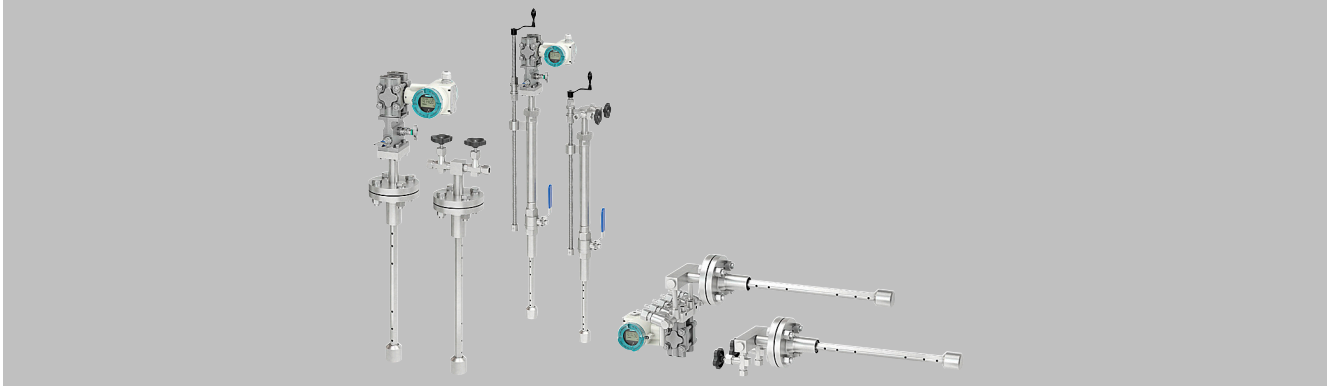


Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube

Overview



Due to the robust technology and the simple principle of measurement, averaging pitot tubes can be used in many different ways even under difficult conditions and offer considerable advantages over other measuring technology from easy installation to long-term measuring stability.

Further special advantages are the possibilities of bidirectional flow measurement as well as the integration of temperature and pressure measurement.

Benefits

- Easy to retrofit (no rebuilding of the pipe)
- Easy to install
- Good for large nominal diameters
- Wide range of application (media, nominal diameters, process conditions)
- Minor measurement inaccuracy
- Special designs possible for special applications
- Also work in rectangular ducts and pipes

Application

- Technical Gases
- Compressed Air
- Exhaust Air
- Fresh and Combustion Air
- Heat Transfer Fluids
- Water
- Exhaust Gas
- Steam/Heat Quantities

Design

Basics: Averaging pitot tubes for flow measurement

- Mounting by insertion into the pipe (no flange-to-flange instrument)
- Differential pressure generation through forced flow
- Variation of the classic "pitot tube" through multiple metering orifices (so-called "averaging pitot tube")
- Design follows manufacturer guidelines, not standardized

Designs

- Averaging pitot tube for gases and liquids (7ME161)
- Averaging pitot tube for steam applications (7ME162)
- Averaging pitot tube with FASTLOK (7ME163), to remove sensor during operation without interruption of process

System design

- Compact design for dry gases and liquids without integrated temperature measurement
- Compact design for wet gases with or without integrated temperature measurement as well as for dry gases and liquids with integrated temperature measurement
- Compact design for steam with or without integrated temperature measurement
- Remote design for dry or wet gases, liquids and steam

Function

Design of the averaging pitot tube

Similar to other differential pressure devices averaging pitot tubes create a differential pressure to measure flow. They are not specified in the general standard ISO 5167, but they follow the same technical principle. In contrast to the classic primary elements, averaging pitot tubes are not "in-line" devices but consist of a "profile" that is inserted into the side of the pipeline.

Differential pressure is created when fluid flows around the profile of the averaging pitot tube. Since the constriction of the pipeline by the profile in relation to the cross-sectional area is much smaller than, for example, with an orifice plate, the created differential pressure and the respective permanent pressure drop are smaller.

The flow comes to a complete stop at the upstream side of the averaging pitot tube creating the upstream pressure. At the downstream side a negative pressure is created by the so-called Kármán vortex street. The differential pressure (difference between upstream pressure and negative pressure) is the measurement signal and is proportional to the flow rate. This results in the following basic formula for flow measurement with averaging pitot tubes:

$$q_m = A \cdot k \cdot \sqrt{2 \cdot \Delta p \cdot \rho}$$

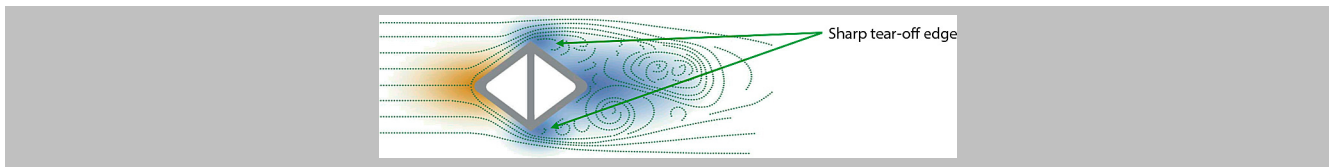
q_m : mass flow

A: cross-sectional area of the pipe

k: device factor of the pitot tube

Δp : differential pressure

ρ : density



The k-factor is the device factor of the averaging pitot tube and is determined, among other things, by the shape of the profile of the pitot tube. Thanks to the sharp-edged shape of the profile, it remains constant over a very wide Reynolds number range and enables linear flow measurement.

The averaging pitot tube features the same number of measuring openings on the front and back. The special distribution of the measuring openings over the cross section allows geometric averaging in case of uneven flow distribution and thus an accurate measurement even with very short inlet and outlet distances. The generated upstream and downstream pressures are averaged in the respective chambers and routed to the differential pressure transmitter.

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube

Technical specifications

SITRANS FP330/FPS300	
General design	
Working principle	Multi-port averaging pitot tube for round and rectangular pipes
Media	<ul style="list-style-type: none"> • Steam (saturated, superheated) • Gas (dry, up to 100% water saturated) (automatic purging unit for high dust applications on request) • Liquids (water, non-conductive liquids, oil, etc.)
Transmitter installation	<ul style="list-style-type: none"> • Compact mount with differential pressure transmitter • Remote mounted differential pressure transmitter
Bidirectional flow	Yes (symmetric sensor design)
Calculation	According to manufacturer standard
Accuracy	
Linearity (of Sensor k-Factor)	Re > 20 000: 1%
Repeatability (of Sensor k-Factor)	Re > 20 000: 0.1%
Measurement range	Typically, up to 1:10 (real measurement range depends on transmitter performance)
Operating conditions	
Pressure	Flange: Max. PN 100 Cutting Ring: Max. PN 40 (max. 180 °C) FASTLOK: Max. PN 16 (max. 180 °C) (higher pressure ratings on request)
Temperature	Stainless Steel sensor: -100 ... 500 °C 16Mo3: -20 ... 530 °C Alloy: -20 ... 700 °C (exact maximum temperature depends on sensor design, feasibility will be calculated by sizing tool)
Pressure loss	generally, <10% of differential pressure
Installation conditions	
Straight inlet diameter	7 × Inner diameter behind 90° elbow
Straight outlet diameter	3 × Inner diameter (for detailed calculation of recommended installation pipe length please refer to sizing tool or manual)
Design	
Material sensor	Standard: Stainless steel 1.4404/ AISI 316L Optional: 1.5415/16Mo3, Alloy C22 (other materials on request)
Diameter	40 ... 4000 mm (larger sensors on request)
Material mounting parts	Standard: Carbon steel Optional: Stainless Steel 1.4404 / AISI 316L (other materials on request)
Process connection	Flange EN 1092-1 B1 Flange ASME B16.5 RF Cutting Ring fitting FASTLOK (retractable design) (other process connections on request)
Thickness of pipe insulation	0 ... 200 mm
Approvals	
Hazardous area	(see differential pressure transmitter)
Enclosure rating	(see differential pressure transmitter)
Operational safety	(see differential pressure transmitter)
QAL1, SIRA	

Options

Further versions that are available on request:

- Weld-in sensor for high pressure steam
- Calibrated metering pipes
- FASTLOK with flange ball valve
- Etc.

More information

For more information please see the Installation Instructions and the Instruction Manuals SITRANS P on SIOS.

Accessories

Z-Options for Cable Glands, Plugs, Labeling, Approvals, blanking plugs, flangs seals, device settings, etc. according to SITRANS P320

Application



SITRANS FP330 compact design



SITRANS FPS300 remote design

These sensors are using the averaging pitot tube technology and can be used wherever flow rates of gases or liquids are to be measured.

