Product Data Sheet
00813-0100-4828, Rev EB
Catalog 2006 - 2007

Rosemount 1595 Conditioning Orifice Plate

- *Designed to provide superior performance in short straight pipe run applications*
- *Requires only two diameters of straight pipe run after an upstream flow disturbance*
- *Accurate and repeatable*
- *Comprehensive offering*
- *Suitable for most gas, liquid, and steam applications*
- *Patent-pending technology*

Contents

Rosemount 1595 Conditioning Orifice Plate

The 1595 Conditioning Orifice Plate is designed to install downstream of a variety of disturbances with minimal straight pipe run, providing superior performance.

1595 Conditioning Orifice Plate

- A revolutionary innovative technology based on the most common differential primary element in the industry
- Requires only two diameters of straight pipe run after an upstream flow disturbance
- Reduced installation costs
- Easy to use, prove, and troubleshoot
- Good for most gas, liquid, and steam as well as high temperature and high pressure applications

1595 Tailored Use

The 1595 can be used in conjunction with the Rosemount 1496 Flange Union / 1497 Meter Section. See Product Data Sheet document number 00813-0100-4792 and Figure 2 and 3 for 1496 and 1497 products.

FIGURE 1. Rosemount 1595 Conditioning Orifice Plate

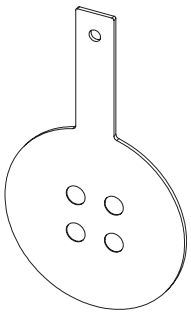


FIGURE 2. Rosemount 1496 Flange Union

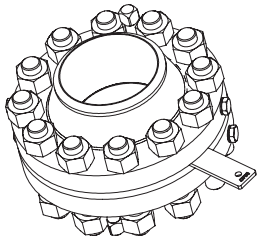
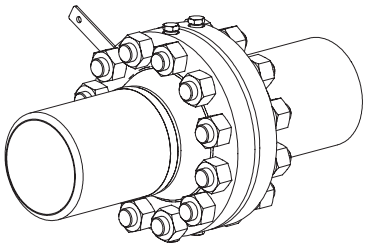


FIGURE 3. Rosemount 1497 Meter Section



Rosemount DP-Flow Solutions

Annubar Flowmeter Series: Rosemount 3051SFA, 3095MFA, 485, and 285

The state-of-the-art, fifth generation Rosemount 485 *Annubar* combined with the 3051S or 3095MV MultiVariable transmitter creates an accurate, repeatable and dependable insertion-type flowmeter. The Rosemount 285 provides a commercial product offering for your general purpose applications.

Compact Orifice Flowmeter Series: Rosemount 3051SFC, 3095MFC, and 405

Compact Orifice Flowmeters can be installed between existing flanges, up to a Class 600 (PN100) rating. In tight fit applications, a conditioning orifice plate version is available, requiring only two diameters of straight run upstream.

Integral Orifice Flowmeter Series: Rosemount 3051SFP *ProPlate*®, 3095MFP Mass *ProPlate*®, and 1195

These integral orifice flowmeters eliminate the inaccuracies that become more pronounced in small orifice line installations. The completely assembled, ready to install flowmeters reduce cost and simplify installation.

Orifice Plate Primary Element Systems: Rosemount 1495 and 1595 Orifice Plates, 1496 Flange Unions and 1497 Meter Sections

A comprehensive offering of orifice plates, flange unions and meter sections that is easy to specify and order. The 1595 Conditioning Orifice provides superior performance in tight fit applications.

Specification

The Rosemount 1595 can be used with Rosemount 1496 Orifice Flange Unions and Rosemount 1497 Meter Sections. For product offering see document number 00813-0100-4792.

Performance

Flow Coefficient Uncertainty

TABLE 1. Discharge Coefficient Uncertainty

Beta Ratio(1)	Accuracy
β = 0.20	±0.50%
β = 0.40	±0.50%
β = 0.65	±0.75%

(1) For 0.65 beta and ReD< 10,000 add an additional 0.5% to the Discharge Coefficient Uncertainty.

