

Bray

Tri Lok

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The Ultimate Critical Service Triple Offset Valve

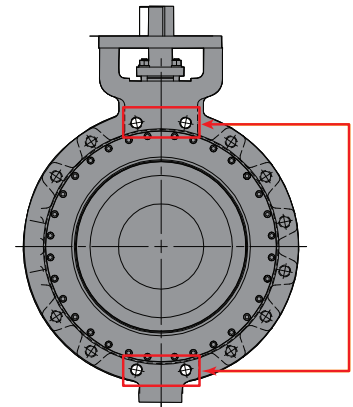
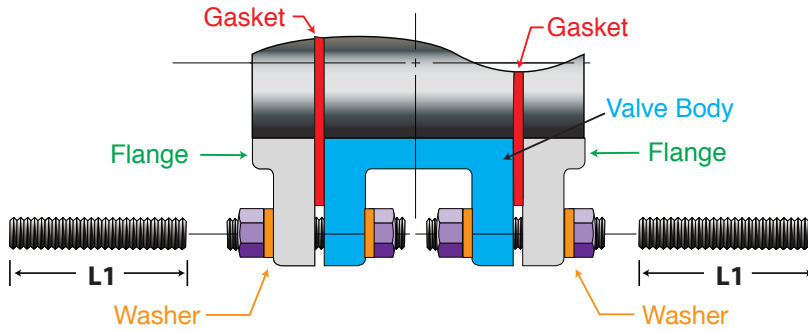
FLANGE BOLTING GUIDE



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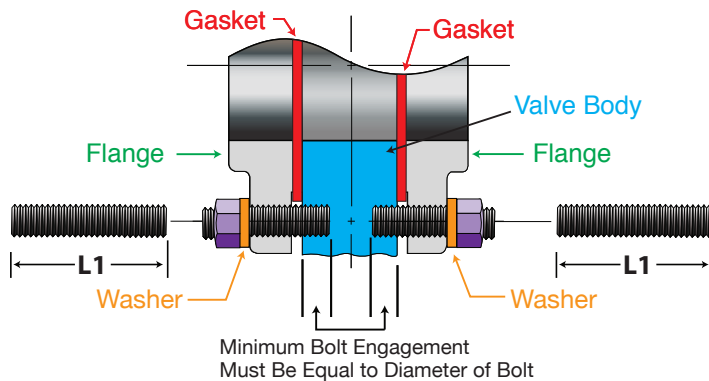
Examples of Typical Flange to Valve Bolting

Double Flange/Gate Body L1 Stud Bolt Length

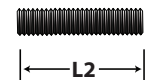


Caution: To ensure proper installation refer to appropriate table within this guide for specific valve drilling information.

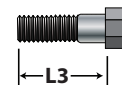
Lug Body L1 Stud Bolt Length



L2 Stud Bolt Length

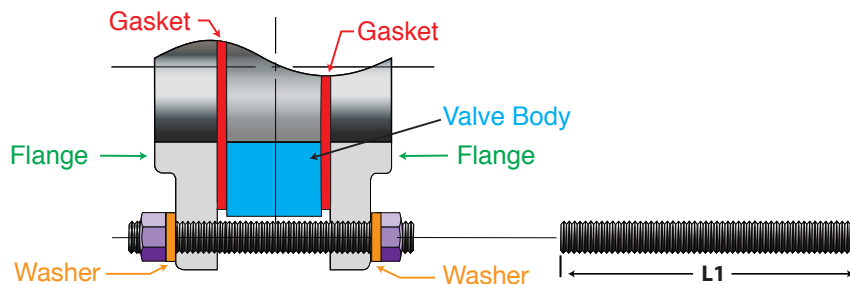


L3 Hex Bolt Length



L2 or L3 specifies special stud lengths for hub and neck locations, that do not permit thru holes.

Wafer Body L1 Stud Bolt Length



* Lug Threads may be tapped from both sides and therefore tap may not be continuous.

