150	3.3
J19	100A	10 K	210	18	151	8	19	175	4.4

¹ Housing weight → 49

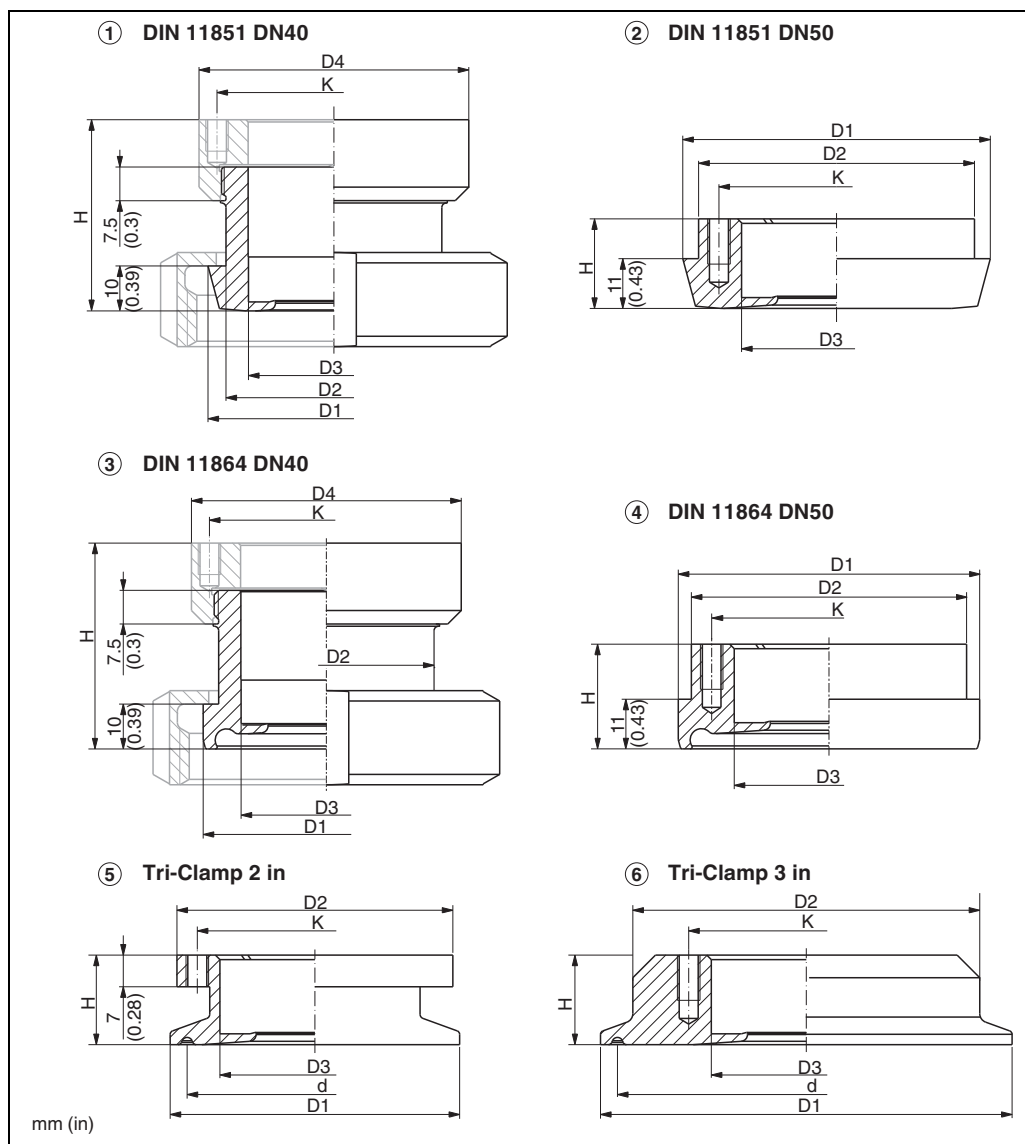
Process connections
PPC-M51 (with ceramic
process isolating
diaphragm) - continued

Installation height H for devices with flange

	F31 housing (I, J)	F15 housing (Q, R, S)
Height H	201 mm (7.91 in)	193 mm (7.6 in)

Process connections
PPC-M51 (with ceramic
process isolating
diaphragm) – continued

Hygienic process connection, flush-mounted process isolating diaphragm

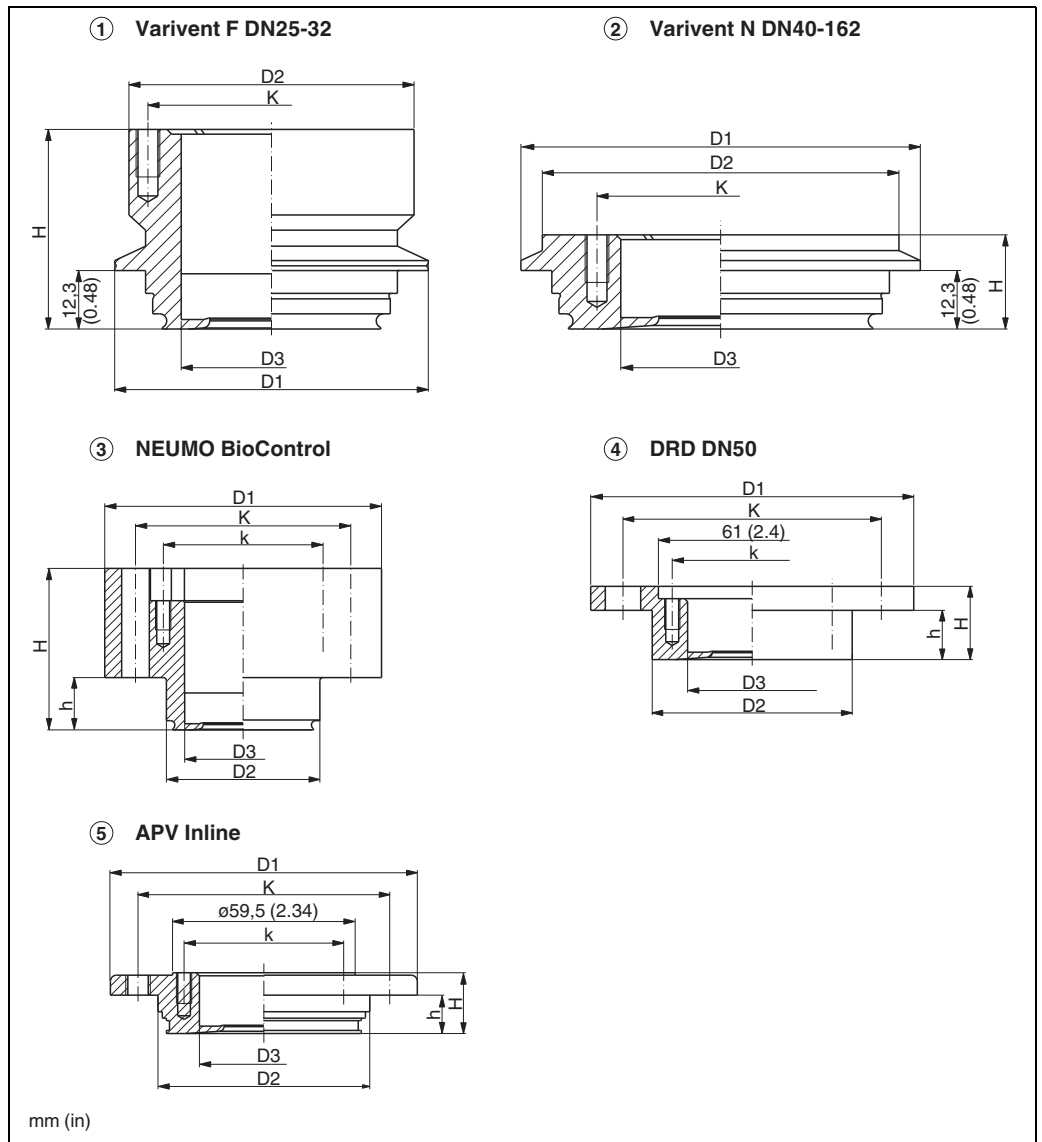


Hygienic process connections, material: AISI 316L (1.4435); Delta ferrite content < 1 %
Surface roughness of the surfaces in contact with the medium R_a 0.76 μm (30 μin).

Pos.	Version	Nominal pressure PN	Outer \varnothing D1	Outer \varnothing D2	Internal \varnothing D3	Outer \varnothing D4	Seal \varnothing d	Hole circle K ¹	Height H	Weight [kg/lbs]
1	M58	25	56 (2.2)	48 (1.89)	38 (1.5)	60 (2.36)	–	52 (2.05)	max. 220 (8.66)	0.652 (1.44)
2	M56	25	68 (2.68)	61 (2.4)	42 (1.65)	–	–	52 (2.05)		0.276 (0.61)
3	M64	16	54.9 (2.16)	48 (1.89)	38 (1.5)	60 (2.36)	–	52 (2.05)		0.656 (1.45)
4	M65	16	66.8 (2.63)	61 (2.4)	42 (1.65)	–	–	52 (2.05)		0.288 (0.64)
5	T65	40	64 (2.52)	61 (2.4)	42 (1.65)	–	56.5 (2.22)	52 (2.05)		0.171 (0.38)
6	T85	40	91 (3.58)	76.7 (3.02)	42 (1.65)	–	83.5 (3.29)	52 (2.05)		0.539 (1.19)

mm (in)

¹ 4 x M5 thread



Hygienic process connections, material: AISI 316L (1.4435); Delta ferrite content < 1 %
Surface roughness of the surfaces in contact with the medium R_a 0.76 μ m (30 μ in).

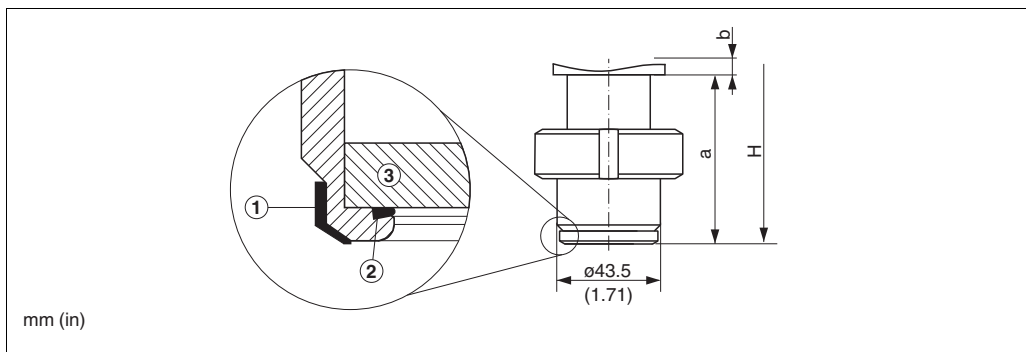
Pos.	Version	Nominal pressure PN	Outer \varnothing D1	Outer \varnothing D2	Internal \varnothing D3	Hole circle K	Hole circle k ¹	Height H	Height h	Weight [kg/lbs]
1	V12	40	66 (2.6)	60 (2.36)	38 (1.5)	52 (2.05) ²	–	max. 220 (8.66)	–	0.459 (1.01)
2	V14	40	84 (3.31)	75 (2.95)	42 (1.65)	52 (2.05) ²	–		–	0.426 (0.94)
3	S4J	40	90 (3.54)	49.9 (1.96)	38 (1.5)	52 (2.05) ²	90 (3.54) ³		17 (0.67)	1.34 (2.95)
4	DR1	25	105 (4.13)	65 (2.56)	42 (1.65)	52 (2.05) ²	84 (3.31) ⁴		16 (0.63)	0.619 (1.36)
5	SP6	40	100 (3.94)	69 (2.72)	42 (1.65)	52 (2.05) ²	82 (3.23) ⁵		12.5 (0.49)	0.519 (1.14)

mm (in)

- 1 4 x M5 thread
- 2 4 x M5 thread
- 3 4 x \varnothing 9 (0.35); 4 screws DIN912 M8 x 45 are enclosed (material (A4-80))
- 4 4 x \varnothing 11.5 (0.45)
- 5 6 x \varnothing 8.6 (0.34) + 2 x M8 thread; 8 x 45° (= 360°)

Process connections
PPC-M51 (with ceramic
process isolating
diaphragm) – continued

Universal adapter



Material: b = top section AISI 316L (1.4404), a = bottom section AISI 316L (1.4435); Pepperl+Fuchs supplies the slotted nut in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).

Surface roughness of the surfaces in contact with the medium R_a 0.76 μm (30 μin).

Version	Process connection approval ¹	Material of the molded seal 1 (changeable)	Material of the measuring cell seal 2 (not changeable) at the ceramic sensor 3	Measuring cell seal approval	Nominal pressure PN	Weight [kg/lbs]
U4S	EHEDG, 3A	Silicone	EPDM (order version "K")	FDA ² 3A Class II, USP Class VI. DVGW, KTW, W270, WRAS, ACS, NSF61	10	0.74 (1.63)
U4E	EHEDG	EPDM	EPDM (order version "J")	FDA ²		

¹ EHEDG or 3A approval only with approved process connection.

