



OUR PRESENCE



FLEXIBLE SOLUTION FOR CRYOGENIC & VACUUM

Liquid & Cryo-Compressed Storage System
Semiconductor
Gas Delivery
Aerospace



BENGAL INDUSTRIES PVT. LTD.

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VACUUM JACKETED PIPE (VJP)

BAYONET CONNECTION

Bayonet connections offer a quick installation as well as a reliable, leak-resistant, thermally efficient connection. Bayonet connections offer a slip-together joint used for easy field assembly of vacuum jacketed pipe sections. The male and female designs provide a long heat path from the outer jacket to the inner pipe. The o-ring seal at the flange make this a pressure-tight connection. Bengal industries offers unique bayonet connections that provides a superior mechanical joint for vacuum jacketed piping sections.

TECHNICAL DATA

Operating Ranges

- Temperatures- 20K to 313K
- MAWP- upto 250 bar

Tests

Mass spectrometer leak test with helium, leak rate shall not be greater than 5×10^{-7}

Service

Liquid argon, helium, hydrogen, nitrogen and oxygen

Materials

Metal components- Stainless steel (304L & 316L)
Soft components-PTFE



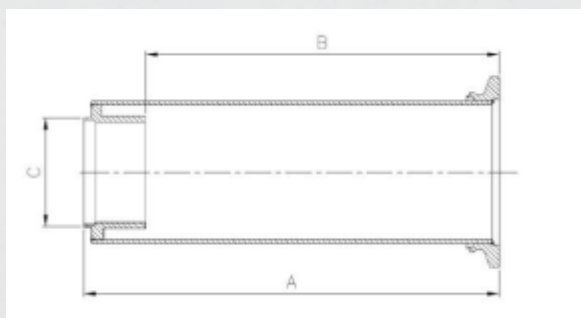
APPLICATION:

- New vacuum jacketed piping systems
- Storage vessels, tanks and dewars
- Transports and trailers
- Transfer hose & fill systems
- Expansion of existing systems & modifications to current designs
- Complete line of vacuum jacketed valves and filters
- Bayonets available for LNG service also
- Consult factory for special applications

FEATURES:

- Reliable Close Tolerance Design for Vertical or Horizontal Applications.
- Designed For Fast and Convenient Installation For Piping Fabricators.
- Constructed of material suitable for cryogenic service.
- Butt weld and socket weld ends for simple fabrication into your system.
- Thermally efficient for vacuum jacketed systems.

Bayonet connections for cryogenic fluids (LOX, LH₂, GHe, etc.) vacuum jacketed male end to non-jacketed female end connection:

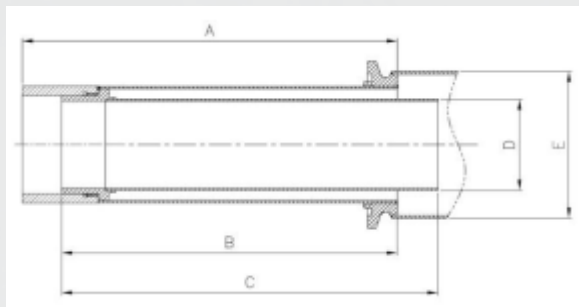


FEMALE BAYONET- CHAIN CLAMP TYPE

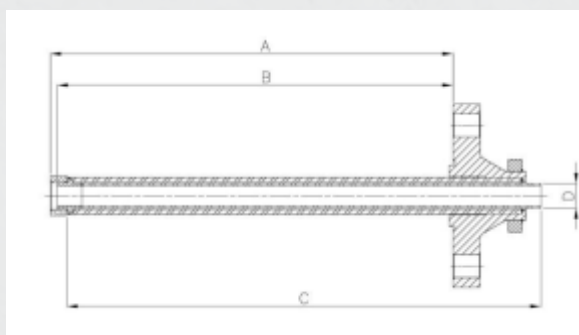
SIZE	A	B	C	WORKING CONDITIONS
25 NB	493	468	32	20K to 313K, 20 Bar
50 NB	365	341.5	53.5	20K to 313K, 20 Bar
80 NB	418	356	109	20K to 313K, 20 Bar
100 NB	417	355	109	20K to 313K, 20 Bar



VACUUM JACKETED PIPE (VJP)