TORQUE LOSS

Torque loss is inherent in any bolted joint. The combined effects of bolt relaxation, (approximately 10% during the first 24 hours after installation), gasket creep, vibration in the system, thermal expansion and elastic interaction during bolt tightening contribute to torque loss. When torque loss reaches an extreme, the internal pressure exceeds the compressive force holding the gasket in place and a leak or blow-out occurs.

A key to reducing these effects is proper gasket installation. By bringing the flanges together slowly and parallel when installing a gasket and taking a minimum of four bolt tightening passes, following the correct bolt tightening sequence, there is a payoff in reduced maintenance costs and increased safety.

Proper gasket thickness is also important. The thicker the gasket, the higher the gasket creep which in turn can result in torque loss. On standard ANSI raised face flanges a 1/16" thick gasket is normally recommended. Thinner gasket materials can take a higher gasket load and therefore higher internal pressures.

Even when the installation is ideal, where the bolt stress is uniformly applied to each bolt, and the gasket is properly compressed, problems can still arise. Inherently with time, loosening will occur due to the factors already mentioned. If other factors such as cycling, thermal upsets, water hammer or just a piping system with inadequate pipe supports are present, periodic retorquing might be necessary.

For problem areas, high temperature applications or where there is temperature cycling, or where a flange cannot be retorqued, conical spring washers have been found to be very helpful as an aid to torque retention. They act as a spring and help lessen the effects of torque loss.

Other factors affecting torque loss include:

1. Rate of heat up
2. New vs. used bolts or studs
3. Use of hardened steel washers
4. Lubrication of bolts, nuts and nut facings
5. Method of bolt up.

Order of efficiency from least to greatest:

- a. Wrench and cheater bar or sledge hammer
- b. Air impact gun
- c. Torque wrench
- d. Hydraulic torque wrench
- e. Hydraulic stud tensioners

Finally, having the torque information for the gasket material is helpful as well. Please refer to the torque data that follows.

GASKET INSTALLATION

The importance of proper gasket installation cannot be stressed enough. The following is a basic explanation of how to properly bring the flanges together parallel and in stages, once the gasket is in place to properly compress the gasket. **As a minimum, four passes are required.** Using the right torque value for the lubricant being used to get the proper gasket compression is important as well.

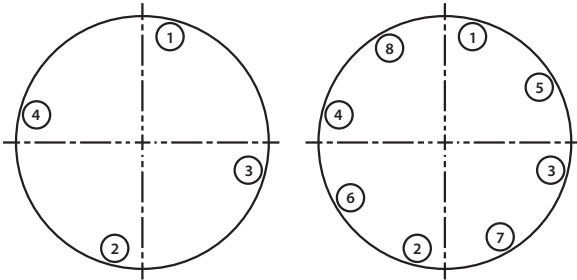
In the torque tables that follow for non-asbestos gasket materials, it is assumed the flanges are in good condition, anti-seize has not been used on any gasket contact surfaces and a proper installation technique such as what is outlined as follows is used. Never use any sheet gasket material as insulating washers in flange insulation kits.

NOTE: As a general rule, soft gaskets are intended for service in Class 300 and below.

GASKET INSTALLATION

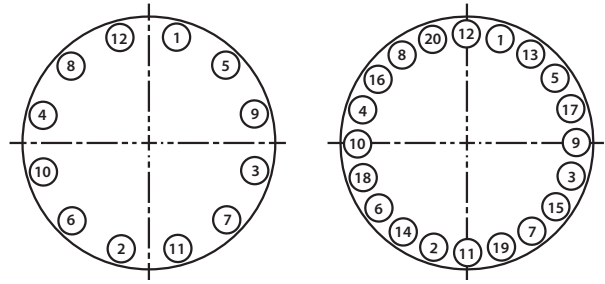
1. Visually examine and clean flanges, bolts, nuts and washers. Replace components if necessary.
2. **LUBRICATE** the bolts, nuts and nut bearing surfaces.
3. Install the new gasket, bolts and nuts. Be sure gasket is properly centered. **DO NOT REUSE** old gasket, or use **MULTIPLE** gaskets.
4. Number bolts in cross-pattern sequence according to the appropriate sketch below.
5. **IMPORTANT! HAND TIGHTEN; then SNUG BOLTS UP to 10/20 FT-LBS torque, but DO NOT EXCEED 20% of target torque.**
6. Check gap for uniformity.
7. Starting at the #1 bolt, use the appropriate cross-pattern tightening sequence in the sketch below for Rounds 1, 2, and 3 and/or Round 4 (each sequence constitutes a "Round").

