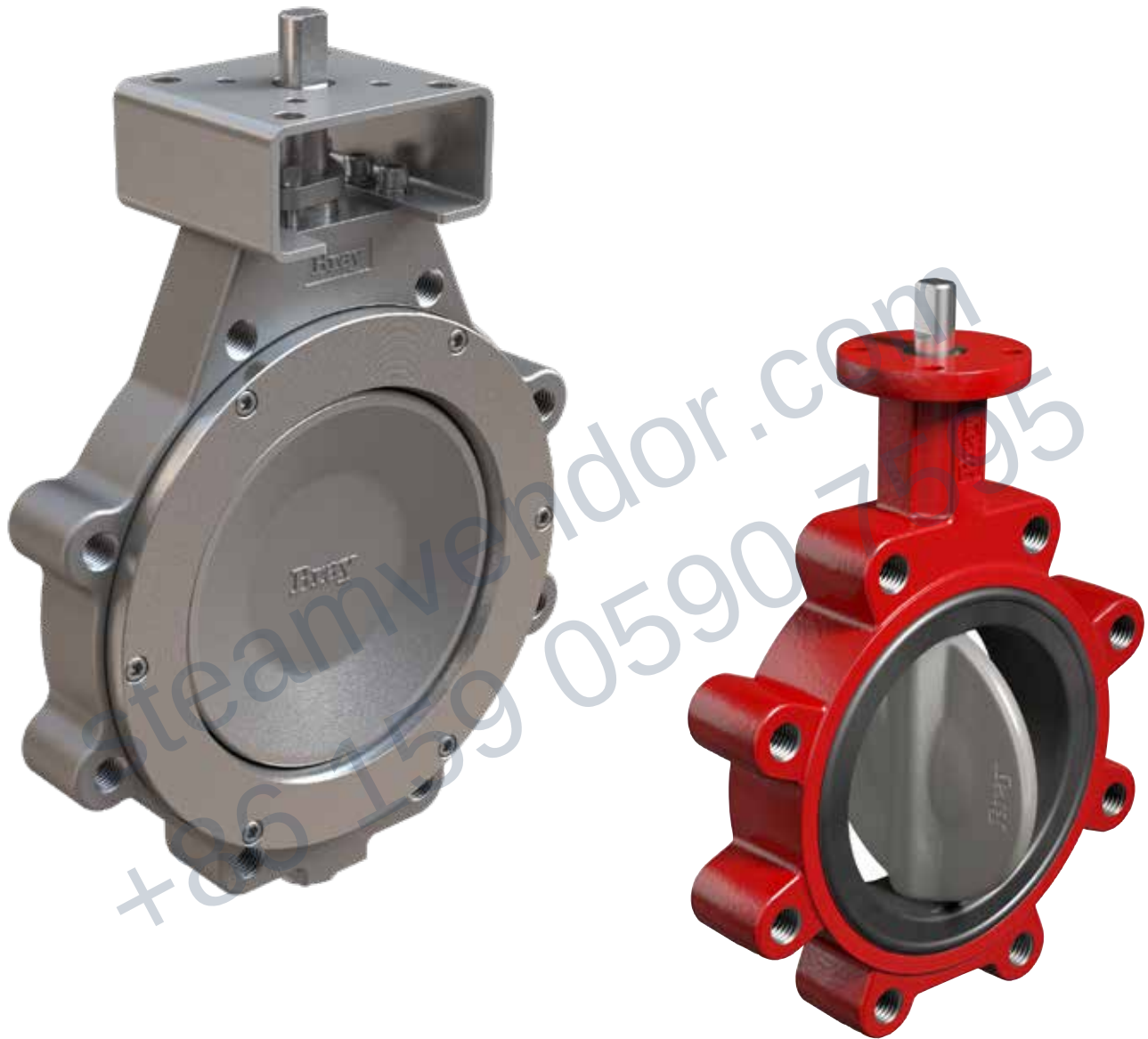


RESILIENT SEATED AND DOUBLE OFFSET VALVES
TYPICAL FLANGE BOLTING without Washers

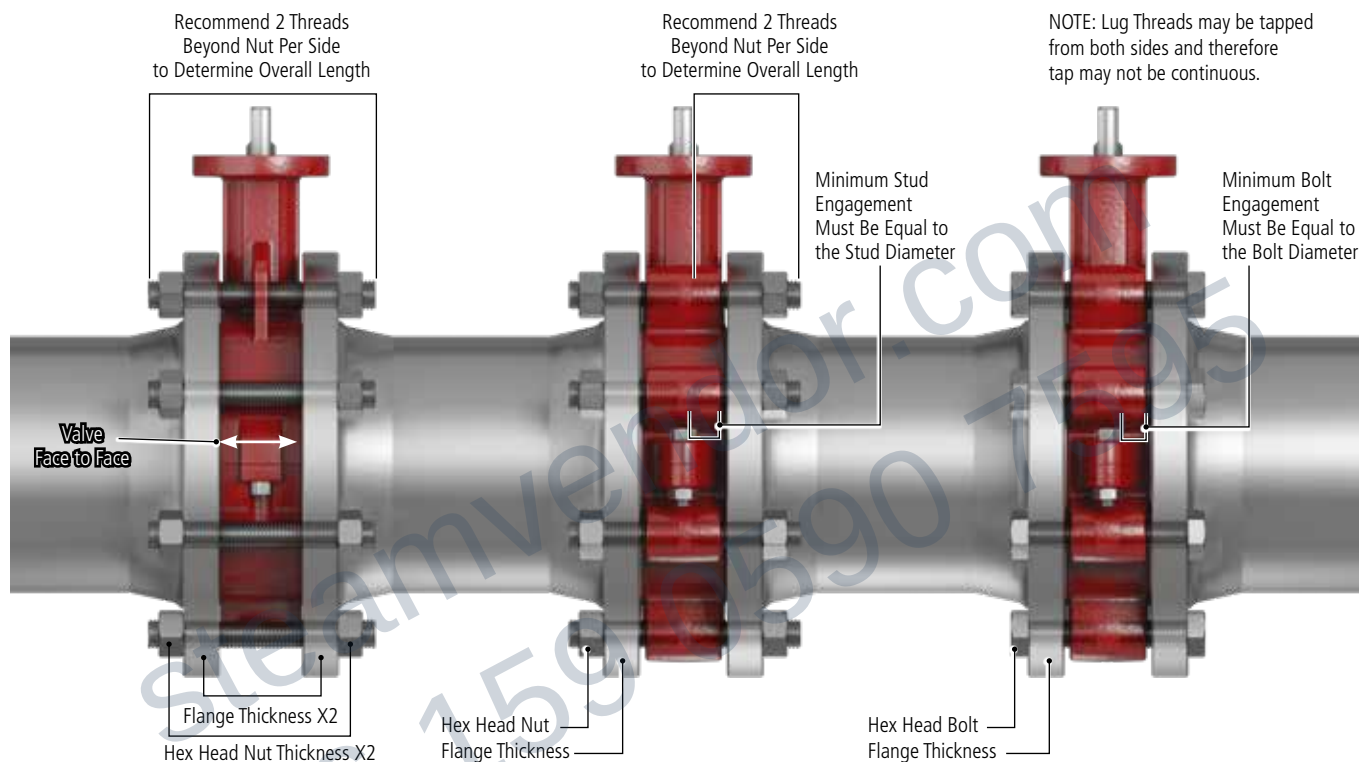


Examples of Typical Valve to Flange Bolting without Washers

When bolting the valve into the line, use standard bolting torque as recommended by applicable piping standards. Additional force from the flange bolts is not required. Minimum bolt engagement must be equal to the diameter of the bolt.

CAUTION: To ensure proper installation refer to appropriate table within this guide for specific valve drilling information.

NOTES: Double flange style bolting not shown. Lug Threads may be tapped from both sides and therefore tap may not be continuous.

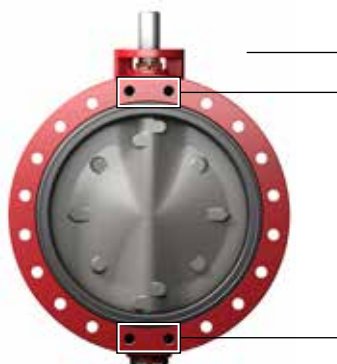


Wafer Valve

Through Stud Length

Valve Face to Face	+	Flange Thickness X2	+	Nut Thickness X2	=	Length of Stud (Plus 2 Threads for Studs)
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FLANGES WITH RAISED FACES - ADD IN THE THICKNESS OF THE RAISED FACE



CAUTION:
Tapped holes at neck locations **DO NOT** permit thru holes.

Lug Valve

Hex Head Bolt Length

Flange Thickness	+	Minimum Bolt Engagement Equal to the Bolt Diameter	=	Length of Bolt
------------------	---	--	---	----------------

Stud Length

Nut Thickness	+	Flange Thickness	+	Minimum Stud Engagement Equal to the Stud Diameter	=	Length of Stud (Plus 2 Threads for Studs)
---------------	---	------------------	---	--	---	---

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION
Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 or ASME B 16.47 Class A.

Note:

