




SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Technical description

Primary differential pressure devices to DIN EN ISO 5167

	Nominal diameters	Nominal pressure
 <p>Orifice plates with annular chambers</p>	EN: DN 50 ... DN 1 000 ASME: 2 inch ... 40 inch	EN: PN 6 ... PN 100 ASME: Class 150 ... 600
 <p>Orifice plates with single tapplings</p>	EN: DN 50 ... DN 500 ASME: 2 inch ... 20 inch	EN: PN 6 ... PN 315 ASME: Class 150 ... 2 500
 <p>Metering pipes</p> <ul style="list-style-type: none"> Orifice plate with annular chambers, mounted between flanges Orifice plate with single tapplings, mounted between flanges 	EN: DN 10 ... DN 50 ASME: ½ inch ... 2 inch	EN: PN 10 ... PN 100 ASME: Class 150 ... 600
	EN: DN 10 ... DN 50 ASME: ½ inch ... 2 inch	EN: PN 10 ... PN 160 ASME: Class 150 ... 2 500

Further products for the complete setup for flow measurements with a primary differential pressure device,

e.g. an orifice plate



+

For **compensation vessels**, see Chap. 2
For **threaded flange pairs**, see Chap. 2

+

For **initial shut-off valves**, see Chap. 2

+

For **valve manifolds**, see Chap. 2, e.g.
5-spindle valve manifold or



Valve manifold combination DN 8 for vapor measurement

+

For **SITRANS P DS III differential pressure transmitter**, see Chap. 2
Possible measuring cells:
20, 60, 250, 600 and 1 600 mbar



Overview

Primary differential pressure devices are standardized mechanical flow sensors, often also referred to as differential pressure transducers.

Through constriction of the line diameter in the pressure device, the flow rate creates a differential pressure that is converted with the help of a differential pressure transmitter into a proportional current signal or flow value. The assignment of differential pressure to flow is created by means of a "calculation of the primary differential pressure device".

Primary differential pressure devices are suitable for single-phase media such as gas, vapor and liquids without solid components.

On lines with small nominal diameters (DN 10 to DN 50) the measurements are influenced by the wall roughness and diameter tolerances of the pipes, far more so than by large nominal diameters. These influences are counteracted by using metering pipes with fitting inlet and outlet pipe sections made of precision pipes. The flow coefficient C for exact measurements with metering pipes must be determined by means of calibration.

Requirement when ordering a primary differential pressure device

The orifice plate calculation and the classification according to the pressure equipment directive (PED) must be quoted when placing an order. The complete data of the measuring point are thus required. Details of installation conditions, flow conditions, corrosiveness/resistance and properties of the media are needed in addition. Pressure conditions, permissible pressure losses and accuracy requirements must be considered.

You must enclose a completed "Questionnaire for calculation of a primary differential pressure device to DIN EN ISO 5167" with the order (see page 4/317).

More information is available under "Pressure equipment directive 97/23/EC" and "Calculation of primary differential pressure devices".

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Benefits

- Primary differential pressure devices are suitable for universal use across the globe
- Primary differential pressure devices are very robust and can be used in a wide range of nominal diameters
- Suitable for high temperature and pressure ranges
- No wet calibration required as they use an internationally standardized flow rate measurement procedure
- The differential pressure transmitter can be used over a long distance from the measuring location
- The differential pressure method is well known and has a large installed base
- The SITRANS P differential pressure transmitter is easy to parameterize again if process data change. They are adapted by recalculating and assigning new parameters to the transmitter or, in the case of the version orifice plate with annular chamber, by using a new orifice disk

Application

Power stations

Measurement of steam, condensate and water.

Petrochemical industry

Measurement of water, steam and liquid and gas hydrocarbons.

Chemical industry

Measurement of various liquid and gas media.

Design

Orifice plate with annular chambers

The version orifice plate with annular chambers comprises two support rings which are connected to the inside of the pipe over an annular chamber and an annular gap. Tapping sockets direct the differential pressure from the support rings to the differential pressure transmitter over shut-off fittings and differential pressure lines.

The orifice disk is inserted between the support rings together with a gasket.

Orifice plate with single tappings

In the version of the orifice plate with single tappings the orifice plate is a single unit. The inside of the tube is connected to the tapping sockets by two single tappings.

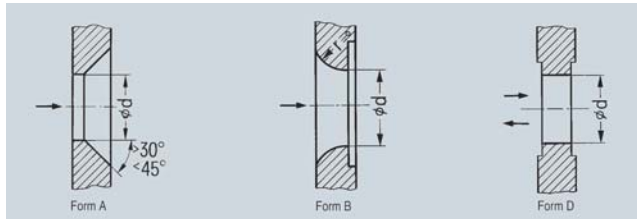
Both types of orifice plate are installed between two flanges in the pipeline.

Function

Mode of operation

The orifice plate creates a differential pressure. The pressure is transferred through the vertical columns of medium in the differential pressure lines to the measuring cell of the differential pressure transmitter. The transmitter converts the pressure signal with square-root characteristic into a flow-proportional current or into a digital signal, e.g. PROFIBUS.

Types of primary differential pressure devices



Shapes of the orifice disk aperture

The primary differential pressure devices are manufactured according to DIN EN ISO 5167. According to this, the application range of the standard orifice disk aperture form A is limited by the Reynolds number. The limits depend on the diameter ratio $\beta = d/D$. (D: internal diameter of pipe).

In the case of Reynolds numbers from approx. 500 to 2.5×10^5 and DN 40 to DN 150, the orifice disk aperture form B (quarter circle) can be used for slightly less accurate measurements. The profile radius r depends on the diameter ratio β and results from the calculation of the diameter of the orifice disk aperture d .

The cylindrical orifice disk aperture form D is used for measurements in both flow directions.

Tapping sockets

Type of threaded connections and welding connections dependent on the measured medium and the nominal pressure of the shut-off fitting

The type of socket connections depends on the measured medium and the nominal pressure of the shut-off fittings; the socket length depends on the nominal diameter (pipe diameter) of the primary differential pressure device and the operating temperature (because of the thermal insulation!). If using with high temperatures and stronger insulations, please quote the insulation thickness and the required length of the tapping sockets when placing an order. The socket position depends on the measured medium and the flow direction.

- With threaded connection $G\frac{1}{2}$ DIN ISO 228/1, connection dimensions to DIN 19207 Form V, for liquids and gases up to PN 160, for steam up to PN 100
- With threaded connection $\frac{1}{4}$ -14 NPT male, for version to ASME up to class 600
- With threaded connection $\frac{3}{4}$ -14 NPT male, for version to ASME from class 900 to 1500
- With ferrule for pipe \varnothing 12 mm, S series
- With welding connection \varnothing 21.3 mm for liquids, gases and steam up to PN 400 or \varnothing 24 mm for liquids, gases and steam over PN 400

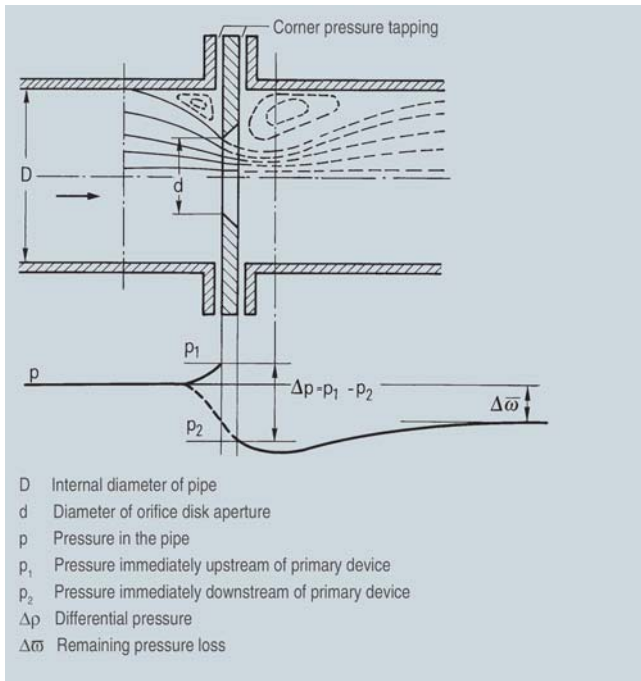
Other connections on request.

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Principle of the differential pressure method



Principle of the differential pressure method: Pressure curve at a pipe restriction

A primary differential pressure device is installed at the measuring point to measure the flow. This restricts the pipe and has two connections for sampling the differential pressure. If the properties of the primary device and the medium are known such that the equation below can be evaluated, the differential pressure is a measure of the absolute flow. No comparison measurements are required; the flow measurement can be checked independent of the device manufacturer.

The differential pressure method is based on the law of continuity and Bernoulli's energy equation.

According to the law of continuity, the flow of a moving medium in a pipeline is the same at all points. If the cross-section is reduced at one point, the flow velocity must increase at this point. According to Bernoulli's energy equation, the energy content of a flowing medium is constant and is the total of the static (pressure) and kinetic (movement) energies. An increase in the flow rate therefore results in a reduction in the static pressure (see the figure "Principle of the differential pressure method: Pressure curve at a pipe restriction"). This pressure difference Δp , the so-called differential pressure, is a measure of the flow.

In general the following equation applies: $q = c\sqrt{\Delta p}$

Where:

- q: flow (q_m , q_v) mass flow or volume flow
- Δp : Differential pressure
- c: Factor depending on the dimensions of the pipeline, the type of constriction, the density of the flowing medium etc.

According to this equation, the differential pressure created by the constriction is proportionally equal to the square of the flow (see the figure "Relationship between flow q and differential pressure Δp ").

Integration

The orifice plate is installed between two flanges in the pipeline. Using compensation vessels (for steam) and initial shut-off valves the differential pressure of the high-pressure side and low-pressure side is directed through differential pressure lines to a multiple valve manifold and on to the differential pressure transmitter. For media with extreme pressure and temperature fluctuations it makes sense to take an additional measurement of the pressure and temperature in order to correct the flow signal of the transmitter in a subsequent correction computer.

Selection of mounting point

The flow measuring regulations DIN EN ISO 5167 do not only consider the design of primary differential pressure devices, but also assume that their installation is in accordance with the standard so that the specified tolerances can be retained. Installation in accordance with the standard should already be considered when planning the pipeline. Particular attention must be paid to ensure that the primary device can be fitted in a sufficiently long straight section of pipe. Bends, valves and similar must be fitted so far upstream of the primary device that they no longer have a detrimental effect. Primary devices with a large diameter ratio are particularly sensitive to interferences.

Design of measuring point

The design of the measuring point depends on the medium and on the spatial conditions. The designs for gas and water only differ in the arrangement of the tapping sockets (see the figure "Measuring setup"); compensation vessels must additionally be provided for steam.