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

Check gap around the circumference between each of these rounds, measured at every other bolt. If the gap is not reasonably uniform around the circumference, make the appropriate adjustments by selective bolt tightening before proceeding.

- **Rotational Round** - 100% of Final Torque (same as Round 3 or 4 above). Use **ROTATIONAL**, clockwise tightening sequence, starting with Bolt No. 1, for one complete round and continue until no further nut rotation occurs at 100% of the Final Torque value for any nut.
- **Final Round - RETORQUE.** After twenty-four hours repeat Round 3 or 4 (above) followed by a Rotational Round. Tests show that a large percentage of the short-term bolt preload loss occurs within twenty-four hours after initial tightening. This Round recovers this loss. **This is especially IMPORTANT for PTFE gaskets.**

Tightening Methods

- Hand Wrench
- Manual Torque Wrench
- Hydraulic Torque Wrench
- Impact Wrench
- Other

CLASS 150 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 13 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			+	Stud Bolts - L2				OR	Hex Head Bolts - L3			
In	mm		In	mm	Qty		In	mm	Qty	TOTAL Nuts & Washers		In	mm	Qty	TOTAL Nuts & Washers
3	80	5/8" - 11 UNC	4	102	8	-	-	-	16	-	-	-	-		
4	100	5/8" - 11 UNC	4	102	12	3	76	4	28	2.25	57	4	24		
6	150	3/4" - 10 UNC	4.25	108	12	3.25	82	4	28	2.25	57	4	24		
8	200	3/4" - 10 UNC	4.5	114	12	3.5	89	4	28	2.5	63	4	24		
10	250	7/8" - 9 UNC	5	127	20	3.5	89	4	44	2.5	63	4	40		
12	300	7/8" - 9 UNC	5	127	20	3.75	95	4	44	2.75	70	4	40		
14	350	1" - 8 UNC	5.5	140	20	4.25	108	4	44	3	76	4	40		
16	400	1" - 8 UNC	5.75	146	28	4.5	114	4	60	3.25	82	4	56		
18	450	1 1/8" - 8 UN	6	152	28	4.5	114	4	60	3.25	82	4	56		
20	500	1 1/8" - 8 UN	6.25	159	36	4.25	108	4	76	3	76	4	72		
24	600	1 1/4" - 8 UN	7	179	36	5	127	4	76	3.5	89	4	72		

CLASS 150 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 13 | Body Drilling ANSI B16.47 Series A

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			+	Stud Bolts - L2				OR	Hex Head Bolts - L3			
In	mm		In	mm	Qty		In	mm	Qty	TOTAL Nuts & Washers		In	mm	Qty	TOTAL Nuts & Washers
30	750	1 1/4" - 8 UN	9.25	235	52	6	152	4	108	4.75	121	4	104		
32	800	1 1/2" - 8 UN	10.25	260	48	6.75	171	8	104	5	127	8	96		
36	900	1 1/2" - 8 UN	11	279	52	7	179	12	116	5.5	140	12	104		
40	1000	-	-	-	-	-	-	-	-	-	-	-	-		
42	1050	1-1/2" - 8 UN	11.5	292	62	7.5	190	10	134	5.75	146	10	124		
48	1200	1 1/2" - 8 UN	12.25	311	72	8	203	16	160	6.25	159	16	144		

CLASS 150 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 13 | Body Drilling ANSI B16.5 Series B

