

## FPD150/160

# Differential pressure – primary flow element orifice plates and orifice flange unions

Simple flow metering solutions for liquids, gases and steam, backed up by comprehensive documentation, certification and testing

Measurement made easy



### Simple orifice plate for low-cost measurement

- installs direct between flanges

### Engineered and manufactured to latest standards

- to ISO5167:2003 as standard
- other design standards available

### Orifice flange Unions ready for direct welding into pipeline

- manufactured in accordance with ASME B16.36
- tappings accurately positioned
- complete with gaskets, nuts and bolts

### Range of flange drillings / ratings available

- raised, flat or RTJ-profile

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## Differential pressure – primary flow element orifice plates and orifice flange unions

### Orifice plates

The differential pressure generated is sensed at a pair (or multiple pairs) of tapping points, each pair comprising a high pressure (inlet or upstream) and a low pressure (outlet or downstream) tapping. A variety of configurations are specified within ISO5167 and other standards, including the following:

#### D and D/2 taps

- the tappings are generally located in the pipe wall
- the upstream tapping is one pipe inside diameter (D) from the upstream face of the plate
- the downstream tapping is half the pipe inside diameter (D/2) from the downstream face of the plate

#### Flange taps

- the tappings are generally located in the pipe flanges
- the upstream tapping is 25.4 mm (1 in.) from the upstream face of the plate
- the downstream tapping is 25.4 mm (1 in.) from the downstream face of the plate

#### Corner taps

- the tappings are generally located in the pipe flanges
- the tappings break into the pipe at the corners formed by the upstream and downstream flange faces and the pipe wall

#### Orifice plate bore profiles

ABB offers a variety of orifice plate bore profiles to cover a wide range of applications. These bore profiles can be classified as follows:

- circular bore, concentric with the pipe
- circular bore, adjacent to the pipe wall
- segmental profile bore, adjacent to the pipe wall

ABB orifice plates are usually supplied with a data tab welded to the circumference. This tab can be engraved with orifice plate details (such as tag number and bore size) that are visible without removing the plate from the line.

### Orifice plate types

#### Concentric square edge type plate

These plates are used to measure the flowrate of clean, low-viscosity liquids, gases and dry steam at Reynolds Numbers in the turbulent flow regime. The bore is sharp-edged on the inlet and usually parallel on the outlet, although, depending on the  $d/D$  ratio (Beta) and thickness, the outlet may be chamfered. The bore is calculated to produce the requested differential pressure at the design meter maximum flowrate and operating flowing conditions. Concentric orifice plates represent the majority of plates used across orifice-based devices and, as the name suggests, the orifice bore is positioned in the exact centre of the plate. The user must arrange for the provision of tapping points in the pipework in the necessary positions so that the generated differential pressure can be sensed and transmitted. They are used with corner, flange or D & D/2 taps.

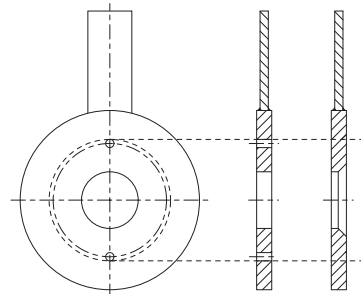


Fig. 1: Concentric square-edge type plate

### Concentric conical entrance type plate

Conical Entrance plates have a bore with a chamfered (or conical) inlet section and a parallel throat / exit section. Their advantage is that they maintain their accuracy down to very low Reynolds Numbers and are therefore used to measure the flow of clean liquids at low velocity and / or at high viscosity. Additionally they are suited to the measurement of low-density gases.

Conical Entrance plates are used exclusively with corner taps.

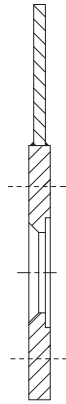


Fig. 2: Conical entrance type plate

### Concentric quarter-circle type plate

Quarter-circle plates differ from conical entry plates by having a bore with an inlet in the form of a radius. They maintain their accuracy down to relatively low Reynolds Numbers (but not as low as those of conical entrance plates). Accordingly, they are used to measure the flow of clean liquids at low velocity and / or at elevated viscosity. They are also suited to the measurement of low-density gases.

Quarter-circle plates are used with either corner taps or flange taps.