Bray Controls is issuing these recommendations only as a guide to installation. This recommendation is based on the full compliance of all materials supplied to their appropriate specifications. Since many of the components are not manufactured by Bray we can take no responsibility for any damage caused during installation.

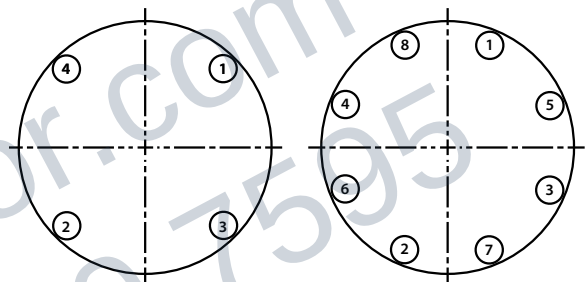
S20/21, S22/23, S30/31, S32/33, S35/36 Recommended Flange Torques

Flange Size Range		Fastener Size		Recommended Torques*	
in	mm	in	mm	lb-ft	Nm
2" - 4"	50-100	5/8	16	35	50
5" - 8"	125-200	3/4	19	45	60
10" - 12"	250-300	7/8	22	75	100
14" - 16"	350-400	1	25	110	150
18" - 20"	450-500	1 1/8	29	200	270
22" - 30"	550-750	1 1/4	32	250	340
32" - 48"	800-1200	1 1/2	38	430	585
52" - 72"	1300-1800	1 3/4	45	715	970
84"	2200	2	51	1175	1595
90" - 96"	2250-2400	2 1/4	57	1675	2270

* Assumes well lubricated fastener selected to a grade sufficiently strong for the corresponding torque rating. Torque value is a general recommendation. Specific applications may require additional torque on flange fastener. Do not exceed 110% of recommended value.

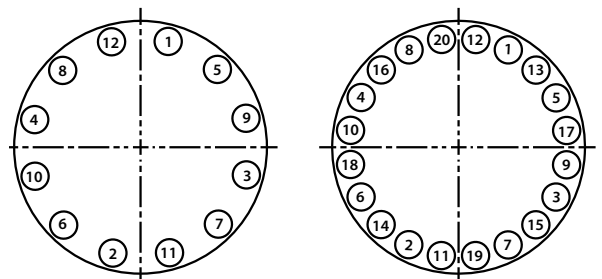
FIGURE 1

4 Bolt and 8 Bolt Flanges



- Lubricate, hand tighten, then SNUG up bolts
- **Round 1** - Tighten to 25% of final torque
- **Round 2** - Tighten to 50% of final torque
- **Round 3** - Tighten to 100% of final torque

12 Bolt Flanges and Above



- Lubricate, hand tighten, then SNUG up bolts
- **Round 1** - Tighten to 20% of final torque
- **Round 2** - Tighten to 40% of final torque
- **Round 3** - Tighten to 80% of final torque
- **Round 4** - Tighten to 100% of final torque

NOTES:

Refer to Bray Resilient BFV Technical Manual for additional flange bolt tensioning data.

