

PitoMaster FPD550

Compact averaging pitot flowmeter

Economical flow metering solutions for gases, liquids and steam



Compact flowmeter with integral transmitter, manifold and temperature element

- for volumetric- or mass-flow metering; available for pipe sizes DN100 to DN600 (4 to 24 in.)
- problems caused by impulse piping eliminated by mounting the transmitter and manifold directly onto the meter
- complete with manifold and ABB DP or Multivariable transmitter

Unique profile shape

- offers high flow turndown

Low permanent pressure loss

- low energy consumption and running costs
- reduced carbon footprint

Dual averaging feature

- gives improved accuracy with asymmetric flow profiles

Factory acceptance report

- supplied with report detailing results of critical inspection checks, plus certification data

PitoMaster FPD550

Compact averaging pitot flowmeter

PitoMaster – compact averaging pitot tube flowmeter

PitoMaster is an averaging pitot tube-based flowmeter designed to greatly simplify specification, installation and commissioning.

PitoMaster is a one-piece flowmeter assembly with the following features:

- Averaging Pitot tube assembly with choice of pipe sizes from DN100 to DN 600 (4 to 24 in.)
- Threaded or flanged pipe connection
- Integral 3-valve instrument manifold (optional 5-valve manifold available)
- Optional integral mineral-insulated temperature element for corrected volume / mass calculations; optional integral temperature transmitter
- Integral DP or multivariable transmitter, factory fitted to manifold
- Fully leak tested

Benefits

PitoMaster avoids many of the difficulties involved in the sizing, selection, procurement, installation and commissioning of conventional DP flowmeter installations.

- With all the major components in one assembly, PitoMaster eliminates the problems of sourcing multiple components. It provides large savings in cost and time due to the simplicity of purchasing, design and installation.
- Integral transmitter and manifold with compact tapping connections eliminates the need to run and connect impulse piping and offers:
 - reduced possibility of impulse line blockage
 - reduced number of potential leakage points
- The assembly is pressure-tested in the factory, ensuring the connections between the tapping points and the transmitter are completely free of leaks.
- The 'Plugged Impulse Line Detection' (PILD) feature generates a warning via HART communication if either or both of the impulse lines become fully or partially obstructed (for example, by foreign material or ice). The meter can also be configured to drive the analog output signal to the 'Alarm current'.



- New 'through-the-glass' (TTG) keypad technology enables configuration without the need to remove the transmitter covers, even in hazardous areas.
- Factory configuration saves the user time during commissioning and ensures that the flowmeter output span truly matches that of the application flowrate.

Versions

PitoMaster is available in two versions:

PitoMaster V

— a compact averaging pitot tube flowmeter for general purpose measurement of liquids, gases and steam in volumetric units (actual volume). It uses the ABB 266 DSH transmitter and provides a flow rate and total display with an output of 4 to 20 mA proportional to the actual volume flowrate.

PitoMaster V has a stainless steel body and an alloy, 304 stainless steel or 316 stainless steel transmitter case.

PitoMaster M

— a compact averaging pitot tube flowmeter, giving measurement directly in mass- or corrected volume-units for liquids and steam. Gas flow measurement is directly in reduced volume units. It uses the ABB 267CS multivariable transmitter to measure DP, temperature and pressure, providing a flowrate and total display and transmits a 4 to 20 mA signal proportional to the mass or corrected volume flowrate.

PitoMaster M has a stainless steel body, an aluminium alloy transmitter case (optionally stainless steel) and an optional internal temperature element.

DP span limits

For both versions there are 6 DP sensor ranges available. For optimum accuracy refer to Table 1 and select the sensor so that the full scale DP is in the shaded area and is as close as possible to the maximum range of the sensor.

