

General Specifications

Model FOP Orifice Plate

GS 06E01B01-00E

Model FOP Orifice Plate is a differential pressure type primary device used to produce a fluid flow restriction in a pipeline. The differential pressure across the orifice plate is proportional to the square of the fluid velocity. Model FOP orifices are widely used in a wide range of pipe sizes from small to large diameters and are effective in both low and high pressure service.

STANDARD SPECIFICATIONS

Orifice Bore Type:

Concentric Sharp Edge Orifices, Concentric Quadrant Edge Orifices, Eccentric Edge Orifices, Segmental Edge Orifices.

Standard Conformance:*

- Concentric Sharp Edge Orifices;
JIS Z 8762-2 : 2007 (ISO 5167-2: 2003)
- Concentric Quadrant Edge Orifices;
Royal Dutch Shell Laboratory Report 1312M.
- Eccentric Edge Orifices;
ASME (Computation Handbook)
- Segmental Edge Orifices;
ASME (Computation Handbook)

*1: For AGA-3 complied orifice plate, please consult with Yokogawa.

Pressure Taps:

Flange Taps, Vena Contracta Taps, 1D-1/2D taps

Nominal Pipe Sizes :

Pressure Taps	*1 Concentric sharp edge	*2 Concentric quadrant edge	Eccentric edge	Segmental edge
Flange Taps	40 to 1500 mm (1 1/2 to 60 inch)	25 to 200 mm (1 to 8 inch)	100 to 350 mm (4 to 14 inch)	100 to 350 mm (4 to 14 inch)
Vena Contracta taps ^{*3}	150 to 1500 mm (6 to 60 inch)	—	100 to 350 mm (4 to 14 inch)	100 to 350 mm (4 to 14 inch)
1D-1/2D taps ^{*3}	150 to 1500 mm (6 to 60 inch)	—	—	—

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*1: For concentric sharp edge orifice, the pipe inner diameter less than 50mm or over 1,000mm is out of Standards. Also, the concentric sharp edge orifice for nominal diameter size less than 25mm is not manufacturable.

*2: For concentric quadrant edge orifice, the minimum bore diameter is 4.5mm and the minimum edge radius is 0.5mm.

*3: Processing of (especially low) pressure tap could be difficult for nominal size under 125mm with Vena Contracta tap or 1D-1/2D tap because of its flange or welded part.



Tab Handle Material:

SUS304 stainless steel.
Titanium for Orifice Plate material code TN

Plate Materials:

SUS304, SUS316 or SUS316L stainless steel,
Monel, Hastelloy C, Hastelloy B, Titanium.

Flange Ratings:


JIS 2, 5, 10, 16, 20, 30, 40 and 63 K
ANSI Class 150, 300, 600 and 900
JPI Class 150, 300, 600 and 900

MODEL AND SUFFIX CODES

Model	Suffix Codes	Description
FOP	Model FOP Orifice Plate
Nominal Pipe Size	<input type="checkbox"/>	Size in mm; <input type="checkbox"/> mm
Orifice Bore Type	-E.....	Concentric sharp edge orifice
	-Q.....	Concentric quadrant edge orifice
	-X.....	Eccentric edge orifice
	-S.....	Segmental edge orifice
	H.....	With tab handle
	N.....	Without tab handle
Pressure Taps *1	F.....	Flange taps
	V.....	Vena contracta taps
	R.....	1D-1/2D taps
Orifice Plate Material *2 *3	-27.....	SUS 304
	-32.....	SUS 316
	-33.....	SUS 316L (Size = < 500 mm)
	-MN.....	Monel (Size = < 500 mm) *4
	-HC.....	Hastelloy C (Size = < 500 mm)
	-HB.....	Hastelloy B (Size = < 500 mm)
	-TN.....	Titanium (Size = < 500 mm)
Flange Rating	-02K ..	JIS 2K (Size > = 450 mm)
	-05K ..	JIS 5K
	-10K ..	JIS 10K
	-16K ..	JIS 16K (Size = < 600 mm)
	-20K ..	JIS 20K (Size = < 600 mm)
	-30K ..	JIS 30K (Size = < 400 mm)
	-40K ..	JIS 40K (Size = < 400 mm)
	-63K ..	JIS 63K (Size = < 400 mm)
	-150 ..	ANSI Class 150 (Size = < 600 mm)
	-300 ..	ANSI Class 300 (Size = < 600 mm)
	-600 ..	ANSI Class 600 (Size = < 600 mm)
	-900 ..	ANSI Class 900 (Size = < 600 mm)
	-151 ..	JPI Class 150 (Size = < 600 mm)
	-301 ..	JPI Class 300 (Size = < 600 mm)
-601 ..	JPI Class 600 (Size = < 600 mm)	
-901 ..	JPI Class 900 (Size = < 600 mm)	
Optional Code	/ <input type="checkbox"/>	