For Series 4X, refer to gasket manufacturers recommended fastener torque.

Do not exceed flange manufacturers' recommended fastener torque.

Tighten in star pattern, progressively increasing fastener torque as per **Figure 1**.

SERIES 20 | WAFER


Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
1	25	½-13UNC	3.75	95	4
1½	30	½-13UNC	4.00	102	4
2	50	⅝-11UNC	4.75	121	4
2½	65	⅝-11UNC	5.25	133	4
3	80	⅝-11UNC	5.25	133	4
4	100	⅝-11UNC	5.50	140	8
5	125	¾-10UNC	6.00	152	8
6	150	¾-10UNC	6.00	152	8
8	200	¾-10UNC	6.75	171	8
10	250	⅞-9UNC	7.25	184	12
12	300	⅞-9UNC	7.75	197	12
14	350	1-8UNC	8.25	210	12
16	400	1-8UNC	9.50	241	16
18	450	1⅛-7UNC	10.25	260	16
20	500	1⅛-7UNC	11.25	286	20

SERIES 21 | LUG


Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
1	25	½-13UNC	2.00	51	8
1½	30	½-13UNC	2.00	51	8
2	50	⅝-11UNC	2.50	64	8
2½	65	⅝-11UNC	2.50	64	8
3	80	⅝-11UNC	2.50	64	8
4	100	⅝-11UNC	2.50	64	16
5	125	¾-10UNC	2.75	70	16
6	150	¾-10UNC	3.00	76	16
8	200	¾-10UNC	3.00	76	16
10	250	⅞-9UNC	3.50	89	24
12	300	⅞-9UNC	3.50	89	24
14	350	1-8UNC	4.00	102	24
16	400	1-8UNC	4.50	114	32
18	450	1⅛-7UNC	4.50	114	32
20	500	1⅛-7UNC	5.00	127	40

OR

Hex Head Bolts		
in	mm	Qty
1.00	25	8
1.25	32	8
1.50	38	8
1.50	38	8
1.75	44	8
1.75	44	16
1.75	44	16
1.75	44	16
2.00	51	16
2.25	57	24
2.50	64	24
2.75	70	24
2.75	70	32
3.25	83	32
3.75	95	40

Dead end Service requires half the number of bolts and nuts

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest ¼" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 Class 150.


SERIES 22 | WAFER

Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	5.00	127	4
2½	65	5/8-11UNC	5.25	133	4
3	80	5/8-11UNC	5.50	140	4
4	100	5/8-11UNC	5.50	140	8
6	150	¾-10UNC	6.25	159	8
8	200	¾-10UNC	6.50	165	8
10	250	7/8-9UNC	7.25	184	12
12	300	7/8-9UNC	7.75	197	12
14	350	1-8UNC	8.50	216	12
16	400	1-8UNC	9.50	241	16
18	450	1 1/8-7UNC	10.50	267	16
20	500	1 1/8-7UNC	11.25	286	20
24	600	1 1/4-7UNC	12.75	324	12
		Blind Bolts	5.00	127	16


SERIES 23 | LUG

Valve Size		Diameter/Thread	Studs			OR	Hex Head Bolts		
in	mm		in	mm	Qty		in	mm	Qty
2	50	5/8-11UNC	2.50	64	8		1.50	38	8
2½	65	5/8-11UNC	2.75	70	8		1.75	44	8
3	80	5/8-11UNC	2.75	70	8		1.75	44	8
4	100	5/8-11UNC	2.75	70	16		1.75	44	8
6	150	¾-10 UNC	3.00	76	16		2.00	51	16
8	200	¾-10UNC	3.25	83	16		2.25	57	16
10	250	7/8-9UNC	3.50	89	24		2.50	64	24
12	300	7/8-9UNC	3.75	95	24		2.50	64	24
14	350	1-8UNC	4.00	102	24		2.75	70	24
16	400	1-8UNC	4.25	108	32		3.00	76	32
18	450	1 1/8-7UNC	4.75	121	32		3.50	89	32
20	500	1 1/8-7UNC	5.25	133	40		3.75	95	40
24	600	1 1/4-7UNC	6.50	165	24		3.75	95	24
		Blind Bolts	5.00	127	16		3.50	89	16

Dead end Service requires half the number of bolts and nuts

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 Class 150.


SERIES 30 | WAFER

Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	5.00	127	4
2½	65	5/8-11UNC	5.50	140	4
3	80	5/8-11UNC	5.25	133	4
4	100	5/8-11UNC	5.50	140	8
5	125	¾-10UNC	6.00	152	8
6	150	¾-10UNC	6.00	152	8
8	200	¾-10UNC	6.75	171	8
10	250	7/8-9UNC	7.25	184	12
12	300	7/8-9UNC	7.75	197	12
14	350	1-8UNC	8.25	210	12
16	400	1-8UNC	9.50	241	16
18	450	1½-7UNC	10.25	260	16
20	500	1½-7UNC	11.25	286	20


SERIES 31 | LUG

Valve Size		Diameter/Thread	Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	2.50	64	8
2½	65	5/8-11UNC	2.50	64	8
3	80	5/8-11UNC	2.50	64	8
4	100	5/8-11UNC	2.50	64	16
5	125	¾-10UNC	2.75	70	16
6	150	¾-10UNC	3.00	76	16
8	200	¾-10UNC	3.00	76	16
10	250	7/8-9UNC	3.50	89	24
12	300	7/8-9UNC	3.50	89	24
14	350	1-8UNC	4.00	102	24
16	400	1-8UNC	4.25	108	32
18	450	1½-7UNC	4.50	114	32
20	500	1½-7UNC	5.25	133	32
		Blind Bolts	4.25	108	8

OR

Hex Head Bolts		
in	mm	Qty
1.50	38	8
1.50	38	8
1.75	44	8
1.75	44	16
1.75	44	16
2.00	51	16
2.00	51	16
2.25	57	24
2.50	64	24
2.75	70	24
3.00	76	32
3.25	83	32
3.75	95	32
3.00	76	8

Dead end Service requires half the number of bolts and nuts

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION
Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 Class 150.


