Differential pressure gauge
For the process industry, all-metal media chamber
Models 732.31, 733.31, 732.51 and 733.51

For further approvals,
see page 8

Configurator

Standard articles

Applications

- For gaseous and liquid aggressive media that are not highly viscous or crystallising, also in aggressive environments
- Pump monitoring and control
- Filter monitoring
- Level measurement on closed vessels

Special features

- Differential pressure measuring ranges from 0 ... 16 mbar to 0 ... 40 bar or 0 ...10 inH_2O to 0 ... 600 psi
- High operating pressure and high overload safety up to 40 bar [600 psi]
- Models 732.31 and 733.31: Case with safety level “S3” per EN 837
- All-welded media chamber
- QR code on dial links to instrument-specific information

Differential pressure gauge model 732.51

Description

These differential pressure gauges are made of highly corrosion-resistant stainless steel and feature an all-metal media chamber to ensure long-term leak tightness (no elastomer sealing elements).

A high overload safety is achieved by the all-metal construction and the close-fitting design of the diaphragm measuring element.

The use of high-quality stainless steel materials and the robust design are geared to applications in the chemical and process engineering industries. Thus the instrument is suitable for liquid and gaseous media, also in aggressive environments.

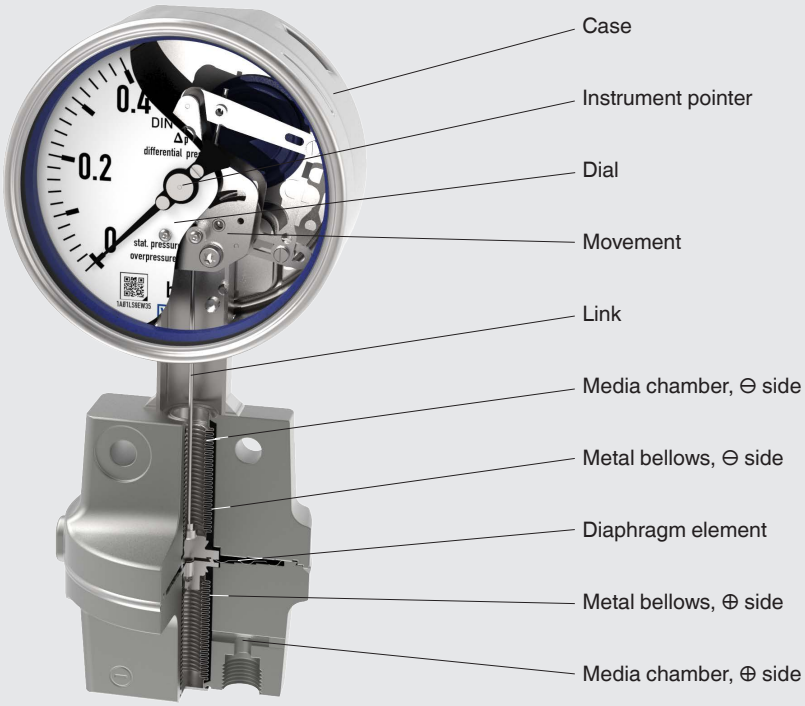
The low-temperature version POLARgauge® allows operation with ambient temperatures down to -70 °C [-94 °F].

Cases with safety level “S3” are fitted with a non-splintering window, a solid baffle wall between measuring system and dial and a blow-out back. In the event of a failure, the operator is protected at the front side, as media or components can only be ejected via the back of the case.

The QR code on the dial allows instrument-specific information such as the serial number, the order number, certificates and other product data to be retrieved from the internet easily and in the long term.

Data sheets showing similar products:
Differential pressure gauge, high overload safety up to 40, 100 or 400 bar; model 732.14; see data sheet PM 07.13
Differential pressure gauge with switch contacts; models DPGS43; see data sheet PV 27.05
Differential pressure gauge with output signal; models DPGT43; see data sheet PV 17.05

Functionality



Design and operating principle

- Media chambers of the ⊕ and ⊖ side are separated by the diaphragm element
- Metal bellows isolate the media chambers from the atmosphere
- The pressure difference between ⊕ and ⊖ side leads to an axial pressure element deflection
- The deflection is transmitted to the movement via the link
- The movement converts the deflection into a pointer rotation

Overload safety

Diaphragm elements have a relatively large actuating force and, due to the annular clamping of the element, they are less sensitive to vibration in comparison with Bourdon tubes. Diaphragm elements can be subject to a higher overload of up to 10 times the full scale value, up to a max. of 40 bar, through load take-up points with metallic seating.

