



# Insulon® Vacuum Jacketed Hose for Hydrogen

## Product Catalog

All cryogenic fluids are not the same, and hydrogen presents specific challenges. Insulon Vacuum Jacketed Hoses are uniquely engineered to deliver ultra-high performance in cryogenic hydrogen applications including liquid and cryo-compressed hydrogen. Improve efficiency in energy storage applications including heavy-duty trucking and aircraft.

Features include fully annealed materials to combat effects of hydrogen embrittlement, low non-volatile residue (NRV) on surfaces, and proprietary high-density multi-layer insulation (MLI). Insulon hose has smaller outer diameters than other vacuum jacketed hoses, and a more hermetic vacuum seal with no pump-down port and no pump-down maintenance required.

## Performance Levels

### Standard

Standard Insulon hose are engineered to be more compact, flexible, and lightweight than traditional vacuum jacketed hoses.

### Multi-Layer Insulation (MLI)

Insulon hose with MLI are engineered with proprietary, high-density multi-layer insulation for maximum thermal insulation performance.

## Pressure Categories

### Low Pressure

Insulon Vacuum Jacketed Hose LP is engineered for low pressure applications up to 72 psi, depending on hose diameter and fluid temperature.

### High Pressure

Insulon Vacuum Jacketed Hose HP is engineered for high pressure applications up to 750 psi, depending on hose diameter and fluid temperature.

### Custom High Pressure

Cryo-compressed hydrogen requires ultra-high pressure transfer hoses. Concept Group engineers custom manufacture Insulon hose for cCH<sub>2</sub>.



## Sizes

Hose Diameters					
Hose Size ID [in]	DN (ISO 10380) [mm]	Inner Hose ID [in]	Standard or MLI	Outer Hose OD [in]	Min. Bend Radius, Static* [in]
1/4	6	0.236	STD	1.05	3.98
			MLI	1.27	5.00
3/8	10	0.394	STD	1.05	3.98
			MLI	1.62	6.15
1/2	12	0.472	STD	1.27	5.00
			MLI	1.62	6.15
3/4	20	0.787	STD	1.62	6.15
			MLI	2.38	9.41
1	25	0.984	STD	1.95	7.62
			MLI	2.38	9.41

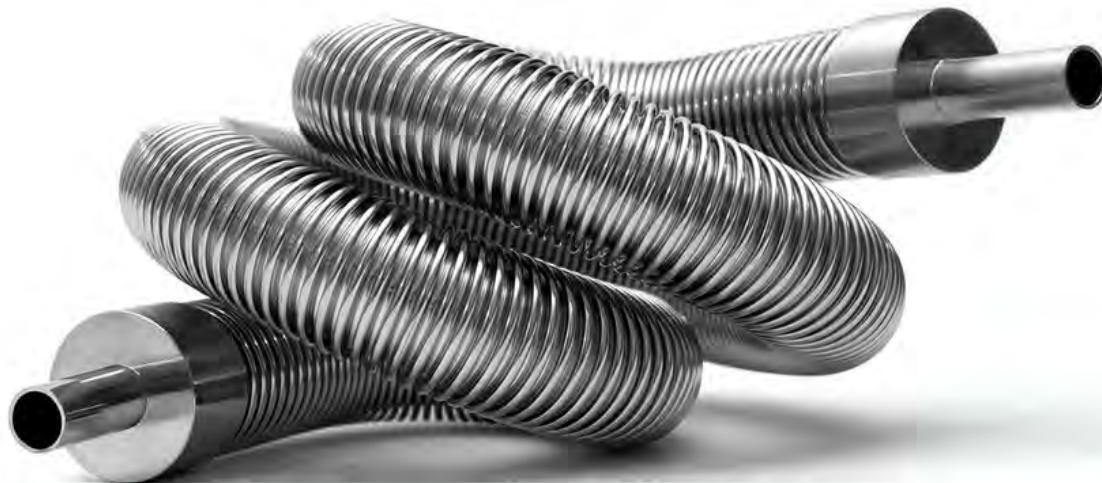
\*For dynamic applications, please contact us at <https://conceptgroupllc.com/contact/>

Hose lengths range from 1.5 to 65.6 feet (18 to 788 inches).

Hoses are measured from end to end, including the tube stubs and any end fittings integrated prior to shipment.

For hoses under 4 feet (48 inches) in length, the length tolerance is +/- 1.5 inches.

For hoses 4 feet (48 inches) in length or longer, the length tolerance is +/- 3%.



## Pressure Ratings

Maximum Allowable Working Pressure (MAWP)			
Hose Size ID [in]	DN (ISO 10380) [mm]	Pressure Category	MAWP [psi] -270 to 38C
1/4	6	LP	72
		HP	750
3/8	10	LP	72
		HP	750
1/2	12	LP	72
		HP	750
3/4	20	LP	43
		HP	600
1	25	LP	43
		HP	500

\*For applications with fluid temperatures greater than 38 degrees Celsius (100 degrees Fahrenheit), see pressure derating factor by temperature.

Contact sales engineering for assistance at <https://conceptgroupllc.com/contact/>

## End Fittings

All Insulon vacuum jacketed hoses are shipped with fully weldable, stainless steel 316 tube stubs.

