




# SITRANS F flowmeters

## SITRANS F O delta p - Primary differential pressure devices

### Technical description

#### Primary differential devices according to DIN 1952, July 1982/DIN EN ISO 5167

	Nominal diameters	Nominal pressures
	<b>Orifice plates with annular chambers</b> DN 50 ... DN 1000 (2" ... 40")	PN 6 ... PN 100 (MWP 87 ... 1450 psi)
	<b>Orifice plates with single tappings</b> DN 50 ... DN 500 (2" ... 20")	PN 6 ... PN 315 (MWP 87 ... 4570 psi)
	<b>Metering pipes</b> <ul style="list-style-type: none"> <li>Orifice plate with annular chambers, mounted between flanges</li> <li>Orifice plate with single tappings, mounted between flanges</li> </ul>	PN 10 ... PN 100 (MWP 145 ... 1450 psi) PN 10 ... PN 160 (MWP 145 ... 1450 psi)

#### Overview

Primary differential pressure devices are standardized, mechanical flow sensors.

Through constriction of the line diameter in the device the flow 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 an orifice plate calculation.

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. These influences are counteracted by using metering pipes with fitting inlet and outlet pipe sections made of precision pipes. The flow coefficient C must be determined by experiment to permit exact measurements with metering pipes.

#### Precondition for ordering a primary differential pressure device

The orifice plate calculation and the classification according to the pressure equipment directive (PED) are necessary preconditions for 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.

The order must be accompanied by a filled-in calculation sheet ("Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167") and the questionnaire on the pressure equipment directive "Questionnaire for manufacture according to the pressure equipment directive (PED), directive 97/23/EC".

You will find the questionnaires under "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167") and "Questionnaire for manufacture according to the pressure equipment directive (PED), 97/23/EC".

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

#### Benefits

- Primary differential pressure devices are very robust and can be used in a wide range of nominal diameters.
- Suitable for wide ranges of temperature and pressure.
- No calibration required as the process is standardized.
- The electronics required in addition 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 electronics is easy to parameterize anew if process data should change. Adaptation is by recalculation and reparameterization of the transmitter or, in the case of the version with annular chamber orifice plate, 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

##### Annular chamber orifice

Orifice plates on the version with annular chamber orifice plate consist of two support rings which are connected to the inside of the pipe by way of an annular chamber and an annular gap. Tapping sockets direct the differential pressure from the support rings through shut-off fittings and differential pressure lines to the differential pressure transmitter.

Inserted between the supported rings is the orifice disk with a gasket.

##### Orifice plate with single tappings

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

The orifice plate is installed between two flanges in the pipeline.



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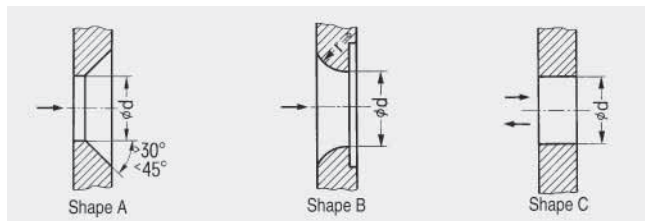
### Technical description

#### 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.  $10^3 \dots 10^5$ , 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  $\beta$  and results from the calculation of the diameter of the orifice disk aperture  $d$ .

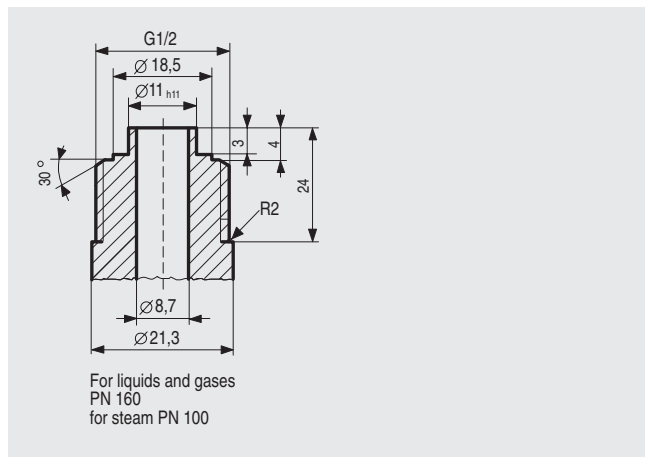
The cylindrical orifice disk aperture form D is used for measurements in both flow directions.

##### Tapping sockets

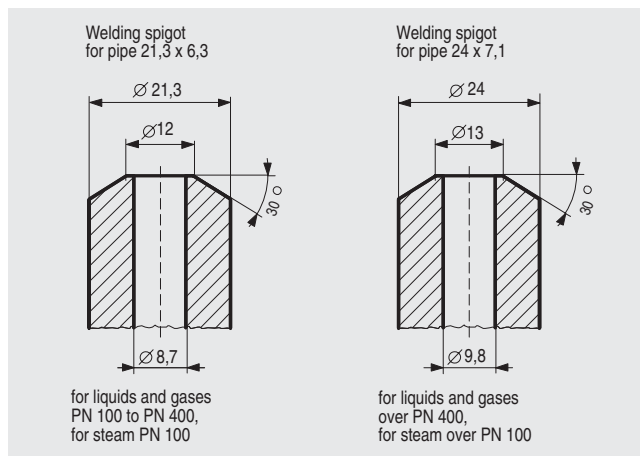
Type of threaded connections and welding connections dependent on the measured medium and the nominal pressure of the shut-off fitting

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!); the socket position depends on the measured medium and the flow direction.

Other connections on request.



Threaded connections of tapping socket, dimensions in mm

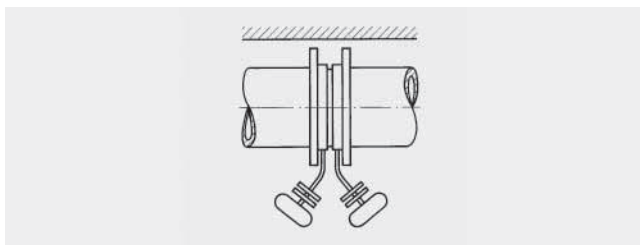


Welding connections of tapping sockets, dimensions in mm

##### Position of the tapping sockets

The arrangement of the tapping sockets is optional when measuring liquids and gases; the compensation vessels must be at the same height when measuring steam.

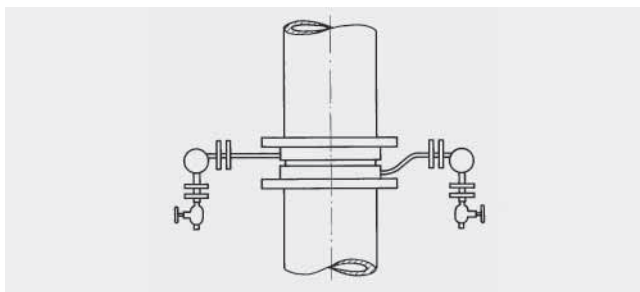
- Horizontal steam lines



Horizontal pipe in front of a wall with primary differential pressure device and valve combination; with annular chamber orifice plate or single part orifice plate with special length of 65 mm

In the case of horizontal steam lines, straight sockets are arranged opposite each other or, if the pipe is close to a wall, bent sockets on one side.

- Vertical steam lines



Vertical steam line with primary differential pressure device and valve combination

In the case of vertical and inclined steam pipes, the lower socket is bent upwards so that the connection flanges and compensation vessels are also at the same height in this case.