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			+	Stud Bolts - L2				OR	Hex Head Bolts - L3			
In	mm		In	mm	Qty		In	mm	Qty	TOTAL Nuts & Washers		In	mm	Qty	TOTAL Nuts & Washers
30	750	3/4" - 8 UNC	6	152	78	4.5	114	10	166	3.5	89	10	156		
32	800	3/4" - 8 UNC	6	152	80	4.5	114	16	176	3.5	89	16	160		
36	900	7/8" - 8 UNC	7	178	72	5	127	16	160	4	102	16	144		
40	1000	1" - 8 UNC	7.25	184	68	5.25	133	20	156	4	102	20	136		
42	1050	1" - 8 UNC	8	203	86	5.5	140	10	182	4.25	108	10	172		
48	1200	1" - 8 UNC	7.5	191	86	5.25	133	10	182	4.25	107.95	10	172		

NOTES:

- Any combination of the above fastener types is applicable.
- All nuts are in accordance with ANSI B18.2.2 Table 9 Heavy Hex nuts.
- All Studs are in accordance with ANSI B18.2.1.
- All Stud and bolt lengths rounded to next 1/4".
- Calculations include 2 washers(.2") for thru stud bolts and 1 (.1") washer for hex bolt and stud bolts/nut.
- Standard gaskets(0.125"), one per side, have been included in the bolting calculations.

The Ultimate Critical Service Triple Offset Valve

CLASS 300 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 13 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			+	Stud Bolts - L2				OR	Hex Head Bolts - L3			
In	mm		In	mm	Qty		In	mm	Qty	TOTAL Nuts & Washers		In	mm	Qty	TOTAL Nuts & Washers
3	80	3/4" - 10 UNC	4.5	114	12		3.25	83	4	28		2.5	63	4	24
4	100	3/4" - 10 UNC	4.75	121	12		3.25	83	4	28		2.5	63	4	24
6	150	3/4" - 10 UNC	5	127	20		3.75	95	4	44		2.75	70	4	40
8	200	7/8" - 9 UNC	5.75	146	20		4	102	4	44		3.25	82	4	40
10	250	1" - 8 UNC	6.5	165	24		4.25	108	8	56		3.25	82	8	48
12	300	1 1/8" - 8 UN	7	178	24		4.5	114	8	56		3.5	89	8	48
14	350	1 1/8" - 8 UN	7.25	184	32		4.75	121	8	72		3.5	89	8	64
16	400	1 1/4" - 8 UN	7.75	197	32		5.25	133	8	72		3.75	95	8	64
18	450	1 1/4" - 8 UN	8	203	40		5.25	133	8	88		4	102	8	80
20	500	1 1/4" - 8 UN	8.25	209	40		5.5	140	8	88		4	102	8	80
24	600	1 1/2" - 8 UN	9.25	235	40		6	152	8	88		4.5	114	8	80

CLASS 300 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 13 | Body Drilling ANSI B16.47 Series A

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			+	Stud Bolts - L2				OR	Hex Head Bolts - L3			
In	mm		In	mm	Qty		In	mm	Qty	TOTAL Nuts & Washers		In	mm	Qty	TOTAL Nuts & Washers
30	750	1 3/4" - 8 UN	12.5	318	40		8.5	216	16	96		6	152	16	80
32	800	-	-	-	-		-	-	-	-		-	-	-	-
36	900	2" - 8 UN	13.25	337	48		8	203	16	112		6	152	16	96
40	1000	-	-	-	-		-	-	-	-		-	-	-	-
42	1050	1 5/8" - 8 UN	13.5	343	52		8.5	216	12	116		7	178	12	104
48	1200	1 7/8" - 8 UN	15.25	387	48		10.5	267	16	144		8	203	4	96

CLASS 300 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 13 | Body Drilling ANSI B16.47 Series B

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			+	Stud Bolts - L2				OR	Hex Head Bolts - L3			
In	mm		In	mm	Qty		In	mm	Qty	TOTAL Nuts & Washers		In	mm	Qty	TOTAL Nuts & Washers
30	750	1 3/8" - 8 UN	11.25	286	56		7	178	16	128		5.5	140	16	112
32	800	-	-	-	-		-	-	-	-		-	-	-	-
36	900	1 5/8" - 8 UN	12.25	311	56		8	203	8	120		6.25	159	8	112
40	1000	-	-	-	-		-	-	-	-		-	-	-	-
42	1050	1 3/4" - 8 UN	13.75	349	56		8.5	216	16	128		6.75	171	16	112
48	1200	1 7/8" - 8 UN	14.75	375	60		9.75	248	20	140		7.75	197	20	120