Option to select from a variety of end fittings including compression unions and adapters (NPT, BSPT, etc.), flared swivel nuts (CGA-295, JIC, etc.), flanges, and more.

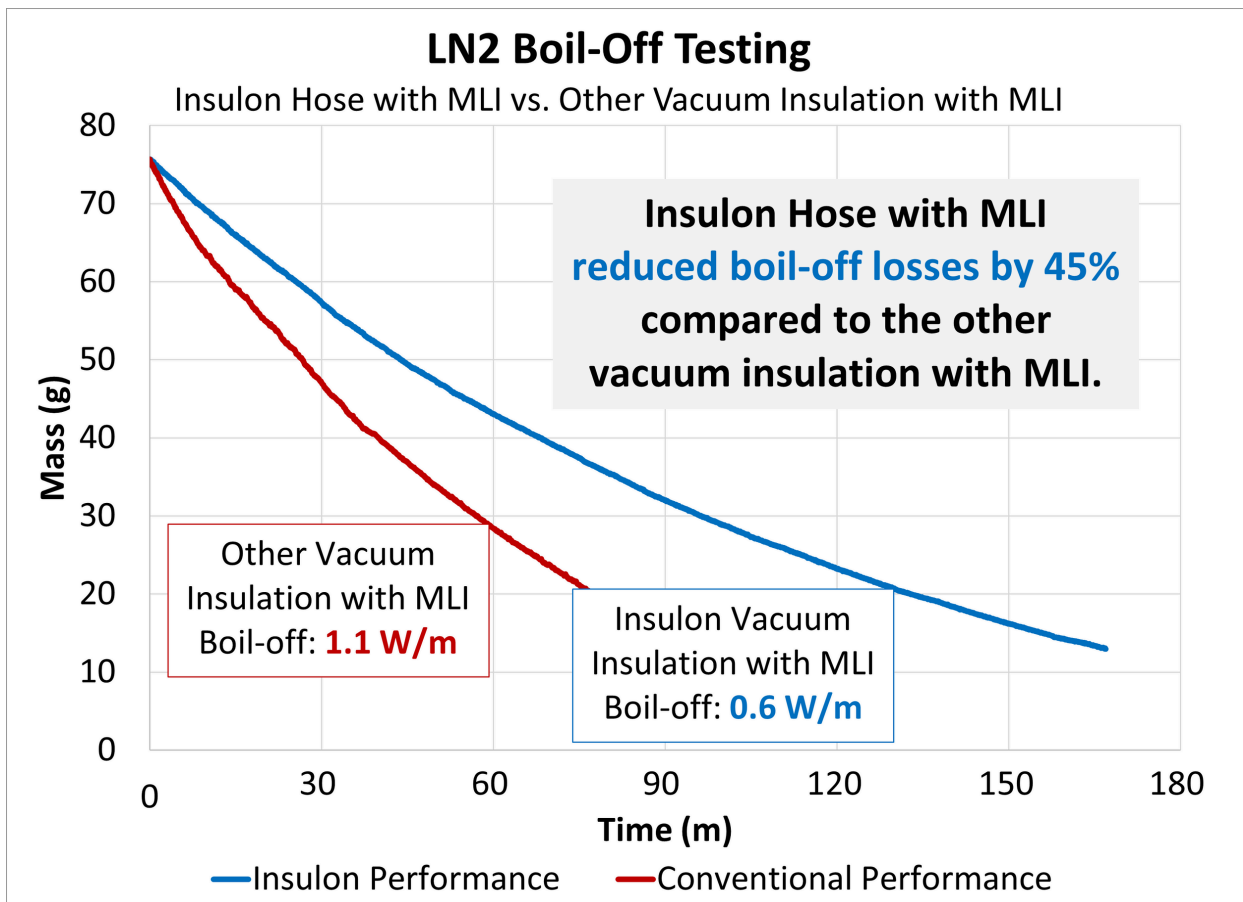
Tube Stub Dimensions						
Hose Size ID [in]	DN (ISO 10380) [mm]	Tube Stub OD [in]	Tube Stub Thickness [in]	Min. Tube Stub ID [in]	Min. Tube Stub Length [in]	Max. Tube Stub Length [in]
1/4	6	0.250	0.028	0.194	1.250	2.250
3/8	10	0.375	0.035	0.305	1.250	2.250
1/2	12	0.500	0.035	0.430	1.250	2.250
3/4	20	0.750	0.049	0.652	1.250	2.250
1	25	1.000	0.065	0.870	1.500	2.500

## Boil-Off Rate, Insulon Hose with MLI

High performance Insulon Vacuum Jacketed Hose includes multi-layer insulation (MLI) to reduce boil-off material losses by up to 45%.

- During the LN2 Boil-Off Testing, Insulon Vacuum Jacketed Hose with MLI achieved a boil-off rate of 0.6 W/m.
- During the same period, another vacuum jacketed hose with MLI allowed liquid nitrogen to boil-off at a rate of 1.1 W/m.

The empirical test below was conducted with liquid nitrogen (LN2).



Setup: Two 1/2" ID x 6' L vacuum jacketed hoses are bent 180° into a "U" configuration. Both ends of each hose assembly are fixtured onto a load-cell. The hoses are filled with LN2. A DAQ system pulls data from both load cells to plot the mass loss of LN2 with respect to time.