CSM

CRYOGENIC

SPECIALTY MANUFACTURING

QUALITY WITH A DIFFERENCE

Liquefied Natural Gas Solutions

LNG

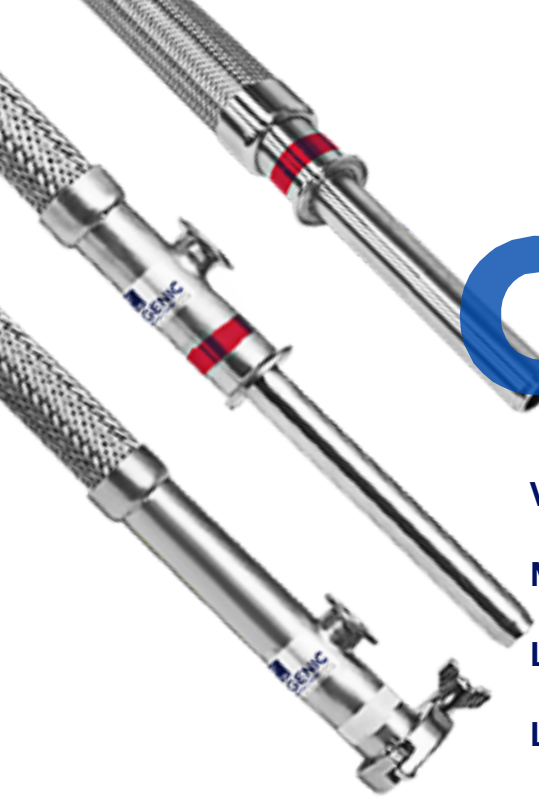


ISO 9001 : 2015

ISO 14001 : 2015

Stay cool under pressure

www.csm-cryogenic.com



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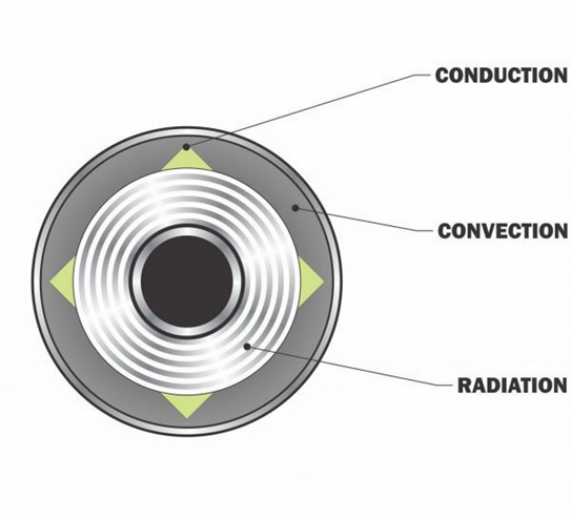
Vacuum Jacketed Technology

Introduction

Vacuum Jacketed Pipes, also known as VJPs, were first developed in the early 1900s. However, the technology did not become commercially available until the 1960s when it was used to insulate cryogenic transfer lines. Since then, VJPs have been widely used in various industries, including in the transportation of liquefied natural gas (LNG), in the food and beverage industry, in the semiconductor industry, and in medical applications. In recent years, VJPs have also gained popularity in biomedical, zero carbon energy, quantum computing and particle physics for their energy-efficient properties.

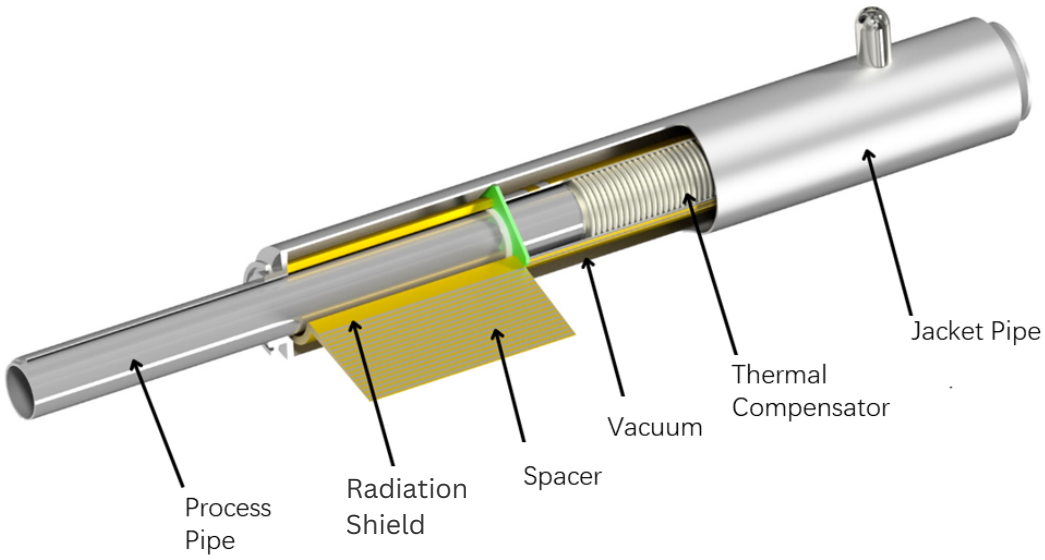
Vacuum Jacketed Pipes (VJPs) have come a long way in terms of insulation technology. Over the years, there have been many advancements in the materials and design used in VJPs, which have greatly improved their insulating capabilities.
One major development has been the use of advanced insulation materials, such as multilayer insulation. VJPs have also benefited from advances in manufacturing technology. For example, modern VJPs are produced using advanced welding techniques and automated manufacturing processes, which ensure a high level of quality control and consistency in the production process. However, despite these advancements, it is not possible to completely eliminate heat transfer (leaks) in any cryogenic system.



