

## FPD190

# Differential pressure – restriction orifice plates

Limits the flowrate or reduces the pressure of liquids, gases and steam

Measurement made easy



### Orifice plate for flow restriction or pressure drop

- installs direct between flanges
- available as single concentric plate, single multi-hole plate or a multi-stage assembly

### Engineered and manufactured to latest standards

- to R W Miller as standard
- noise calculations to IEC 60534-8-3; IEC 60534-8-4

### Range of flange drillings / ratings available

- raised, flat or RTJ-profile

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### Restriction orifice plates

The overall pressure loss generated by the plate is calculated at a pair of theoretical tapping points. The high pressure (inlet or upstream) tapping is considered to be located 2.5 D (pipe diameters) in front of the plate and the low pressure (outlet or downstream) tapping is considered to be 8D downstream of the plate.

#### Orifice plate bore profiles

ABB offers a variety of orifice plate bore profiles for restriction plates and these can be classified as follows:

- circular bore, single square-edged hole, concentric with the pipe
- circular bore, multiple square-edged holes across the plate face
- circular bore, multiple profiled-inlet holes across the plate face

Multiple-stage fabricated assemblies are also available, designed specifically for an application.

ABB restriction 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.

### Applications

Restriction orifice plates are an incredibly versatile technology and can be used wherever a specific pressure drop is required or where the flowrate is to be limited to a certain value, irrespective of changes in the downstream pressure.

### 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  
ISO TN 29001:2010

#### Environmental impact

ISO 14001  
EMS 40882

#### EU Pressure Equipment Directive

97/23/EC

#### Design

R W Miller

**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  
Noise calculations  
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.

# FPD190

## Differential pressure – restriction orifice plates

### Specification

#### Materials

Plates:	Standard – 316/316L stainless steel
Other plate materials:	304 St Stl; 310 St Stl; 321 St Stl; 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;
Gaskets:	For RTJ flanges *: 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 FPD190.P2, the gasket material is the orifice plate holder material.

For FPD190.P3, 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)

DN15 to 900 (1/2 to 36 in.). Other sizes may be possible.

#### Plate thickness

ABB Standard:	3; 6; 10 mm
Others available:	1.5; 2; 4; 8; 12; 15; 16 mm 1/2; 3/4 in.

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

#### Calculation standards

R W Miller

#### Design standards

Plate:	Preferred – ABB
Others:	Saudi Aramco; Shell

#### Pipeline installation

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.

## Ordering information

		Main code										Optional code									
FPD190 restriction orifice plates		FPD190	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XX	XX	XXX	XX	XXX	XXX	XXX	
<b>Product design</b>																					
Restriction plate only			R1																		
Restriction RTJ F integral carrier – counter bore			R2																		
Restriction RTJ F integral carrier – solid			R3																		
Restriction – multi stage			R4																		
Restriction – single stage multi hole			R5																		
<b>Customer-specific design</b>																					
ABB standard			A1																		
Aramco standard			A2																		
Shell standard			S1																		
<b>Orifice design</b>																					
Restriction plate – no tapings			Y0																		
<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 8, 9 and 10

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# FPD190

## Differential pressure – restriction orifice plates

FPD190 restriction orifice plates	Main code										Optional code										
	FPD190	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX	
	See page 5										See pages 8, 9 and 10										
<b>Pipe schedule</b>																					
Schedule 5S																					S1
Schedule 5																					S2
Schedule 10S																					S3
Schedule 10																					S4
Schedule 20																					S5
Schedule 30																					S6
Schedule 40S																					S7
Schedule 40																					S8
Schedule STD																					S9
Schedule 60																					T1
Schedule 80S																					T2
Schedule 80																					T3
Schedule XS																					T4
Schedule 100																					T5
Schedule 120																					T6
Schedule 140																					T7
Schedule 160																					T8
Schedule XXS																					T9
Others																					Z9
<b>Pipe 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

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**FPD190 restriction orifice plates**

Main code										
FPD190	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX
	See page 5			page 6						

Optional code									
XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX
See pages 8, 9 and 10									

Element material	
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
Orifice plate thickness	
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
Flange type	
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

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	FPD190	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX	
		See page 5				page 6			See page 7													
<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>																						
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

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FPD190 restriction orifice plates	Main code										Optional code										
	FPD190	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX	
		See page 5			page 6	See page 7			See page 8												
<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

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FPD190 restriction orifice plates	Main code										Optional code											
	FPD190	XX	XX	XX	XXX	XX	XX	XX	XXX	XX	XX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XXX	
		See page 5			page 6		See page 7			See page 8			See page 9									
<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

## Notes

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