

## CONDITIONING ORIFICE PLATE

### KEY FEATURES

- Orifice plate design on the basis of the ISO5167-1 & ISO5167-2 or ASME.MFC.3M standards
- Recommended for gas, liquid or steam
- Pipe diameter : from 25 mm to 1 000 mm
- Reynolds number : from 5.000 to  $10^8$
- Accuracy : from 0,5% of the max flowrate
- Repeatabily of measurement : 0,1%



Conditioning orifice plate

### ➤ BENEFITS ◀

- Short upstream and downstream straight lengths (2D upstream/2D downstream)
  - Cost-effective solution : low installation cost and maintenance-free
  - Easy and quick installation and commissioning
  - Very long life-time product, no drift over time
  - Suitable for a large range of fluids and process conditions



The conditioning orifice plate is named so because it behaves like a flow conditioner : its four orifices help stabilizing the flow. That is the reason why upstream and downstream straight lengths for a reliable measurement can be reduced.

## STANDARDS

- Non-standardized equipment but designed and manufactured according to the following standards :
- ISO 5167-1 & ISO 5167-2
- ASME MFC-3M

## TECHNICAL CHARACTERISTICS

- Fluid temperature<sup>(1)</sup> : cryogenic to +800°C
- Fluid type : gas, steam, monophasic liquid
- Materials<sup>(2)</sup> : carbon steel, stainless steel, monel, hastelloy, inconel, duplex, super duplex, titanium, tantalum, PVC, PTFE...
- Accuracy : from 0,5% of the max flowrate
- Maximum operating pressure : limited by the flange rating
- Characteristics according to the standard in force :

		ISO 5167-1&2	ASME MFC-3M
ReD	Reynolds number in the pipe	$5.000 \leq ReD \leq 10^8$	
D	Inside pipe diameter	$25 \text{ mm} \leq D \leq 1\,000 \text{ mm}$	
d	Orifice diameter	$d \geq 6 \text{ mm}$	
$\beta$	d/D	$0,2 \leq \beta \leq 0,65$	
Ra	Upstream face roughness	$Ra < 10^4.d$	
r	Sharp adge radius	$r < 0,000\,4.d$	
e	Orifice thickness	$0,005.D \leq e \leq 0,02.D$	
E	Plate thickness	$e \leq E \leq 0,05.D$	
$\alpha$	Angle of the downstream bevel	$\alpha = 45^\circ \pm 15^\circ$	
t	Flatness tolerance	$t < 0,005.(D-d)/2$	

(1) No temperature restriction with a remote-mounted transmitter, otherwise +125°C max

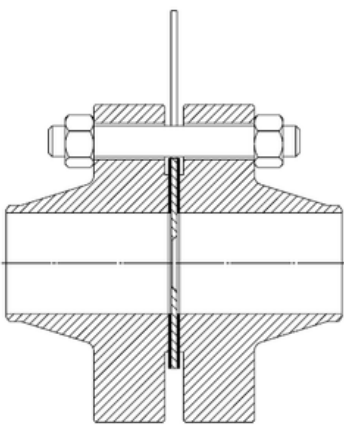
(2) For an aggressive fluid, applying a specific coating on the sharp edges can increase the product lifetime

## MOUNTING

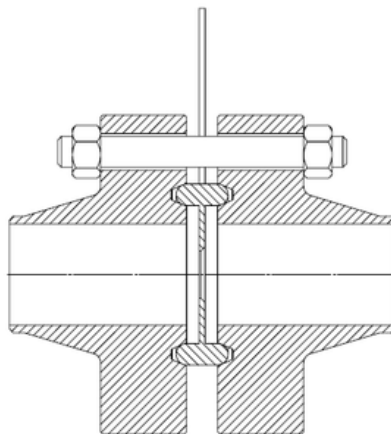
- Mounting between flanges or inserted between 2 carrier rings with annular slots (see page 5)
- Flange types : ISO PN 2,5 to PN 420, ASME 150# to 2500#, API flanges
- Piping connection between straight lengths : 2D upstream and 2D downstream of the orifice plate
- Gasket types : flat gasket (spiral wound, graphite, PTFE) or RTJ (soft iron, inox, monel...)