Conduction - CSM VJP reduces conduction by using low conductivity radial supports to prevent the inner pipe from touching the outer pipe.

Convection - is prevented by removing the gas molecules from the space between the inner and the outer pipe at high vacuum 10-5Torr. Vacuum helps reduce molecular conduction to near zero.

Radiation - the inner pipe is wrapped with multiple layers of reflective radiation shield and low conductive spacer material to reduce radiative heat transfer.



Making A Smart Choice

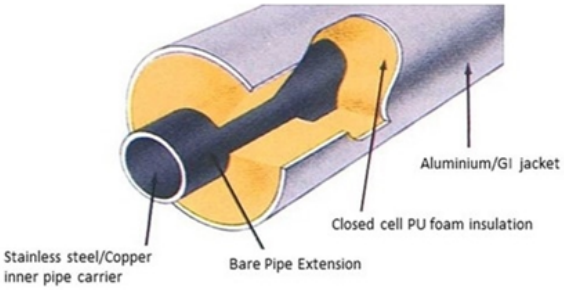
Value vs. Cost of Heat Leak

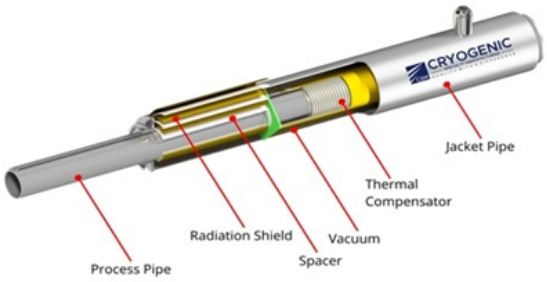
Due to the extreme temperature difference between cryogenic media such as Liquid Hydrogen (LH2) and ambient air, a large amount of heat will transfer even through a very short section of uninsulated or poorly-insulated pipe component very quickly. This can have a substantial impact on the entire system.

Even though the loss is not immediately visible nor is it significant for one day, but over time that loss can add up to thousands of dollars. Increased heat leak at any point in the system can cause two-phase fluid that increases pressure drop, causing irregular flow of liquid, which reduces the overall flow rate. Two- phase flow will create significantly higher pressure drops through the pipe system, irregular liquid delivery, results in warmer liquid at the cryogen use point and shortens the life of valve seats and other components within the system.

Getting the Return on Your Investment

Although the initial purchase price of a VJP system can be higher than for non-vacuum insulated Foam Insulated Pipe, VJP systems typically provide a quick payback by reducing operating costs. These systems can significantly minimize the liquid losses caused by heat leaks, provide a longer life cycle than conventional foam-insulated copper piping, and do not decrease in performance over time.





Heat Leak / Performance Comparison Chart

The table below summarizes the comparison of heat leaks between the Vacuum Insulated stainless steel pipe and the PU insulated copper pipe of various sizes at 77K:

Line Size	Vacuum Jacketed Pipe BTU/HR/FT (Watt / mtr)	Insulated Copper BTU/Hr/ft (Watt / mtr)		Bare Copper BTU/Hr/ft (Watt/mtr)
		New	After 5 Yrs Old	
¾" ODT	0.42	7.9	32.3	165
1" IPS	0.49	8.8	44.2	280
1 ½" IPS	0.52	10.5	52.7	397
2" IPS	0.69	12.2	60.8	530
3" IPS	1.2	15.2	76.1	769
4" IPS	1.4	18.2	90.8	1000

Liquefied Natural Gas

Fueling Progress and Security

The global energy landscape finds itself at a crucial crossroads, where the imperative to address climate change converges with the escalating demand for energy. In the midst of this intricate equation, Liquefied Natural Gas (LNG) emerges as a beacon of promise, ushering in a transformative era of sustainable energy solutions. The role of LNG in today's world is pivotal, resonating through various dimensions such as economic advancement, ecological preservation, energy security, and geopolitical stability.

At the heart of LNG's significance lies its potential to usher in a cleaner energy paradigm. As nations collectively strive to curtail carbon emissions, LNG emerges as a cornerstone due to its markedly lower carbon intensity compared to conventional fuels like coal and oil. This intrinsic attribute translates into reduced greenhouse gas emissions and pollutants upon combustion. Whether harnessed for power generation, industrial processes, or transportation, LNG stands as a dynamic force driving the global ambition of achieving ambitious emissions reduction targets.

LNG's impact extends beyond environmental considerations to encompass energy security and global resilience. Within an increasingly interconnected world, ensuring energy security is paramount. LNG plays a pivotal role in diversifying energy sources, mitigating the perils associated with dependency on a single source or fuel type. This diversification enhances energy security, fortifying nations against the disruptions that may arise from supply chain vulnerabilities. Geopolitically, LNG empowers nations to carve independent energy trajectories, reducing their susceptibilities to geopolitical volatility. This transformative influence ripples on a global scale, reshaping not only energy security but also the geopolitical landscape.

Moreover, LNG introduces a new chapter in geopolitics and diplomatic relations. Historically, energy supply chains have been subject to the sway of political dynamics, exposing nations to vulnerabilities. LNG upends this traditional pattern by diversifying energy sources, thereby curtailing the monopoly of energy-rich nations and the leverage held by energy suppliers. This recalibration holds profound implications for diplomatic negotiations, granting nations newfound bargaining power and reducing their historical dependence on energy providers. This transformation lays the foundation for international relations built on mutual interdependence, thereby bolstering global stability.

