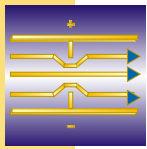




# Compact orifice Oriflow





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Operation of the Oriflow compact orifice is based on the measurement of differential pressure and is used in industrial systems. This measuring system is well-proven and most reliable when in need of a continuous flow measurement system for liquids, gases and vapours in closed pipe systems. Orifices have been standardised both nationally and internationally. Before entering into production, the calculations for the orifices and their designs are based on these standards.

## Oriflow, the modern compact orifice

solves your flow measurement task in a most economical way

- Volume or mass flow measurements
- Integrated counter
- Modular design concept
- High reproducibility
- No moving parts
- Extremely rugged and stable
- Suited also for extreme applications
- Dry calibration is possible (with reference to ISO 5167)
- Easy to install without pulse piping
- Simple change of measurement range

## Applications

The measurement of flows is, in industry, one of the most demanding and complex tasks. Even today there does not exist a universal measuring instrument for all applications. Here both manufacturers and the users face the task selecting the right method of measurement for each application. Owing to their simplicity and reliability, flow meters operating according to the differential pressure method are rated highly. The compact design of the Oriflow series results in considerable cost savings in the areas of fitting and maintenance. The Oriflow compact orifice is used in many branches of industry for the purpose of measuring the flow of liquids, gases and vapours.

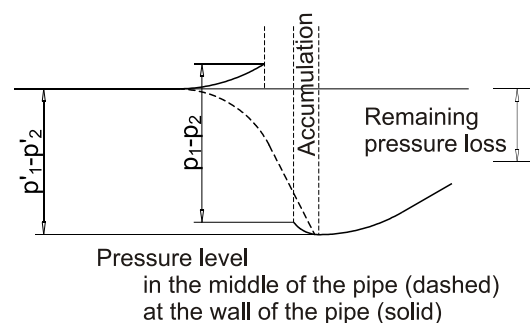
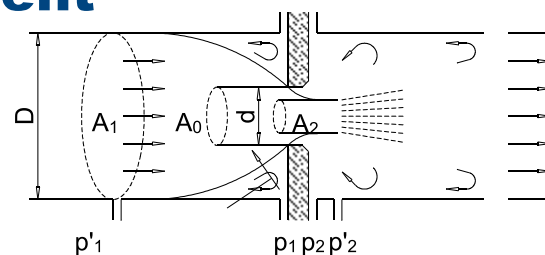
- ⇒ Use at locations where other principles of measurement fail or redundant use in series to instruments which are based on other principles (for example orifice and vortex meter or orifice and turbine)
- ⇒ Use at locations which are exposed to considerable vibrations
- ⇒ Flow measurement (volume/mass) for balancing (for example, steam measurements, heat carriers, chemical products ...)
- ⇒ Process control

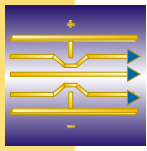
## Principle of measurement

The principle of measuring the differential pressure is based on the fact that a differential pressure is created across that section of a pipe where its cross section is reduced. This is then taken as a measure for the flow. For the differential pressure produced (differential pressure  $\Delta p$  at the point where the pressure is read) and the flow  $q$ , the flowing equation applies:

$$q = k \cdot \sqrt{\Delta p}$$

This principle of measurement is so popular because related terms, definitions and equipment characteristics have been laid down by way of standards already at a very early stage. The agreement between theoretical calculations and measured values has been proven through comprehensive experiments. This has been the basis for wide-spread acceptance throughout the industry. Today, about 50% of all flow meters rely on the principle of measuring the differential pressure.





## Design

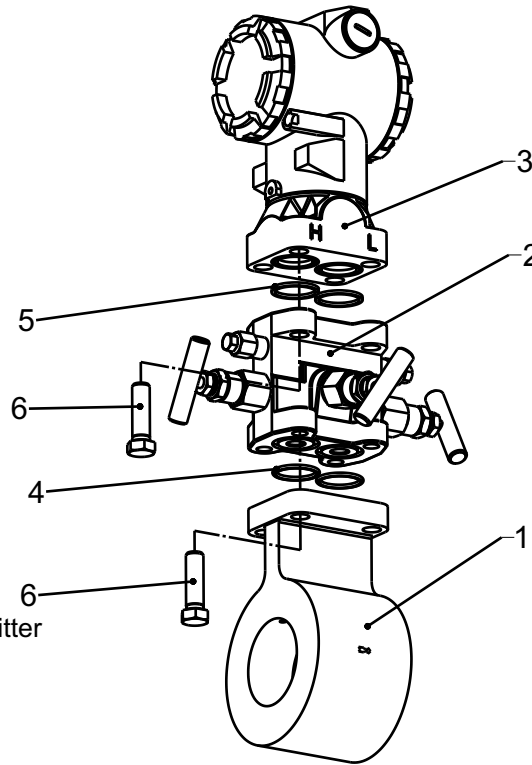
Generally the Oriflow compact orifice will be composed of three principal components:

- a differential pressure sensor with throttle,
- a valve manifold (optional) and
- a differential pressure transmitter

The geometrical arrangement is calculated and optimised individually for each application. For nominal widths from 6 to 150 mm the differential pressure sensor consists of one part as standard; those for greater nominal widths are also manufactured as one or two part units. A differential pressure transmitter is mounted to the differential pressure sensor.