Options

Further versions that are available on request:

- Other nominal diameters and nominal pressures to EN and ASME
- Other lengths, special lengths
- Other materials
- Sealing face with recess or groove
- Flushing rings
- Other tapping sockets, multiple tappings
- Material acceptance test certificates or cold water pressure tests

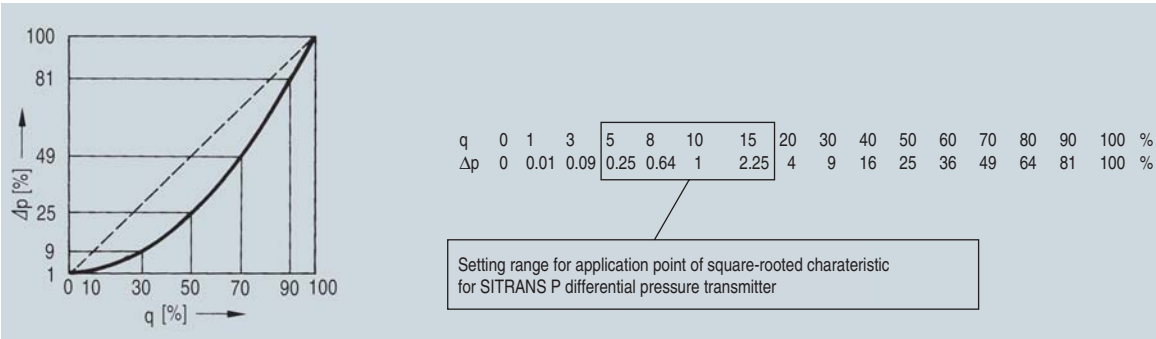
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Technical description

Characteristic curves

The orifice plate has a square-law relationship between differential pressure and flow. A square-root transmitter is required therefore to create a linear flow characteristic.



Relationship between flow q and differential pressure Δp

More information

- Standards
- Instruction Manual SITRANS P
- Installation Instructions

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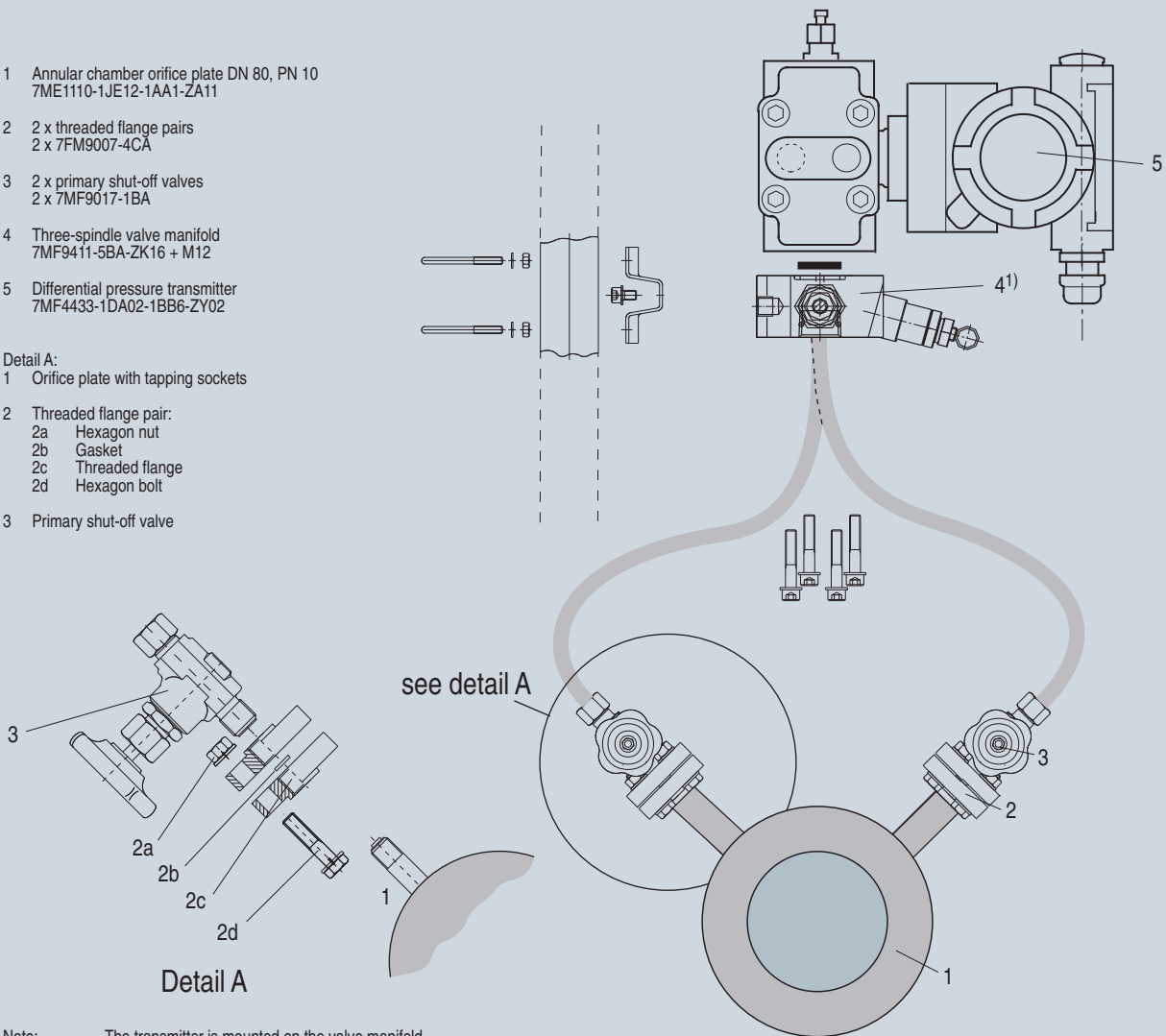
SITRANS F O delta p - Primary differential pressure devices

Technical description

- 1 Annular chamber orifice plate DN 80, PN 10
7ME1110-1JE12-1AA1-ZA11
- 2 2 x threaded flange pairs
2 x 7FM9007-4CA
- 3 2 x primary shut-off valves
2 x 7MF9017-1BA
- 4 Three-spindle valve manifold
7MF9411-5BA-ZK16 + M12
- 5 Differential pressure transmitter
7MF4433-1DA02-1BB6-ZY02

Detail A:

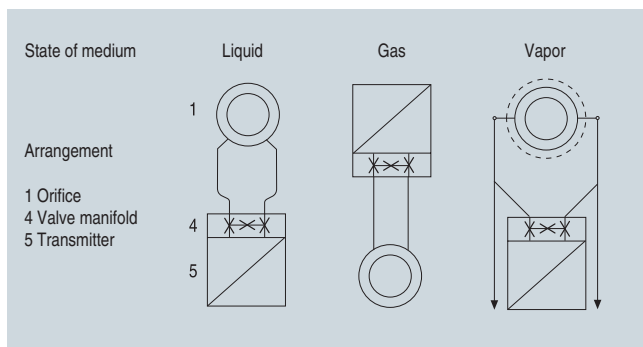
- 1 Orifice plate with tapping sockets
- 2 Threaded flange pair:
 - 2a Hexagon nut
 - 2b Gasket
 - 2c Threaded flange
 - 2d Hexagon bolt
- 3 Primary shut-off valve



Note: The transmitter is mounted on the valve manifold.
The valve manifold is mounted on the pipe (or wall).

- 1) Pipe union of the differential pressure line on the valve manifold must be provided by the customer.
(screwed gland 1/2 NPT to 12 mm (0.47 in) differential pressure line; 12 mm (0.47 in) differential pressure line must be provided by the customer)

Design of measuring point with gas measurement as example (non-corrosive, non-hazardous)



Measuring setup

Technical specifications

The technical properties of the orifice plates depend on the device:

- Nominal diameters
- Nominal pressure
- Materials
- Mass
- Temperature limits

Accessories

- Compensation vessels
- Threaded flange pairs
- Primary shut-offs
- Valve manifold
- Differential pressure lines (to be provided by the plant owner)
- Gaskets, bolts, screws (to be provided by the plant owner)
- Differential pressure transmitter

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Pressure equipment directive 97/23/EC

Overview

The pressure equipment directive 97/23/EC applies to the alignment of the statutory orders of the European member states for pressure equipment. Equipment as defined by the directive includes vessels, pipelines and accessories with a maximum permissible pressure of more than 0.5 bar above atmospheric.

The pressure equipment directive can be used starting November 29, 1999, and is compulsory starting May 29, 2002.

Division according to the danger potential

Equipment is divided in line with the pressure equipment directive according to the danger potential (medium/pressure/volume/nominal diameter) into the categories I to III or Article 3 Paragraph 3.

The following criteria are decisive for assessment of the danger potential and are also shown in the diagrams (see "Characteristic curves").

Fluid group	Group 1 or 2
Aggregate state	Liquid or gaseous
Type of pressurized equipment	
• Pipeline	Nominal diameter, pressure or product of pressure and nominal diameter (PS * DN)

Note

Liquids according to Article 3 are those liquids whose steam pressure is not more than 0.5 bar above standard atmospheric pressure (1013 mbar) at the maximum permissible temperature.

The maximum permissible temperature for the used liquids is the maximum process temperature which can occur, as defined by the user. This must be within the limits defined for the equipment.

Division of media (liquid/gaseous) into the fluid groups

Fluids are divided according to Article 9 into the following fluid groups:

Group 1



Potentially explosive

R phrases:
e.g.: 2, 3 (1, 4, 5, 6, 9, 16, 18, 19, 44)



Highly toxic

R phrases:
e.g.: 26, 27, 28, 39 (32)



Highly combustible

R phrases:
e.g.: 12 (17)



Toxic

R phrases:
e.g.: 23, 24, 25 (29, 31)



Readily flammable

R phrases:
e.g.: 11, 15, 17 (10, 30)



Fire stimulating

R phrases:
e.g.: 7, 8, 9 (14, 15, 19)

Flammable if the maximum permissible temperature is above the flash point.

Group 2

All fluids not belonging to Group 1.

Also applies to fluids which are e.g. dangerous to the environment, corrosive, dangerous to health, irritant or carcinogenic (if not highly toxic).

Conformity rating

Pressure equipment of categories I to IV must comply with the safety requirements of the directive and be assigned the CE symbol.

They must comply with a conformity rating procedure according to Appendix III of the directive.

Pressure equipment according to Article 3 Paragraph 3 must be designed and manufactured in agreement with the sound engineering practice SEP applying in a member country, and must not be assigned a CE symbol (CE symbols from other directives are not affected).