Overview of versions

Model	Case design		With case filling	Low-temperature version POLARgauge®
	Safety level “S3”	Safety level “S1”		
732.31	x			Not selectable
733.31	x		x	Selectable
732.51		x		Not Selectable
733.51		x	x	Selectable

The above-mentioned versions can, optionally, be ordered with Ex approval.

→ For approvals and certificates, see page 8

Specifications

Basic information	
Standard	
EN 837-3	Diaphragm and capsule pressure gauges
DIN 16003	Pressure measuring instruments for differential pressure
→ For information on the “Selection, installation, handling and operation of pressure gauges”, see technical information IN 00.05.	
Further version	■ Oil- and grease-free ■ Oil- and grease-free for oxygen ■ For hydrogen ■ Silicone-free ■ With pre-volume deflagration flame arrester [1] for mounting to zone 0 (EPL Ga); model 910.21; see data sheet AC 91.02
Nominal size (NS)	■ Ø 100 mm [4"] ■ Ø 160 mm [6"]
Window	■ Laminated safety glass ■ Polycarbonate
Connection location	Lower mount (radial) Side connection locations (right, left, front, back) on request.
Case	
Design	■ Safety level “S1” per EN 837-1: With blow-out device ■ Safety level “S3” per EN 837-1: With solid baffle wall and blow-out back
Material	■ Stainless steel 1.4301 (304 SS) ■ Stainless steel 1.4571 (316 Ti)
Case filling [2]	■ Without ■ Glycerine-water mixture ■ Silicone oil Instruments with case filling with compensating valve to vent and reseal case.
Venting of the media chambers [3]	
Span ≤ 0.25 bar [100 inH_2O]	With venting
Span ≥ 0.4 bar [160 inH_2O]	■ Without ■ With venting
Movement	Stainless steel

1) Only for instruments with Ex approval
2) Ingress protection IP65 for instruments with case filling
3) The version for customer-specific spans which are between 0.25 bar [100 inH_2O] und 0.4 bar [160 inH_2O] is defined after an application-specific test.

Measuring element	
Type of measuring element	Diaphragm element
Material [1]	
Span ≤ 0.25 bar [100 inH_2O]	Stainless steel 1.4571 (316 Ti)
Span ≥ 0.4 bar [160 inH_2O]	NiCr alloy (Inconel)

1) The version for customer-specific spans which are between 0.25 bar [100 inH_2O] und 0.4 bar [160 inH_2O] is defined after an application-specific test.

Accuracy specifications	
Accuracy class	■ 1.6 ■ 1.0 ■ 2.5
Zero point setting	
Instruments with case filling [1]	■ Without ■ External setting
Instruments without case filling	■ Without ■ Setting by means of adjustable pointer
Influence of static pressure	
Span ≤ 0.25 bar [100 inH_2O]	±0.3 %/1 bar [14.5 psi]
Span > 0.25 bar [100 inH_2O]	±0.04 %/1 bar [14.5 psi]
Temperature error	On deviation from the reference conditions at the measuring system: ≤ ±0.5 % per 10 °C [≤ ±0.5 % per 18 °F] of full scale value
Reference conditions	
Ambient temperature	+20 °C [+68 °F]

1) Except for model 733.31, setting possible by means of adjustable pointer

Scale ranges

mbar		
0 ... 16 [1]	0 ... 160	0 ... 1,000
0 ... 25	0 ... 250	0 ... 1,100
0 ... 40	0 ... 300	0 ... 1,200
0 ... 60	0 ... 400	0 ... 1,600
0 ... 100	0 ... 600	0 ... 2,500

bar		
0 ... 0.25	0 ... 4	0 ... 20
0 ... 0.4	0 ... 6	0 ... 25
0 ... 0.6	0 ... 7	0 ... 30
0 ... 1	0 ... 10	0 ... 40
0 ... 1.6	0 ... 14	-
0 ... 2.5	0 ... 16	-