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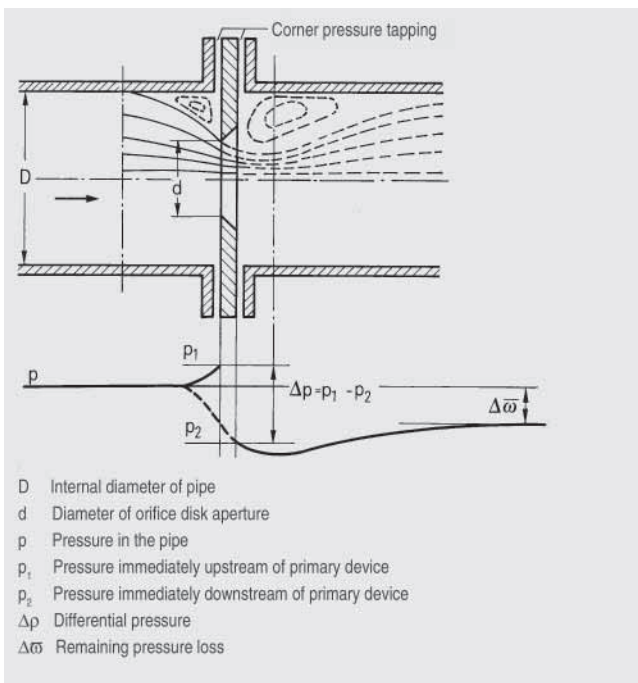
### Technical description

Extract from DIN 19 205, Part 1, August 1988

No.	Pipe position and flow direction			Position of the tapping sockets	Application
1	Horizontal	→		180°	With compensation vessels
2 1)2)				0°	
3 1)2)					
4	Vertical	Rising	↑	90°	
5		Falling	↓		
6		Rising	↑	180°	
7		Falling	↓		
10	Horizontal	→		$< \gamma^3)$	Without compensation vessels
11	Horizontal, vertical	→ ↓ ↑		180°	
13	Vertical	↓ ↑		90°	

- 1) Not possible with orifice plates with single tappings (overall length 40 mm). Special length of 65 mm is possible.  
 2) Only possible with orifice plates with annular chambers (overall length 65 mm) with bent-up tapping sockets.  
 3) Angle  $\gamma$  is dependent on the nominal pressure and nominal diameter in accordance with DIN 19 205.

### 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 proper-

ties 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 pipe is the same at all points. If the cross-section is reduced at one point, the flow rate 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  $\Delta p$ , 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
- $\Delta p$ : Differential pressure
- c: Factor depending on the dimensions of the pipe, the type of restriction, the density of the flowing medium etc.

According to this equation, the differential pressure created by the restriction is proportionally equal to the square of the flow (see the figure "Relationship between flow q and differential pressure  $\Delta p$ ").



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### Technical description

#### Integration

The orifice plate is installed between 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 their effects have died away. Primary devices with a large diameter ratio are particularly sensitive to interferences.

#### Design of measuring point

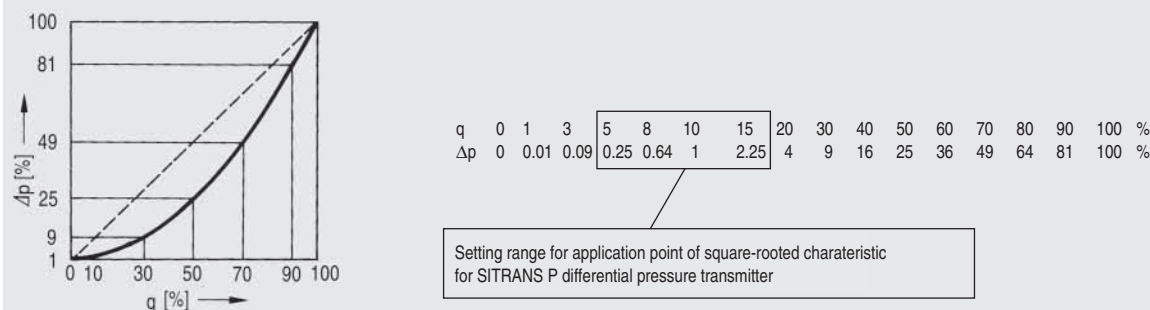
The design of the measuring point depends on the medium and on the spatial conditions. The designs for gas and water only differ in the arrangement of the tapping sockets (see the figure "Arrangement"); compensation vessels must additionally be provided for steam.

#### Options

- ASME versions in plain text with extra charge
- Other overall lengths in plain text
- Other materials on request
- Sealing face with recess of groove in plain text with extra charge
- Flushing rings in addition in plain text with extra charge
- Other tapping sockets on request, multiple tappings on request
- Material acceptance test certificates or cold water pressure test on request

#### 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  $\Delta p$

#### More information

- Standards
- Instruction Manual SITRANS P
- Installation Instructions



# SITRANS F flowmeters

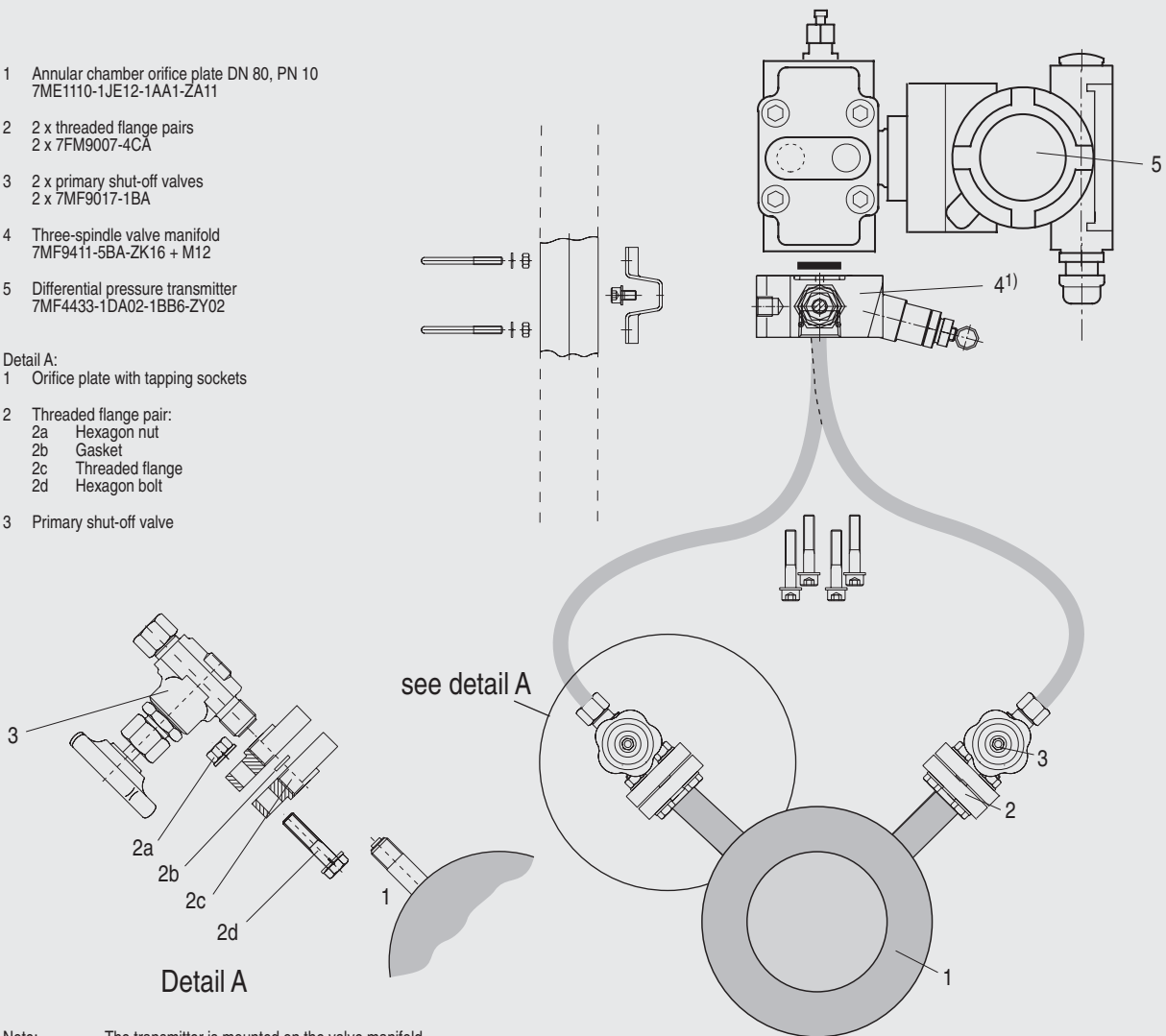
## SITRANS F O delta p - Primary differential pressure devices