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*1: For concentric quadrant edge orifice, "Flange taps" only.
For eccentric or segmental edge orifice, "Flange taps" or "Vena contracta taps" only.

*2:  Users must consider the characteristics of selected wetted parts material and the influence of process fluids. The use of inappropriate materials can result in the leakage of corrosive process fluids and cause injury to personnel and/or damage to plant facilities. It is also possible that the instrument itself can be damaged and that fragments from the instrument can contaminate the user's process fluids. Be very careful with highly corrosive process fluids such as hydrochloric acid, sulfuric acid, hydrogen sulfide, sodium hypochlorite, and high-temperature steam. Contact Yokogawa for detailed information of the wetted parts material.

*3: For eccentric or segmental edge orifice, SUS 304 or SUS 316 only.

*4: For concentric quadrant edge orifice, size = < 65 mm.

OPTIONS

Degrease cleaning treatment:

Orifice plate cleaned with acetone.
Only for orifice plate with material SUS304, SUS316, or SUS 316L.
Optional codes; /S

Drain Hole or Vent Hole:

Limited to 25.4 mm or over of orifice bore diameter.
Drain Hole for Gas or Steam. Optional code; /D
Vent Hole for Liquid. Optional code; /G

High process Temperature version:

For process temperature from 300 to 500°C.
Only for concentric sharp edge orifice with material SUS304 or SUS316.
Less than or equal to Size 500 mm Only.
Optional code; /HPT

Material Certificate:

Reproduced material certificate for Orifice Plate.
Optional code; /M01

ORDERING INSTRUCTIONS

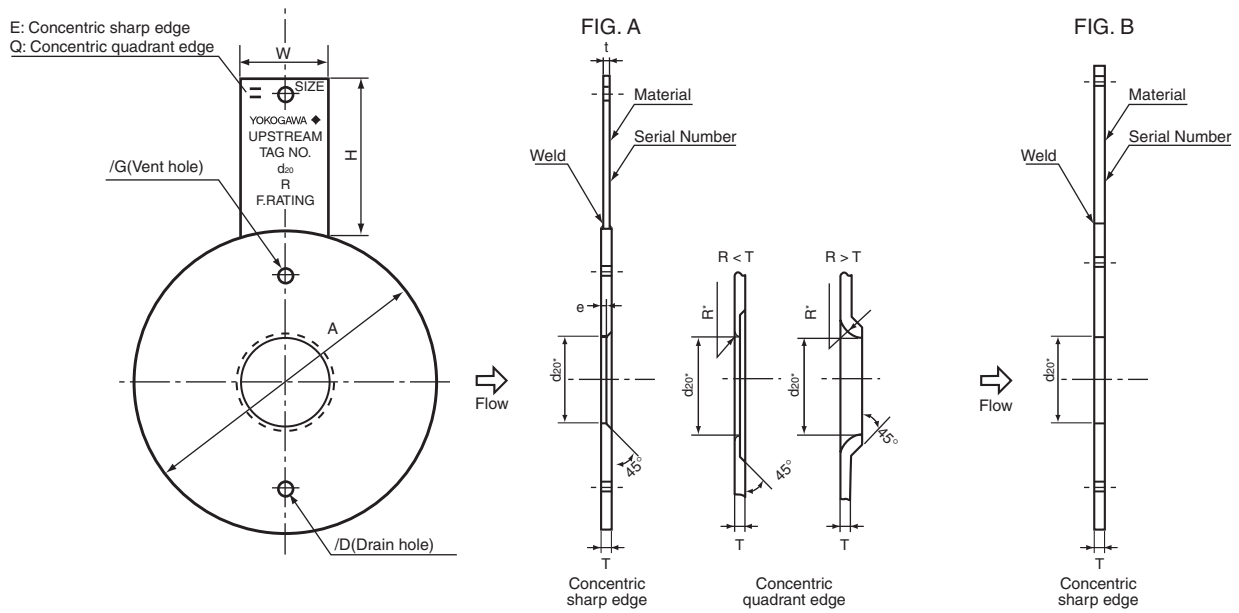
When ordering or giving quotations Specify;
1. Model, Suffix codes and Optional codes.
2. Fluid and piping conditions (by Orifice Specification Sheet WS 06E01A00E).