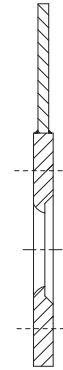


Fig. 3: Quarter circle type plate

### Eccentric square edge type plate

A concentric orifice plate is unsuitable for dirty liquids and gases as the solids can build up in front of the plate causing a deterioration in accuracy and possible blockage. The bore of Eccentric plates is circular but is adjacent to the pipe wall so that solids can pass through freely. They are used to measure the flow of low-viscosity liquids carrying suspended solids (or entrained gas) or for gases carrying entrained liquid.

Eccentric plates are used with either corner taps or flange taps.

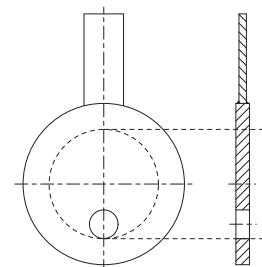


Fig. 4: Eccentric type plate

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## Differential pressure – primary flow element orifice plates and orifice flange unions

### Segmental square-edge type plate

The bore of segmental plates is in the shape of a segment of a circle with its curved edge adjacent to the pipe wall so that solids can pass through freely. It is used to measure the flow of either low-viscosity liquids carrying suspended solids (or entrained gas) or for gases carrying entrained liquid. However, the eccentric type is preferred for such applications.

Segmental plates are used with flange taps.

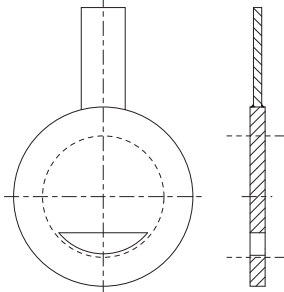


Fig. 5: Segmental type plate

### Orifice flange unions

ABB orifice flange unions combine the orifice plate with a pair of flanges, complete with nuts, bolts, washers and gaskets. To enable separation of the two flanges for removal and installation of the orifice plate, the assembly is supplied with jacking bolts. The resultant assembly is typically butt-welded into the pipework, although the flanges can be supplied for socket weld or screwed installation into the pipework. The orifice plates are usually supplied with a data tab welded to the circumference. This tab can be engraved with plate information (such as tag number and bore size), that is visible without removing the plate from the line.

The differential pressure generated is sensed at a pair (or multiple pairs) of tapping points within the flange assembly, each pair comprising of a high pressure (inlet) and a low pressure (outlet) tapping.

As standard our orifice flange unions are supplied as welding-neck type. Other types, including socket weld and threaded, are available.



Fig. 6: Orifice flange union

## Applications

Orifice plates are an incredibly versatile flow metering technology and can be used in a wide range of flow measurement applications, including:

- Clean liquids, gases and steam
- Fluids containing solids
- High viscosity fluids
- Fluids at low flowrates
- Flow monitoring
- Gas and utility flows to combustion plants
- Steam consumption
- Pilot plants

## Comprehensive documentation

ABB offers unsurpassed quality in its DP devices and we also provide the full testing and documentation that your application needs. Whether the requirement is a single orifice plate with a simple certificate of conformity or a project requiring full material inspection, traceability, third-party verification and comprehensive data dossiers – the ABB facility at Workington satisfies all of the requirements.

### Standards and services

These are just some of the standards we follow and the services we can provide:

#### Quality systems

BS EN ISO 9001:2000 Q 05907

#### Environmental impact

ISO 14001  
EMS 40882

#### EU Pressure Equipment Directive

97/23/EC

#### Design

BS EN ISO 5167-1:2003  
R W Miller  
AGA  
API  
ASME

#### Materials and Traceability

BS EN 10204 3.1 B,C  
NACE MR-01-75

#### Product testing services

Magnetic particle inspection  
Dye-penetrant Inspection  
PMI (Texas Nuclear)  
Customer inspection  
Independent third party Inspection

#### Base metal testing

Charpy impact testing  
Hardness survey  
HIC testing  
Intercrystalline corrosion testing etc.

#### Certification / Documentation to your requirements

Bore calculations  
PED 97/23/EC  
Material certificates to BS EN 10204 3.1 B,C  
NACE MR-01-75 conformity certificate  
Welding qualifications to ASME IX, EN BS 288/287  
GA drawings  
Certificates of conformity  
Weight certificates  
NDT certificates and procedures  
Quality plans  
Full data dossiers  
Installation and operating manuals etc.