### 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:

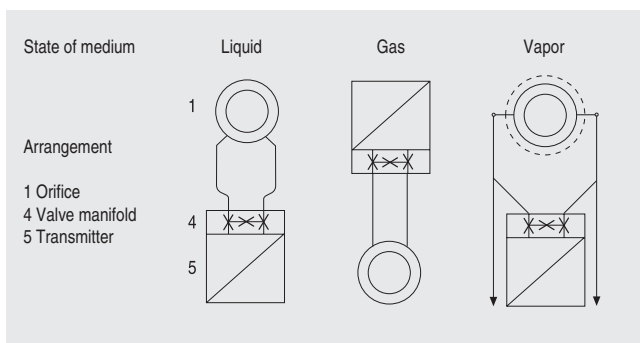
- 1 Orifice plate with tapping sockets
- 2 Threaded flange pair:
  - 2a Hexagon nut
  - 2b Gasket
  - 2c Threaded flange
  - 2d Hexagon bolt
- 3 Primary shut-off valve



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)



Arrangement

### 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



# SITRANS F flowmeters

## SITRANS F O delta p - Primary differential pressure devices

### 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. Such equipment in the sense of 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 "Characteristics").

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

	<u>Potentially explosive</u> R phrases: e.g.: 2, 3 (1, 4, 5, 6, 9, 16, 18, 19, 44)		<u>Highly toxic</u> R phrases: e.g.: 26, 27, 28, 39 (32)
	<u>Highly combustible</u> R phrases: e.g.: 12 (17)		<u>Toxic</u> R phrases: e.g.: 23, 24, 25 (29, 31)
	<u>Readily flammable</u> R phrases: e.g.: 11, 15, 17 (10, 30)		<u>Fire stimulating</u> 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.

#### 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

#### Notes

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: mobile offshore plants, ships, aircraft, water supply and waste water networks, nuclear plants, rockets and pipelines outside industrial plants.



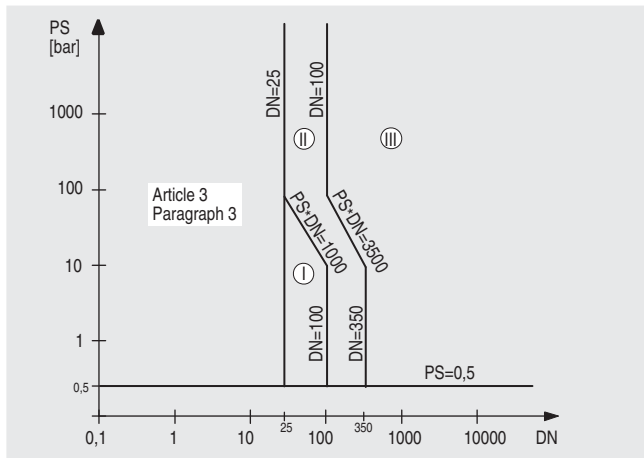
# SITRANS F flowmeters

## SITRANS F O delta p - Primary differential pressure devices

Pressure equipment directive 97/23/EC

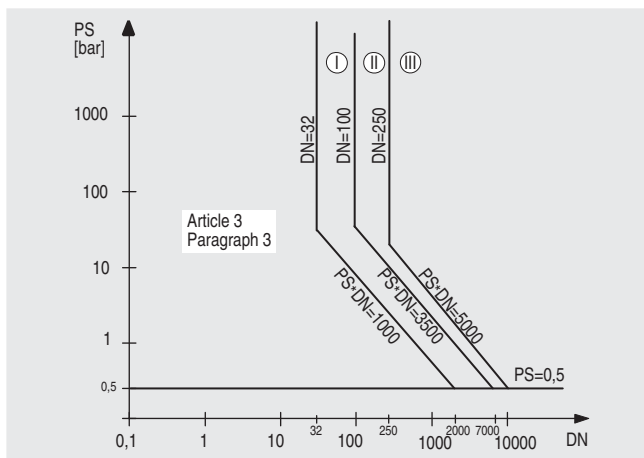
### Characteristic curves

#### 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.

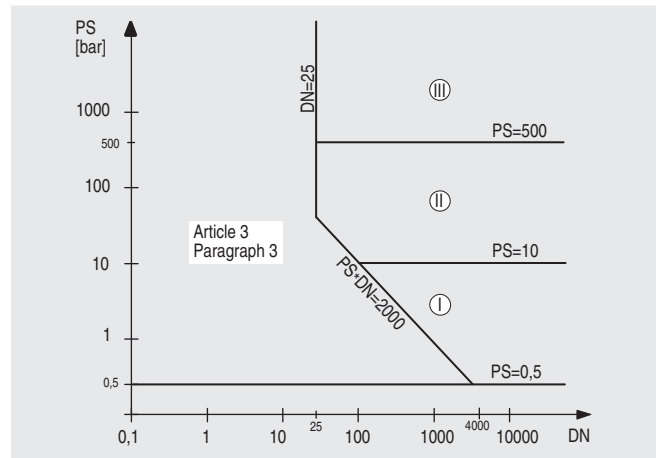
#### Gases of fluid group 2



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

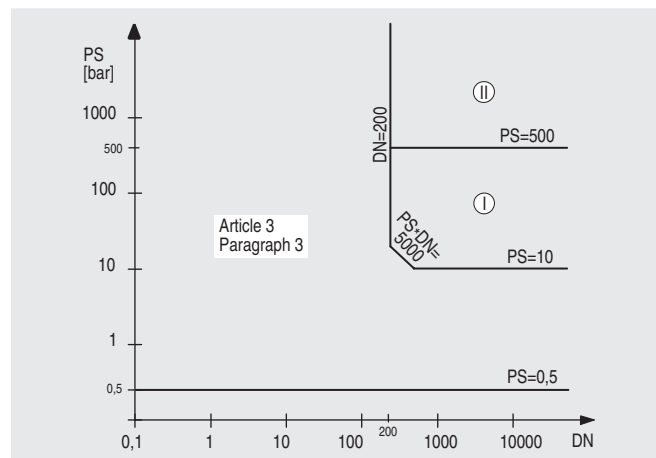
Exception: Liquids at temperatures > 350 °C belonging to Category II must be included in Category III.

#### 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



# Questionnaire for calculation of a primary differential pressure device to DIN EN ISO 5167-1

Tag (e.g. measuring-point number): \_\_\_\_\_

Company: \_\_\_\_\_

## Measured medium:

Design fluid acc. to PED ☐ Group 1 ☐ Group 2

Design pressure (PS): \_\_\_\_\_ ☐ bar ☐ psi; Design temperature (TS): \_\_\_\_\_ ☐ °C ☐ °F

Only for liquids: steam pressure \_\_\_\_\_ ☐ bar ☐ psi at TS

## 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

☐ Liquid

☐ Vapor ⇒ ☐ overheated; ☐ saturated  $p_1$ ; ☐ saturated  $t_1$ ; ☐ steam

☐ Gas ⇒ ☐ dry ☐ moist

Absolute pressure  $p_1$ : \_\_\_\_\_ ☐ bar ☐ psi Design pressure (PS): \_\_\_\_\_ ☐ bar ☐ psi  
(gauge pressure on upstream side plus atmospheric pressure at location)

Operating temperature  $t_1$ : \_\_\_\_\_ ☐ °C ☐ °F Design temperature (TS): \_\_\_\_\_ ☐ °C ☐ °F

Density: \_\_\_\_\_ ☐ kg/m<sup>3</sup> ☐ ..... ☐ standard cond. ☐ operating cond.