NOTES:

- Any combination of the above fastener types is applicable.
- All nuts are in accordance with ANSI B18.2.2 Table 9 Heavy Hex nuts.
- All Studs are in accordance with ANSI B18.2.1.
- All Stud and bolt lengths rounded to next 1/4".
- Calculations include 2 washers(.2") for thru stud bolts and 1 (.1") washer for hex bolt and stud bolts/nut.
- Standard gaskets(0.125"), one per side, have been included in the bolting calculations.

CLASS 600 | DOUBLE FLANGE

Face to Face API 609, ISO 5752 Basic Series 14 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
4	100	—	—	—	—
6	150	1" - 8 UNC	7.25	184	16
8	200	1 1/8" - 8 UN	8	203	16
10	250	1 1/4" - 8 UN	9	229	24
12	300	1 1/4" - 8 UN	11	279	32
14	350	—	—	—	—
16	400	—	—	—	—
18	450	1 5/8" - 8 UN	11.25	286	24
20	500	—	—	—	—

+
PLUS

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers		
In	mm		In	mm			
—	—	—	—	—	—		
5	127	8	40	4	102	8	32
5.5	140	8	40	4.5	114	8	32
7.25	184	8	56	5.75	146	8	48
6.5	165	8	72	5	127	8	64
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
7.75	197	16	64	6	152	16	48
—	—	—	—	—	—	—	—

OR

CLASS 900 | DOUBLE FLANGE

Face to Face ISO 5752 Basic Series 8 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
6	150	—	—	—	—
8	200	1 3/8" - 8 UN	9.75	248	16
10	250	1 3/8" - 8 UN	10.25	260	24
12	300	—	—	0	—
14	350	—	—	0	—
16	400	1 5/8" - 8 UN	12	305	24
18	450	1 7/8" - 8 UN	13.5	343	24
20	500	—	—	0	—

+
PLUS

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers		
In	mm		In	mm			
—	—	—	—	—	—		
6.75	171	8	40	5	127	8	32
7	178	8	56	5.25	133	8	48
—	0	—	—	—	0	—	—
—	0	—	—	—	—	0	—
8.25	210	16	64	6.5	165	16	48
9.5	241	16	64	7.5	191	16	48
—	0	—	—	—	—	0	—

OR

NOTES:

- Any combination of the above fastener types is applicable.
- All nuts are in accordance with ANSI B18.2.2 Table 9 Heavy Hex nuts.
- All Studs are in accordance with ANSI B18.2.1.
- All Stud and bolt lengths rounded to next 1/4".
- Calculations include 2 washers(.2") for thru stud bolts and 1 (.1") washer for hex bolt and stud bolts/nut.
- Standard gaskets(0.125"), one per side, have been included in the bolting calculations.

The Ultimate Critical Service Triple Offset Valve

CLASS 150 | GATE Face to Face

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
3	80	5/8" - 11 UNC	4	102	8
4	100	5/8" - 11 UNC	4	102	12
6	150	3/4" - 10 UNC	4.25	108	12
8	200	3/4" - 10 UNC	4.5	114	16
10	250	7/8" - 9 UNC	5	127	24
12	300	7/8" - 9 UNC	5	127	24
14	350	1" - 8 UNC	5.5	140	24
16	400	1" - 8 UNC	5.75	146	32
18	450	1 1/8" - 8 UN	6.25	159	32
20	500	1 1/8" - 8 UN	6.5	165	40
24	600	1 1/4" - 8 UN	7	178	40