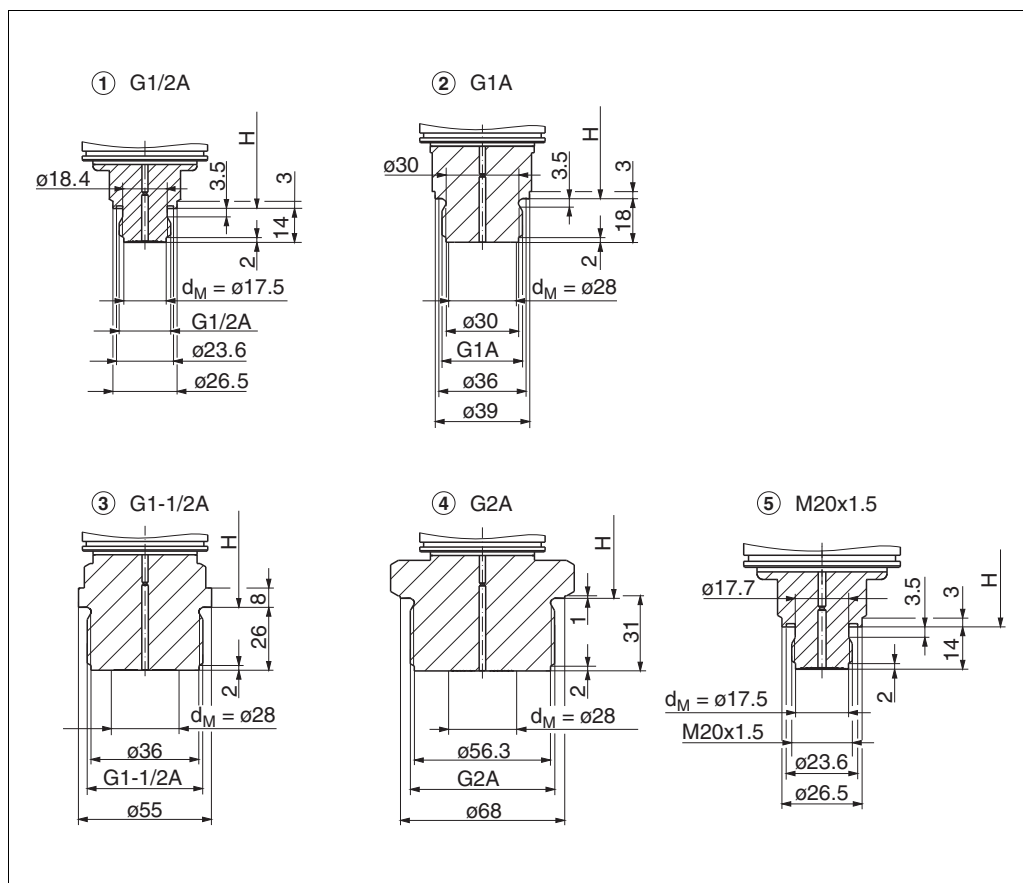
² Suitable for foods FDA 21 CFR 177.2600

Installation height H, devices with universal adapter

	F31 housing (I, J)	F15 housing (Q, R, S)
Height H	196 mm (7.72 in)	189 mm (7.44 in)

Process connections LHC-M51 (with metallic process isolating diaphragm) – continued

Thread, flush-mounted process isolating diaphragm



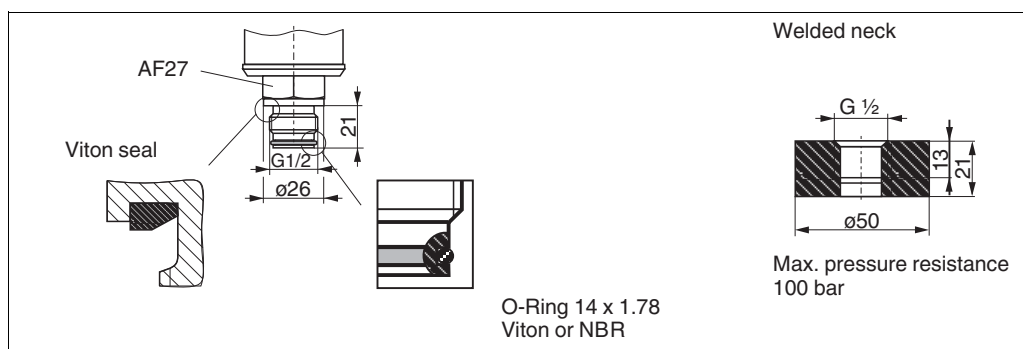
Thread ISO 228

Installation height H → 43.

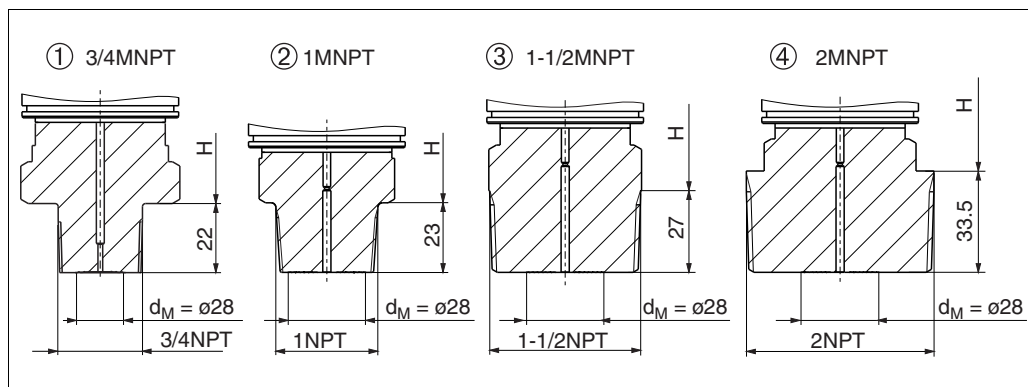
- 1 Thread ISO 228 G1/2A DIN 3852 (Viton seal included);
Material version G1O: AISI 316L, version G1P: Alloy C276; weight: 0.4 kg (0.88 lbs)
- 2 Thread ISO 228 G1A (Viton seal included); material version G31: AISI 316L; weight: 0.7 kg (1.54 lbs)
- 3 Thread ISO 228 G1-1/2A; material version G51: AISI 316L; weight: 1.1 kg (2.43 lbs)
- 4 Thread ISO 228 G2A; material version G61: AISI 316L; weight: 1.5 kg (3.31 lbs)



Pepperl+Fuchs offers a pressure sensor dummy for the welding neck.



Version G73: thread ISO 228 G1/2; weight: 0.4 kg (0.88 lbs)



Process connections LHC-M51, thread ANSI
Installation height see table below.

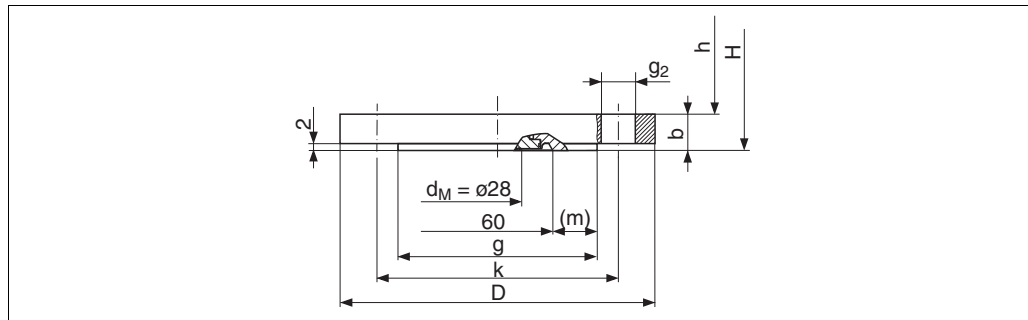
- 1 Thread ANSI 3/4MNPT;
Material version N21: AISI 316L; weight: 0.6 kg (1.32 lbs)
- 2 Thread ANSI 1MNPT;
Material version N31: AISI 316L; weight: 0.7 kg (1.54 lbs)
- 3 Thread ANSI 1-1/2MNPT;
Material version N51: AISI 316L; weight: 1.0 kg (2.21 lbs)
- 4 Thread ANSI 2MNPT
Material version N61: AISI 316L; weight: 1.3 kg (2.86 lbs)

Installation height H for devices with threaded connection and flush-mounted process isolating diaphragm

Description	F31 housing (I, J)	F15 housing (Q, R, S)
G1/2	163 mm (6.42 in)	148 mm (5.83 in)
G1	167 mm (6.57 in)	152 mm (5.98 in)
G1-1/2A	163 mm (6.42 in)	148 mm (5.83 in)
G2A	162 mm (6.38 in)	147 mm (5.79 in)
3/4MNPT	165 mm (6.5 in)	150 mm (5.91 in)
1MNPT	162 mm (6.38 in)	147 mm (5.79 in)
1-1/2MNPT	169 mm (6.65 in)	150 mm (5.91 in)
2MNPT	199 mm (7.83 in)	144 mm (5.67 in)
M20x1.5	163 mm (6.42 in)	148 mm (5.83 in)

Process connections LHC-M51 (with metallic process isolating diaphragm) – continued

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527



Process connections LHC-M51, EN/DIN flange with raised face, material AISI 316L
H: device height = height of device without flange h and flange thickness b
Height H → 45.

Version	Flange ¹						Boltholes				
	Nominal diameter	Nominal pressure	Shape ²	Diameter	Thickness	Raised face	Width of the raised face	Quantity	Diameter	Hole circle	Flange weight ³
				D [mm]	b [mm]	g [mm]	(m) [mm]		g ₂ [mm]	k [mm]	[kg]
CNJ	DN25	PN10-40	B1 (D)	115	18	68 ⁴	4	4	14	85	1.2
CPJ	DN32	PN10-40	B1 (D)	140	18	78 ⁴	19	4	18	100	1.9
CQJ	DN40	PN10-40	B1 (D)	150	18	88 ⁴	14	4	18	110	2.2
CXJ	DN50	PN25/40	B1 (D)	165	20	102	–	4	18	125	3.0
CZJ	DN80	PN10-40	B1 (D)	200	24	138	–	8	18	160	5.5

¹ The roughness of the surface in contact with the medium is $R_a 0.8 \mu\text{m}$ ($31.5 \mu\text{in}$). Lower surface roughness available on request.

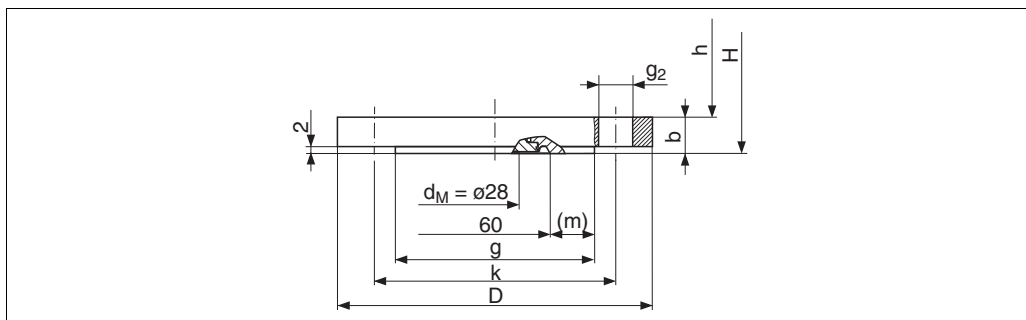
² Designation as per DIN 2527 in brackets

³ Housing weight → 49

⁴ With these process connections the sealing surface is smaller than described in the standard. Due to a smaller sealing surface a special seal must be used. Contact a seal manufacturer or your local Pepperl+Fuchs Sales Center.

**Process connections
LHC-M51 (with metallic
process isolating
diaphragm) – continued**

ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF



Process connection LHC-M51, ANSI flange with raised face RF (see table below)
H: device height = height of device without flange h and flange thickness b. For height H → 45.

Version	Flange ¹							Boltholes			Flange weight ²
	Material	Nominal diameter [in]	Class/ nominal pressure	Diameter D [in]/[mm]	Thick- ness b [in]/[mm]	Diameter of raised face g [in]/[mm]	Width of raised face (m) [in]/[mm]	Qua ntity	Diameter g ₂ [in]/[mm]	Hole circle k [in]/[mm]	
ANSI flanges											
A91	AISI 316/316L ³	1	300 lb./sq.in	4.88/124	0.69/17.5	2.76 ⁴ /50.8	0.2/5	4	0.75/19.1	3.5/88.9	1.3
A51	AISI 316/316L ³	1-1/2	150 lb./sq.in	5/127	0.69/17.5	2.88 ⁴ /73.2	0.52/6.6	4	0.62/15.7	3.88/98.6	1.5
A52	AISI 316/316L ³	1-1/2	300 lb./sq.in	6.12/155.4	0.81/20.6	2.88 ⁴ /73.2	0.52/6.6	4	0.88/22.4	4.5/114.3	2.6
A61	AISI 316/316L ³	2	150 lb./sq.in	6/152.4	0.75/19.1	3.62/91.9	–	4	0.75/19.1	4.75/120.7	2.4
A62	AISI 316/316L ³	2	300 lb./sq.in	7.5/190.5	0.88/22.3	3.62/91.9	–	8	0.75/19.1	5/127	3.2
A81	AISI 316/316L ³	3	150 lb./sq.in	7.5/190.5	0.94/23.9	5/127	–	4	0.75/19.1	6/152.4	4.9
A82	AISI 316/316L ³	3	300 lb./sq.in	8.25/209.5	1.12/28.6	5/127	–	8	0.88/22.4	6.62/168.1	6.7
A91	AISI 316/316L ³	4	150 lb./sq.in	9/228.6	0.94/23.9	6.19/157.2	–	8	0.75/19.1	7.5/190.5	7.1
A92	AISI 316/316L ³	4	300 lb./sq.in	10/254	1.25/31.8	6.19/157.2	–	8	0.88/22.4	7.88/200.2	11.6

¹ The roughness of the surface in contact with the medium is R_a 0.8 µm (31.5 µin). Lower surface roughness available on request.

² Housing weight → 49

³ Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)

⁴ With these process connections the sealing surface is smaller than described in the standard. Due to a smaller sealing surface a special seal must be used. Contact a seal manufacturer or your local Pepperl+Fuchs Sales Center.