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for gases and liquids

Design

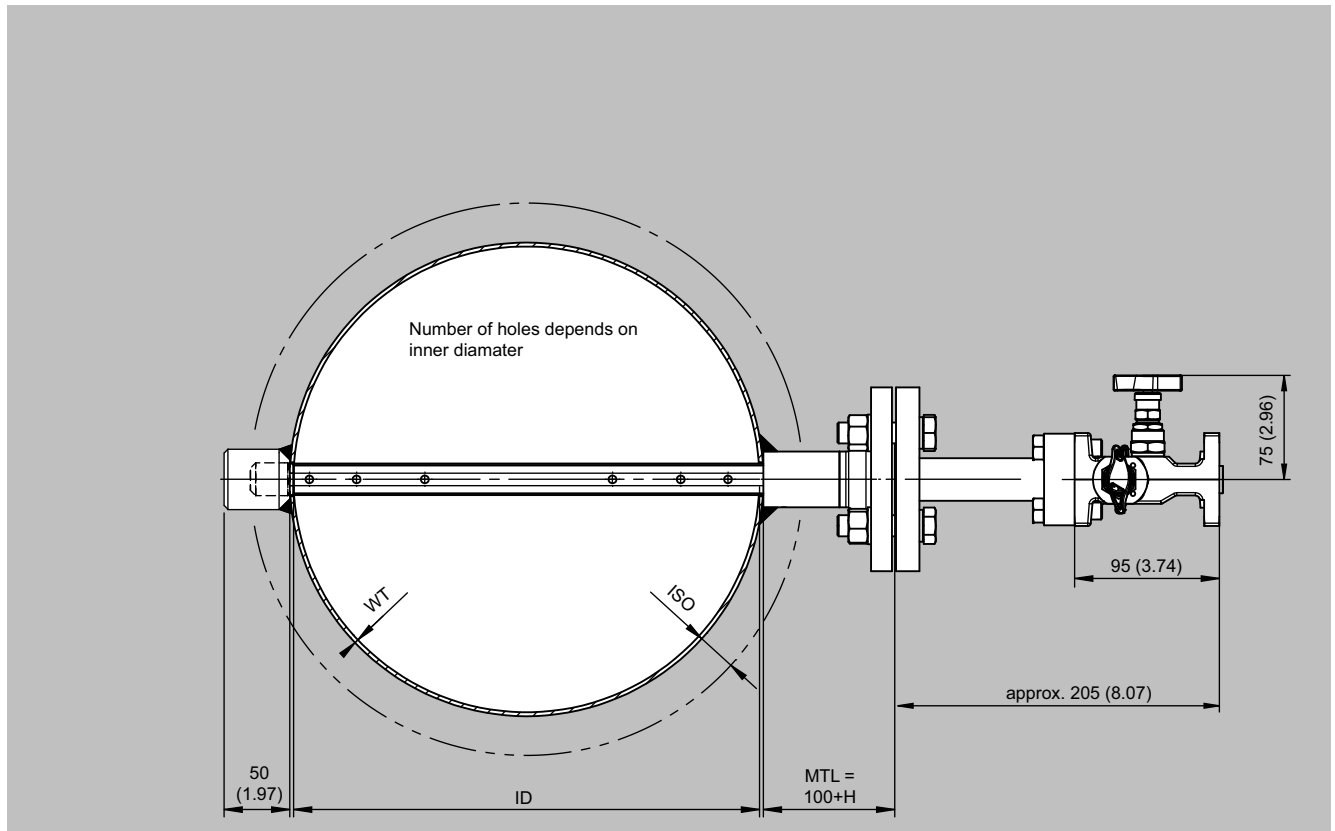
Mounting type

- Flange
- Cutting ring

Material: carbon steel, stainless steel

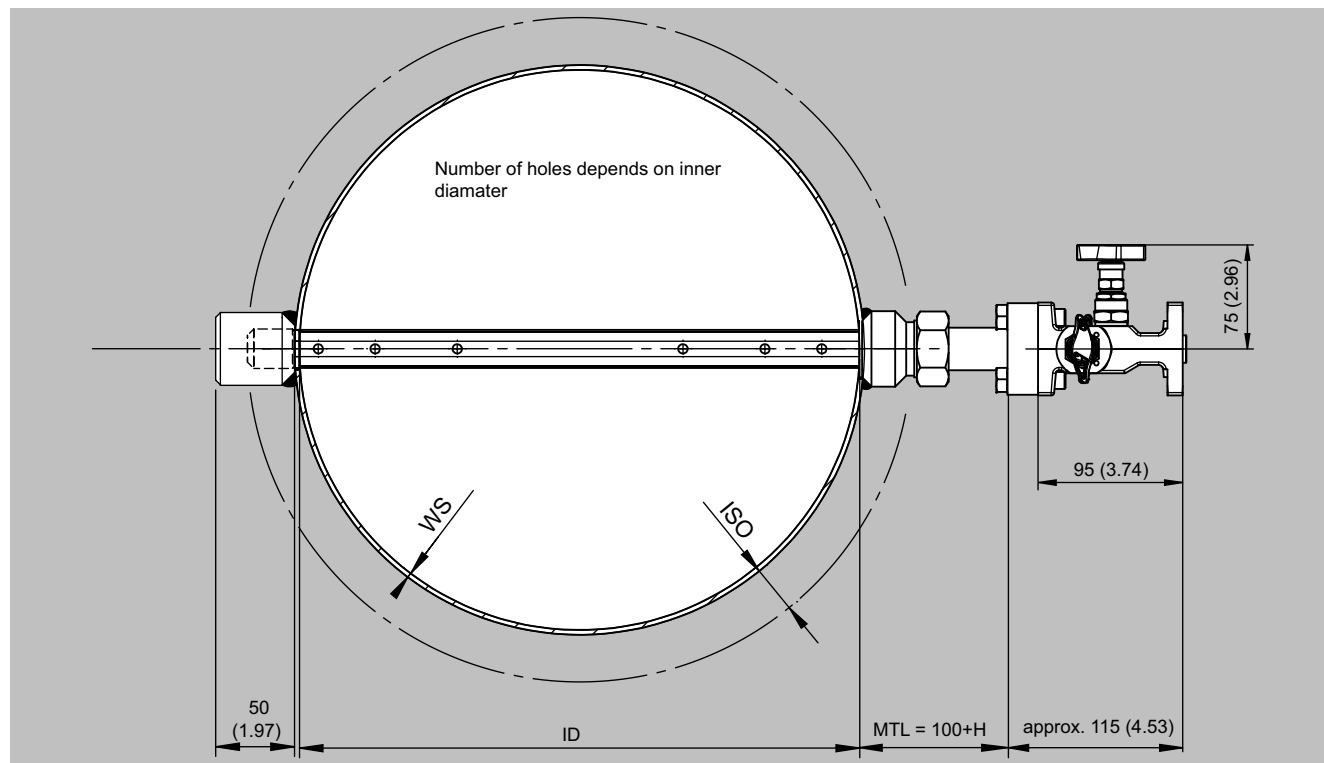
The averaging pitot tube can be mounted to pipes and ducts either with a traditional flange or a cutting ring fitting:

Flange mounting



Design (continued)

Cutting ring mounting



The required mounting components are always supplied together with the averaging pitot tube.

Flange mounting style can be applied to a large range of applications and is widely accepted. Cutting ring mounting style has a limited temperature and pressure range (see max. pressure and max. temperature below) but provides an economic alternative for simple flow measurement applications.

Dimensions of mounting parts

Flange mounting	Profile 10	Profile 22	Profile 32	Profile 50
PN 16	-	-	-	DN 80
PN 40	DN 15	DN 32	DN 40	On request
PN 100	DN 25	DN 40	DN 40	On request
Class 150	½"	1 ¼"	1 ½"	3"
Class 300	½"	1 ¼"	1 ½"	On request
Class 600	1"	1 ½"	1 ½"	On request

Cutting ring mounting	Profile 10	Profile 22
PN 40	M22	M36

Standard lengths of mounting parts (MTL)

Profile 10	Profile 22	Profile 32	Profile 50
80 mm	100 mm	100 mm	120 mm

Mounting part length can be increased based on thermal pipe insulation in 50 mm steps (H).

System design of differential pressure connection

The differential pressure transmitter can be installed in compact design (at the averaging pitot tube) or in remote design.