The manufacturer issues a declaration of conformity if the orifice plates are produced for use in the area covered by the PED and are assignable to the categories I, II, III or IV. This declaration of conformity will receive the orderer. This depends on the maximum permissible design data of the customer plant, which must be specified in the "Questionnaire for manufacture according to the pressure equipment directive PED - Directive 97/23/EC".

Following information is mandatory:

- PS (maximum permissible pressure (not PN)) of the plant
- TS (maximum permissible temperature (not operating temperature)) of the plant
- DN
- Fluid

Note

Equipment designed for media with a high danger potential (e.g. gases of fluid group 1) may also be used for media with a lower danger potential (e.g. gases of fluid group 2, or liquids of fluid groups 1 and 2).

The pressure equipment directive according to Article 1 Paragraph 3 does not apply to equipment such as e.g. mobile offshore plants, ships, aircraft, water supply and waste water networks, nuclear plants, rockets and pipelines outside industrial plants.

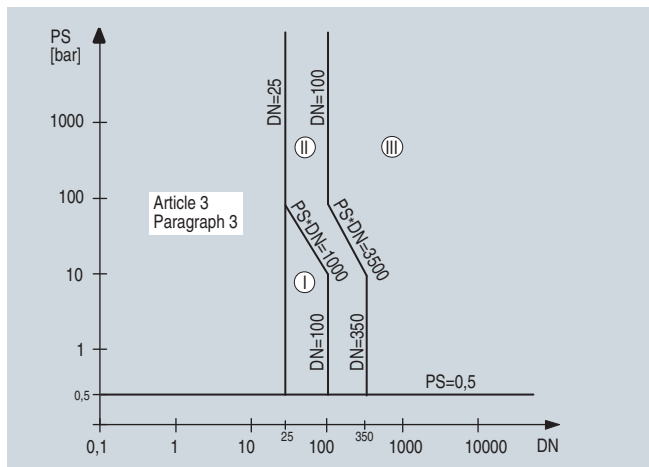
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Pressure equipment directive 97/23/EC

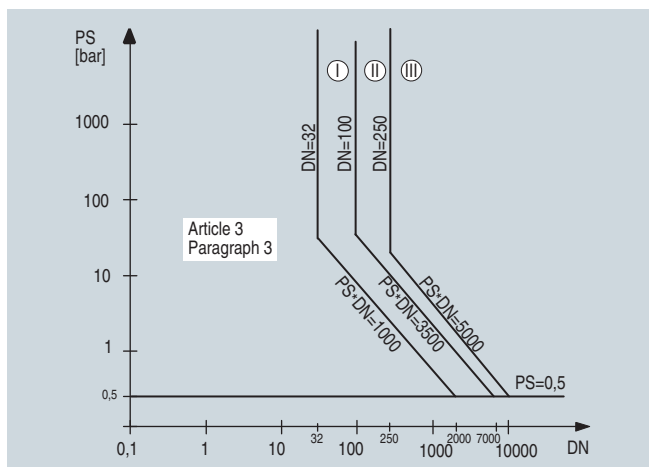
Characteristic curves

Gases of fluid group 1



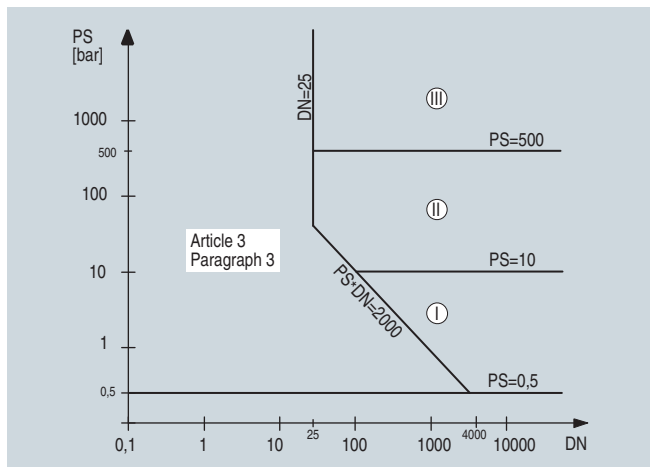
Pipelines according to Article 3 Number 1.3 Letter a) First dash
 Exception: Unstable gases belonging to Categories I and II must be included in Category III.

Gases of fluid group 2



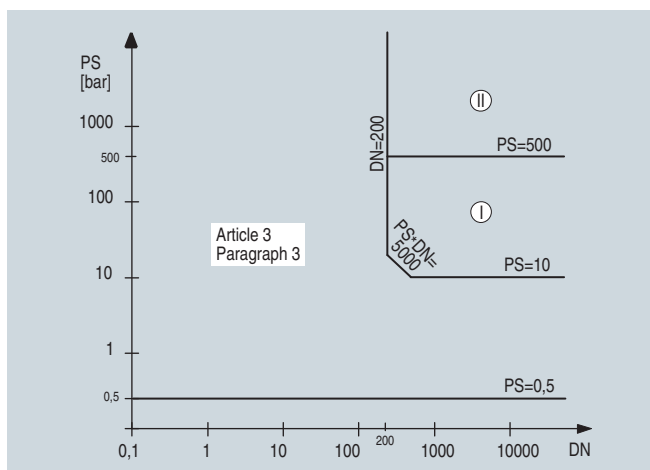
Pipelines according to Article 3 Number 1.3 Letter a) Second dash
 Exception: Liquids at temperatures > 350 °C belonging to Category II must be included in Category III.

Liquids of fluid group 1



Pipelines according to Article 3 Number 1.3 Letter b) First dash

Liquids of fluid group 2



Pipelines according to Article 3 Number 1.3 Letter b) Second dash

4

Questionnaire No.: _____ Page 1/2

Language of the calculation protocol

German

English

French

Dutch

Spanish

Polish

Tag (e.g. measuring-point number): _____

Company: _____

Application according to "Pressure equipment directive 97/23/EC" (use in Europe)

 Yes The following data are required:*Design values of pipeline*• **Maximum permissible pressure** (*not PN*) PS¹⁾ _____ bar psi- at the **maximum permissible temperature** TS²⁾ °C °F¹⁾ PS: setting pressure of the safety mechanism (valve, bursting disk)²⁾ TS: range of the temperature limits• **Nominal diameter** DN _____• **Fluid** (batch material) _____

Name

additionally for liquids:

- **Dependent on steam pressure** _____ bar psi• **Dangerous fluids**- Explosive Group 1

- Slightly of highly combustible

- Fire stimulating

- Toxic, very toxic

All others Group 2

Appendix II of the pressure equipment directive contains 4 diagrams with which the associated category of the primary differential pressure devices can be determined (see page 4/318).

 Article 3, paragraph 3 Category I Category II Category III No When manufacturing without the pressure equipment directive, it is essential to specify the reason: Use outside the scope of the pressure equipment directive Customer with users' testing agency

For calculation of the primary differential pressure device

Medium: _____ Liquid Steam ⇒ overheated; saturated $p_1^{1)}$; saturated $t_1^{2)}$ Gas ⇒ dry moist Relative humidity φ _____ %**Absolute operating pressure p_1 :** _____ bar psi*(overpressure on measuring point plus atmospheric pressure at location)***Operating temperature t_1 :** _____ °C °F**Density** (only for gas and liquid): _____ kg/m³ standard condition operating condition¹⁾ Only the information for absolute operating pressure p_1 required.²⁾ Only the information for operating temperature t_1 required.

**Questionnaire for the calculation
of a primary differential pressure device to EN ISO 5167-1
and data for manufacturing according to "Pressure equipment directive 97/23/EC"**

Questionnaire No.: _____ Page 2/2

Dynamic viscosity (only for gas and liquid): _____ Pa · s cp

Boiling pressure (p_1): _____ bar psi

Boiling temperature (t_1): _____ °C °F

Isentropic exponent (only for gas): _____

Real gas constant Z_n : _____ Z_1 : _____ (without data: $Z_{n,1} = 1$)

Internal pipe diameter: _____

mm inch

Pipe roughness: _____

mm inch

Material of pipeline: _____

Material no.: _____

Material of primary device: _____

Material no.: _____

Primary device:

Kind of tapping/kind of device

Orifice plate

⇒

Corner tap

D, D/2

flange

Nozzle

⇒

Quarter circle

Segment

Quarter circle

Venturi

Venturi tube

⇒

ISA 1932

Long radius

Sheet steel

Other

⇒

Raw cast

Machined

C: _____ ;

ε: _____

Calculation of:

"d";

differential pressure;

flow

Design:

2/3 max. flow

max. flow

Max. flow: _____

q_m

kg/h

..... (mass flow for all media)

q_v

m^3/h

..... (volume flow for liquids and gases)

q_n

m^3/h

..... (volume flow for gases at standard condition)

Differential pressure: _____ mbar

Orifice disk aperture "d": _____ mm inch

Max. permanent pressure loss: _____ mbar

Uncertainties to be allowed for calculation in % (without data: 0 %)

Operating temperature _____; Absolute pressure _____; Differential pressure _____;

Operating density _____; Additional uncertainty _____

Note:

The delivery time will be delayed if the data are incomplete.

For clarification of any questions:

Name: _____  _____ E-Mail: _____

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Orifice plate with annular chambers

Application



Suitable for non-corrosive and corrosive gases, vapors and liquids; permissible operating temperature -60 to +550 °C.

Design

- Two support rings with replaceable orifice disk form A, B or D (see types of primary differential pressure devices in "Technical description", "Function"); see Ordering data for materials.
- Graphite gasket with noncorrosive metal foil insert between orifice disk and support ring outlet

Overall length

65 mm to DIN 19205

Nominal diameters

EN: DN 50 to DN 1000
ASME: 2 inch to 40 inch

Nominal pressure

EN: PN 6 to PN 100
ASME: class 150 to 600

Sealing face to the mating flanges

- Plane, sealing face turned, N10/N12 to DIN ISO 1302, for soft gasket (PN 6 to PN 40)
- Plane, sealing face turned, N8 to DIN ISO 1302, for grooved gasket to DIN 2697 (PN 63 to PN 100)
- Plane, RF (raised faced) for version to ASME

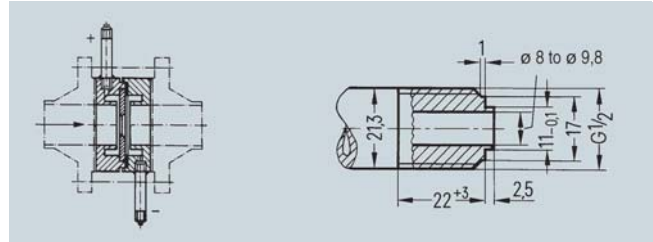
Tapping sockets

For the dimensions of the following tapping sockets (see page 4/313):

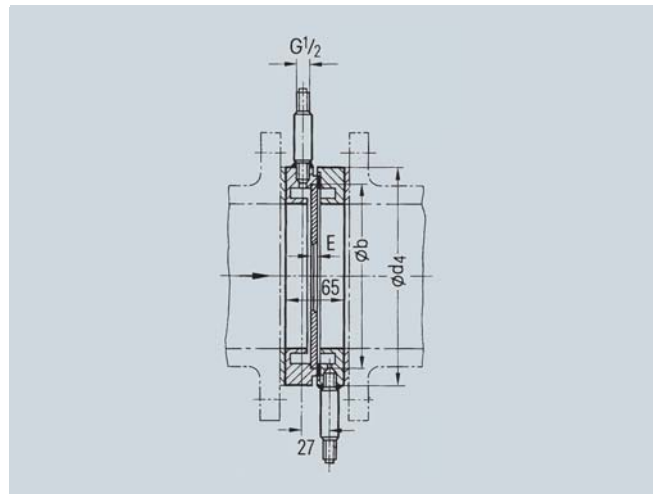
- With connection thread G $\frac{1}{2}$ DIN ISO 228/1, connection dimensions to DIN 19207 form V
- With threaded connection $\frac{1}{2}$ -14 NPT male, for version to ASME
- with ferrule for pipe \varnothing 12 mm, S series
- with welding connection \varnothing 21.3 mm

See "Technical description" and "Function" for position of the tapping sockets.