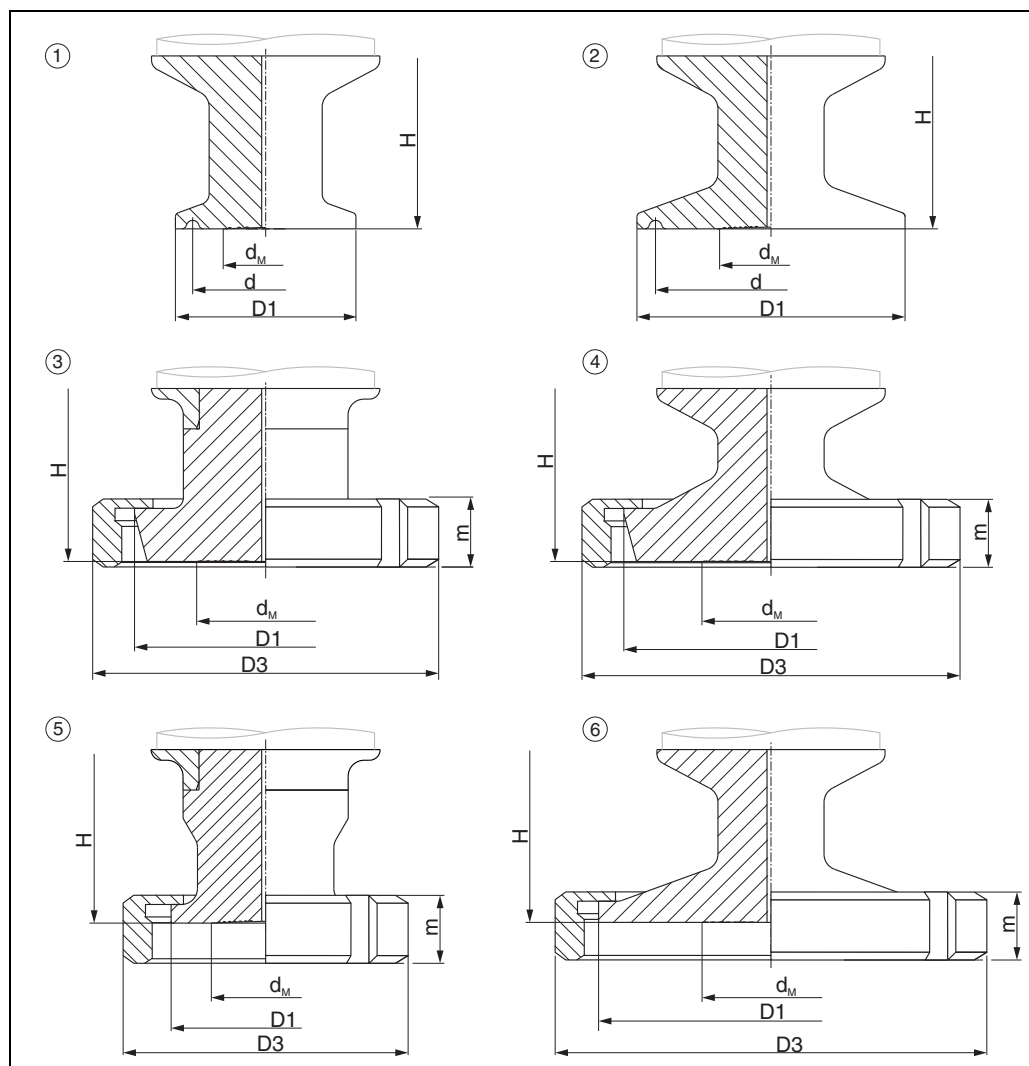
**Process connections
LHC-M51 (with metallic
process isolating
diaphragm) – continued**

Height H for devices with flange

	F31 housing (I, J)	F15 housing (Q, R, S)
Height H	165 mm (6.5 in)	150 mm (5.91 in)

Process connections
LHC-M51 (with metallic
process isolating
diaphragm) – continued

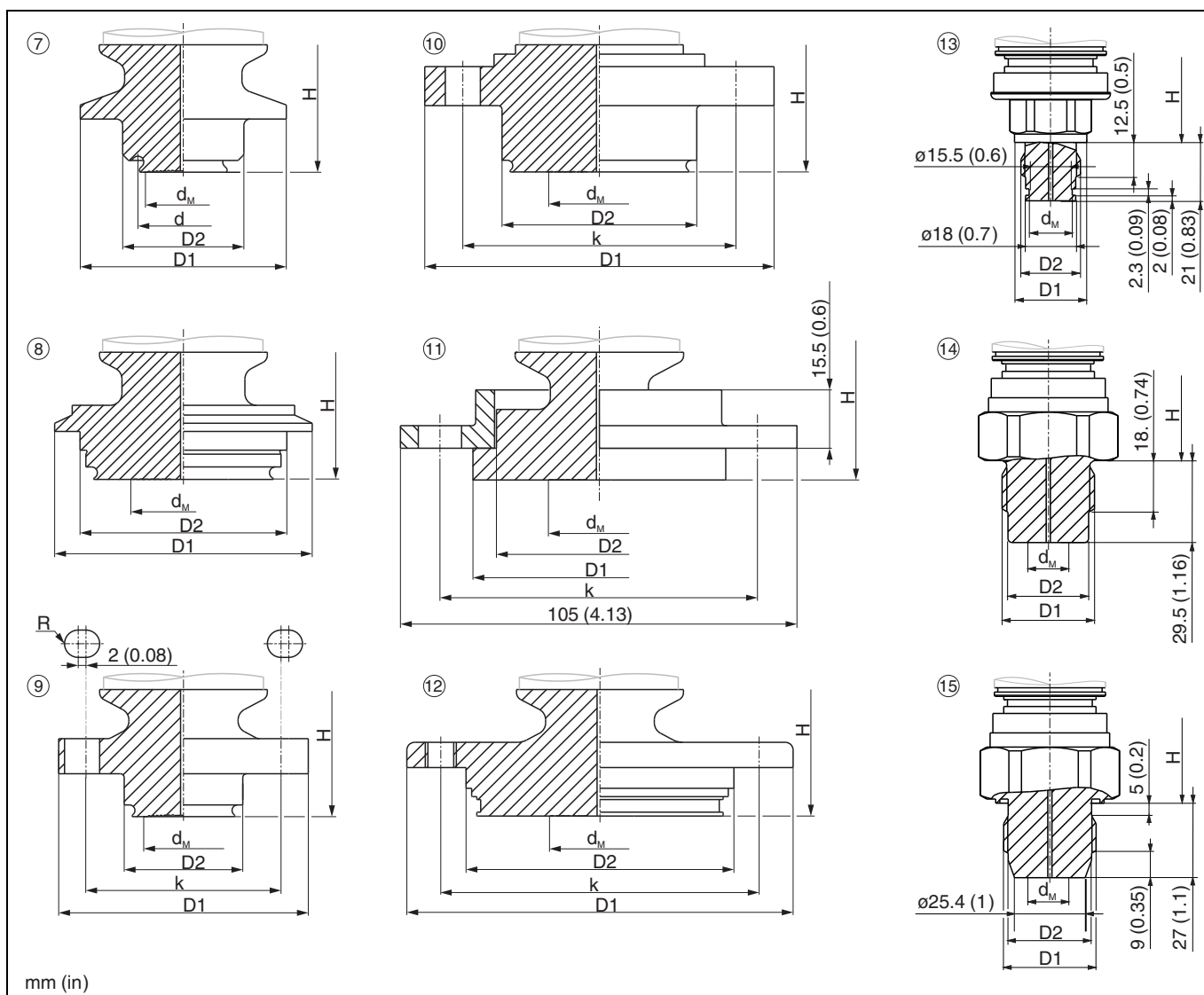
Hygienic process connection, flush-mounted process isolating diaphragm



Hygienic process connections, material: AISI 316L (1.4435)

Surface roughness of the surfaces in contact with the medium R_a 0.76 μm (30 μin).

Pos.	Version	Nominal pressure PN	Outer \varnothing D1	Outer \varnothing D3	Seal \varnothing d	Membrane \varnothing d_M	Height H	Height m	Weight kg (lbs)	
1	Clamp DN18-22	TBJ	40	34 (1.34)	-	27.5 (1.08)	max. 165 (6.5)	-	0.5 (1.10)	
2	Clamp 1 in	T55	40	50.5 (1.99)	-	43.5 (1.71)		-	0.6 (1.32)	
	Clamp 1-1/2 in	T51	40	50.5 (1.99)	-	43.5 (1.71)		-	0.6 (1.32)	
3	DIN11851 B25	M57	40	43.4 (1.71)	63 (2.48)	-		28 (1.10)	21 (0.83)	0.7 (1.54)
	DIN11851 B32	M55	40	49.4 (1.94)	70 (2.76)	-		28 (1.10)	21 (0.83)	0.8 (1.76)
4	DIN11851 B40	M58	40	55.4 (2.18)	78 (3.07)	-		28 (1.10)	21 (0.83)	0.9 (1.98)
	DIN11851 B50	M56	25	67.4 (2.65)	92 (3.62)	-		28 (1.10)	22 (0.87)	1.1 (2.43)
5	SMS 1 in	S45	25	35.5 (1.4)	51 (2.01)	-		21.65 (0.85)	20 (0.79)	0.7 (1.54)
6	SMS 1-1/2 in	S55	25	55 (2.17)	74 (2.91)	-		28 (1.10)	25 (0.98)	0.8 (1.76)
	SMS 2 in	S65	25	65 (2.56)	84 (3.31)	-		28 (1.10)	26 (1.02)	0.9 (1.98)



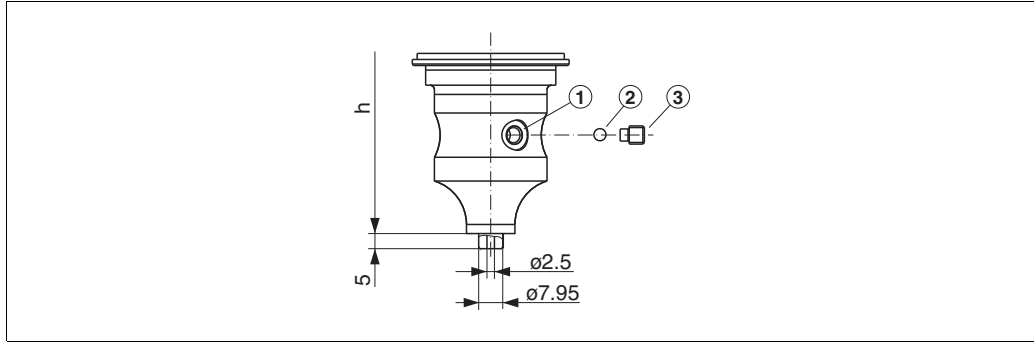
Hygienic process connections, material: AISI 316L (1.4435)

Surface roughness of the surfaces in contact with the medium R_a 0.76 μ m (30 μ in).

Pos.	Version	Version	Nominal pressure PN	Outer \varnothing D1	Outer \varnothing D2	Hole circle \varnothing k	Membrane \varnothing d _M	Height H	Weight kg (lbs)
7	Varivent B	TPJ	40	52.7 (2.07)	31 (1.22)	-	21.65 (0.85)	max. 165 (6.5)	0.7 (1.54)
8	Varivent F	TQJ	40	66 (2.6)	53 (2.09)	-	28 (1.10)		0.9 (1.98)
	Varivent N	TRJ	40	84 (3.31)	68 (2.68)	-	28 (1.10)		1.1 (2.43)
9	Neumo D25	S1J	16	64 (2.52)	30.4 (1.2)	50 (1.97); 4 x, R 3.5 mm (0.14 in)	21.65 (0.85)		0.8 (1.76)
10	Neumo D50	S4J	16	89.5 (3.52)	49.9 (1.96)	70 (2.76); 4 x \varnothing 9 mm (0.35 in)	28 (1.10)		1.2 (2.65)
11	DRD	TIJ	25	64.5 (2.54)	52.5 (2.07)	84 (3.31); 4 x \varnothing 11.5 mm (0.45 in)	28 (1.10)		1.0 (2.21)
12	APV Inline	TMJ	10	99.5 (3.92)	69 (2.72)	82 (3.23); 6 x \varnothing 8.6 mm (0.34 in) and 2 x M8	28 (1.10)		1.2 (2.65)
13	G1/2	G0J	40	26	G1/2	-	17.5 (0.69)		0.5 (1.1)
14	G1	GZJ	40	G1	29	-	17.5 (0.69)		0.8 (1.76)
15	G1	GXJ	100	G1	30	-	17.5 (0.69)		0.8 (1.76)

Process connections
LHC-M51 (with metallic
process isolating
diaphragm) – continued

Prepared for diaphragm seal mount

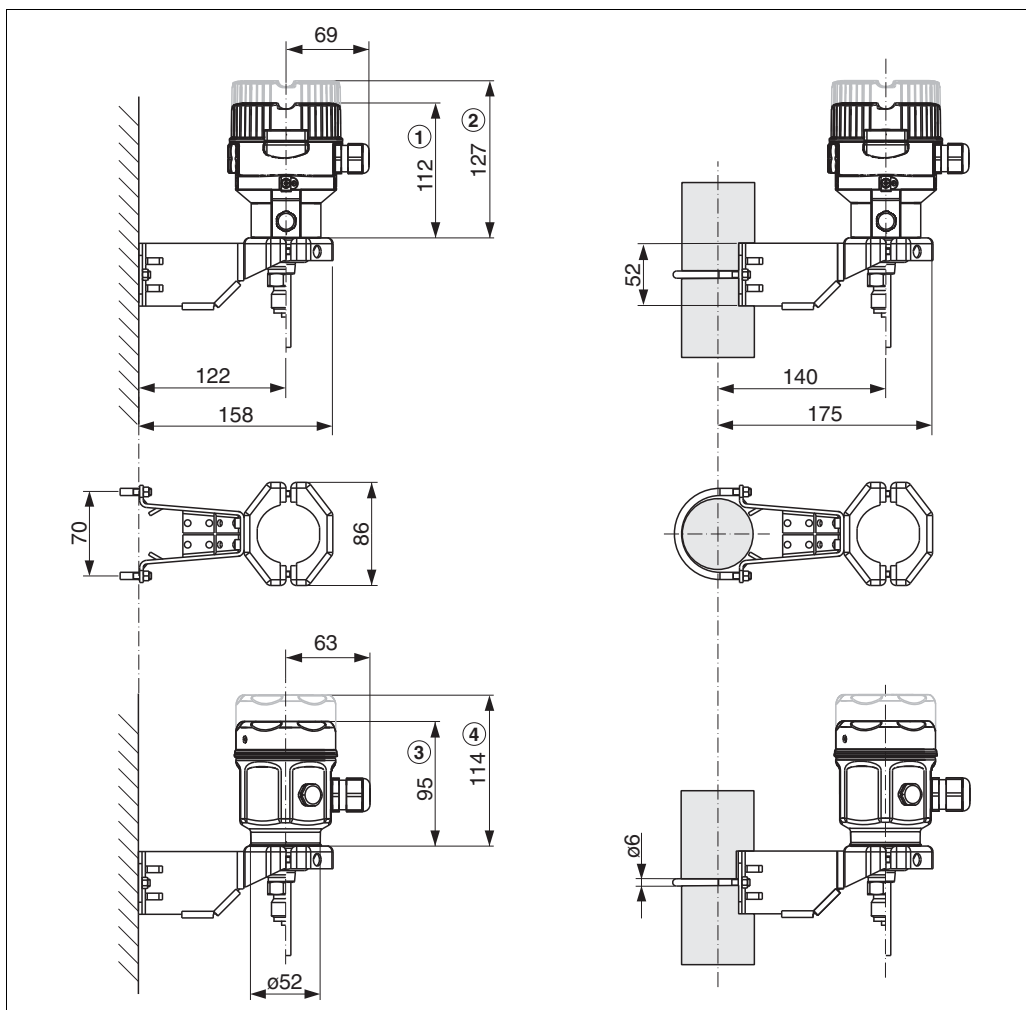


Version XSJ: prepared for diaphragm seal mount

- 1 Hole for fill fluid
- 2 Bearing
- 3 Setscrew with hexagonal recess 4 mm (0.16 in)

	F31 housing (I, J)	F15 housing (Q, R, S)
Height	190 mm (7.48 in)	175 mm (6.89 in)

Wall and pipe mounting with mounting bracket



L PE cable 2 m (6,6 ft), 5 m (16 ft) or 10 m (33 ft). FEP cable 5m (16 ft)

F31 housing dimensions. Housing weight → 49.