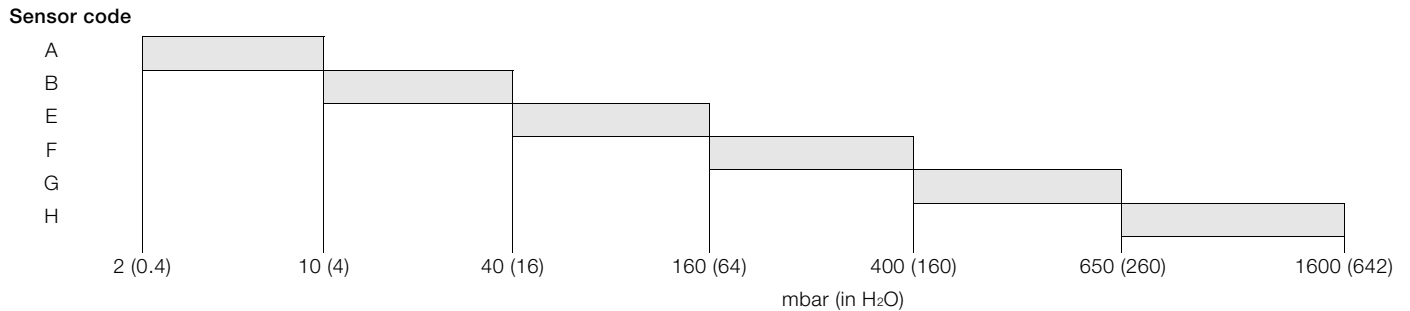


Table 1: PitoMaster V and PitoMaster M – full scale DP application range

PitoMaster FPD550

Compact averaging pitot flowmeter

Specification – general

Fluids

Liquids, gases and saturated steam

Line sizes

100 to 600 mm (4 to 24 in.)

Probe

13 or 25 mm (1/2 or 1 in.) diameter probe with optional end support

Process connection

- Threaded BSPT or NPT
- Flanged DN25 (1 in.) or DN 40 (1 1/2 in.) to ANSI 150RF, 300RF or NP10/16, NP25/40

Construction materials

Probe

316 stainless steel

Manifold

316 stainless steel

Manifold seals

PTFE

Flange

316 stainless steel

Weld adaptor

A105 carbon steel; 316 stainless steel

Process isolating diaphragms

Hastelloy C-276™

(AISI 316 L stainless steel gold plated for Hydrogen service) packing

Process flanges, adapters, plugs and drain / vent valves

AISI 316 L stainless steel

Sensor fill fluid

- Silicone oil
- Inert fill (Halocarbon™ 4.2 or Galden™)

Manifold

Integral 3-valve manifold (optional 5-valve manifold)

Output signal

- Two-wire, 4 to 20 mA, selected for square-root output
- Low flow cut-off facility
- HART® communication provides digital process variable (% , mA or engineering units) superimposed on 4 to 20 mA signal, with protocol based on Bell202 FSK standard
- Optional Profibus PA, Foundation Fieldbus or Modbus communications

Accuracy

Uncalibrated

PitoMaster V:

- ±1.4 % of actual flow

PitoMaster M:

- ±1.15 % of actual flow

Flow range

8:1

Maximum pressure

50 Bar @ 38 °C (725 psi @ 100 °F)

Maximum process temperature

180 °C (356 °F)

At the transmitter sensor

Silicone oil filled sensor F to H:

— -40 to 121 °C (-40 to 250 °F)

Silicone oil filled sensor A, B, E:

— -25 to 121 °C (-13 to 250 °F)

Inert (Galden) filled sensor F to H:

— -20 to 100 °C (-4 to 212 °F)

Inert (Galden) filled sensor E:

— -10 to 100 °C (14 to 212 °F)

Inert (Halocarbon) filled sensor F to H:

— -20 to 100 °C (-4 to 212 °F)

Inert (Halocarbon) filled sensor E:

— -10 to 100 °C (14 to 212 °F)

IMPORTANT

For hazardous atmosphere applications see the temperature range specified on the certificate / approval relevant to the type of protection

Ambient Temperature Limits

Note. LCD display may not be clearly readable below -20 °C (-4 °F) or above 70 °C (158 °F)

PitoMaster V

Up to -40 and 85 °C (-40 and 185 °F)

LCD display limits:

— -40 and 85 °C (-40 and 185 °F)

PitoMaster M

Transmitter:

— -40 to 85 °C (-40 to 185 °F)

LCD display limits:

— -20 to 70 °C (-4 to 158 °F)

All above may be further restricted depending on individual sensor capsule filling fluid

Storage limits

-50 to 85 °C (-58 to 185 °F)

LCD integral display:

— -40 to 85 °C (-40 to 185 °F)

Integral display

PitoMaster V

— Wide screen LCD, 128 x 64 pixel, 52.5 x 27.2 mm (2.06 x 1.07 in.) dot matrix

— Multi language

— 4 keys for flowmeter configuration and management

— Totalized and instantaneous flow indication

— Display can also indicate diagnostic messages and provides configuration facilities

PitoMaster M

19-segment alphanumeric display (2-line, 6-character) with additional bar chart display. Back illumination optional.

