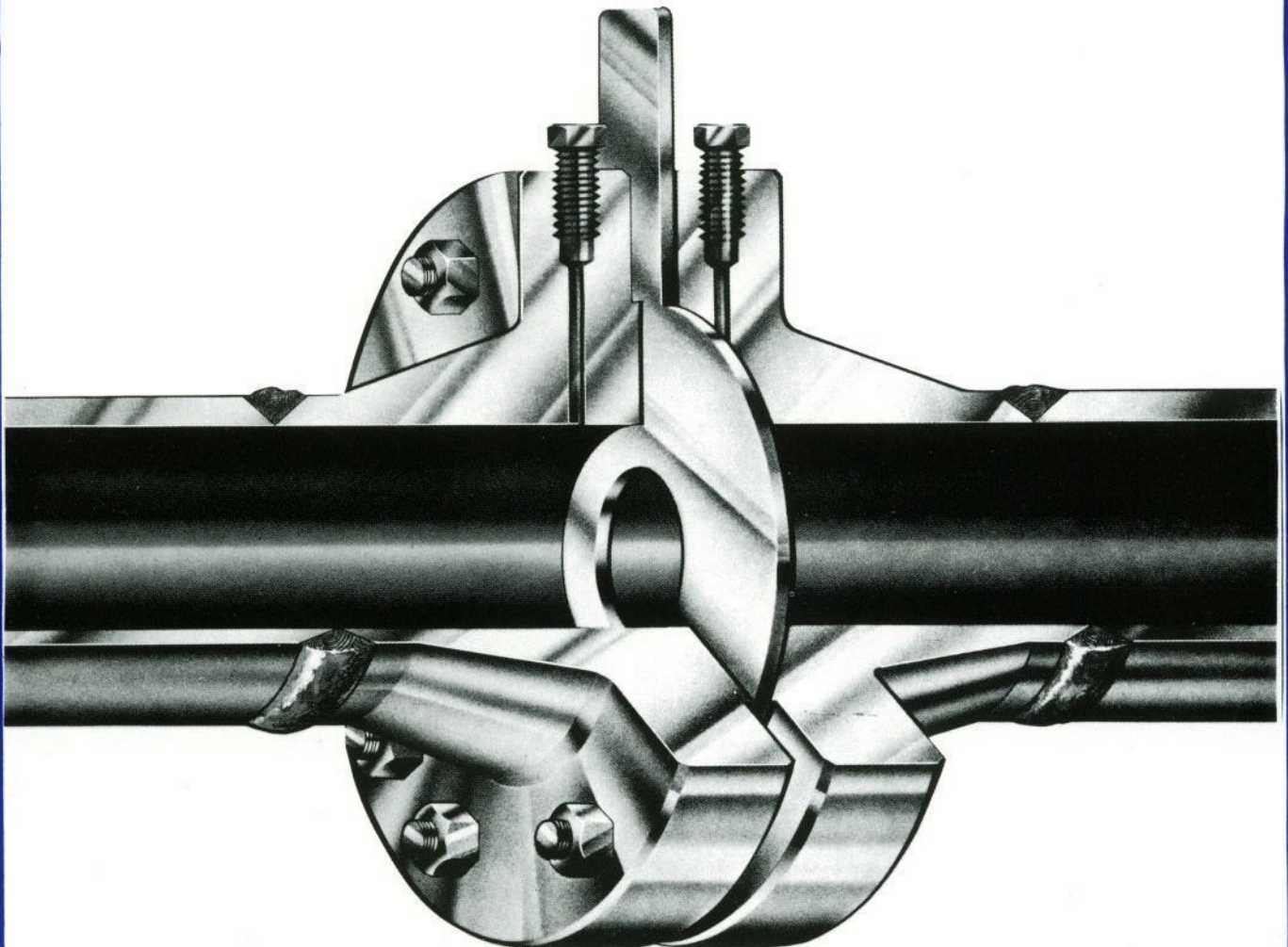


ORIFICE PLATES AND FLANGE UNIONS



PADDLE TYPE ORIFICE PLATES

FOR USE WITH STANDARD RAISED FACE ORIFICE FLANGE UNIONS

Flow-Lin orifice plates are manufactured in accordance with AGA, ASME, ISA and ISO recommendations.

