VAPOR VENT DEVICE

BeaconMedaes®

CRYOGENIC EQUIPMENT

Vapor Vent Device
(aka Keepfull/KeepCold/Cryovent)
SPECIFICATION

Description

Located at a high point in a vacuum jacketed piping system, the vapor vent provides a higher quality of liquid nitrogen by removing the gas phase out of the liquid nitrogen phase. An internal float assembly controls the venting of gaseous nitrogen while retaining liquid nitrogen inside the piping.

The vacuum jacket surrounding the float assembly prevents frost and ice build-up. It is important at this point to understand that gaseous nitrogen escaping the piping is very cold. As a result, moisture surrounding the vent discharge tends to accumulate as ice on the outside of the vent pipe.

It is recommended to install a separate vapor vent heater to the vent pipe to minimize the ice build-up on the vent pipe.

Benefits of the Vapor Vent

There are two main benefits of installing a vapor vent:
a) It provides "liquid nitrogen on demand" at the point of use as it keeps the inner pipe "full" of liquid nitrogen at all times.

b) It minimizes the amount of gaseous nitrogen in the liquid nitrogen, resulting in lower liquid nitrogen temperature and lower pipeline pressures.

What's Happening Inside the VJ Pipe?

Pressure: +
Temperature: +

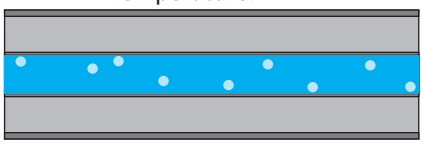


Fig. A
Liquid nitrogen is filling up the entire inner pipe and only a small amount of gaseous nitrogen is present.

Pressure: ++
Temperature: ++

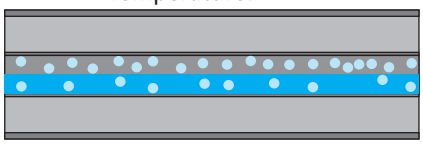


Fig. B
Over time, when there is no flow or when there is no vapor vent, liquid nitrogen evaporates and gaseous nitrogen builds up on top of the liquid nitrogen gradually saturating it.