RELATED DEVICES

Orifice Flanges and Adapters:

Model FGT, FGJ Orifice Flanges and Model FGC Flanges
... Refer to GS 06E01F01-00E
Model FAD Pressure Tap Adapters
... Refer to GS 06E08B01-00E

EXTERNAL DIMENSIONS



Small-to-medium-sized Type (FIG.A)

Unit: mm (approx. inch)

NOMINAL PIPE SIZE mm (inch)	OUTSIDE DIAMETER OF PLATE A #1										THICKNESS OF EDGE e	DIA-METER OF HOLE /G.D	#2 #3 THICKNESS OF PLATE T	TAB HANDLE		
	JIS 5K	JIS 10K	JIS 16, 20K	JIS 30K	JIS 40K	JIS 63K	ANSI, JPI Class 150	ANSI, JPI Class 300	ANSI, JPI Class 600	ANSI, JPI Class 900				WIDTH W	HIGHT H	THICKNESS t
25 (1)	65 (2.6)	74 (2.9)	74 (2.9)	79 (3.1)	79 (3.1)	80 (3.1)	66.7 (2.6)	73.0 (2.9)	73.0 (2.9)	79.4 (3.1)	0.2 to 0.4 (0.01 to 0.02)	-	2 (0.1)	25 (1.0)	95 (3.7)	2 (0.1)
40 (1 1/2)	83 (3.3)	89 (3.5)	89 (3.5)	100 (3.9)	100 (3.9)	108 (4.3)	85.7 (3.4)	95.3 (3.7)	95.3 (3.7)	98.4 (3.9)	0.3 to 0.5 (0.01 to 0.02)	1.6 (0.06)	2 (0.1)	25 (1.0)	95 (3.7)	2 (0.1)
50 (2)	93 (3.7)	104 (4.1)	104 (4.1)	114 (4.5)	114 (4.5)	125 (4.9)	104.8 (4.1)	111.1 (4.4)	111.1 (4.4)	142.9 (5.6)	0.5 to 0.8 (0.02 to 0.03)	1.6 (0.06)	2 (0.1)	25 (1.0)	95 (3.7)	2 (0.1)
65 (2 1/2)	118 (4.6)	124 (4.9)	124 (4.9)	140 (5.5)	140 (5.5)	153 (6.0)	123.8 (4.9)	130.2 (5.1)	130.2 (5.1)	165.1 (6.5)	0.5 to 0.8 (0.02 to 0.03)	1.6 (0.06)	3 (0.1)	32 (1.3)	95 (3.7)	2 (0.1)
80 (3)	129 (5.1)	134 (5.3)	140 (5.5)	150 (5.9)	150 (5.9)	163 (6.4)	136.5 (5.4)	149.2 (5.9)	149.2 (5.9)	168.3 (6.6)	0.5 to 0.8 (0.02 to 0.03)	1.6 (0.06)	3 (0.1)	32 (1.3)	95 (3.7)	2 (0.1)
100 (4)	149 (5.9)	159 (6.3)	165 (6.5)	173 (6.8)	183 (7.2)	196 (7.7)	174.6 (6.9)	181.0 (7.1)	193.7 (7.6)	206.4 (8.1)	0.8 to 1.2 (0.03 to 0.05)	1.6 (0.06)	3 (0.1)	38 (1.5)	105 (4.1)	2 (0.1)
125 (5)	184 (7.2)	190 (7.5)	203 (8.0)	208 (8.2)	226 (8.9)	235 (9.3)	196.9 (7.8)	215.9 (8.5)	241.3 (9.5)	247.7 (9.8)	0.8 to 1.2 (0.03 to 0.05)	1.6 (0.06)	3 (0.1)	38 (1.5)	105 (4.1)	2 (0.1)
150 (6)	214 (8.4)	220 (8.7)	238 (9.4)	251 (9.9)	265 (10.4)	275 (10.8)	222.3 (8.7)	250.8 (9.9)	266.7 (10.5)	288.9 (11.4)	0.8 to 1.2 (0.03 to 0.05)	1.6 (0.06)	3 (0.1)	38 (1.5)	105 (4.1)	2 (0.1)
200 (8)	260 (10.2)	270 (10.6)	283 (11.1)	296 (11.7)	315 (12.4)	330 (13.0)	279.4 (11.0)	308.0 (12.1)	320.7 (12.6)	358.8 (14.1)	1.5 to 2.0 (0.06 to 0.08)	1.6 (0.06)	4 (0.2)	38 (1.5)	105 (4.1)	2 (0.1)
250 (10)	325 (12.8)	333 (13.1)	356 (14.0)	360 (14.2)	380 (15.0)	394 (15.5)	339.7 (13.4)	362.0 (14.3)	400.0 (15.7)	435.0 (17.1)	e = T	2.0 (0.08)	4 (0.2)	44 (1.7)	120 (4.7)	3 (0.1)
300 (12)	370 (14.6)	378 (14.9)	406 (16.0)	420 (16.5)	434 (17.1)	449 (17.7)	409.6 (16.1)	422.3 (16.6)	457.2 (18.0)	498.5 (19.6)	e = T	2.5 (0.1)	4 (0.2)	44 (1.7)	120 (4.7)	3 (0.1)
350 (14)	413 (16.3)	423 (16.7)	450 (17.7)	465 (18.3)	479 (18.9)	488 (19.2)	450.9 (17.8)	485.8 (19.1)	492.1 (19.4)	520.7 (20.5)	e = T	2.5 (0.1)	4 (0.2)	44 (1.7)	120 (4.7)	3 (0.1)
400 (16)	473 (18.6)	486 (19.1)	510 (20.1)	524 (20.6)	534 (21.0)	548 (21.6)	514.4 (20.2)	539.8 (21.2)	565.2 (22.2)	574.7 (22.6)	e = T	3.0 (0.12)	4 (0.2)	44 (1.7)	120 (4.7)	3 (0.1)