Sizing

Perform a flow calculation using the Instrument Toolkit™ software package. Alternatively, contact an Emerson Process Management representative. The “Configuration Data Sheet (CDS)” on page 11” is required prior to order for application verification.

Straight Pipe Requirement

Use the appropriate lengths of straight pipe upstream and downstream of the 1595 to minimize the effects of moderate flow disturbances in the pipe. Table 2 lists recommended lengths of straight pipe.

TABLE 2. 1595 Straight Pipe Requirements(1)

	Beta	0.20	0.40	0.65
Upstream (inlet) side of primary	Single 90° bend or tee	2	2	2
	Two or more 90 ° bends in the same plane	2	2	2
	Two or more 90° bends in different plane	2	2	2
	Up to 10° of swirl	2	2	2
	Reducer (1 line size)	2	2	2
	Butterfly valve (75% open)	2	2	2
Downstream (outlet) side of primary		2	2	2

(1) Consult an Emerson Process Management representative if disturbance is not listed.

Pressure Tap Orientation

Orient the 1595 Conditioning Orifice Plate so that the pressure taps are centered between any 2 (of 4) orifice bore holes.

Centering Requirements

The 1595 should be installed so that it is centered in the pipes as recommended by ISO-5167.

Functional

Service and Flow Range

Liquid, gas or vapor turbulent flow, for pipe Reynold’s Numbers greater than 5,000. For pipe Reynold's Numbers less than 10,000 add an additional +0.5% uncertainty to the discharge coefficient uncertainty.

Pipe Sizes

2 to 24-in. (50 to 600 mm). Contact Emerson Process Management for other pipe sizes.

Operating Limits

Temperature Range: –320 to 1200 °F (–196 to 649 °C)

- – 320 to 800 °F (–196 to 427 °C) and differential pressure up to 800 inH_20
- 800 to 1200 °F (427 to 649 °C) and differential pressure up to 400 inH_20

Maximum Working Pressure

- Flange rating per ANSI B16.5.

Physical Specifications

Materials of Construction

Orifice Plate
TABLE 3.

Code	Description	ASTM	UNS	DIN (W.-Nr.)
S	316/316L SST	A240 Gr 316/316L	S31600 / S31603	1.4401/1.4404 (1.4436/1.4435)
L	304/304L SST	A240 Gr 304/304L	S30400 / S30403	1.4301 / 1.4306
H	Hastelloy C-276	B575 Gr N10376	N10276	2.4819
M	Monel 400	B127 Gr N04400	N04400	2.4360

Flange Mounting Hardware

- The 1595 can be tailored for use in conjunction with the Rosemount 1496 Flange Union and, if required, the Rosemount 1497 Meter Section. See Figures 2 and 3 and Product Data Sheet 00813-0100-4792 for more information regarding the Rosemount 1496 and 1497.

Typical Orifice Hole Sizes

Beta is calculated by: (β) = d_C / Pipe ID, where the calculated bore is equal to 2 x typical orifice hole size (d_C = 2d). The table below shows the diameter of each of the four typical orifice holes.

TABLE 4.