## GASKET FACES

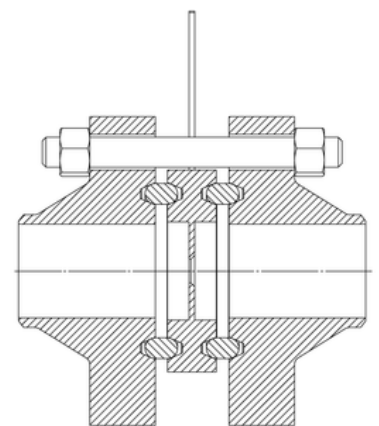
- gasket faces : RF face (Raised Face) - possibility of Stock Finish gasket seat  
RTJ male gasket  
RTJ female<sup>(3)</sup> gasket  
Large male / female face<sup>(4)</sup>  
Tongue / groove face<sup>(4)</sup>
- Mounting examples :



RF orifice plate  
between flanges



RTJ-M orifice plate  
between flanges



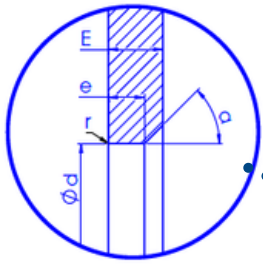
RTJ-F orifice plate<sup>(3)</sup>  
between flanges

(3) RTJ female plates are thicker.

(4) Specify large or small male / female face if flanges according to ASME B16-5. standard.

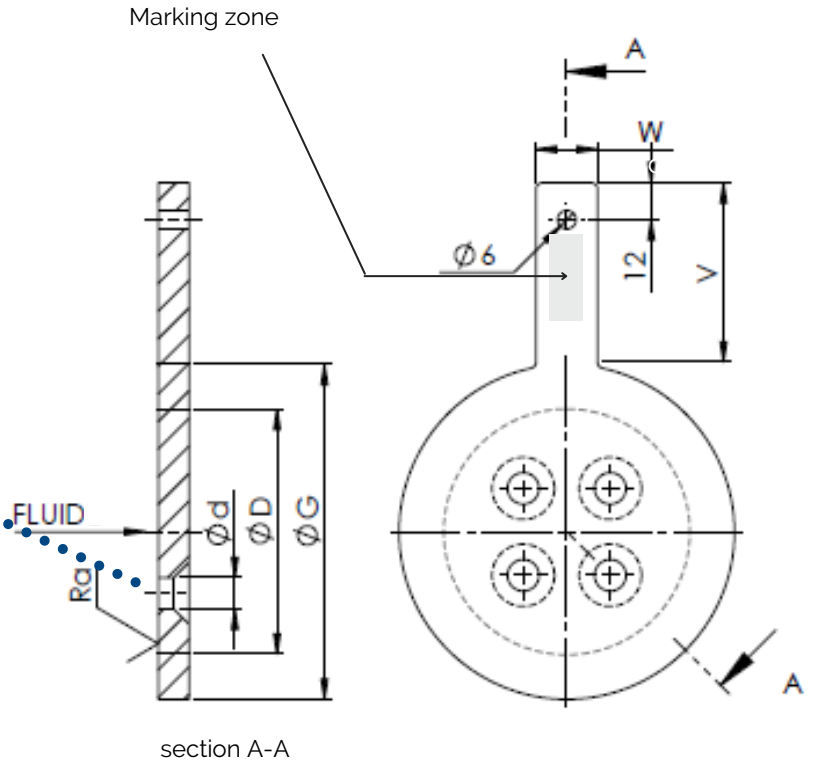
# DIMENSIONS

## RF conditioning orifice plate



Sharp edge detail

- Ød, orifice diameter
- r, sharp edge radius
- e, orifice thickness
- E, plate thickness
- $\alpha$ , angle of the downstream bevel
- ØD, inside pipe diameter
- see page 2 -