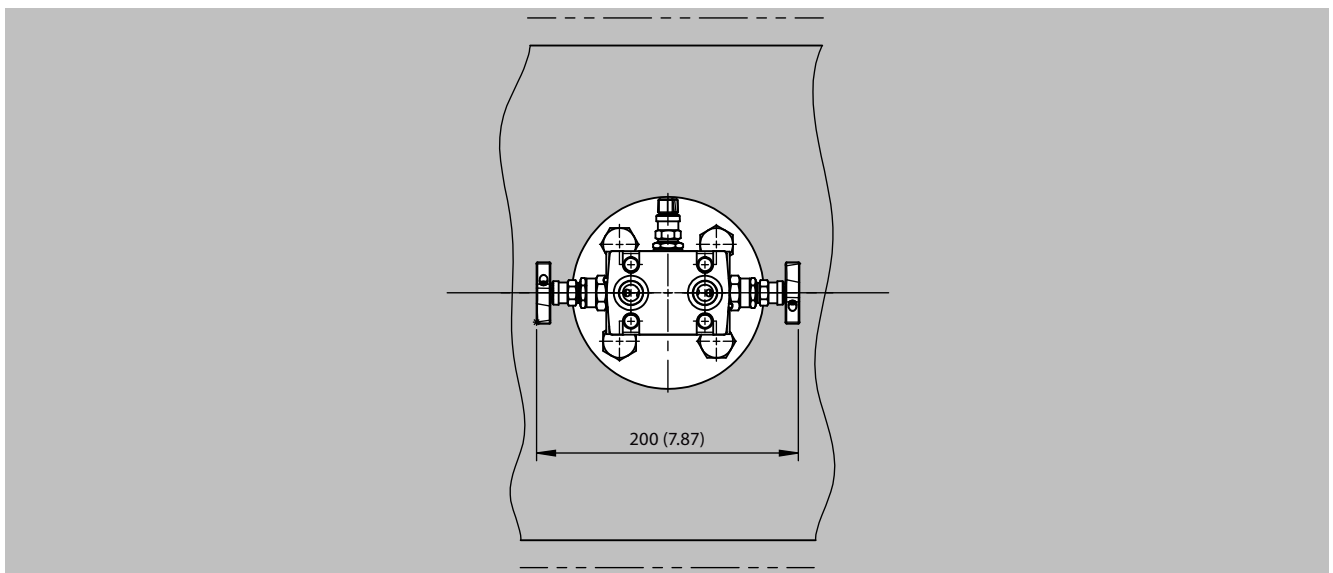
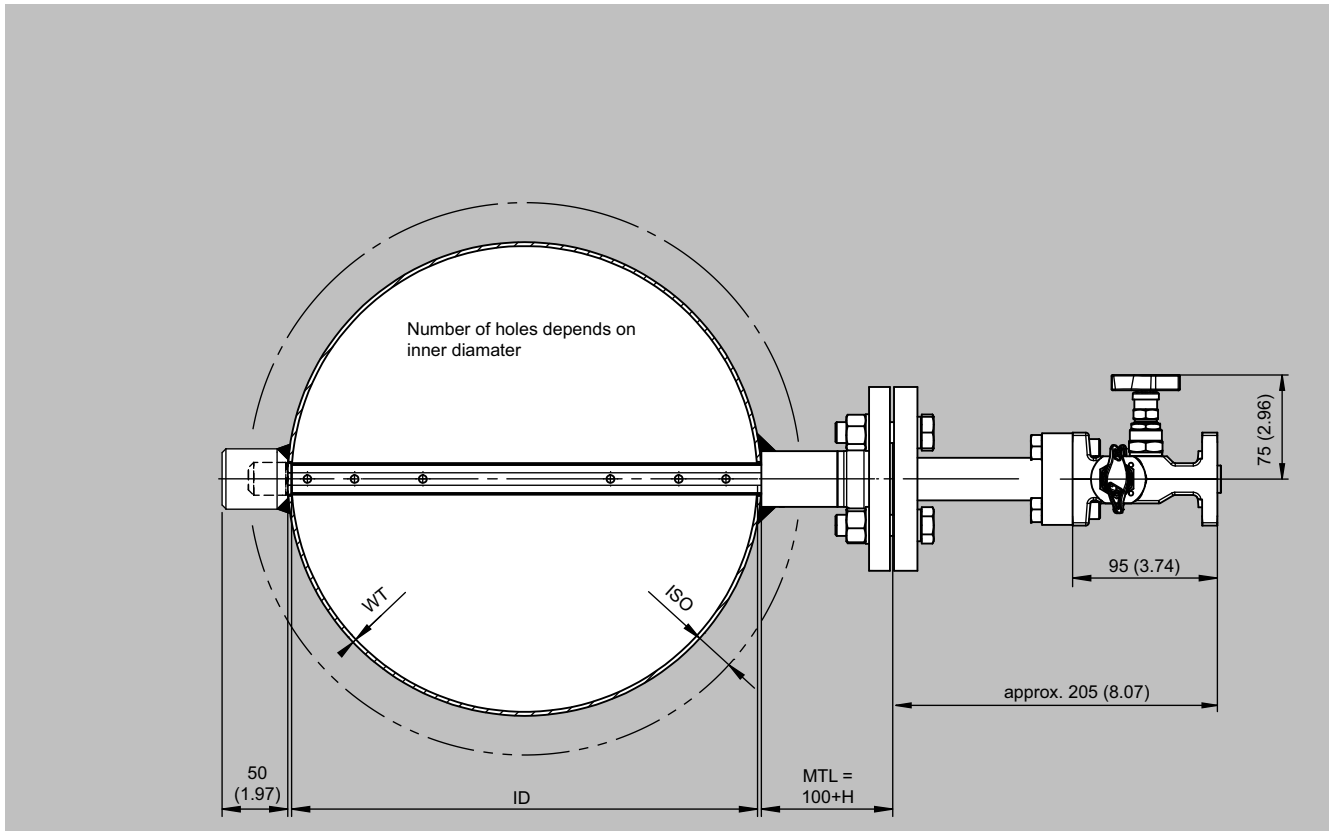
Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for gases and liquids

Design (continued)

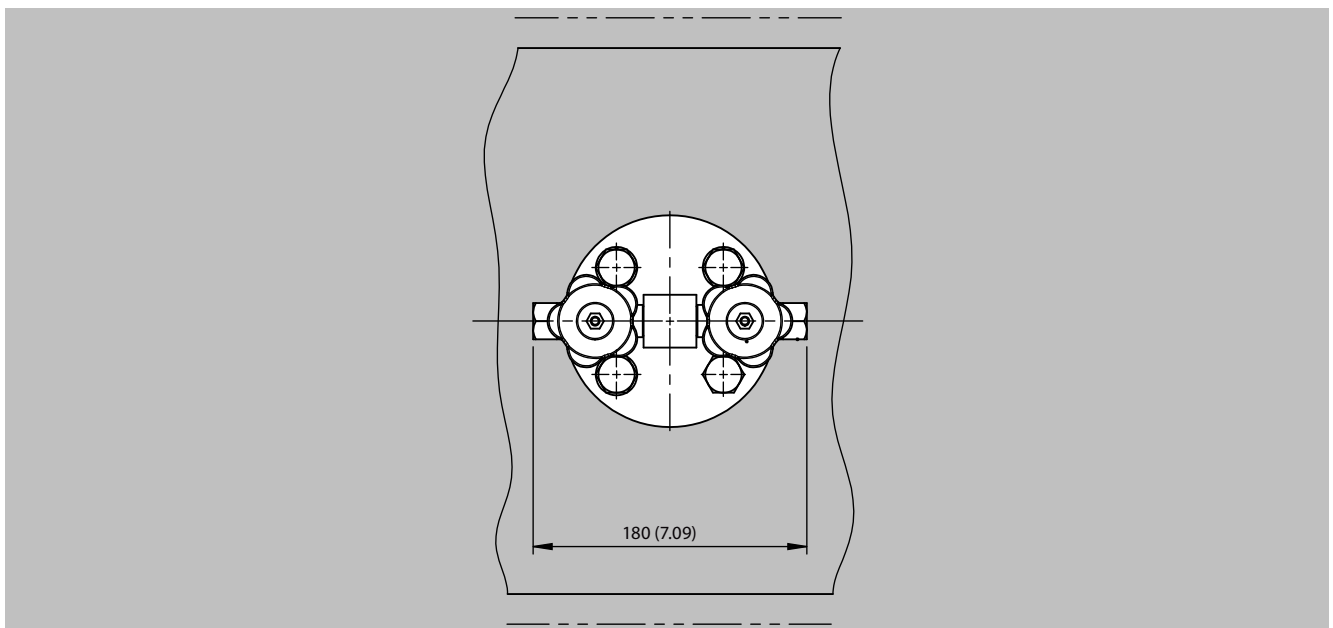
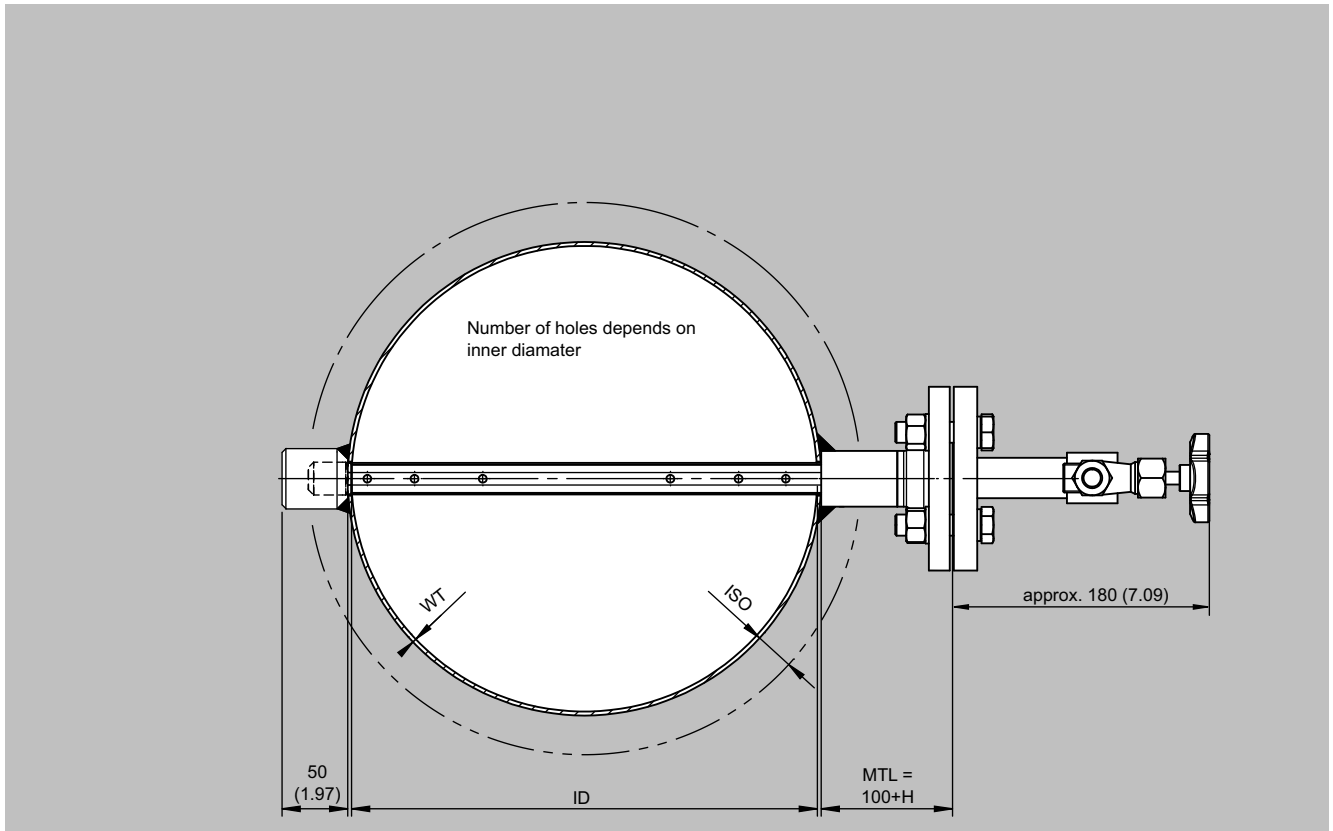
Gas and liquid application, compact design