Line Size	Pipe ID (nominal sch40)	Beta (β) = 0.20 d	Beta (β) = 0.40 d	Beta (β) = 0.65 d
2-in (50.8 mm)	2.067-in. (52.502 mm)	0.207 (5.26)	0.413 (10.49)	0.620 (15.75)
3-in. (76.2 mm)	3.068-in. (77.927 mm)	0.307 (7.80)	0.614 (15.60)	0.997 (25.32)
4-in. (101.6 mm)	4.026-in. (102.26 mm)	0.403 (10.25)	0.805 (20.45)	1.308 (32.22)
6-in. (152.4 mm)	6.065-in. (154.051 mm)	0.607 (15.42)	1.213 (30.81)	1.971 (50.06)
8-in. (203.2 mm)	7.981-in. (202.717 mm)	0.798 (20.27)	1.596 (40.54)	2.594 (65.89)
10-in. (254.0 mm)	10.20-in. (259.08 mm)	1.002 (25.45)	2.004 (50.90)	3.257 (82.73)
12-in. (304.8 mm)	12.00-in. (304.8 mm)	1.200 (30.48)	2.400 (60.96)	3.900 (99.06)
14-in. (355.0 mm)	13.250-in. (336.55 mm)	1.312 (33.32)	2.625 (66.68)	4.265 (108.33)
16-in. (406.4 mm)	15.250-in. (387.35 mm)	1.500 (38.10)	3.000 (76.20)	4.875 (123.83)
18-in. (457.2 mm)	17.250-in. (438.15 mm)	1.688 (42.88)	3.375 (85.73)	5.485 (139.32)
20-in. (508.0 mm)	19.250-in. (488.95 mm)	1.881 (47.78)	3.762 (95.55)	6.114 (155.30)
24-in. (609.6 mm)	23.250-in. (590.55 mm)	2.262 (57.45)	4.525 (114.94)	7.353 (186.77)

Orifice Type

- Paddle, square-edge, concentric
- Universal, square-edge, concentric

Dimensional Drawings

Rosemount 1595 Conditioning Orifice Plate

(ANSI, Paddle, Square edged, Concentric)

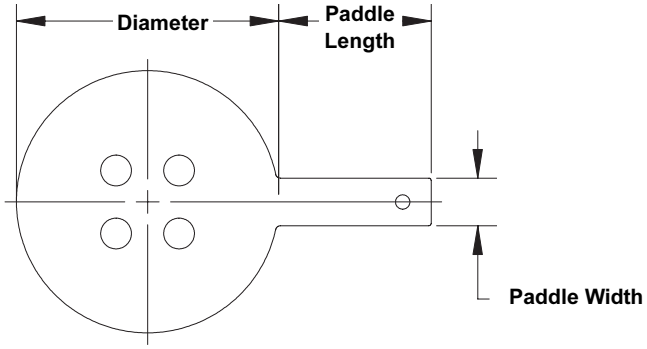


TABLE 5. Orifice Plate Dimensions in inches (millimeters)

	Diameter for Paddle Type							
Line Size	**150#**	**300#**	**600#**	**900#**	**1500#**	**2500#**	**Paddle Length**	**Paddle Width**
2 -in. (50.8 mm)	4.125 (104.78 mm)	4.375-in. (111.13 mm)	4.375-in. (111.13 mm)	5.625-in. (142.875 mm)	5.625-in. (142.875 mm)	5.750-in. (146.050mm)	4-in. (101.6 mm)	1-in. (25.4 mm)
3-in. (76.2 mm)	5.375 (136.53 mm)	5.875-in. (149.23 mm)	5.875-in. (149.23 mm)	6.625-in. (168.275 mm)	6.875-in. (174.625 mm)	7.750-in. (196.85 mm)	4-in. (101.6 mm)	1 1/4-in. (31.75 mm)
4-in. (101.6 mm)	6.875 (174.63 mm)	7.125-in. (180.98 mm)	7.125-in. (180.98 mm)	8.125-in. (206.35 mm)	8.250-in. (209.550 mm)	9.250-in. (234.95 mm)	4-in. (101.6 mm)	1 1/4-in. (31.75 mm)
6-in. (152.4 mm)	8.750 (222.25 mm)	9.875-in. (250.83 mm)	10.500-in. (266.7 mm)	11.375-in. (288.925 mm)	11.125-in. (282.575 mm)	12.500-in. (317.50 mm)	5-in. (127 mm)	1 1/2-in. (38.1 mm)
8-in. (203.2 mm)	11.000 (279.4 mm)	12.125-in. (307.98 mm)	12.625-in. (320.675 mm)	14.125-in. (358.775 mm)	13.875-in. (352.425 mm)	15.250-in. (387.350 mm)	5-in. (127 mm)	1 1/2-in. (38.1 mm)
10-in. (254.0 mm)	13.375 (339.73 mm)	14.250-in. (361.95 mm)	15.750-in. (400.05 mm)	17.125-in. (434.975 mm)	17.125-in. (434.975 mm)	18.750-in. (476.25 mm)	6-in. (152.4 mm)	1 1/2-in. (38.1 mm)
12-in. (304.8 mm)	16.125 (409.58 mm)	16.625-in. (422.26 mm)	18.000-in. (457.2 mm)	19.625-in. (498.475 mm)	20.500-in. (520.7 mm)	21.625-in. (549.275 mm)	6-in. (152.4 mm)	1 1/2-in. (38.1 mm)
14-in. (355.6 mm)	17.750 (450.85 mm)	19.125-in. (485.78 mm)	13.375-in. (339.725 mm)				6-in. (152.4 mm)	1 1/2-in. (38.1 mm)
16-in (406.4 mm)	20.250 (514.35 mm)	21.250-in. (539.75 mm)	22.250-in. (565.15 mm)				6-in. (152.4 mm)	1 1/2-in. (38.1 mm)
18-in. (457.2 mm)	21.500 (546.1 mm)	23.375-in. (593.725 mm)	24.000-in. (609.6 mm)				6-in. (152.4 mm)	1 1/2-in. (38.1 mm)
20-in. (580.0 mm)	23.750 (603.25 mm)	25.625-in. (650.875 mm)	26.750-in. (679.45 mm)				6-in. (152.4 mm)	1 1/2-in. (38.1 mm)
24-in. (609.6 mm)	28.125 (714.375 mm)	30.375-in. (771.525 mm)	31.000-in. (787.4 mm)				6-in. (152.4 mm)	1 1/2-in. (38.1 mm)