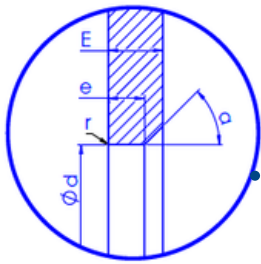


## RF orifice plate dimensional information (values in mm)

DN	DN	E	e	Tab		ØG, orifice plate outside diameter in mm					
				V	W	150# RF PN20 RF	300# RF PN50 RF	600# RF PN100 RF	900# RF PN150 RF	1500# RF PN250 RF	2500# RF PN420 RF
1"	25	3	0,4	100	20	65	71	71	77	77	84
1" 1/2	40	3	0,6	100	20	84	93	93	96	96	115
2"	50	3	0,8	100	20	103	109	109	141	141	144
2" 1/2	65	3	1	100	20	122	128	128	163	163	166
3"	80	3	1,2	100	20	135	147	147	166	173	195
4"	100	3	1,5	150	25	173	179	192	204	208	233
6"	150	3	2	150	25	220	249	265	267	281	315
8"	200	6	3	150	25	277	306	319	357	350	385
10"	250	6	3	150	25	338	360	398	433	433	474
12"	300	6	3	150	25	408	420	455	496	519	547
14"	350	8	5	150	25	449	484	490	519	576	
18"	450	10	8	150	25	547	595	611	636	703	
20"	500	10	8	150	25	604	652	681	696	754	
24"	600	12	10	150	25	716	773	789	836	900	

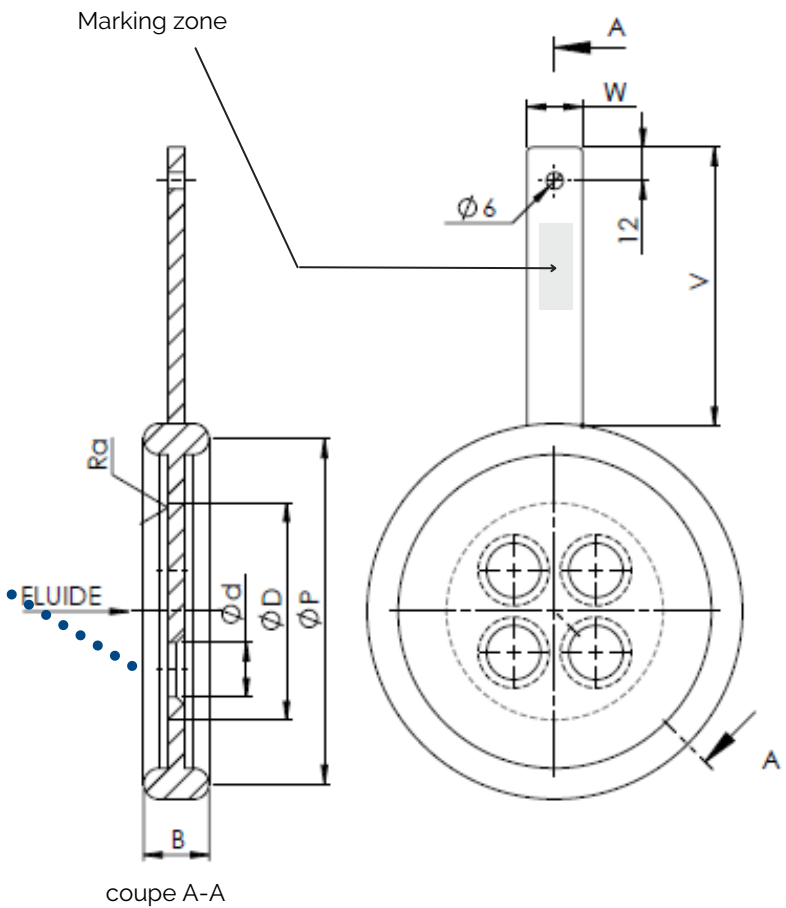
# DIMENSIONS

## RTJ-M conditioning orifice plate



Sharp edge detail


- Ød, orifice diameter
- r, sharp edge radius
- e, orifice thickness
- E, plate thickness
- α, angle of the downstream bevel
- ØD, inside pipe diameter
- see page 2 -