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*1: For JPI flanges, using inch thread is the basis of outside diameters above.

*2: For high process temperature version, refer to the next page.

*3: For concentric quadrant edge orifice, the plate thickness may become thicker than shown above after sizing calculation.

Large-sized Type (FIG.B)

Unit: mm
(approx. inch)

NOMINAL PIPE SIZE	OUTSIDE DIAMETER PLATE A								THICKNESS OF EDGE e	DIAMETER OF HOLE /G /D	THICKNESS OF PLATE T	TAB HANDLE*1		
	JIS 2K	JIS 5K	JIS 10K	JIS 16K 20K	ANSI JPI Class 150	ANSI JPI Class 300	ANSI JPI Class 600	ANSI JPI Class 900				WIDTH W	HIGHT H	THICKNESS T
450 (18)	535 (21.1)	533 (21.0)	541 (21.3)	575 (22.6)	549.3 (21.6)	596.9 (23.5)	612.8 (24.1)	638.2 (25.1)	e=T	3 (0.1)	5 (0.2)	44 (1.7)	160 (6.3)	5
500 (20)	585 (23.0)	583 (23.0)	596 (23.5)	630 (24.8)	606.4 (23.9)	654.1 (25.7)	682.7 (26.9)	698.5 (27.5)	e=T	4 (0.2)	5 (0.2)	44 (1.7)	160 (6.3)	5
550 (22)	643 (25.3)	641 (25.2)	650 (25.6)	684 (26.9)	—	—	—	—	e=T	4 (0.2)	5 (0.2)	44 (1.7)	160 (6.3)	5
600 (24)	693 (27.3)	691 (27.2)	700 (27.6)	734 (28.9)	717.6 (28.3)	774.7 (30.5)	790.6 (31.1)	838.2 (33.0)	e=T	4 (0.2)	5 (0.2)	44 (1.7)	160 (6.3)	5
650 (26)	748 (29.4)	746 (29.4)	750 (29.5)	—	—	—	—	—	e=T	4 (0.2)	5 (0.2)	60 (2.4)	160 (6.3)	5
700 (28)	798 (31.4)	796 (31.3)	810 (31.9)	—	—	—	—	—	e=T	4 (0.2)	5 (0.2)	60 (2.4)	160 (6.3)	5
750 (30)	856 (33.7)	850 (33.5)	870 (34.3)	—	—	—	—	—	e=T	4 (0.2)	6 (0.2)	60 (2.4)	160 (6.3)	6
800 (32)	906 (35.7)	900 (35.4)	920 (36.2)	—	—	—	—	—	e=T	6 (0.2)	6 (0.2)	60 (2.4)	160 (6.3)	6
850 (34)	956 (37.6)	950 (37.4)	970 (38.2)	—	—	—	—	—	e=T	6 (0.2)	6 (0.2)	60 (2.4)	160 (6.3)	6
900 (36)	1,006 (39.6)	1,000 (39.4)	1,020 (40.2)	—	—	—	—	—	e=T	6 (0.2)	8 (0.3)	60 (2.4)	180 (7.1)	8
