FPD175
Compact orifice carrier assembly
Measurement made easy
Orifice flow metering made simple

Optional integral temperature element
- Integral RTD facilitates mass (liquids and steam) and corrected volume (gas) flowrate measurement

Integral manifold
- For direct mounting of DP or multivariable transmitter
- Optional fittings for impulse piping to facilitate remote mounting of transmitter

Reduced pipeline installation costs
- Eliminates need to supply and connect separate manifold, and impulse piping
- Multi-hole orifice plate improves accuracy and dramatically reduces straight pipe requirements

Flexible and accurate installation
- Wafer body fits flanges up to ASME 600 or DIN PN100
- Optional tool for accurate centralization between flanges
- Optional replaceable orifice plates offer easy, economic maintenance and flexibility
**Compact orifice primary element**

The FPD175 is an orifice-based primary element, designed for simplified installation and commissioning.

FPD175 incorporates the following features:

- A wafer-bodied orifice carrier assembly with integral orifice plate and corner tapping points
- Integral welded 3-valve or 5-valve manifold
- Integral welded connections between the carrier tappings and manifold
- Can be site-mounted to any conventional DP or multivariable transmitter
- Optional conditioning orifice plate
- Optional removable orifice plate
- Version for remote-mounted transmitter

**Benefits**

The FPD175 system avoids many of the difficulties involved in the sizing, selection, procurement, installation and commissioning of conventional orifice plate installations.

- Eliminates many of the problems of sourcing multiple components. Provides savings in cost and time due to the simplicity of design and installation.
- Manifold with compact tapping connections offers:
  - guaranteed accuracy of positioning and installation of the tapping points
  - reduced possibility of impulse line problems
- Choice of two discrete Beta ratio values simplifies the sizing and selection process
- Optional design with replaceable orifice plates enables low-cost repair or, when process conditions change, re-ranging of the meter
- Optional element centralizing system ensures meter is concentric with its pipe, thus avoiding significant additional metering errors
- Available in either single-hole (concentric) or multihole (conditioning plate) formats
- Optional remote mounting kit to enable use at higher temperatures, where a compact transmitter would be damaged by excessive temperatures

**Balanced orifice conditioning plate**

Utilizing NASA-designed Balanced Orifice technology, the conditioning plate variant of FPD175 offers significant advantages over the conventional single-hole design.

- Upstream and downstream straight pipe length restrictions reduced
  - can be used without any straight pipe where conditions dictate
- Reduced pressure losses
  - compared to equivalent concentric plate, reduces pressure loss by 50%
- Reduced noise levels
  - compared to equivalent concentric plate
- Self-venting and draining
  - no need for vent or drain holes
  - improved handling of small amounts of entrained solids
- Improved accuracy
  - accuracy of balanced flow meter (BFM) is improved by 54% compared to a standard square edged orifice plate
**Specification**

**Fluids**
Liquids, gases and steam (vapor)

**Line sizes**
25, 40, 50, 80, 100, 200, 250 and 300 mm
(1, 1½, 2, 3, 4, 6, 8, 10 and 12 in.)

**Wetted materials**
Orifice assembly, stem and manifold
316L stainless steel
Manifold seals
Graphite and PTFE

**Process connections**
Wafer body to fit between the following flange drillings:
• ASME B16.5 (ANSI) Class 150, 300 or 600
• DIN PN16, PN25, PN40, PN63 or PN100
Pipeline centralization can be assured using optional centralizing tool

**Pressure limitations**
100 bar (1450 psi) or as flange rating, whichever is the lower

**Temperature limitations**
Direct mount transmitter
–40 to 450 °F (–40 to 232 °C)
When mounted in steam service, mount at 180° and fill impulse lines with water.
Remote mount transmitter
–40 to 850 °F (–100 to 454 °C) – stainless steel

**Assembly to a transmitter**
• There is an option for the ABB 266 transmitter and FPD175 to be factory assembled. If the transmitter and FPD175 are not factory assembled, they may be shipped separately. Please notify your Local Sales Team of your requirements.
• A remote mount kit is available to enable remote location of transmitter. Please specify requirements to your Local Sales Team.

**Integral RTD**
• 100 Ohm platinum RTD temperature sensor assembly with mineral Insulated cable
• The RTD sensor complies with IEC-751 Class B accuracy and meets Intrinsic Safety certification.

* Available only with direct mount transmitter models.