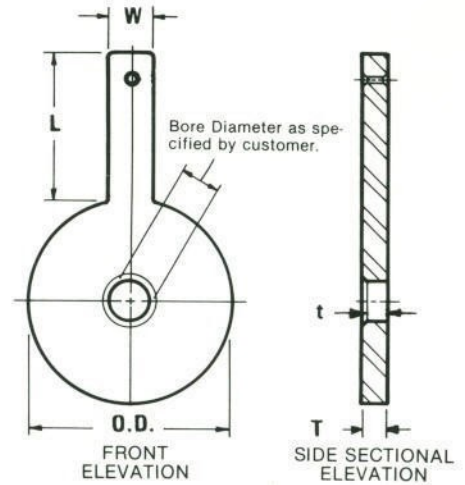
Standard materials of construction are 304SS, 316SS with other materials such as Monel, Hastelloy C, Alloy 20, Titanium and Tantalum available as required. Flow-Lin orifice plates may be supplied with Concentric, Eccentric, Segmental or Quadrant Edge bores as required.

Unless otherwise specified, Flow-Lin orifice plate handles are stamped with INLET, Line Size & Flange Rating, Bore, Tag Number, Material and Flow-Lin Job Number.

When ordering please specify:

- | | |
|------------------------------|--|
| 1. MK-52 | 5. Quantity & Tag No. |
| 2. Line Size & Flange Rating | 6. Bore Type (concentric etc.) |
| 3. Thickness | 7. Orifice Bore, or to be calculated by Flow-Lin |
| 4. Plate Material | 8. Drain or Vent hole if required |

MK-52



Line Size	150 #	300 #	600 #	900 #	1500 #	All Ratings				WEIGHT IN POUNDS - BLANK PLATE				
	O.D.	O.D.	O.D.	O.D.	O.D.	T	t	W	L	150 #	300 #	600 #	900 #	1500 #
1/2"	1.875	2.125	2.125	2.500	2.500	0.125	0.020	1.00	4.00	.2	.2	.2	.3	.3
3/4"	2.250	2.625	2.625	2.750	2.750	0.125	0.020	1.00	4.00	.3	.3	.3	.3	.3
1"	2.625	2.875	2.875	3.125	3.125	0.125	0.020	1.00	4.00	.3	.4	.4	.5	.5
1-1/2"	3.375	3.750	3.750	3.875	3.875	0.125	0.030	1.00	4.00	.5	.5	.5	.6	.6
2"	4.125	4.375	4.375	5.625	5.625	0.125	0.030	1.00	4.00	.6	.7	.7	1.0	1.0
2-1/2"	4.875	5.125	5.125	6.500	6.500	0.125	0.030	1.00	4.00	.8	.9	.9	1.3	1.3
3"	5.375	5.875	5.875	6.625	6.875	0.125	0.030	1.00	4.00	1.0	1.1	1.1	1.4	1.5
4"	6.875	7.125	7.625	8.125	8.250	0.125	0.060	1.00	4.00	1.5	1.6	1.8	2.0	2.1
5"	7.750	8.500	9.500	9.750	10.000	0.125	0.060	1.00	4.00	1.9	2.2	2.7	2.9	3.0
6"	8.750	9.875	10.500	11.375	11.125	0.125	0.060	1.00	4.00	2.4	3.0	3.4	3.9	3.7
8"	11.000	12.125	12.625	14.125	13.875	0.125	0.125	1.00	4.00	3.6	4.4	4.8	5.9	5.7
10"	13.375	14.250	15.750	17.125	17.125	0.125	0.125	1.00	4.00	5.3	6.0	7.3	8.6	8.6
12"	16.125	16.625	18.000	19.625	20.500	0.125	0.125	1.00	4.00	8.1	8.6	10.0	11.7	12.8
14"	17.750	19.125	19.375	20.500	22.75	0.125	0.125	1.00	4.00	11.0	11.7	13.0	14.2	20.7
16"	20.250	21.250	22.250	22.625	25.25	0.250	0.250	1.50	5.00	23.8	26.8	28.2	29.7	36.8
18"	21.625	23.500	24.125	25.125	27.75	0.250	0.250	1.50	5.00	27.5	32.3	34.0	36.8	38.5
20"	23.875	25.750	26.875	27.500	29.75	0.250	0.250	1.50	5.00	33.3	38.6	42.0	43.9	44.2
24"	28.250	30.500	31.125	33.000	35.50	0.250	0.250	1.50	5.00	47.2	53.9	56.0	62.9	63.2