For gas and liquid applications with compact design the averaging pitot tube is equipped with a traditional flange plate to mount manifold and differential pressure transmitter directly at the sensor.

Design (continued)

Gas and liquid application, remote design



For gas and liquid applications with remote design the averaging pitot tube is equipped with valves mounted directly to the sensor. Impulse pressure piping (not supplied) has to be installed from the valves to the remote mounted manifold and differential pressure transmitter.

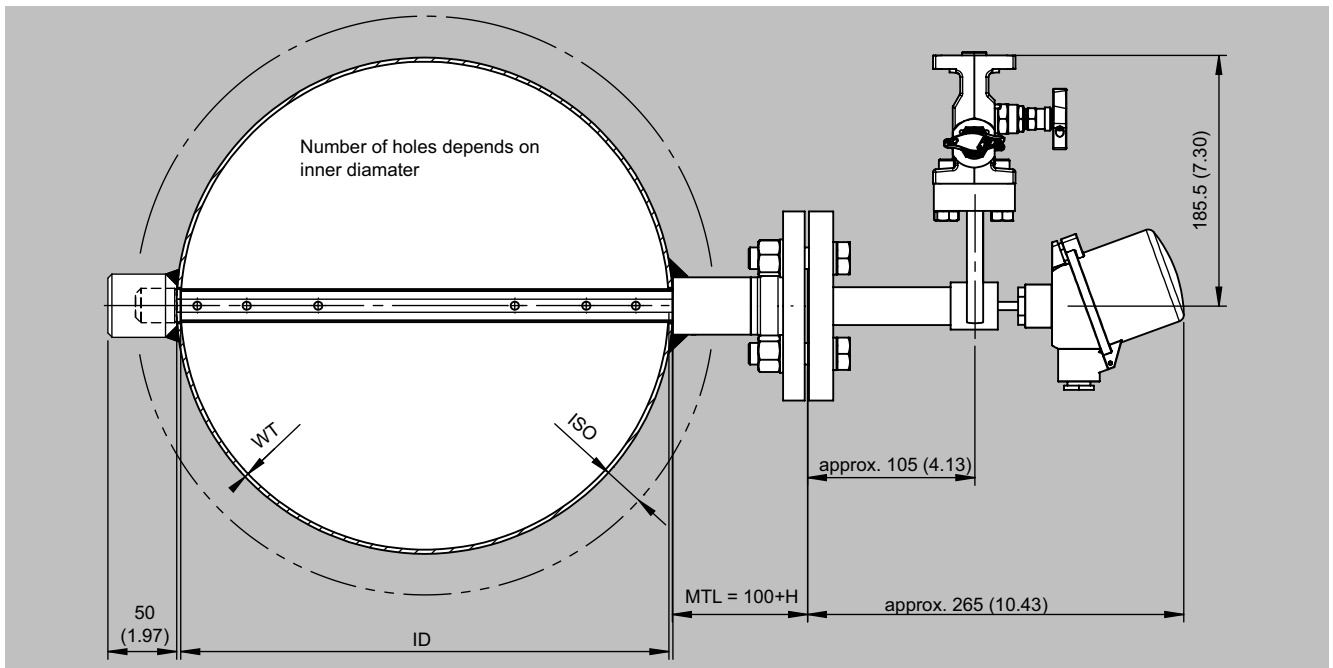
Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for gases and liquids

Design (continued)

Gas and liquid application, compact design for wet gases and/or with integrated temperature measurement with PT100



The averaging pitot tube is equipped with a 90° rotated flange plate to mount manifold and differential pressure transmitter directly at the sensor. The rotated flange plate serves the purpose of providing space for the integrated temperature measurement and will also allow condensed water of wet gases to flow back from the outside assembly into the averaging pitot tube. This is particularly useful for installations in vertical pipes, or in horizontal pipes where the averaging pitot tube has to be mounted from the side. If the pitot tube can be mounted from the top, a regular flange plate is sufficient.

Averaging pitot tube materials

- Standard: 1.4404/316L
- Option: Alloy C22

Mounting parts materials

- Carbon steel, 1.4404/316L

Flange gaskets

- Up to PN 40: Klingersil C4400
- As of PN 63: graphite with stainless steel insert

Integrated temperature measurement using PT100

- Can be integrated in averaging pitot tube (> DN 100, only 1.4404, ≤ PN 40)

Max. pressure

- EN 1092-1: up to PN 100 (for flange), PN 40 (for cutting ring)
- ASME B16.5: up to Class 600 (for flange)

Max. temperature

- Mounting parts:
 - Flange: according to EN 1092-1 or ASME B16.5
 - Cutting ring: 200 °C (carbon steel), 400 °C (stainless steel)
- Sensor: will be calculated by sizing tool

Selection and ordering data

SITRANS FP330/FPS300 averaging pitot tube for gases and liquids		Article No.
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		7ME161 ● - ● ● ● ● ● - ● ● ● ●
Communication		
HART (4 ... 20 mA)		0
PROFIBUS PA		1
FOUNDATION Fieldbus		2
Without transmitter		8
Nominal size/Sensor type (according to sizing tool)		
DN 40/Sensor type 10		1 C
DN 50/Sensor type 10		1 D
DN 65/Sensor type 10		1 E
DN 80/Sensor type 10		1 F
DN 100/Sensor type 10		1 G
DN 125/Sensor type 10		1 H
DN 100/Sensor type 22		2 G
DN 125/Sensor type 22		2 H
DN 150/Sensor type 22		2 J
DN 200/Sensor type 22		2 K
DN 250/Sensor type 22		2 L
DN 300/Sensor type 22		2 M
DN 350/Sensor type 22		2 N
DN 400/Sensor type 22		2 P
DN 450/Sensor type 22		2 Q
DN 500/Sensor type 22		2 R
DN 600/Sensor type 22		2 S
DN 700/Sensor type 22		2 T
DN 800/Sensor type 22		2 U
DN 900/Sensor type 22		2 V
DN 1000/Sensor type 22		2 W
DN 1100/Sensor type 22		2 X
DN 1200/Sensor type 22		2 Y
DN 300/Sensor type 32		3 M
DN 350/Sensor type 32		3 N
DN 400/Sensor type 32		3 P
DN 450/Sensor type 32		3 Q
DN 500/Sensor type 32		3 R
DN 600/Sensor type 32		3 S
DN 700/Sensor type 32		3 T
DN 800/Sensor type 32		3 U
DN 900/Sensor type 32		3 V
DN 1000/Sensor type 32		3 W
DN 1100/Sensor type 32		3 X
DN 1200/Sensor type 32		3 Y
DN 1400/Sensor type 32		4 A
DN 1500/Sensor type 32		4 B
DN 1600/Sensor type 32		4 C
DN 1800/Sensor type 32		4 D
DN 2000/Sensor type 32		4 E
DN 2200/Sensor type 32		4 F
DN 2400/Sensor type 32		4 G
DN 500/Sensor type 50		5 R
DN 600/Sensor type 50		5 S
DN 700/Sensor type 50		5 T
DN 800/Sensor type 50		5 U
DN 900/Sensor type 50		5 V
DN 1000/Sensor type 50		5 W
DN 1100/Sensor type 50		5 X
DN 1200/Sensor type 50		5 Y
DN 1400/Sensor type 50		6 A
DN 1500/Sensor type 50		6 B
DN 1600/Sensor type 50		6 C

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for gases and liquids

Selection and ordering data (continued)