Dimensional drawings



Orifice plate with annular chamber (left); tapping socket with threaded connection, dimensions in mm



Tapping socket: Socket length is fixed in accordance with the pressure and nominal diameter (DIN 19 205, Part 2).
- Threaded connections of tapping sockets for liquids and gases up to PN 160, for steam up to PN 100, dimensions in mm

Versions for steam lines: See "Technical description", "Function" for position of the tapping sockets.

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Orifice plate with annular chambers

Nominal diameter acc. to EN

DN	Inside diameter	External diameter d_4 / sealing face: plane, with recess or with groove.						
		PN 6	PN 10	PN 16	PN 25	PN 40	PN 63	PN 100
50	43 ... 55	96	107	107	107	107	113	119
65	59 ... 71	116	127	127	127	127	138	144
80	73 ... 85	132	142	142	142	142	148	154
100	90 ... 108	152	162	162	168	168	174	180
125	114 ... 132	182	192	192	194	194	210	217
150	142 ... 160	207	218	218	224	224	247	257
200	185 ... 211	262	273	273	284	290	309	324
250	237 ... 262	317	328	329	340	352	364	391
300	285 ... 314	373	378	384	400	417	424	458
350	328 ... 362	423	438	444	457	474	486	512
400	380 ... 408	473	489	495	514	546	543	–
500	477 ... 514	578	594	617	624	628	–	–
600	581 ... 610	679	695	734	731	–	–	–
700	686 ... 710	784	810	804	833	–	–	–
800	776 ... 810	890	917	911	942	–	–	–
900	876 ... 910	990	1 017	1 011	1 042	–	–	–
1000	976 ... 1 010	1 090	1 124	1 128	1 154	–	–	–

Orifice plates with annular chambers for installation between EN flanges to EN 1092-1, dimensions in mm and weights

DN	L				E	Weight (approx. in kg)		
		PN 6	PN 10 ... PN 25	PN 40		PN 63 ... PN 100	PN 6 ... PN 100	With smallest nominal pressure
50	79	79	79	79	79	2±0.2	2,5	4,5
65	96	96	96	96	96	2±0.2	3,4	6,4
80	115	115	115	115	115	4±0.2	4,3	6,9
100	137	137	137	137	137	4±0.25	4,7	8,6
125	164	164	164	164	164	4±0.25	6,3	12,4
150	193	193	193	193	193	4±0.29	7,0	17,0
200	247	247	247	247	247	4±0.29	10,3	26,2
250	302	302	302	302	302	4±0.32	13,1	36,6
300	354	354	354	354	354	4±0.36	17,3	49,0
350	403	403	403	403	403	4±0.4	25,0	63,0
400	452	452	452	452	452	4±0.4	28,0	73,8
500	553	563	563	–	6±0.4	36,2	65,9	
600	659	659	–	–	6±0.4	42,5	75,6	
700	757	762	–	–	8±0.4	51,8	89,5	
800	869	875	–	–	8±0.4	61,7	109	
900	969	975	–	–	8±0.4	68,3	123	
1 000	1 071	1 079	–	–	10±0.4	74,0	148	

Orifice plates with annular chambers for installation between EN flanges to EN 1092-1, dimensions in mm and weights (contd.)

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Orifice plate with annular chambers

Nominal diameter acc. to ASME

Nominal diameter	External diameter d4 / sealing face: Plane, RF (raised faced)			L			E	Weight (approx. in kg)	
	Class 150	Class 300	Class 600	Class 150	Class 300	Class 600	Class 150 ... 600	With smallest nominal pressure	With largest nominal pressure
2 inch	105	111	111	79	79	79	2±0.2	2.5	4.5
2½ inch	124	130	130	96	96	96	2±0.2	3.4	6.4
3 inch	137	149	149	115	115	115	4±0.2	4.3	6.9
4 inch	175	181	194	137	137	137	4±0.2	4.7	8.6
5 inch	197	216	241	164	164	164	4±0.25	6.3	12.4
6 inch	222	251	267	193	193	193	4±0.29	7.0	17.0
8 inch	279	308	321	247	247	247	4±0.29	10.3	26.2
10 inch	340	362	400	302	302	302	4±0.32	13.1	36.6
12 inch	410	422	457	354	354	354	4±0.36	17.3	49.0
14 inch	451	486	492	403	403	403	4±0.4	25.0	63.0
16 inch	514	540	565	452	452	452	4±0.4	28.0	73.8
20 inch	549	597	613	553	563	563	6±0.4	36.2	65.9
24 inch	717	775	790	659	659	–	6±0.4	42.5	75.6

Orifice plates with annular chambers for installation between ASME flanges to ASME B16.5, dimensions in mm and weights

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with annular chambers

Selection and ordering data

Order No.

Orifice plate with annular chambers 7 ME 1 1 1 0 - - - - - Z

for mounting between flanges

Sealing faces to the mating flanges: plane.

Nominal diameter acc. to EN

DN 50

- PN 6 1 GA
- PN 10 ... 40 1 GE
- PN 63 1 GF
- PN 100 1 GG

DN 65

- PN 6 1 HA
- PN 10 ... 40 1 HE
- PN 63 1 HF
- PN 100 1 HG

DN 80

- PN 6 1 JA
- PN 10 ... 40 1 JE
- PN 63 1 JF
- PN 100 1 JG

DN 100

- PN 6 2 AA
- PN 10 and PN 16 2 AC
- PN 25 and PN 40 2 AE
- PN 63 2 AF
- PN 100 2 AG

DN 125

- PN 6 2 BA
- PN 10 and PN 16 2 BC
- PN 25 and PN 40 2 BE
- PN 63 2 BF
- PN 100 2 BG

DN 150

- PN 6 2 CA
- PN 10 and PN 16 2 CC
- PN 25 and PN 40 2 CE
- PN 63 2 CF
- PN 100 2 CG

DN 200

- PN 6 2 EA
- PN 10 and PN 16 2 EC
- PN 25 2 ED
- PN 40 2 EE
- PN 63 2 EF
- PN 100 2 EG

DN 250

- PN 6 2 FA
- PN 10 2 FB
- PN 16 2 FC
- PN 25 2 FD
- PN 40 2 FE
- PN 63 2 FF
- PN 100 2 FG

DN 300

- PN 6 2 GA
- PN 10 2 GB
- PN 16 2 GC
- PN 25 2 GD
- PN 40 2 GE
- PN 63 2 GF
- PN 100 2 GG

Selection and ordering data

Order No.