NOTE: Consult factory for availability of line sizes and flange ratings not shown in the above table.

1595U Orifice Universal Type

(Universal, Square edged, Concentric

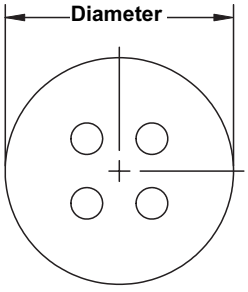


TABLE 6. Orifice Plate Dimensions in inches (millimeters)

Line Size	Diameter for Universal Type
2-in.	2.437-in. (61.8998 mm)
3-in.	3.437-in. (87.2998 mm)
4-in.	4.406-in. (111.912 mm)
6-in.	6.437-in. (163.5 mm)
8-in.	8.437-in. (214.3 mm)
10-in.	10.687-in. (271.45 mm)
12-in.	12.593-in. (319.862 mm)

NOTE: Consult Factory for availability of line sizes not shown in the above table.

Rosemount 1595 Conditioning Orifice Plate

(DIN, Paddle, Square edged, Concentric)

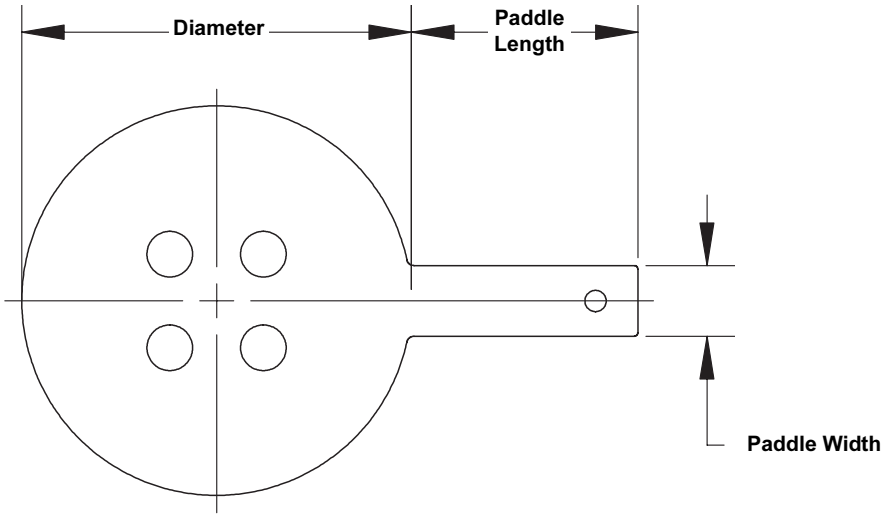


TABLE 7. Orifice Plate Dimensions in millimeters (inches)