FEMALE BAYONET FLANGE TYPE				
SIZE	A	B	C	WORKING CONDITIONS
25 NB	443	427	477	35K to 313K, 250 Bar



MALE BAYONET CHAIN CLAMP TYPE						
SIZE	A	B	C	D	E	WORKING CONDITIONS
25 NB	494	487	497	28	76.1	20K to 313K, 20 Bar
50 NB	371.5	365	380	54	88.9	20K to 313K, 20 Bar
80 NB	433.5	388.5	436.5	88.9	168.3	20K to 313K, 20 Bar
100 NB	433.5	388.5	434.5	104	168.3	20K to 313K, 20 Bar



MALE BAYONET FLANGE TYPE					
SIZE	A	B	C	D	WORKING CONDITIONS
25 NB	458	450	539	28	35K to 313K, 250 Bar

COMMERCIAL BAYONETS

ASSEMBLY KITS & OPTIONS:

Chain Clamp Type Bayonets

- Kit includes PTFE/PCTFE O-Ring and PTFE nose seal.
- Dust caps and pressure caps can be provided separately as per requirements.
- Material of dust caps and pressure caps shall be as per customer.

Super insulated type bayonet connections can also be developed as per customer's specifications.

Features and Benefits:

- Frost and condensation free connections
- Minimization of heat leak
- Easy to install or disassemble, both at cold and warm condition
- Compatible with hygienic type clamping system for leak free operation
- Can be installed in any orientation
- Bayonets can be assembled much quicker compared to traditional welding joint, significantly lowering your installation costs
- High-efficiency flex & pipe connection for vacuum-jacketed transfer lines.





VACUUM JACKETED PIPE (VJP)

VACUUM PUMPING PORT

Bengal Industries offers a number of different types of cryogenic transfer hoses. This particular piece of equipment is an indispensable accessory for the safe and efficient transfer of liquid cryogenics, including liquid helium, liquid nitrogen, liquid argon, and liquid oxygen. The product line ranges from the simplest non-jacketed flex line to the vacuum-encased system necessary for transferring liquid helium. The materials of construction make these transfer systems useable in any type of work environment, whether it be a laboratory, industrial site, or as an instrumentation accessory. Inside or outside, our cryogenic transfer hoses will perform optimally to deliver liquid cryogenics trouble-free. Bengal Industries Products design, and manufacture a liquid transfer system for your cryogenic application. We are specialists in cryogenic fluid transfer, control, and storage systems.

Our system component products include:

Stainless Steel Rigid and Bendable Vacuum Jacketed Pipe is a low heat leak, high-performance vacuum insulated pipe designed to transfer cryogenic liquids such as liquid nitrogen. It is manufactured in easy-to-assemble sections using bayonet connections. Vacuum jacketed pipe is safe to touch and reduces frost formation and condensation improving on-site safety. ASME and Canadian Registration Numbers (CRNs) certifications are available.

Vacuum Insulated Hoses:

Durable, efficient, and maintenance-free, Techflex transfer hoses deliver liquid quicker. The outer surface remains at room temperature and is safe to the touch with bare hands. Standard hoses are stocked for quick shipment. Customizable configurations are also available. Cryogenic Vacuum Jacketed Valves, engineered for minimal losses, offer solid closure at cryogenic temperatures. All pipe valves are ASME code compliant. Non-vacuum jacketed valve is also available. Custom cryogenic equipment, Custom Dewars, Phase Separators, Tank Switchers, and Injectors are all available to aid in fluid control. All are manufactured to insure the highest quality with an industry-leading warranty.

Features

- Durable Covering; Braided, light weight and flexible Outer.
- Vacuum Port: Factory evacuated and sealed shall be re-vacuumed at site.
- Bengal offers a proprietary vacuum port which can seal off the vacuum as well as acting as a pressure relief valve.
- Thermally Efficient: Low heat leak rate and highly efficient.

