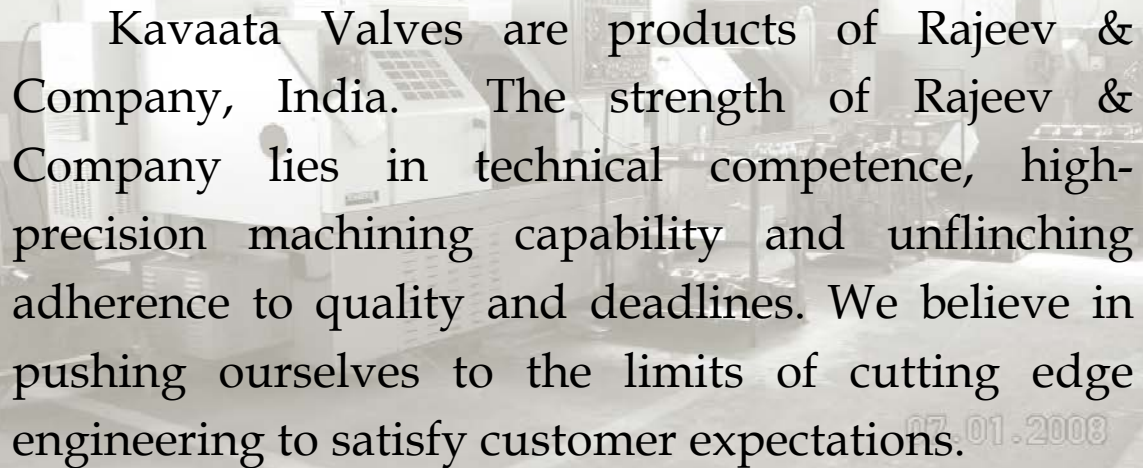




## 3 WAY BALL VALVE CATALOG

**KAVAATA<sup>®</sup>** VALVES



Kavaata Valves are products of Rajeev & Company, India. The strength of Rajeev & Company lies in technical competence, high-precision machining capability and unflinching adherence to quality and deadlines. We believe in pushing ourselves to the limits of cutting edge engineering to satisfy customer expectations.

Rajeev & Company boasts of state of the art machining centers. All machining activities are carried out in-house by qualified & highly trained personnel.

The design facilities include Modeling, simulation and Analysis package. We believe in getting it right the first time in resonance with our motto "*from excellence to perfection.*"

The three way L-Port ball valve is a valve with a spherical obturator inside with seats on both sides. The valves are basically quarter-turn i.e. to open or close the ball valve the handle needs to be rotated through 90°. The ball valves can have a variety of features, modifications and arrangements to serve various needs of customers and the processes.

The materials used for construction also consist of various combinations. The body and adapter can be made from Carbon Steels, ASTM A216 Gr WCB, and ASTM A351 Gr CF8/CF8M.

The ball is constructed using ASTM A276 SS304/ SS316/ASTM A351 Gr CF8/CF8M/CF3/CF3M, with special processed features for metal seated valves. These processed features include ENP (Electroless Nickel Plating) and stellite hard facing.

The stem and gland are made from ASTM A276 SS304/ SS316/ SS316L. The stem is designed to withstand torques of high magnitude – usually 2 to 3 times the operational torque of the respective valve. This ensures the stem never twists during normal operation.

The seats are usually made of PTFE for temperatures up to 200°C and pressures up to 15 bars. As the operational pressures increase, seats can be made from PEEK, CPTFE, and POM. STELLITED metal seats are used when both operational temperatures and pressures are high.

The ports are full bore; this ensures flow without pressure drop and helps pigging.

We at Kavaata Valves manufacture ball valves that strictly adhere to standards: ASME B16.34, ASME B16.5, ASME B16.10, ASME B16.11 and ISO 17292 (design), for testing standards BS 6755 Part I, API 598 and API 6D. We maintain highest standards of quality through implementation of ISO 9001:2008 system.