However, it's crucial to distinguish LNG from Compressed Natural Gas (CNG), not only in terms of production and storage but also in their applications. CNG, though also a cleaner fuel alternative, stands apart due to its method of storage and transportation. Unlike LNG, CNG does not require cryogenic vaporizers to convert it into gas, making it easier to use in vehicles. This characteristic renders CNG particularly suitable for light-duty vehicles and applications with limited space for storage. Conversely, LNG, owing to its liquefaction process and the subsequent requirements of cryogenic storage and onboard regassification equipment, finds its optimal fit in the realm of medium to heavy vehicles and applications that demand higher energy density.

Additionally, LNG's ascent ignites economic growth through innovation. The infrastructure required for LNG production, transportation, and utilization generates employment opportunities, spurs local economies, and fosters technological progress. As the demand for LNG escalates, investments in infrastructure snowball, catalyzing an upward spiral of economic prosperity. Technological advancements in LNG storage, shipping, and related processes further enhance its accessibility, making it a versatile option for diverse applications.

LNG's significance extends to promoting sustainable development as a bridge towards fully renewable energy systems. While not an exhaustive solution, LNG serves as a catalyst for change during the transition. This role aligns seamlessly with the global consensus on sustainable development and contributes to the realization of the United Nations' Sustainable Development Goals.

In this epoch of energy transformation, Liquefied Natural Gas emerges as a catalyst that reverberates across environmental stewardship, economic prosperity, energy security, and geopolitical equilibrium. As the global trajectory veers towards cleaner, more resilient energy systems, LNG shines as an emblem, illuminating the harmonious coexistence of progress and preservation. The unwavering significance of LNG in today's world extends far beyond conventional confines, heralding a future marked by elevated prosperity, environmental integrity, and worldwide stability.

A Pathway to Sustainable Development

LNG is an intermediary towards the ultimate goal of sustainable development. While not a panacea, it lays the foundation for more profound transformations by offering cleaner energy alternatives during the transition to fully renewable energy systems. This alignment with the global consensus on sustainable development bolsters the United Nations' Sustainable Development Goals.

In the epoch of energy transformation, Liquefied Natural Gas emerges as a catalyst, bridging the chasm between conventional fossil fuels and an ecologically sustainable future. Its myriad advantages span environmental stewardship, economic advancement, energy security, and geopolitical equilibrium. As the global compass veers toward cleaner, more resilient energy systems, LNG stands as a beacon of hope, reminding humanity that progress and preservation can coexist in perfect harmony. The undeniable significance of LNG in today's world heralds a future that is brighter, cleaner, and more prosperous for all.



LNG: Overcoming Challenges on the Path to Transition

While it is clear that LNG emerges as a promising solution for the global energy agenda. The widespread adoption of LNG has been slower than anticipated, primarily due to a confluence of factors that include infrastructure investment, technical complexities, geographical constraints, regulatory challenges, market volatility, and perceptual barriers. Additionally, the intricate nature of cryogenic technology and infrastructure presents a formidable obstacle to the broader use of LNG.

The development of a robust LNG infrastructure demands substantial upfront investment in constructing liquefaction plants, storage facilities, regasification terminals, and specialized transportation. The capital-intensive nature of these projects can dissuade regions with limited resources or existing energy infrastructure from committing to them. LNG markets are still evolving, leading to price fluctuations and market uncertainties. This volatility can influence investor decisions and project viability. Moreover, the technical intricacies involved in the liquefaction and regasification processes necessitate specialized equipment and expertise. This complexity can impede swift adoption, particularly in areas lacking the necessary technical capabilities.

Moreover, Geographical Constraints and Regulatory Challenges. The distribution of LNG requires a network of suitable ports, transportation routes, and storage facilities. These geographical prerequisites can limit accessibility, particularly in regions with inadequate infrastructure. The establishment of LNG facilities also involves navigating complex regulatory processes and obtaining permits, which can lead to delays and hinder project development. Misconceptions surrounding LNG's safety, environmental impact, and feasibility can further hinder its adoption among the public, policymakers, and industry stakeholders.

A significant hindrance to the widespread use of LNG is the specialized cryogenic technology required for its liquefaction, storage, and regasification. Cryogenic processes involve working with materials at extremely low temperatures, demanding not only specialized equipment but also stringent safety measures due to the hazardous nature of handling cryogenic fluids. The need for cryogenic storage and handling infrastructure presents unique challenges and costs that can deter potential adopters, particularly in areas lacking the necessary expertise and facilities.

Liquid Hydrogen (LH2): A Parallel Endeavor

Parallel to LNG, Liquid Hydrogen (LH2) garners attention as a cleaner alternative. Though distinct, LNG and LH2 share several attributes. Both are considered cleaner energy sources compared to conventional fossil fuels, emit fewer pollutants, and require specialized infrastructure due to their low temperatures and high energy densities. LH2, however, takes environmental benefits a step further, producing only water vapor upon combustion. Yet, producing, storing, and transporting LH2 present challenges related to energy-intensive processes and the maintenance of extremely low temperatures.

