Flexible Vacuum Insulated Pipe (FVIP)

CryoWorks Flexible Vacuum Insulated Pipe (FVIP) is a vacuum insulated, stainless steel flexible pipe. Each spool section is factory evacuated and sealed, eliminating the need for any on-site vacuum pumps. Flexible VIP is modular in construction and available in standard line sizes of ¾", 1¼" & 2" ID.

Features:

- Modular design, highly reusable, facilitates future expansions.
- Ideal for LN2 and other inert applications.
- Bayonet connections with no field welding required.
- Standard system components: tees, crosses, elbows, valves, keepfull vents, and gas traps.
- Each spool section is helium leak tested, evacuated, and vacuum sealed prior to shipment.

Benefits:

- Easy to install - its lightweight, compact jacket size, and bendable nature facilitates even the toughest installations.
- Cost effective shipping - assemblies are coiled in small wooden crates.
- Need something quick? - we stock reels of raw flex hose material.
- Great alternative to foam insulated copper or Rigid VIP.
- Approximately 30 times more effective than conventional foam insulation in preventing heat gain to the inner line and nearly 150 times more effective than bare copper lines.
- Extremely long-lasting and impervious to UV degradation.
- Superior vacuum insulation saves LN2 and reduces operating costs.
- Less mass - the thin wall inner material allows for a quicker cool down time while also minimizing start-up losses.
- CryoWorks bayonets utilized for ease of installation.

Available Accessories/Options:

- Keepfulls/High Point Vents
- Vent Heaters
- Vacuum Insulated Valves
- Emergency Shut Off Valves
- Isolation Valves
- Bronze Cryo-Valves
- Phase Separators
- Internal Low Loss Gas Traps
- Safety Relief Valves
- Custom Weldments/Adapters
- Vacuum Gauges (DV-6R)
- Vacuum Insulated Transfer Hoses (Connection to equipment)
- ASME Code Compliant Testing and Certification

Bayonet Connection

CryoWorks, Inc.® | 951.360.0920 | www.CryoWorks.net | 3309 Grapevine Street, Jurupa Valley, CA 91752

Technical Specifications:

Inner ID	Jacket ID	Inner-Braid	MAWP psi	Inner Nominal ID		Jacket Nominal OD (Braid)		Jacket Nominal OD (Spiral)		Bend Radius Dynamic		Bend Radius Static	
				in	mm	in	mm	in	mm	in	mm	in	mm
¾"	1½"	N/A	150	0.75	19.05	2.28	57.91	2.41	61.21	12.00	304.80	4.00	101.60
1¼"	2½"	Y	150	1.25	31.75	3.33	84.58	3.41	79.76	20.00	508.00	8.00	203.20
2"	3½"	Y	150	2.00	50.80	4.45	113.03	N/A	N/A	24.00	609.60	10.00	254.00

ID = Inner Diameter, OD = Outer Diameter, MAWP = Maximum Allowable Working Pressure

LN2 Flow Data:

Line Size	gpm	lpm	lbs/min
¾"	6.82	25.8	46
1¼"	26.3	99.6	177
2"	90.4	342	610

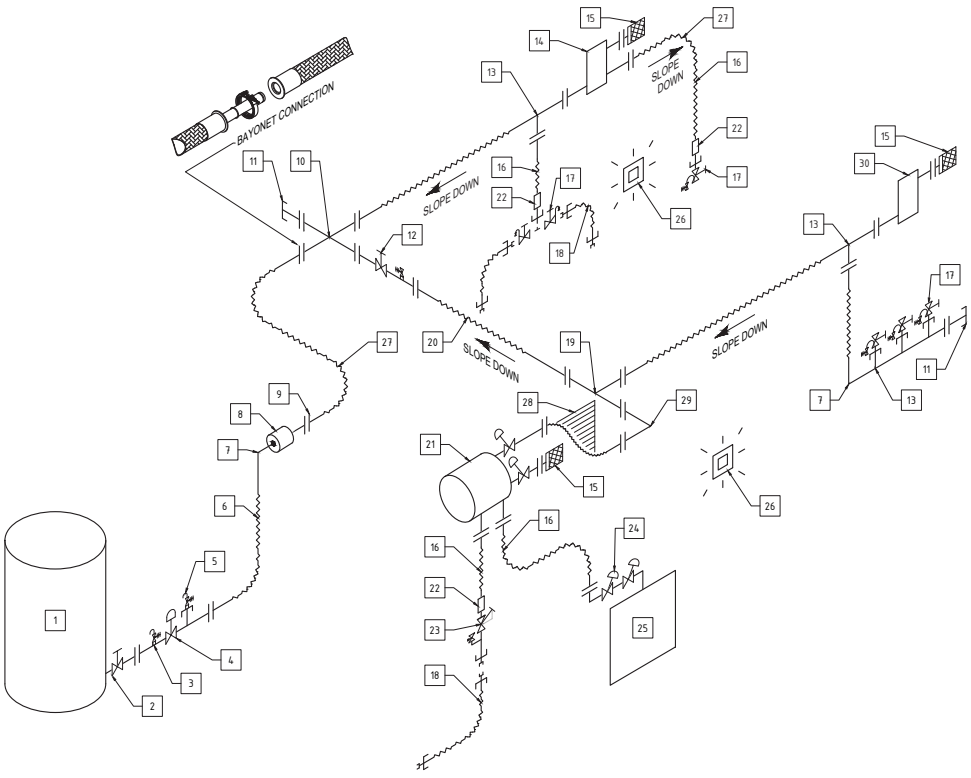
Data based on:
1. Maximum recommended flow rate
2. 100 feet of flexible piping while maintaining less than 5 psi friction pressure drop @ 60 psi operating pressure

LN2 Loss Comparisons:

Line Size	Flexible VIP		Insulated Copper		Bare Copper	
	BTU/hr/ft	Watt/m	BTU/hr/ft	Watt/m	BTU/hr/ft	Watt/m
¾" ID	1.21	1.16	36.36	34.96	181.80	174.80
1¼" ID	1.61	1.55	48.30	46.44	241.50	232.20
2" ID	2.37	2.28	71.10	68.36	355.50	341.81

Data is provided for estimation only. Contact CryoWorks for a thorough system analysis.

System Schematic:

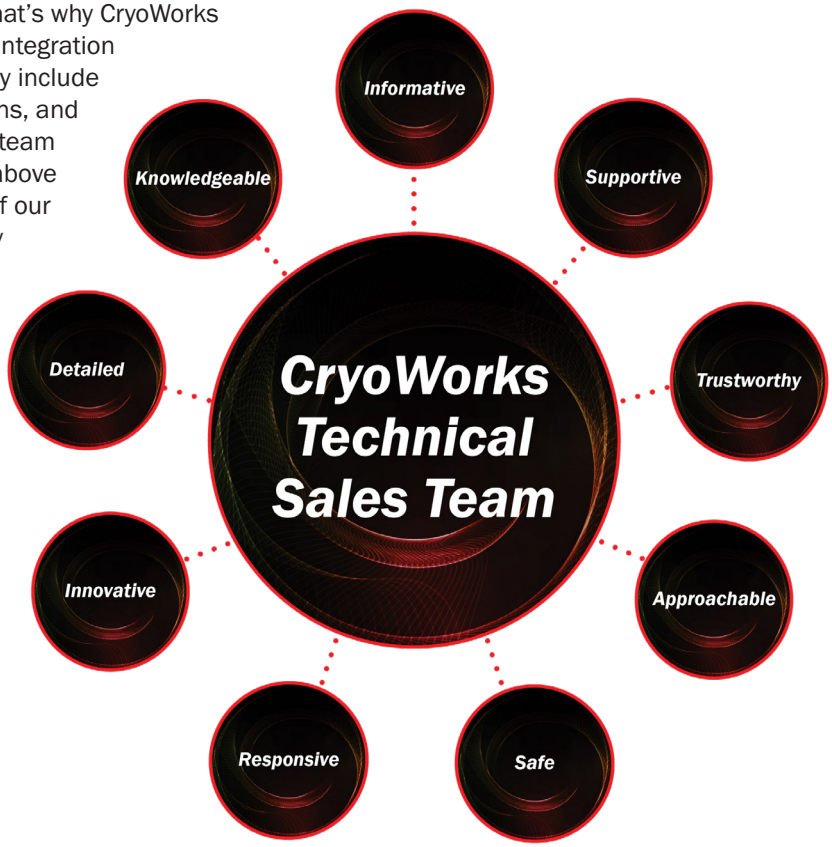


Item	Description
1	LN2 Bulk Tank
2	Vacuum Insulated Withdrawal Valve and Bayonet
3	Safety Relief Valve (SRV) on Pigtail Style Relief Port
4	Emergency Shut-Off Valve (E-Stop)
5	Safety Relief Valve (SRV) on Vacuum Insulated Riser
6	Flexible Vacuum Insulated Pipe
7	Rigid Vacuum Insulated Elbow
8	Building Wall Penetration
9	Bayonet Connection (FxM)
10	Modular Vacuum Insulated Cross (FxMxMxM)
11	Capped Female Bayonet (Future Connection)
12	Modular Vacuum Insulated Manual Isolation (FxM)
13	Rigid Vacuum Insulated Tee
14	Keepfull Vent Device, Inline (FxM)
15	Vent Heater
16	Flexible VIP Drop
17	Bronze CryoValve with Integral SRV
18	Vacuum Insulated Transfer Hose
19	Vacuum Insulated Modular Tee (FxMxM)
20	Flexible VIP Section (FxM)
21	Adjustable Pressure Phase Separator (2 Outlet)
22	Gas Trap with M. NPT End
23	Vacuum Insulated Manual Valve (Y-pattern w/SRV)
24	Vacuum Insulated Pneumatic Control Valve Manifold
25	Customer Equipment
26	Oxygen Deficiency Monitor
27	Flexible Vacuum Insulated Pipe Bend
28	Vertical Flex Offset
29	Vacuum Insulated Modular Elbow (FxM)
30	Keepfull Vent Device, End of Line (F)

Engineering & Design:

Project Management and Engineering go hand in hand. That's why CryoWorks strives to ensure excellent communication and seamless integration between the two. Engineering services for your project may include project reviews, intricate drawings, calculations, simulations, and much more. No matter the complexity of your project, our team is prepared to meet these demands. Operating at a level above our competition, we take pride in the exceptional quality of our designs, drawings, and documentation that convey exactly what you need.

Having our engineering team work closely with our skilled employees enables CryoWorks to maintain tight quality control over the manufacturing process. This allows us to tackle issues and obstacles quickly by making adjustments and changes as needed. Rest assured that during the project life cycle, your single point of contact, our Technical Sales engineers, will Make It Happen, Make It Easy, and Make It Fun!



What you can expect from CryoWorks is a skilled engineering team that designs safe, fully functional, and reliable systems.

Is It Time To Install a VIP System at Your Location?

CryoWorks VIP systems make cryogenic handling more economical, efficient, and safe.

Many "types" of cryogenic fluid delivery systems exist, the trick is to find the one type that best suits your needs. The common progression, as a user's cryogenic fluid volume increases, goes from a simple single dewar and flex hose, to multiple dewars with switching units and rigid piping, all the way to multiple bulk tanks with a complex network of piping, valves, and drops, with many variations existing between the examples provided. Installing the correct type of system for your operation will optimize cost for both the cryogenic product and handling labor, as well as the safety of those handling the related equipment and fluids.

If you are dealing with the troubles of moving heavy dewars from location to location, work interruptions caused by late delivery and dewar swap out, rental fees, floor and wall damages, and all the countless associated safety risks, then it is time to upgrade your system to a type utilizing VIP.