1 Cover without viewing window

2 Cover with viewing window

F15 housing dimensions. Housing weight → 49.

3 Cover without viewing window

4 Cover with viewing window

Weight

Housing

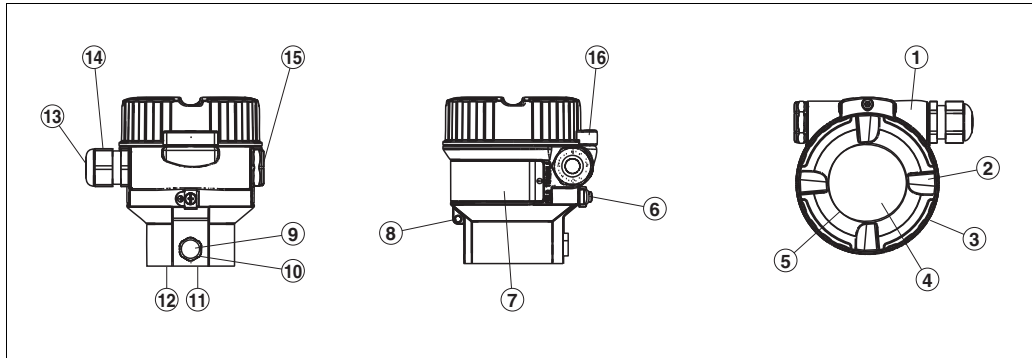
	F31 (I, J), aluminum	F15 (Q, R, S), stainless steel	Separate housing
With electronic insert and local display	1.1 kg (2.43 lbs)	0.8 kg (1.76 lbs)	Weight of housing + 0.5 kg (1.10 lbs).
With electronic insert without local display	1.0 kg (2.21 lbs)	0.7 kg (1.54 lbs)	Weight of sensor + 0.5 kg (1.10 lbs).

Process connections

- Process connections PPC-M51 (with ceramic process isolating diaphragm): → 32 ff
- Process connections LHC-M51 (with metallic process isolating diaphragm): → 41 ff

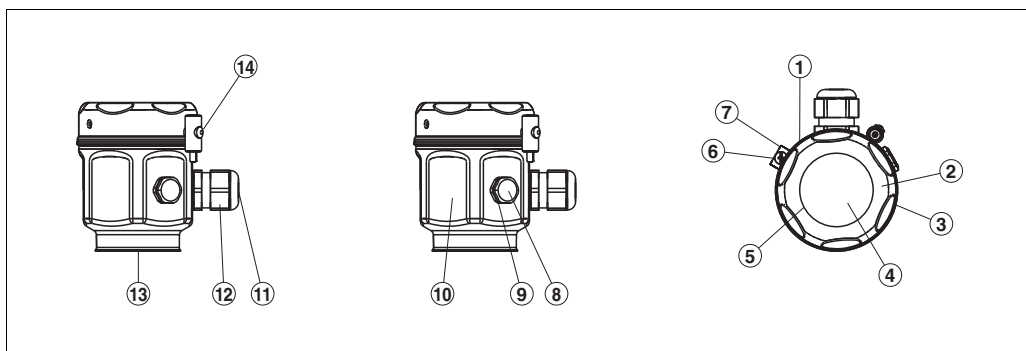
Material (not wetted)

Housing



Front view, left-hand side view, top view

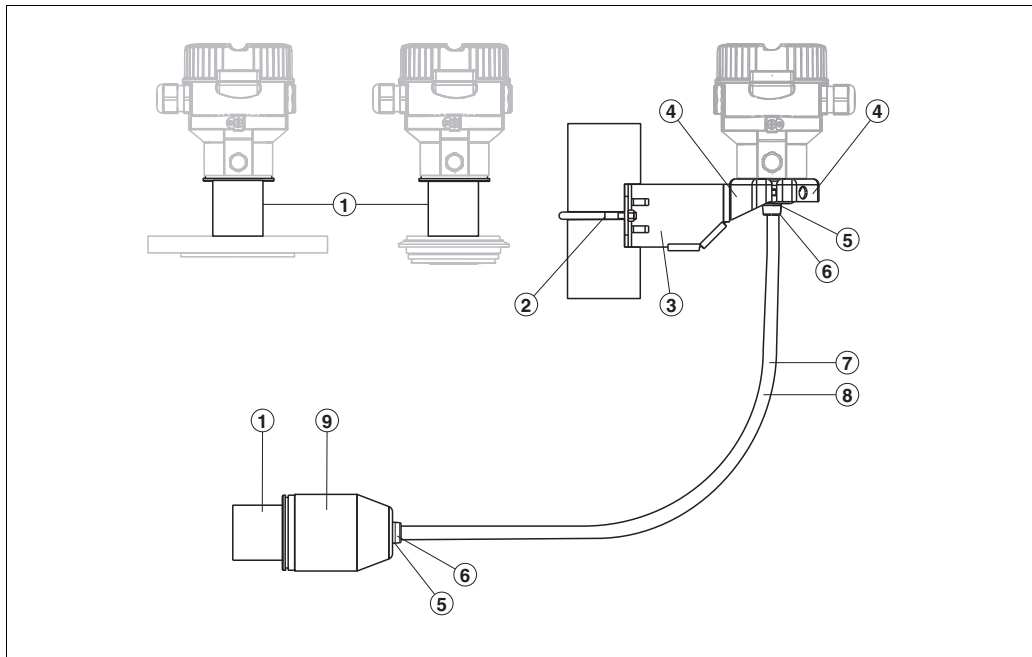
Item number	Component part	Material
1	F31 housing (I, J)	Die-cast aluminum with protective powder-coating on polyester base
2	Cover	Die-cast aluminum with protective powder-coating on polyester base
3	Cover seal	EPDM
4	Sight glass	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	External ground terminal	AISI 304 (1.4301)
7	Nameplates	Plastic film
8	Attachment for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
9	Pressure compensation filter	PA6 GF10
10	Pressure compensation filter, O-ring	Silicone (VMQ)
11	Sealing ring	EPDM
12	Snap ring	PC Plastic
13	Seal of cable gland and blind plug	EPDM/NBR
14	Cable gland	Polyamide (PA) or CuZn nickel-plated
15	Blind plug	PBT-GF30 FR for dust ignition-proof, Ex d, FM XP and CSA XP: AISI 316L (1.4435)
16	Cover clamp	Clamp AISI 316L (1.4435), screw A4



Front view, left-hand side view, top view

Item number	Component part	Material
1	F15 housing (Q, R, S)	AISI 316L (1.4404)
2	Cover	
3	Cover seal	Silicone with PTFE coating
4	Sight glass for non-hazardous area, ATEX Ex ia, NEPSI Zone 0/1 Ex ia, IECEx Zone 0/1 Ex ia, FM NI, FM IS, CSA IS	Polycarbonate (PC)
4	Sight glass for ATEX 1/2 D, ATEX 1/3 D, ATEX 1 GD, ATEX 1/2 GD, ATEX 3 G, FM DIP, CSA dust ignition-proof	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	External ground terminal	AISI 304 (1.4301)
7	Attachment for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
8	Pressure compensation filter	PA6 GF10
9	Pressure compensation filter, O-ring	Silicone (VMQ)
10	Nameplates	lasered
11	Cable gland	Polyamide (PA), for dust ignition-proof: CuZn nickel-plated
12	Seal of cable gland and blind plug	NBR/Silicone/EPDM
13	Sealing ring	EPDM
14	Screw	A4-50

Connecting parts



Item number	Component parts	Material
1	Connection between the housing and process connection	AISI 316L (1.4404)
2	Mounting bracket	Bracket AISI 304 (1.4301), AISI 304L (1.4306)
3		Screw and nuts A2-70
4		Half-shells: AISI 304L (1.4306)
5	Seal for cable from separate housing	FKM, EPDM
6	Gland for cable from separate housing: Screws:	AISI 316L (1.4404) A2 or A4
7	PE cable for separate housing	Abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
8	FEP cable for separate housing	Abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
9	Process connection adapter for separate housing	AISI 316L (1.4404)

Filling oil

See "Ordering Information" → 65 ff.

Miscellaneous:

- Protective hose for diaphragm seal capillary: AISI 304 (1.4301)

Material (wetted)



The wetted device components are listed in the "Mechanical Construction" section (→ 32 ff) and "Ordering Information" section (→ 65 ff).

TSE Certificate of Suitability (Transmissible Spongiform Encephalopathy)

The following applies to all process wetted device components:

- They do not contain any materials derived from animals.
- No auxiliaries or operating materials derived from animals are used in production or processing.

Process connections

- "Clamp connections" and "Hygienic process connections" (see also "Ordering Information" section):
- AISI 316L (DIN/EN material number 1.4435)
- Pepperl+Fuchs supplies process connections with threaded connections and DIN/EN flanges made of stainless steel as per AISI 316L (DIN/EN material number 1.4404 (AISI 316) or 14435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1 Tab.18. The chemical composition of the two materials can be identical.
- Some process connections are also available in the material Alloy C276 (DIN/EN material number 2.4819). See the information in the "Mechanical Construction" section.

Process isolating diaphragm

- PPC-M51: Al₂O₃ Aluminium-oxide ceramic, (FDA 21 CFR 186.1256, USP Class VI), ultrapure 99.9 %
- LHC-M51:
 - AISI 316L (DIN/EN material number 1.4435)
 - AISI 316L with gold-rhodium coating
 - Alloy C276 (DIN/EN material number 2.4819)

Seals

See "Ordering Information", → 65 ff

Human Interface

Operating elements

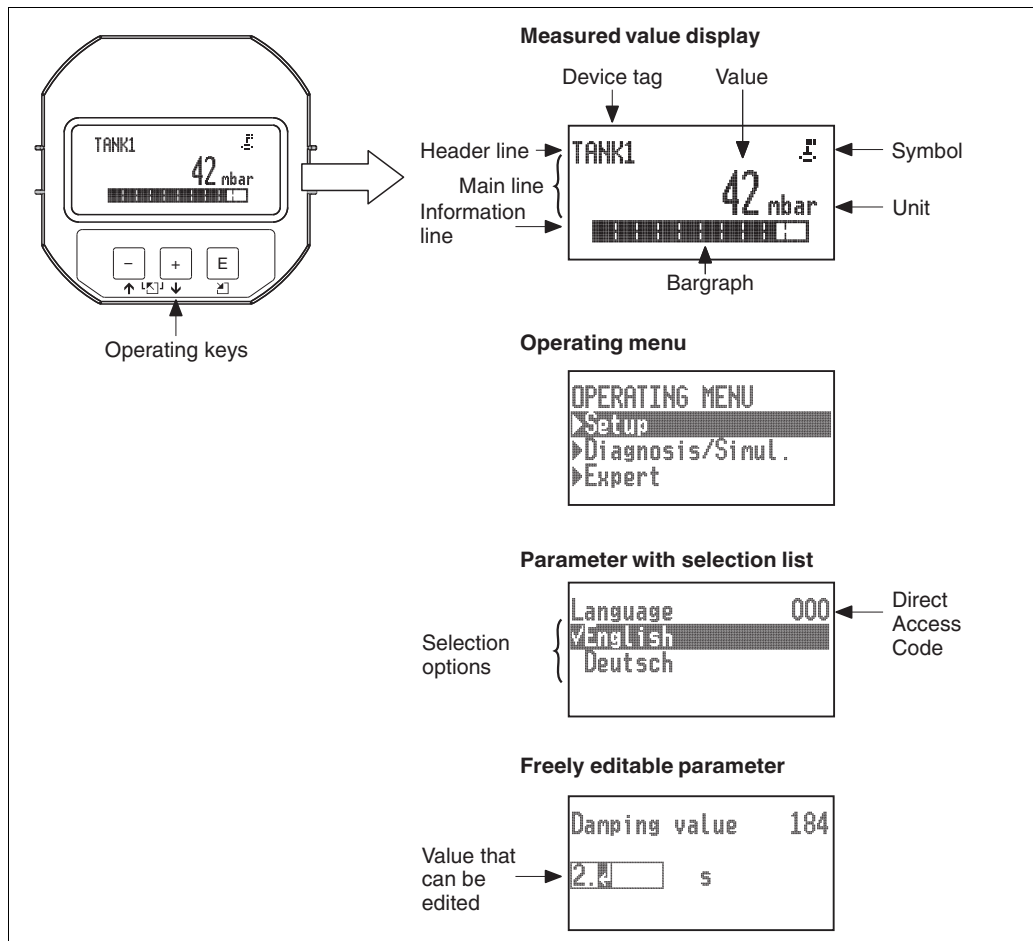
Local display (optional) for devices with HART or PROFIBUS PA electronics

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog texts as well as fault and notice messages in plain text, thereby supporting the user at every stage of operation. The liquid crystal display of the device can be turned in 90° stages.

Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.

Functions:

- 8-digit measured value display including sign and decimal point, bar graph for 4 mA to 20 mA HART as current display; or for PROFIBUS PA as graphic display of the standardized value of the AI Block.
- Three keys for operation
- Simple and complete menu guidance as parameters are split into several levels and groups
- Each parameter is given a 3-digit ID number for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature etc.
- Comprehensive diagnostic functions (fault and warning message etc.)