PitoMaster FPD550

Compact averaging pitot flowmeter

Environmental limits

Electromagnetic compatibility (EMC)

Complies with EN 61326 and NAMUR NE-21

Surge immunity level (with surge protector)

4 kV (according to IEC 1000-4-5 EN 61000-4-5)

Pressure equipment directive (PED)

Complies with 97/23/EEC Category III Module H

Humidity

Relative humidity:

- up to 100 %

Condensing, icing:

- admissible

Vibration resistance

Accelerations up to 2 g at frequency up to 1000 Hz (according to IEC 60068-2-6)

Shock resistance

Acceleration:

- 50 g

Duration:

- 11 ms (according to IEC 60068-2-27)

Wet and dust-laden atmospheres

The meter is dust and sand tight and protected against immersion effects as defined by EN 60529 (1989) to IP 67 (IP 68 on request) or by NEMA to 4X or by JIS to C0920. IP65 with Harting Han connector.

Hazardous atmospheres

With or without integral display

Combined ATEX code EW (= E1 + E2 + E3 below)

Combined ATEX and FM Approvals code EN

(= E1 + E2 + E3 + E4 + E6 below)

Intrinsic safety:

- ATEX Europe (code E1)
- II 1/2 G Ex ia IIC T6/T5/T4; IP67
- II 1 D Ex iaD 20 T85 °C
- II 1/2 D Ex iaD 21 T85 °C; IP67

Explosion proof:

- ATEX Europe (code E2)
- II 1/2 G Ex d IIC T6
- II 1/2 D Ex tD A21 T85 °C (–50 °C • Ta •+75 °C); IP67

Type 'N':

- ATEX Europe (code E3) type examination
- II 3 G Ex nL IIC T6/T5/T4
- II 3 D Ex tD A22 T85 °C; IP67

FM Approvals US (code E6) and Canada (code E4)

Explosion proof (US):

- Class I, Div. 1, Groups A, B, C, D

Explosion proof (Canada):

- Class I, Div. 1, Groups B, C, D

Dust ignition proof:

- Class II, Div. 1, Groups E, F, G

Suitable for:

- Class II, Div. 2, Groups F, G; Class III, Div.1, 2

Non-incendive:

- Class I, Div. 2, Groups A, B, C, D

Intrinsically safe:

- Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G
- Class I, Zone 0 AEx ia IIC T6/T4, Zone 0 (FM US)
- Class I, Zone 0 Ex ia IIC T6/T4, Zone 0 (FM Canada)

FM Approvals US

Intrinsically safe (code EA):

- Class I; Division 1; Groups A, B, C, D;
- Class I; Zone 0; Group IIC; AEx ia IIC

Explosion proof (code EB):

- Class I, Division 1, Groups A, B, C, D;
- Class II/III, Division 1, Groups E, F, G

Refer to certificates for ambient temperature ranges (within the limits –50 to 85 °C) related to the different temperature classes

CSA Approvals Canada (code EE):

Explosion proof:

- Class I, Division 1, Groups B, C, D;
- Class II/III, Division 1, Groups E, F, G

Weights

Typical product weights in kg (lbs) excluding pipe fittings and end supports

Size mm (in.)	Threaded	Flanged 1½ in. ANSI 150lb	Flanged 1½ in. ANSI 300lb	Flanged DN40 PN10/16	Flanged DN40 PN25
100 (4)	10 (22)	12 (26.5)	13 (28.7)	12 (26.5)	12 (26.5)
150 (6)	10 (22)	12 (26.5)	13 (28.7)	13 (28.7)	13 (28.7)
200 (8)	10 (22)	12 (26.5)	13 (28.7)	13 (28.7)	13 (28.7)
250 (10)	11 (24.3)	12 (26.5)	14 (30.9)	13 (28.7)	13 (28.7)
300 (12)	11 (24.3)	12 (26.5)	14 (30.9)	13 (28.7)	13 (28.7)
350 (14)	11 (24.3)	12 (26.5)	14 (30.9)	13 (28.7)	13 (28.7)
400 (16)	11 (24.3)	12 (26.5)	14 (30.9)	13 (28.7)	13 (28.7)
450 (18)	11 (24.3)	13 (28.7)	14 (30.9)	13 (28.7)	13 (28.7)
500 (20)	11 (24.3)	13 (28.7)	14 (30.9)	13 (28.7)	13 (28.7)
600 (24)	11 (24.3)	13 (28.7)	14 (30.9)	13 (28.7)	13 (28.7)

Weight adders:

5 valve manifold +1 kg (2.2 lbs)

PitoMaster V design level 2 (SS) +2 kg (4.4 lbs)

PitoMaster M design level 1 (SS) +1 kg (2.2 lbs)