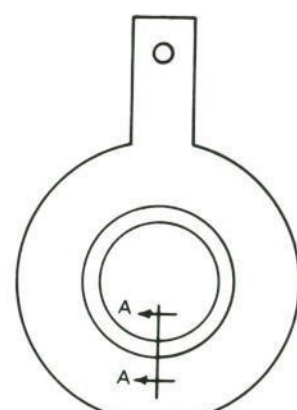
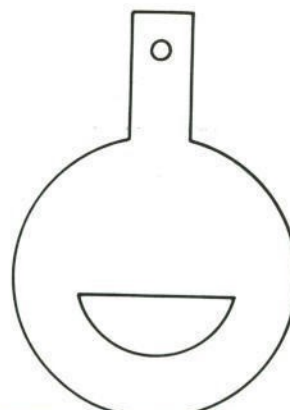
LARGER SIZE ORIFICE PLATES AVAILABLE ON REQUEST.

CONCENTRIC

ECCENTRIC

SEGMENTAL

QUADRANT EDGE



Section A-A

UNIVERSAL TYPE ORIFICE PLATES

FOR USE WITH RING JOINT ORIFICE PLATE HOLDERS

MK-50

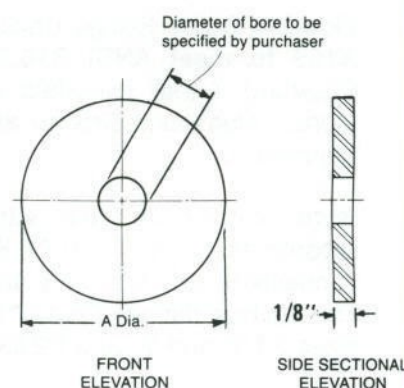
LINE SIZE	A	WEIGHT BLANK
1"	1.312"	0.05 #
1-1/2"	2.000"	0.15 #
2"	2.437"	0.20 #
2-1/2"	2.812"	0.30 #
3"	3.437"	0.35 #
4"	4.406"	0.60 #
6"	6.437"	1.20 #
8"	8.437"	2.00 #
10"	10.687"	3.25 #
12"	12.593"	4.50 #

Flow-Lin Universal Orifice Plates meet industry size standards and can be used interchangeable in orifice fitting up to 10" line size and in RTJ Plate Holders.

Each Flow-Lin universal plate is stamped with OUTLET, Line Size, Bore, Material and Tag No. near outer edge on downstream face.

When ordering please specify:

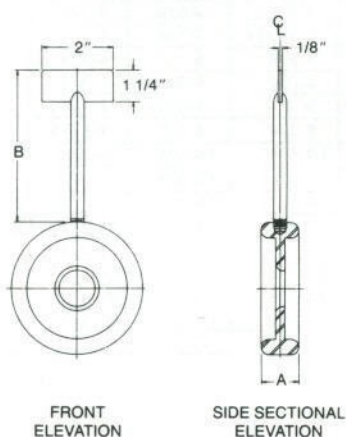
1. MK-50
2. Line Size
3. Bore Size
4. Material
5. Quantity
6. Tag No.



RING JOINT TYPE PLATE HOLDERS

FOR USE WITH RING JOINT TYPE ORIFICE FLANGES

MK-56

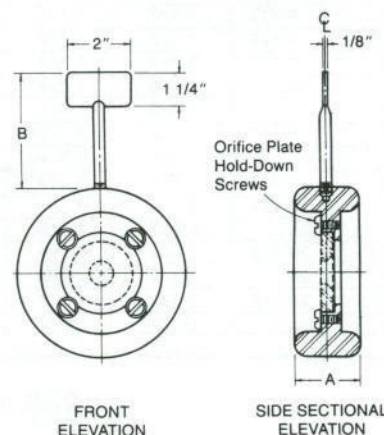


Flow-Lin MK-59 Plate Holders have hold-down screws to keep the MK-50 orifice plate in the holder, while MK-56 Holders are one-piece integral plateseals. The Oval Form is standard. Flow-Lin Plate Holders are available in mild steel, 304SS, 316SS and Monel.