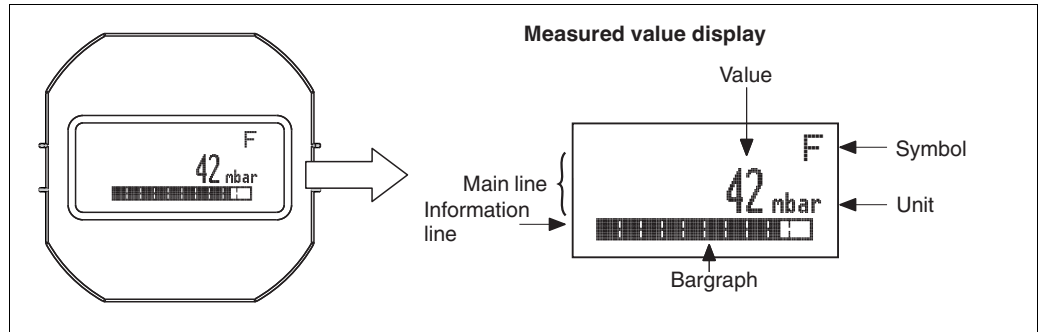


Local display (optional) for devices with analog electronics

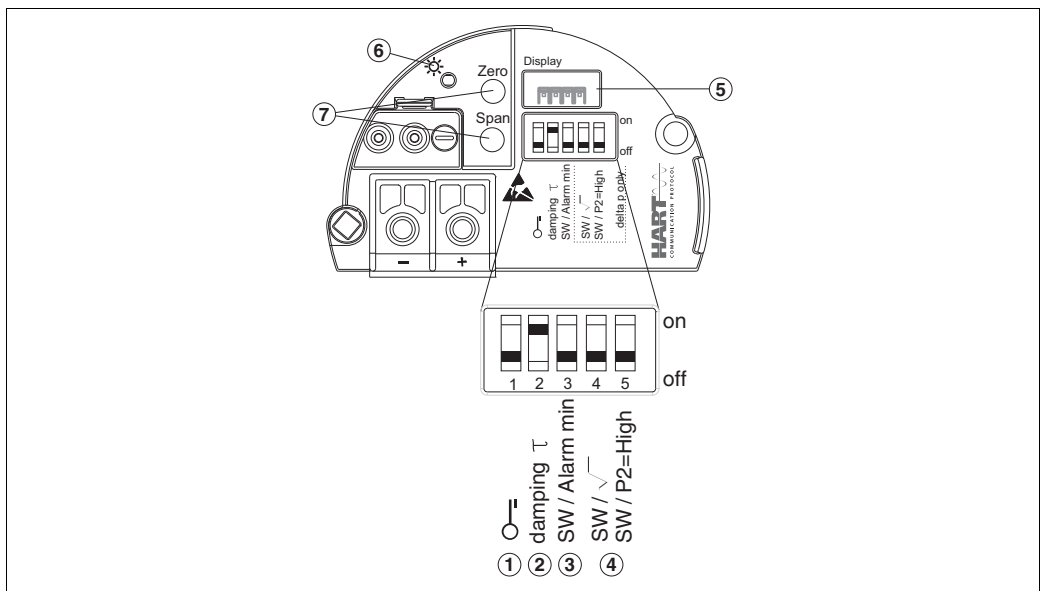
A 4-line liquid crystal display (LCD) is used. The local display shows measured values, fault messages and notice messages. The liquid crystal display of the device can be turned in 90° stages. Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.

Functions:

- 8-digit measured value display including sign and decimal point, bar graph for 4 mA to 20 mA as current display.
- Diagnostic functions (fault and warning message etc.)

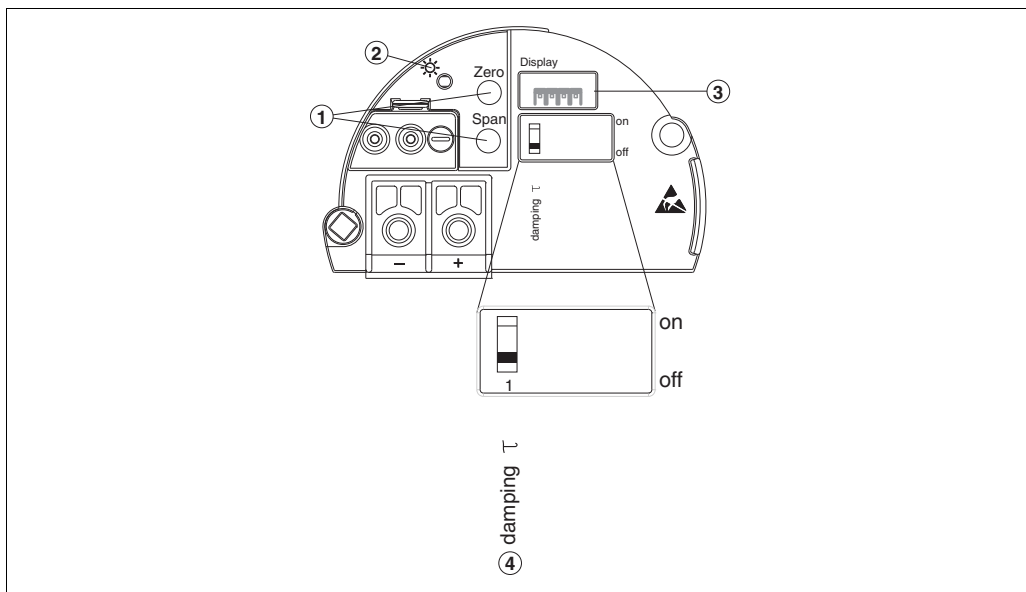


Operating keys and elements located on the electronic insert



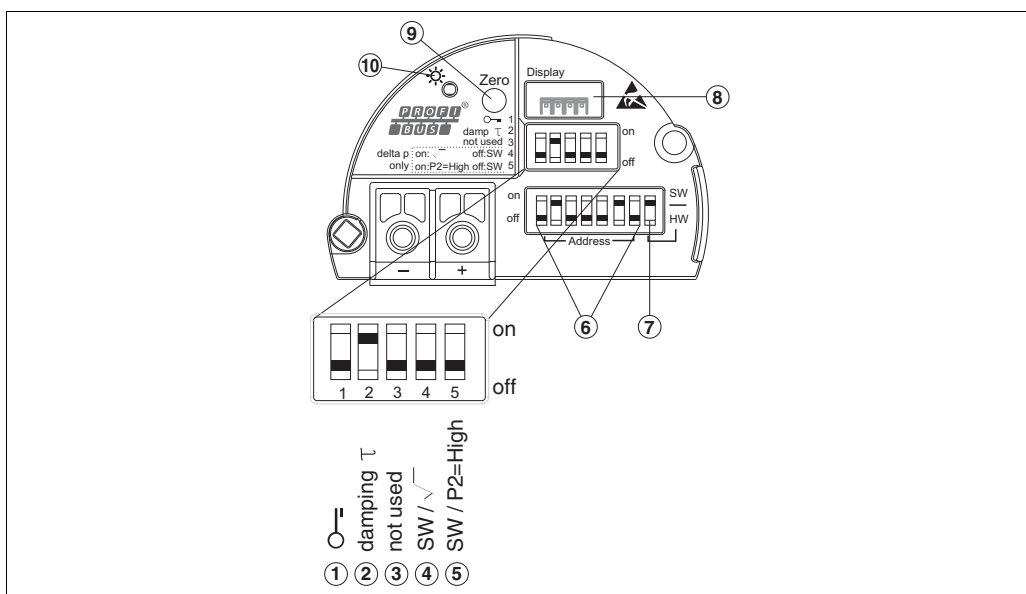
HART electronic insert

- 1 DIP switch for locking/unlocking parameters relevant to the measured value
- 2 DIP switch for switching damping on/off
- 3 DIP switch for alarm current SW/Alarm Min (3.6 mA)
- 4 DIP switch not active
- 5 Slot for optional local display
- 6 Green LED to indicate successful operation
- 7 Operating keys for lower range value (zero), upper range value (span), position zero adjustment or reset



Analog electronic insert

- 1 Operating keys for lower range value (zero), upper range value (span), position zero adjustment or reset
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4 DIP switch for switching damping on/off



PROFIBUS PA electronic insert

- 1 DIP switch for locking/unlocking parameters relevant to the measured value
- 2 DIP switch for switching damping on/off
- 3 Not used
- 4 Not used
- 5 Not used
- 6 DIP-switch for hardware address
- 7 DIP-switch for bus address SW/HW
- 8 Slot for optional local display
- 9 Operating key for position zero adjustment (Zero) or reset
- 10 Green LED to indicate successful operation

Onsite operation

Function	Operation without display with operating keys and DIP switches on the electronic insert		
	Analog electronics	HART	PROFIBUS PA
Position adjustment (zero point correction)	X	X	X
Setting lower range value and upper range value – reference pressure present at the device	X	X	–
Device reset	X	X	X
Locking and unlocking parameters relevant to the measured value	–	X	X
Value acceptance indicated by the green LED	X	X	X
Switching damping on and off	X	X	X

Function	Operation via display (option)		
	Analog electronics	HART	PROFIBUS PA
Position adjustment (zero point correction)	–	X	X
Setting lower range value and upper range value – reference pressure present at the device	–	X	X
Device reset	–	X	X
Locking and unlocking parameters relevant to the measured value	–	X	X
Value acceptance indicated by the green LED	–	–	–
Switching damping on and off	–	X	X

Remote operation

All software parameters are accessible depending on the position of the write protection switch on the device.

HART

Remote operation via:

- PACTware™
- Field communication

PROFIBUS PA

Remote operation via:

- Profiboard: For connecting a PC to PROFIBUS
- Proficard: For connecting a laptop to PROFIBUS

**Hardware and software for
onsite and remote
operation**

Field communication

Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART current output (4 mA to 20 mA).

PACTware™

PACTware™ based on FDT technology. With **PACTware™**, you can configure all Pepperl+Fuchs devices as well as devices from other manufacturers that support the FDT standard.

The software supports the following functions:

- Configuration of transmitters in offline and online mode
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Connection options:

- HART via field communication and the USB port on a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

For further information see www.pepperl-fuchs.com.

Planning Instructions for Diaphragm Seal Systems



The performance and the permitted applications for a diaphragm seal system depend on the process isolating diaphragm used, the filling oil, the coupling, the design and the process and ambient conditions at the place of operation.

For further details, or for information on an optimum diaphragm seal solution, please contact your local Pepperl+Fuchs Sales Center.

Applications

Diaphragm seal systems should be used if the process and the device need to be separated. Diaphragm seal systems offer clear advantages in the following instances:

- In the case of extreme process temperatures
- For aggressive media
- If extreme measuring point cleaning is necessary, or in the event of very damp mounting locations
- If the measuring point is exposed to severe vibrations
- For mounting locations that are difficult to access

Function and design

Diaphragm seals separate the measuring system from the process.

A diaphragm seal system consists of:

- A diaphragm seal
- A capillary tube or a temperature isolator if necessary
- Fill fluid
- A pressure transmitter

The process pressure acts via the process isolating diaphragm of a diaphragm seal on the liquid-filled system, which transfers the process pressure to the sensor of the pressure transmitter.

Pepperl+Fuchs delivers all diaphragm seal systems as welded versions. The system is hermetically sealed, which ensures greater reliability.

The diaphragm seal determines the application range of the system on the basis of

- The diameter of the process isolating diaphragm
- The process isolating diaphragm: stiffness and material
- The design (oil volume)

Diameter of the process isolating diaphragm

The greater the diameter of the process isolating diaphragm (less stiff), the smaller the temperature effect on the measurement result.

Stiffness of the process isolating diaphragm

The stiffness depends on the diameter of the process isolating diaphragm, the material, any existing coating, the thickness of the process isolating diaphragm and the shape. The thickness of the process isolating diaphragm and the shape are determined by the design. The stiffness of a process isolating diaphragm of a diaphragm seal influences the temperature application range and the measuring error caused by temperature effects.

Capillary

Capillaries with an internal diameter of 1 mm (0.04 in) are used as standard.

As a result of its length and internal diameter, the capillary tube influences the thermal change, the ambient temperature application range and the response time of a diaphragm seal system.

Filling oil

When selecting the filling oil, the medium temperature and ambient temperature, as well as the process pressure, are of crucial importance. Observe the temperatures and pressures during commissioning and cleaning. A further selection criterion is the compatibility of the filling oil with the requirements of the medium. For example, only filling oils that do not present a health hazard are used in the food industry, e. g. vegetable oil or silicone oil. → See also the following section "Diaphragm seal filling oils".

The filling oil used influences the thermal change, the temperature application range of a diaphragm seal system and the response time. A temperature change results in a volume change in the filling oil. The volume change depends on the thermal expansion coefficient of the filling oil and on the volume of the fill fluid at calibration temperature (constant in the range: +21 °C to +33 °C (+70 °F to 91 °F)).

For example, the filling oil expands in the event of a temperature increase. The additional volume presses against the process isolating diaphragm of a diaphragm seal. The stiffer a process isolating diaphragm is, the greater its return force, which counteracts a volume change and acts together with the process pressure on the measuring cell, thus shifting the zero point.

Pressure transmitter

The pressure transmitter influences the temperature application range, the thermal change and the response time as a result of its volume change. The volume change is the volume that has to be shifted in order to pass through the complete measuring range.

Pressure transmitters from Pepperl+Fuchs are optimized with regard to minimum volume change.

Diaphragm seal filling oils

Filling oil	Permissible temperature range ¹ at 0.05 bar (0.725 psi) $\leq p_{abs} \leq 1$ bar (14.5 psi)	Permissible temperature range ² at $p_{abs} \geq 1$ bar (14.5 psi)	Density [g/cm ³]/ [SGU]	Viscosity [mm ² /s]/[cSt] at 25 °C (77 °F)	Thermal expansion coefficient [1/K]	Note
Silicone oil	-40 °C to +180 °C (-40 °F to +356 °F)	-40 °C to +250 °C (-40 °F to +482 °F)	0.96	100	0.00096	Suitable for foods FDA 21 CFR 175.105
Inert oil	-40 °C to +80 °C (-40 °F to +176 °F)	-40 °C to +175 °C (-40 °F to +347 °F)	1.87	27	0.000876	For ultrapure gas and oxygen applications
Vegetable oil	-10 °C to +120 °C (+14 °F to +248 °F)	-10 °C to +200 °C (+14 °F to +392 °F)	0.94	9.5	0.00101	Suitable for foods FDA 21 CFR 172.856
High-temperature oil ²	-10 °C to +200 °C (+14 °F to +392 °F)	-10 °C to +400 °C (+14 °F to +752 °F)	1.07	37	0.0007	High temperatures
Low-temperature oil	-70 °C to +80 °C (-94 °F to +176 °F)	-70 °C to +180 °C (-94 °F to +356 °F)	0.92	4.4	0.00108	Low temperatures

¹ Observe temperature limits of the device (→ 30) and of the system (→ 59).

² When simultaneously applying the diaphragms seal at high process temperatures and low absolute pressures, Pepperl+Fuchs recommends a vacuum service

Operating temperature range

The operating temperature range of a diaphragm seal system depends on the fill fluid, capillary length and internal diameter, process temperature and oil volume of the diaphragm seal.

The range of application can be extended by using a fill fluid with a smaller expansion coefficient and a shorter capillary.