Dynamic viscosity: \_\_\_\_\_ ☐ Pa · s ☐ cp

Boiling pressure ( $p_1$ ): \_\_\_\_\_ ☐ bar ☐ psi

Boiling temperature ( $t_1$ ): \_\_\_\_\_ ☐ °C ☐ °F

Isentropic exponent (only for gas and vapor): \_\_\_\_\_

Specific gas constant

$Z_n$ : \_\_\_\_\_

$Z_1$ : \_\_\_\_\_

(without data:  $Z_{n,1} = 1$ )

Relative humidity:

$\phi$  \_\_\_\_\_ %

Material of primary device: \_\_\_\_\_

Material of pipeline: \_\_\_\_\_

Pipe roughness: \_\_\_\_\_

Internal pipe diameter: \_\_\_\_\_

Material no.: \_\_\_\_\_

Material no.: \_\_\_\_\_

☐ mm

☐ Inch

☐ mm

☐ Inch

## Primary device:

Kind of tapping/kind of device

☐ Orifice ⇒ ☐ Corner tap ☐ D, D/2 tap ☐ Flange tap ☐ Segmental dev.  
☐ Nozzle ⇒ ☐ ISA 1932 ☐ Long radius ☐ Quarter circle ☐ Venturi  
☐ Venturi tube ⇒ ☐ Raw cast ☐ Machined ☐ Sheet welded  
☐ other ⇒ \_\_\_\_\_ C: \_\_\_\_\_;  $\epsilon$ : \_\_\_\_\_

Calculation of:

☐ "d";

☐ diff. pressure;

☐ flow

Design:

☐ 2/3 max. flow;

☐ max. flow

Max. flow:

☐  $q_m$

☐ kg/h

☐ ..... (mass flow for all media)

☐  $q_v$

☐ m<sup>3</sup>/h

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

☐  $q_n$

☐ m<sup>3</sup>/h

☐ ..... (volume flow for gases at standard cond.)

Differential pressure: \_\_\_\_\_ ☐ mbar ☐ .....

Orifice hole "d": \_\_\_\_\_ ☐ mm ☐ Inch

Max. permanent pressure loss: \_\_\_\_\_ ☐ mbar ☐ .....

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

Operating temp. \_\_\_\_\_; abs. pressure \_\_\_\_\_; diff. pressure \_\_\_\_\_;

operating density \_\_\_\_\_; additional uncer. \_\_\_\_\_

## For clarification of any questions:

Name: \_\_\_\_\_ ☎ \_\_\_\_\_ Fax: \_\_\_\_\_

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



**Article 3 - technical requirement**

Conformity evaluation procedure: *data can only be provided by owner*

The possible conformity evaluation procedures are determined from article 3 in association with appendix (see „Pressure equipment directive 97/23/EC) depending on:

- Maximum permissible pressure (*not PN*) PS \_\_\_\_\_ ☐ bar ☐ psi
- Nominal diameter DN \_\_\_\_\_ [-]
- Fluid (batch material) \_\_\_\_\_ Name
  - At the maximum permissible temperature TS \_\_\_\_\_ ☐ °C ☐ °F
- Additionally for liquids:
  - Dependent on steam pressure \_\_\_\_\_ ☐ bar ☐ psi

The fluids are divided into 2 groups:

- Dangerous fluids
  - Explosive
  - Slightly or highly combustible
  - Fire stimulating
  - Toxic, very toxic
 Group 1 ☐
- All others Group 2 ☐

Liquids with a steam pressure of more than 0.5 bar (7.25 psi) above normal atmospheric pressure are handled like gases.

Appendix II of the PED contains 4 diagrams with which the associated category of the primary differential pressure devices can be determined.

- |                                                 |                                       |                              |
|-------------------------------------------------|---------------------------------------|------------------------------|
| <input type="checkbox"/> Article 3, paragraph 3 | Without <b>CE</b>                     | "Sound engineering practice" |
| <input type="checkbox"/> Category I             | With <b>CE</b>                        | Manufacturer                 |
| <input type="checkbox"/> Category II            | With <b>CE</b> and No. of named point |                              |
| <input type="checkbox"/> Category III           | With <b>CE</b> and No. of named point |                              |

Pressure equipment with a **CE** marking must have a conformity declaration from the manufacturer.

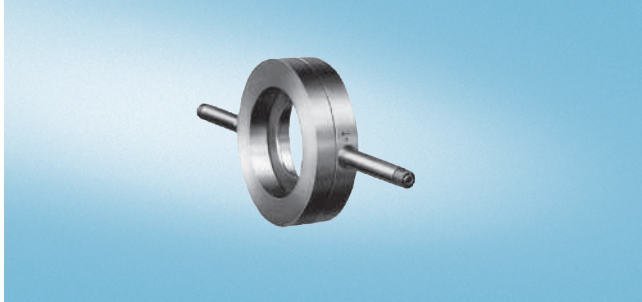


# SITRANS F flowmeters

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### Annular chamber orifice

#### 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 foil insert between support rings and orifice disks.

#### Overall length

65 mm to DIN 19205

#### Nominal diameters

DN 50 to DN 1000

#### Nominal pressure

PN 6 to PN 100

#### Sealing face to the mating flanges

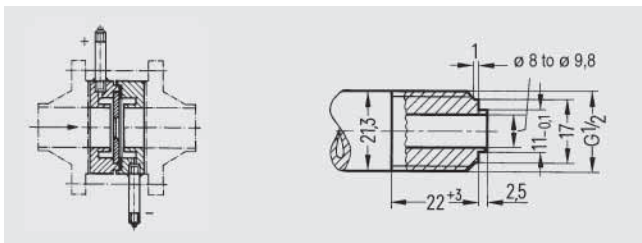
- Plane, sealing face turned, N10/N12 to DIN ISO 1302, for soft gasket (PN 6 to PN 40)
- Plane, sealing face turned, N8 to DIN ISO 1302, for grooved gasket to DIN 2697 (PN 63 to PN 100)

#### Tapping sockets straight or bent

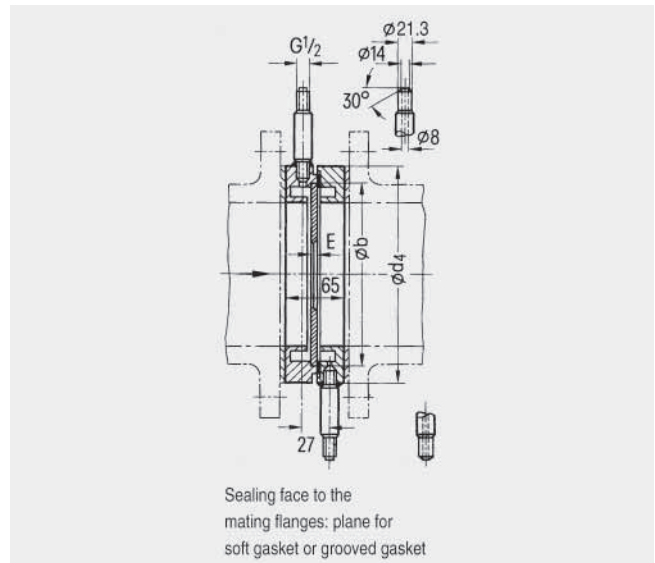
- With pipe thread G $\frac{1}{2}$  DIN ISO 228/1, connection dimensions to DIN 19207 form V, see "Dimension drawings" or
- with welding connection  $\varnothing$  21.3 mm.

See "Technical description", "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).

