

Liquid Nitrogen Dosing

BEVERAGE | FOOD | PERSONAL CARE | CHEMICAL



Stay cool under pressure
www.csm-cryogenic.com



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LN2 Dosing Applications

How it works

The dosing process involves supplying LN2 to the doser through a vacuum-insulated pipe, which then flows into the dosing head. A sensor detects the presence of the container and sends pulses to the controller. Upon receiving the signals, the controller instructs the dosing head to dispense the necessary quantity of LN2 into the container.

As the LN2 droplets enter the container, they rapidly evaporate and expand approximately 700 times, transforming into gaseous N2. This process effectively fills the headspace of the container with inert N2 gas, achieving the desired pressure.

Why dosing the liquid nitrogen?

PRESSURIZATION

- ✓ PET and PP bottles
- ✓ Aluminum cans
- ✓ Aluminum bottles
- ✓ Non carbonated drinks



Enhanced Container Rigidity: Improve the strength of bottles or cans to eliminate paneling issues, particularly during the hot filling process.

Container Light weighting: Decrease packaging costs and reduce the environmental carbon footprint by using lighter materials for packaging.



LN2 Dosing Applications

NITRO-INFUSED BEVERAGE

- ☒ Coffee
- ☒ Tea
- ☒ Beer

Nitro-Infused Beverage: Infusing the beverage with nitrogen provides a luxurious, thick, and creamy texture, enhancing the mouthfeel and flavor of the drink and a beautiful cascade of nitrogen bubbles in your glass



INERTING

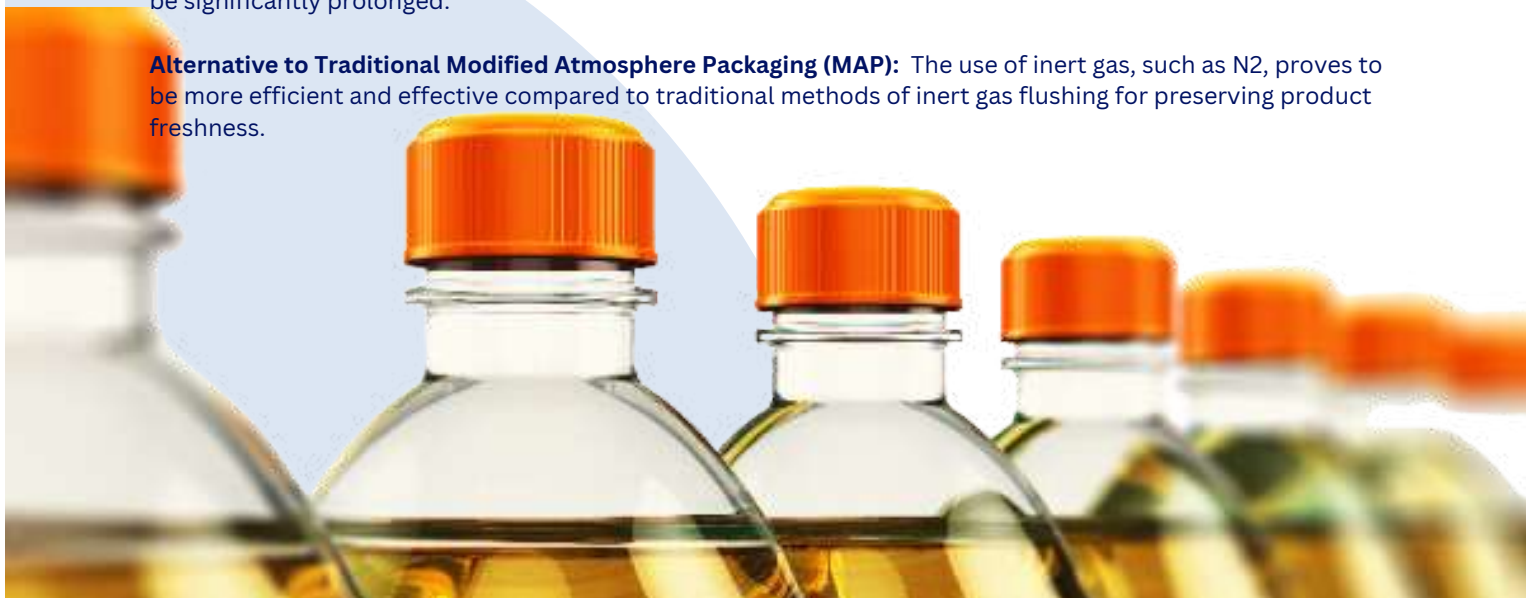
- ☒ Nuts
- ☒ Wine
- ☒ Fruit Juice
- ☒ Vegetable Oil
- ☒ Vitamin Drink
- ☒ Sauces
- ☒ Snack
- ☒ Automobile Oil
- ☒ Beer
- ☒ Tea
- ☒ Coffee Seed



Oxygen Exclusion: Minimize the presence of residual oxygen in the product's headspace to prevent oxidation and maintain the quality of the product.

Extended Product Shelf Life: By incorporating N2 gas in the product packaging, the shelf life of the product can be significantly prolonged.

Alternative to Traditional Modified Atmosphere Packaging (MAP): The use of inert gas, such as N2, proves to be more efficient and effective compared to traditional methods of inert gas flushing for preserving product freshness.