Installation instructions

Diaphragm seal systems

- Pepperl+Fuchs offer flushing rings as accessory to clean process isolating diaphragms without taking the transmitters out of process.
For further information please contact your local Pepperl+Fuchs Sales Center.
- A diaphragm seal together with the transmitter form a closed, calibrated system, which is filled through openings in the diaphragm seal and in the transmitter's measurement system. These openings are sealed and must not be opened.
- In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. If a measuring cell with a small measuring range is selected, a position adjustment can cause range violation.
- For devices with a temperature isolator or capillary, a suitable fastening device (mounting bracket) is recommended.
- When using diaphragm seal systems with a capillary, sufficient strain relief must be ensured in order to prevent the capillary bending down (bending radius ≥ 100 mm (3.94 in)).

Capillary

In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:

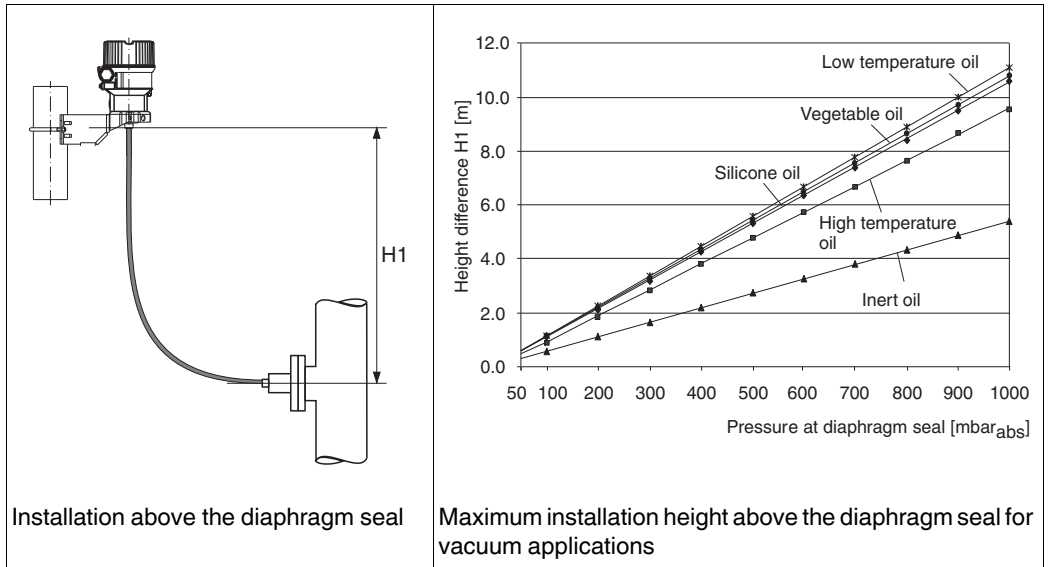
- Vibration-free (in order to avoid additional pressure fluctuations)
- Not in the vicinity of heating or cooling lines
- Insulate if the ambient temperature is below or above the reference temperature
- With a bending radius of ≥ 100 mm (3.94 in).

Vacuum applications

For applications under vacuum, Pepperl+Fuchs recommends mounting the pressure transmitter below the diaphragm seal. This prevents vacuum loading of the diaphragm seal caused by the presence of fill fluid in the capillary.

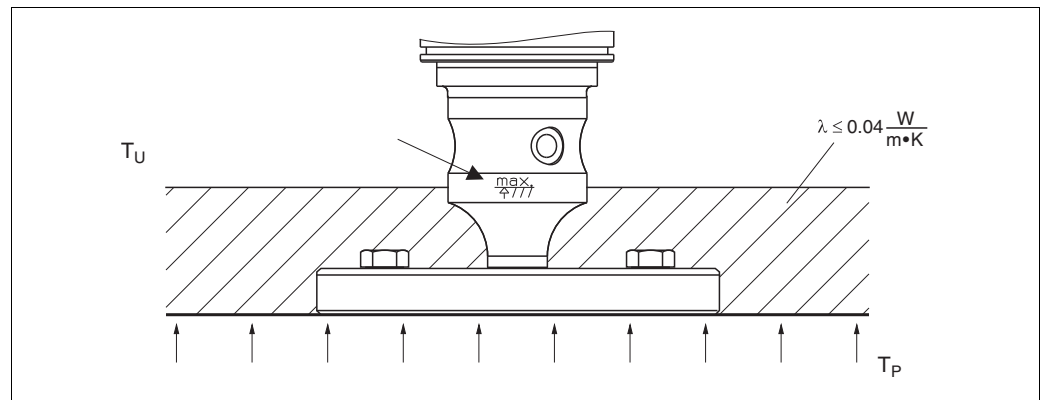
When the pressure transmitter is mounted above the diaphragm seal, the maximum height difference H1 in accordance with the illustration below must not be exceeded. The maximum height difference depends on the density of the filling oil and the smallest ever pressure that is permitted to occur at the diaphragm seal (empty container), see illustration below right.

When simultaneously applying the diaphragm seal systems at high process temperatures and low absolute pressures, Pepperl+Fuchs recommends a vacuum service.



Thermal insulation

The devices may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the devices and applies to an insulation material with a heat conductivity $\leq 0,04 \text{ W}/(\text{m} \times \text{K})$ and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air".



Maximum permitted insulation height, here indicated on an example

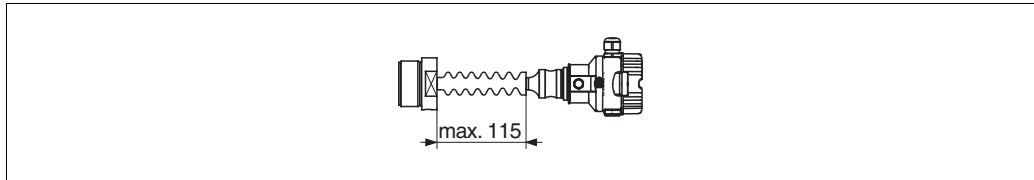
Mounting with temperature isolator

Pepperl+Fuchs recommends the use of temperature isolators in the event of constant extreme medium temperatures which lead to the maximum permissible electronics temperature of +85 °C (+185° F) being exceeded.

Depending on the filling oil used, diaphragm seal systems with temperature isolators can be used for maximum temperatures of up to 260 °C (+500 °F). → For the temperature application limits, see → 60, "Diaphragm seal filling oils" section.








To minimize the influence of rising heat, Pepperl+Fuchs recommends the device be mounted horizontally or with the housing pointing downwards.

The additional installation height also brings about a maximum zero point shift of 21 mbar (0.315 psi) due to the hydrostatic column in the temperature isolator. You can correct this zero point shift at the device.



Pressure transmitter with temperature isolator

Certificates and Approvals

CE mark	The device meets the legal requirements of the relevant EC directives. Pepperl+Fuchs confirms that the device has been successfully tested by applying the CE mark.
Ex approvals	<ul style="list-style-type: none"> • ATEX • IECEX • FM • CSA • Also combinations of different approvals <p>All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.</p> <p>→  73 ff, "Safety instructions" section and "Installation/Control Drawings" section.</p>
Suitability for hygienic processes	<p>The pressure transmitter is suitable for use in hygienic processes. Overview of suitable process connections →  32 ff.</p> <p>Many versions meet the requirements of 3A-Sanitary Standard No. 74 and are certified by the EHEDG.</p> <p>Suitable fittings and seals must be used for hygienic design in accordance with 3A and EHEDG specifications.</p> <p> Gap-free connections can be cleaned without residue using the usual cleaning methods.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>
Functional safety SIL	The pressure transmitter with 4 mA to 20 mA output signal has been developed to assessed and certified by TÜV NORD CERT as per IEC 61508 Edition 2.0 and IEC 61511. These devices can be used to monitor the process level and pressure up to SIL 2. For a detailed description of the safety functions, settings and functional safety data, see the "Safety Integrity Level" manual.
Marine approval	GL (German Lloyd)
CRN approval	Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→  32 ff, Process connections) has to be ordered with a CSA approval (→  65 ff, ordering information, feature "Approval"). The devices are fitted with a separate plate bearing the registration number.
Pressure Equipment Directive (PED)	<p>The devices PPC-M51 and LHC-M51 correspond to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice.</p> <p>The following also applies:</p> <p>LHC-M51 with threaded connection and internal process isolating diaphragm PN > 200: suitable for stable gases in group 1, category I</p>
Drinking water approval	NSF61 approval

Standards and guidelines **DIN EN 60770 (IEC 60770):**

Transmitters for use in industrial process control systems
Part 1: Methods for inspection and routine testing

DIN 16086:

Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications on data sheets

EN 61326 series:

EMC product family standard for electrical equipment for measurement, control and laboratory use.

**North-American practice
for installation of process
seals**

Pepperl+Fuchs instruments are designed according to ANSI/ISA 12.27.01 either as single seal or dual seal devices with annunciation, allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids.

Further information can be found in the control drawings of the relevant devices.

Ordering Information

Ordering Designation

option with * = in preparation

Device	
LHC-M51	Pressure transmitter with metallic welded process isolating diaphragm
Sensor range	
Sensors for gauge pressure	
R1D	400 mbar/40 kPa/6 psi/relative/4 m H ₂ O/13 ft H ₂ O/160 in H ₂ O
R2A	1 bar/100 kPa/15 psi/relative/10 m H ₂ O/33 ft H ₂ O/400 in H ₂ O
R2C	2 bar/200 kPa/30 psi/relative/20 m H ₂ O/67 ft H ₂ O/800 in H ₂ O
R2D	4 bar/400 kPa/60 psi/relative/40 m H ₂ O/133 ft H ₂ O/1600 in H ₂ O
R3A	10 bar/1 Mpa/150 psi/relative/100 m H ₂ O/333 ft H ₂ O/4000 in H ₂ O
R3D	40 bar/4 Mpa/600 psi/relative/400 m H ₂ O/1334 ft H ₂ O/16000 in H ₂ O
R4A	100 bar/10 Mpa/1500 psi/relative/1000 m H ₂ O/3330 ft H ₂ O/40000 in H ₂ O
R4D	400 bar/40 Mpa/6000 psi/relative/4000 m H ₂ O/13340 ft H ₂ O/160000 in H ₂ O
Sensors for absolute pressure	
A1D	400 mbar/40 kPa/6 psi/absolute/4 m H ₂ O/13 ft H ₂ O/160 in H ₂ O
A2A	1 bar/100 kPa/15 psi/absolute/10 m H ₂ O/33 ft H ₂ O/400 in H ₂ O
A2C	2 bar/200 kPa/30 psi/absolute/20 m H ₂ O/67 ft H ₂ O/800 in H ₂ O
A2D	4 bar/400 kPa/60 psi/absolute/40 m H ₂ O/133 ft H ₂ O/1600 in H ₂ O
A3A	10 bar/1 Mpa/150 psi/absolute/100 m H ₂ O/333 ft H ₂ O/4000 in H ₂ O
A3D	40 bar/4 Mpa/600 psi/absolute/400 m H ₂ O/1334 ft H ₂ O/16000 in H ₂ O
A4A	100 bar/10 Mpa/1500 psi/absolute/1000 m H ₂ O/3330 ft H ₂ O/40000 in H ₂ O
A4D	400 bar/40 Mpa/6000 psi/absolute/4000 m H ₂ O/13340 ft H ₂ O/160000 in H ₂ O
XXX	Special version
Calibration; unit	
1	Sensor range; mbar/bar
2	Sensor range; kPa/MPa
3	Sensor range; mm/m H ₂ O
4	Sensor range; in H ₂ O/ft H ₂ O
5	Sensor range; psi
A	Sensor range; %
J	Customized pressure (see additional specification)
K	Customized level (see additional specification)
Y	Special version
Reference accuracy	
D	Platinum
G	Standard
Y	Special version
Process connection	
A32	1 in 300 lbs RF, 316/316L, flange ANSI B16.5
A3H	1-1/2 in 150 lbs RF, 316 /316L, flange ANSI B16.5
A52	1-1/2 in 300 lbs RF, 316/316L, flange ANSI B16.5
A61	2 in 150 lbs RF, 316/316L, flange ANSI B16.5
A62	2 in 300 lbs RF, 316/316L, flange ANSI B16.5
A81	3 in 150 lbs RF, 316/316L, flange ANSI B16.5
A82	3 in 300 lbs RF, 316/316L, flange ANSI B16.5
A91	4 in 150 lbs RF, 316/316L, flange ANSI B16.5
A92	4 in 300 lbs RF, 316/316L, flange ANSI B16.5
DR1	* DRD DN50 65 mm PN25, 316L
F45	DN25 PN10-40 B1, 316L, flange EN 1092-1
F55	DN32 PN10-40 B1, 316L, flange EN 1092-1
F65	DN40 PN10-40 B1, 316L, flange EN 1092-1
F75	DN50 PN10-40 B1, 316L, flange EN 1092-1
F95	DN80 PN10-40 B1, 316L, flange EN 1092-1
G11	Thread ISO228 G1/2, 316L
G13	Thread ISO228 G1/2 G1/4 female, AlloyC