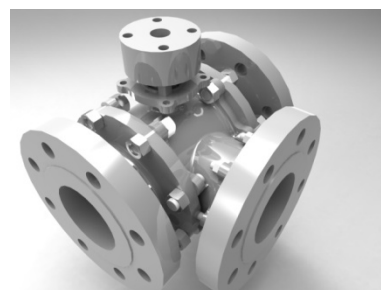


Image A: 3Way Valve with operating flange

## EXPLODED VIEW OF A 3WAY L-PORT BALL VALVE

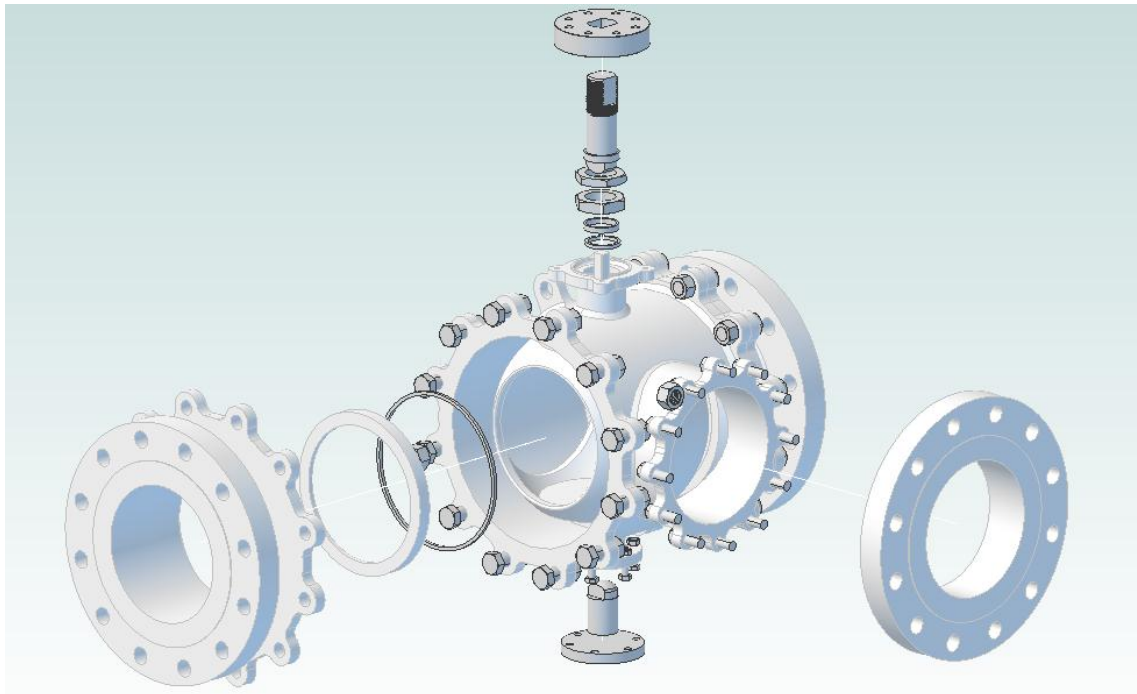


Image B: The exploded view shows various components of the ball valve.

3 way ball valves have 3 ports; one inlet and two outlets or one outlet and two inlets depending upon the process requirement. These valves have balls with either an L type port or a T type port.

3 way ball valves are used for:

- a. Flow Diversion (L Port Ball Valve)
- b. Flow Diversion and Mixing (T Port Ball Valve)

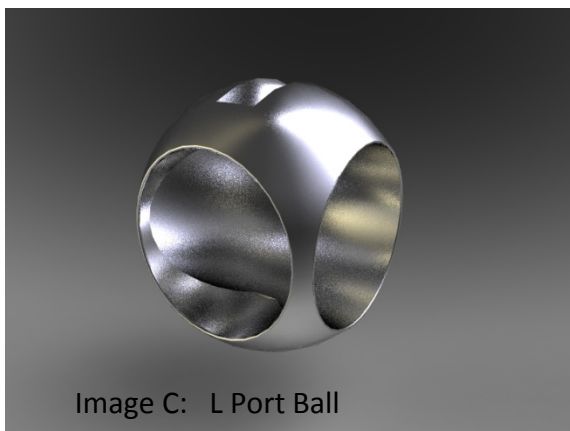


Image C: L Port Ball

Image C shows an L Port ball. This is the heart of an L port ball valve. It can be seen that an L port ball can connect two adjacent ports (located at right angles to each other) while blocking the flow to the other port. By rotating the ball through  $90^{\circ}$ , flow diversion is achieved. The third side port acts as the common port which is always connected.



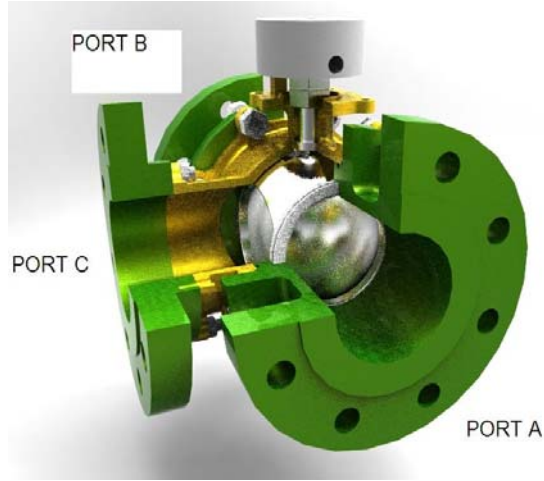


Image D: 3 Way L-Port Ball Valve

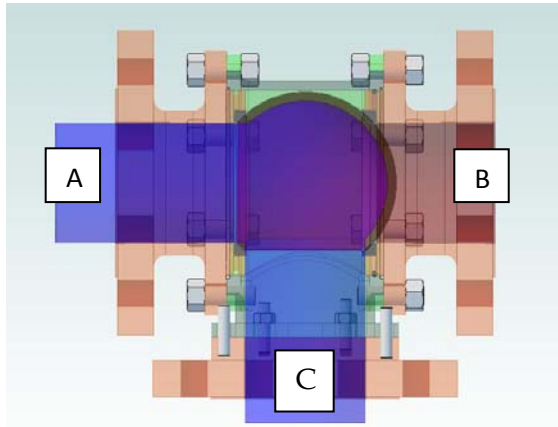


Image E: Port A to Port C, Port B Shut Off

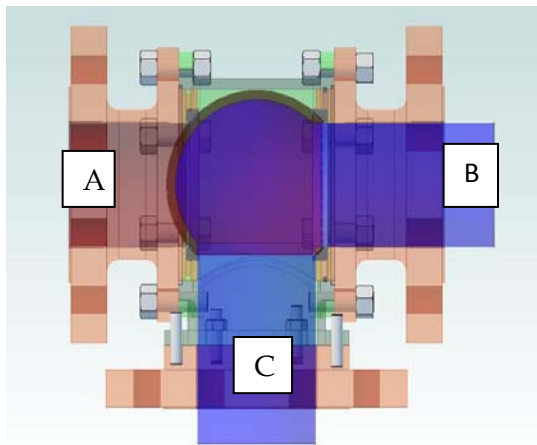


Image F: Port B to Port C, Port A Shut Off

**KAVAATA** manufactures world class 3 Way L Port Ball valves. These ball valves are suitable for use in Duplex Filters and Heat Exchangers (Oil Coolers). Pressure Equalization Line is provided in the case of 3 way ball valves for heat exchangers.