As a recommended option, a valve manifold may be fitted for testing, venting and shutting off. In the case of measurements involving water vapour, a bend for the purpose of forming condensate is integrated between differential pressure sensor and differential pressure transmitter.

- |     |                                   |
|-----|-----------------------------------|
| 1   | Differential pressure sensor      |
| 2   | Valve manifold                    |
| 3   | Differential pressure transmitter |
| 4+5 | Gaskets                           |
| 6   | Bolts                             |

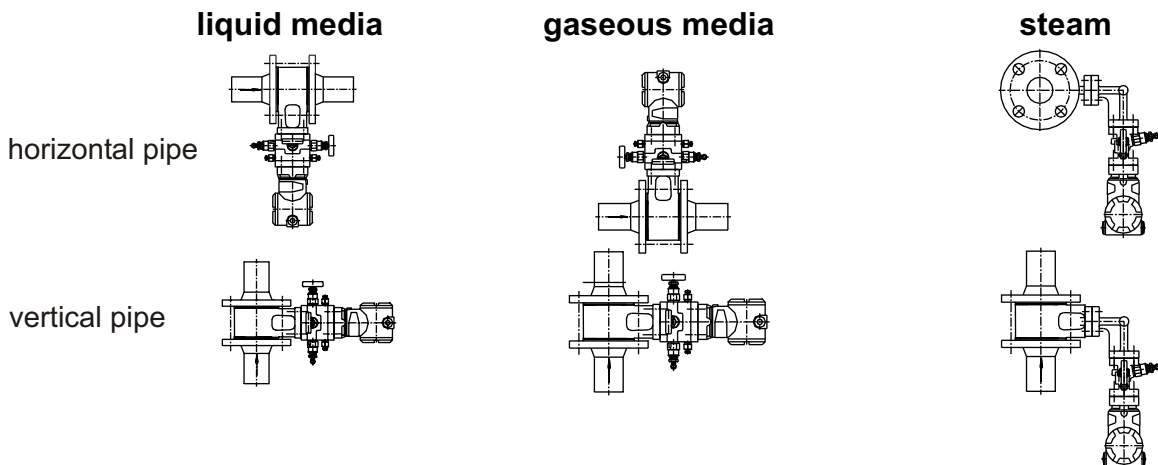


## Fitting position

In general, the following needs to be observed:

- sufficiently long inlet and outlet
- avoidance of sudden changes in diameter
- centering so as to avoid offsets
- no projecting welded seams
- direction of flow (also correct fitting of the orifice)
- correct gaskets which do not extend into the measurement chamber

Recommended fitting positions for:



## Variants of the compact orifice Oriflow

The compact orifice works according the differential pressure measurement principle.

Diameter ratio 0,1 bis 0,75

Connection: 2-wire HART®-Communication

Oriflow with and without manifold  
DN 15 to 150  
PN 10 to 40  
NPS ½" to 4"  
Class 150 to 600



Modell D

Oriflow with flanges

DN 15 to 500  
PN 10 to 40

Modell T



Oriflow with flanges and temperature extension for high temperatures up to 400°C

DN 15 to 500  
PN 10 to 40

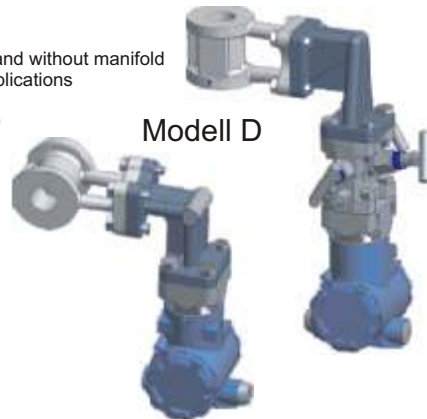
Modell U



Oriflow with and without manifold for steam applications

DN 15 to 150  
PN 10 to 40

Modell D



Oriflow for large nominal width

DN 200 to 1000  
NPS 5" to 24"  
Class 150 to 600  
length 40mm

Modell D



Oriflow for small nominal width and flow rates with changeable orifice

Modell G



Oriflow for large nominal width and redundant measurements

DN 200 to 1000  
length 40mm

Modell D Triple



Oriflow with 2 transmitters for redundant measurements, for forward and backward measurement, and for measurements of small and large amounts in the process

DN 15 to 200  
PN 10 to 160

Modell D Double



Oriflow mit temperature measurement and pressure measurement

Transmitter 3095 MV with absolut pressure, differential pressure, gauge pressure and temperature input for mass flow measurement