DN	Diameter (max) – by flange rating						Handle Length	Handle Width
	PN 10	PN 16	PN 25	PN 40	PN 63/64	PN 100		
DN 50 (2-in.)	107 (4.21)	107 (4.21)	107 (4.21)	107 (4.21)	113 (4.45)	119 (4.69)	160 (6.299)	40 (1.575)
DN 80 (3-in.)	142 (5.60)	142 (5.60)	142 (5.60)	142 (5.60)	148 (5.82)	154 (6.06)	160 (6.299)	40 (1.575)
DN 100 (4-in.)	162 (6.38)	162 (6.38)	168 (6.61)	168 (6.61)	174 (6.85)	180 (7.09)	160 (6.299)	40 (1.575)
DN 150 (6-in.)	218 (8.58)	218 (8.58)	224 (8.82)	224 (8.82)	247 (9.72)	257 (10.12)	160 (6.299)	40 (1.575)
DN 200 (8-in.)	273 (10.74)	273 (10.74)	284 (11.18)	290 (11.42)	309 (12.17)	324 (12.76)	160 (6.299)	40 (1.575)
DN 250 (10-in.)	328 (12.91)	329 (12.95)	340 (13.39)	352 (13.86)	364 (14.33)	391 (15.39)	160 (6.299)	40 (1.575)
DN 300 (12-in.)	378 (14.88)	384 (15.12)	400 (15.75)	417 (16.42)	424 (16.69)	458 (18.03)	160 (6.299)	40 (1.575)

NOTE: Consult factory for availability of line sizes and flange ratings not shown in the above table.

TABLE 8. A.P.I Ring No.'s and Rating

Line Size	A.P.I Ring No.	Rating (lbs.)
02	R-23	300-600
02	R-24	900-1500
02	R-26	2500
03	R-31	300-600 & 900
03	R-35	1500
04	R-37	300-600 & 900
04	R-39	1500
06	R-45	300-600 & 900
06	R-46	1500
08	R-49	300-600 & 900
10	R-53	300-600 & 900
12	R-57	300-600 & 900
14	R-61	300-600
14	R-62	900
16	R-65	300-600
16	R-66	900
18	R-69	300-600
18	R-70	900
20	R-73	300-600
20	R-74	900
24	R-77	300-600
24	R-78	900

NOTE
Refer to Table 5 for line size and pressure rating availability.

TABLE 9. Available Beta Ratio (β)

The table below shows the available Beta Ratio (β) for line size vs. pipe schedule