kPa		
0 ... 1.6 [1]	0 ... 40	0 ... 700
0 ... 2.5	0 ... 60	0 ... 800
0 ... 4	0 ... 100	0 ... 1,000
0 ... 6	0 ... 160	0 ... 1,400
0 ... 10	0 ... 250	0 ... 1,600
0 ... 16	0 ... 300	0 ... 2,500
0 ... 25	0 ... 400	-
0 ... 30	0 ... 600	-

inH_2O		
0 ... 10 [1]	0 ... 30	0 ... 150
0 ... 15	0 ... 40	0 ... 200
0 ... 20	0 ... 60	0 ... 250
0 ... 25	0 ... 100	-

psi		
0 ... 6	0 ... 60	0 ... 250
0 ... 8	0 ... 100	0 ... 300
0 ... 10	0 ... 150	0 ... 400
0 ... 15	0 ... 160	0 ... 600
0 ... 30	0 ... 200	-

Vacuum and +/- scale ranges

mbar		
-16 ... 0 [1]	-600 ... 0	-50 ... +50
-25 ... 0	-1,000 ... 0	-80 ... +80
-40 ... 0	-1,100 ... 0	-125 ... +125
-60 ... 0	-1,200 ... 0	-200 ... +200
-100 ... 0	-8 ... +8	-300 ... +300
-160 ... 0	-10 ... +15	-500 ... +500
-250 ... 0	-20 ... +20	-600 ... +400
-400 ... 0	-30 ... +30	-1,000 ... +600

psi	
-15 ... 0 inHg	-30 inHg ... +300
-30 ... 0 inHg	-5 ... +5
-30 inHg ... +15	-15 ... +15
-30 inHg ... +30	-30 ... +30
-30 inHg ... +60	-50 ... +50
-30 inHg ... +100	-100 ... +100
-30 inHg ... +160	-150 ... +150
-30 inHg ... +200	-

bar		
-0.6 ... 0	-1 ... +1.5	-1 ... +9
-1 ... 0	-1 ... +3	-1 ... +15
-1 ... +0.6	-1 ... +5	-1 ... +24

kPa		
-60 ... 0	-15 ... +15	-100 ... +500
-100 ... 0	-20 ... +40	-100 ... +700
-2 ... +4	-100 ... +60	-100 ... +900
-4 ... +6	-100 ... +100	-100 ... +1,000
-6 ... +4	-100 ... +150	-100 ... +1,500
-6 ... +10	-100 ... +200	-100 ... +2,400
-10 ... +6	-100 ... +300	-
-10 ... +15	-100 ... +400	-

1) Scale angle approx. 180°, with all other scale ranges the scale angle is usually 270°.

→ Other scale ranges on request

Further details on: scale ranges		
Unit	■ mbar ■ bar ■ psi ■ kPa ■ MPa ■ mmH_2O ■ inH_2O ■ kg/cm^2	
	Other units on request	
Overload safety and max. operating pressure (static pressure)	The possibility of selection depends on the span. → See separate table on page 6	
Dial		
Scale layout	■ Single scale ■ Dual scale	
Scale colour	Single scale	Black
	Dual scale	Black/red
Material	Aluminium	
Customer-specific version	■ Without ■ With special scale, e.g. linear pressure or square root incrementation	
	Other scales, e.g. with red mark, circular arcs or circular sectors, on request → Alternatively, adhesive label set for red and green circular arcs; see data sheet AC 08.03	

Further details on: scale ranges		
Pointer		
Instrument pointer	With case filling	Standard pointer, aluminium, black
	Without case filling	Adjustable pointer, aluminium, black
Mark pointer/drag pointer	■ Without ■ Red mark pointer on window, adjustable ■ Mark pointer on bayonet ring, adjustable ■ Red drag pointer on window, adjustable	
Pointer stop pin	■ Without ■ At 6 o'clock	