SERIES 32/33 | WAFER

Valve Size		Diameter/Thread	Studs			OR	Blind Studs		
in	mm		in	mm	Qty		in	mm	Qty
24	600	1¼-7UNC	12.75	324	20		N/A	N/A	N/A
26	650	1¼-7UNC	15.00	381	20		5.50	140	8
28	700	1¼-7UNC	15.00	381	24		5.75	146	8
30	750	1¼-7UNC	15.50	394	24		5.75	146	8
32	800	1½-6UNC	17.50	445	24		6.50	165	8
36	900	1½-6UNC	18.50	470	28		7.00	178	8

SERIES 35/36 | DOUBLE FLANGE

Valve Size		Diameter/Thread	Studs			Hex Head Bolts			AND	Blind Studs			Blind Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty		in	mm	Qty	in	mm	Qty
22	550	1¼-7UNC	6.25	159	32	4.50	114	32		4.50	114	8	3.25	83	8
24	600	1¼-7UNC	6.25	159	32	4.75	121	32		4.50	114	8	3.25	83	8
26	650	1¼-7UNC	7.00	178	40	5.75	146	40		5.50	140	8	4.00	102	8
28	700	1¼-7UNC	7.25	184	48	6.00	152	48		5.50	140	8	4.25	108	8
30	750	1¼-7UNC	7.50	191	48	6.00	152	48		5.75	146	8	4.25	108	8
32	800	1½-6UNC	8.50	216	48	6.75	171	48		6.50	165	8	4.50	114	8
34	850	1½-6UNC	8.75	222	56	7.00	178	56		6.50	165	8	4.75	121	8
36	900	1½-6UNC	9.00	229	56	7.25	184	56		6.75	171	8	5.00	127	8
40	1000	1½-6UNC	9.00	229	64	7.25	184	64		6.75	171	8	5.00	127	8
42	1050	1½-6UNC	9.75	248	64	8.25	210	64		7.00	178	8	5.50	140	8
44	1100	1½-6UNC	10.00	254	72	8.50	216	72		7.25	184	8	5.50	140	8
46	1150	1½-6UNC	10.25	260	72	8.50	216	72		7.25	184	8	5.75	146	8
48	1200	1½-6UNC	10.25	260	80	8.75	222	80		7.50	191	8	5.75	146	8
52	1300	1¾-8UN	11.50	292	80	9.75	248	80		8.25	210	8	6.50	165	8
54	1350	1¾-8UN	11.75	298	80	10.00	254	80		8.50	216	8	6.50	165	8
60	1500	1¾-8UN	12.25	311	96	10.50	267	96		9.00	229	8	7.00	178	8
66	1650	1¾-8UN	9.75	248	96	8.00	203	96		6.25	159	8	4.50	114	8
72	1800	1¾-8UN	10.25	260	104	8.25	210	104		6.50	165	16	4.50	114	16
78	2000	2-8UN	11.00	279	112	8.75	222	112		7.25	184	16	5.00	127	16
84	2200	2-8UN	11.00	279	112	9.00	229	112		7.25	184	16	5.00	127	16
90	2250	2¼-8UN	12.00	305	120	9.75	248	120		7.75	197	16	5.50	140	16
96	2400	2¼-8UN	12.75	324	120	10.50	267	120		8.00	203	16	5.75	146	16


Blind Bolts

CAUTION: Tapped holes at neck locations **DO NOT** permit thru holes.

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

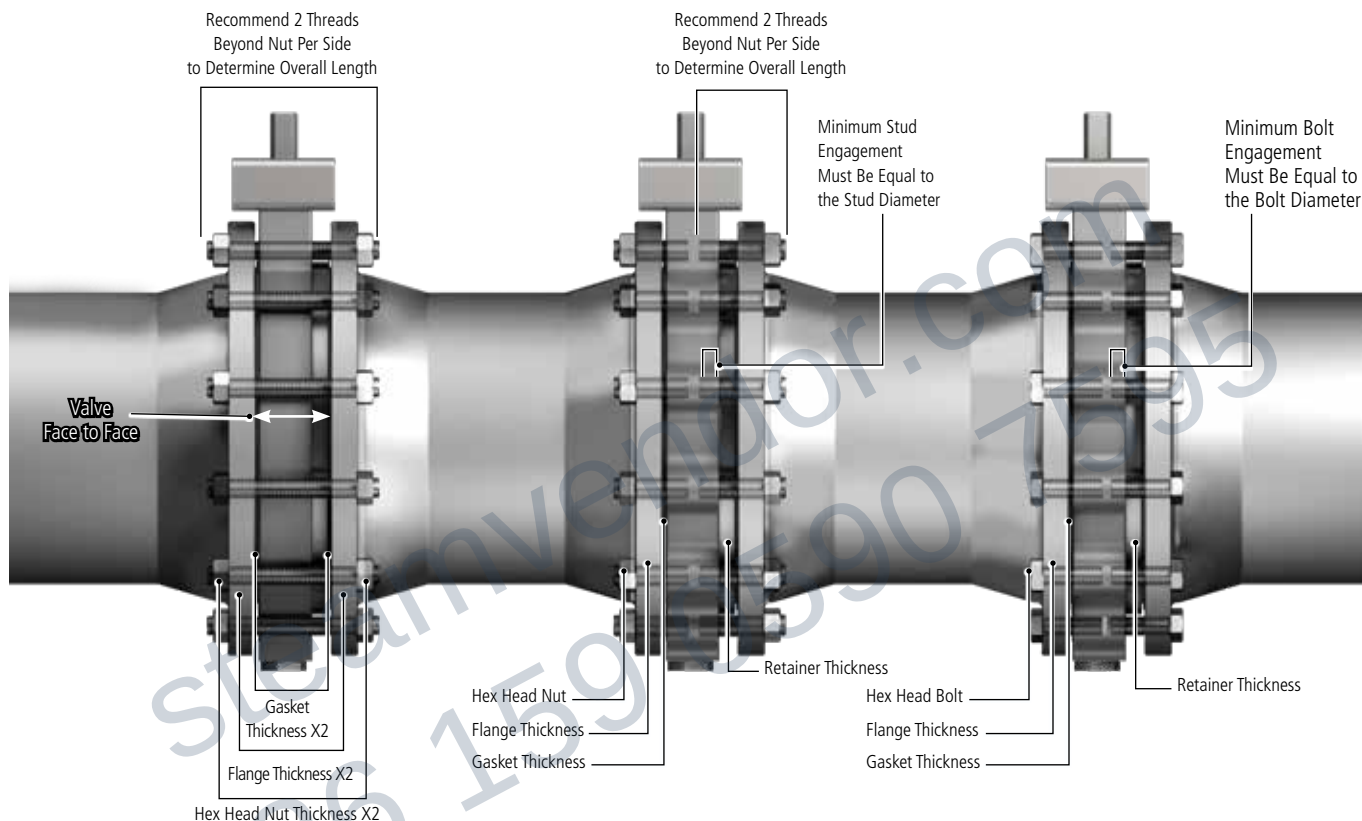
Flange thickness as per ASME B16.47 Class 150 Series A, sizes 66" - 96" per AWWA C207 Class D.