While the widespread adoption of LNG faces multifaceted challenges, its pivotal role as a transitional energy source remains unchanged. The obstacles presented by infrastructure, technical complexities, regulatory hurdles, and cryogenic technology must be navigated for LNG to fulfill its potential. As societies worldwide strive for energy sustainability, LNG and emerging alternatives like LH2 are integral components of the global energy transition. Despite the complexities, the journey towards a cleaner energy future persists, fortified by the determination to overcome challenges and embrace transformative solutions.

How Does Cryogenic Technology Make LNG Possible As A Clean Fuel

At the heart of the LNG revolution lies cryogenic technology, a remarkable technology which enables chilling natural gas to incredibly low temperatures of 161.5°C (111.65 K), causing it to condense into a liquid state. This transforms natural gas into a substance with significantly reduced volume, enabling efficient and cost-effective transportation over long distances. Paired with this technological marvel is the ingenious application of super insulation. This specialized insulation employs advanced materials and designs that minimize heat transfer, ensuring that the cryogenic conditions required for LNG storage and transportation are maintained throughout.

In the context of LNG, cryogenic technology serves several critical functions

Emission Reduction: The seamless integration of cryogenic liquefaction and super insulation allows for denser storage of LNG, enabling larger quantities to be transported in fewer vessels. This streamlined efficiency translates into a significant reduction in greenhouse gas emissions associated with shipping, making LNG a compelling solution for curbing carbon footprints.

Energy Density Optimization: Super insulation's ability to minimize heat exchange ensures the integrity of cryogenic conditions, enhancing energy density. This optimization enables more energy to be stored and transported, amplifying the economic and environmental viability of LNG.

Long-Distance Accessibility: Cryogenic technology, coupled with the advancements in super insulation, empowers the efficient transportation of LNG across vast distances. This newfound accessibility empowers regions lacking local energy resources to tap into the benefits of cleaner fuel alternatives.

In summation, the combination of cryogenic technology and super insulation emerges as a testament to human innovation, propelling LNG into a position of prominence in the pursuit of a cleaner energy landscape. This dynamic interplay is instrumental not only in optimizing the efficiency and viability of LNG but also in exemplifying our capacity to shape industries, diminish environmental impacts, and navigate towards a future that is both environmentally conscious and energy secure.



CSM Cryogenic's Solutions In Improving LNG Accessibility

In the dynamic landscape of sustainable energy solutions, the emergence of LNG as an alternative fuel source has ignited a wave of innovation and possibilities. At CSM, our expertise in cryogenics positions us as pioneers in shaping the future of energy. As we stand on the beginnings of an LNG powered economy, we offer an array of product solutions to industries seeking to harness the potential of LNG as their next fuel source.

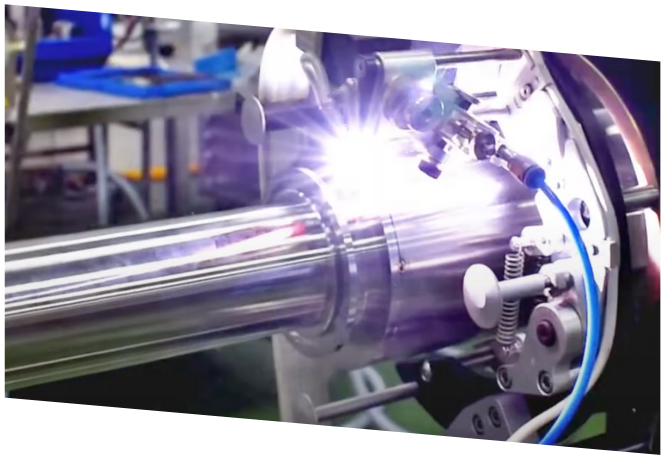
Super Insulated Vacuum Hoses and Pipes

Central to our product offerings is the development and manufacturing of super insulated vacuum hoses and pipes. These components play a foundational role in the safe and efficient transportation of LNG. Our expertise in cryogenics allows us to engineer super insulation solutions that minimize heat transfer, ensuring the preservation of LNG's low temperatures throughout the supply chain. Whether for fueling stations, industrial processes, or power generation, our super insulated vacuum hoses and pipes provide the backbone for the seamless integration of LNG.



Orbital Welding Manufacturing Process

At CSM, our commitment to precision and excellence is embodied in our orbital welding manufacturing process. This state-of-the-art technique ensures the integrity and reliability of critical components in LNG infrastructure. Orbital welding delivers consistent and high-quality welds, guaranteeing leak-free connections and enhancing the safety and performance of LNG systems to meet the stringent demands of utilizing LNG as a fuel source.



Tailored Solutions for Diverse Industries

Recognizing the diverse applications of LNG, we offer tailored solutions that cater to the specific needs of various industries. Whether it's the automotive sector seeking efficient and rapid refueling solutions, the industrial realm requiring precise temperature control, or the power generation field aiming for reliable and clean energy production, CSM's cryogenic expertise enables us to customize product solutions that align with the unique requirements of each industry.



The Applications

Liquefied Natural Gas (LNG) has found a wide range of applications across various sectors, driven by its environmental advantages, energy efficiency, and versatility. Its clean-burning nature, combined with its ease of transport and storage, makes it a valuable resource in several domains. Here are some key applications of LNG:

Transportation

The integration of Liquefied Natural Gas (LNG) as a transportation fuel is rapidly gaining momentum, reshaping the dynamics of the sector. Its adoption spans a spectrum of vehicles, including trucks, buses, ships, and trains, positioning LNG as a compelling eco-friendly alternative to conventional diesel or gasoline. This transformative shift towards LNG-fueled vehicles is rooted in their distinct capacity to emit significantly fewer pollutants.