Line Size	Pipe Schedule	Beta (β) Available
2	≤ 80	0.20, 0.40, 0.60
2	160	0.20
2	XXS	0.20
3	≤ 80	0.20, 0.40, 0.65
3	160	0.20, 0.40
3	XXS	0.20
4	≤ 80	0.20, 0.40, 0.65
4	120	0.20, 0.40
4	160	0.20, 0.40
4	XXS	0.20
6	≤ 80	0.20, 0.40, 0.65
6	120	0.20, 0.40
6	160	0.20, 0.40
6	XXS	0.20
8	≤ 80	0.20, 0.40, 0.65
8	100	0.20, 0.40, 0.65
8	120	0.20, 0.40
8	140	0.20, 0.40
8	160	0.20, 0.40
8	XXS	0.20, 0.40
10	≤ 80	0.20, 0.40, 0.65
10	100	0.20, 0.40, 0.65
10	120	0.20, 0.40
10	140	0.20, 0.40
10	160	0.20, 0.40
10	XXS	0.20, 0.40
12	≤ 80	0.20, 0.40, 0.65
12	100	0.20, 0.40
12	120	0.20, 0.40
12	140	0.20, 0.40
12	160	0.20, 0.40
12	XXS	0.20, 0.40
14	≤ 80	0.20, 0.40, 0.65
14	100	0.20, 0.40
14	120	0.20, 0.40
14	140	0.20, 0.40
14	160	0.20, 0.40
14	XXS	0.20, 0.40
16	≤ 80	0.20, 0.40, 0.65
16	100	0.20, 0.40
16	120	0.20, 0.40
16	140	0.20, 0.40
16	160	0.20, 0.40
16	XXS	0.20, 0.40
18	≤ 80	0.20, 0.40, 0.65
18	100	0.20, 0.40, 0.65
18	120	0.20, 0.40
18	140	0.20, 0.40
18	160	0.20, 0.40
18	XXS	0.20, 0.40
20	≤ 80	0.20, 0.40, 0.65
20	100	0.20, 0.40, 0.65
20	120	0.20, 0.40
20	140	0.20, 0.40
20	160	0.20, 0.40
20	XXS	0.20, 0.40
24	≤ 80	0.20, 0.40, 0.65
24	100	0.20, 0.40
24	120	0.20, 0.40
24	140	0.20, 0.40
24	160	0.20, 0.40
24	XXS	0.20, 0.40

Ordering Information

Rosemount 1595 Orifice Plate Ordering Table

Model	Product Description
1595	Conditioning Orifice Plate
Code	**Plate Type**
P	Paddle, Square Edged
U(1)	Universal, Square Edge
Code	**Line Size**
020	2-in. (50 mm)
030	3-in. (76 mm)
040	4-in. (100 mm)
060	6-in. (150 mm)
080	8-in. (200 mm)
100	10-in. (250 mm)
120	12-in. (300 mm)
140	14-in. (350 mm)
160	16-in. (400 mm)
180	18-in. (450 mm)
200	20-in. (500 mm)
240 (2)	24-in. (600 mm)
Code	**Flange Rating**
A1	ANSI Class 150 Raised Face (*Note: Not compatible with standard ASME B16.36 Orifice Flanges)*
A3	ANSI Class 300 Raised Face
A6	ANSI Class 600 Raised Face
A9(1)	ANSI Class 900 Raised Face
AF(1)	ANSI Class 1500 Raised Face
AT(1)	ANSI Class 2500 Raised Face
D1(1)	DIN PN 10 (only available with Plate Type P)
D2(1)	DIN PN 16 (only available with Plate Type P)
D3(1)	DIN PN 25 (only available with Plate Type P)
D4(1)	DIN PN40 (only available with Plate Type P)
D5(1)(3)	DIN PN 63 (only available with Plate Type P)
D6(1)	DIN PN 100 (only available with Plate Type P)
R3	ANSI Class 300 Ring Joint (only available with Orifice Plate Type code U and requires Plate Holder code PH)
R6	ANSI Class 600 Ring Joint (only available with Orifice Plate Type code U and requires Plate Holder code PH)
R9(1)	ANSI Class 900 Ring Joint (only available with Orifice Plate Type code U and requires Plate Holder code PH)
RF(1)	ANSI Class 1500 Ring Joint (only available with Orifice Plate Type code U and requires Plate Holder code PH)
RT(1)	ANSI Class 2500 Ring Joint (only available with Orifice Plate Type code U and requires Plate Holder code PH)
Code	**Material Type**
S	316/316L Stainless Steel
L	304/304L Stainless Steel
M	*Monel*®
H	*Hastelloy*® C-276
Code	**Orifice Plate Thickness**
A	0.125-in. (default for Line Sizes 2 to 4-in. (50 mm to 100 mm))
B(4)	0.250-in. (default for Line Sizes 6 to 12-in. (150 to 300 mm))
C	0.375-in. (default for line sizes 14 to 20-in. (350 to 500 mm))
D	0.500-in. (default for line sizes 24-in. (600 mm))