Examples of Typical Valve to Flange Bolting without Washers

When bolting the valve into the line, use standard bolting torque as recommended by applicable piping standards. Additional force from the flange bolts is not required. Minimum bolt engagement must be equal to the diameter of the bolt.

CAUTION: To ensure proper installation refer to appropriate table within this guide for specific valve drilling information.

NOTES: Double flange style bolting not shown. Lug Threads may be tapped from both sides and therefore tap may not be continuous.



Wafer Valve

Through Stud Length

Valve Face to Face	+	Gasket Thickness X2	+	Flange Thickness X2	+	Nut Thickness X2	=	Length of Stud (Plus 2 Threads for Studs)
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Lug Valve

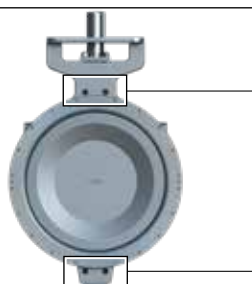
Hex Head Bolt Length

Flange Thickness	+	Gasket Thickness	+	Minimum Bolt Engagement of One Bolt Diameter	+	Seat Retainer Ring Raised Face (Only for Retainer Ring Side)	=	Length of Bolt
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**FLANGES WITH RAISED FACES -
ADD IN THE THICKNESS OF
THE RAISED FACE**

Stud Length

Nut Thickness	+	Flange Thickness	+	Gasket Thickness	+	Minimum Stud Engagement of One Stud Diameter	+	Seat Retainer Ring Raised Face (Only for Retainer Ring Side)	=	Length of Stud (Plus 2 Threads for Studs)
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CAUTION:
Tapped holes at neck locations **DO NOT** permit thru holes.

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 or ASME B16.47 Series A.

Gasket thickness .175".

Raised Face - .06".



Series 40 Typical Wafer



Series 41 Typical Lug

SERIES 40 CLASS 150 | WAFER

Valve Size		Diameter/Thread	 Studs		
in	mm		in	mm	Qty
2	50	5/8-11UNC	5.25	133	4
2½	65	5/8-11UNC	5.75	146	4
3	80	5/8-11UNC	5.75	146	4
4	100	5/8-11UNC	6.00	152	8
5	125	¾-10UNC	6.50	165	8
6	150	¾-10UNC	6.50	165	8
8	200	¾-10UNC	7.00	178	8
10	250	7/8-9UNC	7.75	197	12
12	300	7/8-9UNC	8.25	210	12
14	350	1-8UNC	9.50	241	12
16	400	1-8UNC	10.00	254	16
18	450	1½-8UN	11.00	279	16
20	500	1½-8UN	11.50	292	16
24	600	1¼-8UN	13.00	330	20
26	650	1¼-8UN	15.50	394	20
28	700	1¼-8UN	15.50	394	24
30	750	1¼-8UN	16.75	425	24
32	800	1¼-8UN	17.75	451	24
36	900	1½-8UN	19.25	489	28
42	1050	1½-8UN	21.00	533	32
48	1200	1½-8UN	22.50	572	40
54	1350	1¾-8UN	24.75	629	40

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.25	133	4	4.50	114	4
N/A	N/A	N/A	N/A	N/A	N/A
6.75	171	4	5.75	146	4
6.50	165	4	5.75	146	4
7.25	184	4	6.00	152	4
7.75	197	4	6.75	171	4
8.00	203	4	7.00	178	4
8.00	203	4	7.25	184	4
8.25	210	4	7.75	197	4
10.00	254	4	8.75	222	4

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex

Flange thickness as per ASME B16.5 Class 150 or ASME B16.47 Class 150 Series A.

Gasket thickness .175"

Raised Face - .06"

SERIES 41 CLASS 150 | LUG - STUD LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Studs			Back Side Studs		
			in	mm	Qty	in	mm	Qty
2½	65	¾-11UNC	2.75	70	4	2.50	64	4
3	80	¾-11UNC	2.75	70	4	2.50	64	4
4	100	¾-11UNC	3.00	76	8	2.50	64	8
5	125	¾-10UNC	3.00	76	8	2.75	70	8
6	150	¾-10UNC	3.25	83	8	2.75	70	8
8	200	¾-10UNC	3.50	89	8	3.00	76	8
10	250	¾-9UNC	3.75	95	12	3.50	89	12
12	300	¾-9UNC	4.00	102	12	3.75	95	12
14	350	1-8UNC	4.75	121	12	4.00	102	12
16	400	1-8UNC	4.50	114	16	4.50	114	16
18	450	1½-8UN	5.25	133	16	5.00	127	16
20	500	1½-8UN	5.25	133	16	5.25	133	16
24	600	1¼-8UN	6.00	152	20	5.75	146	20
28	700	1¼-8UN	6.50	165	24	6.75	171	24
30	750	1¼-8UN	7.25	184	24	6.75	171	24
32	800	1½-8UN	7.75	197	24	7.75	197	24
36	900	1½-8UN	8.00	203	28	8.00	203	28
40	1000	1½-8UN	7.75	197	32	8.50	216	32
42	1050	1½-8UN	7.75	197	32	9.00	229	32
48	1200	1½-8UN	8.00	203	40	9.25	235	40
54	1350	1¾-8UN	9.25	235	40	10.25	260	40
60	1500	1¾-8UN	10.00	254	42	9.00	229	42