	Article No.
SITRANS FP330/FPS300 averaging pitot tube for gases and liquids	7ME161 ● - ● ● ● ● ● - ● ● ● ●
DN 1800/Sensor type 50	6 D
DN 2000/Sensor type 50	6 E
DN 2200/Sensor type 50	6 F
DN 2400/Sensor type 50	6 G
DN 2600/Sensor type 50	6 H
DN 2800/Sensor type 50	6 J
DN 3000/Sensor type 50	6 K
DN 3200/Sensor type 50	6 L
DN 3400/Sensor type 50	6 M
DN 3600/Sensor type 50	6 N
DN 3800/Sensor type 50	6 P
DN 4000/Sensor type 50	6 Q
Process connection/wetted parts material	
Flange EN 1092-1 type B1, PN 16/stainless steel 316L/1.4404	C
Flange EN 1092-1 type B1, PN 40/stainless steel 316L/1.4404	E
Flange EN 1092-1 type B1, PN 64/100/stainless steel 316L/1.4404	F
Flange EN 1092-1 type B1, PN 160/stainless steel 316L/1.4404	H
Flange EN 1092-1 type B1, PN 16/alloy C22 (up to max. 0.5 bar g)	L
Flange EN 1092-1 type B1, PN 40/alloy C22 (up to max. 0.5 bar g)	M
Cutting ring PN 40/stainless steel 316L/1.4404	N
Flange ASME B16.5, Class 150 RF/stainless steel 316L/1.4404	Q
Flange ASME B16.5, Class 300 RF/stainless steel 316L/1.4404	R
Flange ASME B16.5, Class 600 RF/stainless steel 316L/1.4404	S
Flange ASME B16.5, Class 900 RF/stainless steel 316L/1.4404	T
Flange ASME B16.5, Class 150 RF/alloy C22 (up to max. 0.5 bar g)	W
Material of welding parts/type of end support	
Carbon steel P235GH/without end support	0
Stainless steel 316L/1.4404 / without end support	1
Heat-resistant steel 16Mo3/1.5415 / without end support	2
Carbon steel P235GH mounting components with closed end support	3
Stainless steel 316L/1.4404 / closed end support	4
Heat-resistant steel 16Mo3/1.5415 / closed end support	5
Carbon steel P235GH/end support with flange	6
Stainless steel 316L/1.4404 / end support with flange	7
Thickness of pipe insulation	
Pipe insulation: 0 ... < 50 mm	0
Pipe insulation: 50 ... < 100 mm	1
Pipe insulation: 100 ... < 150 mm	2
Pipe insulation: 150 ... < 200 mm	3
System design	
Compact design for dry gases and liquids without integrated temperature measurement	0
Compact design for wet gases with or without integrated temperature measurement as well as for dry gases and liquids with integrated temperature measurement	1
Remote design for dry gases, wet gases and liquids	3
Type of protection of pressure transmitter	
No Ex/without pressure transmitter	A
Intrinsic safety	B
Explosion proof	C
Intrinsic safety, Explosion proof	D
Dust ignition proof zone 21/22 (DIP), increased safety zone 2	L
Dust ignition proof zone 20/21/22 (DIP), increased safety zone 2	M
Intrinsic safety, Explosion proof, Dust ignition proof zone 21/22 (DIP), increased safety zone 2	S
Intrinsic safety, Explosion proof, Dust ignition proof zone 21/22 (DIP), increased safety zone 2, class division	T
Electrical connections/cable entries of pressure transmitter	
Without pressure transmitter	A
2 x M20 x 1.5	F
2 x 1/2-14 NPT	M
Local operation/display of pressure transmitter	
Without display (closed lid)/without pressure transmitter	0
With display (closed lid)	1

Selection and ordering data (continued)

SITRANS FP330/FPS300 averaging pitot tube for gases and liquids		Article No.
With display (lid with glass window)		7ME161 ● - ● ● ● ● ● - ● ● ● ●
		2

	Order code
Further designs*	
Please add "-Z" to Article No. and specify Order code(s) and plain text.	
Certificates of primary element incl. fittings	
Inspection certificate of the primary element (EN 10204-3.1) - material of pressure-containing and wetted parts	C52
Factory certificate of the primary element (EN 10204-2.2) - wetted parts (MR 0175-2015)	C54
Dimensional record of the primary element	C55
Inspection certificate (DIN EN 571-1) - dye penetration test of weldings	C56
Hydrostatic pressure test of the primary element (EN 13480-5)	C58
Dimensional drawing 1:1 DWG of the primary element	C59
Maximum measuring span of pressure transmitter	
20 mbar (8.037 inH ₂ O)	I01
60 mbar (24.11 inH ₂ O)	I02
250 mbar (100.5 inH ₂ O)	I03
600 mbar (241.1 inH ₂ O)	I04
1600 mbar (643 inH ₂ O)	I05
Integrated temperature measurement	
Integrated temperature measurement with Pt100; cl. A; 3-wire; without head transmitter	S01
Integrated temperature measurement with Pt100; cl. A; 3-wire; ATEX II 1/2G Ex ia IIC T5 Ga/Gb; without head transmitter	S02
Integrated temperature measurement with Pt100; cl. A; 3-wire; incl. Head transmitter TH320, General Purpose (non Ex) (CE, RCM, FM, CSA) (7NG0310-0BA00-0AAA)	S03
Integrated temperature measurement with Pt100; cl. A; 3-wire; ATEX II 1/2G Ex ia IIC T5 Ga/Gb; incl. Head transmitter TH320, Ex i, Ex nA (ec)(Ex- Zone)/IS, NIFW, NI (Class-Div) (ATEX, IECEx, CSA, FM, NEPSI) (7NG0310-0BA00-0NA0)	S04
Shut-off valves	
With mounted shut-off valves DN8 made of carbon steel, up to 300 °C with tube fitting 12 mm	T50
With mounted shut-off valves DN8 made of stainless steel, up to 300 °C with tube fitting 12 mm	T51
With mounted ball valve made of stainless steel, up to 200 °C with tube fitting 12 mm	T59
Valve manifolds for mounting on primary element	
With mounted manifold (3-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws	U40
With mounted manifold (3-fold) made of stainless steel, PTFE sealings, stainless steel screws	U41
With mounted manifold (5-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws	U42
With mounted manifold (5-fold) made of stainless steel, PTFE sealings, stainless steel screws	U43
With mounted multi-way cock made of stainless steel, PTFE sealings, cadmium-plated steel screws	U44

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for gases and liquids

Selection and ordering data (continued)

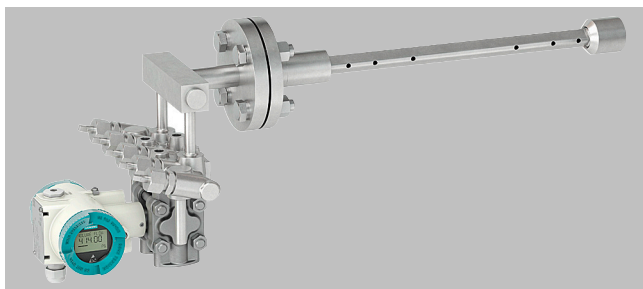
	Order code
With mounted multi-way cock made of stainless steel, PTFE sealings, stainless steel screws	U45
With enclosed manifold (3-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws with tube fitting 12 mm	U50
With enclosed manifold (3-fold) made of stainless steel, PTFE sealings, stainless steel screws with tube fitting 12 mm	U51
With enclosed manifold (5-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws with tube fitting 12 mm	U52
With enclosed manifold (5-fold) made of stainless steel, PTFE sealings, stainless steel screws with tube fitting 12 mm	U53
With enclosed multi-way cock made of stainless steel, PTFE sealings, cadmium-plated steel screws with tube fitting 12 mm	U54
With enclosed multi-way cock made of stainless steel, PTFE sealings, stainless steel screws with tube fitting 12 mm	U55
Application data	
ID number of the primary element according to sizing tool	Y40
Measuring range setting (temperature transmitter): lower range value (max. 5 characters), upper range value (max. 5 characters), unit (C, F)	Y41

* For further options, please refer to SITRANS P320.

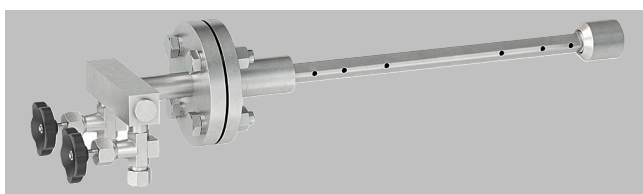
Scope of delivery

- Averaging pitot tube with differential pressure connections
- Mounting part:
 - Flanged installation: Flanged mounting part including gasket, screws and nuts.
 - Cutting ring installation: Welding socket, cutting ring, nut
- If necessary: closed counter support
- Shut-off valves for remote design (options T5x selected in PIA)
- Manifold for compact/remote design (options U4x, U5x selected in PIA) incl. mounting brackets

Application



SITRANS FP330 compact design



SITRANS FPS300 remote design

These sensors for steam probes are used wherever flow of superheated or saturated steam is to be measured.