+
PLUS

Face to Face API 609, ASME B16.10 | Body Drilling ANSI B16.5

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers	
In	mm		In	mm		
-	-	16	-	-	-	
2.75	70	4	2.25	57	4	24
3	76	4	2.25	57	4	24
-	-	32	-	-	-	
-	-	48	-	-	-	
-	-	48	-	-	-	
-	-	48	-	-	-	
-	-	64	-	-	-	
-	-	64	-	-	-	
-	-	80	-	-	-	
-	-	80	-	-	-	

OR

CLASS 150 | GATE Face to Face

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
30	750	1 1/4" - 8 UN	9.25	235	48

+
PLUS

Face to Face API 609, ASME B16.10 | Body Drilling ANSI B16.47 Series A

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers	
In	mm		In	mm		
6	152	8	4.75	121	8	96

OR

CLASS 300 | GATE Face to Face

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
3	80	3/4" - 10 UNC	4.5	114	12
4	100	3/4" - 10 UNC	4.75	121	12
6	150	3/4" - 10 UNC	5.25	133	20
8	200	7/8" - 9 UNC	5.75	146	20
10	250	1" - 8 UNC	6.5	165	32
12	300	1 1/8" - 8 UN	7	178	32
14	350	1 1/8" - 8 UN	7.25	184	36
16	400	1 1/4" - 8 UN	7.75	197	36
18	450	1 1/4" - 8 UN	8	203	44
20	500	1 1/4" - 8 UN	8.25	210	44
24	600	1 1/2" - 8 UN	9.25	235	48

+
PLUS

Face to Face API 609, ASME B16.10 | Body Drilling ANSI B16.5

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers	
In	mm		In	mm		
3.5	89	4	2.5	64	4	24
3.5	89	4	2.5	64	4	24
3.75	95	4	2.75	70	4	40
4	102	4	3.25	83	4	40
-	-	64	-	-	-	-
-	-	64	-	-	-	-
5	127	4	4	102	4	72
5.75	146	4	4.25	108	4	72
6	152	4	4.5	114	4	88
6	152	4	4.5	114	4	88
-	-	96	-	-	-	-

OR

NOTES:

- Any combination of the above fastener types is applicable.
- All nuts are in accordance with ANSI B18.2.2 Table 9 Heavy Hex nuts.
- All Studs are in accordance with ANSI B18.2.1.
- All Stud and bolt lengths rounded to next 1/4".
- Calculations include 2 washers(.2") for thru stud bolts and 1 (.1") washer for hex bolt and stud bolts/nut.
- Standard gaskets(0.125"), one per side, have been included in the bolting calculations.

CLASS 150 | LUG

Face to Face API 609 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
3	80	5/8" - 11 UNC	3	76	8
4	100	5/8" - 11 UNC	3.25	83	16
6	150	3/4" - 10 UNC	3.25	82	16
8	200	3/4" - 10 UNC	3.75	95	16
10	250	7/8" - 9 UNC	4	101	24
12	300	7/8" - 9 UNC	4.25	108	24
14	350	1" - 8 UNC	4.75	121	24
16	400	1" - 8 UNC	4.5	114	32
18	450	1 1/8" - 8 UN	5.25	133	32
20	500	1 1/8" - 8 UN	5.25	133	32
24	600	1 1/4" - 8 UN	6	152	32

+
PLUS

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers
In	mm		In	mm	
-	-	8	-	-	-
-	-	16	-	-	-
-	-	16	-	-	-
-	-	16	-	-	-
-	-	24	-	-	-
-	-	24	-	-	-
-	-	24	-	-	-
-	-	32	-	-	-
-	-	32	-	-	-
4	102	8	2.75	70	32
5	127	8	3.5	89	32

OR

CLASS 300 | LUG

Face to Face API 609 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1		
In	mm		In	mm	Qty
3	80	3/4" - 10 UNC	3.5	89	16
4	100	3/4" - 10 UNC	3.5	89	16
6	150	3/4" - 10 UNC	4	102	24
8	200	7/8" - 9 UNC	4.5	114	24
10	250	1" - 8 UNC	5	127	32
12	300	1 1/8" - 8 UN	5.5	140	24
14	350	1 1/8" - 8 UN	5.5	140	32
16	400	1 1/4" - 8 UN	6	152	32
18	450	1 1/4" - 8 UN	6.25	159	40
20	500	1 1/4" - 8 UN	6.25	159	40
24	600	1 1/2" - 8 UN	7.25	184	40