Flexibility is the hallmark of **KAVAATA** 3 Way ball valves. They can be supplied with flanged ends conforming to different standards. Available in sizes from 15mm to 200mm, they can be supplied in ASTM A216 Gr. WCB, ASTM A351 Gr. CF8 and CF8M body with suitable trim material. PTFE is the normal seat material.

METAL SEATED VALVES CAN ALSO BE SUPPLIED FOR HIGH TEMPERATURE APPLICATIONS.

*Image D shows cut section of a 3 Way L Port Ball Valve. Image E describes the working of an L Port 3 Way Ball Valve- Port A is connected to Port C (common port). Port B is shut off. By rotating the ball by 90° in the clockwise direction, Port B can be connected to Port C and Port A can be shut off. Diversion of flow is thus achieved*

## T-PORT BALL

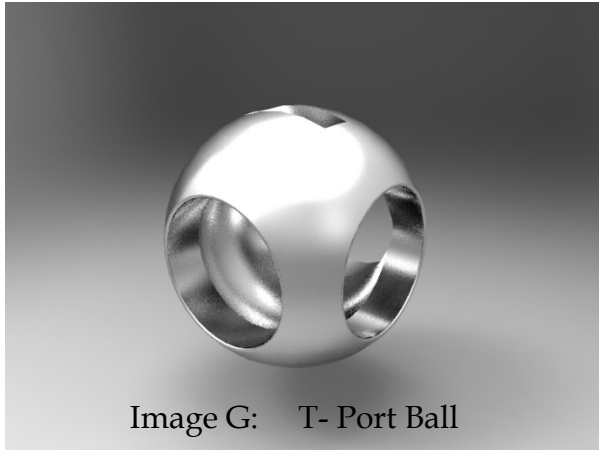


Image G: T- Port Ball

Image G shows a T- Port Ball. This ball is a combination of straight port and L port ball. Hence, it can perform the function of mixing of flow and diverting flow. This ball has to be rotated by  $180^{\circ}$  to achieve flow mixing and diverting.

T Port ball valves can be classified into:

- a. 2 seat design
- b. 4 seat design

In 2 seat design, the T port valve can mix and divert flow. The third port is always open.

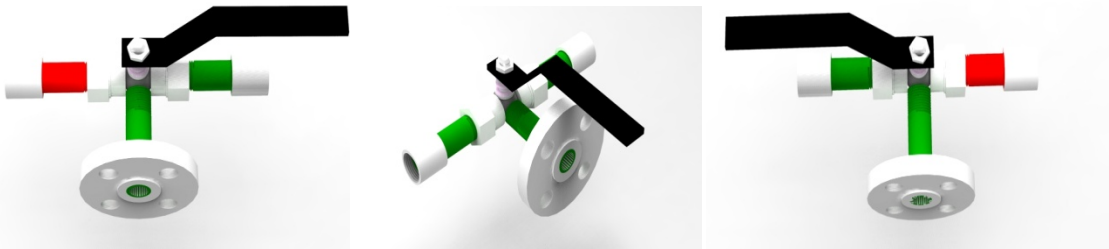
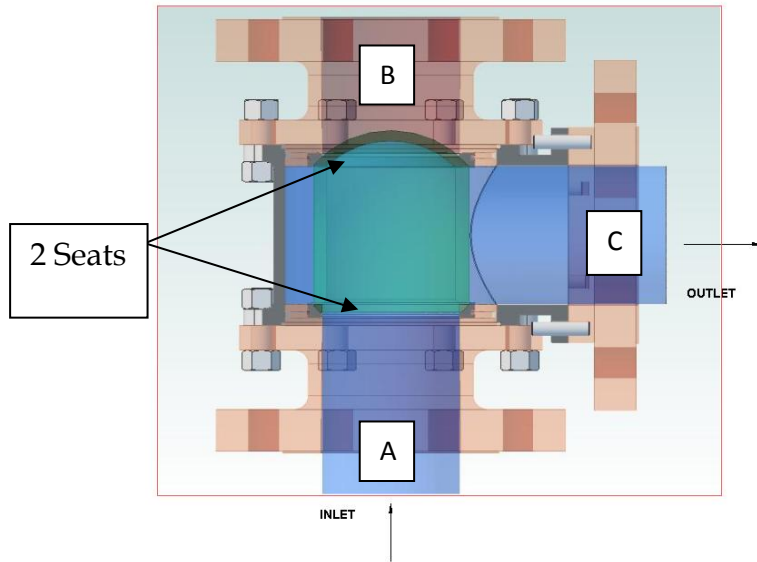


Image H: 3 Positions of a T Port Ball Valve.

Image H: shows the 3 positions of a T Port Ball Valve. Green indicates flow and red indicates shut off.

The valve has three positions. Port A to Port C—Port B shut off, Port B to Port C—Port A shut off, all three ports open (Mixing). To perform all these functions, the ball is rotated through  $180^{\circ}$ .