Furthermore, within the realm of heavy-duty transportation, LNG stands as a formidable frontrunner. Specifically, in the context of trucks and buses, LNG's higher energy density gives it the distinct advantage of substantially extended driving ranges when compared to its counterpart, Compressed Natural Gas (CNG).

Moreover, the maritime arena is witnessing rapid growth in LNG as a marine fuel, an evolution triggered by stringent emissions mandates within the shipping industry. LNG-powered ships serve as instrumental agents in improving air quality within port cities and coastal regions. The differential lies in their reduced emissions of sulfur and particulates.

Power Generation

Liquefied Natural Gas (LNG) finds extensive application in the realm of power generation. Its combustion yields reduced emissions when compared to traditional coal or oil, rendering it an environmentally superior choice for electricity production. Furthermore, LNG-fired power plants exhibit commendable flexibility, swiftly adapting to fluctuating demand levels, thereby bolstering the stability of the grid. The versatility of LNG extends to the practice of peak shaving, whereby LNG storage facilities furnish additional natural gas supply during periods of heightened demand. This strategic approach empowers utility providers to adeptly manage supply fluctuations, curbing the risk of price surges during peak consumption phases.

Moreover, LNG serves as a potent solution for addressing energy needs in remote or off-grid locations. Distinguished by its remarkable energy density and seamless transportability, LNG emerges as a feasible means of supplying energy to regions that lack conventional energy infrastructure.

Industrial Processes

Diverse industrial sectors, including steel, cement, chemicals, and manufacturing, strategically harness the potential of Liquefied Natural Gas (LNG) as a reliable heat source for multifarious processes. Its distinct appeal lies in its capacity to deliver a uniform and precisely regulated heat output. This attribute not only engenders operational consistency but also contributes to mitigating production expenses while concurrently curbing emissions.

Residential and Commercial Heating

LNG is utilized for heating in homes, businesses, and institutions. It provides a reliable and efficient heat source, contributing to reduced greenhouse gas emissions compared to traditional heating fuels.

As the global energy landscape evolves towards cleaner alternatives, LNG's diverse applications play a crucial role in providing efficient, accessible, and environmentally responsible solutions for various sectors.





CSM Cryogenic Transfer Pipe

StatiRigid Vacuum Insulated Transfer Pipe



Engineered as modular sections, these stainless steel coaxial vacuum insulated piping spools are joined together with close tolerance bayonet connections, or welded connection forming a complete cryogenic transfer system.

Each section is evacuated, sealed and tested for vacuum integrity to ensure minimal heat gain. StatiRigid comes with internal bellows at required intervals to serve as thermal compensators with 10,000 fatigue cycles calculated based on EJMA standard. The pipe comes with smooth inner bore to minimize pressure drop and improve flow characteristics.

Installation for StatiRigid can be done easily both indoor and outdoor, by incorporating CryoFlex sections strategically to offset misalignments.

CSM offers a complete line of components including in-line venting devices, phase separators and gas traps to maximize the cryogenic system performance.

Features and Benefits

- StatiRigid pipe is easy and cost effective to install due to its modular design
- Greater thermal efficiency compared to foam insulated pipes by more than 40 times
- Excellent flow characteristics make StatiRigid an ideal as main supply pipe and as header pipe
- Super insulation and proprietary chemical getters ensures long lasting vacuum integrity
- Fabricated by mechanized welding system process ensuring consistent weld quality

StatiRigid Technical Specifications

Model	Inner Rigid Pipe Size	Nominal Jacket OD*	Actual Flow Diameter	Standard Overall Lengths	Hole Required to Accommodate Pump Out**	Bayonet Clamp OD (F)	Weight / Length
R5T	¾" ODT 19.05mm	2" PS (60.3mm)	16.6mm	6' (1.8m) 10' (3.0m) 15' (4.5m) 20' (6.0m) 40' (12.0m)	4" (100mm)	51mm	2.0lb/ft (3.0kg/m)
R5P	½" PS 21.3mm	2" PS (60.3mm)	18.0mm		4" (100mm)	65mm	2.2lb/ft (3.3kg/m)
R10T	1-1/8"ODT 29.00mm	2.5" PS (73.0mm)	26.6mm		5 " (120mm)	65mm	3.1lb/ft (4.6kg/m)
R10P	1" PS 33.4mm	3" PS (88.9mm)	30.0mm		5 " (120mm)	78mm	4.0lb/ft (5.9kg/m)
R15P	1 ½" PS (48.3mm)	3 ½" PS (101.6mm)	1.770" PS (45mm)		6" (150mm)	91mm	4.9lb/ft (7.3kg/m)
R20P	2" PS (60.3mm)	3 ½" PS (101.6mm)	2.245" PS (57mm)		7 " (180mm)	120mm	5.2lb/ft (7.8kg/m)
R30P	3" PS (88.9mm)	5" PS (141.3mm)	3.334" PS (85mm)		8" (200mm)	145mm	9.7lb/ft (14.4kg/m)