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



# SITRANS F flowmeters

## SITRANS F O delta p - Primary differential pressure devices

### Annular chamber orifice

4

DN	Int. diameter	External diameter d <sub>4</sub> / sealing face: Plane						
		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	20	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	1017	1011	1042	–	–	–
1000	976 ... 1010	1090	1124	1128	1154	–	–	–

Orifice plates with annular chambers for use with EN flanges, dimensions in mm and weights

DN	b				E	Weight (approx. in kg)	
	PN 6	PN 10 ... PN 25	PN 40	PN 63 ... PN 100		With smallest nominal pressure	With largest nominal pressure
50	79	79	79	79	2±0.1	2.5	4.5
65	96	96	96	96	2±0.1	3.4	6.4
80	115	115	115	115	4±0.2	4.3	6.9
100	137	137	137	137	4±0.2	4.7	8.6
125	164	164	164	164	4±0.2	6.3	12.4
150	193	193	193	193	4±0.2	7.0	17.0
200	247	247	247	247	4±0.2	10.3	26.2
250	302	302	302	302	4±0.2	13.1	36.6
300	354	354	354	354	4±0.2	17.3	49.0
350	403	403	403	403	4±0.2	25.0	63.0
400	452	452	452	452	4±0.2	28.0	73.8
500	553	553	553	–	6±0.2	36.2	65.9
600	659	659	–	–	6±0.2	42.5	75.6
700	757	757	–	–	8±0.2	51.8	89.5
800	869	869	–	–	8±0.2	61.7	109
900	969	969	–	–	8±0.2	68.3	123
1000	1071	1071	–	–	10±0.2	74.0	148

Orifice plates with annular chambers for use with EN flanges, dimensions in mm and weights (continued)



# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

### Annular chamber orifice

#### 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 DN 50

- PN 6
- PN 10 ... PN 40
- PN 63
- PN 100

1 GA  
1 GE  
1 GF  
1 GG

#### Nominal diameter DN 65

- PN 6
- PN 10 ... PN 40
- PN 63
- PN 100

1 HA  
1 HE  
1 HF  
1 HG

#### Nominal diameter DN 80

- PN 6
- PN 10 ... PN 40
- PN 63
- PN 100

1 JA  
1 JE  
1 JF  
1 JG

#### Nominal diameter DN 100

- PN 6
- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

2 AA  
2 AC  
2 AE  
2 AF  
2 AG

#### Nominal diameter DN 125

- PN 6
- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

2 BA  
2 BC  
2 BE  
2 BF  
2 BG

#### Nominal diameter DN 150

- PN 6
- PN 10 and PN 16
- PN 25 and PN 40
- PN 63
- PN 100

2 CA  
2 CC  
2 CE  
2 CF  
2 CG

#### Nominal diameter DN 200

- PN 6
- PN 10 and PN 16
- PN 25
- PN 40
- PN 63
- PN 100

2 EA  
2 EC  
2 ED  
2 EE  
2 EF  
2 EG

#### Nominal diameter DN 250

- PN 6
- PN 10
- PN 16
- PN 25
- PN 40
- PN 63
- PN 100

2 FA  
2 FB  
2 FC  
2 FD  
2 FE  
2 FF  
2 FG

#### Nominal diameter DN 300

- PN 6
- PN 10
- PN 16
- PN 25
- PN 40
- PN 63
- PN 100

2 GA  
2 GB  
2 GC  
2 GD  
2 GE  
2 GF  
2 GG

#### Nominal diameter DN 350

- PN 6
- PN 10
- PN 16
- PN 25

2 HA  
2 HB  
2 HC  
2 HD

#### Selection and Ordering data

Order No.

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

- PN 40
- PN 63
- PN 100

2 HE  
2 HF  
2 HG

#### Nominal diameter DN 400

- PN 6
- PN 10
- PN 16
- PN 25
- PN 40
- PN 63

2 JA  
2 JB  
2 JC  
2 JD  
2 JE  
2 JF

#### Nominal diameter DN 500

- PN 6
- PN 10
- PN 16
- PN 25
- PN 40

2 KA  
2 KB  
2 KC  
2 KD  
2 KE

#### Nominal diameter DN 600

- PN 6
- PN 10
- PN 16
- PN 25

3 AA  
3 AB  
3 AC  
3 AD

#### Nominal diameter DN 700

- PN 6
- PN 10
- PN 16
- PN 25

3 BA  
3 BB  
3 BC  
3 BD

#### Nominal diameter DN 800

- PN 6
- PN 10
- PN 16
- PN 25

3 CA  
3 CB  
3 CC  
3 CD

#### Nominal diameter DN 900

- PN 6
- PN 10
- PN 16
- PN 25

3 DA  
3 DB  
3 DC  
3 DD

#### Nominal diameter DN 1000

- PN 6
- PN 10
- PN 16
- PN 25

3 EA  
3 EB  
3 EC  
3 ED

#### For non-corrosive media

- Support rings made of P250GH, mat. No. 1.0460 or P265GH, mat. No. 1.0425
- tapping socket made of P235G1TH, material No. 1.0305;
- orifice disk made of X 6 CrNiMoTi 17-12-2, material No. 1.4571; permissible operating temp. -10 to +400 °C

1 2

#### For corrosive media

- Support rings, tapping socket and orifice disk made of X 6 CrNiMoTi 17-12-2, material No. 1.4571; permissible operating temp. -60 to +550 °C

1 4

#### Tapping sockets

- with threaded connection G $\frac{1}{2}$ ;
- for liquids and gases PN 160, for steam PN 100
- Opposite one another, straight
- Opposite one another, bent-up, for vertical pipes
- Arranged on one side, for horizontal pipes

1 A  
1 B  
1 C



# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

### Annular chamber orifice

Selection and Ordering data	Order No.
<b>Orifice plate with annular chambers</b>	<b>7 ME 1 1 1 0 - - - - - Z</b>
<ul style="list-style-type: none"> <li>with welding connection Ø 21.3 mm; for liquids and gases PN 100 to PN 400, for steam PN 100</li> <li>- Opposite one another, straight</li> <li>- Opposite one another, bent-up, for vertical pipes</li> <li>- Arranged on one side, for horizontal pipes</li> </ul>	1 D 1 E 1 F
<b>Shape of orifice disk aperture</b> (see figure "Shapes of orifice disk aperture") <ul style="list-style-type: none"> <li>for flow in one direction               <ul style="list-style-type: none"> <li>Orifice plate form A</li> <li>Quarter-circle nozzle form B</li> </ul> </li> <li>for flow in both directions               <ul style="list-style-type: none"> <li>Cylindrical orifice plate form D</li> </ul> </li> </ul>	A B D
<b>Manufacture according to pressure equipment directive</b> (see "Questionnaire for manufacture according to the pressure equipment directive (PED) 97/23/EC") <ul style="list-style-type: none"> <li>without <sup>1)</sup></li> <li>according to Article 3, Paragraph 3</li> <li>according to category 1</li> <li>according to category 2</li> <li>according to category 3</li> </ul>	0 1 2 3 4
<b>Further designs</b> Please add "-Z" to Order No. and specify Order code(s) and plain text.	Order code <sup>2)</sup>
<b>Calculation of orifice disk aperture</b> Enclose a calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167 with the order!"	A11
<b>Orifice plate without calculation</b> Specify in plain text: Diameter of orifice disk aperture <b>d = ... mm</b> Internal diameter of pipe <b>D = ... mm</b> Radius of quarter-circle nozzle <b>r = ... mm</b>	Y01
<b>Orifice plate degreased</b> for oxygen measurements Note: Cleaned and foil-packed. When using, note that the orifice plate must be completely degreased when fitted in the pipe.	A12
<b>Orifice disk including gasket</b>	On request
<b>Version to ASME</b> (20% extra charge)	
<b>Other materials on request</b>	
<b>Acceptance test certificate B to EN 10204, cold water pressure test at 1.5 x PN</b> (extra charge)	
<b>Flushing rings</b> (25% extra charge)	
<b>Support rings made of 1.7335</b> (20% extra charge)	
<b>Sealing face of orifice plate with recess or groove</b> (5% extra charge)	

#### Note on ordering

Enclose a filled-in 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 flat gasket with foil insert (1.4401, 0.1 mm). Application for liquids, steam, gases, liquidgases, acids, hydrocarbons, oils and oil products.

#### Accessories

See "SITRANS P measuring instruments for pressure".

<sup>1)</sup> Only possible outside Europe (manufacturing is carried out acc. to Article 3, Paragraph 3 of the pressure equipment guideline, without CE identification).

<sup>2)</sup> Order codes additive, any sequence.