Picture I 1(above) I 2 (below)

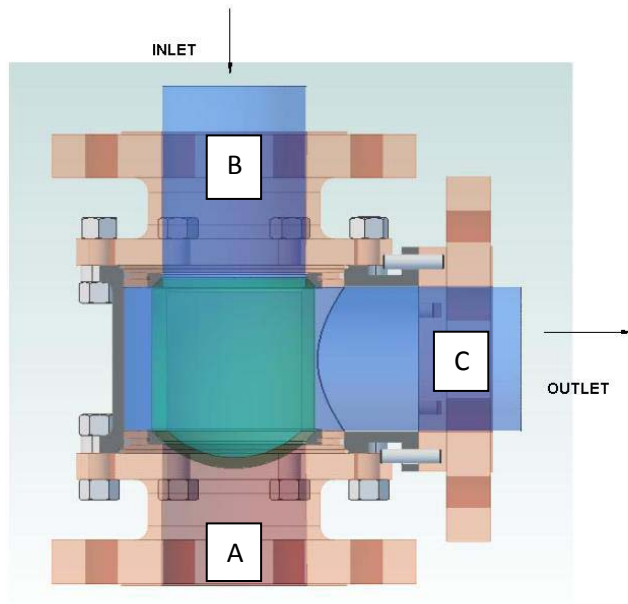


Image I 1 shows flow of fluid from Port A to C with Port B shut off. I 2 shows the flow of fluid from Port B to C with Port A shut off. I 3 show mixing.

Note the arrangement of the 2 seats is similar to L Port Ball Valve



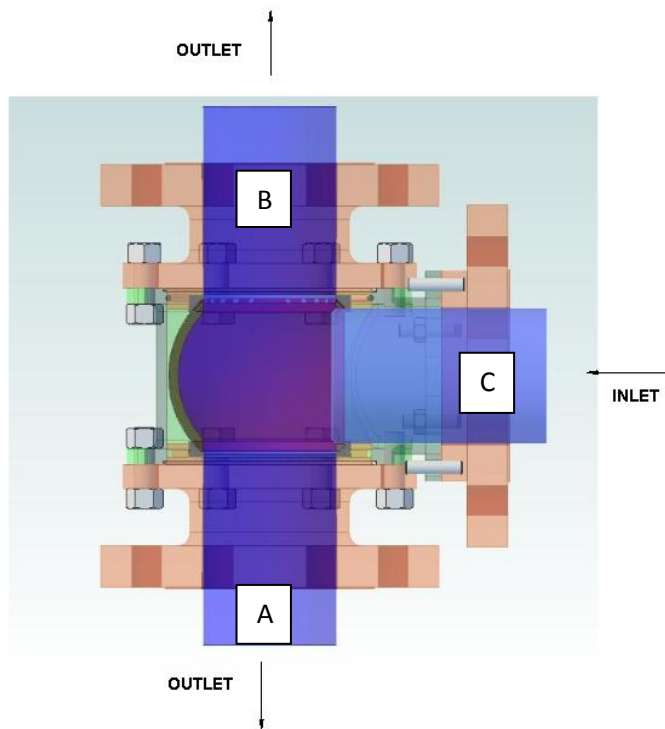


Image I 3

In 4 seat design, one more position is added to the above three positions viz. Port C shut off. By shutting off Port C, inlet or outlet (as the case may be), can be shut off. This obviates the inclusion of a shut off valve in the line preceding the 3 Way valve.

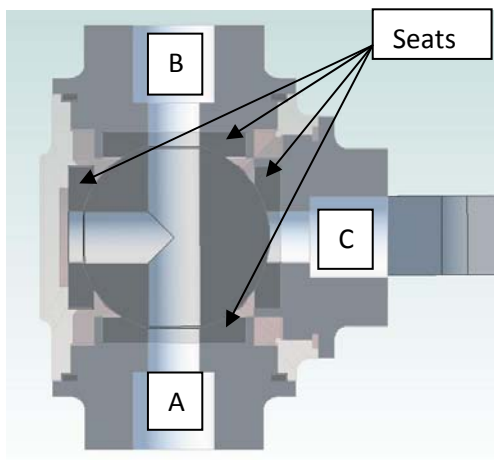


Image J

Image J shows the condition described above

Kavaata valves are tested to perfection, as illustrated below.