Orifice plate with annular chambers 7 ME 1 1 1 0 - - - - - Z

DN 350

- PN 6 2 HA
- PN 10 2 HB
- PN 16 2 HC
- PN 25 2 HD

- PN 40 2 HE
- PN 63 2 HF
- PN 100 2 HG

DN 400

- PN 6 2 JA
- PN 10 2 JB
- PN 16 2 JC
- PN 25 2 JD
- PN 40 2 JE
- PN 63 2 JF

DN 500

- PN 6 2 KA
- PN 10 2 KB
- PN 16 2 KC
- PN 25 2 KD
- PN 40 2 KE

DN 600

- PN 6 3 AA
- PN 10 3 AB
- PN 16 3 AC
- PN 25 3 AD

DN 700

- PN 6 3 BA
- PN 10 3 BB
- PN 16 3 BC
- PN 25 3 BD

DN 800

- PN 6 3 CA
- PN 10 3 CB
- PN 16 3 CC
- PN 25 3 CD

DN 900

- PN 6 3 DA
- PN 10 3 DB
- PN 16 3 DC
- PN 25 3 DD

DN 1000

- PN 6 3 EA
- PN 10 3 EB
- PN 16 3 EC
- PN 25 3 ED

Nominal diameter acc. to ASME

2 inch

- Class 150 5 GA
- Class 300 5 GB
- Class 600 5 GC

2½ inch

- Class 150 5 HA
- Class 300 5 HB
- Class 600 5 HC

3 inch

- Class 150 5 JA
- Class 300 5 JB
- Class 600 5 JC

4 inch

- Class 150 6 AA
- Class 300 6 AB
- Class 600 6 AC

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with annular chambers

Selection and ordering data	Order No.	Selection and ordering data	Order No.
Orifice plate with annular chambers	7 ME 1 1 1 0 - ■ ■ ■ ■ - ■ ■ ■ ■ - Z	Orifice plate with annular chambers	7 ME 1 1 1 0 - ■ ■ ■ ■ - ■ ■ ■ ■ - Z
5 inch		Tapping sockets	
• Class 150	6 BA	• With threaded connection G½; for liquids and gases PN 160, for steam PN 100	
• Class 300	6 BB	- Opposite one another, straight	1 A
• Class 600	6 BC	- Opposite one another, bent-up, for vertical pipelines	1 B
6 inch		- Arranged on one side, for horizontal pipelines	1 C
• Class 150	6 CA	• With threaded connection ½-14 NPT male	
• Class 300	6 CB	- Opposite one another, straight	1 Q
• Class 600	6 CC	- Opposite one another, bent-up, for vertical pipelines	1 R
8 inch		- Arranged on one side, for horizontal pipelines	1 S
• Class 150	6 EA	• With ferrule for pipe Ø 12 mm, S series	
• Class 300	6 EB	- Opposite one another, straight	1 J
• Class 600	6 EC	- Opposite one another, bent-up, for vertical pipelines	1 K
10 inch		- Arranged on one side, for horizontal pipelines	1 L
• Class 150	6 FA	• With welding connection Ø 21.3 mm; for liquids and gases PN 100 to PN 400 for steam PN 100	
• Class 300	6 FB	- Opposite one another, straight	1 D
• Class 600	6 FC	- Opposite one another, bent-up, for vertical pipelines	1 E
12 inch		- Arranged on one side, for horizontal pipelines	1 F
• Class 150	6 GA	Shape of orifice disk aperture (see figure "Shapes of orifice disk aperture")	
• Class 300	6 GB	• For flow in one direction	
• Class 600	6 GC	- Orifice plate form A	A
14 inch		- Quarter-circle nozzle form B	B
• Class 150	6 HA	• For flow in both directions	
• Class 300	6 HB	- Cylindrical orifice plate form D	D
• Class 600	6 HC	Manufactured according to pressure equipment directive (see "Questionnaire" (page 4/319))	
16 inch		• Without ²⁾	0
• Class 150	6 JA	• According to Article 3, Paragraph 3	1
• Class 300	6 JB	• According to category 1	2
• Class 600	6 JC	• According to category 2	3
18 inch		• According to category 3	4
• Class 150	6 KA		
• Class 300	6 KB		
• Class 600	6 KC		
20 inch			
• Class 150	7 AA		
• Class 300	7 AB		
• Class 600	7 AC		
for non-corrosive media			
• Support rings made of P250GH, Mat.No. 1.0460 or P265GH, Mat.No. 1.0425; Tapping sockets made of P235G1TH, Mat.No. 1.0345; orifice disk made of X 6 CrNiMoTi 17-12-2, Mat.No. 1.4571; permissible operating tempera- ture -10 up to +450 °C, for tapping socket with ferrule for pipe, 12 mm, S series, max. 200 °C	1 2		
For corrosive media			
• Support rings, tapping socket and orifice disk made of X 6 CrNiMoTi 17-12-2, Mat.No. 1.4571; permissible temperature -60 to +550 °C, for tapping socket with ferrule for pipe, 12 mm, S series, max. 400 °C	1 4		

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with annular chambers

Selection and ordering data	Order No.
Orifice plate with annular chambers	7 ME 1 1 1 0 - ■■■■ - ■■■■ - Z
Further designs	Order code¹⁾
Add "-Z" to Order No. and specify Order code(s) and plain text.	
Calculation of orifice disk aperture Enclose a calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167" with the order!	A11
Orifice plate without calculation Specify in plain text: Diameter of orifice disk aperture d = ... mm Internal diameter of pipe D = ... mm Radius of quarter-circle nozzle r = ... mm	Y01
Material certificate Acceptance test certificate to EN 10204-3.1	C01
Orifice plate degreased for oxygen measurements Note: Cleaned and foil-packed. When using, note that the orifice plate must be completely degreased when fitted in the pipeline.	A12
Orifice disk including gasket	On request
Other materials	On request
Additional nominal diameters and nominal pressure stages according to EN and ASME	On request
Cold water pressure test 1.5 x PN, acceptance test certificate to EN 10204	On request
Flushing rings	On request
Support rings made of 1.7335	On request
Sealing face of orifice plate with recess or groove	On request

¹⁾ Order codes additive, any sequence.

²⁾ Option only available outside Europe (manufactured according to Article 3, Paragraph 3 of the pressure equipment directive, without CE marking).

Note on ordering

Enclose a filled-out calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167" with the order (necessary for device selection)!

scope of delivery

Two support rings with tapping sockets, one orifice disk, one gasket between orifice disk and support ring.
Graphite (99.85 %) flat gasket with foil insert (1.4401, 0.1 mm).
Application for liquids, steam, gases, liquid gases, acids, hydrocarbons, oils and oil products.

Accessories

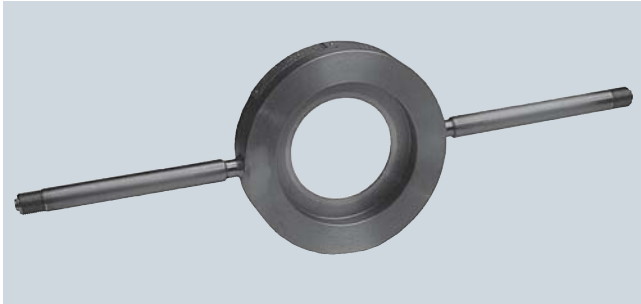
See "SITRANS P measuring instruments for pressure".

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with single tappings

Application



Suitable for non-corrosive and corrosive gases, vapors and liquids; permissible operating temperature -60 to +570 °C

Design

One-piece orifice plate, orifice disk form A, B or D (see types of primary differential pressure devices in "Technical description", "Function"); see Ordering data for materials.

Overall length

40 mm to DIN 19205

Nominal diameters

EN: DN 50 to DN 500
ASME: 2 inch to 20 inch

Nominal pressure

EN: PN 6 to PN 315
ASME: class 150 to 2500

Sealing face to the mating flanges

- Plane, sealing face turned, N10/N12 to DIN ISO 1302, for soft gasket (PN 6 to PN 40)
- Plane, sealing face turned, N8 to DIN ISO 1302, for grooved gasket to DIN 2697 (PN 63 to PN 400)
- Plane, RF (raised faced) for versions to ASME

Tapping sockets

- With connection thread G $\frac{1}{2}$ DIN ISO 228/1, for connection dimensions to DIN 19207 form V (see page 4/313)
- With threaded connection $\frac{1}{2}$ -14 NPT male, for version to ASME
- With ferrule for pipe \varnothing 12 mm, S series
- With welding connection \varnothing 21.3 mm

Connection size

The connection size depends on the operating pressure, the temperature of the medium (DIN 19 207 and 19 211) and the medium, e.g.

- For liquids and gases,
 - up to PN 160: Thread G $\frac{1}{2}$ or welding connection \varnothing 21.3 mm
 - from PN 6 and PN 400: Welding connection \varnothing 21.3 mm
 - > PN 400: Welding connection \varnothing 24 mm
- For steam
 - up to PN 100: Thread G $\frac{1}{2}$ or welding connection \varnothing 21.3 mm
 - from PN 6: Welding connection \varnothing 24 mm

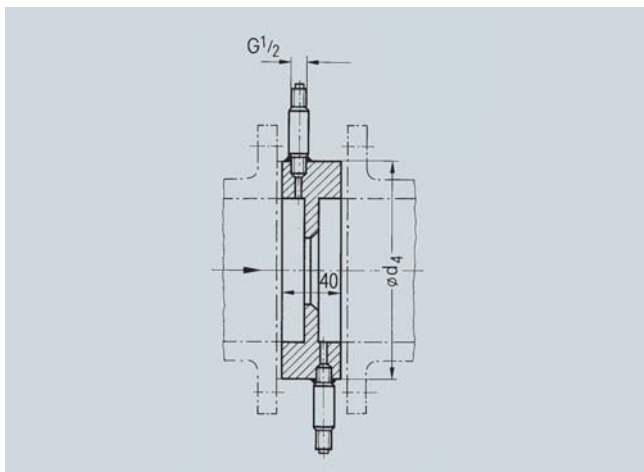
See "Technical description" and "Function" for position of the tapping sockets.

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with single tapplings

Dimensional drawings



Tapping socket: Socket length is fixed in accordance with the pressure and nominal diameter (DIN 19 205, Part 2), dimensions in mm
 - Threaded connections of tapping sockets for liquids and gases up to PN 160, for steam up to PN 100,

Versions for steam lines: See "Technical description", "Function" for position of the tapping sockets.

Nominal diameter acc. to EN

DN	Inside diameter	External diameter d_4 / sealing face: plane, with recess or with groove.										Weight (approx. in kg)	
		PN 6	PN 10	PN 16	PN 25	PN 40	PN 63	PN 100	PN 160	PN 250	PN 315	With smallest nom. pressure	With largest nom. pressure
50	45 ... 55	96	107	107	107	107	113	119	119	124	134	1.6	4.0
65	61 ... 71	116	127	127	127	127	138	144	144	154	170	2.2	6.3
80	77 ... 85	132	142	142	142	142	148	154	154	170	190	2.9	7.8
100	94 ... 108	152	162	162	168	168	174	180	180	202	229	3.2	11.5
125	117 ... 132	182	192	192	194	194	210	217	217	242	274	4.3	15.9
150	144 ... 160	207	218	218	224	224	247	257	257	284	311	4.7	20.6
200	188 ... 211	262	273	273	284	290	309	324	324	358	398	7.0	33.7
250	240 ... 262	317	328	329	340	352	364	391	388	442	488	9.0	50.6
300	292 ... 314	373	378	384	400	417	424	458	458	538	-	12.3	37.3
350	331 ... 362	423	438	444	457	474	486	512	-	-	-	17.7	44.6
400	383 ... 408	473	489	495	514	546	543	-	-	-	-	19.8	43.1
500	480 ... 514	578	594	617	624	628	-	-	-	-	-	25.6	46.6

Orifice plates with single tapplings for installation between EN flanges to EN 1092-1, dimensions in mm and weights

Nominal diameter acc. to ASME

Nominal diameter	External diameter d_4 / sealing face: plane, with recess or with groove.			Weight (approx. in kg)	
	Class 150	Class 300	Class 600	With smallest nominal pressure	With largest nominal pressure
2 inch	105	111	111	1.6	4.0
2½ inch	124	130	130	2.2	6.3
3 inch	137	149	149	2.9	7.8
4 inch	175	181	194	3.2	11.5
5 inch	197	216	241	4.3	15.9
6 inch	222	251	267	4.7	20.6
8 inch	279	308	321	7.0	33.7
10 inch	340	362	400	9.0	50.6
12 inch	410	422	457	12.3	37.3
14 inch	451	486	492	17.7	44.6
16 inch	514	540	565	19.8	43.1
20 inch	549	597	613	25.6	46.6

Orifice plates with single tapplings for installation between ASME flanges to ASME B 16.5, dimensions in mm and weights