Overload safety and max. operating pressure (static pressure)	
Span [1]	**Overload safety / max. operating pressure (static) Either side max.**
16 ... 40 mbar [10 ... 16 inH_2O]	■ 2.5 bar [36 psi] / 2.5 bar [36 psi] ■ 2.5 bar [36 psi] / 6 bar [87 psi] [2]
60 ... 250 mbar [25 ... 100 inH_2O]	■ 2.5 bar [36 psi] / 6 bar [87 psi] ■ 6 bar [87 psi] / 10 bar [145 psi] [2]
400 mbar [6 psi]	■ 4 bar [58 psi] / 25 bar [363 psi] ■ 40 bar [600 psi] / 40 bar [600 psi] [2]
0.6 bar [10 psi]	■ 6 bar [87 psi] / 25 bar [363 psi] ■ 40 bar [600 psi] / 40 bar [600 psi] [2]
1 bar [15 psi]	■ 10 bar [145 psi] / 25 bar [363 psi] ■ 40 bar [600 psi] / 40 bar [600 psi] [2]
1.6 bar [30 psi]	■ 16 bar [232 psi] / 25 bar [363 psi] ■ 40 bar [600 psi] / 40 bar [600 psi] [2]
2.5 ... 40 bar [60 ... 600 psi]	■ 25 bar [363 psi] / 25 bar [363 psi] ■ 40 bar [600 psi] / 40 bar [600 psi] [2]

1) Values for customer-specific spans are defined after an application-specific test.
2) Version with higher values for overload safety / max. operating pressure (static) selectable.

Process connection		
Standard	■ EN 837-1 ■ ANSI/B1.20.1	
	→ For valve manifolds for an instrument hook-up, see “Accessories and spare parts”.	
Size		
EN 837-1	■ 2 x G ¼, female thread ■ 2 x G ½ B, male thread	
ANSI/B1.20.1	■ 2 x ¼ NPT, female thread ■ 2 x ½ NPT, male thread	
Restrictor	■ Without ■ Ø 0.6 mm [0.024"], stainless steel ■ Ø 0.3 mm [0.012"], stainless steel	
Material (wetted)		
Media chambers with process connection	Stainless steel 1.4571 (316 Ti)	
Venting of the media chambers	Stainless steel 1.4571 (316 Ti)	
Diaphragm element [1]	Span ≤ 0.25 bar [100 inH_2O]	Stainless steel 1.4571 (316 Ti)
	Span ≥ 0.4 bar [160 inH_2O]	NiCr alloy (Inconel)
Bellows	Stainless steel 1.4571 (316 Ti)	

1) The version for customer-specific spans which are between 0.25 bar [100 inH_2O] und 0.4 bar [160 inH_2O] is defined after an application-specific test.

→ Other process connections on request

Operating conditions	
Medium temperature range	■ -20 ... +100 °C [-4 ... +212 °F] ■ -20 ... +120 °C [-4 ... +248 °F] ■ -20 ... +150 °C [-4 ... +284 °F]
Ambient temperature range	■ -20 ... +60 °C [-4 ... +140 °F] ■ -40 ... +60 °C [-40 ... +140 °F] 1) ■ -70 ... +60 °C [-94 ... +140 °F] for low-temperature version POLARgauge® 1)
Storage temperature range	-20 ... +60 °C [-4 ... 140 °F]
Pressure limitation	
Steady	Full scale value
Fluctuating	0.9 x full scale value
Ingress protection per IEC/EN 60529	■ IP54 ■ IP65 2) ■ IP66

1) Only selectable in combination with silicone oil case filling
2) Ingress protection IP65 for instruments with case filling

Approvals

Logo	Description	Region
CE	**EU declaration of conformity** Pressure equipment directive PS > 200 bar, module A, pressure accessory	European Union

Optional approvals

Logo	Description	Region
CE Ex	**EU declaration of conformity** ATEX directive Hazardous areas Gas II 2G Ex h IIC T6 ... T1 Gb X Dust II 2D Ex h IIIC T85 °C T450 °C Db X	European Union
EAC Ex	**EAC** Hazardous areas	Eurasian Economic Community
	Ex Ukraine Hazardous areas	Ukraine
	PAC Kazakhstan Metrology, measurement technology	Kazakhstan
-	**MChS** Permission for commissioning	Kazakhstan
-	**PAC Ukraine** Metrology, measurement technology	Ukraine
	PAC Usbekistan Metrologie, Messtechnik	Usbekistan
-	**PAC China** Metrology, measurement technology	China
-	**CRN** Safety (e.g. electr. safety, overpressure, ...)	Canada