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## Differential pressure – primary flow element orifice plates and orifice flange unions

### Specification

#### Materials

Plates:	Standard – 316/316L stainless steel
Flanges:	Standard – carbon steel; 316/316L stainless steel
Other flange & plate materials:	304 St Stl ; 310 St Stl; 317/317L St Stl ; 321 St Stl; Low temp carbon steel (ASTM A350 LF2 Class 1); CrMo steel (ASTM A182 F11, F5 and F22); 22Cr duplex St Stl ; 25Cr super duplex St Stl; Alloy 400; Alloy 625; Alloy 800; Alloy 825; Alloy C276; Titanium;
Nuts:	ASTM A194 2H; ASTM A194 8MA
Bolts:	ASTM A193 B7; ASTM A193 B8M
Gaskets:	RF and FF flanges, RTJ flanges* – Asbestos free; spiral wound (SS windings with CS or SS outer ring) 22 % Cr duplex (UNS S31803); 25 % Cr super duplex St Steel (S32750, S32760); Soft iron; 316 / 316L stainless steel; 304 / 304L stainless steel S32750, S32760); 6 % Mo SS (UNS S31254); Alloy 400 (UNS N04400); Alloy 625 (UNS N06625); Alloy 800 (UNS N08800); Alloy 825 (UNS N08825)

\*For FPD150.P1 & FPD160.F1, the gasket material relates solely to the gasket.

For FPD150.P2 & FPD160.F2, the gasket material is the orifice plate holder material.

For FPD150.P3 & FPD160.F3, the plate and RTJ gasket are manufactured in a single piece and therefore the gasket must be specified to be the same material as the orifice plate.

#### Maximum working pressure

Limited by the application flange rating.

#### Maximum working temperature

Dependent on the material selection and application.

#### Pipeline size range (typical)

Concentric:	DN15 to 900 (½ to 36 in.)
Conical entrance:	DN15 to 500 (½ to 20 in.)
Quarter circle:	DN15 to 500 (½ to 20 in.)
Eccentric:	DN100 to 900 (4 to 36 in.)
Segmental:	DN25 to 600 (1 to 24 in.)

#### Plate thickness

ABB Standard:	3; 6; 10 mm
Others available:	1.5; 2; 4; 8; 12; 15; 16 mm ½; ¾ in.

The thickness of the orifice plate depends significantly on the application and design conditions.

#### Calculation standards

Preferred:	BS EN ISO 5167-1 & -2: 2003, unless otherwise requested
Others:	ASME; API; R W Miller; AGA

#### Design standards

Plate:	Preferred – ABB
Others:	Saudi Aramco; Shell
Flange:	ASME B16.36

### Pressure losses

Typical pressure loss: 40 to 95% of the generated differential pressure, dependent on the Beta ratio (d/D) and plate design

### Pipeline installation

Mounting: Butt weld, socket weld or screwed flanges  
Facing: Raised face; flat face; RTJ (octagonal or oval profile)  
Facing standards: ASME 150; 300; 400; 600; 900; 1500; 2500 lb.

Plates to fit between other flange standards can be supplied.

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## Differential pressure – primary flow element orifice plates and orifice flange unions