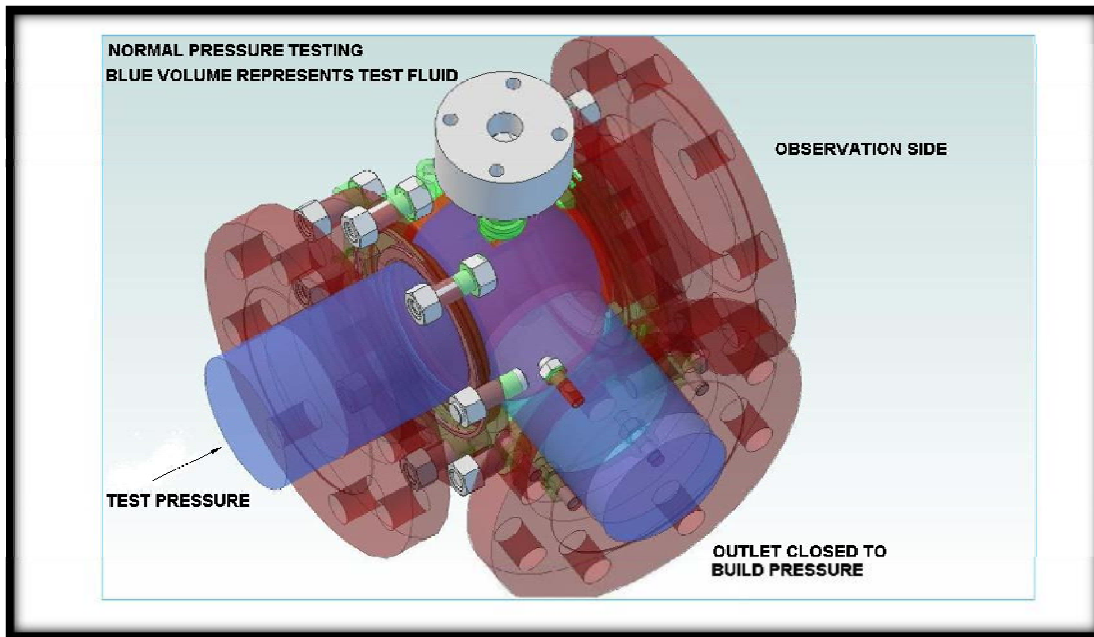


Image K: Normal testing of three way ball valve.

Pressure testing of 3 Way ball valves is normally done across two open ports and leakage is observed on the closed side, as shown in Picture K above. This way of testing is suitable for a test bench to determine acceptability of the valve. However, if the Ports A and B are mounted on any equipment and Port C is open for observation, it is impossible to build pressure. On the other hand, if Port C is closed to build pressure, all ports become unavailable for visual leak detection. This situation is highly pertinent to the Heat Exchanger (Oil Cooler) manufacturers. Heat Exchangers are tested for leak tightness along with the mounted valves. Picture L below shows the test method required. Here, testing is required to be done from the closed port (B) side and observation for leakage from Port C. This presents a peculiar problem, especially in the larger sized valves. Due to the pressure applied from the closed port side, the ball tends to move away from its seat to create a gap, resulting in leakage. The solution is obviously to increase the pre-compression in the seats so that a slight movement of the ball does not allow a gap to form between the seat and the ball.

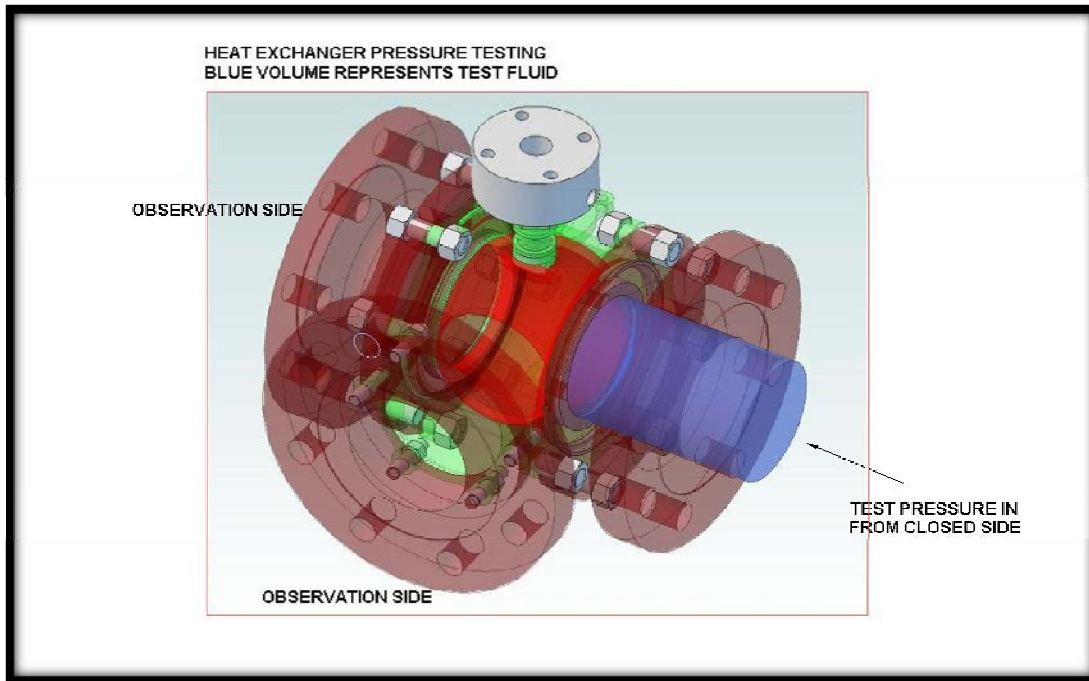


Image L: Heat Exchanger Pressure testing of three way ball valve.

However, the higher pre-compression in the seats along the change in the ball axis (due to the pressure), increase the operating torque abnormally. Duplex heat exchangers require two similar sized valves to be coupled and operated together. This doubles the required effort. In the case of larger sized valves, extension pipes and more men are required to operate the valves. There is an increased torsion experienced by the valve stem which can lead to permanent stem twist.

KAVAATA have developed special 3 Way ball valves especially for the heat exchanger industry. **Innovative ball and seat design allows KAVAATA ball valves to exceed the requirement of the industry with very low operating torque.** Pressure Equalization line, which is an essential accessory, is supplied duly mounted on each valve. Pressure equalization line is used to prevent drop in pressure during changeover from one heat exchanger to the other in a duplex heat exchanger.

The features, design and technique involved ensures the best product being delivered to our customer. The L-Port ball valve is available in CL150#, CL300# (usually in stock) and CL600# and above is made as per the demands of the customer. The dimensional details of CL150# are mentioned in the table below.