When ordering please specify:

1. Model Number
2. Line Size
3. Flange Rating
4. Material
5. Bore size if MK56
6. Quantity

MK-59



DIMENSIONS AND A.P.I. RING NUMBERS

SIZE	300-600 LBS. ANSI			900 LBS. ANSI			1500 LBS. ANSI			2500 LBS. ANSI		
	A.P.I. Ring Nos.	A	B	A.P.I. Ring Nos.	A	B	A.P.I. Ring Nos.	A	B	A.P.I. Ring Nos.	A	B
1"	R-16	1"	5-1/4"	R-16	1"	5-1/4"	R-16	1"	5-1/4"	R-18	1"	5-1/4"
1-1/2"	R-20	1"	5-1/4"	R-20	1"	5-1/4"	R-20	1"	5-1/4"	R-23	1-1/16"	5-1/4"
2"	R-23	1-1/16"	5-1/4"	R-24	1-1/16"	5-1/4"	R-24	1-1/16"	5-1/4"	R-26	1-1/16"	5-1/4"
2-1/2"	R-26	1-1/16"	5-1/4"	R-27	1-1/16"	5-1/4"	R-27	1-1/16"	5-1/4"	R-28	1-3/16"	5-1/4"
3"	R-31	1-1/16"	5-1/4"	R-31	1-1/16"	5-1/4"	R-35	1-1/16"	5-1/4"	R-32	1-3/16"	6-1/4"
4"	R-37	1-1/16"	5-1/4"	R-37	1-1/16"	5-1/4"	R-39	1-1/16"	5-1/4"	R-38	1-5/16"	6-1/4"
5"	R-41	1-1/16"	6-1/4"	R-41	1-1/16"	6-1/4"	R-44	1-1/16"	6-1/4"	R-42	1-7/16"	7-1/4"
6"	R-45	1-1/16"	6-1/4"	R-45	1-1/16"	6-1/4"	R-46	1-1/8"	6-1/4"	R-47	1-7/16"	7-1/4"
8"	R-49	1-1/16"	6-1/4"	R-49	1-1/16"	6-1/4"	R-50	1-5/16"	6-1/4"	R-51	1-9/16"	7-1/4"
10"	R-53	1-1/16"	7-1/4"	R-53	1-1/16"	7-1/4"	R-54	1-5/16"	7-1/4"	R-55	1-7/8"	7-1/4"
12"	R-57	1-1/16"	7-1/4"	R-57	1-1/16"	7-1/4"	R-58	1-9/16"	7-1/4"	R-60	2"	9-1/4"

ORIFICE FLANGE UNIONS

Flow-Lin Orifice Flange Unions are furnished in ASTM A105 to meet ANSI B16.36 Steel Orifice Flange Standard. Other materials such as 304SS, 316SS, Monel, Aluminum, Bronze and PVC are available as required.

Bore tolerances are within AGA and ASME recommendations for 0.75 Beta Ratio. Pressure tap connections are 1/2" NPT and 180° apart as standard. The tap hole diameter is 1/4" for sizes up to 2", 3/8" for sizes 2-1/2" and 3", and 1/2" for sizes 4" and over.

Each Flow-Lin Flange Union is supplied with:

Stud Bolts - ASTM A193 GR.B7
Nuts - ASTM A194 GR.2H
Jackscrews (2) - ASTM A307
Gaskets (2) - 1/16" Thick
Pipe Plugs (4) - Hex Head Forged Steel

When ordering please specify:

1. Line size and pipe schedule
2. Flange type and rating
3. Flange Material
4. Tap connections if not 1/2" NPT

300# ORIFICE FLANGE UNION DIMENSIONS

Line	A.O.D.	B. Flange	Y Flange	C	D	D1	E	E1	E2	F	F1	Face	G
Size	Flange	Thickness	Thickness	Thickness	Bore	Bore	Length	Length	Length	Dia	Dia	Dia	Dia
1/2"	3-3/4	1-1/2	1-1/4	1/16		.88	3	1-13/16	3	.84	1-1/2	1-3/8	1-11/32
1 "	4-7/8	1-1/2	1-1/4	1/16		1.36	3-1/4	1- 7/8	3	1.32	2-1/8	2	2
1-1/4"	5-1/4	1-1/2	1-1/4	1/16		1.70	3-5/16	1-13/16	3-1/16	1.66	2-1/2	2-1/2	2-3/8
1-1/2"	6-1/8	1-1/2	1-1/4	1/16		1.95	3-3/8	1-7/8	3-1/8	1.90	2-3/4	2-7/8	2-11/16
2 "	6-1/2	1-1/2	1-1/4	1/16		2.44	3-3/8	1-15/16	3-1/8	2.38	3-5/16	3-5/8	3-1/4
2-1/2"	7-1/2	1-1/2	1-1/4	1/16		2.94	3-1/2	2	3-1/4	2.88	3-15/16	4-1/8	4
3 "	8-1/4	1-1/2	1-1/4	1/16		3.57	3-1/2	2-1/16	3-1/4	3.50	4-5/8	5	4-7/8
4 "	10	1-1/2	1-1/4	1/16		4.57	3-5/8	2-1/8	3-3/8	4.50	5-3/4	6-3/16	5-7/8
5 "	11	1-1/2	1-3/8	1/16		5.66	4	2-1/8	3-7/8	5.56	7	7-5/16	7-1/8
6 "	12-1/2	1-1/2	1-7/16	1/16		6.72	3-15/16	2-1/8	3-7/8	6.63	8-1/8	8-1/2	8-5/16
8 "	15	1-5/8	1-5/8	1/16		8.72	4-3/8	2-7/16	4-3/8	8.63	10-1/4	10-5/8	10-5/8
10 "	17-1/2	1-7/8	1-7/8	1/16		10.88	4-5/8	2-5/8	4-5/8	10.75	12-5/8	12-3/4	12-3/4
12 "	20-1/2	2	2	1/16		12.88	5-1/8	2-7/8	5-1/8	12.75	14-3/4	15	15
14 "	23	2-1/8	2-1/8	1/16		14.14	5-5/8	3	5-5/8	14.00	16-3/4	16-1/4	16-1/2
16 "	25-1/2	2-1/4	2-1/4	1/16		16.16	5-3/4	3-1/4	5-3/4	16.00	19	18-1/2	18-1/2
18 "	28	2-3/8	2-3/8	1/16		18.18	6-1/4	3-1/2	6-1/4	18.00	21	21	21
20 "	30-1/2	2-1/2	2-1/2	1/16		20.20	6-3/8	3-3/4	6-3/8	20.00	23-1/8	23	23
24 "	36	2-3/4	2-3/4	1/16		24.25	6-5/8	4-3/16	6-5/8	24.00	27-5/8	27-1/4	27-1/4

Per Customer Specifications

600# ORIFICE FLANGE UNION DIMENSIONS

Line	A.O.D.	B. Flange	Y Flange	C	D	D1	E	E1	E2	F	F1	Face	G
Size	Flange	Thickness	Thickness	Thickness	Bore	Bore	Length	Length	Length	Dia	Dia	Dia	Dia
1/2"	3-3/4	1-1/2	1-1/4	1/16		.88	3	1-13/16	3	.84	1-1/2	1-3/8	1-11/32
1 "	4-7/8	1-1/2	1-1/4	1/16		1.36	3-1/4	1-7/8	3	1.32	2-1/8	2	2
1-1/4"	5-1/4	1-1/2	1-1/4	1/16		1.70	3-15/16	1-13/16	3-1/16	1.66	2-1/2	2-1/2	2-3/8
1-1/2"	6-1/8	1-1/2	1-1/4	1/16		1.95	3-3/8	1-7/8	3-1/8	1.90	2-3/4	2-7/8	2-11/16
2 "	6-1/2	1-1/2	1-1/4	1/16		2.44	3-3/8	1-15/16	3-1/8	2.38	3-5/16	3-5/8	3-1/4
2-1/2"	7-1/2	1-1/2	1-1/4	1/16		2.94	3-1/2	2	3-1/4	2.88	3-15/16	4-1/8	4
3 "	8-1/4	1-1/2	1-1/4	1/16		3.57	3-1/2	2-1/16	3-1/4	3.50	4-5/8	5	4-7/8
4 "	10-3/4	1-3/4	1-1/2	1/4		4.57	4-1/4	2-3/8	4	4.50	6	6-3/16	5-7/8
5 "	13	2	1-3/4	1/4		5.66	4-3/4	2-5/8	4-1/2	5.56	7-7/16	7-5/16	7-1/8
6 "	14	2-1/8	1-7/8	1/4		6.72	4-7/8	2-7/8	4-5/8	6.63	8-3/4	8-1/2	8-5/16
8 "	16-1/2	2-7/16	2-3/16	1/4		8.72	5-1/2	3-1/4	5-1/4	8.63	10-3/4	10-5/8	10-5/8
10 "	20	2-3/4	2-1/2	1/4		10.88	6-1/4	3-5/8	6	10.75	13-1/2	12-3/4	12-3/4
12 "	22	2-7/8	2-5/8	1/4		12.88	6-3/8	3-7/8	6-1/8	12.75	15-3/4	15	15
14 "	23-3/4	3	2-3/4	1/4		14.14	6-3/4	3-15/16	6-9/16	14.00	17	16-1/4	16-1/2
16 "	27	3-1/4	3	1/4		16.16	7-1/4	4-7/16	7-1/16	16.00	19-1/2	18-1/2	18-1/2
18 "	29-1/4	3-1/2	3-1/4	1/4		18.18	7-1/2	4-7/8	7-15/16	18.00	21-1/2	21	21
20 "	32	3-3/4	3-1/2	1/4		20.20	7-3/4	5-1/4	7-5/8	20.00	24	23	23
24 "	37	4-1/4	4	1/4		24.25	8-1/4	5-3/4	8-3/16	24.00	28-1/4	27-1/4	27-1/4