### Ordering information

#### FPD150 orifice plates

Orifice plates	FPD150	Main code										Optional code									
		XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XX	XX	XXX	XX	XXX	XXX			
<b>Product design</b>																					
Orifice plate only (for RF/FF flanges)	P1																				
Orifice plate screwed into RTJ male carrier	P2																				
Orifice RTJ male plate (integral, one piece)	P3																				
<b>Customer-specific design</b>																					
ABB Standard	A1																				
Aamco Standard	A2																				
Shell Standard	S1																				
<b>Orifice design</b>																					
Concentric square edged – corner taps	C1																				
Concentric square edged – flange taps	C2																				
Concentric – D & D/2 taps	C3																				
Conical entrance – corner taps	L1																				
Eccentric – corner taps	E1																				
Eccentric – flange taps 90°	E2																				
Eccentric – flange taps 180°	E3																				
Quarter circle – corner taps	U1																				
Quarter circle – flange taps	U2																				
Segmental – flange taps	S2																				
<b>Line nominal bore</b>																					
DN 15 (1/2 in.)																					
DN 20 (3/4 in.)																					
DN 25 (1 in.)																					
DN 32 (1 1/4 in.)																					
DN 40 (1 1/2 in.)																					
DN 50 (2 in.)																					
DN 65 (2 1/2 in.)																					
DN 80 (3 in.)																					
DN 90 (3 1/2 in.)																					
DN 100 (4 in.)																					
DN 125 (5 in.)																					
DN 150 (6 in.)																					
DN 200 (8 in.)																					
DN 250 (10 in.)																					
DN 300 (12 in.)																					
DN 350 (14 in.)																					
DN 400 (16 in.)																					
DN 450 (18 in.)																					
DN 500 (20 in.)																					
DN 550 (22 in.)																					
DN 600 (24 in.)																					
DN 650 (26 in.)																					
DN 700 (28 in.)																					
DN 750 (30 in.)																					
DN 800 (32 in.)																					
DN 850 (34 in.)																					
DN 900 (36 in.)																					
DN 950 (38 in.)																					
DN 1000 (40 in.)																					
DN 1050 (42 in.)																					
Others																					

See pages 11, 12 and 13

Continued on next page ...



	Main code										Optional code									
<b>Orifice plates</b>	FPD150	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XX	XX	XXX	XX	XXX	XXX	XXX	
	See page 8																			
<b>Pipe schedule</b>																				
Schedule 5S																				
Schedule 5																				
Schedule 10S																				
Schedule 10																				
Schedule 20																				
Schedule 30																				
Schedule 40S																				
Schedule 40																				
Schedule STD																				
Schedule 60																				
Schedule 80S																				
Schedule 80																				
Schedule XS																				
Schedule 100																				
Schedule 120																				
Schedule 140																				
Schedule 160																				
Schedule XXS																				
Others																				
<b>Pipe material</b>																				
316 / 316L stainless steel																				
304 / 304L stainless steel																				
310 stainless steel																				
321 stainless steel																				
317 / 317L stainless steel																				
22 % Cr duplex (UNS S31803)																				
25 % Cr super duplex (UNS S32750)																				
25 % Cr super duplex (UNS S32760)																				
6 % Mo SS (UNS S31254)																				
Alloy 400 (UNS N04400)																				
Alloy 625 (UNS N06625)																				
Alloy 800 (UNS N08800)																				
Alloy 825 (UNS N08825)																				
Alloy C276 (UNS N10276)																				
Others																				

Continued on next page ...

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## Differential pressure – primary flow element orifice plates and orifice flange unions

Main code										Optional code									
Orifice plates										Orifice plates									
FPD150	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX	XXX
See page 8					page 9					See pages 11, 12 and 13									
<b>Element material</b>																			
316 / 316L stainless steel										S6									
304 / 304L stainless steel										S4									
310 stainless steel										S3									
321 stainless steel										S2									
317 / 317L stainless steel										S8									
22% Cr duplex (UNS S31803)										D1									
25% Cr super duplex (UNS S32750)										D2									
25% Cr super duplex (UNS S32760)										D3									
6% Mo SS (UNS S31254)										M1									
Alloy 400 (UNS N04400)										M4									
Alloy 625 (UNS N06625)										N2									
Alloy 800 (UNS N08800)										U4									
Alloy 825 (UNS N08825)										U5									
Alloy C276 (UNS N10276)										U7									
Others										Z9									
<b>Orifice plate thickness</b>																			
1.5 mm										S01									
2 mm										S02									
3 mm										S03									
4 mm										S04									
6 mm										S05									
8 mm										S06									
10 mm										S07									
12 mm										S08									
15 mm										S09									
16 mm										S10									
Others										Z99									
<b>Flange type</b>																			
Raised face flange										R1									
Oval RTJ										J1									
Octagonal RTJ										J3									
Flat face flange (within bolt circle)										F1									
Flat face flange (full face diameter plate with bolt holes)										F2									
Others										Z9									

Continued on next page ...