Pressure: +++
Temperature: +++

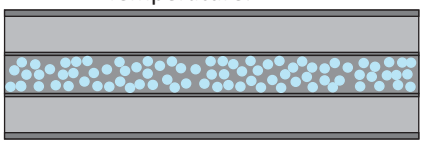
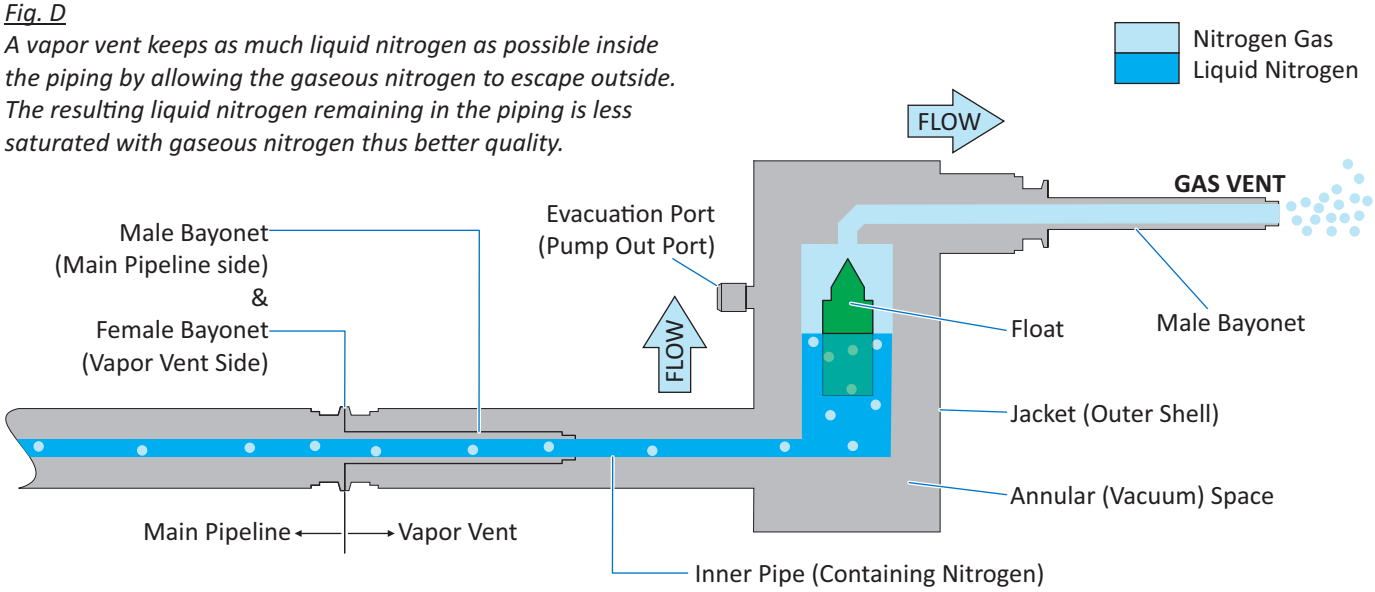
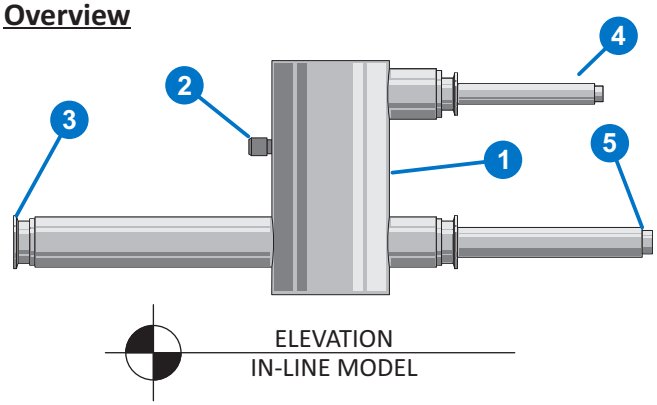


Fig. C
Eventually under these conditions, liquid nitrogen will totally evaporate and only gaseous nitrogen remains in the pipe.

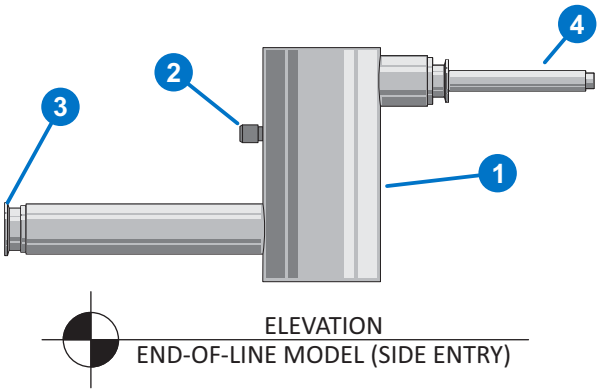
Fig. D
A vapor vent keeps as much liquid nitrogen as possible inside the piping by allowing the gaseous nitrogen to escape outside. The resulting liquid nitrogen remaining in the piping is less saturated with gaseous nitrogen thus better quality.