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.25	133	4	4.25	108	4
N/A	N/A	N/A	N/A	N/A	N/A
6.50	165	4	5.75	146	4
7.25	184	4	5.75	146	4
7.75	197	4	6.50	165	4
8.00	203	4	7.00	178	4
7.75	197	4	7.00	178	4
7.75	197	4	7.25	184	4
8.00	203	4	7.75	197	4
9.25	235	4	8.25	210	4
10.00	254	10	9.00	229	10

SERIES 41 CLASS 150 | LUG - BOLT LENGTHS

Valve Size		Diameter/Thread Bore	 Retainer Side Hex Head Bolts			 Back Side Hex Head Bolts		
			in	mm	Qty	in	mm	Qty
2½	65	¾-11UNC	2.00	51	4	1.75	44	4
3	80	¾-11UNC	2.00	51	4	1.75	44	4
4	100	¾-11UNC	2.25	57	8	1.75	44	8
5	125	¾-10UNC	2.25	57	8	2.00	51	8
6	150	¾-10UNC	2.25	57	8	2.00	51	8
8	200	¾-10UNC	2.50	64	8	2.25	57	8
10	250	7/8-9UNC	2.75	70	12	2.50	64	12
12	300	7/8-9UNC	3.00	76	12	2.75	70	12
14	350	1-8UNC	3.50	89	12	3.00	76	12
16	400	1-8UNC	3.50	89	16	3.50	89	16
18	450	1½-8UN	4.00	102	16	3.75	95	16
20	500	1½-8UN	4.00	102	16	4.25	108	16
24	600	1¼-8UN	4.75	121	20	4.50	114	20
28	700	1¼-8UN	5.25	133	24	5.50	140	24
30	750	1¼-8UN	6.00	152	24	5.50	140	24
32	800	1½-8UN	6.25	159	24	6.25	159	24
36	900	1½-8UN	6.50	165	28	6.50	165	28
40	1000	1½-8UN	6.25	159	32	7.00	178	32
42	1050	1½-8UN	6.25	159	32	7.50	191	32
48	1200	1½-8UN	6.50	165	40	7.75	197	40
54	1350	1¾-8UN	7.50	191	40	8.50	216	40
60	1500	1¾-8UN	8.25	210	42	7.25	184	42

AND

 Retainer Blind Hex Head Bolts			 Back Blind Hex Head Bolts		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
4.00	102	4	3.25	83	4
N/A	N/A	N/A	N/A	N/A	N/A
5.25	133	4	4.25	108	4
5.75	146	4	4.50	114	4
5.75	146	4	4.75	121	4
6.25	159	4	5.25	133	4
5.75	146	4	5.00	127	4
6.00	152	4	5.50	140	4
6.50	165	4	6.00	152	4
7.00	178	4	6.25	159	4
8.00	203	10	6.75	171	10



Series 42
Typical Wafer



Series 43
Typical Lug

SERIES 42 CLASS 300 | WAFER

Valve Size		Diameter/Thread Bore	Studs		
in	mm		in	mm	Qty
2½	65	¾-10UNC	6.00	152	8
3	80	¾-10UNC	6.25	159	8
4	100	¾-10UNC	6.75	171	8
5	125	¾-10UNC	7.25	184	8
6	150	¾-10UNC	7.50	191	12
8	200	¾-9UNC	8.50	216	12
10	250	1-8UNC	9.75	248	16
12	300	1½-8UN	10.50	267	16
14	350	1½-8UN	12.00	305	16
16	400	1¼-8UN	13.25	337	16
18	450	1¼-8UN	14.00	356	20
20	500	1¼-8UN	14.50	368	20
24	600	1½-8UN	16.50	419	20
30	750	1¾-8UN	20.50	521	24
36	900	2-8UN	24.00	610	28

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
5.50	140	4	5.00	127	4
5.50	140	4	5.25	133	4
6.25	159	4	5.50	140	4
6.25	159	4	5.50	140	4
6.75	171	4	6.25	159	4
8.00	203	4	7.75	197	4
9.00	229	4	8.75	222	4

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE

DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 Class 300 or ASME B16.47 Class 300 Series A.

Gasket thickness .175".

Raised Face - .06".