DP span

Sensor code	Upper range limit (URL)	Minimum span
A	1 kPa	0.05 kPa
	10 mbar	0.5 mbar
	4 in. H ₂ O	0.2 in. H ₂ O
B	4 kPa	0.2 kPa
	40 mbar	1.4 mbar
	16 in. H ₂ O	0.56 in. H ₂ O
E	16 kPa	0.54 kPa
	160 mbar	1.6 mbar
	64 in. H ₂ O	0.65 in. H ₂ O
F	40 kPa	0.4 kPa
	400 mbar	4 mbar
	160 in. H ₂ O	1.6 in. H ₂ O
G	65 kPa	0.65 kPa
	650 mbar	6.5 mbar
	260 in. H ₂ O	2.6 in. H ₂ O
H	160 kPa	1.6 kPa
	1600 mbar	16 mbar
	642 in. H ₂ O	6.4 in. H ₂ O

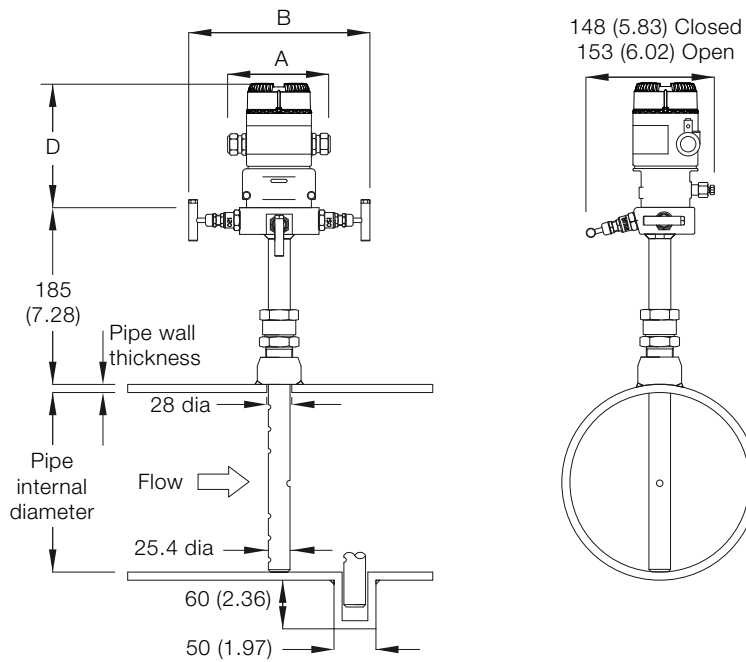
PitoMaster FPD550

Compact averaging pitot flowmeter

Dimensions – PitoMaster V

Design level 1 – threaded process connection

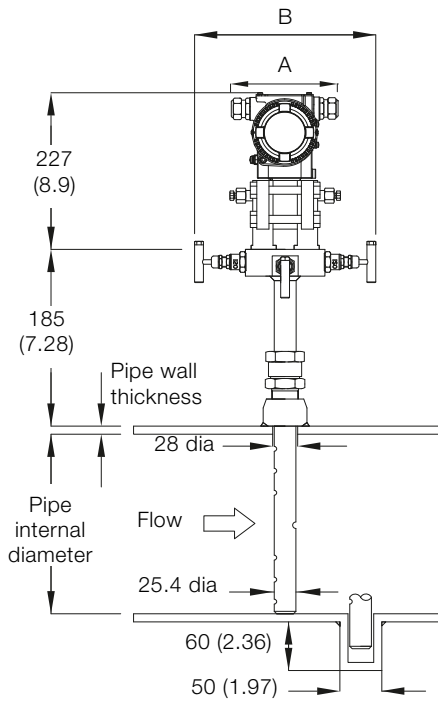
Dimensions in mm (in.)



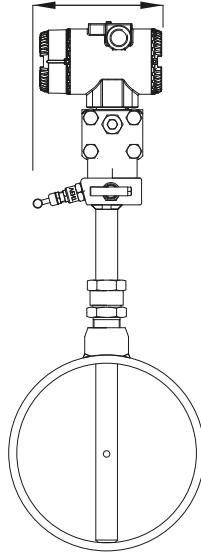
A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed
		212 (8.35) open
	5-valve	252 (9.92) closed
		269 (10.59) open
D	153 (6.0) with display	
	124 (4.9) without display	

Design level 2 – threaded process connection

Dimensions in mm (in.)