Flow Measurement

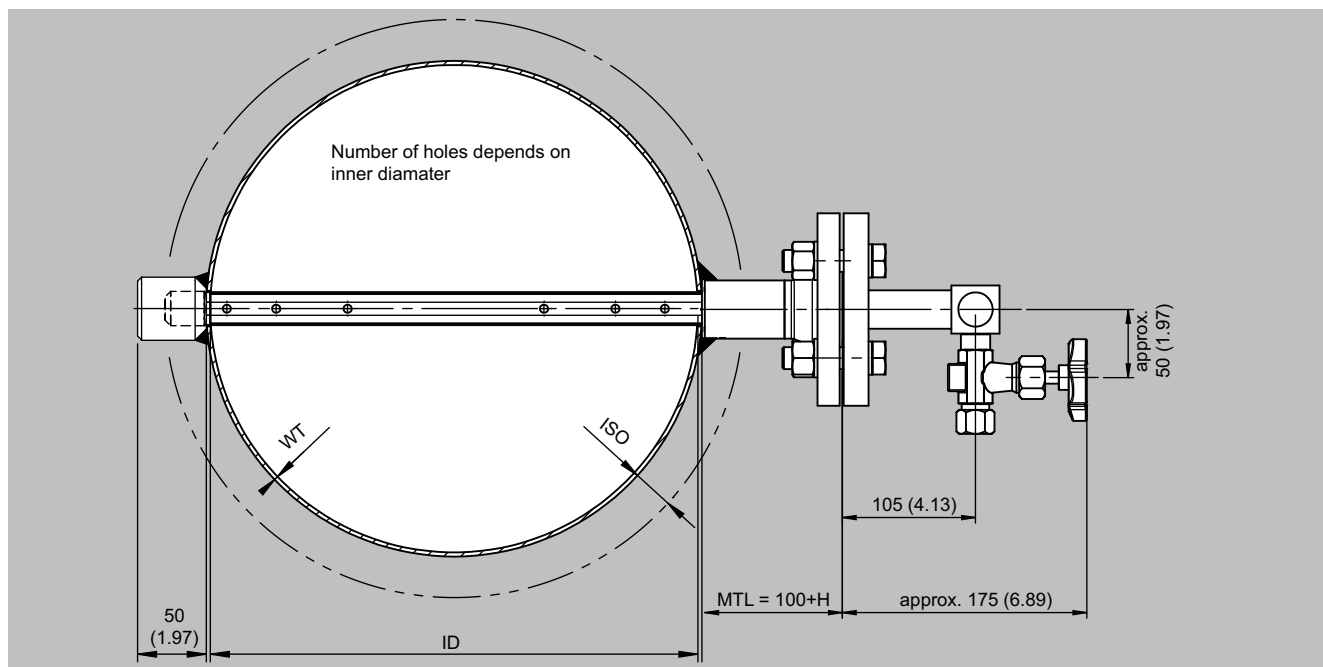
SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for steam applications

Design

Mounting type

The averaging pitot tube for steam can be mounted to pipes with a traditional flange:



Dimensions of mounting parts

Flange mounting	Profile 10	Profile 22	Profile 32
PN 40	DN 15	DN 32	DN 40
PN 100	DN 25	DN 40	DN 40
Class 150	½"	1 ¼"	1 ½"
Class 300	½"	1 ¼"	1 ½"
Class 600	1"	1 ½"	1 ½"

Standard lengths of mounting parts

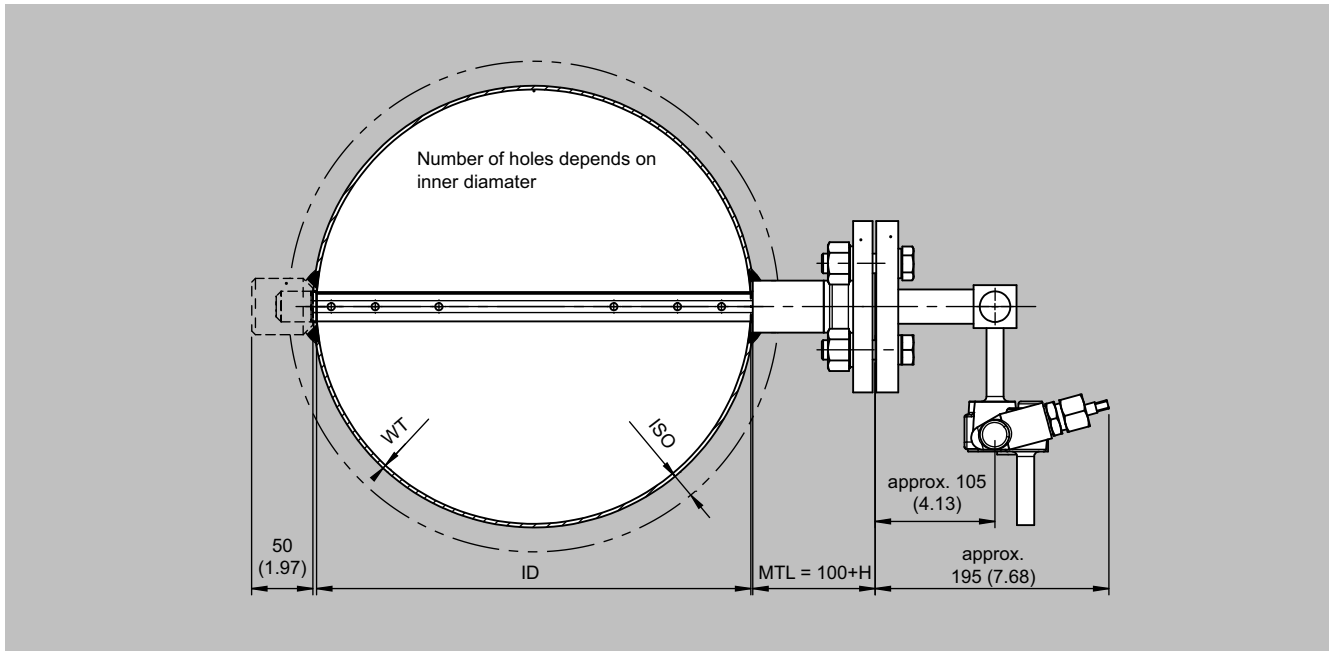
Profile 10	Profile 22	Profile 32
80 mm	100 mm	100 mm

System design of differential pressure connection

The differential pressure transmitter can be installed in compact design (at the averaging pitot tube) or in remote design.

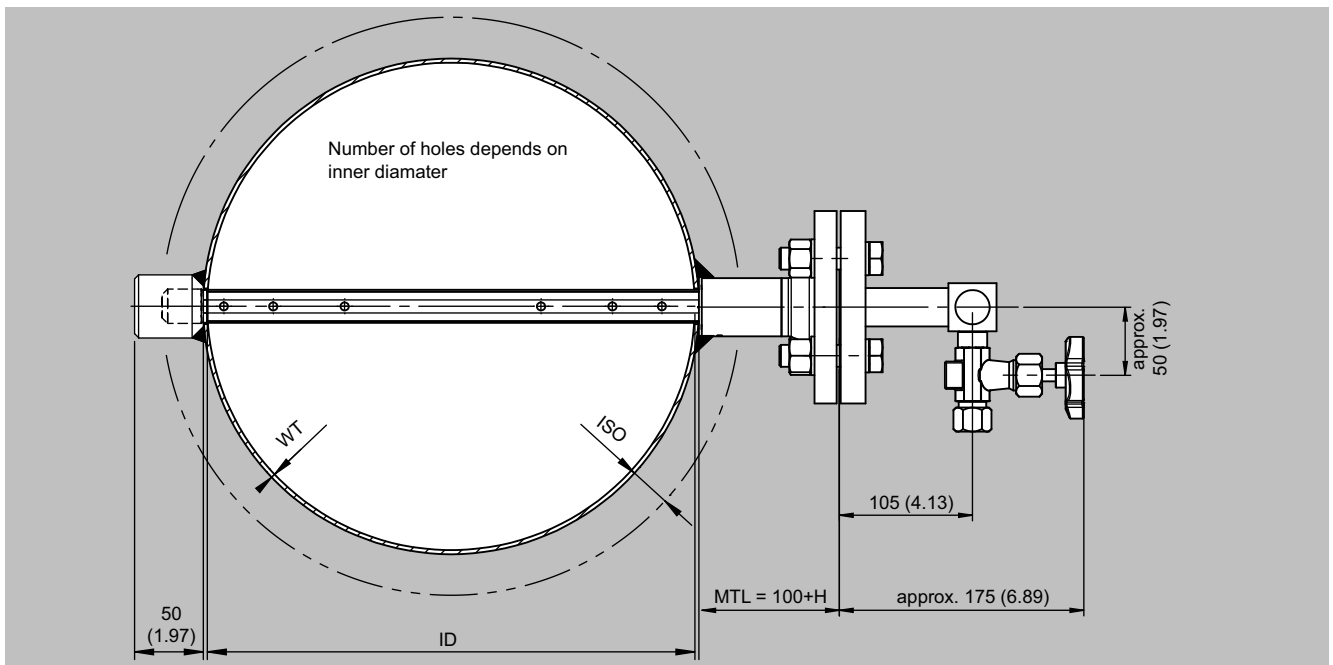
Design (continued)

Steam applications, compact design



For steam applications with compact design the averaging pitot tube sensor is equipped with integrated condensation pots, a 5-way-manifold is welded directly to the sensor.

Steam applications, remote design



For steam applications with remote design the averaging pitot tube sensor is equipped with integrated condensation pots, valves are welded directly to the sensor. Impulse pressure piping (not supplied) has to be installed from the valves to the remote mounted manifold and differential pressure transmitter.