Inner Pipe Size (DN)	Outer Pipe Size (DN)	Pipe Material	Heat Leak Rate (W/m)
1/2"	1 1/2"	AISI 304 or 316L	0.31
1"	2"	AISI 304 or 316L	0.43
1 1/2"	3"	AISI 304 or 316L	0.54
2"	3 1/2"	AISI 304 or 316L	0.72
3"	5"	AISI 304 or 316L	0.94



VACUUM JACKETED PIPE (VJP)

HEAT BRIDGE

Vacuum jacketed pipes are constructed with heat bridge at the ends to facilitate vacuum tight joint between inner and outer pipe. A long heat transfer path of heat bridge control heat leak rate due to conduction of Heat from outer to inner pipe. Also it compensates relative displacement of inner pipe to outer pipe due to thermal expansion and contraction. Segments of VJ pipes constructed with heat bridge facilitate easy field welding of long pipelines.



BELLOWS

What is the purpose of bellows?

The main function of a bellows is to contain air to expel it at a certain pressure and direction to achieve different purposes, it is a deformable container or not, that when compressing it and reducing its volume, the air that was kept inside comes out through a nozzle or outlet conduit to achieve different purposes.

What are the different types of bellows?

There are three main types of metal bellows:
Formed, Welded, and Electroformed.

Formed bellows are produced by reworking tubes, normally produced by deep drawing, with a variety of processes, including cold forming (rolling), and hydroforming. They are also called convoluted bellows or siphons. Expansion joints (bellows) Expansion joints are installed in a piping system to absorb vibration and shock. They also have advantages such as reducing the noise and compensating caused by misalignment.



Overall system flexibility can be addressed by adding expansion loops, specifically when external bellows are used. For vacuum jackets with external bellows, external pipe supports shall allow the piping system to move in order to relieve thermal expansion.

What are Vacuum Bellows used for?

Hydroformed Vacuum Bellows are thin-walled flexible bellows that are mechanically formed by a Hydraulic forming process that shapes the bellows into the desired size and shape. Expansion bellows may be located on the inner or outer line to compensate for thermal contraction. Figure 3 shows an example of internal and external expansion bellows. Expansion bellows shall be designed to absorb thermal contraction of the inner pipe when operating at low temperatures. See Appendix A for typical materials. If bellows are subject to a large axial mechanical loading, care shall be taken when designing bellows to provide axial support or movement constraints that will accommodate the axial loading without damage to the bellows or piping. See 5.2.1.



VACUUM JACKETED HOSE

Bengal Industries vacuum jacketed transfer Hoses are lightweight, extremely flexible, and thermally efficient.

FEATURES:

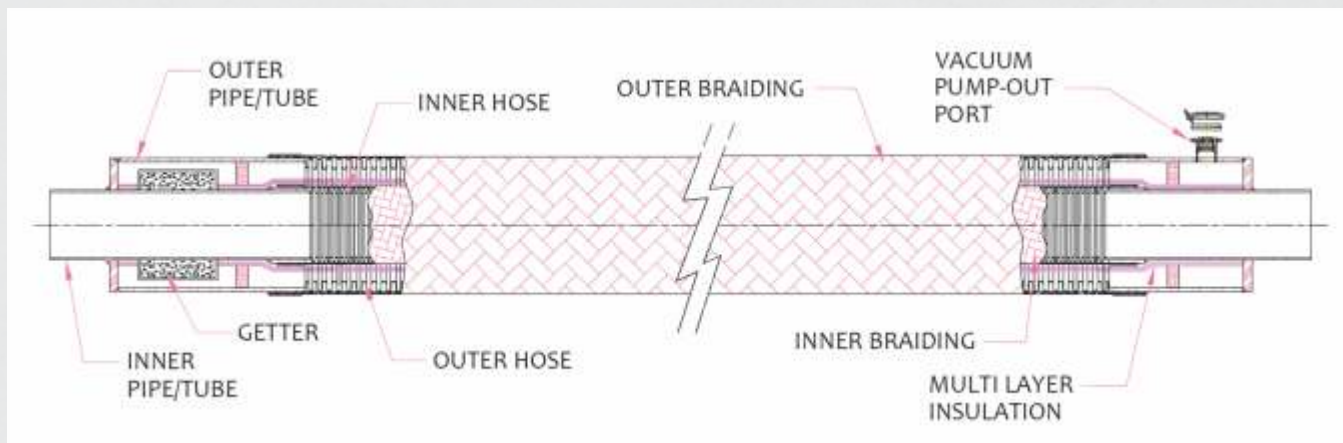
- **Durable Covering** – Braided, lightweight, and flexible outer.
- **Vacuum Port** – Factory evacuated and sealed, and can be re-evacuated at the site, We also provide a proprietary vacuum port which can seal off the vacuum as well as act as a pressure relief valve,
- **Thermally Efficient** – Low heat leak rate and highly efficient.
- **Quick Delivery** – Popular styles maintained in stock to reduce lead time.
- **Customization** – Choose from a wide variety of inner sizes, end connections, lengths, pressure ratings, and protective covers.
- **Cleaning** – Oxygen class cleaning can be provided for flex assemblies as per ASTM G93,