145 (5.71) Closed
151 (5.94) Open



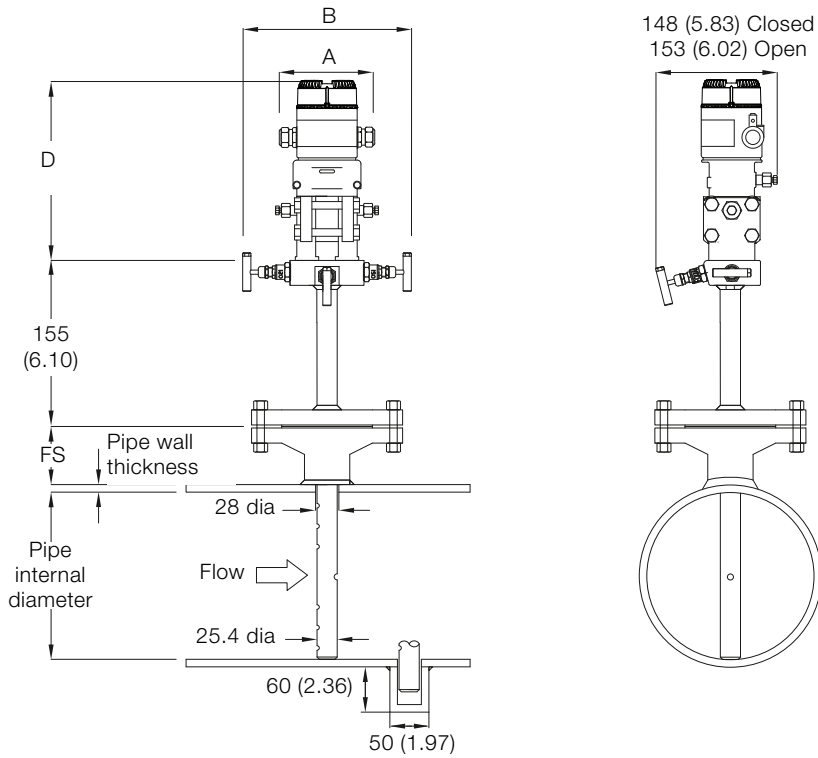
A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open

PitoMaster FPD550

Compact averaging pitot flowmeter

Design level 1 – flanged process connection

Dimensions in mm (in.)

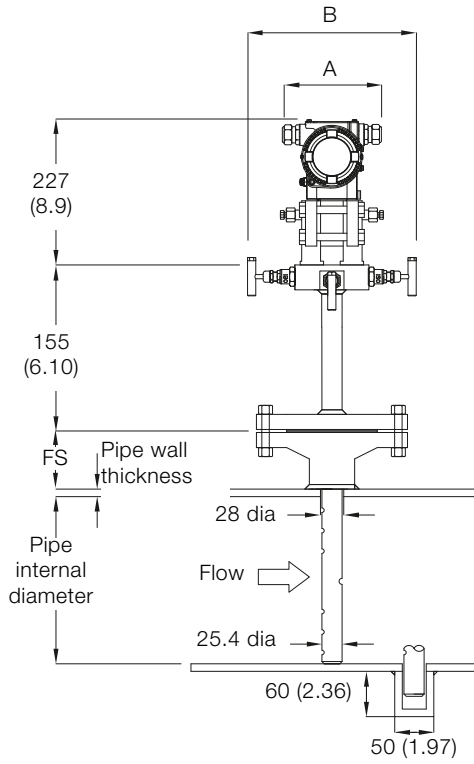


A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open
D	153 (6.0) with display	
	124 (4.9) without display	

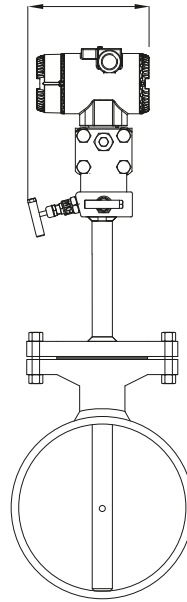
Flange Rating	150 lb	300 lb	PN10 PN16	PN25
FS	95 (3.74)	100 (3.94)	78 (3.07)	78 (3.07)

Design level 2 – flanged process connection

Dimensions in mm (in.)



145 (5.71) Closed
151 (5.94) Open



A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open

Flange Rating	150 lb	300 lb	PN10 PN16	PN25
FS	95 (3.74)	100 (3.94)	78 (3.07)	78 (3.07)