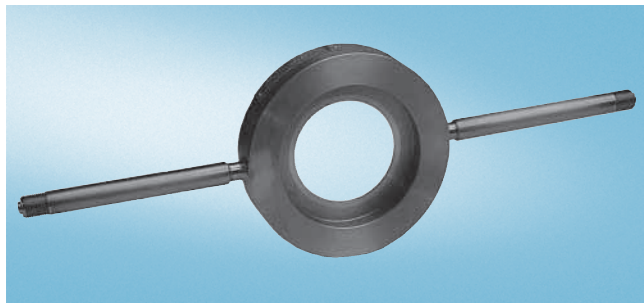


# SITRANS F flowmeters

## 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

DN 50 to DN 500

#### Nominal pressure

PN 6 to PN 315

#### 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)

#### Straight tapping sockets

- With pipe thread G $\frac{1}{2}$  DIN ISO 228/1, connection dimensions to DIN 19 207 form V (see "Annular chamber orifice plate", "Dimension drawings") or
- Welding connection,  $\varnothing$  21.3 mm or  $\varnothing$  24 mm

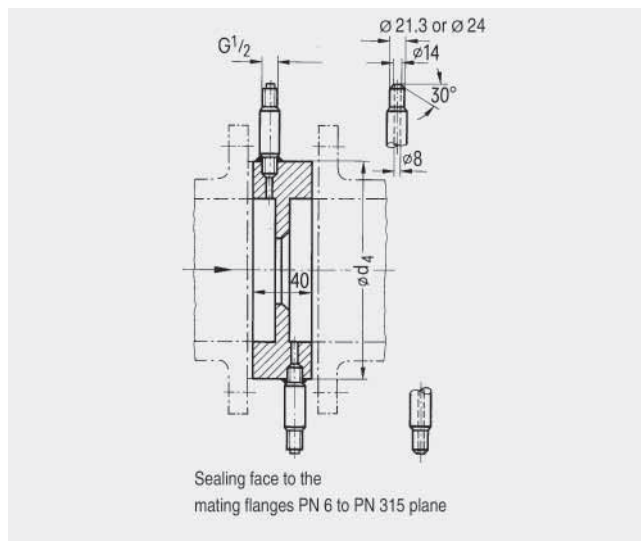
#### Connection size

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
  - PN 6 to PN 160: Thread G $\frac{1}{2}$ , welding connection  $\varnothing$  21.3 mm
  - PN 250 and PN 315: Welding connection  $\varnothing$  21.3 mm
- For steam
  - PN 6 to PN 100: Thread G $\frac{1}{2}$ , welding connection  $\varnothing$  21.3 mm
  - PN 160 to PN 315: Welding connection  $\varnothing$  24 mm

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

#### Dimensional drawings



Tapping socket: Socket length is fixed in accordance with the pressure and nominal diameter (DIN 19 205, Part 2).

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

DN	Internal diameter	External diameter d <sub>4</sub> / sealing face: Plane										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 nominal pressure	With largest nominal 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 tappings for use with EN flanges, dimensions in mm, weights in kg



# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

### Orifice plate with single tapplings

Selection and Ordering data	Order No.
<b>Orifice plate with single tapplings</b>	<b>7 ME 1 1 2 0 – – – – – Z</b>
<u>for mounting between flanges</u>	
Sealing faces to the mating flanges: plane.	
<b>Nominal diameter DN 50</b>	
• PN 6	1 GA
• PN 10 ... PN 40	1 GE
• PN 63	1 GF
• PN 100 and PN 160	1 GH
• PN 250	1 GJ
• PN 315	1 GK
<b>Nominal diameter DN 65</b>	
• PN 6	1 HA
• PN 10 ... PN 40	1 HE
• PN 63	1 HF
• PN 100 and PN 160	1 HH
• PN 250	1 HJ
• PN 315	1 HK
<b>Nominal diameter DN 80</b>	
• PN 6	1 JA
• PN 10 ... PN 40	1 JE
• PN 63	1 JF
• PN 100 and PN 160	1 JH
• PN 250	1 JJ
• PN 315	1 JK
<b>Nominal diameter DN 100</b>	
• PN 6	2 AA
• PN 10 and PN 16	2 AC
• PN 25 and PN 40	2 AE
• PN 63	2 AF
• PN 100 and PN 160	2 AH
• PN 250	2 AJ
• PN 315	2 AK
<b>Nominal diameter DN 125</b>	
• PN 6	2 BA
• PN 10 and PN 16	2 BC
• PN 25 and PN 40	2 BE
• PN 63	2 BF
• PN 100 and PN 160	2 BH
• PN 250	2 BJ
• PN 315	2 BK
<b>Nominal diameter DN 150</b>	
• PN 6	2 CA
• PN 10 and PN 16	2 CC
• PN 25 and PN 40	2 CE
• PN 63	2 CF
• PN 100 and PN 160	2 CH
• PN 250	2 CJ
• PN 315	2 CK
<b>Nominal diameter DN 200</b>	
• 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 and PN 160	2 EH
• PN 250	2 EJ
• PN 315	2 EK

Selection and Ordering data	Order No.
<b>Orifice plate with single tapplings</b>	<b>7 ME 1 1 2 0 – – – – – Z</b>
<b>Nominal diameter DN 250</b>	
• PN 6	2 FA
• PN 10 and PN 16	2 FC
• PN 25	2 FD
• PN 40	2 FE
• PN 63	2 FF
• PN 100 and PN 160	2 FH
• PN 250	2 FJ
• PN 315	2 FK
<b>Nominal diameter DN 300</b>	
• 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 and PN 160	2 GH
<b>Nominal diameter DN 350</b>	
• 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
<b>Nominal diameter DN 400</b>	
• PN 6	2 JA
• PN 10	2 JB
• PN 16	2 JC
• PN 25	2 JD
• PN 40	2 JE
• PN 63	2 JF
<b>Nominal diameter DN 500</b>	
• PN 6	2 KA
• PN 10	2 KB
• PN 16	2 KC
• PN 25	2 KD
• PN 40	2 KE
<b>For non-corrosive media</b>	
• Orifice plate and tapping socket made of 13 CrMo 4-5, material No. 1.7335; metering edge with X 5 CrNiMoNb 19 12, material No. 1.4576, welded as ordered; permissible operating temp. –10 to +570 °C	2 4
<b>For corrosive media</b>	
• Orifice plate and tapping sockets made of X 6 CrNiMoTi 17-12-2, material No. 1.4571; permissible operating temp. –200 to +550 °C	2 2





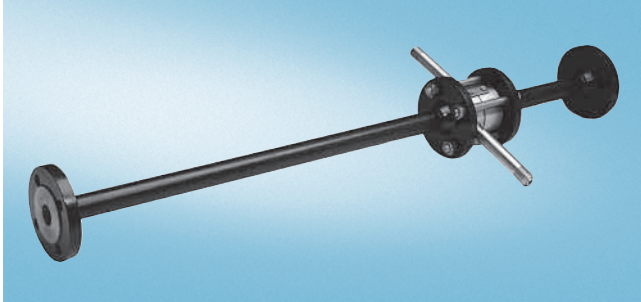


# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

### Metering pipe with annular chamber orifice

#### Application



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

#### 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 19 205.

#### Nominal diameters

- DN 10 to DN 50

#### Nominal pressure

- PN 10 to PN 100

#### 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)

#### Straight tapping sockets

- With pipe thread G $\frac{1}{2}$  DIN ISO 228/1, connection dimensions to DIN 19 207 form V

See "Technical description", "Function" for position of the tapping sockets. Tapping socket length for all metering pipes  $l = 120$  mm.