## RTJ-M orifice plate dimensional information (values in mm)

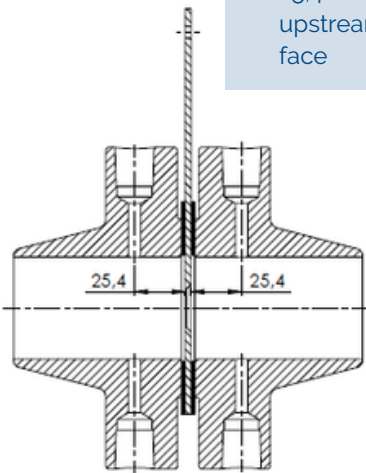
DN	DN	E	e	Tab		Rating & PN - ring seal type R   B (mm)   ØP (mm)											
				V	W	300# PN50		600# PN100		900# PN150		1500# PN250		2500# PN420			
1"	25	3	0,4	100	20	R16	25,4	50,8	R16	25,4	50,8	R16	25,4	50,8	R18	25,4	60,3
1" 1/2	40	3	0,6	100	20	R20	25,4	68,3	R20	25,4	68,3	R20	25,4	68,3	R23	27	82,5
2"	50	3	0,8	100	20	R23	27	82,5	R24	27	95,2	R24	27	95,2	R26	27	101,6
2" 1/2	65	3	1	100	20	R26	27	101,6	R27	27	107,9	R27	27	107,9	R28	30,2	111,1
3"	80	3	1,2	100	20	R31	27	123,8	R31	27	123,8	R35	27	136,5	R32	30,2	127
4"	100	3	1,5	150	25	R37	27	149,2	R37	27	149,2	R39	27	161,9	R38	33,3	157,1
6"	150	3	2	150	25	R45	27	211,1	R45	27	211,1	R46	28,6	211,1	R47	36,5	228,6
8"	200	6	3	150	25	R49	27	269,9	R49	27	269,9	R50	33,3	269,9	R51	39,7	279,4
10"	250	6	3	150	25	R53	27	323,8	R53	27	323,8	R54	33,3	323,8	R55	47,6	342,9
12"	300	6	3	150	25	R57	27	381	R57	27	381	R58	39,7	381	R60	50,8	406,4
14"	350	8	5	150	25	R61	27	419,1	R62	33,3	419,1	R63	44,4	419,1			
18"	450	10	8	150	25	R69	30,2	533,4	R70	39,7	533,4	R71	50,8	533,4			
20"	500	10	8	150	25	R73	31,8	584,2	R74	39,7	584,2	R75	54	584,2			
24"	600	12	10	150	25	R77	36,5	692,1	R78	47,6	692,1	R79	58,7	692,1			

# PRESSURE TAPS TYPES

 For a conditioning orifice plate, the pressure taps have to be positioned and centered between 2 of the 4 orifices of the plate so that averaged upstream and downstream pressures are taken into account <sup>(5)</sup>

- flange tap <sup>(6)</sup> (or 1"/1")  
with orifice flanges  
ASME standard only and from 300#

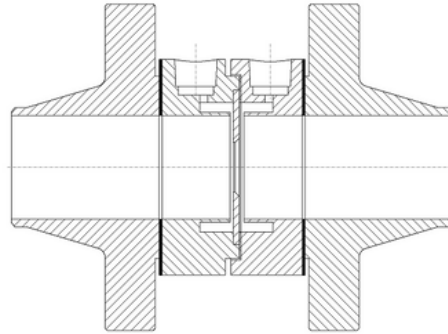
➤ The measurement is executed at 25,4 mm (1 inch) from the upstream and downstream plate face