Profile width

- Depending on selected type

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for steam applications

Design (continued)

Averaging pitot tube materials

- Standard: 1.4404/316L
- Option: 16Mo3/1.5415

Mounting parts materials

- Carbon steel, 1.4404/316L

Flange gaskets

- Up to PN 40: graphite
- As of PN 63: graphite with stainless steel insert

Integrated temperature measurement using PT100

- Can be integrated in averaging pitot tube (> DN 100, only 1.4404, ≤ PN 40)

Max. pressure

- EN: up to PN 100
- ASME: up to Class 600

Max. temperature

- Mounting parts: According to EN 1092-1 or ASME B16.5
- Sensor: Will be calculated by sizing tool

Selection and ordering data

SITRANS FP330/FPS300 averaging pitot tube for steam applications	Article No.										
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	7ME162	●	-	●	●	●	●	-	●	●	●
Communication											
HART (4 ... 20 mA)	0										
PROFIBUS PA	1										
FOUNDATION Fieldbus	2										
Without transmitter	8										
Nominal size/Sensor type (according to sizing tool)											
DN 40/Sensor type 10		1		C							
DN 50/Sensor type 10		1		D							
DN 65/Sensor type 10		1		E							
DN 80/Sensor type 10		1		F							
DN 100/Sensor type 10		1		G							
DN 125/Sensor type 10		1		H							
DN 100/Sensor type 22		2		G							
DN 125/Sensor type 22		2		H							
DN 150/Sensor type 22		2		J							
DN 200/Sensor type 22		2		K							
DN 250/Sensor type 22		2		L							
DN 300/Sensor type 22		2		M							
DN 350/Sensor type 22		2		N							
DN 400/Sensor type 22		2		P							
DN 450/Sensor type 22		2		Q							
DN 500/Sensor type 22		2		R							
DN 600/Sensor type 22		2		S							
DN 700/Sensor type 22		2		T							
DN 800/Sensor type 22		2		U							
DN 900/Sensor type 22		2		V							
DN 1000/Sensor type 22		2		W							
DN 1100/Sensor type 22		2		X							
DN 1200/Sensor type 22		2		Y							
DN 300/Sensor type 32		3		M							
DN 350/Sensor type 32		3		N							
DN 400/Sensor type 32		3		P							
DN 450/Sensor type 32		3		Q							
DN 500/Sensor type 32		3		R							
DN 600/Sensor type 32		3		S							
DN 700/Sensor type 32		3		T							
DN 800/Sensor type 32		3		U							
DN 900/Sensor type 32		3		V							
DN 1000/Sensor type 32		3		W							
DN 1100/Sensor type 32		3		X							
DN 1200/Sensor type 32		3		Y							
DN 1400/Sensor type 32		4		A							
DN 1500/Sensor type 32		4		B							
DN 1600/Sensor type 32		4		C							
DN 1800/Sensor type 32		4		D							
DN 2000/Sensor type 32		4		E							
DN 500/Sensor type 50		5		R							
DN 600/Sensor type 50		5		S							
DN 700/Sensor type 50		5		T							
DN 800/Sensor type 50		5		U							
DN 900/Sensor type 50		5		V							
DN 1000/Sensor type 50		5		W							
DN 1100/Sensor type 50		5		X							
DN 1200/Sensor type 50		5		Y							
DN 1400/Sensor type 50		6		A							
DN 1500/Sensor type 50		6		B							
DN 1600/Sensor type 50		6		C							
DN 1800/Sensor type 50		6		D							
DN 2000/Sensor type 50		6		E							

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube for steam applications

Selection and ordering data (continued)

SITRANS FP330/FPS300 averaging pitot tube for steam applications		Article No.
		7ME162 ● - ● ● ● ● ● - ● ● ● ● ●
Process connection/wetted parts material		
Flange EN 1092-1 type B1, PN 16/stainless steel 316L/1.4404		C
Flange EN 1092-1 type B1, PN 40/stainless steel 316L/1.4404		E
Flange EN 1092-1 type B1, PN 64/100/stainless steel 316L/1.4404		F
Flange EN 1092-1 type B1, PN 160/stainless steel 316L/1.4404		H
Flange EN 1092-1 type B1, PN 64/100/heat-resistant steel 16Mo3/1.5415		J
Flange ASME B16.5, Class 150 RF/stainless steel 316L/1.4404		Q
Flange ASME B16.5, Class 300 RF/stainless steel 316L/1.4404		R
Flange ASME B16.5, Class 600 RF/stainless steel 316L/1.4404		S
Flange ASME B16.5, Class 900 RF/stainless steel 316L/1.4404		T
Flange ASME B16.5, Class 600 RF/heat-resistant steel 16Mo3/1.5415		U
Material of welding parts/type of end support		
Carbon steel P235GH/without end support		0
Stainless steel 316L/1.4404 / without end support		1
Heat-resistant steel 16Mo3/1.5415 / without end support		2
Carbon steel P235GH mounting components with closed end support		3
Stainless steel 316L/1.4404 / closed end support		4
Heat-resistant steel 16Mo3/1.5415 / closed end support		5
Carbon steel P235GH/end support with flange		6
Stainless steel 316L/1.4404 / end support with flange		7
Thickness of pipe insulation		
Pipe insulation: 0 ... < 50 mm		0
Pipe insulation: 50 ... < 100 mm		1
Pipe insulation: 100 ... < 150 mm		2
Pipe insulation: 150 ... < 200 mm		3
System design		
Compact design for steam with or without integrated temperature measurement		2
Remote design for dry gases, wet gases and liquids		3
Type of protection of pressure transmitter		
No Ex/without pressure transmitter		A
Intrinsic safety		B
Explosion proof		C
Intrinsic safety, Explosion proof		D
Dust ignition proof zone 21/22 (DIP), increased safety zone 2		L
Dust ignition proof zone 20/21/22 (DIP), increased safety zone 2		M
Intrinsic safety, Explosion proof, Dust ignition proof zone 21/22 (DIP), increased safety zone 2		S
Intrinsic safety, Explosion proof, Dust ignition proof zone 21/22 (DIP), increased safety zone 2, class division		T
Electrical connections/cable entries of pressure transmitter		
Without pressure transmitter		A
2 × M20 × 1.5		F
2 × 1/2-14 NPT		M
Local operation/display of pressure transmitter		
Without display (closed lid)/without pressure transmitter		0
With display (closed lid)		1
With display (lid with glass window)		2

Order code	
Further designs*	
Please add "-Z" to Article No. and specify Order code(s) and plain text.	
Certificates of primary element incl. fittings	
Inspection certificate of the primary element (EN 10204-3.1) - material of pressure-containing and wetted parts	C52
Factory certificate of the primary element (EN 10204-2.2) - wetted parts (MR 0175-2015)	C54

Selection and ordering data (continued)

	Order code
Dimensional record of the primary element	C55
Inspection certificate (DIN EN 571-1) - dye penetration test of weldings	C56
Hydrostatic pressure test of the primary element (EN 13480-5)	C58
Dimensional drawing 1:1 DWG of the primary element	C59
Maximum measuring span of pressure transmitter	
20 mbar (8.037 inH ² O)	I01
60 mbar (24.11 inH ² O)	I02
250 mbar (100.5 inH ² O)	I03
600 mbar (241.1 inH ² O)	I04
1600 mbar (643 inH ² O)	I05
Integrated temperature measurement	
Integrated temperature measurement with Pt100; cl. A; 3-wire; without head transmitter	S01
Integrated temperature measurement with Pt100; cl. A; 3-wire; ATEX II 1/2G Ex ia IIC T5 Ga/Gb; without head transmitter	S02
Integrated temperature measurement with Pt100; cl. A; 3-wire; incl. Head transmitter TH320, General Purpose (non Ex) (CE, RCM, FM, CSA) (7NG0310-0BA00-0AA0)	S03
Integrated temperature measurement with Pt100; cl. A; 3-wire; ATEX II 1/2G Ex ia IIC T5 Ga/Gb; incl. Head transmitter TH320, Ex I, Ex nA (ec)(Ex-Zone)/IS, NIFW, NI (Class-Div) (ATEX, IECEx, CSA, FM, NEPSI) (7NG0310-0BA00-0NA0)	S04
Shut-off valves	
With mounted shut-off valves DN8 made of carbon steel, up to 300 °C with tube fitting 12 mm	T50
With mounted shut-off valves DN8 made of stainless steel, up to 300 °C with tube fitting 12 mm	T51
With mounted shut off valves DN8 made of carbon steel, up to 550 °C with butt weld end 14 × 2,5 mm	T58
Valve manifolds for mounting on primary element	
With mounted manifold (5-fold) made of carbon steel, up to 300 °C cadmium-plated steel screws	U46
With mounted manifold (5-fold) made of carbon steel, up to 550 °C cadmium-plated steel screws with butt weld end 14 × 2,5 mm	U48
With enclosed manifold (5-fold) made of carbon steel, up to 300 °C cadmium-plated steel screws with tube fitting 12 mm	U56
With enclosed manifold (5-fold) made of carbon steel, up to 550 °C cadmium-plated steel screws with butt weld end 14 × 2,5 mm	U58
Application data	
ID number of the primary element according to sizing tool	Y40
Measuring range setting (temperature transmitter): lower range value (max. 5 characters), upper range value (max. 5 characters), unit (C, F)	Y41

* For further options, please refer to SITRANS P320.