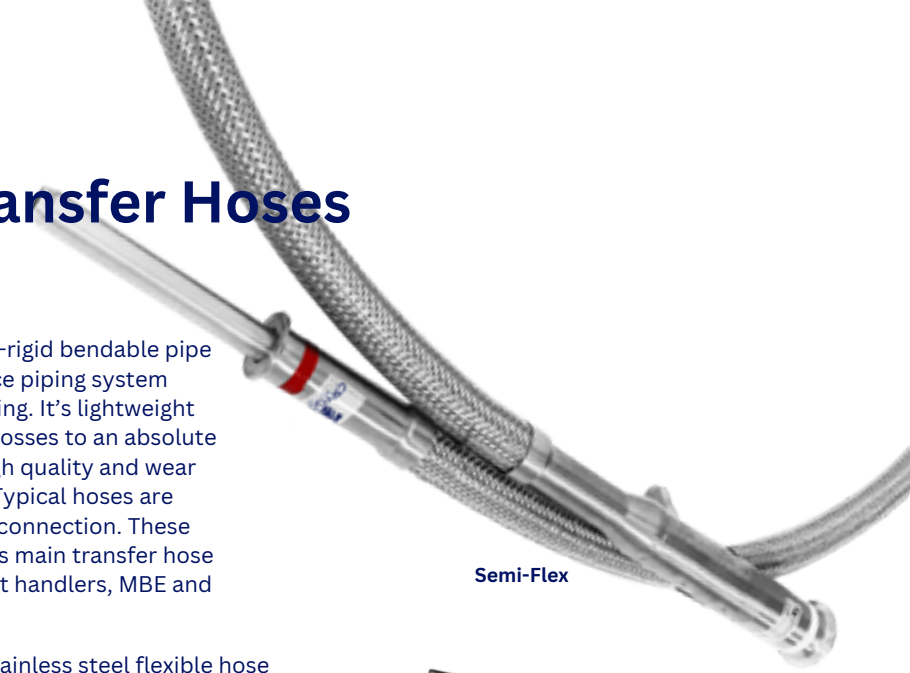
StatiRigid Ln2 Flow Guide Line

Model	Nominal Flowrate @30m, ΔP 0.1Bar			Maximum Flowrate @30m, ΔP 0.3Bar		
	gpm	lpm	kg/hr*	gpm	lpm	kg/hr*
R5T	3.1	11.7	500	5.2	19.8	850
R5P	3.7	14	600	6.1	23.3	1000
R10T	9.2	35	1500	17.8	67.7	2900
R10P	13.5	51.3	2200	24.6	93.3	4000
R15P	38.1	144.7	6200	73.7	280	12000
R20P	73.7	280	12000	128.9	490	21000
R30P	214.9	816.7	35000	380.7	1446.7	62000

CSM Cryogenic Transfer Hoses

Hoses Selection Guide

Semi-Flex Static Transfer Hose Semi-Flex, a semi-rigid bendable pipe with optimal flexibility is suitable for long distance piping system application, an alternative to traditional rigid piping. It's lightweight stainless steel construction reduces cool-down losses to an absolute minimum. Semi-Flex hoses are protected by a high quality and wear resistant stainless steel braided outer covering. Typical hoses are manufactured with pipe thread ends or bayonet connection. These hoses are used in a wide variety of applications as main transfer hose for LN2 such as food freezing, semiconductor test handlers, MBE and LN2 dosing applications.



Semi-Flex

Cryo-Flex Transfer Hose is a vacuum insulated stainless steel flexible hose designed to meet high flow capacity without compromising its flexibility. Engineered as modular section with close tolerance bayonet connections. It can be used on its own, or as part of StatiRigid sections for misalignment offset. Cryo-Flex pipe is evacuated and sealed at the factory as a static vacuum and is available in dynamic vacuum. Cryo-Flex are available in wide variety of sizes from DN16 up to DN50 to meet most the standard or custom requirements. Cryo-Flex is used in a wide variety of applications including biotech, cryogenic storage, food and beverage, nanotech, environmental temperature chambers and R&D applications.



Cryo-Flex



Ultra-Flex

Ultra-Flex transfer hose is a ultra-flexible, vacuum insulated LN2 transfer hose with high flexibility. It has the lowest dynamic bend radius among all cryogenic hoses in the market. Due to its lightweight stainless steel construction, cool-down loss can be reduced to an absolute minimum. Ultra-Flex hoses are protected by a tough and anti-kink stainless steel spiral wrap outer covering, its non wire braid prevent potential operator injury due to sharp wire found in traditional braided sleeve. Typical hoses are manufactured with pipe thread ends or female flare 1/2" JIC/CGA fittings or C5 bayonet. These hoses are used in a wide variety of applications including tool connections with portable dewars supplying LN2 to test handlers, LN2 doser, or any moving reservoirs and custom OEM applications.



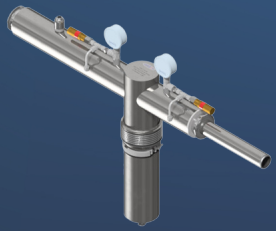
Triax-Flex

Triax-Flex ® transfer hose when use together with atmospheric Phase Separator system delivers liquid nitrogen (LN2) in pure liquid form at atmospheric pressure. This system ultimately eliminates two-phase flow to use points by constantly venting gaseous vapor to the atmosphere via phase separator. By separating vapor and venting them prior to liquid delivery, only sub-cooled LN2 will be delivered to each use point through gravity. Triax-Flex ® are commonly used in applications where single-phase liquid is critical to the production process such as MBE, LN2 Doser, Cryopreservation or any critical process that demands pure LN2 supply. Triax-Flex® is available in either static or dynamic vacuum insulation. For Dynamic Triax-Flex®, it requires an external pump to continuously evacuate its vacuum annular space to ensure its vacuum insulation integrity. Both static and dynamic systems come with Triax female bayonet connection, elbow, tee, valve or customize connections e.g. A5, A10 or TAL, to the point of use.