Per Customer Specifications



Notes:

1. Stud Lengths for RFWN, RFSO and RFTHD Unions.
2. Stud Lengths for RTJ Unions.
3. Weight (lbs) for RFWN and RTJ Unions.
4. Weight (lbs) for RFSO and RFTHD Unions.

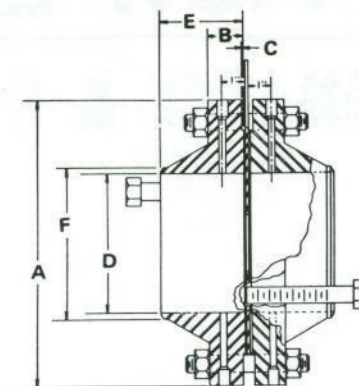
300 LB.

STUDS					Weight	Weight
No.			Lgth.	Lgth	Approx.	Approx.
Holes	Dia.	Circle	Note 1	Note 2	Note 3	Note 4
4	1/2	2-5/8	5	5	14	8
4	5/8	3-1/2	5	5-1/4	18	11
4	5/8	3-7/8	5	5-1/4	20	14
4	3/4	4-1/2	5-1/4	5-1/2	25	18
8	5/8	5	5	5-1/4	27	19
8	3/4	5-7/8	5-1/4	6	35	28
8	3/4	6-5/8	5-1/4	6	43	34
8	3/4	7-7/8	5-1/4	6	66	59
8	3/4	9-1/4	5-1/4	6	78	88
12	3/4	10-5/8	5-1/4	6	106	102
12	7/8	13	5-3/4	6-1/2	152	152
16	1	15-1/4	6-1/2	7-1/2	319	224
16	1-1/8	17-3/4	7	7-3/4	444	315
20	1-1/8	20-1/4	7-1/2	8	520	434
20	1-1/4	22-1/2	7-3/4	8-1/2	672	570
24	1-1/4	24-3/4	8-1/4	9	835	697
24	1-1/4	27	8-1/2	10	995	853
24	1-1/2	32	9-1/2	11	1460	1335

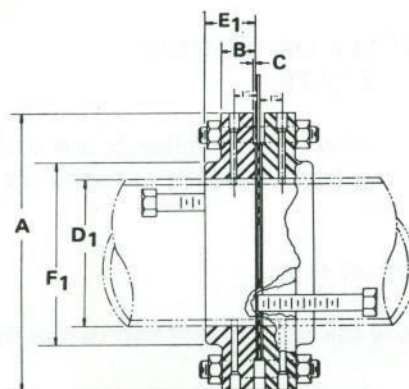
600 LB.

STUDS					Weight	Weight
No.			Lgth.	Lgth	Approx.	Approx.
Holes	Dia.	Circle	Note 1	Note 2	Note 3	Note 4
4	1/2	2-5/8	5	5	14	9
4	5/8	3-1/2	5	5-1/4	18	13
4	5/8	3-7/8	5	5-1/4	20	15
4	3/4	4-1/2	5-1/4	5-1/2	25	19
8	5/8	5	5	5-1/4	27	23
8	3/4	5-7/8	5-1/4	5-1/2	35	34
8	3/4	6-5/8	5-1/4	5-1/2	56	40
8	7/8	8-1/2	6	6-1/4	99	104
8	1	10-1/2	6-1/2	7	158	156
12	1	11-1/2	7	7-1/2	197	200
12	1-1/8	13-3/4	8	8-1/2	284	270
16	1-1/4	17	8-3/4	9	472	410
20	1-1/4	19-1/4	9	9-1/2	571	489
20	1-3/8	20-3/4	9-3/4	9-3/4	720	576
20	1-1/2	23-3/4	10-1/2	10-1/2	997	810
20	1-5/8	25-3/4	11-1/4	11-1/4	1155	991
24	1-5/8	28-1/2	11-3/4	12	1439	1259
24	1-7/8	33	13-1/4	13-1/2	2032	1815