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**Orifice plate bore at 20 °C (68 °F)**

For Beta = 0.4

<table>
<thead>
<tr>
<th>Size</th>
<th>Typical weight in Kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm (1 in.)</td>
<td>8 (17.6)</td>
</tr>
<tr>
<td>40 mm (1½ in.)</td>
<td>10 (22)</td>
</tr>
<tr>
<td>50 mm (2 in.)</td>
<td>12.5 (27.5)</td>
</tr>
<tr>
<td>80 mm (3 in.)</td>
<td>15.5 (34.1)</td>
</tr>
<tr>
<td>100 mm (4 in.)</td>
<td>17 (37.4)</td>
</tr>
<tr>
<td>150 mm (6 in.)</td>
<td>20 (44)</td>
</tr>
<tr>
<td>200 mm (8 in.)</td>
<td>22 (48)</td>
</tr>
<tr>
<td>250 mm (10 in.)</td>
<td>26 (57.2)</td>
</tr>
<tr>
<td>300 mm (12 in.)</td>
<td>30.5 (67.1)</td>
</tr>
</tbody>
</table>

For Beta = 0.65

<table>
<thead>
<tr>
<th>Size</th>
<th>Typical weight in Kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm (1 in.)</td>
<td>17.32 (38.2)</td>
</tr>
<tr>
<td>40 mm (1½ in.)</td>
<td>26.58 (58.5)</td>
</tr>
<tr>
<td>50 mm (2 in.)</td>
<td>34.11 (75.2)</td>
</tr>
<tr>
<td>80 mm (3 in.)</td>
<td>50.65 (111.5)</td>
</tr>
<tr>
<td>100 mm (4 in.)</td>
<td>66.47 (146.3)</td>
</tr>
<tr>
<td>150 mm (6 in.)</td>
<td>100.15 (220.4)</td>
</tr>
<tr>
<td>200 mm (8 in.)</td>
<td>131.78 (290.0)</td>
</tr>
<tr>
<td>250 mm (10 in.)</td>
<td>165.43 (364.2)</td>
</tr>
<tr>
<td>300 mm (12 in.)</td>
<td>197.1 (435.0)</td>
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</tbody>
</table>

**Concentric orifice straight pipe requirements**
As per ISO 5167:2003

<table>
<thead>
<tr>
<th></th>
<th>β= 0.4</th>
<th>β= 0.65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conical reducer (2D – D)</td>
<td>5D</td>
<td>12D</td>
</tr>
<tr>
<td>Conical expander (0.5D – D)</td>
<td>12D</td>
<td>28D</td>
</tr>
<tr>
<td>Single 90 ° bend</td>
<td>16D</td>
<td>44D</td>
</tr>
<tr>
<td>2 off 90 ° bends in same plane</td>
<td>10D</td>
<td>44D</td>
</tr>
<tr>
<td>2 off 90 ° bends in different plane</td>
<td>50D</td>
<td>60D</td>
</tr>
</tbody>
</table>

Where D = pipe diameter
Conditioning orifice straight pipe requirements

Normal uncertainty
- 7D upstream and 2D downstream

Increased uncertainty
- No straight pipe upstream and downstream

Performance
Concentric and conditioning plate coefficient uncertainties at reference conditions, excluding transmitter

Concentric plate (for Re >10^5)
- Beta 0.4: 1 % uncertainty
- Beta 0.65: 1 % uncertainty

* For a combination of Re <10^5 and Beta = 0.65, add 0.5 %

Conditioning plate (for Re >6000)
- Beta 0.4: 0.5 % uncertainty
- Beta 0.65: 0.5 % uncertainty

Repeatability
- 0.1 %

ABB recommends a minimum differential pressure of 25 in. wg (62 mbar) to ensure no increase in uncertainty if upstream straight pipe is less than 5 x pipe diameter

Turndown
- Up to 8:1
### Dimensions

Dimensions in mm (in.)

