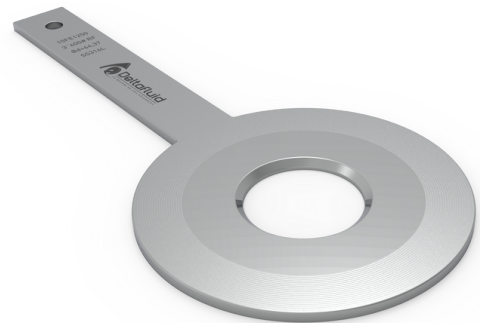


SHARP-EDGE ORIFICE PLATE

KEY FEATURES

- Orifice plate design according to ISO5167-1 & ISO5167-2 or ISO/TR 15377 or ASME.MFC.3M or AGA3 / API MPMS 14.3 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
- Repeatability of measurement : 0,1%



Sharp-edge orifice plate

BENEFITS

- ▶ Cost-effective measurement system : low installation cost and maintenance-free
 - ▶ Very long life-time product, no drift over time
- ▶ Standardized principle : reliability and accuracy of measurement, no need of calibration
 - ▶ Easy and quick installation and commissioning
 - ▶ Suitable for a large range of fluids and process conditions
 - ▶ Use for custody transfer metering



The sharp-edge orifice plate is the most widely used for flow measurement thanks to its accuracy, easy installation and operation with all types of fluids.

STANDARDS

- ISO 5167-1 & ISO 5167-2
- ISO/TR 15377
- ASME MFC-3M
- AGA3 / API MPMS 14.3

TECHNICAL CHARACTERISTICS

- Fluid temperature ⁽¹⁾ : cryogenic to +800°C
- Fluid type : gas, steam, monophasic liquid
- Materials ⁽²⁾ : 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/TR 15377	ISO 5167-1&2	ASME MFC-3M
ReD	Reynolds number in the pipe	$5,000 \leq \text{ReD} \leq 10^8$		
D	Inside pipe diameter	$25 \text{ mm} \leq D \leq 50 \text{ mm}$	$50 \text{ mm} \leq D \leq 1\,000 \text{ mm}$	
d	Orifice diameter	$d \geq 12,5 \text{ mm}$		
β	d/D	$0,5 \leq \beta \leq 0,7$	$0,1 \leq \beta \leq 0,75$	
Ra	Upstream face roughness	$Ra < 10^4 d$		
r	Sharp edge radius	$r < 0,000\,4 \cdot d$		
e	Orifice thickness	$0,005 \cdot D \leq e \leq 0,02 \cdot D$		
E	Plate thickness	$e \leq E \leq 0,05 \cdot D$		
α	Angle of the downstream bevel	$\alpha = 45^\circ \pm 15^\circ$		
t	Flatness tolerance	$t < 0,005 \cdot (D-d)/2$		

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

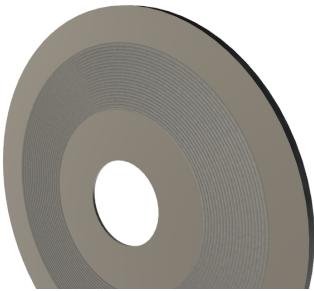
(2) For an aggressive fluid, applying a specific coating on the sharp edge can increase the product lifetime

MOUNTING

- Mounting between flanges or inserted between 2 carrier rings with annular slots (see page 6)
- Flange types : ISO PN 2,5 to PN 420, ASME 150# to 2500#, API flanges
- Piping connection between straight sections according to the standard (variable upstream and downstream straight lengths according to β ($\beta=d/D$) and according to the upstream fittings) - see upstream straight lengths table on page 7
- Gasket types : flat gasket (spiral wound, graphite, PTFE) or RTJ (soft iron, inox, monel...)