BENEFITS:

- Safely handles the cryogenic fluids with a vacuum insulated transfer hose that remains flexible during fluid transfer,
- Transfer hose material is designed for strenuous conditions.
- Can be used with all quid cryogenes from LNG the liquid helium (Lhe).
- Manoeuver around abstractions with our extremely flexible corrugated hose design.
- Get better liquid performance: each hose vacuum space includes Super-Insulation (Multilayer Insulation, MLI) that keeps thermal heat loss to a minimum.
- Long Term Vacuum Levels: Chemical gathering is installed within the vacuum and helium leak tested by MSLD
- Hose assemblies can be fabricated with full-length armor casing or cuffs.

APPLICATIONS:

- Liquid and Cryo-compressed storage systems
- Aerospace
- Cleanroom Manufacturing
- Exhaust Systems
- Semiconductor Gas Delivery
- Military & Defense



S.N.	INNER HOSE SIZE (DN)	OUTER HOSE SIZE (DN)	WORKING PRESSURE (bar)	BEND RADIUS (mm)	HEAT LEAK RATE (W/m)
01	80	150	16	1250	3.5
02	100	150	16	1250	3.5
03	25	65	16	460	1.8
04	15	40	250	340	1.8
05	65	125	16	1000	3.5



VACUUM JACKETED HOSE

MATERIALS:

Our vacuum jacketed flexible tubing is typically built with stainless steel, different materials can also be used according to your requirement. We ensure that material selection suits the unique needs of your applications, including medical-grade, food-grade, and clean room requirements. Please do mention any material specifications while submitting your project inquiry.



END FITTINGS:

We supply vacuum-insulated tubing across a variety of industries, so we understand the importance of the right end fittings. We are pleased to supply flexible lines with various types of end fittings (bayonets, pipe threads, compression, and custom end fittings) available configurations that your application requires. Please inform us of your unique end fitting specifications in your project inquiry.

STANDARD HOSE DETAILS:

TEMPERATURE RATING

- Standard: -320° F (-196° C/77K)
- Optional: -452° F (-269° C/4K)

PRESSURE RATING

- Low Pressure (LP): Upto 16 bar
- Medium Pressure (MP): Upto 35 bar
- High Pressure (HP): Upto 250 bar

STANDARD MATERIALS

- 321 or 316L Stainless Steel: Inner and Outer Hose
- 304/304L (Dual Certified) Stainless Steel: Braid, Braid Band, Tube, Pipe, and End Fittings

*Other high-performance materials are also available as per project requirements.



ABOUT US

Bengal Industries, An ISO-9001 accredited Company founded in 1978 has a reputed name in the field of Engineering & Manufacturing of Stainless Steel Corrugated Flexible Hoses, Stainless Steel wire braid, Hose Assemblies, Interlock hoses, Automotive Exhaust Connectors and Stainless Steel Metallic Expansion Joints / Bellows specialised in Vacuum Jacketed Piping for various cryogenic applications, situated at Faridabad, falls under national capital region i.e., New Delhi in India.

Bengal Industries is the only hose manufacturer in India to receive "CE" certification. This is from DNV, Norway for design, manufacture and testing of stainless steel corrugated flexible hose assemblies under Pressure Equipment Directive of European Council 97/23/EC.



Supplying quality products continuously over three decades to over 35 countries worldwide by following a simple philosophy of continuous improvement in all spheres of business activity has now become a tradition. This has benefited the company substantially in attaining the status of priority supplier for its products to all of its customers in India as well as overseas.

Bengal Industries provides clients with engineering expertise throughout the completion of the project; from feasibility studies and scope documents to design conceptualisation, execution methodology & management and post-Project evaluations. Its objective is to provide integrated, client-driven consulting engineering and design solutions that help its clients attain a competitive edge in the market. The team of professionals has the best resources and proficiency in delivering fast and accurate results that ensure value addition at every stage of work, contributing to the project's success.