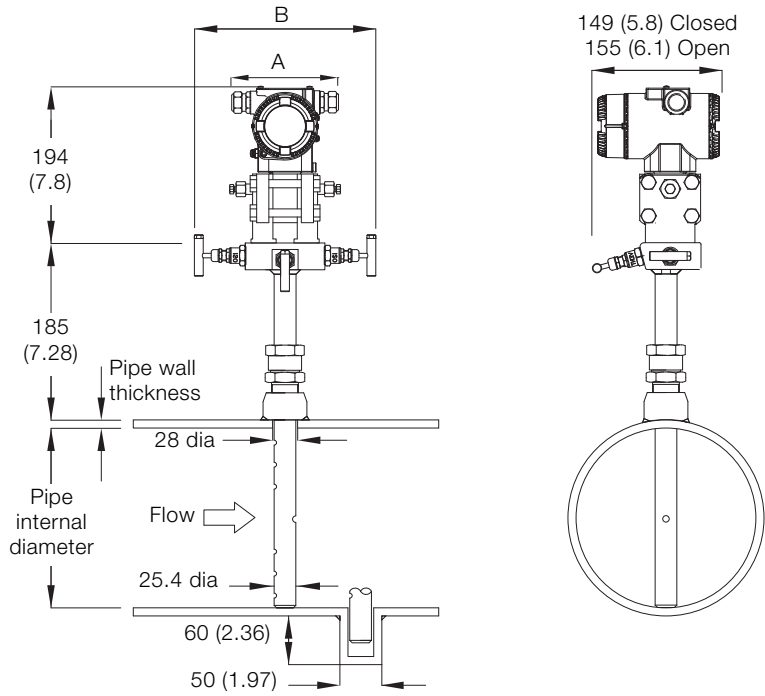
PitoMaster FPD550

Compact averaging pitot flowmeter

Dimensions – PitoMaster M

Design level 1 – threaded process connection

Dimensions in mm (in.)

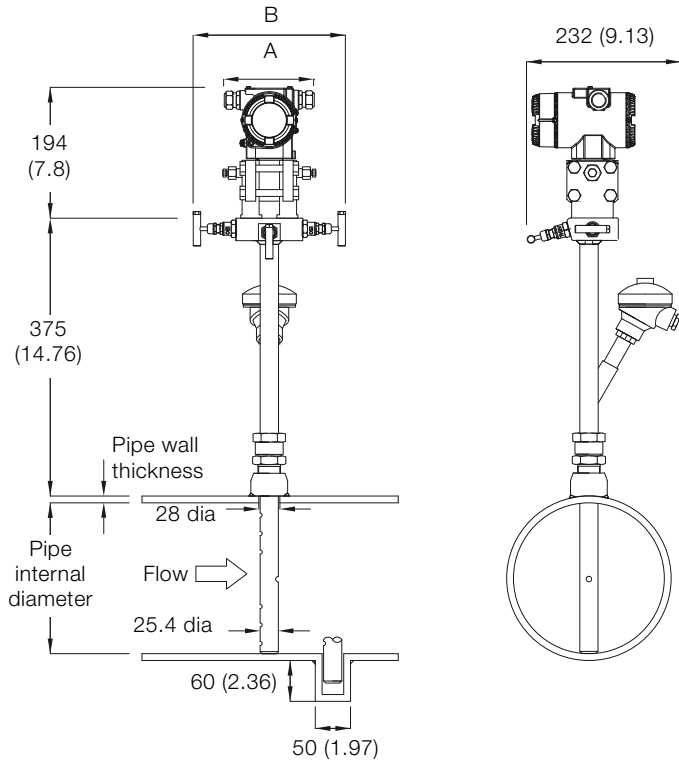


149 (5.8) Closed
155 (6.1) Open

A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open

Design level 1 – threaded process connection and integral temperature measurement

Dimensions in mm (in.)



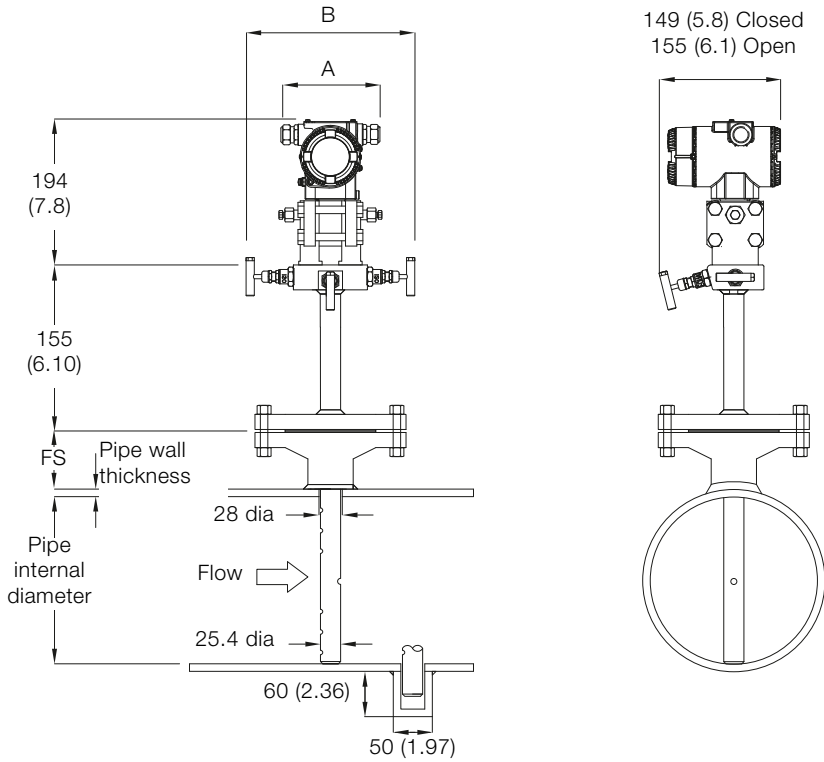
A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open

PitoMaster FPD550

Compact averaging pitot flowmeter

Design level 1 – flanged process connection

Dimensions in mm (in.)