Overview



ELEVATION
IN-LINE MODEL

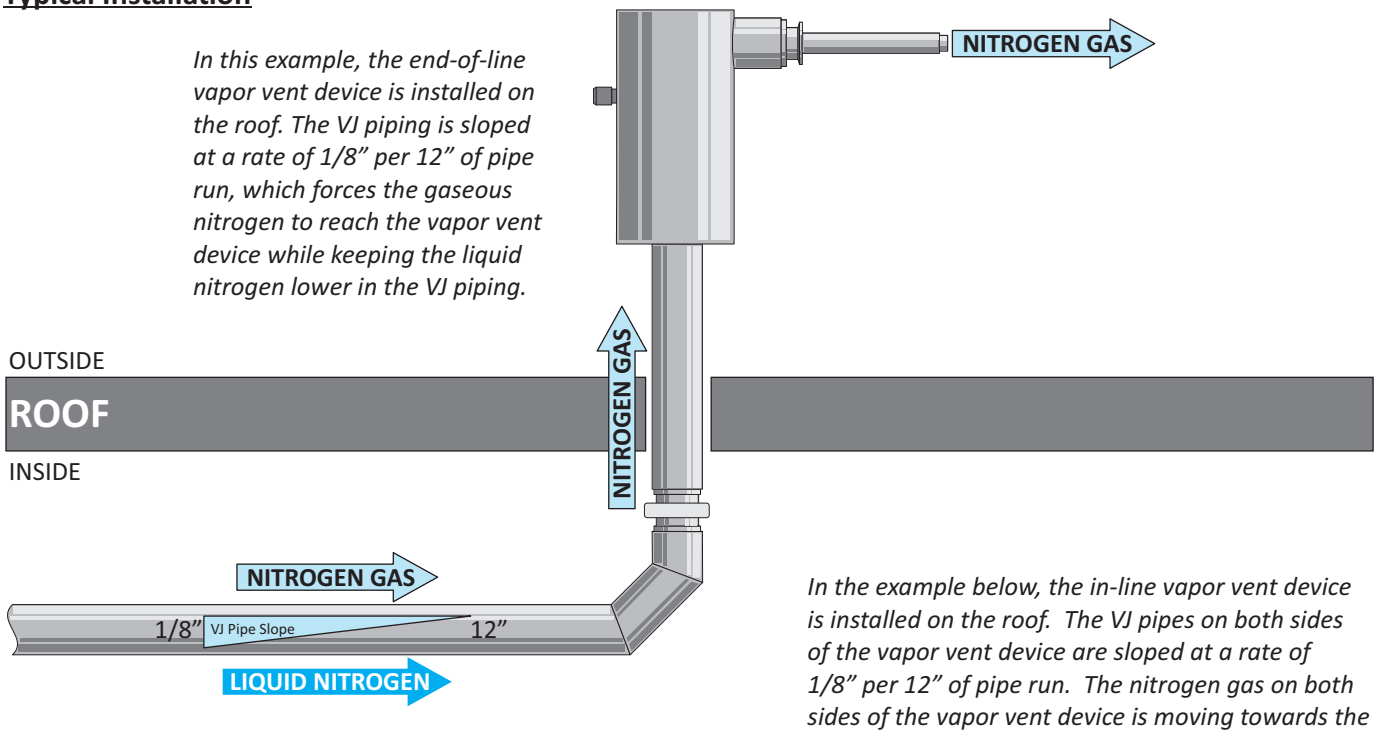


ELEVATION
END-OF-LINE MODEL (SIDE ENTRY)

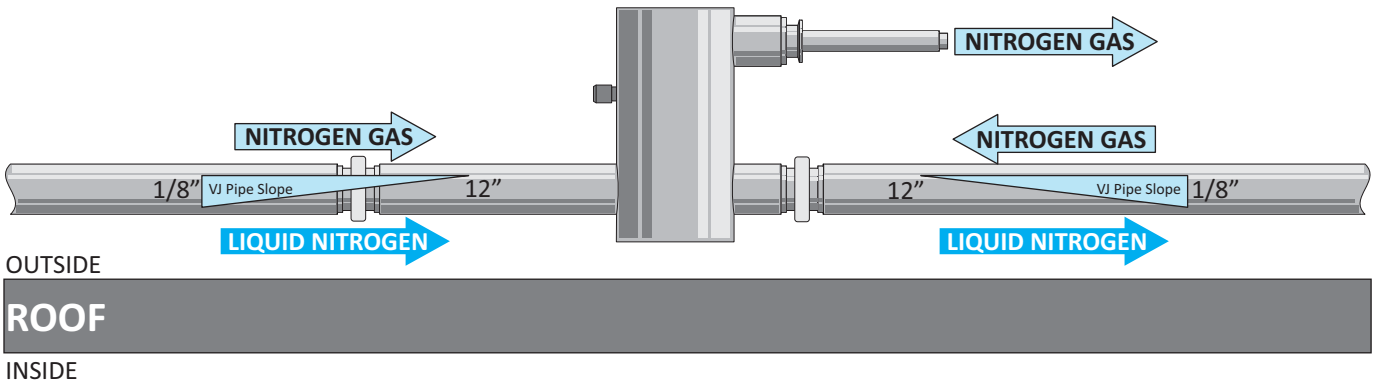
1. Vacuum Jacketed Phase Separator
2. Pump Out Port
3. Liquid Nitrogen Inlet Female Bayonet
4. Vent Outlet Male Bayonet
5. Liquid Nitrogen Outlet Male Bayonet