- Easily interchangeable measuring element
- Plate / flange materials can be different

- corner tap <sup>(6)</sup> (or 0/0)  
with annular slots

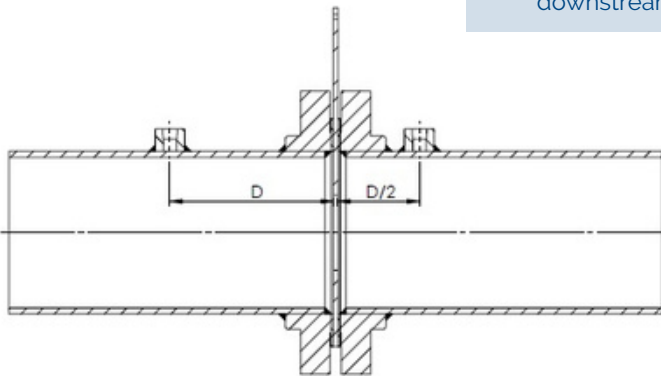
➤ The measurement is executed at the upstream and downstream plate edge



- Assembly used for better accuracy : averaged upstream and downstream pressure taps
- Mounting between simple flanges (welding neck, slip-on...)
- Flange / annular slots materials can be different

- D - D/2

➤ The measurement is executed respectively at D and D/2 from the upstream and downstream plate face



- Mounting of the orifice plate between simple flanges (welding neck, slip-on...)
- Assembly used for diameters > DN150
- Pressure taps welded to the pipe

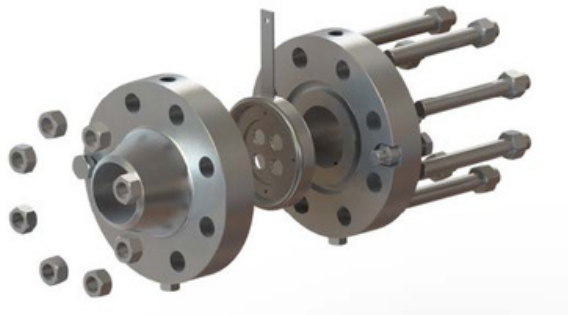
- illustrations with a RF orifice plate - the same types of pressure taps also exist in RTJ

(5) see recommendations on pressure taps orientation on page 7

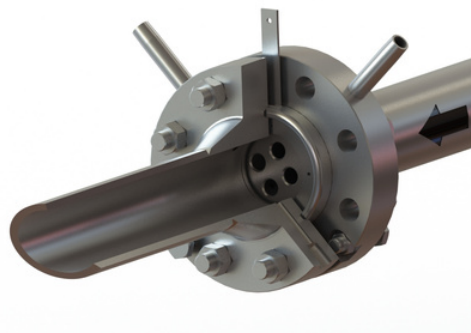
(6) for a flange tap (1"/1") or corner tap (0/0) monobloc version, see the corresponding datasheets

## ASSEMBLY EXAMPLES

- RTJ-M conditioning orifice plate between Welding-Neck orifice flanges (1"/1" pressure taps)



- RTJ-M conditioning orifice plate section with Welding-Neck orifice flanges – Mounting with upwards pressure taps (gas)

