

CHART VACUUM VALVES

Isolation valves are often needed in cryogenic systems to help service parts of the system, the equipment, or expansion of the system. It is generally recommended to have isolation valves in the following instances:

- Main isolation valve at the exit of the bulk storage tank - a valve here will allow shutting down the entire pipe system. This valve is helpful during system installation. A valve here will allow filling of the tank before the vacuum insulated pipe system is installed. This valve can also be equipped with an actuator (electric or pneumatic) for remote control. This actuator can be integrated with safety systems to close the valve in certain situations.
- Main system branches - it is often useful to put an isolation valve at the start of any new branch. A branch is a run of pipe that will be feeding multiple drops. These valves make it possible to shut down an entire section for service.
- Equipment Drops - Valves on the individual drops make it possible to supply liquid nitrogen to specific chambers, but not all chambers. For example, if some chambers will be installed and operating sooner than others, it is convenient to be able to open just the drops that are connected, and leave the drops without the chambers connected valved off.
- Before Cap Bayonets - placing an isolation valve just before a cap bayonet allows expanding a pipe system without having to shut it down. This allows production or other testing to continue without being disturbed while the system is being expanded.



Isolation valves can either be vacuum insulated, or non-vacuum insulated. A vacuum insulated valve is more expensive on initial purchase, but quickly pays for itself in many ways. The vacuum insulation makes the valve much more thermally efficient than one that is not vacuum insulated. A non-vacuum insulated valve allows significantly more heat to enter the liquid causing warmer liquid, two phase flow, and boil-off of liquid. All of these things mean more liquid nitrogen is used to run the test chamber.

The following table shows the difference in heat transfer and the money that can be saved by using a vacuum insulated valve:

Valve	Heat Leak	Nitrogen Cost
1" Bronze Valve	470 BTU/Hr	\$2,300/Yr
1" Vacuum Insulated Valve	10.4 BTU/Hr	\$50.00/Yr
2" Bronze Valve	850 BTU/Hr	\$3,990/Yr
2" Vacuum Insulated Valve	27.3 BTU/Hr	\$135.00/Yr
3" Bronze Valve	1250 BTU/Hr	\$6,123/Yr
3" Vacuum Insulated Valve	68.7 BTU/Hr	\$338.00/Yr



In addition to the obvious financial savings shown in the above table, non-vacuum insulated valves can present significant service issues. The valves develop large ice balls around them while in service. It is not uncommon for these ice balls to completely surround the valve. If the valve ever needs to be closed in a hurry, one must first chip away all of the ice around the valve. This can cause considerable safety issues. These ice balls will also tend to drip water when the use pattern slows down. This dripping can ruin ceilings, make floors slippery, or drip on computers/electronic equipment and destroy very valuable equipment. The vacuum insulated valves will help prevent the formation of ice or dripping water.