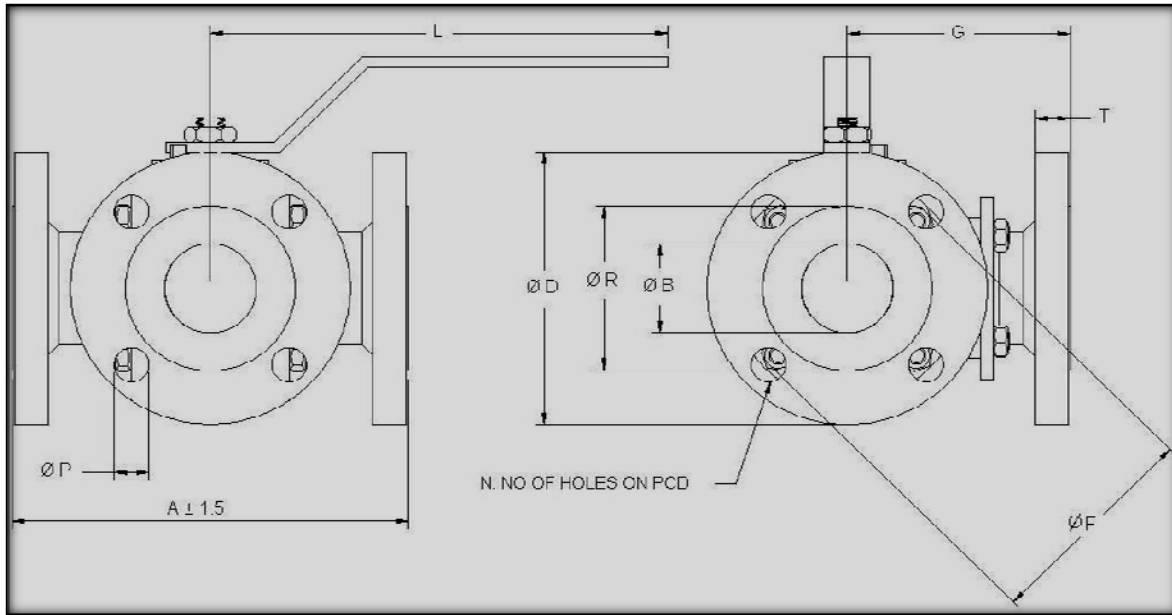


Image M showing general assembly and dimensions.

TABLE A										
CLASS 150# BALL VALVE DIMENSIONS										
SIZE	A	$\varnothing B$	$\varnothing D$	$\varnothing R$	G	$\varnothing F$	T	N	$\varnothing P$	L
1/2"	108	12.5	90	35	66	60.3	10	4	16	170
3/4"	117	19	100	43	68	69.9	10.9	4	16	170
1"	127	25	108	51	75	79.4	11.2	4	16	190
1 1/2"	165	38	127	73	92	98.55	14.2	4	16	250
2"	215	50	152	92.1	107	120.6	15.75	4	19	250
2 1/2"	207	64	178	105	125	139.7	17.53	4	19	300
3"	245	75	190.5	127	140	152.4	19.05	4	19	300
4"	280	100	229	157	190	190.5	23.88	8	19	400
6"	403	150	279	215.9	220	241.3	25.4	8	22.35	800

NOTE: All dimensions are in mm

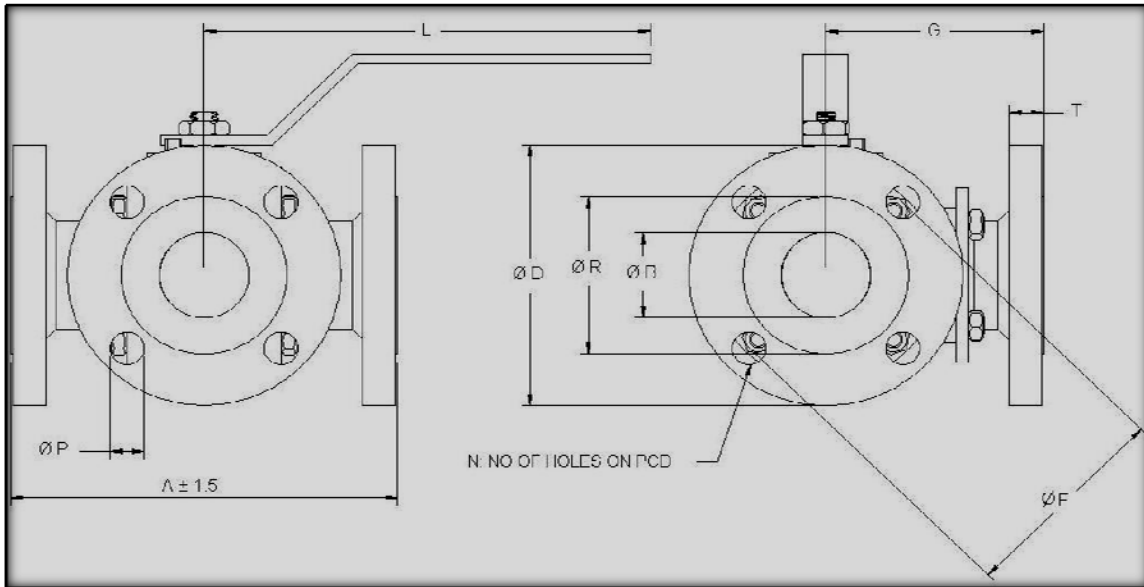


Image N showing general assembly and dimensions.