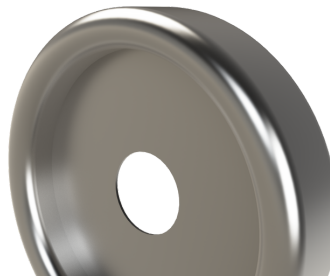
GASKET FACES

- RF / flat gasket

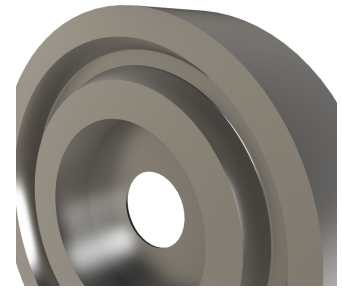


Possibility of Stock Finish gasket seat

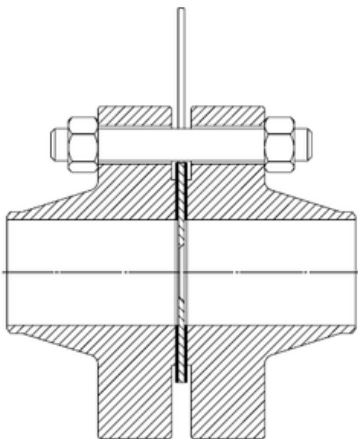
- RTJ-M gasket



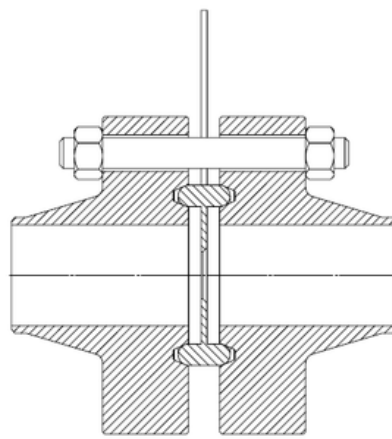
- RTJ-F gasket ⁽³⁾



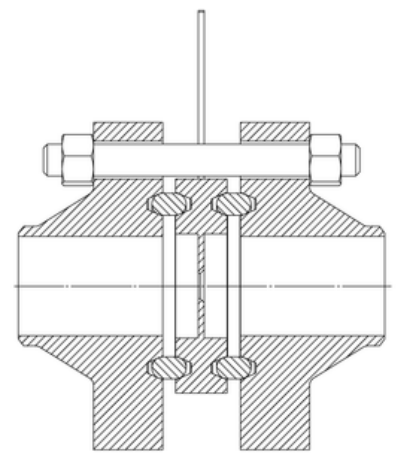
- Mounting



RF orifice plate
between flanges



RTJ-M orifice plate
between flanges

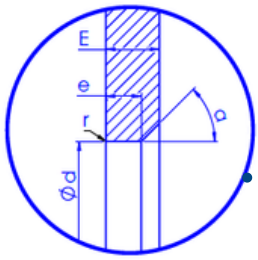


RTJ-F orifice plate ⁽³⁾
between flanges

(3) RTJ-F orifice plates are thicker.

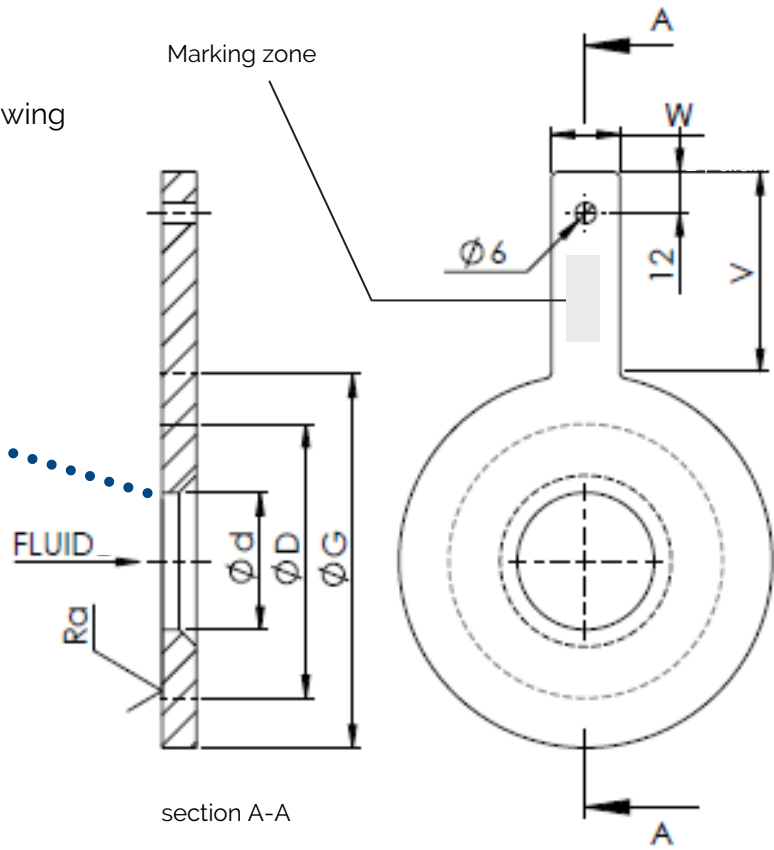
DIMENSIONS

RF sharp-edge orifice plate drawing



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 -

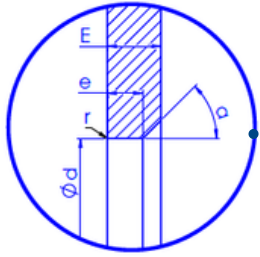


RF orifice plate dimensional information (values in mm)