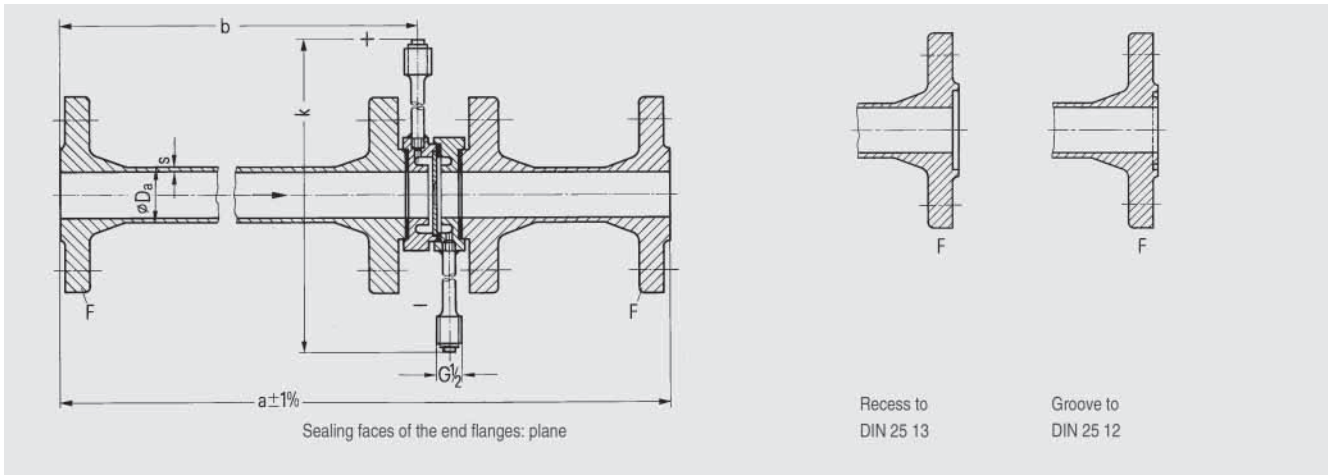
Design for flow in both directions (orifice disk aperture form D), special lengths on request.

End flanges to ASME on request.

#### Technical specifications

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

#### Dimensional drawings



DN	PN	a	b	k	End flange F <sup>1)</sup>	Pipe D <sub>a</sub> x s	Weight Approx. kg
10	10 and 16 25 and 40 63 and 100	400	218	320 320 295	DIN 2633 DIN 2635 DIN 2637	16 x 3	4.5 5 6.5
15	10 and 16 25 and 40 63 and 100	550	368	325 325 300	DIN 2633 DIN 2635 DIN 2637	20 x 2.5	5 5.5 7.5
20	10 and 16 25 and 40	700	488	335	DIN 2633 DIN 2635	25 x 2.5	6.5 7
25	10 and 16 25 and 40 63 and 100	900	638	310	DIN 2633 DIN 2635 DIN 2637	30 x 2.5	8 9 14
32	10 and 16 25 and 40	1100	788	320	DIN 2633 DIN 2635	38 x 3	11.5 12.5
40	10 and 16 25 and 40 63 and 100	1300	988	330 330 335	DIN 2633 DIN 2635 DIN 2637	50 x 5	13 15 25
50	10 and 16 25 and 40 63 100	1500	1188	340 340 345 345	DIN 2633 DIN 2635 DIN 2636 DIN 2637	60 x 5	20 22 34 34

Metering pipes for mounting between EN flanges, orifice plates with annular chambers flanged; dimensions in mm and weights

<sup>1)</sup> Flange standard replaced by EN 1092-1



# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

### Metering pipe with annular chamber orifice

Selection and Ordering data	Order No.
<b>Metering pipe for mounting between flanges for non-corrosive media</b>	7 ME 1 3 1 0 - - - - - Z
Orifice plate with annular chambers mounted between flanges	
Sealing faces to the mating flanges: plane (with recess or with groove on request).	
<b>Nominal diameter DN 10</b>	
• PN 10 and PN 16	1 AC 3 2
• PN 25 and PN 40	1 AE 3 2
• PN 63	1 AF 3 2
• PN 100	1 AG 3 2
<b>Nominal diameter DN 15</b>	
• PN 10 and PN 16	1 BC 3 2
• PN 25 and PN 40	1 BE 3 2
• PN 63	1 BF 3 2
• PN 100	1 BG 3 2
<b>Nominal diameter DN 20</b>	
• PN 10 and PN 16	1 CC 3 2
• PN 25 and PN 40	1 CE 3 2
<b>Nominal diameter DN 25</b>	
• PN 10 and PN 16	1 DC 3 2
• PN 25 and PN 40	1 DE 3 2
• PN 63	1 DF 3 2
• PN 100	1 DG 3 2
<b>Nominal diameter DN 32</b>	
• PN 10 and PN 16	1 EC 3 2
• PN 25 and PN 40	1 EE 3 2
<b>Nominal diameter DN 40</b>	
• PN 10 and PN 16	1 FC 3 2
• PN 25 and PN 40	1 FE 3 2
• PN 63	1 FF 3 2
• PN 100	1 FG 3 2
<b>Nominal diameter DN 50</b>	
• PN 10 and PN 16	1 GC 3 2
• PN 25 and PN 40	1 GE 3 2
• PN 63	1 GF 3 2
• PN 100	1 GG 3 2
<b>Shape of orifice disk aperture</b> (see figure "Shapes of orifice disk aperture")	
• Orifice plate form A	1 AA
• Quarter-circle nozzle form B	1 AB
<b>Manufacture according to pressure equipment directive</b> (see "Questionnaire for manufacture according to the pressure equipment directive (PED) 97/23/EC")	
• without <sup>1)</sup>	0
• according to Article 3, Paragraph 3	1
• according to category 1	2
• according to category 2	3

<sup>1)</sup> Only possible outside Europe (manufacturing is carried out acc. to Article 3, Paragraph 3 of the pressure equipment guideline, without CE identification).

Selection and Ordering data	Order code <sup>1)</sup>
<b>Further designs</b> Please add "-Z" to Order No. and specify Order code(s) and plain text.	
<b>Calculation of orifice disk aperture</b> Add calculation sheet "Questionnaire for calculation of a primary differential pressure device to DIN EN ISO 5167-1 to the order!"	A11
<b>Orifice plate without calculation</b> Specify in plain text: Diameter of orifice disk aperture <b>d = ... mm</b> Internal diameter of pipe <b>D = ... mm</b> Radius of quarter-circle nozzle <b>r = ... mm</b>	Y01
<b>Outer flange version acc. to ASME</b> (10% extra charge); for all flanges acc. to ASME (20% extra charge)	
<b>Other materials on request</b>	
<b>Acceptance test certificate B to EN 10204, cold water pressure test at 1.5 × PN</b> (extra charge)	
<b>Metering pipes for corrosive media</b> (on request)	

<sup>1)</sup> Order codes additive, any sequence.

#### Note on ordering

Enclose a filled-in 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 pipes, with gaskets between orifice plate and support ring and between support rings and flanges of the inlet and outlet pipes, including bolts and nuts.  
Graphite 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".

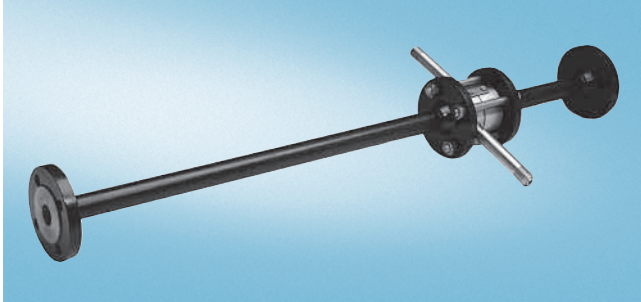


# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

### Metering pipe with orifice plate with single tappings

#### Application



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

#### Design

Orifice plate with single tappings, 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 19 205.

##### Nominal diameters

- DN 10 to DN 50

##### Nominal pressure

- PN 10 to PN 160

##### 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)

#### Straight tapping sockets

- 120 mm long
  - With pipe thread G $\frac{1}{2}$  DIN ISO 228/1, connection dimensions to DIN 19 207 form V or
  - with welded connection

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

#### 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,
  - PN 10 to PN 160: Thread G $\frac{1}{2}$ ; welding connection Ø 21.3 mm
- For steam
  - PN 10 to PN 100: Thread G $\frac{1}{2}$ ; welding connection Ø 21.3 mm
  - PN 160: Welding connection Ø 24 mm

Design for flow in both directions (orifice disk aperture form D), special lengths on request.