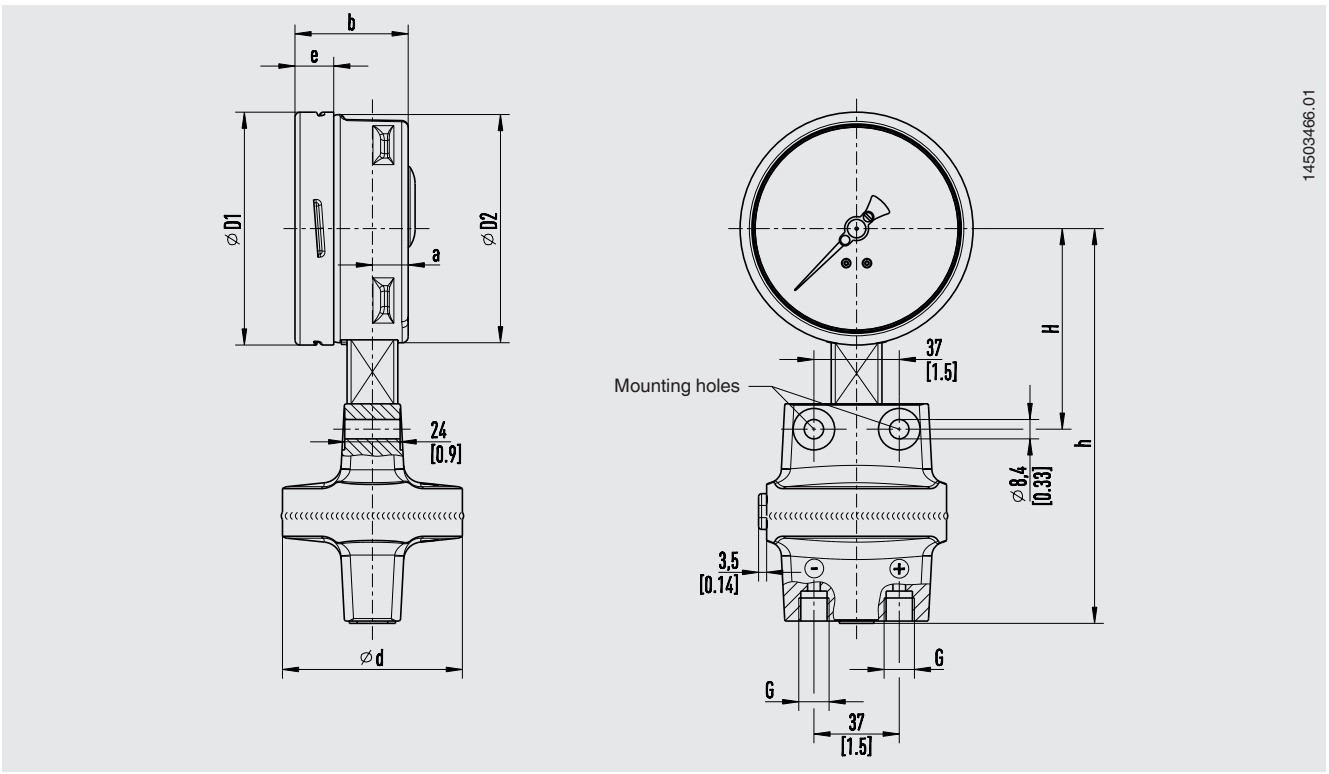
Certificates (option)

Certificates	
Certificates	■ 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, indication accuracy) ■ 3.1 inspection certificate per EN 10204 (e.g. material proof for wetted metal parts, indication accuracy)
Recommended calibration interval	1 year (dependent on conditions of use)

→ For approvals and certificates, see website

Dimensions in mm [in]