SERIES 43 CLASS 300 | LUG - STUD LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Studs			Back Side Studs			AND			Retainer Blind Studs			Back Blind Studs		
			in	mm	Qty	in	mm	Qty				in	mm	Qty	in	mm	Qty
2½	65	¾-10UNC	3.00	76	8	2.75	70	8				N/A	N/A	N/A	N/A	N/A	N/A
3	80	¾-10UNC	3.25	83	8	3.00	76	8				N/A	N/A	N/A	N/A	N/A	N/A
4	100	¾-10UNC	3.25	83	8	3.00	76	8				N/A	N/A	N/A	N/A	N/A	N/A
5	125	¾-10UNC	3.50	89	8	3.25	83	8				N/A	N/A	N/A	N/A	N/A	N/A
6	150	¾-10UNC	3.75	95	12	3.50	89	12				N/A	N/A	N/A	N/A	N/A	N/A
8	200	7/8-9UNC	4.25	108	12	3.75	95	12				N/A	N/A	N/A	N/A	N/A	N/A
10	250	1-8UNC	4.75	121	16	4.25	108	16				N/A	N/A	N/A	N/A	N/A	N/A
12	300	1½-8UN	5.25	133	16	4.50	114	16				N/A	N/A	N/A	N/A	N/A	N/A
14	350	1½-8UN	5.00	127	16	5.75	146	16				5.00	127	4	4.75	121	4
16	400	1½-8UN	5.50	140	16	6.50	165	16				5.50	140	4	5.00	127	4
18	450	1½-8UN	6.00	152	20	6.00	152	20				6.00	152	4	5.25	133	4
20	500	1½-8UN	6.00	152	20	6.00	152	20				6.00	152	4	5.25	133	4
24	600	1½-8UN	6.50	165	20	6.75	171	20				6.50	165	4	6.00	152	4
30	750	1¾-8UN	7.75	197	24	9.00	229	24				7.75	197	4	7.50	191	4
36	900	2-8UN	8.75	222	28	10.25	260	28				8.75	222	4	8.50	216	4
40	1000	1¾-8UN	9.00	229	28	9.75	248	28				9.00	229	4	7.75	197	4
42	1050	1¾-8UN	9.50	241	28	8.25	210	28				9.50	241	4	7.75	197	4
44	1100	1¾-8UN	8.75	222	28	8.75	222	28				8.75	222	4	8.75	222	4
48	1200	1¾-8UN	11.25	286	28	9.75	248	28				11.25	286	4	9.25	235	4
54	1350	2¼-8UN	12.25	311	24	11.25	286	24				12.25	311	4	10.75	273	4

SERIES 43 CLASS 300 | LUG - BOLT LENGTHS

Valve Size		Diameter/Thread Bore	Retainer Side Hex Head Bolts			Back Side Hex Head Bolts			AND			Retainer Blind Hex Head Bolts			Back Blind Hex Head Bolts		
			in	mm	Qty	in	mm	Qty				in	mm	Qty	in	mm	Qty
2½	65	¾-10UNC	2.25	57	8	1.75	44	8				N/A	N/A	N/A	N/A	N/A	N/A
3	80	¾-10UNC	2.25	57	8	2.00	51	8				N/A	N/A	N/A	N/A	N/A	N/A
4	100	¾-10UNC	2.25	57	8	2.25	57	8				N/A	N/A	N/A	N/A	N/A	N/A
5	125	¾-10UNC	2.75	70	8	2.25	57	8				N/A	N/A	N/A	N/A	N/A	N/A
6	150	¾-10UNC	2.75	70	12	2.50	64	12				N/A	N/A	N/A	N/A	N/A	N/A
8	200	7/8-9UNC	3.25	83	12	2.75	70	12				N/A	N/A	N/A	N/A	N/A	N/A
10	250	1-8UNC	3.75	95	16	3.25	83	16				N/A	N/A	N/A	N/A	N/A	N/A
12	300	1½-8UN	4.25	108	16	3.50	89	16				N/A	N/A	N/A	N/A	N/A	N/A
14	350	1½-8UN	4.00	102	16	4.50	114	16				3.75	95	4	3.25	83	4
16	400	1½-8UN	4.25	108	16	5.25	133	16				4.00	102	4	3.50	89	4
18	450	1½-8UN	4.75	121	20	4.75	121	20				4.50	114	4	3.75	95	4
20	500	1½-8UN	4.75	121	20	4.75	121	20				4.50	114	4	4.00	102	4
24	600	1½-8UN	5.00	127	20	5.25	133	20				4.75	121	4	4.50	114	4
30	750	1¾-8UN	6.00	152	24	7.25	184	24				5.75	146	4	5.50	140	4
36	900	2-8UN	6.75	171	28	8.25	210	28				6.50	165	4	6.50	165	4
40	1000	1¾-8UN	7.75	197	28	8.50	216	28				7.75	197	4	6.50	165	4
42	1050	1¾-8UN	8.50	216	28	7.25	184	28				8.25	210	4	6.50	165	4
44	1100	1¾-8UN	7.00	178	28	7.00	178	28				7.00	178	4	6.75	171	4
48	1200	1¾-8UN	9.50	241	28	8.00	203	28				9.25	235	4	7.25	184	4
54	1350	2¼-8UN	10.00	254	24	9.00	229	24				9.75	248	4	8.25	210	4

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.
Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 Class 300 or ASME B16.47 Class 300 Series A.
Gasket thickness .175".
Raised Face - .06".



**Series 44
Typical Wafer**

SERIES 44 CLASS 600 | WAFER

Valve Size		Diameter/Thread	Studs			Retainer Blind Studs			Back Blind Studs		
in	mm		in	mm	Qty	in	mm	Qty	in	mm	Qty
3	80	3/4-10UNC	7.00	178	8	N/A	N/A	N/A	N/A	N/A	N/A
4	100	7/8-9UNC	8.25	210	8	N/A	N/A	N/A	N/A	N/A	N/A
6	150	1-8UNC	10.00	254	12	N/A	N/A	N/A	N/A	N/A	N/A
8	200	1 1/8-8UN	11.75	298	12	N/A	N/A	N/A	N/A	N/A	N/A
10	250	1 1/4-8UN	13.25	337	12	6.00	152	4	5.50	140	4
12	300	1 1/4-8UN	14.00	356	16	6.00	152	4	5.50	140	4
14	350	1 3/8-8UN	15.25	387	16	6.25	159	4	6.00	152	4
16	400	1 1/2-8UN	17.00	432	16	6.75	171	4	6.50	165	4
18	450	1 5/8-8UN	18.50	470	16	7.50	191	4	7.00	178	4
20	500	1 3/4-8UN	19.75	502	20	8.00	203	4	7.25	184	4
24	600	1 7/8-8UN	21.75	552	20	8.50	216	4	8.25	210	4

AND

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE

DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 Class 600 or ASME B16.47 Class 600 Series A.

Gasket thickness .175".

Raised Face - .06" Raised Face - Assumption of .06".