1,000 (40)	1,106 (43.5)	1,100 (43.3)	1,124 (44.3)	—	—	—	—	—	e=T	6 (0.2)	8 (0.3)	60 (2.4)	180 (7.1)	8
1,100 (44)	1,216 (47.9)	1,210 (47.6)	1,234 (48.6)	—	—	—	—	—	e=T	6 (0.2)	10 (0.4)	75 (3.0)	180 (7.1)	10
1,200 (48)	1,326 (52.2)	1,320 (52.0)	1,344 (52.9)	—	—	—	—	—	e=T	6 (0.2)	10 (0.4)	75 (3.0)	180 (7.1)	10
1,350 (54)	1,481 (58.3)	1,475 (58.1)	1,498 (59.0)	—	—	—	—	—	e=T	6 (0.2)	12 (0.5)	75 (3.0)	200 (7.9)	12
1,500 (60)	1,636 (64.4)	1,630 (64.2)	1,658 (65.3)	—	—	—	—	—	e=T	6 (0.2)	12 (0.5)	75 (3.0)	200 (7.9)	12

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*1: For high process temperature version, refer to the table below.

High Process Temperature Version (FIG.A)

Unit: mm
(approx. inch)

NOMINAL PIPE SIZE mm (inch)	THICKNESS OF EDGE e	THICKNESS OF PLATE T
40 (1 1/2)	0.3 to 0.5 (0.01 to 0.02)	3 (0.1)
50 (2)	0.5 to 0.8 (0.02 to 0.03)	3 (0.1)
65 (1 1/2)	0.5 to 0.8 (0.02 to 0.03)	4 (0.2)
80 (3)	0.5 to 0.8 (0.02 to 0.03)	4 (0.2)
100 (4)	0.8 to 1.2 (0.03 to 0.05)	5 (0.2)
125 (5)	0.8 to 1.2 (0.03 to 0.05)	5 (0.2)
150 (6)	0.8 to 1.2 (0.03 to 0.05)	5 (0.2)
200 (8)	1.5 to 2.0 (0.06 to 0.08)	5 (0.2)
250 (10)	3.5 to 4.0 (0.14 to 0.16)	8 (0.3)
300 (12)	3.5 to 4.0 (0.14 to 0.16)	8 (0.3)
350 (14)	3.5 to 4.0 (0.14 to 0.16)	8 (0.3)
400 (16)	3.5 to 4.0 (0.14 to 0.16)	8 (0.3)

Unit: mm
(approx. inch)

NOMINAL PIPE SIZE mm (inch)	THICKNESS OF EDGE e	THICKNESS OF PLATE T	TAB HANDLE		
			WIDTH W	HIGHT H	THICKNESS T
450 (18)	4.5 to 5.0 (0.18 to 0.20)	8 (0.3)	44 (1.7)	160 (6.3)	5 (0.2)
500 (20)	4.5 to 5.0 (0.18 to 0.20)	8 (0.3)	44 (1.7)	160 (6.3)	5 (0.2)

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*1: For concentric quadrant edge orifice, the plate thickness may become thicker than shown above after sizing calculation.