Scope of delivery

- Averaging pitot tube with integrated condensation pots and differential pressure connections
- Flanged mounting part including gasket, screws and nuts
- If necessary: closed counter support
- Shut-off valves for remote design (options T5x selected in PIA)
- Manifold for compact/remote design (options U4x, U5x selected in PIA) incl. mounting brackets

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube with FASTLOK

Application



SITRANS FP330 compact design



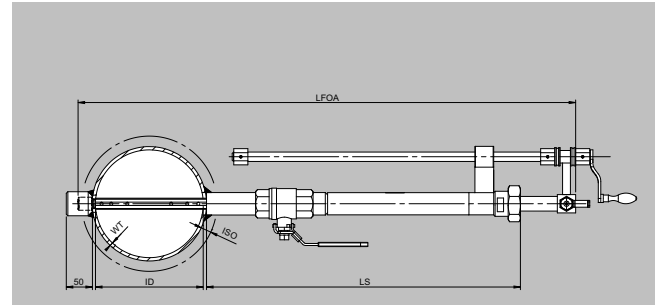
SITRANS FPS300 remote design

In the FASTLOK version the sensor can be assembled and disassembled into the pipe without interrupting plant operation. This pitot tube is used for dry gases, wet gases and liquids. On request it is available in different pressure ratings or with an integrated gear drive.

Design

Mounting type

The averaging pitot tube with FASTLOK mechanism is mounted with a screwed ball valve. A threaded nozzle is welded to the pipe onto which the ball valve is screwed.



Isolation mechanism

- Ball valve with screwed-on threaded pipe with gland packing

Retraction mechanism

- The sensor is inserted or removed into/out of the pipe by turning the operating handle on top of the threaded rod. A gland packing prevents gas or liquid from exiting while the isolation ball valve is opened.

System design of differential pressure connection¹⁾

- Compact, remote

Profile width

- Depending on selected type

Averaging pitot tube materials

- 1.4404/316L

Mounting parts materials

- Carbon steel, 1.4404/316L

Ball valve material

- Stainless steel 1.4404

Gasket ball valve

- PTFE

Pressure rating

- PN16

Max. temperature

- Approx. 200 °C

¹⁾ For details see Design under the section "Averaging pitot tube for gas and liquids".

Selection and ordering data

SITRANS FP330/FPS300 averaging pitot tube with FASTLOK		Article No.
		7ME163 ● - ● ● ● ● ● - ● ● ● ●
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Communication		
HART (4 ... 20 mA)		0
PROFIBUS PA		1
FOUNDATION Fieldbus		2
Without transmitter		8
Nominal size/Sensor type (according to sizing tool)		
DN 40/Sensor type 10		1 C
DN 50/Sensor type 10		1 D
DN 65/Sensor type 10		1 E
DN 80/Sensor type 10		1 F
DN 100/Sensor type 10		1 G
DN 125/Sensor type 10		1 H
DN 100/Sensor type 22		2 G
DN 125/Sensor type 22		2 H
DN 150/Sensor type 22		2 J
DN 200/Sensor type 22		2 K
DN 250/Sensor type 22		2 L
DN 300/Sensor type 22		2 M
DN 350/Sensor type 22		2 N
DN 400/Sensor type 22		2 P
DN 450/Sensor type 22		2 Q
DN 500/Sensor type 22		2 R
DN 600/Sensor type 22		2 S
DN 700/Sensor type 22		2 T
DN 800/Sensor type 22		2 U
DN 900/Sensor type 22		2 V
DN 1000/Sensor type 22		2 W
DN 1100/Sensor type 22		2 X
DN 1200/Sensor type 22		2 Y
DN 300/Sensor type 32		3 M
DN 350/Sensor type 32		3 N
DN 400/Sensor type 32		3 P
DN 450/Sensor type 32		3 Q
DN 500/Sensor type 32		3 R
DN 600/Sensor type 32		3 S
DN 700/Sensor type 32		3 T
DN 800/Sensor type 32		3 U
DN 900/Sensor type 32		3 V
DN 1000/Sensor type 32		3 W
DN 1100/Sensor type 32		3 X
DN 1200/Sensor type 32		3 Y
DN 1400/Sensor type 32		4 A
DN 1500/Sensor type 32		4 B
DN 1600/Sensor type 32		4 C
DN 1800/Sensor type 32		4 D
DN 2000/Sensor type 32		4 E
DN 500/Sensor type 50		5 R
DN 600/Sensor type 50		5 S
DN 700/Sensor type 50		5 T
DN 800/Sensor type 50		5 U
DN 900/Sensor type 50		5 V
DN 1000/Sensor type 50		5 W
DN 1100/Sensor type 50		5 X
DN 1200/Sensor type 50		5 Y
DN 1400/Sensor type 50		6 A
DN 1500/Sensor type 50		6 B
DN 1600/Sensor type 50		6 C
DN 1800/Sensor type 50		6 D
DN 2000/Sensor type 50		6 E

Flow Measurement

SITRANS FP (differential pressure flow measurement)

SITRANS FP330/FPS300 averaging pitot tube / Averaging pitot tube with FASTLOK

Selection and ordering data (continued)

SITRANS FP330/FPS300 averaging pitot tube with FASTLOK		Article No.
		7ME163 ● - ● ● ● ● ● - ● ● ● ● ●
Process connection/wetted parts material		
Cutting ring PN40/stainless steel 316L/1.4404		N
Material of welding parts/type of end support		
Carbon steel P235GH/without end support		0
Stainless steel 316L/1.4404 / without end support		1
Carbon steel P235GH mounting components with closed end support		3
Stainless steel 316L/1.4404 / closed end support		4
Thickness of pipe insulation		
Pipe insulation: 0 ... < 50 mm		0
Pipe insulation: 50 ... < 100 mm		1
Pipe insulation: 100 ... < 150 mm		2
Pipe insulation: 150 ... < 200 mm		3
System design		
Compact design for dry gases and liquids without integrated temperature measurement		0
Compact design for wet gases with or without integrated temperature measurement as well as for dry gases and liquids with integrated temperature measurement		1
Remote design for dry gases, wet gases and liquids		3
Type of protection of pressure transmitter		
No Ex/without pressure transmitter		A
Intrinsic safety		B
Explosion proof		C
Intrinsic safety, Explosion proof		D
Dust ignition proof zone 21/22 (DIP), increased safety zone 2		L
Dust ignition proof zone 20/21/22 (DIP), increased safety zone 2		M
Intrinsic safety, Explosion proof, Dust ignition proof zone 21/22 (DIP), increased safety zone 2		S
Intrinsic safety, Explosion proof, Dust ignition proof zone 21/22 (DIP), increased safety zone 2, class division		T
Electrical connections/cable entries of pressure transmitter		
Without pressure transmitter		A
2 × M20 × 1.5		F
2 × 1/2-14 NPT		M
Local operation/display of pressure transmitter		
Without display (closed lid)/without pressure transmitter		0
With display (closed lid)		1
With display (lid with glass window)		2

Order code	
Further designs*	
Please add "-Z" to Article No. and specify Order code(s) and plain text.	
Certificates of primary element incl. fittings	
Inspection certificate of the primary element (EN 10204-3.1) - material of pressure-containing and wetted parts	C52
Factory certificate of the primary element (EN 10204-2.2) - wetted parts (MR 0175-2015)	C54
Dimensional record of the primary element	C55
Dimensional drawing 1:1 DWG of the primary element	C59
Maximum measuring span of pressure transmitter	
20 mbar (8.037 inH ₂ O)	I01
60 mbar (24.11 inH ₂ O)	I02
250 mbar (100.5 inH ₂ O)	I03
600 mbar (241.1 inH ₂ O)	I04
1600 mbar (643 inH ₂ O)	I05
Shut-off valves	
With mounted shut-off valves DN8 made of carbon steel, up to 300 °C with tube fitting 12 mm	T50
With mounted shut-off valves DN8 made of stainless steel, up to 300 °C with tube fitting 12 mm	T51

Selection and ordering data (continued)

	Order code
With mounted ball valve made of stainless steel, up to 200 °C with tube fitting 12 mm	T59
Valve manifolds for mounting on primary element	
With mounted manifold (3-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws	U40
With mounted manifold (3-fold) made of stainless steel, PTFE sealings, stainless steel screws	U41
With mounted manifold (5-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws	U42
With mounted manifold (5-fold) made of stainless steel, PTFE sealings, stainless steel screws	U43
With mounted multi-way cock made of stainless steel, PTFE sealings, cadmium-plated steel screws	U44
With mounted multi-way cock made of stainless steel, PTFE sealings, stainless steel screws	U45
With enclosed manifold (3-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws with tube fitting 12 mm	U50
With enclosed manifold (3-fold) made of stainless steel, PTFE sealings, stainless steel screws with tube fitting 12 mm	U51
With enclosed manifold (5-fold) made of stainless steel, PTFE sealings, cadmium-plated steel screws with tube fitting 12 mm	U52
With enclosed manifold (5-fold) made of stainless steel, PTFE sealings, stainless steel screws with tube fitting 12 mm	U53
With enclosed multi-way cock made of stainless steel, PTFE sealings, cadmium-plated steel screws with tube fitting 12 mm	U54
With enclosed multi-way cock made of stainless steel, PTFE sealings, stainless steel screws with tube fitting 12 mm	U55
Application data	
ID number of the primary element according to sizing tool	Y40

* For further options, please refer to SITRANS P320.

Scope of delivery

- Averaging pitot tube with removal mechanism, packing gland, differential pressure connection
- Mounting part threaded welding socket with isolation ball valve
- If necessary: closed counter support
- Shut-off valves for remote design (options T5x selected in PIA)
- Manifold for compact/remote design (options U4x, U5x selected in PIA) incl. mounting brackets