	Main code										Optional code												
	FPD150	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX				
<b>Orifice plates</b>	See page 8			page 9			See page 10																
<b>Flange rating</b>																							
ASME Class 150																					A1		
ASME Class 300																					A3		
ASME Class 400																					A4		
ASME Class 600																					A6		
ASME Class 900																					A7		
ASME Class 1500																					A8		
ASME Class 2500																					A9		
DIN PN 6																					D0		
DIN PN 10																					D1		
DIN PN 16																					D2		
DIN PN 25																					D3		
DIN PN 40																					D4		
DIN PN 63																					D5		
DIN PN 100																					D6		
DIN PN 160																					D7		
Others																				Z9			
<b>Gasket material</b>																							
Soft iron																						GP3	
316 / 316L stainless steel																						GS6	
304 / 304L stainless steel																						GS4	
22 % Cr duplex (UNS S31803)																						GD1	
25 % Cr super duplex (UNS S32750)																						GD2	
25 % Cr super duplex (UNS S32760)																						GD3	
6 % Mo SS (UNS S31254)																						GM1	
Alloy 20 (UNS N08020)																						GU1	
Alloy 400 (UNS N04400)																						GM4	
Alloy 600 (UNS N06600)																						GU3	
Alloy 625 (UNS N06625)																						GN2	
Alloy 800 (UNS N08800)																						GU4	
Alloy 825 (UNS N08825)																						GU5	
Alloy C276 (UNS N10276)																						GU7	
Others																						GZ9	
<b>Orifice sealing face</b>																							
Scrolled (3.2 to 6.3 µm)																						SF6	
<b>Drain / Vent hole</b>																							
Drain hole (gas applications)																							HT1
Vent hole (liquid applications)																							HT2

Continued on next page ...

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## Differential pressure – primary flow element orifice plates and orifice flange unions

Orifice plates	Main code										Optional code										
	FPD150	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX		
		See page 8				page 9		See page 10													
<b>Drain / vent hole size</b>																					
1 mm												HA1									
1.5 mm												HA2									
2 mm												HA3									
3 mm												HA4									
4 mm												HA5									
5 mm												HA6									
5.5 mm												HA7									
6 mm												HA8									
6.5 mm												HA9									
7.5 mm												HB1									
8 mm												HB2									
10 mm												HB3									
3/32 in.												HB4									
1/8 in.												HB5									
5/32 in.												HB6									
3/16 in.												HB7									
7/32 in.												HB8									
1/4 in.												HB9									
9/32 in.												HC1									
5/16 in.												HC2									
11/32 in.												HC3									
3/8 in.												HC4									
13/32 in.												HC5									
7/16 in.												HC6									
15/32 in.												HC7									
1/2 in.												HC8									
Others												HZ9									
<b>Surface Treatment</b>																					
Oxygen cleaning												P1									
Others												Z9									
<b>Certification</b>																					
Material certificates to BS EN 10204 3.1 B												C2									
Material certificates to BS EN 10204 3.1 C												C3									
Material NACE MR0175												CN									
Material NACE MR0103												CM									
Positive material identification (NITRON XRF)												CA									
100% dimensional check												C6									
Others												Z9									

Continued on next page ...

Orifice plates	Main code										Optional code									
	FPD150	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XX	XX	XX	XXX	XX	XXX	XXX
		See page 8				page 9			See page 10											
<b>Testing</b>																				
Impact testing @ -46 °C (-50.8 °F)																CH1				
Impact testing @ -196 °C (-320.8 °F)																CH2				
Hardness survey																CH3				
<b>Documentation language (default = English)</b>																				
German																M1				
Italian																M2				
Spanish																M3				
French																M4				
Chinese																M6				
<b>Added requirements</b>																				
Manufactured to customer drawing																GD9				
Special device																STZ				
Material source limitations apply																MS1				
Others																MZ9				
<b>Tab handle</b>																				
No tab handle																		TH0		