Oriflow for high pressure applications

DN 6 to 16  
PN 325

Modell L



Oriflow mit 3 transmitters for redundant measurements in the process

DN 15 to 200  
PN 10 to 160

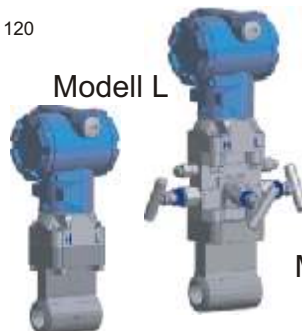
Modell O Triple



Oriflow for high pressure applications

DN 24 to 120  
PN 325

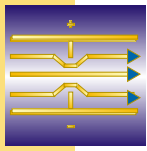
Modell L



Oriflow for high pressure applications with redundant measurements

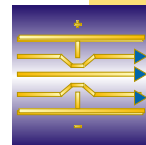
DN 6 to 120  
PN 325

Modell M Double



## Specifications

Measurement range	1 - 150000 m <sup>3</sup> /h gas/vapour 0,2 - 9000 m <sup>3</sup> /h for liquids
Output	4-20 mA, HART (Profibus, Field Bus upon request)
Deviation of the measurements	± 0,8 % of meas. value for dry calibration (>= DN 50) ± 0,6 % of meas. value for wet calibration
Conditions of usage	as to the conditions of usage the guidelines of VDI/VDE must be taken in to account
Fitting position	horizontal or vertical
Ambient temperature limits	- 40 °C bis + 70 °C
Stocking temperature	- 40 °C bis + 85 °C
Humidity	0-100% rel. humidity of the air
System of protection	IP 65
Temperature limits for the material measured	- 40 °C bis + 400 °C (depending on model)
Inlet and outlet	acc. to ISO 5167 and VDI/VDE
State of aggregate of the medium	for liquid, gaseous and vapour phase media
Viscosity	max. approx. 30 mPas (higher viscosities upon request)
Pressure loss	remaining pressure loss is calculated for each orifice
Weight	Differential pressure sensor: DN 10 1,8 kg ... DN 200 16 kg Valve manifold: 2,1 kg Differential pressure transmitter: 2,3 kg
Material	Pressure sensor: 1.4571, 1.4408, (Hastelloy and others upon request)
Process connection	DN 10 - 150 (bis DN 1000 upon request, other connections like ANSI can be specified) PN 40 (up to PN 325 upon request)
Electrical connection	Power supply 24 VDC, 2 - two-wire system M20x1,5, ½ -14 NPT, PG 13,5
Display	five digit LC display
Certificates and approvals	CE conformity Ex approvals in accordance with ATEX / FM / CENELEC / JIS / CSA / SAA



## Orifice profile

Project	TAG – Nr.
Company	Country
Name	Tel.
Dept.	Fax
Post code, city	Date

Medium  Liquid  Gas  Vapour

Designation

Only required for gases

Isentropic exponent   
Relative humidity  % r.F.

compressibility factor

### Operating conditions

Volume flow	Min.	<input style="width: 50px; height: 20px;" type="text"/>	Max.	<input style="width: 50px; height: 20px;" type="text"/>	m <sup>3</sup> /h
Mass flow	Min.	<input style="width: 50px; height: 20px;" type="text"/>	Max.	<input style="width: 50px; height: 20px;" type="text"/>	kg/h
Pressure	Operation	<input style="width: 50px; height: 20px;" type="text"/>	Max.	<input style="width: 50px; height: 20px;" type="text"/>	<input style="width: 20px; height: 20px;" type="text"/> bar <input style="width: 20px; height: 20px;" type="text"/> mbar <input style="width: 20px; height: 20px;" type="text"/> abs. <input style="width: 20px; height: 20px;" type="text"/> rel.
Temperature	Operation	<input style="width: 50px; height: 20px;" type="text"/>	Max.	<input style="width: 50px; height: 20px;" type="text"/>	°C
Density	Operation	<input style="width: 50px; height: 20px;" type="text"/>	Std.	<input style="width: 50px; height: 20px;" type="text"/>	kg/m <sup>3</sup>
Viscosity		<input style="width: 50px; height: 20px;" type="text"/>			mPas

### Piping

Nominal widths	<input style="width: 100px; height: 20px;" type="text"/>	Material	<input style="width: 100%; height: 20px;" type="text"/>
Max. Length	<input style="width: 50px; height: 20px;" type="text"/> mm	factory standards	<input style="width: 100%; height: 20px;" type="text"/>
Pipe I.D.	<input style="width: 50px; height: 20px;" type="text"/> mm	wall thickness	<input style="width: 100%; height: 20px;" type="text"/>

Pipe orientation  Horizontal  Vertical

### Output

Verified  Appropriate for verification  EExe  EExi  EExd IP   
 Output signal  4..20 mA  HART  Profibus  Field Bus

### Optimisation criteria

Maximum dynamics (small diameter ratio  $\beta$ )  
 Lowest remaining pressure loss (large diameter ratio  $\beta$ )

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