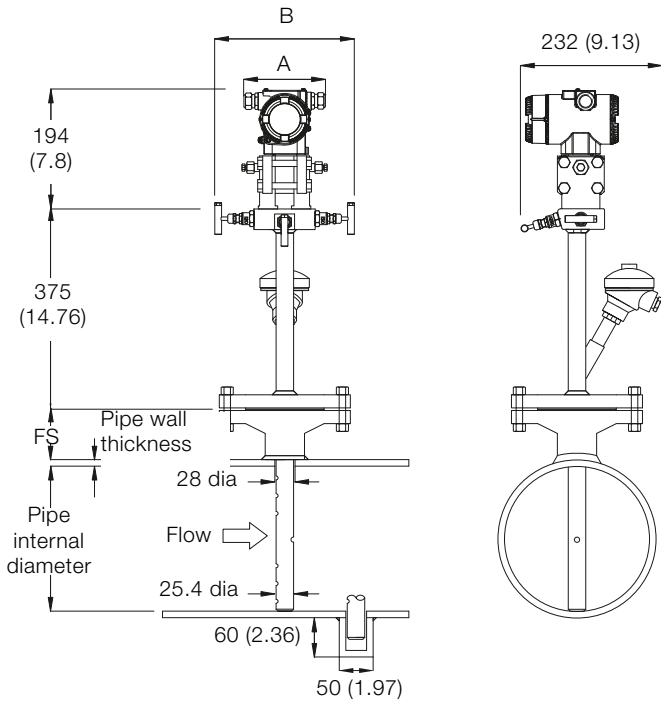


A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open

Flange Rating	150 lb	300 lb	PN10 PN16	PN25
FS	95 (3.74)	100 (3.94)	78 (3.07)	78 (3.07)

Design level 1 – flanged process connection and integral temperature measurement

Dimensions in mm (in.)



A	154 (6.06) over glands	
B	3-valve	202 (7.95) closed 212 (8.35) open
	5-valve	252 (9.92) closed 269 (10.59) open

Flange Rating	150 lb	300 lb	PN10 PN16	PN25
FS	95 (3.74)	100 (3.94)	78 (3.07)	78 (3.07)

PitoMaster FPD550

Compact averaging pitot flowmeter

Ordering information

		Main code										Optional code							
PitoMaster compact averaging pitot flowmeter		FPD550	XX	XXX	X	X	XX	XX	X	X	X	X	X	X	XX	XX	XX	XX	XX
Model and design level																			
PitoMaster V, for volume flow, design level 1 (364DS)			V1																
PitoMaster V, for volume flow, design level 2 (266DSH)			V2																
PitoMaster M, for mass flow, design level 1 (267CS)			M1																
Meter size (nominal inside diameter) specify actual id within range...																			
100 mm (4 in.)		88 ... 111 mm (3.5 ... 4.4 in.)	100																
125 mm (5 in.)		112 ... 137 mm (4.4 ... 5.4 in.)	125																
150 mm (6 in.)		138 ... 174 mm (5.4 ... 6.9 in.)	150																
200 mm (8 in.)		175 ... 224 mm (6.9 ... 8.8 in.)	200																
250 mm (10 in.)		225 ... 274 mm (5.4 ... 6.9 in.)	250																
300 mm (12 in.)		275 ... 324 mm (3.5 ... 4.5 in.)	300																
350 mm (14 in.)		325 ... 374 mm (4.5 ... 5.5 in.)	350																
400 mm (16 in.)		375 ... 424 mm (5.5 ... 6.9 in.)	400																
450 mm (18 in.)		425 ... 474 mm (5.4 ... 6.9 in.)	450																
500 mm (20 in.)		475 ... 549 mm (18.5 ... 21.5 in.)	500																
600 mm (24 in.)		550 ... 674 mm (21.5 ... 26.5 in.)	600																
Other			999																
Fluid																			
Liquid			L																
Gas			G																
Steam			S																
Fitting material																			
A105 CS pipe fitting			1																
316L SS fitting			6																
Process connection type																			
Threaded, 1 in. BSPT process connection with weld fitting			B3																
Threaded, 1 in. BSPT process connection with weld fitting and weld cup end support			B4																
Threaded, 1 in. NPT process connection with weld fitting			N3																
Threaded, 1 in. NPT process connection with weld fitting and weld cup end support			N4																
Flanged RF process connection DN 40 (1½ in.), with flanged stand-off, nuts, bolts and gaskets			F3																
Flanged RF process connection DN 40 (1½ in.), with flanged stand-off, nuts, bolts, gaskets and weld cup end support			F4																

Continued on next page ...