Bengal with its proven design capabilities and world class technology offers quality metal expansion joints to meet specific customer requirements. It has also successfully developed metallic expansion Joints / bellows for different Industrial applications including pipelines, process ducts, condensers, turbines, boilers, exhaust manifolds and other equipment.

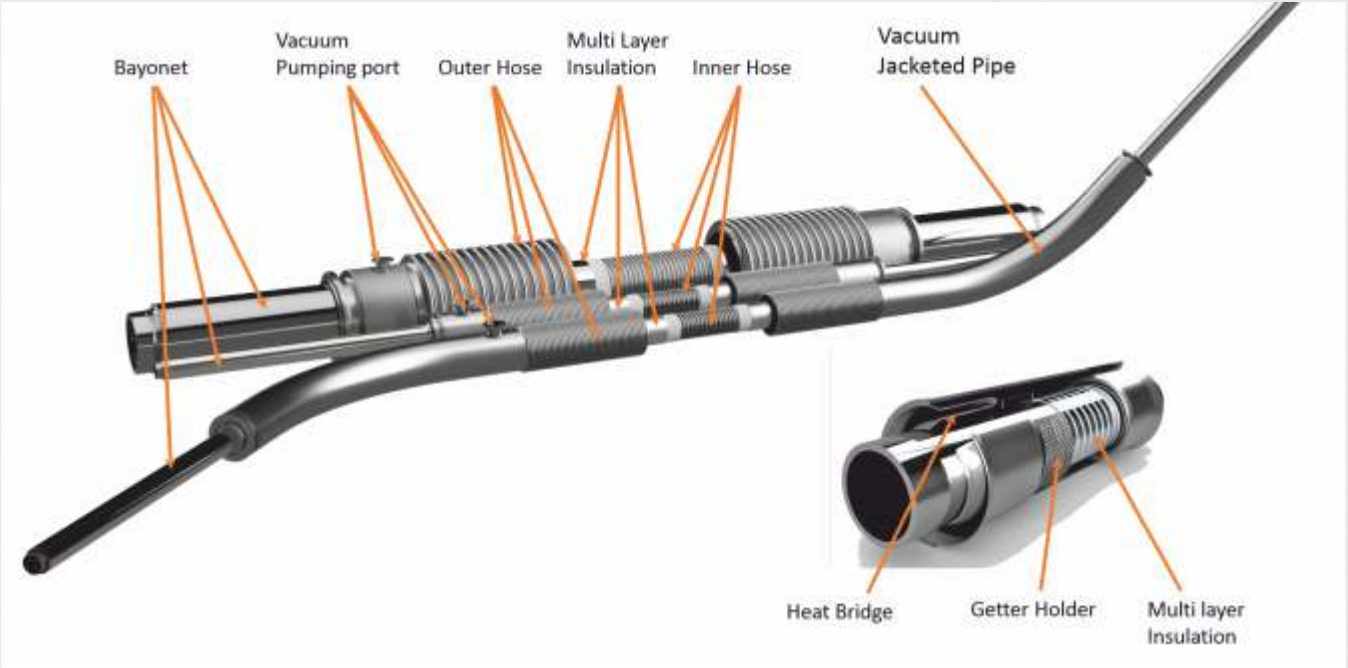
Bengal Industries for past couple of years focussed on Vacuum Jacketed Piping systems for various sectors including Space, Defence, Power, Transport, Automotive etc.

And Now planning to step in to Gas Insulated Pipe system for Power Substations power transfer. Our R & D Team have done a tremendous achievement in developing a new products inline with current Engineering Trend.

Why Buy Cryogenic Transfer Hoses from Bengal Industries?

Founded in 1978, Bengal Industries,. has weathered the test of time and flourished by keeping up-to-date on product changes, industry advancements, fabricating and procedural improvements. Maintaining state of the art techniques in welding, super insulation, materials and vacuum technology has been a key factor in our longevity.

Customer service and the ability to deliver products, parts and service that meet the customer's individual requirements and expectations has enabled us to build an excellent reputation as a company that people freely recommend.



CERTIFICATES