Rosemount 1595 Orifice Plate Ordering Table

Code	Beta Ratio
020	0.20 Beta Ratio
040	0.40 Beta Ratio
065	0.65 Beta Ratio (0.60 beta ratio for Line Size option 020 only)
Code	**Options**
Flow Calibration	
WC	Discharge Coefficient Verification (3 points)
WD	Discharge Coefficient Verification (full 10 points)
Plate Holder	
PH	Plate Holder for Universal Type Orifice Plate for use with RTJ flange or section
Special Cleaning	
P2	Cleaning for special processes
Special Inspection	
QC1	Visual and dimensional Inspection with certification
QC7	Inspection and performance certificate
Material Traceability Certification	
Q8	Material Certification per ISO 10474 3.1-B and EN 10204 3.1.B
Code Conformance	
J5(5)	NACE MR-0175 / ISO 15156
Country Certification	
J1	Canadian Registration

Typical Model Number: 1595 P 060 A3 S A 040

(1) Currently available up to 12-in. (300 mm) line size.

(2) Consult factory for availability of line sizes and flange ratings not shown.

(3) Previously PN64.

(4) For a Universal plate style in a 6-in. (150 mm) line size, the plate thickness is 0.125-in. (3.175 mm) and you will need to select code B.

(5) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

Calculation Data Sheet

This Calculation Data Sheet can be provided. The detailed sizing calculation may be done through the “Configuration Data Sheet (CDS)” on page 11.

ROSEMOUNT INC.
1595 CONDITIONING ORIFICE PLATE
CALCULATION DATA SHEET

GENERAL DATA

Customer:	Customer Name
Project:	2004 Official Calculations
S. O. No:	Sales Order Number
P. O. No:	Customer Name
Calc. Date:	4/7/2004
Model No:	1595P080A3SB040
Tag No:	Tag Number

PRODUCT DESCRIPTION

Plate Type:	Paddle, Square-Edged	Tap Type:	Flange tapping
Plate Material:	316 SST	Tap Location:	Upstream
		Line Size:	8-in. (200 mm) (DN 200)
Process Connection:		Pipe Schedule:	40
		Pipe Material:	Carbon Steel

INPUT DATA

Fluid Type:	Steam		Calibration Factor:	1.000
Fluid Description:				
Pipe I.D.:	7.981	inch		
Pressure:	60.000023	psig	Base Pressure	
Temperature at Flow:	307.33	F	Base Temperature	
Absolute Viscosity:	0.01409	cP		
Isentropic Exponent:	1.31746			
Compressibility at Flow:			Base Compressibility	
Density at Flow:	0.171328	lb/ft^3	Base Density	
			Atmospheric Pressure:	14.696 psia
Flow Rates:				
Minimum:	6000.00	lb/hr		
Normal:	8000.00	lb/hr		
Maximum:	10000.00	lb/hr		
Full Scale:	10000.00	lb/hr		

CALCULATED DATA (Calculation performed at normal conditions)

Orifice Bore Size:	0.596	inch	Bore Reynolds Number (Normal):	1120650	
Orifice Effective Bore Size:	3.192	inch	Pipe Reynolds Number (Normal):	448514	
DP at Minimum Flow:	42.859	in H_2O at 68 °F	Gas Expansion Factor:	0.9900	
DP at Normal Flow:	76.194	in H_2O at 68 °F	Permanent Pressure Loss:		
DP at Maximum Flow:	119.054	in H_2O at 68 °F	at Normal Flow:	62.671	in H_2O at 68 °F
URV (DP at Full Scale):	119.054	in H_2O at 68 °F	at Max Flow:	97.928	in H_2O at 68 °F
Beta:	0.400		Velocity at Max. Flow:	46.669	ft/sec
Discharge Coefficient:	0.6009		Minimum Accurate Flow:	1313.27	lb/hr
Max. Allow. Pressure at Temp:	555.500	psig @ 310 °F			

Warnings

Gas Expansion Factor Notice at Normal Flow.
Calculation by HL

Notes

Version: 3.0 (Build 109B) Printed on: 8-Apr-04