# FPD150/160

## Differential pressure – primary flow element orifice plates and orifice flange unions

### FPD160 orifice flange unions

		Main code												Options												
Orifice flange unions		FPD160	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XXX	XXX	XX	XXX	XX	XXX	XXX	XXX	XX	XXX	XX	XXX	XXX
<b>Product design</b>																										
Orifice plate only (RF/FF flanges)			F1																							
Orifice screwed carrier flange assembly (RTJ male)			F2																							
Orifice integral carrier flange assembly (RTJ male)			F3																							
<b>Customer-specific design</b>																										
ABB Standard			A1																							
Aamco Standard			A2																							
Shell Standard			S1																							
<b>Orifice design</b>																										
Concentric square edged – corner taps			C1																							
Concentric square edged – flange taps			C2																							
Conical entrance – corner taps			L1																							
Eccentric – corner taps			E1																							
Eccentric – flange taps 90°			E2																							
Eccentric – flange taps 180°			E3																							
Quarter circle – corner taps			U1																							
Quarter circle – flange taps			U2																							
Segmental – flange taps			S2																							
<b>Line nominal bore</b>																										
DN 15 (1/2 in.)																										
DN 20 (3/4 in.)																										
DN 25 (1 in.)																										
DN 32 (1 1/4 in.)																										
DN 40 (1 1/2 in.)																										
DN 50 (2 in.)																										
DN 65 (2 1/2 in.)																										
DN 80 (3 in.)																										
DN 90 (3 1/2 in.)																										
DN 100 (4 in.)																										
DN 125 (5 in.)																										
DN 150 (6 in.)																										
DN 200 (8 in.)																										
DN 250 (10 in.)																										
DN 300 (12 in.)																										
DN 350 (14 in.)																										
DN 400 (16 in.)																										
DN 450 (18 in.)																										
DN 500 (20 in.)																										
DN 550 (22 in.)																										
DN 600 (24 in.)																										
DN 650 (26 in.)																										
DN 700 (28 in.)																										
DN 750 (30 in.)																										
DN 800 (32 in.)																										
DN 850 (34 in.)																										
DN 900 (36 in.)																										
Other																										

See pages 17 and 18

Main code – continued on next page ...

		Main code												Options																
Orifice flange unions	FPD160	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XXX	XXX	XX	XXX	XX	XX	XXX	XX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XXX	
		See page 14												See pages 17 and 18																
<b>Pipe schedule</b>																														
Schedule 5S																														
Schedule 5																														
Schedule 10S																														
Schedule 10																														
Schedule 20																														
Schedule 30																														
Schedule 40S																														
Schedule 40																														
Schedule STD																														
Schedule 60																														
Schedule 80S																														
Schedule 80																														
Schedule XS																														
Schedule 100																														
Schedule 120																														
Schedule 140																														
Schedule 160																														
Schedule XXS																														
Other																														
<b>Flange material</b>																														
316 / 316L stainless steel																														
304 / 304L stainless steel																														
Carbon Steel (A105N/A106 Gr.B)																														
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)																														
310 stainless steel																														
321 stainless steel																														
317 / 317L stainless steel																														
22 % Cr duplex (UNS S31803)																														
25% Cr super duplex (UNS S32750/S32760)																														
6 % Mo SS (UNS S31254)																														
Alloy 400 (UNS N04400)																														
Alloy 625 (UNS N06625)																														
Alloy 800 (UNS N08800)																														
Alloy 825 (UNS N08825)																														
Alloy C276 (UNS N10276)																														
5 Cr-1/2 Mo low alloy F5 (UNS K41545)																														
1 1/4 Cr-1/2 Mo low alloy F11 (UNS K11597)																														
2 1/4 Cr-1 Mo low alloy F22 (UNS K21590)																														
Others																														
<b>Element material</b>																														
316 / 316L stainless steel																														
304 / 304L stainless steel																														
310 stainless steel																														
321 stainless steel																														
317 / 317L stainless steel																														
22% Cr duplex (UNS S31803)																														
25% Cr super duplex (UNS S32750)																														
25% Cr super duplex (UNS S32760)																														
6% Mo SS (UNS S31254)																														
Alloy 400 (UNS N04400)																														
Alloy 625 (UNS N06625)																														
Alloy 800 (UNS N08800)																														
Alloy 825 (UNS N08825)																														
Alloy C276 (UNS N10276)																														
Others																														

Main code – continued on next page ...