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with single tapplings

Selection and ordering data	Order No.	Selection and ordering data	Order No.
Orifice plate with single tapplings	7 ME 1 1 2 0 - - - - - Z	Orifice plate with single tapplings	7 ME 1 1 2 0 - - - - - Z
for mounting between flanges			
Sealing faces to the mating flanges: plane.			
Nominal diameter acc. to EN			
DN 50		DN 250	
• PN 6	1 GA	• PN 6	2 FA
• PN 10 ... 40	1 GE	• PN 10 and PN 16	2 FC
• PN 63	1 GF	• PN 25	2 FD
• PN 100 and PN 160	1 GH	• PN 40	2 FE
• PN 250	1 GJ	• PN 63	2 FF
• PN 315	1 GK	• PN 100 and PN 160	2 FH
DN 65		• PN 250	2 FJ
• PN 6	1 HA	• PN 315	2 FK
• PN 10 ... 40	1 HE	DN 300	
• PN 63	1 HF	• PN 6	2 GA
• PN 100 and PN 160	1 HH	• PN 10	2 GB
• PN 250	1 HJ	• PN 16	2 GC
• PN 315	1 HK	• PN 25	2 GD
DN 80		• PN 40	2 GE
• PN 6	1 JA	• PN 63	2 GF
• PN 10 ... 40	1 JE	• PN 100 and PN 160	2 GH
• PN 63	1 JF	DN 350	
• PN 100 and PN 160	1 JH	• PN 6	2 HA
• PN 250	1 JJ	• PN 10	2 HB
• PN 315	1 JK	• PN 16	2 HC
DN 100		• PN 25	2 HD
• PN 6	2 AA	• PN 40	2 HE
• PN 10 and PN 16	2 AC	• PN 63	2 HF
• PN 25 and PN 40	2 AE	• PN 100	2 HG
• PN 63	2 AF	DN 400	
• PN 100 and PN 160	2 AH	• PN 6	2 JA
• PN 250	2 AJ	• PN 10	2 JB
• PN 315	2 AK	• PN 16	2 JC
DN 125		• PN 25	2 JD
• PN 6	2 BA	• PN 40	2 JE
• PN 10 and PN 16	2 BC	• PN 63	2 JF
• PN 25 and PN 40	2 BE	DN 500	
• PN 63	2 BF	• PN 6	2 KA
• PN 100 and PN 160	2 BH	• PN 10	2 KB
• PN 250	2 BJ	• PN 16	2 KC
• PN 315	2 BK	• PN 25	2 KD
DN 150		• PN 40	2 KE
• PN 6	2 CA	Nominal diameter acc. to ASME	
• PN 10 and PN 16	2 CC	2 inch	
• PN 25 and PN 40	2 CE	• Class 150	5 GA
• PN 63	2 CF	• Class 300	5 GB
• PN 100 and PN 160	2 CH	• Class 600	5 GC
• PN 250	2 CJ	2½ inch	
• PN 315	2 CK	• Class 150	5 HA
DN 200		• Class 300	5 HB
• PN 6	2 EA	• Class 600	5 HC
• PN 10 and PN 16	2 EC	3 inch	
• PN 25	2 ED	• Class 150	5 JA
• PN 40	2 EE	• Class 300	5 JB
• PN 63	2 EF	• Class 600	5 JC
• PN 100 and PN 160	2 EH	4 inch	
• PN 250	2 EJ	• Class 150	6 AA
• PN 315	2 EK	• Class 300	6 AB
		• Class 600	6 AC
		5 inch	
		• Class 150	6 BA
		• Class 300	6 BB
		• Class 600	6 BC

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with single tapplings

Selection and ordering data

Order No.

Orifice plate with single tapplings 7 ME 1 1 2 0 - ■ ■ ■ ■ - ■ ■ ■ ■ - Z

6 inch

- Class 150
- Class 300
- Class 600

6 CA
6 CB
6 CC

8 inch

- Class 150
- Class 300
- Class 600

6 EA
6 EB
6 EC

10 inch

- Class 150
- Class 300
- Class 600

6 FA
6 FB
6 FC

12 inch

- Class 150
- Class 300
- Class 600

6 GA
6 GB
6 GC

14 inch

- Class 150
- Class 300
- Class 600

6 HA
6 HB
6 HC

16 inch

- Class 150
- Class 300
- Class 600

6 JA
6 JB
6 JC

20 inch

- Class 150
- Class 300
- Class 600

6 KA
6 KB
6 KC

for non-corrosive media

- Orifice plate and tapping socket made of 13 CrMo 4-5, Mat.No. 1.7335; metering edge with X 5 CrNiMoNb 19 12, Mat.No. 1.4576, deposition welded; permissible working pressure -10 to +570 °C, for tapping socket with ferrule for pipe, 12 mm, S series, max. 200 °C

2 4

for corrosive media

- Orifice plate and tapping socket made of X 6 CrNiMoTi 17-12-2, Mat. No. 1.4571; permissible operating temperature -200 to +550 °C, for tapping socket with ferrule for pipe, 12 mm, S series, max. 400 °C

2 2

Selection and ordering data

Order No.

Orifice plate with single tapplings 7 ME 1 1 2 0 - ■ ■ ■ ■ - ■ ■ ■ ■ - Z

Tapping sockets

- With threaded connection G½; for liquids and gases PN 160, for steam PN 100
 - Opposite one another, straight 1 A
 - Opposite one another, bent-up, for vertical pipelines 1 B
 - Any arrangement of tapping sockets (specify angle in plain text) 1 G
- With threaded connection ½-14 NPT male
 - Opposite one another, straight 1 Q
 - Opposite one another, bent-up, for vertical pipelines 1 R
 - Any arrangement of tapping sockets (specify angle in plain text -Z Y02) 1 T
- With ferrule for pipe Ø 12 mm, S series, max. 200 °C permissible
 - Opposite one another, straight 1 J
 - Opposite one another, bent-up, for vertical pipelines 1 K
 - Any arrangement of tapping sockets (specify angle in plain text -Z Y02) 1 M
- With welding connection Ø 21.3 mm; for liquids and gases PN 100 ... 400, for steam PN 100 or Ø 24 mm; for liquids and gases over PN 400, for steam over PN 100
 - Opposite one another, straight 1 D
 - Opposite one another, bent-up, for vertical pipelines 1 E
 - Any arrangement of tapping sockets (specify angle in plain text) 1 H

Shape of orifice disk aperture (see figure "Shapes of orifice disk aperture")

- For flow in one direction
 - Orifice plate form A A
 - Quarter-circle nozzle form B B
- For flow in both directions
 - Cylindrical orifice plate form D D

Manufactured according to pressure equipment directive (see "Questionnaire" (page 4/319))

- Without²⁾ 0
- According to Article 3, Paragraph 3 1
- According to category 1 2
- According to category 2 3
- According to category 3 4

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Orifice plate with single tapplings

Selection and ordering data	Order No.
Orifice plate with single tapplings	7 ME 1 1 2 0 – ■■■■ – ■■■■ – Z
Further designs Add "-Z" to Order No. and specify Order code(s) and plain text.	Order code¹⁾
Calculation of orifice disk aperture Add calculation sheet "Questionnaire for calculation of a primary differential pressure device acc. to DIN EN ISO 5167" to the order!	A11
Orifice plate without calculation Specify in plain text: Diameter of orifice disk aperture d = ... mm Internal diameter of pipe D = ... mm Radius of quarter-circle nozzle r = ... mm	Y01
Material certificate Acceptance test certificate to EN 10204-3.1	C01
Orifice plate degreased for oxygen measurements Note: Cleaned and foil-packed. When using, note that the orifice plate must be completely degreased when fitted in the pipeline.	A12
Angle between tapping sockets (specify in plain text: Angle between the tapping sockets ... °)	Y02
Other materials	On request
Additional nominal diameters and nominal pressure stages according to EN and ASME	On request
Overall length 65 mm (required for tapping sockets arranged on one side)	On request
Cold water pressure test 1.5 x PN, acceptance test certificate to EN 10204	On request
Flushing rings	On request
Sealing face of orifice plate with recess or groove	On request

Note on ordering

Enclose a filled-out calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167" with the order (necessary for device selection)!

Scope of delivery:

One-part orifice plate with tapping sockets

Accessories:

See "SITRANS P measuring instruments for pressure".

¹⁾ Order codes additive, any sequence.

²⁾ Option only available outside Europe (manufactured according to Article 3, Paragraph 3 of the pressure equipment directive, without CE marking).

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate and annular chambers

Application



Suitable for non-corrosive and corrosive gases, vapors and liquids; permissible operating temperature -10 to +400 °C.

4

Design

Orifice plate with annular chambers consisting of two support rings with replaceable orifice disk form A or B (see types of primary differential pressure devices in "Technical description", "Function"); flanged between inlet and outlet pipe sections with lengths according to DIN 19205.

Nominal diameters

- EN: DN 10 to DN 50
ASME: ½ inch to 2 inch

Nominal pressure

- EN: PN 10 to PN 100
ASME: class 150 to 600

Sealing face of the end flanges

- Plane, sealing face turned, N10/N12 to DIN ISO 1302, for soft gasket (PN 10 to PN 40)
- Plane, sealing face turned, N8 to DIN ISO 1302, for grooved gasket to DIN 2697 (PN 63 to PN 100)
- Plane, RF (raised faced) for versions to ASME

Tapping sockets straight or bent

- With connection thread G½ DIN ISO 228/1, for connection dimensions to DIN 19207 form V, see page 4/313
- With threaded connection ½-14 NPT male, for version to ASME
- With ferrule for pipe Ø 12 mm, S series
- With welding connection Ø 21.3 mm

For length of tapping sockets for all metering pipe $L = 120$ mm and position of tapping socket, see "Technical Description" and "Function".

Technical specifications

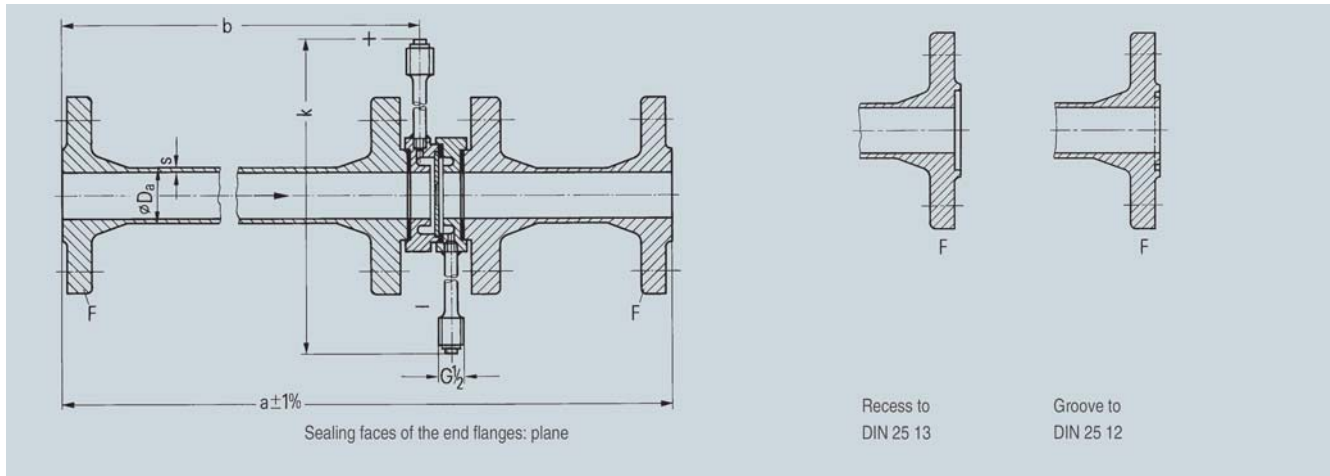
Permissible operating temperature	-10 ... + 400 °C
Pipes made of	P235G1TH, Mat. No. 1.0305, ST37.4, Mat. No. 1.0255 or P235GH, Mat. No. 1.0345
Tapping sockets made of	P235G1TH, Mat. No. 1.0305
Flanges made of	P250GH, Mat. No. 1.0460
Support rings made of	P250GH, Mat. No. 1.0460
Orifice disk made of	X 6 CrNiMoTi 17 12-2, Mat. No. 1.4571