Process connection: 2 x G ¼, female thread



Models 732.31 and 733.31

NS	Span	G	Dimensions in mm [in]								Weight in kg [lb]
			a	b	D_1	D_2	d	e	h ±1	H	
100 [4"]	≤ 0.25 bar [100 inH_2O]	G ¼	23.5 [0.96]	59 [2.32]	101 [3.98]	99 [3.90]	140 [5.51]	17.5 [0.69]	160 [6.30]	90 [3.54]	2.70 [5.95]
	≥ 0.4 bar [160 inH_2O]	G ¼	23.5 [0.96]	59 [2.32]	101 [3.98]	99 [3.90]	78 [3.07]	17.5 [0.69]	170 [6.69]	87 [3.43]	1.90 [4.12]
160 [6"]	≤ 0.25 bar [100 inH_2O]	G ¼	23.5 [0.96]	59 [2.32]	161 [6.34]	159 [6.26]	140 [5.51]	17.5 [0.69]	190 [7.48]	120 [4.72]	3.40 [7.5]
	≥ 0.4 bar [160 inH_2O]	G ¼	23.5 [0.96]	59 [2.32]	161 [6.34]	159 [6.26]	78 [3.07]	17.5 [0.69]	200 [7.87]	117 [4.61]	2.40 [5.29]

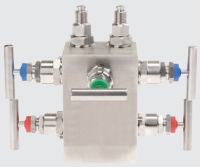
1) The version for customer-specific spans which are between 0.25 bar [100 inH_2O] und 0.4 bar [160 inH_2O] is defined after an application-specific test.

Models 732.51 and 733.51

NS	Span	G	Dimensions in mm [in]								Weight in kg [lb]
			a	b	D_1	D_2	d	e	h ±1	H	
100 [4"]	≤ 0.25 bar [100 inH_2O]	G ¼	15.5 [0.61]	49.5 [1.95]	101 [3.98]	99 [3.90]	140 [5.51]	17.5 [0.69]	160 [6.30]	90 [3.54]	2.70 [5.95]
	≥ 0.4 bar [160 inH_2O]	G ¼	15.5 [0.61]	49.5 [1.95]	101 [3.98]	99 [3.90]	78 [3.07]	17.5 [0.69]	170 [6.69]	87 [3.43]	1.90 [4.12]
160 [6"]	≤ 0.25 bar [100 inH_2O]	G ¼	15.5 [0.61]	49.5 [1.95]	161 [6.34]	159 [6.26]	140 [5.51]	17.5 [0.69]	190 [7.48]	120 [4.72]	3.40 [7.5]
	≥ 0.4 bar [160 inH_2O]	G ¼	15.5 [0.61]	49.5 [1.95]	161 [6.34]	159 [6.26]	78 [3.07]	17.5 [0.69]	200 [7.87]	117 [4.61]	2.40 [5.29]

1) The version for customer-specific spans which are between 0.25 bar [100 inH_2O] und 0.4 bar [160 inH_2O] is defined after an application-specific test.