<table>
<thead>
<tr>
<th>Size</th>
<th>H</th>
<th>J</th>
<th>E (J/2)</th>
<th>D (H – E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 (1)</td>
<td>180 (7.10)</td>
<td>50.8 ±1 (2.00 ±0.04)</td>
<td>25.4 ±0.5 (1.00 ±0.02)</td>
<td>154.6 ±5 (6.10 ±0.20)</td>
</tr>
<tr>
<td>40 (11/2)</td>
<td>203 (8.00)</td>
<td>73.2 ±1 (2.88 ±0.04)</td>
<td>36.6 ±0.5 (1.44 ±0.02)</td>
<td>166.4 ±5 (6.56 ±0.20)</td>
</tr>
<tr>
<td>50 (2)</td>
<td>221 (8.70)</td>
<td>92.1 ±1 (3.63 ±0.04)</td>
<td>46.05 ±0.5 (1.81 ±0.02)</td>
<td>174.95 ±5 (6.89 ±0.20)</td>
</tr>
<tr>
<td>80 (3)</td>
<td>257 (10.12)</td>
<td>127 ±1 (4.99 ±0.04)</td>
<td>63.5 ±0.5 (2.50 ±0.02)</td>
<td>193.5 ±5 (7.62 ±0.20)</td>
</tr>
<tr>
<td>100 (4)</td>
<td>314 (12.36)</td>
<td>157.2 ±1 (6.19 ±0.04)</td>
<td>78.6 ±0.5 (3.09 ±0.02)</td>
<td>235.4 ±5 (9.27 ±0.20)</td>
</tr>
<tr>
<td>150 (6)</td>
<td>372 (14.65)</td>
<td>215.9 ±1 (8.50 ±0.04)</td>
<td>107.95 ±0.5 (4.25 ±0.02)</td>
<td>264.05 ±5 (10.40 ±0.20)</td>
</tr>
<tr>
<td>200 (8)</td>
<td>426 (16.77)</td>
<td>269.9 ±1 (10.63 ±0.04)</td>
<td>134.95 ±0.5 (5.31 ±0.02)</td>
<td>291.05 ±5 (11.46 ±0.20)</td>
</tr>
<tr>
<td>250 (10)</td>
<td>502 (19.76)</td>
<td>323.8 ±1 (12.75 ±0.04)</td>
<td>161.9 ±0.5 (6.37 ±0.02)</td>
<td>340.1 ±5 (13.39 ±0.20)</td>
</tr>
<tr>
<td>300 (12)</td>
<td>560 (22.04)</td>
<td>381.0 ±1 (15.00 ±0.04)</td>
<td>190.5 ±0.5 (7.50 ±0.02)</td>
<td>369.5 ±5 (14.55 ±0.20)</td>
</tr>
</tbody>
</table>
### Ordering information

<table>
<thead>
<tr>
<th>FPD175 compact orifice carrier assembly</th>
<th>Main code</th>
<th>Optional code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPD175</td>
<td>FPD175 XX</td>
<td>FPD175 XX</td>
</tr>
</tbody>
</table>

#### Model and design level
- Orifice meter - fixed plate: F5
- Orifice meter - removable plate*: F4
- Conditioning orifice - fixed plate: C7

#### Meter size
- 25 mm. (1 in.): 025
- 40 mm (1 1/2 in.): 040
- 50 mm (2 in.): 050
- 80 mm (3 in.): 080
- 100 mm (4 in.): 100
- 150 mm (6 in.): 150
- 200 mm (8 in.): 200
- 250 mm (10 in.): 250
- 300 mm (12 in.): 300

#### Fluid
- Liquid: L1
- Gas: G1
- Saturated steam: S1
- Superheated steam: S2

#### Beta ratio
- 0.4: B1
- 0.65: B2

#### Pressure rating
- ASME CL 150: A1
- ASME CL 300: A3
- ASME CL 600: A6
- PN 10: D1
- PN 16: D2
- PN 25: D3
- PN 40: D4
- PN 63: D5
- PN 100: D6

#### Pipeline orientation
- Horizontal pipe: PNH
- Vertical pipe**: PNV

#### Manifold
- Integral 3-valve manifold: M3
- Integral 5-valve manifold: M5

#### Temperature element
- Integral: AT

#### Certification
- Material monitoring with inspection certificate 3.1 acc. EN10204: C2
- Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN10204: CN

#### Documentation language
- Others: CZ
- German: M1
- Italian: M2
- Spanish: M3
- Chinese: M5
- English (standard): M6

#### Mounting adaptors
- Tapping adaptor kit for remote mount transmitter: TNA
- Coplanar adaptor: TNC

#### Transmitter options
- Factory-fitted transmitter (free issue): TM2
- No transmitter (customer supply and fit on site): TM0

*Not available for meter sizes below 100 mm (4 in.)
** Not available for steam applications