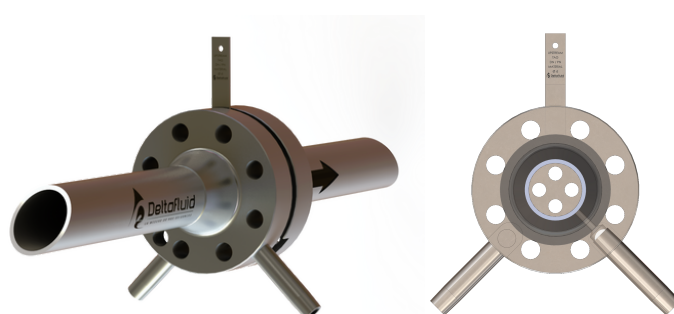
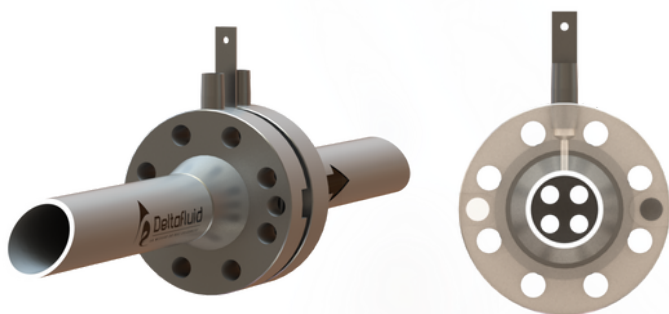


## PRESSURE TAPS ORIENTATION

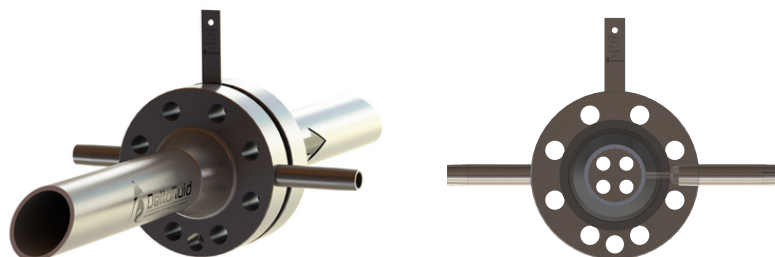
- **Reminder : the pressure taps have to be positioned and centered between 2 of the 4 orifices of the plate so that averaged upstream and downstream pressures are taken into account.**

- Gas<sup>(7)</sup> : for a gas application, the pressure taps will preferably be oriented upwards

- Liquid<sup>(7)</sup> : for a liquid application, the pressure taps will preferably be oriented downwards



- Steam<sup>(7)</sup> : for a steam application, the pressure taps will preferably be oriented horizontally



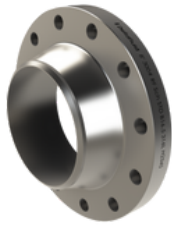
(7) For more details on pressure taps orientation for orifice plate assembly, see corresponding User Guides



# ACCESSORIES

For flow measurement, we offer a full range of accessories for assembly with orifice plates.

## ■ Flanges



Flanges with flat gasket face, raised face, large male/female face, tongue/groove face, RTJ-F face

For a complete assembly with orifice flanges, see flange tap flowmeter datasheet

## ■ Gaskets & Boltings



Example of boltings with orifice flanges

## ■ Transmitter



Differential pressure transmitter, multivariable transmitter

## ■ Manifold



2-way / 3-way / 5-way manifold with or without direct mounting

## ■ Condensation pot



## ■ Valve



## ■ Siphon



## ■ Fittings



# FURTHER INFORMATION

All information on the mounting of orifice plates (and their accessories) such as :

- pressure taps orientation
- mounting of the differential pressure transmitter
- flange tightening

can be found on the IOM notice "User guide - Installation, operation and maintenance manual".



# ITEM CODES

- Conditioning orifice plate : DPLO4T-DN-PN-Face type-Material

DPLO4T	DN	PN	Face type	Material
Nominal diameter - ASME	1/2" to 24"	150# to 2500#	RF RTJ SEM <sup>(5)</sup> SEF <sup>(5)</sup> DEM <sup>(5)</sup> DEF <sup>(5)</sup>	304L 316L Others
OR				
Nominal diameter - ISO	DN15 to 600	PN2,5 to 400		

- Examples conditioning orifice plate codes :

- DPLO4T-2-300-RF-316
- DPLO4T-DN100-PN64-RF-304
- DPLO4T-12-900-RTJM-316

(5) Specify large or small male/female face if flanges according to ASME B16-5 standard.



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