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate and annular chambers

Dimensional drawings



Nominal diameter acc. to EN

DN	PN	a	L	k	Pipe ¹⁾ D _a x s	Weight kg			
10	10 and 16	400	218	320	16 x 3	4.5			
	25 and 40			320		5			
	63 and 100			295		6.5			
15	10 and 16	550	368	325	20 x 2.5	5			
	25 and 40			325		5.5			
	63 and 100			300		7.5			
20	10 and 16 25 and 40	700	488	335	25 x 2.5	6.5 7			
25	10 and 16	900	638	310	30 x 2.5	8			
	25 and 40					9			
	63 and 100					14			
32	10 and 16 25 and 40	1100	788	320	38 x 3	11.5 12.5			
	40					10 and 16 25 and 40 63 and 100	1300	988	330 330 335
50	10 and 16 25 and 40	1500	1188	340 340 345 345	60 x 5	20 22 34 34			

Metering pipes with orifice plates and annular chambers for installation between EN flanges to EN 1092.1, dimensions in mm and weights

¹⁾ The stated pipe dimensions may vary, depending on availability. The pipe dimensions used can be found in the calculation for primary differential pressure devices and/or in the order confirmation.

Nominal diameter acc. to ASME

Nom. diameter	PN	a	L	k	Pipe ¹⁾ D _a x s	Weight kg
½ inch	Class 150	550	368	297	20 x 2.5	5
	Class 300			307		5.5
	Class 600			307		7.5
¾ inch	Class 150	700	488	297	25 x 2.5	6.5
	Class 300			307		7
	Class 600			307		8
1 inch	Class 150	900	638	307	30 x 2.5	8
	Class 300			313		9
	Class 600			313		14
1 1/4 inch	Class 150	1100	788	316	38 x 3	11.5
	Class 300			322		12.5
	Class 600			322		14
1 1/2 inch	Class 150	1300	988	326	48, 3 x 3.6 or 50 x 5	13
	Class 300			335		15
	Class 600			335		25
2 inch	Class 150	1500	1188	345	60 x 5	20
	Class 300			371		22
	Class 600			351		34

Metering pipes with orifice plates and annular chambers for installation between ASME flanges to ASME B 16.5, dimensions in mm and weights

¹⁾ The stated pipe dimensions may vary, depending on availability. The pipe dimensions used can be found in the calculation for primary differential pressure devices and/or in the order confirmation.

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate and annular chambers

Selection and ordering data

Order No.

Metering pipe for mounting between flanges for non-corrosive media

7 ME 1 3 1 0 - - - - - Z

Orifice plate with annular chambers mounted between flanges

permissible operating temperature -10 to +400 °C,

Orifice disk made of Mat. No. 1.4571, support rings and flanges made of Mat. No. 10460, pipes and tapping sockets made of Mat. No. 10305, 1.0255 or 1.0345

Sealing faces to the mating flanges: plane, with recess or with groove.

Nominal diameter acc. to EN

DN 10

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

1 AC 3 2

1 AE 3 2

1 AF 3 2

1 AG 3 2

DN 15

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

1 BC 3 2

1 BE 3 2

1 BF 3 2

1 BG 3 2

DN 20

- PN 10 and PN 16
- PN 25 and PN 40

1 CC 3 2

1 CE 3 2

DN 25

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

1 DC 3 2

1 DE 3 2

1 DF 3 2

1 DG 3 2

DN 32

- PN 10 and PN 16
- PN 25 and PN 40

1 EC 3 2

1 EE 3 2

DN 40

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

1 FC 3 2

1 FE 3 2

1 FF 3 2

1 FG 3 2

DN 50

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

1 GC 3 2

1 GE 3 2

1 GF 3 2

1 GG 3 2

Nominal diameter acc. to ASME

½ inch

- Class 150
- Class 300
- Class 600

5 BA 3 2

5 BB 3 2

5 BC 3 2

¾ inch

- Class 150
- Class 300
- Class 600

5 CA 3 2

5 CB 3 2

5 CC 3 2

1 inch

- Class 150
- Class 300
- Class 600

5 DA 3 2

5 DB 3 2

5 DC 3 2

1¼ inch

- Class 150
- Class 300
- Class 600

5 EA 3 2

5 EB 3 2

5 EC 3 2

Selection and ordering data

Order No.

Metering pipe for mounting between flanges for non-corrosive media

7 ME 1 3 1 0 - - - - - Z

1½ inch

- Class 150
- Class 300
- Class 600

5 FA 3 2

5 FB 3 2

5 FC 3 2

2 inch

- Class 150
- Class 300
- Class 600

5 GA 3 2

5 GB 3 2

5 GC 3 2

Tapping sockets

- With threaded connection G½; for liquids and gases PN 160, for steam PN 100

- Opposite one another, straight
- Opposite one another, bent-up, for vertical pipelines
- Arranged on one side, for horizontal pipelines

1 A

1 B

1 C

- With threaded connection ½-14 NPT male; for liquids and gases PN 160, for steam PN 100

- Opposite one another, straight
- Opposite one another, bent-up, for vertical pipelines
- Arranged on one side, for horizontal pipelines

1 Q

1 R

1 S

- With ferrule for pipe Ø 12 mm, S series, max. 200 °C permissible

- Opposite one another, straight
- Opposite one another, bent-up, for vertical pipelines
- Arranged on one side, for horizontal pipelines

1 J

1 K

1 L

- With welding connection Ø 21.3 mm; for liquids and gases PN 100 to PN 400 for steam PN 100

- Opposite one another, straight
- Opposite one another, bent-up, for vertical pipelines
- Arranged on one side, for horizontal pipelines

1 D

1 E

1 F

Shape of orifice disk aperture

(see figure "Shapes of orifice disk aperture")

- Orifice plate form A
- Quarter-circle nozzle form B

A

B

Manufactured according to pressure equipment directive

(see "Questionnaire" (page 4/319))

- Without²⁾
- According to Article 3, Paragraph 3
- According to category 1
- According to category 2

0

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SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate
and annular chambers

Selection and ordering data	Order No.
Metering pipe for mounting between flanges for non-corrosive media	7 ME 1 3 1 0 -  - Z
Further designs Add "-Z" to Order No. and specify Order code(s) and plain text.	Order code ¹⁾
Calculation of orifice disk aperture Add calculation sheet "Questionnaire for calculation of a primary differential pressure device acc. to DIN EN ISO 5167" to the order!	A11
Orifice plate without calculation Specify in plain text: Diameter of orifice disk aperture d = ... mm Internal diameter of pipe D = ... mm Radius of quarter-circle nozzle r = ... mm	Y01
Material certificate Acceptance test certificate to EN 10204-3.1	C02
Other materials	On request
Additional nominal diameters and nominal pressure stages according to EN and ASME	On request
Cold water pressure test 1.5 x PN, acceptance test certificate to EN 10204	On request
Sealing face of metering pipe with orifice plate, with recess or groove	On request
Metering pipes for corrosive media	On request

Note on ordering

Enclose a filled-out calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167" with the order (necessary for device selection)!

Scope of delivery:

Orifice plate comprised of two support rings with tapping sockets and an orifice disk; flanged between inlet and outlet pipe section, with gaskets between orifice plate and support ring and between support rings and flanges of the inlet and outlet pipes, including screws and nuts.

Graphite (99.85 %) flat gasket with foil insert (1.4401, 0.1 mm). application for liquids, steam, gases, liquid gases, acids, hydrocarbons, oils and oil products.

Accessories:

See "SITRANS P measuring instruments for pressure".

¹⁾ Order codes additive, any sequence.

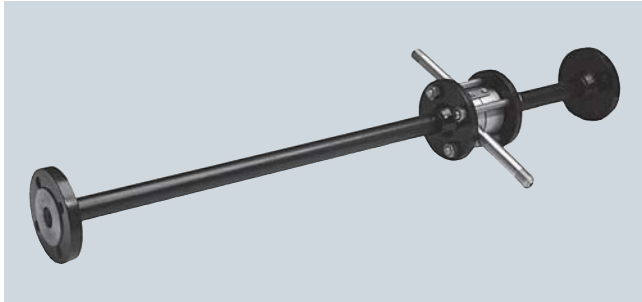
²⁾ Option only available outside Europe (manufactured according to Article 3, Paragraph 3 of the pressure equipment directive, without CE marking).

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate with single tapplings

Application



Suitable for non-corrosive and corrosive gases, vapors and liquids; permissible operating temperature -10 to +400 °C

Design

Orifice plate with single tapplings, orifice disk aperture form A or B (see types of primary differential pressure devices in "Technical description"); flanged between standard inlet and outlet pipe sections with lengths according to DIN 19205.

Nominal diameters

EN: DN 10 to DN 50
ASME: ½ inch to 2 inch

Nominal pressure

EN: PN 10 to PN 160
ASME: class 150 to 2 500

Sealing face of the end flanges

- Plane, sealing face turned, N10/N12 to DIN ISO 1302, for soft gasket (PN 10 to PN 40)
- Plane, sealing face turned, N8 to DIN ISO 1302, for grooved gasket to DIN 2697 (PN 63 to PN 160)
- Plane, RF (raised faced) for versions to ASME

Tapping sockets straight or bent

- With connection thread G½ DIN ISO 228/1, for connection dimensions to DIN 19207 form V (see page 4/313)
- With threaded connection ½-14 NPT male, for version to ASME
- With ferrule for pipe Ø 12 mm, S series
- With welding connection Ø 21.3 mm

For length of tapping sockets for all metering pipe L = 120 mm and position of tapping socket, see "Technical Description" and "Function".

Connection size

The connection size depends on the operating pressure, the temperature of the medium (DIN 19 207 and 19 211) and the medium, e.g.