	Main code													Options											
<b>Orifice flange unions</b>	FPD160	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XXX
		See page 14			See page 15			See page 16																	
<b>Orifice sealing face</b>																									
Scrolled (3.2 to 6.3 µm)	SF6																								
<b>Drain / Vent hole</b>																									
Drain hole (gas applications)	HT1																								
Vent hole (liquid applications)	HT2																								
<b>Drain / Vent hole size</b>																									
1 mm	HA1																								
1.5 mm	HA2																								
2 mm	HA3																								
3 mm	HA4																								
4 mm	HA5																								
5 mm	HA6																								
5.5 mm	HA7																								
6 mm	HA8																								
6.5 mm	HA9																								
7.5 mm	HB1																								
8 mm	HB2																								
10 mm	HB3																								
<sup>3</sup> / <sub>32</sub> in.	HB4																								
<sup>1</sup> / <sub>8</sub> in.	HB5																								
<sup>5</sup> / <sub>32</sub> in.	HB6																								
<sup>3</sup> / <sub>16</sub> in.	HB7																								
<sup>7</sup> / <sub>32</sub> in.	HB8																								
<sup>1</sup> / <sub>4</sub> in.	HB9																								
<sup>9</sup> / <sub>32</sub> in.	HC1																								
<sup>5</sup> / <sub>16</sub> in.	HC2																								
<sup>11</sup> / <sub>32</sub> in.	HC3																								
<sup>3</sup> / <sub>8</sub> in.	HC4																								
<sup>13</sup> / <sub>32</sub> in.	HC5																								
<sup>7</sup> / <sub>16</sub> in.	HC6																								
<sup>15</sup> / <sub>32</sub> in.	HC7																								
<sup>1</sup> / <sub>2</sub> in.	HC8																								
Others	HZ9																								
<b>Surface treatment</b>																									
Oxygen cleaning	P1																								
Others	Z9																								
<b>Tapping type</b>																									
Threaded (female)	CTT																								
Nipolet	TT2																								
Nipoflange (B16.5)	TT3																								
Socket weld	TT4																								
Thread (male) nipple	TT5																								
Others	TZ9																								

Optional codes continued on next page ...

# FPD150/160

## Differential pressure – primary flow element orifice plates and orifice flange unions

Orifice flange unions	Main code												Options											
	FPD160	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XX		
		See page 14			See page 15			See page 16			See page 17													
<b>Tapping rating</b>																								
BSP Tr (M)																						TRB		
NPT F																						TRC		
NPT M																						TRD		
As line rating																						TRE		
ASME Class 150 RF																						TR1		
ASME Class 300 RF																						TR2		
ASME Class 600 RF																						TR3		
ASME Class 900 RF																						TRV		
ASME Class 1500 RF																						TRW		
ASME Class 2500 RF																						TRX		
ASME Class 150 RTJ																						TRY		
ASME Class 300 RTJ																						TRZ		
ASME Class 600 RTJ																						TR6		
ASME Class 900 RTJ																						TR7		
ASME Class 1500 RTJ																						TR8		
ASME Class 2500 RTJ																						TR9		
Kidney Flange																						TRK		
<b>Tapping size</b>																								
1/2 in.																						TS2		
3/4 in.																						TS3		
Others																						TZ9		
<b>Tapping sets</b>																								
1 Set																						TN1		
2 Sets																						TN2		
3 Sets																						TN3		
4 Sets																						TN4		
<b>Tapping orientation</b>																								
Inclined up																						TG2		
Horizontal																						TG3		
Inclined down																						TG4		
<b>Certification</b>																								
Material certificates EN 10204 3.1																						C2		
Material certificates EN 10204 3.2																						C3		
Material NACE MR0175																						CN		
Material NACE MR0103																						CM		
Positive material identification (NITRON XRF)																						CA		
100% dimensional check																						C6		
Others																						Z9		
<b>Testing</b>																								
Impact testing @ -46 °C																						CH1		
Impact testing @ -196 °C																						CH2		
Hardness survey																						CH3		
Others																						CZ9		
<b>Documentation language (default = English)</b>																								
German																						M1		
Italian																						M2		
Spanish																						M3		
French																						M4		
Chinese																						M6		
<b>Added requirements</b>																								
Manufactured to customer drawing																						GD9		
Special device																						STZ		
Material source limitations apply																						MS1		
Others																						MZ9		
<b>Tab handle</b>																								
No tab handle																								

## Notes

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