+
PLUS

Stud Bolts - L2		TOTAL Nuts & Washers	Hex Head Bolts - L3		TOTAL Nuts & Washers
In	mm		In	mm	
-	-	16	-	-	-
-	-	16	-	-	-
-	-	24	-	-	-
-	-	24	-	-	-
-	-	32	-	-	-
4.5	114	8	3	76	24
4.5	114	8	3.25	82	32
5	127	8	3.75	95	32
5	127	8	3.75	95	40
5.25	133	8	4	102	40
6	152	8	4.5	114	40

OR

NOTES:

- Any combination of the above fastener types is applicable.
- All nuts are in accordance with ANSI B18.2.2 Table 9 Heavy Hex nuts.
- All Studs are in accordance with ANSI B18.2.1.
- All Stud and bolt lengths rounded to next 1/4".
- Calculations include 2 washers(.2") for thru stud bolts and 1 (.1") washer for hex bolt and stud bolts/nut.
- Standard gaskets(0.125"), one per side, have been included in the bolting calculations.

The Ultimate Critical Service Triple Offset Valve

CLASS 150 | WAFER

Face to Face API 609 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			Stud Bolts - L2			TOTAL Nuts & Washers
In	mm		In	mm	Qty	In	mm	Qty	
3	80	5/8" - 11 UNC	6	152	4	-	-	-	8
4	100	5/8" - 11 UNC	6	152	8	-	-	-	16
6	150	3/4" - 10 UNC	6.5	165	8	-	-	-	16
8	200	3/4" - 10 UNC	7	178	8	-	-	-	16
10	250	7/8" - 9 UNC	7.75	197	12	-	-	-	24
12	300	7/8" - 9 UNC	8.25	209	12	-	-	-	24
14	350	1" - 8 UNC	9.25	235	12	-	-	-	24
16	400	1" - 8 UNC	9.75	248	16	-	-	-	32
18	450	1 1/8" - 8 UN	10.75	273	16	-	-	-	32
20	500	1 1/8" - 8 UN	11.5	292	16	4.25	108	8	40
24	600	1 1/4" - 8 UN	13	330	16	5	127	8	40

+
PLUS

CLASS 300 | WAFER

Face to Face API 609 | Body Drilling ANSI B16.5

VALVE SIZE		Stud Diameter/Thread	Stud Bolts - L1			Stud Bolts - L2			TOTAL Nuts & Washers
In	mm		In	mm	Qty	In	mm	Qty	
3	80	3/4" - 10 UNC	6.5	165	8	-	-	-	16
4	100	3/4" - 10 UNC	7	179	8	-	-	-	16
6	150	3/4" - 10 UNC	7.5	190	12	-	-	-	24
8	200	7/8" - 9 UNC	8.75	222	12	-	-	-	24
10	250	1" - 8 UNC	10	254	12	4.5	114	8	32
12	300	1 1/8" - 8 UN	11	279	12	4.75	121	8	32
14	350	1 1/8" - 8 UN	12	305	16	4.5	114	8	40
16	400	1 1/4" - 8 UN	13.5	343	16	5.25	132	8	40
18	450	1 1/4" - 8 UN	14	356	20	5.25	132	8	48
20	500	1 1/4" - 8 UN	15	381	20	5.25	132	8	48
24	600	1 1/2" - 8 UN	17	432	20	6.25	159	8	48

+
PLUS

NOTES:

- Any combination of the above fastener types is applicable.
- All nuts are in accordance with ANSI B18.2.2 Table 9 Heavy Hex nuts.
- All Studs are in accordance with ANSI B18.2.1.
- All Stud and bolt lengths rounded to next 1/4".
- Calculations include 2 washers(.2") for thru stud bolts and 1 (.1") washer for hex bolt and stud bolts/nut.
- Standard gaskets(0.125"), one per side, have been included in the bolting calculations.