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	

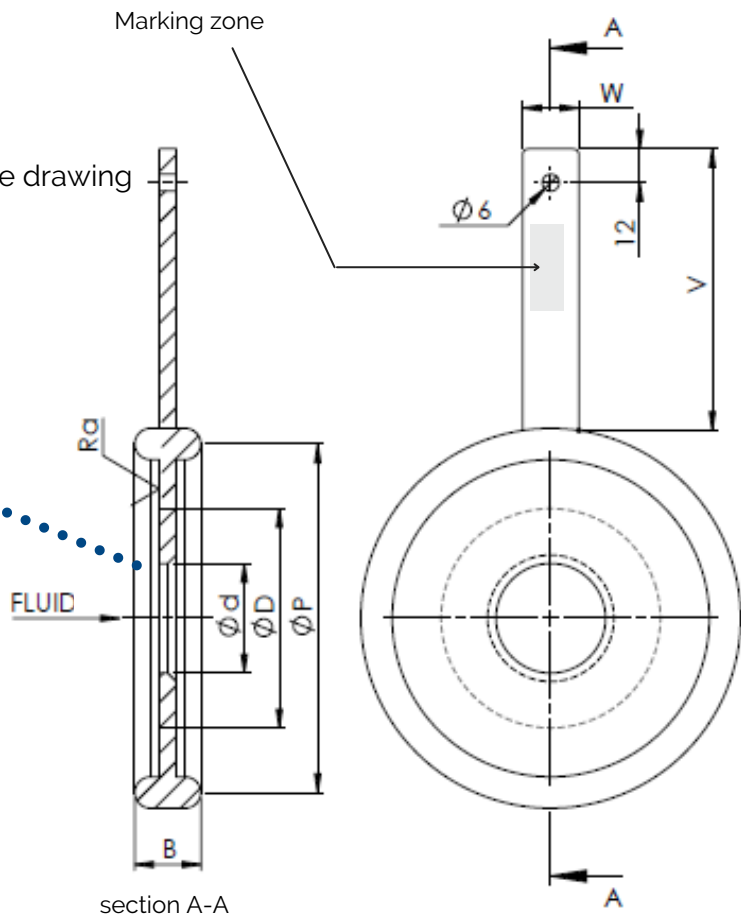
DIMENSIONS

RTJ-M sharp-edge orifice plate drawing



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 -



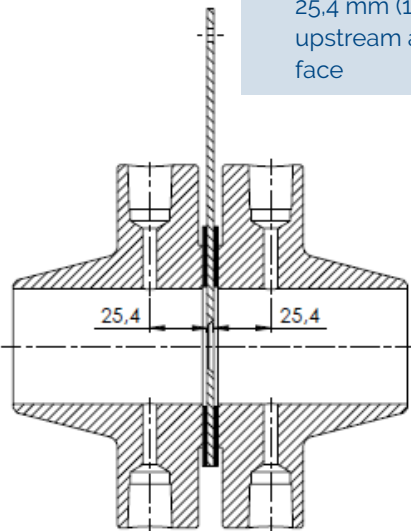
RTJ-M orifice plate dimensional information (values in mm)

				Tab		Rating & PN - ring seal type R											
						B (mm)		ØP (mm)									
DN	DN	E	e	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

- flange tap⁽⁴⁾ (or 1"/1")
with orifice flanges
ASME standard only from 300#

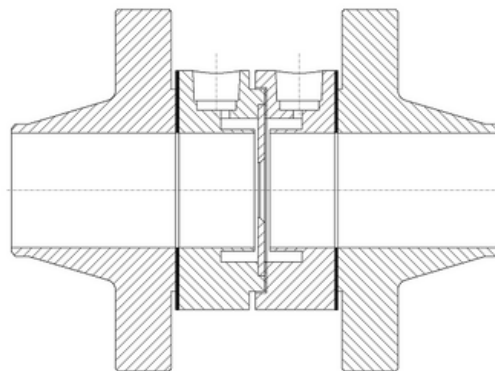
➤ The measurement is executed at 25,4 mm (1 inch) from the upstream and downstream plate face