TABLE B										
CLASS 300# BALL VALVE DIMENSIONS										
SIZE	A	$\varnothing B$	$\varnothing D$	$\varnothing R$	G	$\varnothing F$	T	N	$\varnothing P$	L
1/2"	140	12.5	95	35	70	66.7	14.7	4	16	170
3/4"	152	19	115	43	95	82.6	16.3	4	19	170
1"	165	25	125	51	90	88.9	17.9	4	19	190
1 1/2"	190	38	155	73	100	114.3	21.1	4	22.35	250
2"	216	50	165	92.1	115	127	22.7	8	19	250
2 1/2"	241	64	190	105	130	149.2	25.9	8	22.35	300
3"	312	75	210	127	155	168.3	29	8	22.35	300
4"	316	100	255	157	180	200	32.2	8	22.35	400
6"	403	150	320	215.9	230	269.9	37	12	22.35	800

NOTE: All dimensions are in mm

NOTE: Due to continuous improvement, dimensions may vary without notice.

Actuator mounting pads are provided as per ISO 5211: 2001(E) standards in most sizes.



Optional features for three way ball valves are as shown below.



Image O: Ball valve with operating flange.

Operating flanges serve as a connection between the two valves usually for operating both of them simultaneously with a common lever.



Image P: Ball valve with pressure equalization line.

Pressure equalization line before changing over, the pressure in the system has to be equalized to avoid pressure shocks and air locks. Our three way ball valves offer the possibility to mount an integrated pressure equalizing ball valve.

Duplex filtration systems cannot accommodate a straight operating lever, hence we supply with a handle bent at 45°.

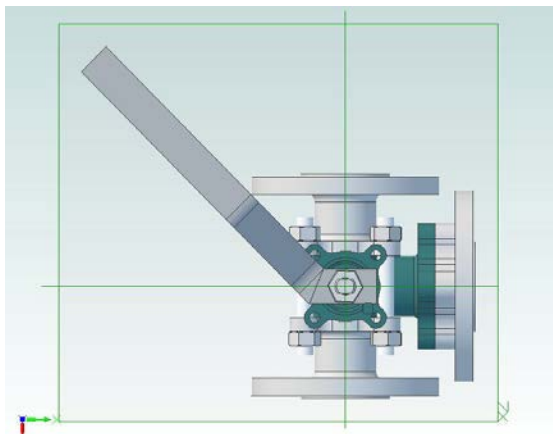


Image Q: Ball valve with 45 deg handle.

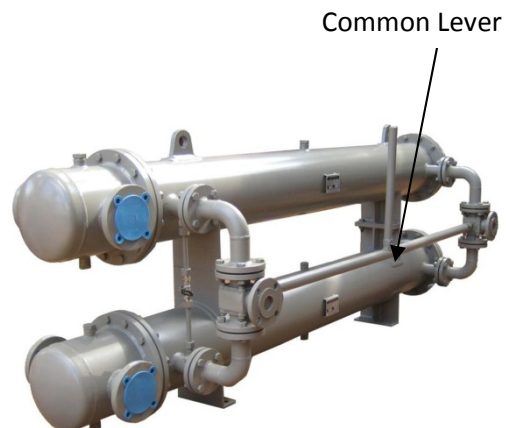


Image R: Common Lever Arrangement.

OPERATING FLANGE DIMENSIONS

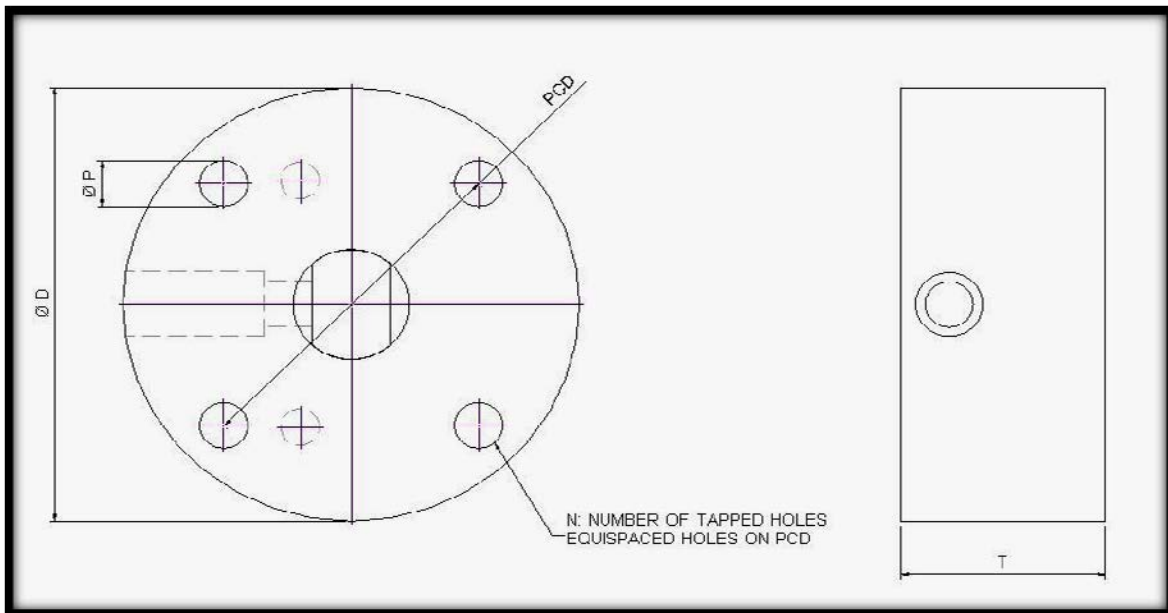


Image S: showing general drawing of operating flange.