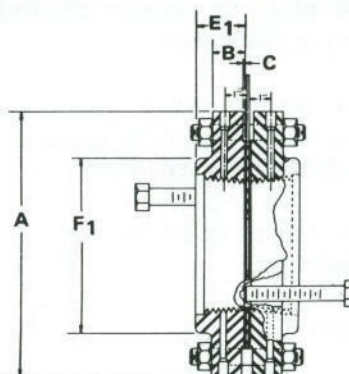
RFWN ORIFICE FLANGE UNION



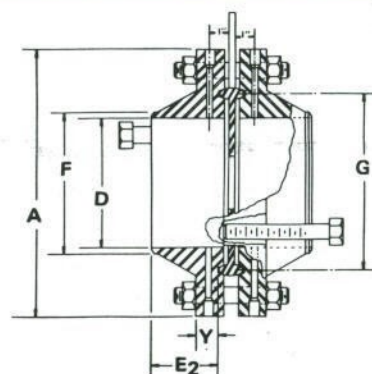
RFSO ORIFICE FLANGE UNION



RFTHD ORIFICE FLANGE UNION



RTJ ORIFICE FLANGE UNION

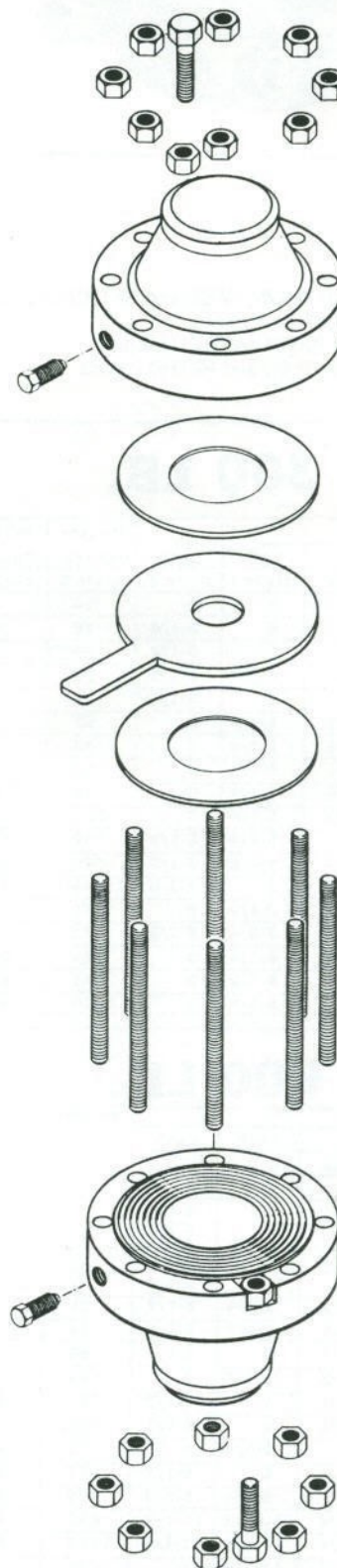


Flow-Lin CORPORATION

MAINTENANCE & INSTALLATION INSTRUCTIONS

TO INSTALL OR REMOVE ORIFICE PLATE:

1. Make certain the pipeline is not under pressure and has been properly drained or purged as required.
2. Loosen all studs.
3. Remove the studs in one half of the flange union.
4. Spread flange union by turning jackscrews clockwise.
5. Install new plate or remove existing plate for replacement or inspection.
6. Install new gaskets when installing plate. We recommend installing new gaskets each time orifice flange union is separated.
7. Release the flange union by turning jackscrews counter clockwise.
8. Replace studs.
9. Tighten studs starting with two studs opposite each other.



ORIFICE BORE CALCULATION

 * FLOW-LIN CALCULATION (ASME MFC-3M-2004) *
 * CONCENTRIC SHARP EDGE ORIFICE PLATE *

CUSTOMER NAME: ABC INSTRUMENT COMPANY
 PURCHASE ORDER NO.: 10-0110
 TAG NO.: FE-1098

CAL.NO.: BC-24000-1
 DATE: 10-07-2010
 ENTERED BY: *Klin*

OPERATING CONDITIONS:

UPSTREAM PIPE I.D. AT 68 DEG.F (INCHES)	7.981
DIFFERENTIAL PRESSURE AT MAX. FLOW (INCH. WATER)	100.0000
MAXIMUM FLOW RATE (LB/HR)	40,000.00
NORMAL FLOW RATE (LB/HR)	30,000.00
FLOWING PRESSURE (P.S.I.G.)	150.000
FLOWING TEMPERATURE (DEG. F) (SATURATED)	365.869
BAROMETRIC PRESSURE (P.S.I.A)	14.700
DENSITY OF DRY STEAM (LBm/CU-FT)	0.3628
PERCENT OF MOISTURE	0.00
VISCOSITY AT FLOW CONDITIONS (CENTIPOISES)	0.0153
FLOWING FLUID	STEAM
ORIFICE PLATE MATERIAL	316SS
UPSTREAM PIPE MATERIAL	CARBON STEEL
PRESSURE TAP LOCATIONS	FLANGE
STATIC PRESSURE TAP LOCATION	UPSTREAM

CALCULATION DETAILS:

$$Q_m = 0.09970190 \times C \times Y \times d \times d \times F_a \times \text{SQR} [H_w \times D_f / (1 - B^4)]$$

Qm : MAXIMUM MASS FLOW RATE (LBm/SEC)	11.1111
C : DISCHARGE COEFFICIENT, EQ.(2-4) (2-5)	0.6044
Fa : THERMAL EXPANSION CORRECTION FACTOR	1.0061
Y : EXPANSION FACTOR OF FLOWING FLUID, EQ.(2-6)	0.9960
Hw : MAXIMUM DIFFERENTIAL PRESSURE (INCH. WATER)	100.0000
Df : DENSITY OF FLOWING FLUID (LBm/CU-FT)	0.3628
V : MAXIMUM MEAN VELOCITY IN THE PIPE (FT/SEC)	88.1492
Rn : PIPE REYNOLDS NUMBER AT NORMAL FLOW	1,555,329

B : BETA RATIO (BORE / PIPE I.D.)	0.65761
d : ORIFICE BORE DIAMETER (INCHES)	5.2484

FLOW RATE (LB/HR) = 4,000.00 x SQ. ROOT (DIFF. INCH. WATER)

DIFFERENTIAL PRESSURE AT NORMAL FLOW (INCH. WATER)	56.2500
PERMANENT PRESSURE LOSS AT MAX. FLOW (PSI) EQ.(2-9)	2.035
PERMANENT PRESSURE LOSS AT NORMAL FLOW (PSI)	1.145
DRAIN HOLE DIAMETER = 3/16 INCH.	
HOLE CENTER TO ORIFICE BORE EDGE = 1.273 INCH.	

REFERENCE: AMERICAN NATIONAL STANDARD ASME MFC-3M-2004, MFC-3Ma-2007

E-MAIL SALES@FLOWLIN.COM : PH.817-478-0808 : FAX 817-478-7954

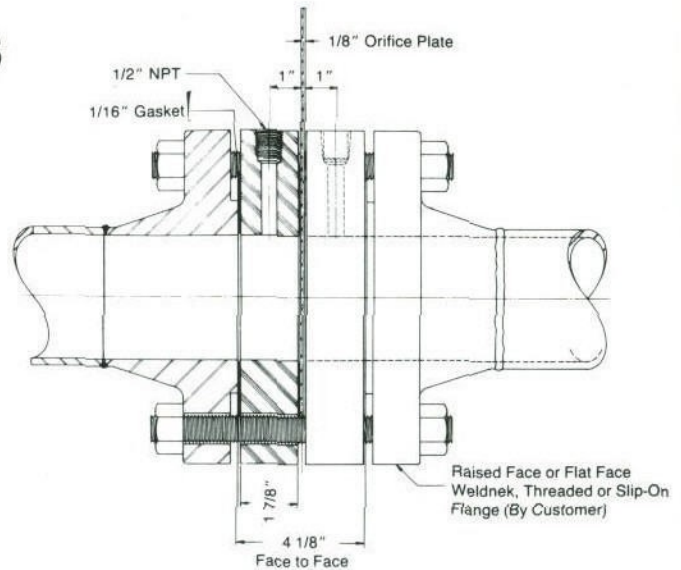
ORIFICE HOLDING BLOCKS

Flow Lin Orifice Holding Blocks are available in PVC, Teflon and other materials suitable for use in severe or caustic applications. They are used between 150# ANSI flanges.

For sizes up to 3", the holding block O.D. equals flange O.D. and bolt holes are included. For sizes 4" and over, the holding block O.D. equal orifice plate O.D. and bolt holes are not included.

When ordering please specify:

1. Material
2. Line size
3. Flange I.D.
4. Hardware if required



Flow-Lin CORPORATION

P. O. Box 171197
Arlington, Texas 76003

Phone (817) 478-0808

Dallas-Fort Worth Area

Fax (817) 478-7954