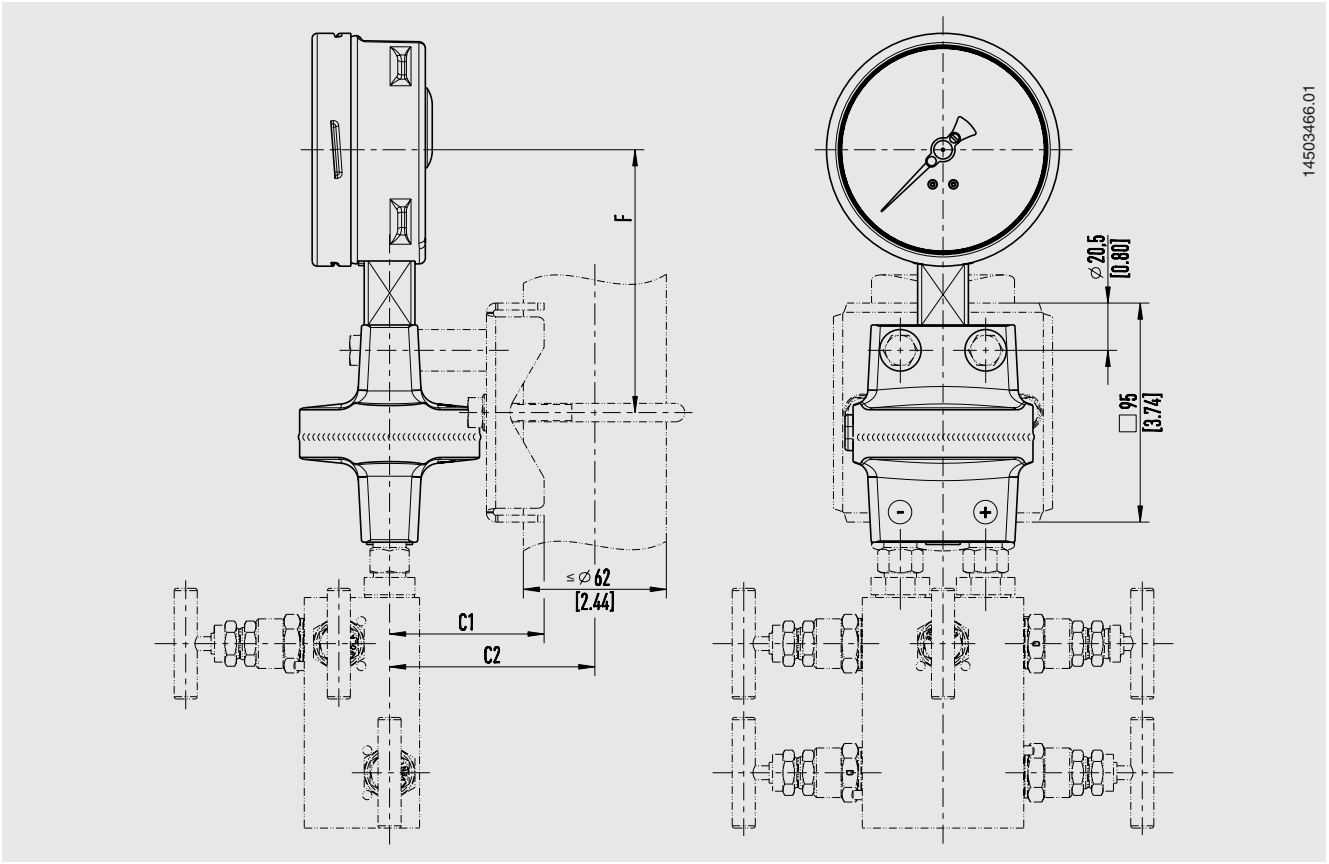
Accessories and spare parts

Model		Description	Order number
	**910.33**	Adhesive label set for red and green circular arcs → See data sheet AC 08.03	-
		NS 100 [4"]	14238945
		NS 160 [6"]	14228352
	**910.17**	Sealings → See data sheet AC 09.08	On request
	**IV304**	3-valve manifold Process connection / instrument connection: 2 x G ½, male thread / 2 x G ¼, male nut	37105018
		3-valve manifold Process connection / instrument connection: 2 x ½ NPT, male thread / 2 x G ¼, male nut	48752900
	**IV504**	5-valve manifold Process connection / instrument connection / vent connection: 2 x G ½, male thread / 2 x G ¼, male nut / 2 x G ⅛, female thread	2020389
		5-valve manifold Process connection / instrument connection / vent connection: 2 x ½ NPT, male thread / 2 x G ¼, male nut / 2 x G ⅛, female thread	81640336
		Valve manifolds for differential pressure measuring instruments → See data sheet AC 09.23	On request
	-	Instrument mounting bracket for wall or pipe mounting Steel, silver painted	1282999
		Instrument mounting bracket for wall or pipe mounting Stainless steel	1473700

Accessories

Dimensions in mm [in]

Representation with mounting bracket for wall or pipe mounting and fitted 5-valve manifold



NS	Span [1]	Dimensions in mm [in]		
		F	C1	C2
100 [4"]	≤ 0.25 bar [100 inH_2O]	114 [4.49]	96 [3.78]	118 [4.65]
	≥ 0.4 bar [160 inH_2O]	114 [4.49]	66 [2.60]	88 [3.46]
160 [6"]	≤ 0.25 bar [100 inH_2O]	144 [5.67]	96 [3.78]	118 [4.65]
	≥ 0.4 bar [160 inH_2O]	144 [5.67]	66 [2.60]	88 [3.46]

1) The version for customer-specific spans which are between 0.25 bar [100 inH_2O] und 0.4 bar [160 inH_2O] is defined after an application-specific test.

Ordering information

Model / Nominal size / Scale range / Scale layout (linear pressure or square root incrementation) / Max. operating pressure (static pressure) ... bar / Process connection / Connection location / Options

Standard articles

Konfigurator

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