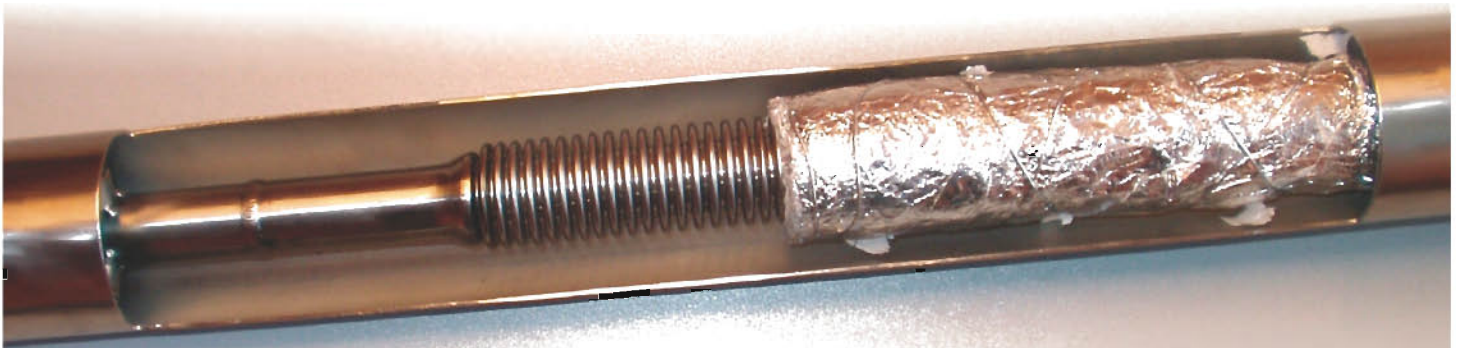


Vacuum Insulated Pipes



- **Liquid Savings**
- **Minimum Maintenance**
- **Versatility**
- **Accessories**
- **“Turn-key” Delivery**

Vacuum insulated pipe (VIP) systems provide the most efficient method of transferring quality cryogenic liquid, allowing you to focus on operations rather than the liquid supply. Once the system is installed, its maintenance free design will provide you with long term trouble free service.

Serving variety of markets and usage requirements Chart Ferox's vacuum insulated pipe systems meet the unique demands of every customer. With our industry-leading experience we can help you to select the pipe system that best suits your application and installation.

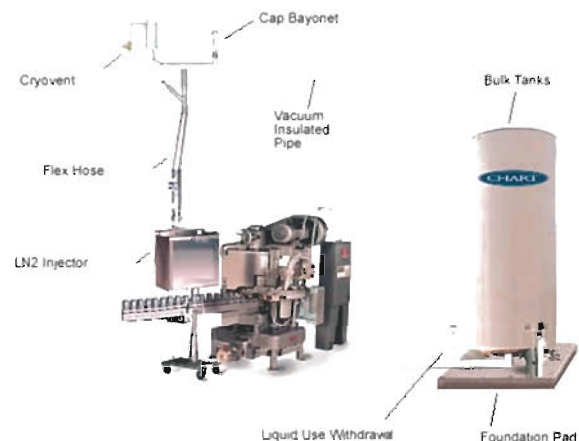
Chart Ferox's vacuum insulated pipe systems are custom engineered and manufactured to meet your application's specifications. Chart Ferox's complete system solution package ensures quality liquid to keep your processes operating at their peak efficiency. Built for long-term integrity and industry-leading efficiency, these systems give you the highest performance at the lowest operating cost. For standard set ups Chart Ferox also provides predefined modules of vacuum insulated system to allow quick delivery and flexibility.

Chart Ferox also has a full "turn-key" capability of vacuum insulated systems, including design analysis, economic evaluation, supports and accessories (valves, "keep full" devices, etc.) supply, installation and startup.

Markets served

Vacuum insulated pipe systems meet wide range of requirements from different industries. Most common applications are within following applications:

- **Biological Storage and Research**
- **Molecular Beam Epitaxy**
- **Food and Beverage Packaging**
- **Food Freezing**
- **Aerospace**
- **LNG service**
- **Electronic Manufacturing and Testing**
- **Environmental Test Chambers**
- **Cryobiological Storage**
- **Liquid Nitrogen Injector**



Vacuum Insulated Pipes

Manufacturing

Our experience and dedication to meet customers' expectations ensures that your job is completed to high quality standards and on schedule. Our shop is ISO 9001 certified. Each segment of VIP system is properly fabricated, evacuated and tested in accordance with EN 13480 code under PED module A/A1 as standard with MAWP 10 bar.

VIP design

Design flexibility is provided by combining rigid and flexible sections, which are joined by the unique Chart Ferox bayonet assemblies. As a standard the positive seal type utilizing the differential temperature contraction rates of Invar 36 and stainless steel (bi-metallic) bayonets are used. Bayonet design has long records of faultless operation and eliminates the need for costly field joints, leak checking and insulation. Bayonet joints allow for easy future expansion and re-configuration of vacuum-insulated pipe systems.

Chart Ferox VIP use composite insulation combined with high level vacuum to produce a lower inherent heat leak than any other known method of insulation. This optimum efficiency minimizes vaporization of cryogenics and provides a controllable high quality liquid when and where you need it.

Stainless steel construction and manufacturing excellence eliminate preventive maintenance and emergency shutdowns associated with more traditional insulated pipe systems.

To accommodate thermal contractions bellows are used, mainly on inner pipe.

VIP systems are typically equipped with:

- Cryovent, ensuring quality liquid availability
- safety valves
- vacuum jacketed valves



Vacuum Insulated Pipes	Technical specification					
	Unit	NPS1/2"	NPS1"	NPS1-1/2"	NPS2"	NPS3"
Inner tube dimensions	mm	D21.3x1.65	D33.4x1.65	D48.3x1.65	D60.3x1.65	D88.9x2.11
Inner tube ID	mm	18	30	45	57	85
Outer tube dimensions	mm	D60.3x1.65	D88.9x2.11	D101.6x2.11	D101.6x2.11	D141.3x2.77
Weight	kg/m	3.9	7.1	8.7	9.3	17.1
Heat leak rigid line	W/m	0.557	0.611	0.754	0.954	1.143
Heat leak flexible	W/m	1.671	1.833	2.262	2.862	3.429
Heat leak bayonet	W	2.16	3.43	3.49	3.49	10.46
Heat leak field joint	W	1.67	2.24	3.24	4.22	5.11