End flanges to ASME on request.

#### Technical specifications

Permissible operating temperature	-10 to +400 °C
Pipes and tapping sockets made of	P235G1TH, material No. 1.0305, ST37.4, material No. 1.0255 or P235GH, material No. 1.0345
Flanges made of	P250GH, material No. 1.0460
Support ring made of	P250GH, material No. 1.0460/1.4571
Orifice plate made of	X 6 CrNiMoTi 17 12-2, material No. 1.4571

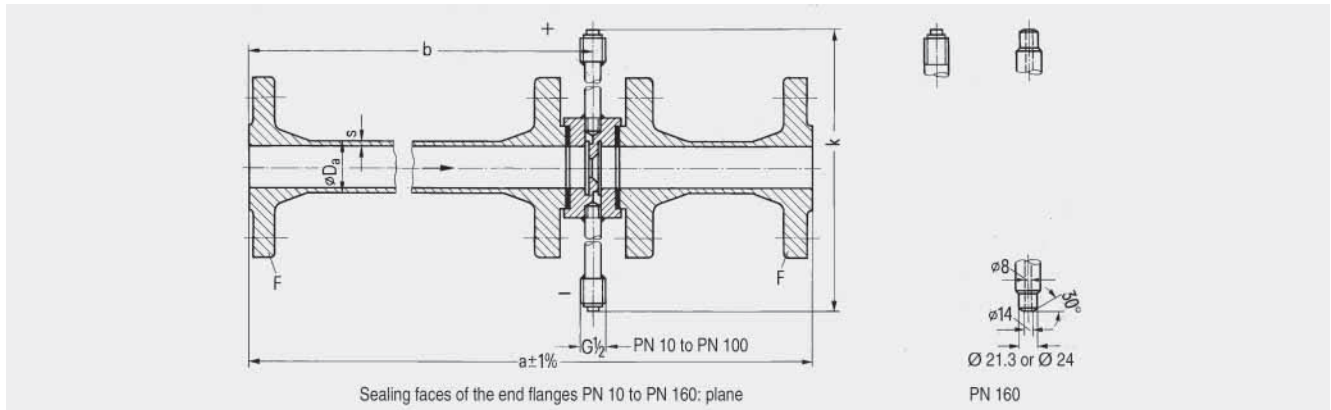


# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

Metering pipe with orifice plate  
with single tappings

### Dimensional drawings



DN	PN	a	b	k	End flange F <sup>1)</sup>	Pipe D <sub>a</sub> x s	Weight Approx. kg
10	10 and 16	400	229	322	DIN 2633	16 x 3	4.5
	25 and 40		229	322	DIN 2635		5
	63 and 100		229	295	DIN 2637		6.5
	160		230	335	DIN 2638		6.5
15	10 and 16	550	379	325	DIN 2633	20 x 2.5	5
	25 and 40		379	325	DIN 2635		5.5
	63 and 100		379	300	DIN 2637		7.5
	160		380	340	DIN 2638		7.5
20	10 and 16	700	499	300	DIN 2633	25 x 2.5	6.5
	25 and 40				DIN 2535		7
25	10 and 16	900	649	310	DIN 2633	30 x 2.5	8
	25 and 40		649	310	DIN 2635		9
	63 and 100		649	310	DIN 2637		14
	160		650	350	DIN 2638		14
32	10 and 16	1100	799	310	DIN 2633	38 x 3	11.5
	25 and 40				DIN 2535		12.5
40	10 and 16	1300	999	320	DIN 2633	50 x 5	13
	25 and 40		999	320	DIN 2635		15
	63 and 100		999	320	DIN 2637		25
	160		1000	372	DIN 2638		22.5
50	10 and 16	1500	1199	332	DIN 2633	60 x 5	20
	25 and 40		1199	332	DIN 2635		22
	63		1199	332	DIN 2636		34
	100		1199	332	DIN 2637		34
	160		1200	380	DIN 2638		35

Metering pipes for mounting between EN flanges, orifice plates with single tappings flanged; dimensions in mm and weights

<sup>1)</sup> Flange standard replaced by EN 1092-1



# SITRANS F flowmeters

## SITRANS F O delta p primary differential pressure devices

Metering pipe with orifice plate  
with single tappings

Selection and Ordering data	Order No.									
<b>Metering pipe for mounting between flanges for non-corrosive media</b>	7	M	E	1	3	2	0	-	-	- Z
Orifice plate with single tappings, flanged										
Sealing faces to the mating flanges: plane (with recess or with groove on request).										
Tapping socket:										
Tapping sockets opposite one another $\nless 180^\circ$ ; specify other angles in plain text.										
<b>Nominal diameter DN 10</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
• PN 63									1	A
• PN 100									1	A
• PN 160									1	A
welded connection										
• PN 160									1	D
<b>Nominal diameter DN 15</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
• PN 63									1	A
• PN 100									1	A
• PN 160									1	A
welded connection										
• PN 160									1	D
<b>Nominal diameter DN 20</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
<b>Nominal diameter DN 25</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
• PN 63									1	A
• PN 100									1	A
• PN 160									1	A
welded connection										
• PN 160									1	D
<b>Nominal diameter DN 32</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
<b>Nominal diameter DN 40</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
• PN 63									1	A
• PN 100									1	A
• PN 160									1	A
welded connection										
• PN 160									1	D
<b>Nominal diameter DN 50</b>										
threaded connection										
• PN 10 and PN 16									1	A
• PN 25 and PN 40									1	A
• PN 63									1	A
• PN 100									1	A
• PN 160									1	A
welded connection										
• PN 160									1	D

Selection and Ordering data	Order No.									
<b>Metering pipe for mounting between flanges for non-corrosive media</b>	7	M	E	1	3	2	0	-	-	- Z
<b>Shape of orifice disk aperture</b> (see figure "Shapes of orifice disk aperture")										
• Orifice plate form A									A	
• Quarter-circle nozzle form B									B	
<b>Manufacture according to pressure equipment directive</b> (see "Questionnaire for manufacture according to the pressure equipment directive (PED) 97/23/EC")										
• without <sup>1)</sup>										0
• according to Article 3, Paragraph 3										1
• according to category 1										2
• according to category 2										3
<b>Further designs</b>										
Please add "-Z" to Order No. and specify Order code(s) and plain text.										
<b>Calculation of orifice disk aperture</b>										
Enclose a calculation sheet "Questionnaire for calculation of a primary differential pressure device according to DIN EN ISO 5167 with the order!"										
<b>Orifice plate without calculation</b>										
Specify in plain text: Diameter of orifice disk aperture <b>d</b> = ... mm Internal diameter of pipe <b>D</b> = ... mm Radius of quarter-circle nozzle <b>r</b> = ... mm										
<b>Tapping sockets not opposite one other; angle to DIN 19 205</b> Specify in plain text: Angle between the tapping sockets ...°										
<b>External flange design to ASME</b> (10% extra charge) with all external flanges to ASME (20% extra charge)										
<b>Other materials on request</b>										
<b>Acceptance test certificate B to EN 10204, cold water pressure test at 1.5 × PN</b> (extra charge)										
<b>Metering pipes for corrosive media</b> (on request)										

- <sup>1)</sup> Only possible outside Europe (manufacturing is carried out acc. to Article 3, Paragraph 3 of the pressure equipment guideline, without CE identification).
- <sup>2)</sup> Order codes additive, any sequence.

### Note on ordering

Enclose a filled-in 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 bolts and nuts. Graphite 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

### 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-in 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 filled in completely, an extra charge will be made for the additionally required calculations.

Selection and Ordering data		Order No.
<b>Calculation of orifice disk aperture</b> of an orifice plate, orifice plate without support rings, ISA 1932 nozzle or Venturi nozzle (without measuring sheet or sketch)		7ME1910-0A-Z
<b>Calculation of differential pressure or flow</b> on an existing primary device		7ME1910-0D-Z
<b>Further designs</b> 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