Related Product :



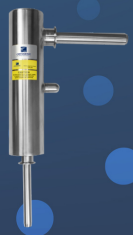
Modular Fittings



Modular T-Filter



CryoVent Electronic



CryoVent Mechanical

The connections

Welded Connections

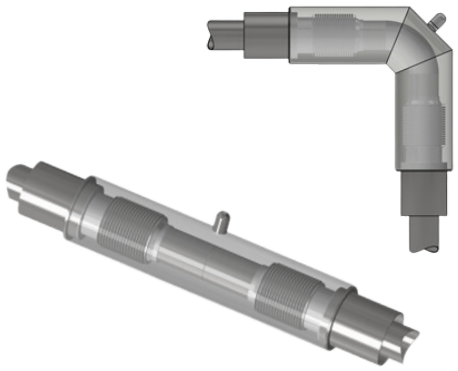
Vacuum Insulated Welded Connections CSM uses a highly efficient field-welded cryogenic connection for vacuum insulated piping systems. Vacuum insulated welded connection ensures lowest heat leak by providing a continuous vacuum insulation between the spool sections. Constructed in stainless steel, the vacuum insulated welded connections are designed with high-quality long heat path transition to be installed with our standard low profile sleeve tube. These design features translate to lowest heat leak and preserve liquid cryogen quality. Fully welded connection ensure full working pressure up to 35 Bar and suitable for extreme hazardous working environment like petrochemical complex or ASU plant. Connection insulation can be done either by low heat leaks vacuum insulation or polyurethane foam insulation.

Typical Applications

- LNG vacuum insulated rigid lines
- LH2 vacuum insulated flex lines
- Applicable for all cryogenic medium with temperature down to 4 Kelvin

Features and Benefits

- Frost and condensation free connections
- Minimization of heat leak
- Easy to install at compact working spaces
- Can be installed in any orientation
- Welded connection ensures high durability & vibration resistant
- Available in Vacuum jacketed or Polyurethane insulation options



Welded connections Specifications

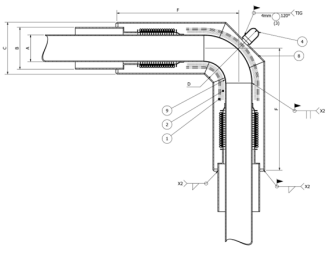
Sizes	Max Design Pressure psi (bar)	Vacuum Jacketed Heat Leak BTU / Hr (W)	PU Insulated Heat Leak BTU / Hr (W)	Inner & Outer Jacket Pipe Construction
W10	500 (35)	5.46 (1.60)	50.98 (14.95)	S/S300
W15	500 (35)	5.76 (1.69)	60.49 (17.74)	S/S300
W20	500 (35)	9.21 (2.70)	72.05 (21.13)	S/S300
W25	500 (35)	9.34 (2.74)	78.29 (22.96)	S/S300
W30	500 (35)	13.09 (3.84)	90.81 (26.63)	S/S300
W40	500 (35)	18.48 (5.42)	109.87 (32.22)	S/S300

***Larger sizes such as 6" to 14" available. Please contact factory for details.**

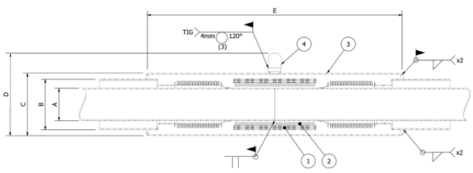
Welded connections Dimensions

Sizes Mm	Inner Pipe Diameter	Vacuum Jacket Diameter	Vacuum Jacket Sleeve Diameter	Overall Height	Vacuum Jacket Sleeve Tube Length (Straight)	Vacuum Jacket Sleeve Length (Elbow)	Vacuum Jacket Sleeve Horizontal Length (Tee)	Vacuum Jacket Sleeve Vertical Length (Tee)
	A	B	C	D	E	F	G	H
W10	1" NB (33.4mm)	2 ½" NB (73.0mm)	3 ½" NB (101.6mm)	5.8" (146.8mm)	20.5" (520.0mm)	11.8" (300.0mm)	22.8" (580.0mm)	10.6" (270.0mm)
W15	1 ½" NB (48.3mm)	3" NB (88.9mm)	4" NB (114.3mm)	6.3" (159.5mm)	21.3" (540.0mm)	12.2" (310.0mm)	23.2" (590.0mm)	11" (280.0mm)
W20	2" NB (60.3mm)	4" NB (114.3mm)	5" NB (141.3mm)	7.4" (186.5mm)	22" (560.0mm)	12.6" (320.0mm)	24.4" (620.0mm)	11" (280.0mm)
W25	2 ½" NB (73.0mm)	4" NB (114.3mm)	5" NB (141.3mm)	7.4" (186.5mm)	23.6" (600.0mm)	13.4" (340.0mm)	25.2" (640.0mm)	11.8" (300.0mm)
W30	3" NB (88.9mm)	5" NB (141.3mm)	6" NB (169.3mm)	8.4" (213.5mm)	23.6" (600.0mm)	13.4" (340.0mm)	25.2" (640.0mm)	11.8" (300.0mm)
W40	4" NB (114.3mm)	6" NB (168.3mm)	8" NB (219.1mm)	10.5" (264.5mm)	27.6" (700.0mm)	15" (380.0mm)	28.3" (720.0mm)	13.4" (340.0mm)