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

- corner tap⁽⁴⁾ (or 0/0)
with annular slots

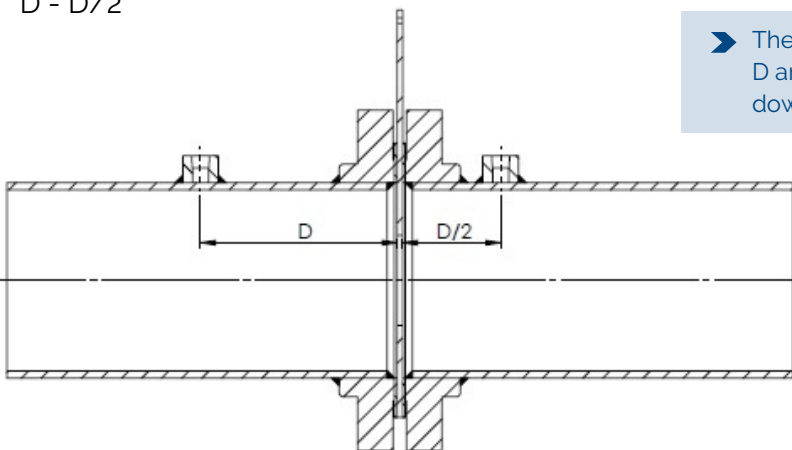
➤ The measurement is executed at the upstream and downstream plate edge



- 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

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

STRAIGHT LENGTHS

- required straight lengths between orifice plates and fittings
- Values expressed as multiple of pipe internal diameter, D

UPSTREAM SIDE OF ORIFICE PLATE														Downstream side of orifice plate												
d/D	Single 90° bend or two 90° bends in any plane (S>30S)	Two 90° bends in the same plane 30D>S>10D	Two 90° bends in the same plane 10D>S	Two 90° bends in perpendicular planes 30D>S>5D	Two 90° bends in perpendicular planes 5D>S	Single 90° tee with or without extension	Single 45° bend or two bends in the same plane (S>2D)	Concentric reducer 2D to D over a length of 1,5D to 3D	Concentric expander 0,5D to D over a length of D to 2D	Full bore ball valve or gate valve fully open	Abrupt symmetrical reduction	Thermometer pocket or well of diameter ≤ 0,03D	Fittings (columns 2 to 11) and densitometer pocket													
1	2	3	4	5	6	7	8	9	10	11	12	13														
<0,2	6	3	10	10	19	18	34	17	3	7	5	6	12	6	30	15	5	3	4	2						
0,40	16	3	10	10	44	18	50	25	9	3	30	5	12	8	12	6	30	15	5	3	6	3				
0,50	22	9	18	10	22	10	44	18	75	34	19	9	30	18	8	5	20	9	12	6	30	15	5	3	6	3
0,60	42	13	30	18	42	18	44	18	65	25	29	18	30	18	9	5	26	11	14	7	30	15	5	3	7	3,5
0,67	44	20	44	18	44	20	44	20	60	18	36	18	44	18	12	6	28	14	18	9	30	15	5	3	7	3,5
0,75	44	20	44	18	44	22	44	20	75	18	44	18	44	18	13	8	36	18	24	12	30	15	5	3	8	4

Nota :

The minimum straight lengths required are the lengths between various fittings located upstream or downstream of the orifice plate and the orifice plate itself.

Straight lengths shall be measured from the downstream end of the curved / conical portion of the nearest bend or tee or reducer or expander to the upstream face of the orifice plate.

In the columns, left values give lengths corresponding to zero additional uncertainty (see ISO 5167-1 standard)

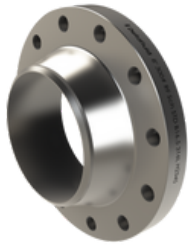
Right values give lengths corresponding to 0,5% additional uncertainty (see ISO 5167-1 standard). Empty cells when no available data.

S is the distance between two fittings..

ACCESSORIES

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

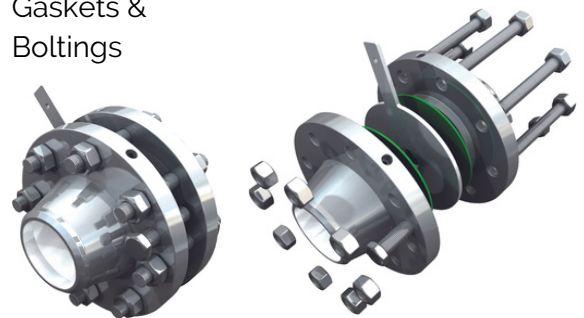
■ Flanges



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



■ Flow straightener or conditioner



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

- Orifice plate : DPLO-DN-PN-Face type-Material

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

- Examples orifice plate codes :

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

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



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