PitoMaster compact averaging pitot flowmeter

Main code											
FPD550	XX	XXX	X	X	XX	XX	X	X	X	X	XX
See page 16											

Optional code				
XX	XX	XX	XX	XX
See page 19				

Pressure rating											
Threaded connection											Y0
ASME CL 150											A1
ASME CL 300											A3
PN 10 / 16											D1
PN 25 / 40											D3
Pipeline orientation											
Horizontal											H
Vertical											V
Manifold											
Integral 3-valve manifold											3
Integral 5-valve manifold											5
DP span limits											
0.05 ... 1 kPa / 0.5 ... 10 mbar / 0.2 ... 4 in. H ₂ O											A
0.14 ... 4 kPa / 1.4 ... 40 mbar / 0.56 ... 16 in. H ₂ O											B
0.2 ... 6 kPa / 2 ... 60 mbar / 0.8 ... 24 in. H ₂ O											C
0.16 ... 16 kPa / 1.6 ... 160 mbar / 0.64 ... 64 in. H ₂ O											E
0.27 ... 16 kPa / 2.7 ... 160 mbar / 1.08 ... 64 in. H ₂ O											E
0.4 ... 40 kPa / 4 ... 400 mbar / 1.6 ... 160 in. H ₂ O											F
0.65 ... 65 kPa / 6.5 ... 650 mbar / 2.6 ... 260 in. H ₂ O											G
1.6 ... 160 kPa / 16 ... 1600 mbar / 6.4 ... 642 in. H ₂ O											H
2.5 ... 250 kPa / 25 ... 2500 mbar / 10 ... 1000 in. H ₂ O											L

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PitoMaster FPD550

Compact averaging pitot flowmeter

PitoMaster compact averaging pitot flowmeter	Main code													
	FPD550	XX	XXX	X	X	XX	XX	X	X	X	X	X	XX	
	See page 16				See page 17									
Transmitter seal material														
Without seal													0	
Viton													3	
PTFE													4	
EPDM													5	
Perbunan													6	
Electronic housing material / electrical connection														
Aluminium alloy / 1/2-14 NPT													A	
Aluminium alloy / M20 x 1.5													B	
AISI 304L SST / 1/2-14 NPT													H	
AISI 304L SST / M20 x 1.5													L	
AISI 316L SST / 1/2-14 NPT													S	
AISI 316L SST / M20 x 1.5													T	
Integrated digital display (LCD)														
None (blind)													0	
LCD display													1	
LCD display (backlit)													2	
TTG (through-the-glass) controlled digital LCD display													5	
Output signal														
HART digital communications and 4 ... 20 mA													H1	
HART digital communications and 4 ... 20 mA, SIL2 and SIL3 certified to IEC 61508													H2	
PROFIBUS PA													P1	
FOUNDATION Fieldbus													F1	
MODBUS RS 485													M1	
Wireless HART													W1	

Optional code

XX	XX	XX	XX	XX
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 See next page ...

PitoMaster compact averaging pitot flowmeter	Main code												Optional code				
	FPD550	XX	XXX	X	X	XX	XX	X	X	X	X	X	XX	XX	XX	XX	XX
	See page 16																
Temperature element																	
Integral																	AT
Remote (element not included)																	AR
Certificates																	
Material monitoring with inspection certificate 3.1 acc. EN 10204																	C2
Dye penetrant NDE of welds																	C9
Hydrostatic pressure test certificate																	CB
Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204																	CN
PED certificate (Pressure Equipment Directive 97 / 23 / EC)																	CP
Explosion protection certification																	
Factory mutual (FM) – intrinsically safe																	EA
Factory mutual (FM) – explosion proof																	EB
Canadian standard association (CSA) – explosion proof																	EE
ATEX + FM + CSA																	EN
ATEX II 1/2 GD EEx ia + ATEX II 1/2 GD EEx d + ATEX EEx nL																	EW
Documentation language																	
German																	M1
Italian																	M2
Spanish																	M3
French																	M4
English																	M5
Chinese																	M6
Special applications																	
Degreased (oil- and grease-free) with inert capsule filling for oxygen applications																	P1
Gold-plated diaphragm (silicone oil-filled) for hydrogen applications																	P2

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