TABLE C				
CLASS 150#				
Dimension	ØD	PCD	ØP x N	T
40FB	90	65	M10x4	20
50FB	105	80	M10x4	18
65FB	105	80	M10x4	18
80FB	75	50	M12x4	42.5
100FB	75	50	M12x4	42.5
150FB	135	102	M12x8	30
CLASS 300#				
Dimension	ØD	PCD	ØP x N	T
40FB	90	65	M10x4	20
50FB	105	80	M10x4	18
65FB	105	80	M10x4	18
80FB	95	75	M10x4	42.5
100FB	95	75	M10x4	42.5
150FB	135	102	M12x8	30

NOTE: All dimensions are in mm

SEAT MATERIAL BEHAVIOUR

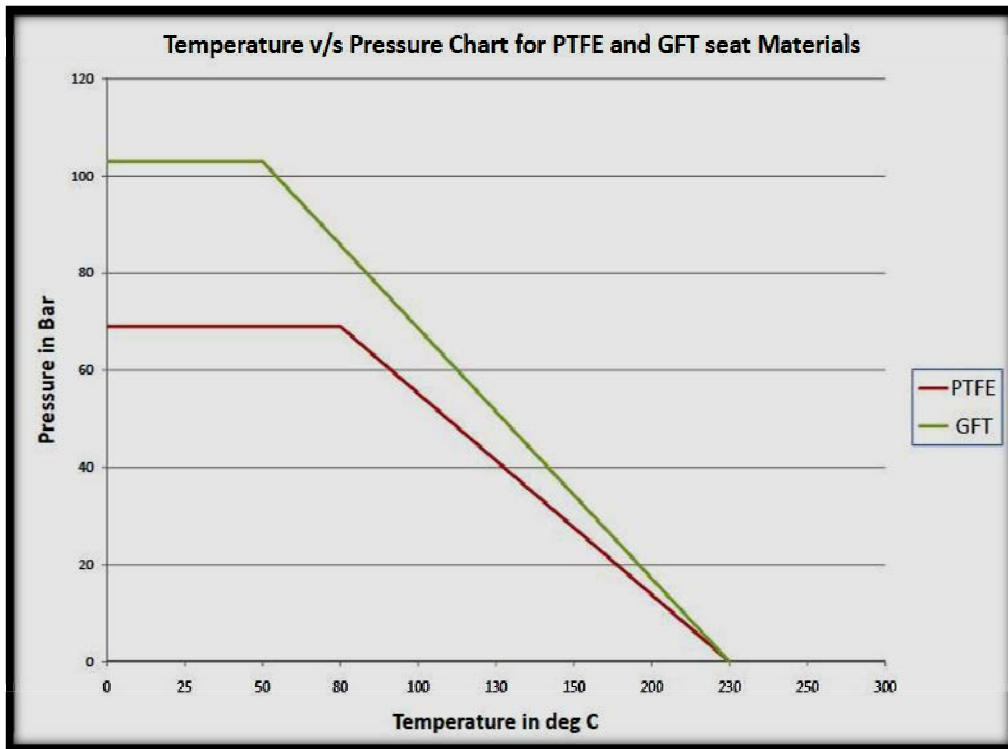


Image T: showing PTFE & GFT behavior at various temperature & pressure.

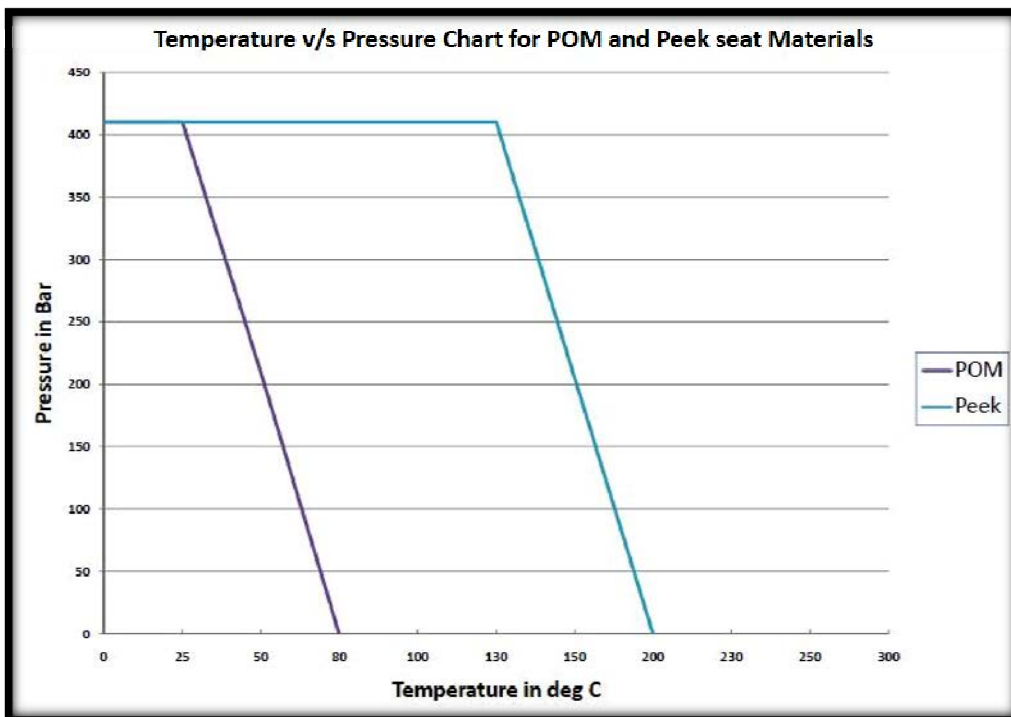


Image U: showing POM & Peek behavior at various temperature & pressure.

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