G14	Thread ISO228 G1/2 G1/4 female, 316L
G1C	Thread ISO228 G1/2, AlloyC
G1M	Thread ISO228 G1/2 hole 11.4 mm, 316L
G1N	Thread ISO228 G1/2 hole 11.4 mm, AlloyC
G1O	Thread ISO228 G1/2, 316L, flush-mounted
G1P	Thread ISO228 G1/2, AlloyC, flush-mounted
G31	Thread ISO228 G1, 316L, flush-mounted
G51	Thread ISO228 G1-1/2, 316L, flush-mounted
G61	Thread ISO228 G2, 316L, flush-mounted
G71	* Thread ISO228 G1 flush-mounted, metal sealing cone, 316L
G72	* Thread ISO228 G1 O-ring seal, 316L
G73	* Thread ISO228 G1/2 O-ring seal, fm = flush-mounted, 316L
G74	Thread DIN 13 M20x1.5, 316L
M55	* DIN 11851 DN32 PN25 cap-nut, 316L, EHEDG, 3A
M56	* DIN 11851 DN50 PN25 cap-nut, 316L, EHEDG, 3A
M57	* DIN 11851 DN25 PN25 cap-nut, 316L, EHEDG, 3A
M58	* DIN 11851 DN40 PN25 cap-nut, 316L, EHEDG, 3A
N21	* Thread ANSI MNPT3/4, 316L, flush-mounted
N31	Thread ANSI MNPT1, 316L, flush-mounted
N51	Thread ANSI MNPT1-1/2, 316L, flush-mounted
N61	Thread ANSI MNPT2, 316L, flush-mounted
R1C	Thread ANSI FNPT1/2, AlloyC
R1J	Thread ANSI FNPT1/2, 316L
RKC	Thread ANSI MNPT1/2 hole 11.4 mm, AlloyC
RKJ	Thread ANSI MNPT1/2 hole 11.4 mm, 316L
RLC	Thread ANSI MNPT1/2 FNPT1/4, AlloyC
RLJ	Thread ANSI MNPT1/2 FNPT1/4, 316L
S1J	* NEUMO BioControl D25 PN16, 316L, EHEDG, 3A
S4J	* NEUMO BioControl D50 PN16, 316L, EHEDG, 3A
S45	* SMS 1" PN25, 316L, EHEDG, 3A
S55	* SMS 1-1/2" PN25, 316L, EHEDG, 3A
S65	* SMS 2" PN25, 316L, EHEDG, 3A
SP6	* APV-Inline DN50 PN40, 316L, 3A
T51	* Tri-Clamp ISO2852 DN38 (1-1/2 in), 316L, DIN 32676 DN40, EHEDG, 3A, ASME-BPE
T55	* Tri-Clamp ISO2852 DN25 (1 in), 316L, DIN 32676 DN25, EHEDG, 3A, ASME-BPE
T65	* Tri-Clamp ISO2852 DN40-51 (2 in), 316L, DIN 32676 DN50, EHEDG, 3A, ASME-BPE
TBJ	* Clamp ISO2852 DN12-22 (1/2 in to 3/4 in), 316L, DIN 32676 DN10-20, EHEDG, 3A, ASME-BPE
TUJ	* KingGage 1777-2(short), 316L, 3A
TVJ	* KingGage 1777(medium), 316L, 3A
TWJ	* KingGage 1777-3(long), 316L, 3A
V10	* Varivent B pipe DN10-15 PN40, 316L, EHEDG, 3A
V12	* Varivent F pipe DN25-32 PN40, 316L, EHEDG, 3A
V14	* Varivent N pipe DN40-162 PN40, 316L, EHEDG, 3A
XSJ	Prepared for diaphragm seal mount, 316L
XXX	Special version
Material of the process isolating diaphragm	
1	316 L
4	Allox C
A	Rhodium>gold>316L
X	Special version
Fill fluid	
1	Silicone oil
2	Inert oil
3	Synthetic oil, FDA
9	Special version
Housing	
I	Aluminum housing F31
J	Aluminum housing F31; glass window
Q	Stainless steel housing F15, hygienic version

R	Stainless steel housing F15, hygienic version; glass window
S	Stainless steel housing F15, hygienic version; plastic window
Y	Special version
Output	
I2	4 mA to 20 mA analog electronics
IH	4 mA to -20 mA SMART electronics, HART protocol
PA	PROFIBUS-PA P3.0
9	Special version
Electrical connection	
A	Gland M20, IP66/68 NEMA4X/6P
B	Thread M20, IP66/68 NEMA4X/6P
C	Thread G1/2, IP66/68 NEMA4X/6P
D	Thread NPT1/2, IP66/68 NEMA4X/6P
I	Connector M12, IP66/68 NEMA4X/6P
M	Connector 7/8 in, IP66/68 NEMA4X/6P
P	Connector Han7D, 90deg., IP65
S	PE cable 5 m, IP66/68 NEMA4X/6P and pressure compensation via cable
V	Valve connector ISO4400 M16, IP64
Y	Special version
Display, operation	
1	LCD, push buttons on display electronics
2	W/o LCD, push buttons on electronics
9	Special version
Approval	
C1	CSA C/US IS/XP Cl. I,II Div. 1 Gr. A-G/B-G, Zone 1,2
CD	CSA C/US Cl. II,III Div. 1 Gr. E-G, US: Zone 21,22
CG	CSA General Purpose
CU	CSA C/US IS Cl. I,II,III Div. 1 Gr. A-G, CSA C/US IS Cl. I Div. 2 Gr. A-D, Ex ia, C: Zone 0,1,2/US: Zone 0,1,2,20,21,22
CX	CSA C/US XP Cl. I,II Div. 1 Gr. B-G, Ex d, (conduit seal not required), Zone 1,2
E1	ATEX II 2G Ex ia IIC T6
E2	ATEX II 3G Ex nA IIC T6
E3	ATEX II 3G Ex ic IIC T6
ES	ATEX II 1/2D Ex t IIIC
EX	ATEX II 1/2G Ex ia IIC T6
FD	FM DIP Cl. II,III Div. 1 Gr. E-G, Zone 21,22
FM	FM IS Cl. I,II,III Div. 1 Gr. A-G, AEx ia, FM NI Cl. I Div. 2 Gr. A-D, FM IS: Zone 0,1,2,20,21,22/FM NI: Zone 2
FN	FM NI Cl. I Div. 2 Gr. A-D, Zone 2
I1	IEC Ex ia IIC T6 Ga/Gb + Ex ia IIIC Da/Db
IA	IEC Ex ia IIC T6 Ga/Gb
IB	IEC Ex d IIC T6 Gb
ID	IEC Ex t IIIC Da/Db
IE	IEC Ex ic IIC T6 Gc
NA	For non-hazardous areas
SX	ATEX II 1/2G Ex ia IIC T6 + ATEX II 1/2D Ex iaD

Options

option with * = in preparation

no option = 0

Additional operation language	
A	English
B	German
C	French
D	Spanish
E	Italian
K	Chinese simplified

L	Japanese
Calibration	
1	Factory calibration certificate, 5-point
Service (multiple selection possible)	
F	Oil and grease removed (only device, not accessory or enclosed accessory)
Test, certificate (multiple selection possible)	
3	Material certification, metallic parts in contact with medium, EN 10204-3.1 inspection certificate
Other approvals (multiple selection possible)	
H	SIL
J	GL marine certificate
Separate housing (multiple selection possible)	
6	Cable PE, 2 m/80 in and housing mounting bracket, wall/pipe, 304
7	Cable PE, 5 m/200 in and housing mounting bracket, wall/pipe, 304
8	Cable PE, 10 m/400 in and housing mounting bracket, wall/pipe, 304
9	Cable FEP, 5 m/200 in IP69K and housing mounting bracket, wall/pipe, 304
Firmware version	
M	01.00.zz, PROFIBUS PA, DevRev01
N	01.00.zz, HART, DevRev01
Identification (multiple selection possible)	
O	Measuring point (TAG), see additional specification
P	Bus address, see additional specification
Q	* Mounting accessory, see additional specification

Ordering Designation

option with * = in preparation

Device	
PPC-M51	Pressure transmitter with ceramic process isolating diaphragm
Sensor range	
Sensors for gauge pressure	
R1A	100 mbar/10 kPa/1,5 psi/relative/14 m H ₂ O/3 ft H ₂ O/40 in H ₂ O
R1C	250 mbar/25 kPa/3,75 psi/relative/2,5 m H ₂ O/7.5 ft H ₂ O/100 in H ₂ O
R1D	400 mbar/40 kPa/6 psi/relative/4 m H ₂ O/13 ft H ₂ O/160 in H ₂ O
R2A	1 bar/100 kPa/15 psi/relative/10 m H ₂ O/33 ft H ₂ O/400 in H ₂ O
R2C	2 bar/200 kPa/30 psi/relative/20 m H ₂ O/67 ft H ₂ O/800 in H ₂ O
R2D	4 bar/400 kPa/60 psi/relative/40 m H ₂ O/133 ft H ₂ O/1600 in H ₂ O
R3A	10 bar/1 Mpa/150 psi/relative/100 m H ₂ O/333 ft H ₂ O/4000 in H ₂ O
R3D	40 bar/4 Mpa/600 psi/relative/400 m H ₂ O/1334 ft H ₂ O/16000 in H ₂ O
Sensors for absolute pressure	
A1A	100 mbar/10 kPa/1,5 psi/absolute/1 m H ₂ O/3 ft H ₂ O/40 in H ₂ O
A1C	250 mbar/25 kPa/3,75 psi/absolute/2,5 m H ₂ O/7.5 ft H ₂ O/100 in H ₂ O
A1D	400 mbar/40 kPa/6 psi/absolute/4 m H ₂ O/13 ft H ₂ O/160 in H ₂ O
A2A	1 bar/100 kPa/15 psi/absolute/10 m H ₂ O/33 ft H ₂ O/400 in H ₂ O
A2C	2 bar/200 kPa/30 psi/absolute/20 m H ₂ O/67 ft H ₂ O/800 in H ₂ O
A2D	4 bar/400 kPa/60 psi/absolute/40 m H ₂ O/133 ft H ₂ O/1600 in H ₂ O
A3A	10 bar/1 Mpa/150 psi/absolute/100 m H ₂ O/333 ft H ₂ O/4000 in H ₂ O
A3D	40 bar/4 Mpa/600 psi/absolute/400 m H ₂ O/1334 ft H ₂ O/16000 in H ₂ O
XXX	Special version
Calibration; unit	
1	Sensor range; mbar/bar
2	Sensor range; kPa/MPa
3	Sensor range; mm/m H ₂ O
4	Sensor range; in H ₂ O/ft H ₂ O
5	Sensor range; psi
A	Sensor range; %
J	Customized pressure (see additional specification)
K	Customized level (see additional specification)
Y	Special version
Reference accuracy	
D	Platinum
G	Standard
Y	Special version
Process connection	
A31	1 in 150 lbs RF, 316/316L, flange ANSI B16.5
A32	1 in 300 lbs RF, 316/316L, flange ANSI B16.5
A51	1-1/2 in 150 lbs RF, 316/316L, flange ANSI B16.5
A52	1-1/2 in 300 lbs RF, 316/316L, flange ANSI B16.5
A6V	2 in 150 lbs RF, PVDF, flange ANSI B16.5
A61	2 in 150 lbs RF, 316/316L, flange ANSI B16.5
A62	2 in 300 lbs RF, 316/316L, flange ANSI B16.5
A6H	2 in 150 lbs, ECTFE>316/316L, flange ANSI B16.5
A81	3 in 150 lbs RF, 316/316L, flange ANSI B16.5
A82	3 in 300 lbs RF, 316/316L, flange ANSI B16.5
A8H	3 in 150 lbs, ECTFE>316/316L, flange ANSI B16.5
A8V	3 in 150 lbs RF, PVDF, flange ANSI B16.5
A91	4 in 150 lbs RF, 316/316L, flange ANSI B16.5
A92	4 in 300 lbs RF, 316/316L, flange ANSI B16.5
A9H	4 in 150 lbs, ECTFE>316/316L, flange ANSI B16.5
DR1	* DRD DN50 65 mm PN25, 316L

F45	DN25 PN10-40 B1, 316L, flange EN 1092-1
F55	DN32 PN10-40 B1, 316L, flange EN 1092-1
F62	* DN40 PN10/16 B1, PVDF, flange EN 1092-1
F65	DN40 PN10-40 B1, 316L, flange EN 1092-1
F6H	DN40 PN10-40, ECTFE>316L, flange EN 1092-1
F72	DN50 PN10/16 B1, PVDF, flange EN 1092-1
F75	DN50 PN10-40 B1, 316L, flange EN 1092-1
F7H	DN50 PN25/40, ECTFE>316L, flange EN 1092-1
F95	DN80 PN10-40 B1, 316L, flange EN 1092-1
F9H	DN80 PN25/40, ECTFE>316L, flange EN 1092-1
G11	Thread ISO228 G1/2, 316L
G13	Thread ISO228 G1/2 G1/4 female, AlloyC
G14	Thread ISO228 G1/2 G1/4 female, 316L
G1C	Thread ISO228 G1/2, AlloyC
G1M	Thread ISO228 G1/2 hole 11.4 mm, 316L
G1N	Thread ISO228 G1/2 hole 11.4 mm, AlloyC
G1V	Thread ISO228 G1/2, PVDF
G44	Thread DIN 13 M44x1.25, 316L, flush-mounted
G51	Thread ISO228 G1-1/2, 316L, flush-mounted
G61	Thread ISO228 G2, 316L, flush-mounted
J16	10K 50A RF, 316L, flange JIS B2220
J17	10K 80A RF, 316L, flange JIS B2220
J19	10K 100A RF, 316L, flange JIS B2220
J31	Thread JIS B0202 G1/2 male, 316L
J32	Thread JIS B0203 R1/2 male, 316L
M56	* DIN 11851 DN50 PN25 cap-nut, 316L, EHEDG, 3A
M58	* DIN 11851 DN40 PN25 cap-nut, 316L, EHEDG, 3A
M64	DIN 11864-1 A DN40 PN16 pipe DIN 11866-A, cap-nut, 31with seal6L, EHEDG, 3A with seal FDA
M65	DIN 11864-1 A DN50 PN16 pipe DIN 11866-A, cap-nut, 316L, EHEDG, 3A with seal FDA
N51	Thread ANSI MNPT1-1/2, 316L, flush-mounted
N61	Thread ANSI MNPT2, 316L, flush-mounted
R1C	Thread ANSI FNPT1/2, AlloyC
R1J	Thread ANSI FNPT1/2, 316L
RJF	Thread ANSI MNPT1/2 hole 3 mm, PVDF
RKC	Thread ANSI MNPT1/2 hole 11.4 mm, AlloyC
RKJ	Thread ANSI MNPT1/2 hole 11.4 mm, 316L
RLC	Thread ANSI MNPT1/2 FNPT1/4, AlloyC
RLJ	Thread ANSI MNPT1/2 FNPT1/4, 316L
S4J	* NEUMO BioControl D50 PN16, 316L, EHEDG, 3A
SP6	* APV-Inline DN50 PN40, 316L, 3A
T65	* Tri-Clamp ISO2852 DN40-51 (2"), 316L, DIN 32676 DN50, EHEDG, 3A, ASME-BPE
T85	Tri-Clamp ISO2852 DN76.1 (3"), 316L, EHEDG, 3A with seal FDA
U4E	Universaladapter 44 mm 316L, EPDM molded seal, EHEDG
U4S	Universaladapter 44 mm 316L, silicone molded seal, EHEDG, 3A with seal FDA
V12	*Varivent F pipe DN25-32 PN40, 316L, EHEDG, 3A
V14	*Varivent N pipe DN40-162 PN40, 316L, EHEDG, 3A
XXX	Special version for welded nozzles (only with vegetable oil)
Seal material	
1	FKM Viton
4	EPDM, FDA
B	FKM Viton, FDA, 3A Class I, USP Class VI
F	NBR
G	HNBR, FDA, 3A Class II, KTW, AFNOR, BAM
H	NBR, low temperature
K	EPDM, FDA, 3A Class II, USP Class VI, DVGW, KTW, W270, WRAS, ACS, NSF61
L	FFKM Kalrez 6375
M	FFKM Kalrez 7075
N	FFKM Kalrez 6221, FDA, USP Class VI
P	Fluoroprene XP40, FDA, USP Class VI, 3A Class I