**Series 45
Typical Lug**

SERIES 45 CLASS 600 | LUG - STUD LENGTH

Valve Size		Diameter/Thread	Retainer Studs			Studs Back		
in	mm		in	mm	Qty	in	mm	Qty
3	80	¾-10UNC	3.75	95	8	3.25	83	8
4	100	7/8-9UNC	4.25	108	8	3.75	95	8
6	150	1-8UNC	4.75	121	12	4.50	114	12
8	200	1½-8UN	5.50	140	12	5.00	127	12
10	250	1¾-8UN	6.25	159	12	5.50	140	12
12	300	1¾-8UN	6.25	159	16	5.75	146	16
14	350	1¾-8UN	6.50	165	16	6.00	152	16
16	400	1½-8UN	6.75	171	16	6.50	165	16
18	450	1¾-8UN	7.50	191	16	7.00	178	16
20	500	1¾-8UN	8.00	203	20	7.25	184	20
24	600	1¾-8UN	8.75	222	20	8.25	210	20

AND

Retainer Blind Studs			Back Blind Studs		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
6.25	159	4	5.50	140	4
6.25	159	4	5.75	146	4
6.50	165	4	6.00	152	4
6.75	171	4	6.50	165	4
7.50	191	4	7.00	178	4
8.00	203	4	7.25	184	4
8.75	222	4	8.25	210	4

SERIES 45 CLASS 600 | LUG - BOLT LENGTH

Valve Size		Diameter/Thread	Retainer Hex Head Bolts			Back Side Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty
3	80	¾-10UNC	2.75	70	8	2.25	57	8
4	100	7/8-9UNC	3.00	76	8	2.75	70	8
6	150	1-8UNC	3.50	89	12	3.25	83	12
8	200	1½-8UN	4.25	108	12	3.50	89	12
10	250	1¾-8UN	4.75	121	12	4.00	102	12
12	300	1¾-8UN	4.75	121	16	4.25	108	16
14	350	1¾-8UN	4.75	121	16	4.50	114	16
16	400	1½-8UN	5.00	127	16	4.75	121	16
18	450	1¾-8UN	5.75	146	16	5.25	133	16
20	500	1¾-8UN	6.25	159	20	5.50	140	20
24	600	1¾-8UN	6.50	165	20	6.25	159	20

AND

Retainer Blind Hex Head Bolts			Back Blind Hex Head Bolts		
in	mm	Qty	in	mm	Qty
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
4.50	114	4	3.75	95	4
4.50	114	4	4.00	102	4
4.50	114	4	4.25	108	4
4.75	116	4	4.50	114	4
5.50	140	4	5.00	127	4
6.00	152	4	5.25	133	4
6.25	159	4	6.00	152	4


SERIES 4A CLASS 150 | DOUBLE FLANGE

Valve Size		Diameter/ Thread	Retainer Hex Head Bolts			Back Side Hex Head Bolts			Retainer Blind Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty	in	mm	Qty
3	80	5/8-11UNC	3.25	83	4	3.00	76	4	N/A	N/A	N/A
4	100	5/8-11UNC	3.50	89	6	3.00	76	8	2.00	51	2
5	125	3/4-10UNC	3.50	89	6	3.00	76	8	2.25	57	2
6	150	3/4-10UNC	3.75	95	6	3.25	83	8	2.25	57	2
8	200	3/4-10UNC	4.00	102	6	3.50	89	8	2.50	64	2
10	250	7/8-9UNC	4.25	108	10	3.75	95	12	2.75	70	2
12	300	7/8-9UNC	4.50	114	8	3.75	95	12	2.75	70	4
14	350	1-8UNC	5.00	127	8	4.25	108	12	3.00	76	4
16	400	1-8UNC	5.00	127	12	4.25	108	16	3.00	76	4
18	450	1 1/8-8UN	5.50	140	12	4.75	121	16	3.25	83	4
20	500	1 1/8-8UN	5.75	146	16	5.00	127	20	3.50	89	4
24	600	1 1/4-8UN	6.50	165	16	5.50	140	20	3.75	95	4
30	750	1 1/4-8UN	9.25	235	24	7.50	191	28	5.00	127	4

AND

SERIES 4B CLASS 300 | DOUBLE FLANGE

Valve Size		Diameter/ Thread	Retainer Hex Head Bolts			Back Side Hex Head Bolts			Blind Hex Head Bolts		
in	mm		in	mm	Qty	in	mm	Qty	in	mm	Qty
3	80	3/4-10UNC	2.25	57	8	3.50	89	8	N/A	N/A	N/A
4	100	3/4-10UNC	2.25	57	8	3.75	95	8	N/A	N/A	N/A
5	125	3/4-10UNC	2.50	64	12	4.00	102	12	N/A	N/A	N/A
6	150	3/4-10UNC	2.50	64	12	4.25	108	12	N/A	N/A	N/A
8	200	7/8-9UNC	2.75	70	12	4.75	121	12	N/A	N/A	N/A
10	250	1-8UNC	3.25	83	16	5.25	133	16	3.25	83	8
12	300	1 1/8-8UN	3.50	89	16	5.75	146	16	3.50	89	8
14	350	1 1/8-8UN	3.50	89	16	6.00	152	16	3.50	89	8
16	400	1 1/4-8UN	3.75	95	16	6.25	159	16	3.75	95	8
18	450	1 1/4-8UN	4.00	102	20	6.50	165	20	4.00	102	8
20	500	1 1/4-8UN	4.00	102	20	6.75	171	20	4.00	102	8
24	600	1 1/2-8UN	4.50	114	20	7.50	191	20	4.50	114	8
30	750	1 1/4-8UN	6.00	152	24	9.75	248	24	6.00	152	8
36	900	2-8UN	6.50	165	28	10.75	273	28	6.50	165	8

AND

PLEASE REFER TO APPROPRIATE BRAY DIMENSIONAL DRAWINGS FOR SPECIFIC VALVE DRILLING INFORMATION

Assumptions Made in Calculations

Lengths rounded to the nearest 1/4" for maximum thread engagement.

Nut thickness as per ASME B18.2.2 Heavy Hex.

Flange thickness as per ASME B16.5 or ASME B16.47 Series A.

Gasket thickness .175".

Raised Face - .06".

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