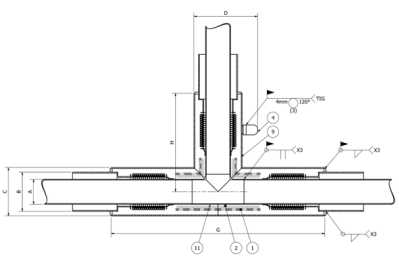
***Larger sizes such as 6" to 14" available. Please contact factory for details.**



Welded Elbow Connection



Welded Straight Connection



Welded Tee Connection

Turnkey Solutions

Benefits to customer

Single source, single responsibility from system design, manufacturing, install, test & commissioning

Single Project Management with lowest overall project cost, Lowest heat leak & lower LN2 losses

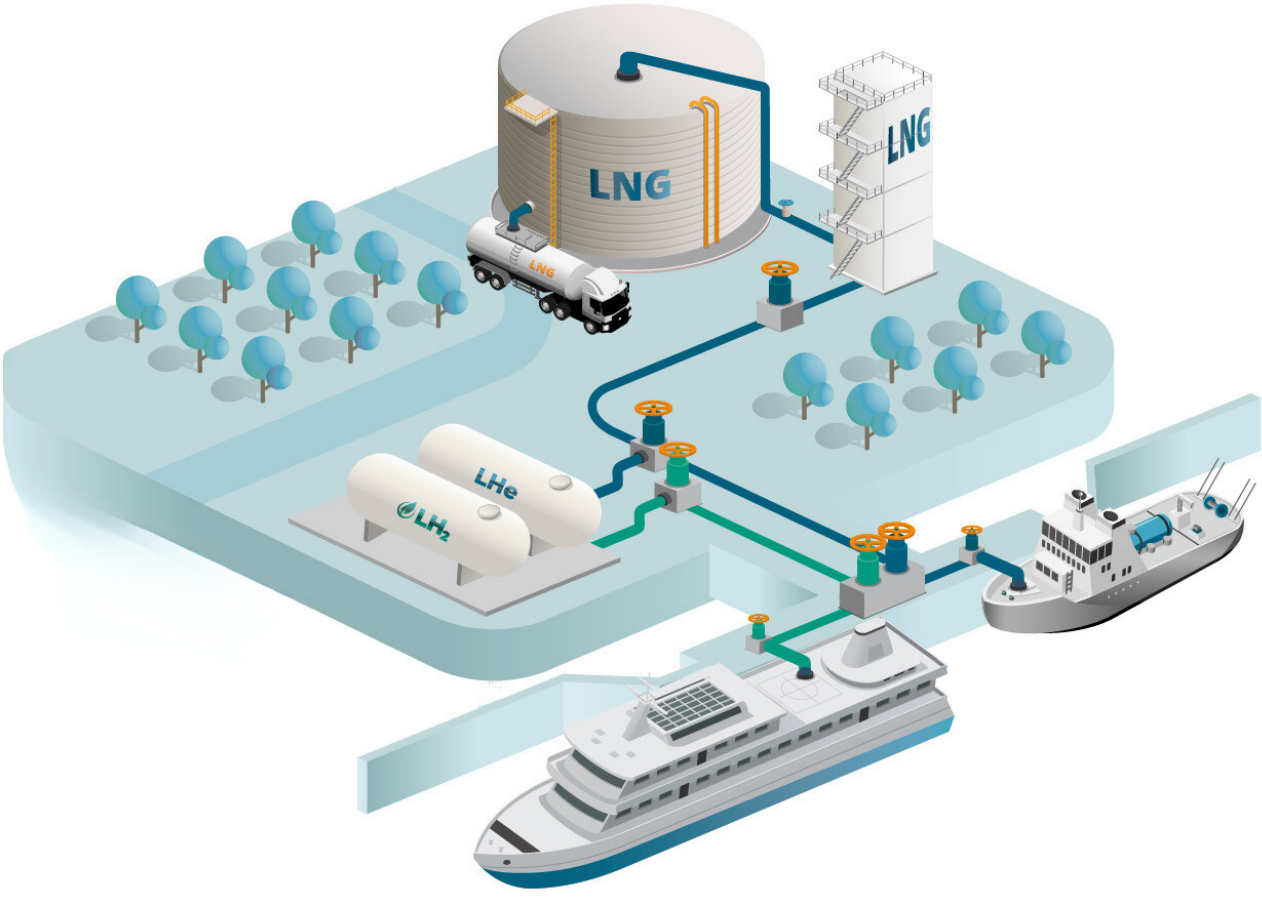
Integration with safety function & performance monitoring system e.g. O2 monitoring and emergency shut-down system; thermo, pressure & flow monitoring

Integration to FMCS is seamless by Standardized communication protocol with MODBUS TCP/IP

What We Offer

- A 5 + 5 years warranty on all Cryorigid vacuum jacketed pipe.
- On-site measurements.
- Most efficient layout of the vacuum jacketed pipe system required for your application.
- Detailed proposal describing every component of the vacuum jacketed pipe system.
- Manufacturer's specifications of the system presented for your review.
- Isometric CAD drawing showing every detail of the proposed system.
- A Heat Leak Guide to show LN2 losses of current foam insulated copper pipe system.
- Break-even analysis on anticipated return on investment and long-term financial benefits to operation's bottom line.
- Cash flow analysis to show immediate effect the new system will have on your plant operation.

Turnkey Solutions System



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