Rigid Vacuum Insulated Pipe (RVIP)

CryoWorks uses stainless steel inner and outer pipe in the manufacturing of our Rigid Vacuum Insulated Pipe (RVIP) systems. The piping consists of a factory-fabricated inner line and outer jacket. The inner line carries the cryogenic fluid while a vacuum space between the inner and outer pipe provides insulation that minimizes heat transfer and boil-off gas (BOG). The vacuum annular space consists of a multi-layer superinsulation, internal gettering material, and high vacuum insulation. Standard sizes of our Rigid VIP Systems include ½" to 16" NPS with either internal or external expansion joints.

Features:

- 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.
- Integrated flex sections added for system offsets, thermal expansion, expansion loops, flexibility, and use-point transitions
- Each spool section is helium leak tested, evacuated, and vacuum sealed prior to shipment.
- No on-site vacuum pumps required - factory evacuated and sealed.

Benefits:

- Easy to install - its lightweight, compact jacket size, facilitates even the toughest installations.
- CryoWorks bayonets utilized for ease of installation.
- Need something quick? - we stock bundles of raw pipe material.
- Great alternative to foam insulated copper.
- Approximately 50 times more effective than conventional foam insulation in preventing heat gain to the inner line and nearly 200 times more effective than bare copper lines.
- Extremely long-lasting and impervious to UV degradation.
- Superior vacuum insulation minimizes vaporization, reduces operating costs, and provides controllable quality liquid when and where you need it.
- Less mass - the thin wall inner material allows for a quicker cool down time while also minimizing start-up losses.
- Cost effective shipping - systems can be shipped in wooden crates or by flatbed truck.

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 Gauge Tubes (DV-6R or DV-6S)
- Vacuum Insulated Transfer Hoses (Connection to equipment)
- ASME Code Compliant Testing and Certification

Bayonet Connection

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RVIP Technical Specifications:

Inner PIpe NPS (DN)	Outer PIpe NPS (DN)	Pipe Wall Schedule (Inner/Jacket)	Jacket OD Nominal Inch (mm)	Dry Weight		MAWP - Internal Expansion Joints			MAWP - External Expansion Joints		
						Bayonet	Bayonet	Field Joint	Bayonet	Bayonet	Field Joint
				lbs/ft	kg/m	CT or Invar	F-Series	Welded	CT or Invar	F-Series	Welded
½" (15)	2" (50)	5/5	2.375 (60.33)	3.00	4.46	150	275	350	150	275	2388
1" (25)	3" (80)	5/5	3.500 (88.90)	4.48	6.67	150	275	350	150	275	1505
1 ½" (40)	3 ½" (90)	5/5	4.000 (101.60)	5.46	8.12	150	150	150	150	275	1034
2" (50)	4" (100)	5/5	4.500 (114.30)	6.07	9.03	150	150	150	150	275	819
3" (80)	5" (125)	5/5	5.563 (141.30)	10.32	15.35	See Eng	150	150	See Eng	275	711
4" (100)	6" (150)	5/5	6.625 (168.28)	12.65	18.83	See Eng	150	150	See Eng	275	552
6" (150)	8" (200)	10s/10s	8.625 (219.08)	24.96	37.14	See Eng	See Eng	See Eng	See Eng	275	604
8" (200)	10" (250)	10s/10s	10.750 (273.05)	35.31	52.55	See Eng	See Eng	See Eng	See Eng	275	512
10" (250)	12" (300)	10s/10s	12.750 (323.85)	47.15	70.16	See Eng	See Eng	See Eng	See Eng	See Eng	457
12" (300)	16" (450)	10s/10s	16.000 (406.40)	61.50	91.52	See Eng	See Eng	See Eng	See Eng	See Eng	421

OD = Outer Diameter, MAWP = Maximum Allowable Working Pressure, CT = Close Tolerance, Invar = Dissimilar Metal, F-Series = Flange Series.

RVIP Flow Rate:

Line Size	gpm	lpm	lbs/min
½" (15)	7.66	29	51.7
1" (25)	29.6	112	199.7
1 ½" (40)	85.2	323	574.8
2" (50)	159	602	1,072.8
3" (80)	441	1,669	2,975.4
4" (100)	890	3,369	6,004.7
6" (150)	2,417	9,149	16,307.2
8" (200)	4,883	18,484	32,945.0
10" (250)	8,740	33,084	58,967.7
12" (300)	13,700	51,860	92,432.2

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

RVIP Heat Leak (Btu/hr*ft):

Line Size	LNG -265°F	LOX -297°F	LN2 -320°F	LH2 -423°F	LHe -452°F
	20 MLI Layers				24 MLI Layers
½" (15)	0.199 (0.05)	0.222 (0.06)	0.236 (0.06)	0.298 (0.08)	0.272 (0.07)
1" (25)	0.290 (0.08)	0.324 (0.09)	0.344 (0.10)	0.434 (0.12)	0.394 (0.11)
1 ½" (40)	0.375 (0.10)	0.419 (0.12)	0.445 (0.13)	0.562 (0.16)	0.507 (0.14)
2" (50)	0.490 (0.14)	0.547 (0.16)	0.581 (0.17)	0.734 (0.21)	0.659 (0.19)
3" (80)	0.704 (0.20)	0.785 (0.23)	0.834 (0.24)	1.053 (0.30)	0.942 (0.27)
4" (100)	0.892 (0.26)	0.996 (0.29)	1.058 (0.31)	1.336 (0.39)	1.192 (0.34)
6" (150)	1.296 (0.37)	1.446 (0.42)	1.537 (0.45)	1.940 (0.56)	1.727 (0.50)
8" (200)	1.673 (0.49)	1.867 (0.54)	1.984 (0.58)	2.504 (0.73)	2.226 (0.65)
10" (250)	2.078 (0.60)	2.319 (0.67)	2.464 (0.72)	3.110 (0.91)	2.762 (0.80)
12" (300)	2.431 (0.71)	2.714 (0.79)	2.884 (0.84)	3.640 (1.06)	3.236 (0.94)

Data is provided for estimation only. Contact CryoWorks for a thorough system analysis.
*Data based on straight pipe only (no internal spacers, fittings, or bayonets).
For system estimates with average components, increase per foot data by 20%.

