
McMENON ENGINEERING SERVICES | DATA SHEET

FPD175

Compact orifice carrier assembly



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.

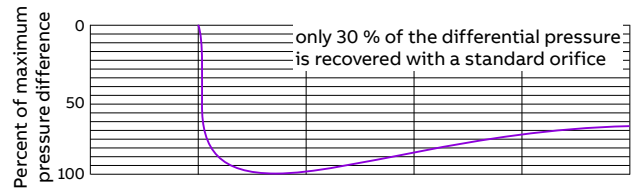
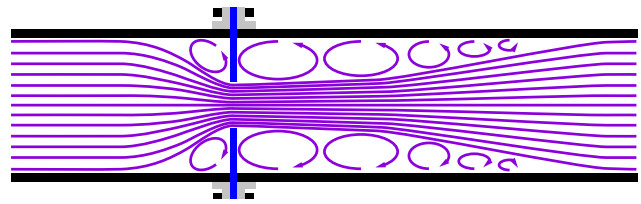


Fig. 1 Standard orifice plates generate significant eddies and pressure losses

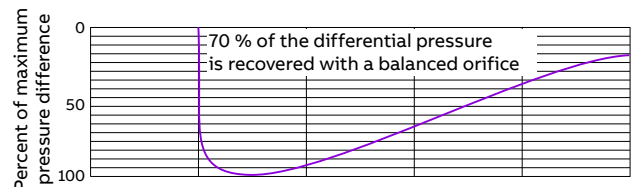
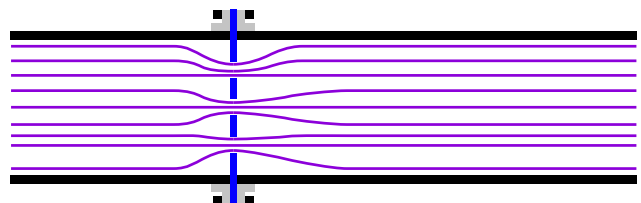


Fig. 2 Balanced orifice conditioning meter reduces eddies and pressure losses

- 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, 150, 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 McMenon 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.

Orifice plate bore at 20 °C (68 °F)

For Beta = 0.4

25 mm (1 in.)	10.66 mm (0.42 in.)
40 mm (1½ in.)	16.36 mm (0.644 in.)
50 mm (2 in.)	20.99 mm (0.826 in.)
80 mm (3 in.)	31.17 mm (1.227 in.)
100 mm (4 in.)	40.90 mm (1.610 in.)
150 mm (6 in.)	61.63 mm (2.426 in.)
200 mm (8 in.)	81.10 mm (3.193 in.)
250 mm (10 in.)	101.8 mm (4.008 in.)
300 mm (12 in.)	121.29 mm (4.775 in.)

For Beta = 0.65

25 mm (1 in.)	17.32 mm (0.682 in.)
40 mm (1½ in.)	26.58 mm (1.047 in.)
50 mm (2 in.)	34.11 mm (1.343 in.)
80 mm (3 in.)	50.65 mm (1.994 in.)
100 mm (4 in.)	66.47 mm (2.617 in.)
150 mm (6 in.)	100.15 mm (3.942 in.)
200 mm (8 in.)	131.78 mm (5.188 in.)
250 mm (10 in.)	165.43 mm (6.513 in.)
300 mm (12 in.)	197.1 mm (7.76 in.)

Weight (approximately)

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

Concentric orifice straight pipe requirements

As per ISO 5167:2003

	β= 0.4	β= 0.65
Conical reducer (2D – D)	5D	12D
Conical expander (0.5D – D)	12D	28D
Single 90 ° bend	16D	44D
2 off 90 ° bends in same plane	10D	44D
2 off 90 ° bends in different plane	50D	60D

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 %

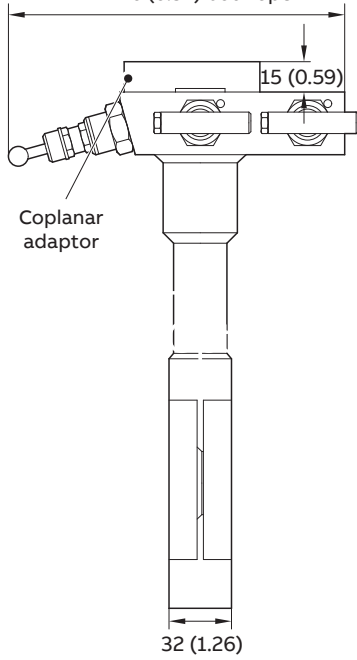
McMenon recommends a minimum differential pressure of 25 in. wg (62 mbar) to ensure no increase in uncertainty if upstream straight pipe is less than 5 x pipe diameter

Turndown
Up to 8:1

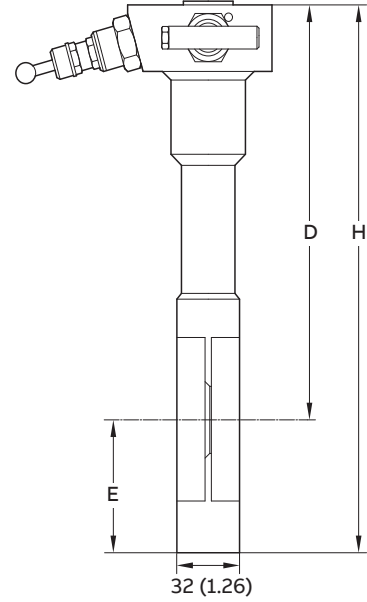
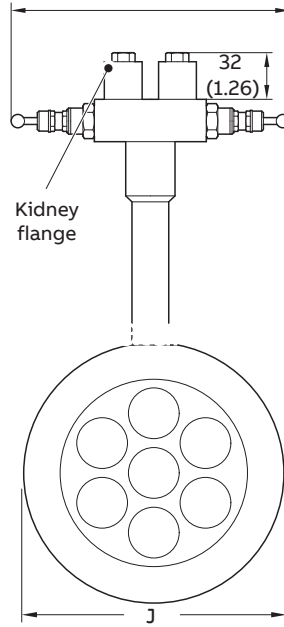
Dimensions

Dimensions in mm (in.)

3-valve 157 (6.20) both closed
 163 (6.41) both open
 5-valve 170 (6.70) both closed
 176 (6.92) both open



3-valve 210 (8.27) both closed
 220 (8.66) both open
 5-valve 225 (8.85) both closed
 235 (9.25) both open



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

Ordering information

FPD175 compact orifice carrier assembly	Main code							Optional code				
	FPD175	XX	XXX	XX	XX	XX	XXX	XX	XX	XX	XXX	XXX
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 (1½ 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	
French											Md	
English (standard)											M5	
Chinese											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)												TMO

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

** Not available for steam applications

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