- For liquids and gases,
 - up to PN 160: Thread G½ or welding connection Ø 21.3 mm
 - from PN 6 and PN 400: Welding connection Ø 21.3 mm
 - > PN 400: Welding connection Ø 24 mm
- For steam
 - up to PN 100: Thread G½ or welding connection Ø 21.3 mm
 - from PN 6: Welding connection Ø 24 mm

Technical specifications

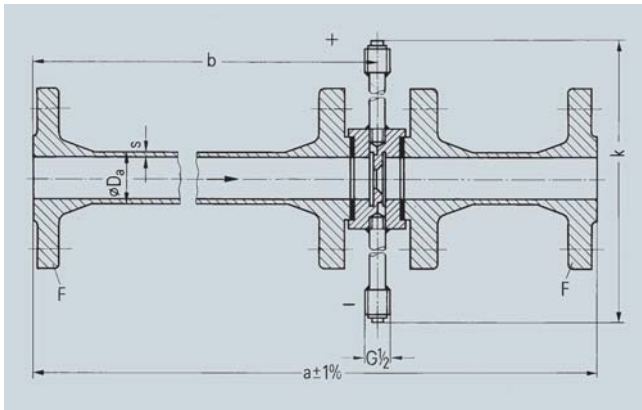
Permissible operating temperature	-10 ... + 400 °C
Pipes and tapping sockets made of	P235G1TH, Mat. No. 1.0305, ST37.4, Mat. No. 1.0255 or P235GH, Mat. No. 1.0345
Flanges made of	P250GH, Mat. No. 1.0460
Orifice plate made of	Mat. No. 1.0460, 1.7335
Metering edge deposition welded	Mat. No. 1.4576

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate
with single tappings

Dimensional drawings



Nominal diameter acc. to ASME

DN	PN	a	L	k	Pipe ¹⁾ D _a x s	Weight kg
10	10 and 16	400	229	297	16 x 3	4.5
	25 and 40		229	307		5
	63 and 100		229	307		6.5
	160		230	307		6.5
15	10 and 16	550	379	297	20 x 2.5	5
	25 and 40		379	307		5.5
	63 and 100		379	307		7.5
	160		380	307		7.5
20	10 and 16	700	499	307	25 x 2.5	6.5
	25 and 40		499	313		7
25	10 and 16	900	649	316	30 x 2.5	8
	25 and 40		649	322		9
	63 and 100		649	322		14
	160		650	322		14
32	10 and 16	1100	799	310	38 x 3	11.5
	25 and 40		799	335		12.5
40	10 and 16	1300	999	345	48.3 x 3.6 or 50 x 5	13
	25 and 40		999	371		15
	63 and 100		999	351		25
	160		1 000	351		22.5
50	10 and 16	1500	1 199	297	60 x 5	20
	25 and 40		1 199	307		22
	63		1 199	307		34
	100		1 199	307		34
	160		1 200	307		35

Metering pipes with orifice plates and with single tappings for installation between EN flanges to EN 1092-1, dimensions in mm and weights

¹⁾ The stated pipe dimensions may vary, depending on availability. The pipe dimensions used can be found in the calculation for primary differential pressure devices and/or in the order confirmation.

Nominal diameter acc. to ASME

Nom. diameter	PN	a	L	k	Pipe ¹⁾ D _a x s	Weight kg
½ inch	Class 150	550	368	297	20 x 2.5	5
	Class 300			307		5.5
	Class 600			307		7.5
¾ inch	Class 150	700	488	297	25 x 2.5	6.5
	Class 300			307		7
	Class 600			307		8
1 inch	Class 150	900	638	307	30 x 2.5	8
	Class 300			313		9
	Class 600			313		14
1¼ inch	Class 150	1100	788	316	38 x 3	11.5
	Class 300			322		12.5
	Class 600			322		14
1½ inch	Class 150	1300	988	326	48.3 x 3.6 or 50 x 5	13
	Class 300			335		15
	Class 600			335		25
2 inch	Class 150	1500	1188	345	60 x 5	20
	Class 300			371		22
	Class 600			351		34

Metering pipes with orifice plates and with single tappings for installation between ASME flanges to ASME B 16.5, dimensions in mm and weights

¹⁾ The stated pipe dimensions may vary, depending on availability. The pipe dimensions used can be found in the calculation for primary differential pressure devices and/or in the order confirmation.

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate
with single tapplings

Selection and ordering data

Order No.

Metering pipe for mounting
between flanges
for non-corrosive media

7 ME 1 3 2 0 - - - - - Z

Orifice plate with single tapplings,
flangedSealing faces to the mating
flanges: planePermissible operating tempera-
ture -10 to +400 °C,Orifice plate made of Mat. No.
1.0460, metering edge deposition
welded of Mat. No. 1.4576,
flanges and pipes made of Mat.
No. 10460, pipes and tapping
sockets made of Mat. No.
10305/1.0255/or 1.0345

Nominal diameter acc. to EN

DN 10

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100
- PN 160

1 AC 3 5
1 AE 3 5
1 AF 3 5
1 AG 3 5
1 AH 3 5

DN 15

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100
- PN 160

1 BC 3 5
1 BE 3 5
1 BF 3 5
1 BG 3 5
1 BH 3 5

DN 20

- PN 10 and PN 16
- PN 25 and PN 40

1 CC 3 5
1 CE 3 5

DN 25

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100
- PN 160

1 DC 3 5
1 DE 3 5
1 DF 3 5
1 DG 3 5
1 DH 3 5

DN 32

- PN 10 and PN 16
- PN 25 and PN 40

1 EC 3 5
1 EE 3 5

DN 40

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100
- PN 160

1 FC 3 5
1 FE 3 5
1 FF 3 5
1 FG 3 5
1 FH 3 5

DN 50

- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100
- PN 160

1 GC 3 5
1 GE 3 5
1 GF 3 5
1 GG 3 5
1 GH 3 5

Nominal diameter acc. to ASME

½ inch

- Class 150
- Class 300
- Class 600

5 BA 3 5
5 BB 3 5
5 BC 3 5

¾ inch

- Class 150
- Class 300
- Class 600

5 CA 3 5
5 CB 3 5
5 CC 3 5

1 inch

- Class 150
- Class 300
- Class 600

5 DA 3 5
5 DB 3 5
5 DC 3 5

Selection and ordering data

Order No.

Metering pipe for mounting
between flanges
for non-corrosive media

7 ME 1 3 2 0 - - - - - Z

1¼ inch

- Class 150
- Class 300
- Class 600

5 EA 3 5
5 EB 3 5
5 EC 3 5

1½ inch

- Class 150
- Class 300
- Class 600

5 FA 3 5
5 FB 3 5
5 FC 3 5

2 inch

- Class 150
- Class 300
- Class 600

5 GA 3 5
5 GB 3 5
5 GC 3 5

Tapping sockets

- With threaded connection G½;
for liquids and gases PN 160,
for steam PN 100
 - Opposite one another, straight
 - Opposite one another, bent-up,
for vertical pipelines
 - Any arrangement of tapping
sockets (specify angle in
plain text)
- With threaded connection
½-14 NPT male;
for liquids and gases PN 160,
for steam PN 100
 - Opposite one another, straight
 - Opposite one another, bent-up,
for vertical pipelines
 - Any arrangement of tapping
sockets (specify angle in
plain text -Z Y02)
- With ferrule for
pipe Ø 12 mm, S series,
max. 200 °C permissible
 - Opposite one another, straight
 - Opposite one another, bent-up,
for vertical pipelines
 - Any arrangement of tapping
sockets (specify angle in
plain text -Z Y02)
- With welding connection
Ø 21.3 mm; for liquids and
gases PN 100 ... 400,
for steam PN 100 or Ø 24 mm;
for liquids and gases over
PN 400, for steam over PN 100
 - Opposite one another, straight
 - Opposite one another, bent-up,
for vertical pipelines
 - Any arrangement of tapping
sockets (specify angle in
plain text)

1 A

1 B

1 G

1 Q

1 R

1 T

1 J

1 K

1 M

1 D

1 E

1 H

Shape of orifice disk aperture

(see figure "Shapes of orifice disk
aperture")

- Orifice plate form A
- Quarter-circle nozzle form B

A

B

Manufactured according to

pressure equipment directive
(see "Questionnaire" (page 4/319))

- Without²⁾
- According to Article 3,
Paragraph 3
- According to category 1
- According to category 2

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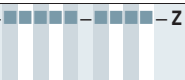
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SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Metering pipe with orifice plate
with single tapplings

Selection and ordering data	Order No.
Metering pipe for mounting between flanges for non-corrosive media	7 ME 1 3 2 0 -  - Z
Further designs Add "-Z" to Order No. and specify Order code(s) and plain text.	Order code ¹⁾
Calculation of orifice disk aperture Enclose a calculation sheet "Questionnaire for calculation of a primary differential pressure device acc. DIN EN ISO 5167" with the order!	A11
Orifice plate without calculation Specify in plain text: Diameter of orifice disk aperture d = ... mm Internal diameter of pipe D = ... mm Radius of quarter-circle nozzle r = ... mm	Y01
Material certificate Acceptance test certificate to EN 10204-3.1	C02
Other materials	On request
Angle between the tapping sockets Specify in plain text: Angle between the tapping sockets ...°	Y02
Additional nominal diameters and nominal pressure stages according to EN and ASME	On request
Cold water pressure test 1.5 x PN, acceptance test certificate to EN 10204	On request
Sealing face of metering pipe with orifice plate, with recess	On request
Metering pipes for corrosive media	On request

Note on ordering

Enclose a filled-out calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167" with the order (necessary for device selection)!

Scope of delivery:

One-piece orifice plate with tapping sockets flanged between inlet and outlet pipes, with gaskets between orifice plate and flanges of the inlet and outlet pipes, including screws and nuts. Graphite (99.85 %) flat gasket with foil insert (1.4401, 0.1 mm). Application for liquids, steam, gases, liquid gases, acids, hydrocarbons, oils and oil products.

Accessories:

See "SITRANS P measuring instruments for pressure".

¹⁾ Order codes additive, any sequence.

²⁾ Option only available outside Europe (manufactured according to Article 3, Paragraph 3 of the pressure equipment directive, without CE marking).

SITRANS F flowmeters

SITRANS F O delta p - Primary differential pressure devices

Calculation of primary differential pressure devices

Overview

When ordering a primary differential pressure device, the calculation can be ordered at the same time.

Add the Order code "A11" to the Order No. of the primary device, and enclose a filled-out calculation sheet ("Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167) with the order.

If the calculation sheet is not complete, an extra charge will be made for the additionally required calculations.

Selection and Ordering data	Order No.
Calculation of orifice disk aperture of an orifice plate, orifice plate without support rings, ISA 1932 nozzle or Venturi nozzle (without measuring sheet or sketch)	7ME1910-0A-Z
Calculation of differential pressure or flow on an existing primary device	7ME1910-0D-Z
Further designs Please add "-Z" to Order No. and specify Order code(s) and plain text.	Order Code
Enclose a calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167 with the order!	Y01