

## **Both T-Port and L-Port Valves Should Be Considered for 3-Way Ball Valve Applications.**



L-port 3-way ball valves are the first choice by many Application Engineers when selecting a multiport ball valve, but are they the best choice for your application?

### ***“What is the difference between a L-port and a T-Port Ball Valve?”***

With a L-port the ball is drilled from two different sides (90 degrees) and the drilling resembles the shape of an L. The T-port valve is basically the L-port valve, but the ball is drilled all the way through in one direction. So the drilling of the ball resembles the shape of the letter T.

With a L-port, the middle port is the common port, and with a T-port, one of the side ports is the common port. But this assumes you want to use a T-port ball to divert as you would an L-port ball valve.

Common Applications for a L-port ball valve:

- divert a flow from one source tank to another source tank,
- divert a flow from one source, like switching between pump #1 and pump #2,
- diverting from free cooling to using a chiller due to seasonal demand
- diverting a flow to one storage tank to another storage tank

Common Applications for a T-port ball:

- the applications are basically the same, but you can flow straight thru the valve in position #1 and have less pressure loss and then divert in another direction in position #2
- when you want to choose between using one paint sprayer or both paint sprayers at the same time (all three ports connected)
- piping arrangement suggests that the end port should be the common port
- replacement for lubricated T-port plug valve in tank farms

Note: Although there are both side entry and bottom entry 3 way ball valves, we are focusing on side entry ball valves for this discussion. Commercial Bottom Entry 3way ball valves can be used for mixing or diverting in temperature control loops. Industrial Bottom Entry 3way ball valves can have a center off position, so no mixing occurs. With Side Entry 3way ball valves, there is always mixing when switching positions, and can be a benefit if you have considerations about dead heading a pump.

Lever Assembly	T-Port				L-Port		
	T-1	T-2	T-3	T-4	L-1	L-2	L-3
Position 1							
Position 2							
Note	The flow paths are indicated by the markings on the spindle.						

Chart Showing Flow Path of 3 Way T-Port and L-Port Ball Valves

Courtesy of Bonomi North America

***Some reasons to consider a T-port 3 way ball valve are: port and piping arrangement; flow coefficient and pressure drop; and valve function.***

**Port and Piping Arrangement** – Sometimes it is easier to use a T-port ball valve instead of an L-port ball valve in an instance where the piping lines up better. You can use a T-port ball valve can replace an L-port in almost any instance. For diverter service, the piping arrangement will be different as with an L-port ball valve, the center port will be the common port. With a T-port ball valve, one of the side ports will be the common port.

**Valve Function** – For general diverter service, L-port ball valves are often used. If you want maximum flow in one direction, an L-port valve won't help you as the flow will have to turn a corner in both valve positions. With a T-port ball valve you can have straight through flow in one position and turn the corner in the other direction or diverted flow. You might want to have straight through flow when feeding water spray heads for keeping coal dust down in position one and use the divert port to drain the excess water from the spray heads in position two. With a T-port ball valve you can have flow to one port or paint gun in position one and flow to 2 paint guns in position two as all 3 ports can be connected. This cannot be accomplished with an L-port valve.

## Some other Considerations when Selecting 3 Way Ball Valves:

**Flow Coefficient** – 3way ball valves are available in full port and standard port sizes.

1) Full port ball valve - Although it makes logical sense to think that a full port valve is line size, most are not. A line size valve is a “piggable valve”, which means that a pig can be sent down the line without being stopped by a reduction in pipe size. What’s a pig? A pig is a device which can be used to clean out a line before another product is put through the line or may contain electronic sensors to measure internal pipe conditions. So then what is a full port valve measure? Typically a 1” full port ball valve will measure .98”.

2) Standard port ball valve - A standard port size would be one size less than full port or in the case of the 1” ball valve the standard port would measure .75” to .78”. In most cases, a standard port valve is a full port valve with one size larger end connections screwed into it. That is one of the reasons that the end connectors are screwed into the valve instead of cast into the valve body. It also allows the manufacturer a way to put the ball, stem and seats into the valve body.

3) Are there other port sizes? Yes, reduced port size, which is 2 sizes less than a full port or in this example of a 1” ball valve, the port size for a reduced bore would be typically .43” to .59”. In valves  $\frac{1}{2}$ ” and smaller, many manufacturers only make one valve size and put reduced end connections on them. If you see a  $\frac{1}{4}$ ” valve costing the same as a  $\frac{1}{2}$ ” valve, it is likely a  $\frac{1}{2}$ ” valve with  $\frac{1}{4}$ ” end connections. You don’t typically see reduced port valves in this instance because the valve is larger than the end connections. A manufacturer may make a valve that is 2” and then sell it with 2”, 2.5” and 3” end connectors. The flow coefficient would be that of a 2” valve.

The valve construction and cost is much the same for both L-port and T-port 3 way ball valves. Sometimes T-port valves are slightly more expensive because not as many are sold, so it costs more to inventory them.

**Number of Valve Seats** – If a 3 way ball valve only has 2 seats; it is likely an L-port ball valve because the seats are typically on the side ports. You can only shut off the valve or isolate a port that has a seat. If you try to use a 2 seat valve with a T-ball, it will leak in most arrangements. In some situations where there is a pressure difference across the ports, an L-port valve may also leak. L-port ball valves with 4 seats or 3 seats and a trunnion are typically more expensive than 2 seat ball valves because there are more parts and they are typically higher quality valves. The torque is higher because there are more seats. A valve with 4 seats could have a torque value twice as high as a 2 seat valve. When an actuator is used, it would need to have a torque large enough to overcome break torque. A safety factor of 25% is typical for general purpose applications. Considerably higher safety factors should be considered for non-lubricating, sticky and abrasive applications.

Note: 3 way ball valves are typically used to switch flow from one port to the other. They are not typically meant to be used as shut off valves as you can cut the seats when trying to shut off a high velocity flow. A separate isolation valve should be used as the shutoff valve.

**Conclusion:** Both L-port and T-port ball valves have their place. L-port ball valves are more commonly used and are more available. The T-port has less pressure drop straight through the valve, whereas an L-port will have to turn a corner and the pressure drop is higher. T-port ball valves can give more versatility than L-port ball valves for some applications. Economy 2 seat 3way ball valves are usually only available in L port configuration as they are less expensive to manufacture.

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### **Examples of 3 Way Ball Valves:**

3way NPT, Socket Weld, Sanitary Triclamp, Sanitary Tube, Butt Weld Ball Valves  
<http://www.sk-automation.com/ballvalves/3wayballvalve.html>

3way Flanged Ball Valves  
<http://www.sk-automation.com/ballvalves/3wayflangedballvalve.html>

3way Air and Electric Actuated Ball Valve  
<http://www.sk-automation.com/ballvalves/3wayballvalveactuated.html>