Typical Installation

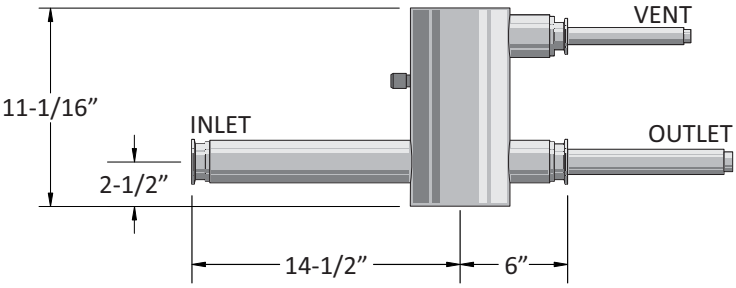
In this example, the end-of-line vapor vent device is installed on the roof. The VJ piping is sloped at a rate of 1/8" per 12" of pipe run, which forces the gaseous nitrogen to reach the vapor vent device while keeping the liquid nitrogen lower in the VJ piping.



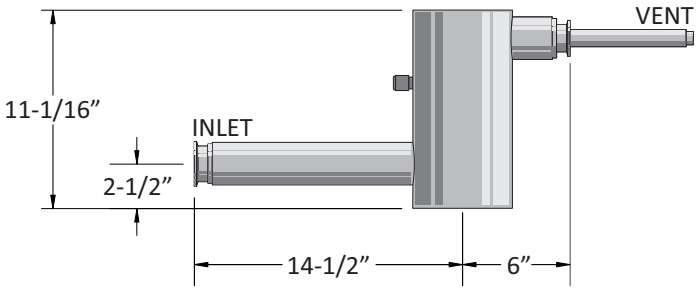
In the example below, the in-line vapor vent device is installed on the roof. The VJ pipes on both sides of the vapor vent device are sloped at a rate of 1/8" per 12" of pipe run. The nitrogen gas on both sides of the vapor vent device is moving towards the vapor vent while the liquid nitrogen remains in the VJ piping.



Dimensions



Inline Model



End of Line Model

Picture 1
Inline vapor vent mounted to a horizontal VJ piping installed on the roof of a building.

Installation Notes

The vapor vent device shall be installed at the highest point of the vacuum jacketed piping network.

It is important to maintain a proper slope throughout the VJ piping network to allow gaseous nitrogen (which is lighter than liquid nitrogen) to reach the vapor vent.

The sizing of the vapor vent device will be done by BeaconMedaes when quoting the vacuum jacketed piping. The vapor vent is not a stand-alone item, but is incorporated into the design of a liquid nitrogen delivery system.

A significant amount of gaseous nitrogen will be released out of the vapor vent device. Over time nitrogen can displace oxygen in the atmosphere. Therefore, the vapor vent device shall be vented in a manner to keep the oxygen level safe for people.

The preferred location to discharge the vapor vent device is outside. If vented inside a building, there has to be enough air exchanges to prevent oxygen depletion.

A vapor vent heater is recommended to be installed at the end of the vapor vent device to prevent ice build-up.

If a copper pipe is used to vent the vapor vent device outside, please indicate this so that the bayonet-to-copper adapter can be included. We strongly recommend to insulate the copper pipe from the vapor vent device up to the outside to prevent condensation and freeze up on the copper pipe.

The selection between the end-of-the-line and the inline models will be discussed between the project management team and BeaconMedaes engineers.

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