S	VMQ Silicone, FDA
X	Special version
Housing	
I	Aluminum housing F31
J	Aluminum housing F31; glass window
Q	Stainless steel housing F15, hygienic version
R	Stainless steel housing F15, hygienic version; glass window
S	Stainless steel housing F15, hygienic version; plastic window
Y	Special version
Output	
I2	4 mA to 20 mA analog electronics
IH	4 mA to -20 mA SMART electronics, HART protocol
PA	PROFIBUS-PA, P3.0
9	Special version
Electrical connection	
A	Gland M20, IP66/68 NEMA4X/6P
B	Thread M20, IP66/68 NEMA4X/6P
C	Thread G1/2, IP66/68 NEMA4X/6P
D	Thread NPT1/2, IP66/68 NEMA4X/6P
I	Connector M12, IP66/68 NEMA4X/6P
M	Connector 7/8 in, IP66/68 NEMA4X/6P
P	Connector Han7D, 90deg., IP65
S	PE cable 5 m, IP66/68 NEMA4X/6P and pressure compensation via cable
V	Valve connector ISO4400 M16, IP64
Y	Special version
Display, operation	
1	LCD, push buttons on display electronics
2	W/o LCD, push buttons on electronics
9	Special version
Approval	
CU	CSA C/US IS Cl. I,II,III Div. 1 Gr. A-G, CSA C/US IS Cl. I Div. 2 Gr. A-D, Ex ia, C: Zone 0,1,2/US: Zone 0,1,2,20,21,22
CG	CSA General Purpose
E1	ATEX II 2G Ex ia IIC T6
E2	ATEX II 3G Ex nA IIC T6
E3	ATEX II 3G Ex ic IIC T6
EM	ATEX II 1/2D Ex ia IIIC
ES	ATEX II 1/2D Ex t IIIC
EX	ATEX II 1/2G Ex ia IIC T6
FM	FM IS Cl. I,II,III Div. 1 Gr. A-G, AEx ia, FM NI Cl. I Div. 2 Gr. A-D, FM IS: Zone 0,1,2,20,21,22/FM NI: Zone 2
FN	FM NI Cl. I Div. 2 Gr. A-D, Zone 2
IA	IEC Ex ia IIC T6 Ga/Gb
IE	IEC Ex ic IIC T6 Gc
IF	IEC Ex ia IIIC Da/ Db
I1	IEC Ex ia IIC T6 Ga/Gb+Ex ia IIIC Da/Db
NA	For non-hazardous areas
SX	ATEX II 1/2G Ex ia IIC T6 +ATEX II 1/2D Ex iaD

Options

option with * = in preparation

no option = 0

Additional operation language	
A	English
B	German
C	French

D	Spanish
E	Italian
K	Chinese simplified
L	Japanese
Calibration	
1	Factory calibration certificate, 5-point
Service (multiple selection possible)	
F	Oil and grease removed
Test, certificate (multiple selection possible)	
3	Material certification, metallic parts in contact with medium, EN 10204-3.1 inspection certificate
Other approvals (multiple selection possible)	
H	SIL
J	GL marine certificate
Separate housing (multiple selection possible)	
6	Cable PE, 2 m/80 in and housing mounting bracket, wall/pipe, 304
7	Cable PE, 5 m/200 in and housing mounting bracket, wall/pipe, 304
8	Cable PE, 10 m/400 in and housing mounting bracket, wall/pipe, 304
9	Cable FEP, 5 m/200 in IP69K and housing mounting bracket, wall/pipe, 304
Firmware version	
M	01.00.zz, PROFIBUS PA, DevRev01
N	01.00.zz, HART, DevRev01
Identification (multiple selection possible)	
O	Measuring point (TAG), see additional specification
P	Bus address, see additional specification
Q	* Mounting accessory, see additional specification

Supplementary Documentation

Technical Information • LHCR-51, LHCS-51: TI004370/98/EN

Operating Instructions • 4 mA to 20 mA Analog: BA003850/98/EN
• 4 mA to 20 mA HART: BA003820/98/EN
• PROFIBUS PA: BA003830/98/DE

Brief Operating Instructions • 4 mA to 20 mA Analog: KA010360/98/EN
• 4 mA to 20 mA HART: KA010300/98/EN
• PROFIBUS PA: KA010310/98/EN

Functional safety manual (SIL) • 4 mA ... 20 mA HART: SD003470/98/EN

Safety instructions

Authorities	Version in the order code	Approval	Category	Type	Housing		Electronics	Documentation
					F31	F15		
ATEX	EX	Ex ia IIC	II 1/2 G	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004640/98
	ES	Ex t IIIC	II 1/2 D	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004660/98
	E2	Ex nA	II 3 G	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART PROFIBUS PA	SI004690/98
	E1	Ex ia IIC	II 2 G	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004640/98
	EM	Ex ia IIIC	II 1/2 D	PPC-M51	X	X	4 mA to 20 mA HART	SI004650/98
	E3	Ex ic IIC	II 3 G	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004890/98
	SX	Ex ia IIC Ex ia IIIC	II 1/2 G II 1/2 D	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004680/98

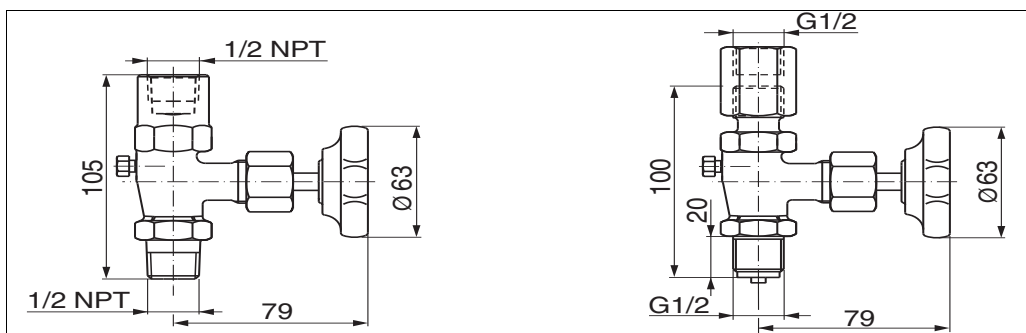
Authorities	Version in the order code	Approval	EPL	Type	Housing		Electronics	Documentation
					F31	F15		
IECEX	IA	Ex ia IIC	Ga/Gb	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004700/98
	ID	Ex t IIIC	Da/Db	LHC-M51	X	X	4 mA to 20 mA HART	SI004720/98
	IE	Ex ic IIC	Gc	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004880/98
	IF	Ex ia IIIC	Da/Db	PPC-M51	X	X	4 mA to 20 mA HART	SI004870/98
	I1	Ex ia IIC Ex ia IIIC	Ga/Gb Da/Db	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART	SI004730/98

**Installation/Control
Drawings**

Authorities	Version in the order code	Approval	Type	Housing		Electronics	Documentation
				F31	F15		
FM	FD	FM NI Cl. I Div. 2 Gr. A-D, Zone 2	LHC-M51	X	X	4 mA ... 20 mA HART	In preparation
	FM	FM IS Cl. I, II, III Div. 1 Gr. A-G, AEx ia, FM NI Cl. I Div. 2 Gr. A-D, FM IS: Zone 0, 1, 2, 20, 21, 22/ FM NI: Zone 2	PPC-M51, LHC-M51	X	X	4 mA ... 20 mA HART PROFIBUS PA	SI005630/98 SI005640/98
	FN	FM NI Cl. I Div. 2 Gr. A-D, Zone 2	PPC-M51, LHC-M51	X	-	4 mA ... 20 mA HART	SI005670/98
CSA	CU	C/US IS Cl. I, II, III Div. 1 Gr. A-G, C/US IS Cl. I Div. 2 Gr. A-D, Ex ia	PPC-M51, LHC-M51	X	X	4 mA to 20 mA HART PROFIBUS PA	SI005560/98 SI005580/98
	CX	CSA C/US CP Cl. I, II Div. 1 Gr. B-G, Ex d (factory sealed) Zone 1,2	LHC-M51	X	-	4 mA to 20 mA HART	ZD002490/98
	CD	CSA C/US Cl. II, III Div. 1 Gr. E-G, Zone 21,22	LHC-M51	X	X	4 mA to 20 mA HART	In preparation
	C1	CSA C/US IS/XP CL. I, II Div. 1 Gr. A-G/B-G, Zone 1,2	LHC-M51	X	-	4 mA to 20 mA HART PROFIBUS PA	SI005770/98 SI005610/98

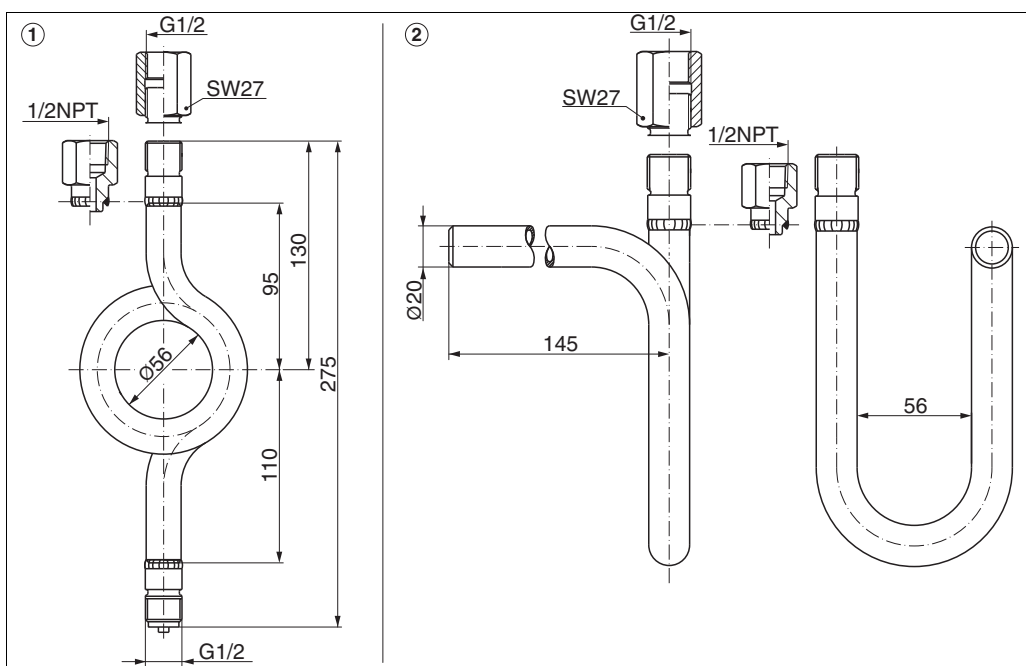
Accessories

Shutoff valve



Max. working pressure [bar (psi)]	Connection thread [d]	Material	Version
400 (5800)	G1/2	C22.8 (1.0460)	R1A1
		316Ti (1.4571)	R1A2, B1A2
	NPT1/2	C22.8 (1.0460)	R1D1
		316Ti (1.4571)	R1D2, B1D2

Siphon



No.	Max. working pressure [bar (psi)]	Max. operating temperature °C (°F) in front of the siphon (process side)	Connection thread [d]	Material	Version
1	<ul style="list-style-type: none"> • 104 (1508) • 120 (1740) • 160 (2320) 	<ul style="list-style-type: none"> • 400 (752) • 300 (572) • 120 (248) 	G1/2	1.0345	RA21
				316Ti (1.4571)	RA22, BA22
			1/2NPT	316Ti (1.4571)	BB22
2			G1/2	1.0345	RC11
			1/2NPT	1.0345	RD11



**Welding necks and Weld-
in tool flanges** On request



**Mounting bracket for wall
and pipe mounting** →  25 ff

M12 connector →  17 ff

Pressure

The following configuration data sheet has to be filled in and included with the order if the version "J" has been selected in feature "Calibration; unit" in the product structure.

Pressure engineering unit	
<input type="checkbox"/> mbar	<input type="checkbox"/> mmH ₂ O
<input type="checkbox"/> bar	<input type="checkbox"/> mHg
<input type="checkbox"/> psi	<input type="checkbox"/> inH ₂ O
<input type="checkbox"/> mmHg	<input type="checkbox"/> Pa
<input type="checkbox"/> mmH ₂ O	<input type="checkbox"/> kPa
<input type="checkbox"/> ftH ₂ O	<input type="checkbox"/> MPa
<input type="checkbox"/> kgf/cm ²	
Calibration range/output	
Low range value _____ [pressure engineering unit] (LRV):	
Upper range value _____ [pressure engineering unit] (URV):	
Display	
1st value display ¹ <input type="checkbox"/> Main value	2nd value display ¹ <input type="checkbox"/> None (Default) <input type="checkbox"/> Main value [%] <input type="checkbox"/> Pressure <input type="checkbox"/> Current [mA] (only HART) <input type="checkbox"/> Temperature
¹ Depending on sensor and communication variant	
Damping	
Damping: _____ sec (Default 2 sec)	



 Smallest calibratable span (preset at the factory) →  9 ff.

Configuration Data Sheet (Analog Electronics)

Pressure

The following configuration data sheet has to be filled in and included with the order if the version "J" has been selected in feature "Calibration; unit" in the product structure.

Pressure Engineering Unit	
<input type="checkbox"/> mbar	<input type="checkbox"/> mmH ₂ O
<input type="checkbox"/> bar	<input type="checkbox"/> mH ₂ O
<input type="checkbox"/> psi	<input type="checkbox"/> inH ₂ O
<input type="checkbox"/> mmHg	<input type="checkbox"/> kgf/cm ²
<input type="checkbox"/> Pa	<input type="checkbox"/> kPa
<input type="checkbox"/> MPa	
Calibration range/output	
Low range value _____ [pressure engineering unit] (LRV):	
Upper range value _____ [pressure engineering unit] (URV):	
Display	
1st value display ¹ <input type="checkbox"/> Main value	2nd value display ¹ <input type="checkbox"/> None (Default)
¹ Depending on sensor and communication variant	
Damping	
Damping: _____ sec (Default 2 sec)	

 Smallest calibratable span (preset at the factory) →  9 ff.

PROCESS AUTOMATION – PROTECTING YOUR PROCESS



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