Ergonomic Features And Benefits

- **Frost-free Nozzle** – Self-generating GN2 for dosing head blanketing
- **Consistent Container Pressure** – Deliver accurate dosing $\pm 1\%$
- **Lowest LN2 Consumption** – Discrete dosing, for speed up to 2500* containers per minute
- **Lowest LN2 Losses** – Proprietary vacuum insulation with lowest heat leak 0.1 LPH
- **Minimized Product Splash** – Lowest dose pressure in its class, 0.3 psi
- **Sub-cooled LN2** – Ensuring constant LN2 density for accurate dosing
- **Corrosion Resistant** – Optional 316L material grade of construction for Doser body
- **Highest Hygiene Design** – All external surface has rounded corners and sloped design for easy wash-down
- **Lowest Maintenance** – Ultra long life cycle dosing valve > 60 million; and better than IP65 rated sensors & electrical cables
- **Ease of Installation** – Compact size for easy installation in limited space
- **Applications Flexibility** – Compatible with soft-dose and micro-dose technology for hot fill, powder, and granular applications
- **Multi-lingual HMI** – English, Spanish, Chinese, etc
- **5 Years Vacuum Warranty** – Lowest cost of ownership



Doser Selection Guide

NovoDoser® Specifications

BODY TYPE	L series	H series	Q series
			
Material	Stainless Steel 300 Series	Stainless Steel 300 Series	Stainless Steel 300 Series
Head Pressure	0.3psi (0.020 bar)	0.15 ~ 0.55psi (0.010~0.038 bar)	0.3 ~ 1.05psi (0.020~0.072 bar)
Nozzle Blanketing	Self Generate N2	Self Generate N2	Self Generate N2
Steady State Consumption	< 0.026 gal/hr. (<0.098 liter/hr.)	< 0.029 gal/hr. (<0.109 liter/hr.)	< 0.035 gal / hour (<0.132 liter/hr.)
Body Dimension	36"H x 5"W (910 x 129mm)	42"H x 5"W (1070 x 129mm)	58"H x 5"W (1474 x 129mm)
Dosing Head	**Pneumatic / EA Head / ES Head	**Pneumatic / EA Head / ES Head	**EA Head / ES Head
Dosing Head Arm Reach	18" (457mm)	18" (457mm)	31" (788mm)
Weight	30lbs (14kg)	35lbs (16kg)	44lbs (19kg)
Utilities: Liquid Nitrogen Supply	22 psi (1.5 bar)	30 ~ 100 psi (2.0 ~ 6.5 bar)	30 ~ 100 psi (2.0 ~ 6.5 bar)
Gaseous N2	60 - 100 psi (4.1 - 6.8 bar)	60 - 100 psi (4.1 - 6.8 bar)	60 - 100 psi (4.1 - 6.8 bar)
Electrical	110-220VAC	110-220VAC	110-220VAC

** Dosing Head Dimension**

Pneumatic : 2.5"H x 1.5"W (62 x 38mm)

EA Head : 6.4"H x 2"W (162 x 45mm)

ES Head : 9.7"H x 1.6"W (247 x 40mm)

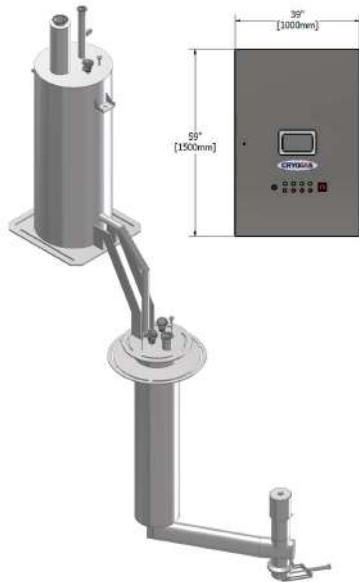
Controller Selection Guide

Controller *Specifications*

CONTROLLER TYPE	500FD	800SC	2000DSC
			
PLC Platform	Siemens S7-1200	Siemens S7-1200	Siemens S7-1200
HMI (LCD touch screen)	4.3" Color	4.3" Color	7.0" Color
Dose Duration, 1ms interval	20 to 1500 ms	15 to 1500 ms	5 to 1500 ms
Dose Volume, mg/dose	10 to 1400	10 to 1400	5 to 1400
Dose Accuracy	± 3%	± 2%	± 1%
Max. Discrete Dosing	500 CPM	800 CPM	2000 CPM
Fixed Delay	✓	✓	✓
Speed Compensation		✓	✓
Dose Compensation		✓	✓
Dynamic Dose	✓		
Encoder Compatible			✓
Nozzle Pre-Cooling	Manual	Manual	Automatic
Dose Head Purging	Optional (Manual)	Automatic	Automatic
Nozzle Defrost	Optional (Manual)	Automatic	Automatic
User's Filler Signal Interface			Optional
Modbus RTU User Interface	✓	✓	✓
Mobile Remote Monitoring (Wi-Fi / Lan)			✓
Smart Maintenance			✓
Overall Equipment Effectiveness	✓	✓	✓
Recipe Storage	5	5	12
Dosing Head	Bimba / EA	Bimba / EA / ES	Bimba / EA / ES
Certifications	CE, IP65	CE, IP65	CE, IP66

AsepticDoser®

Liquid Nitrogen Dosing



CSM Aseptic LN2 Doser is a state-of-the-art dosing system designed to deliver precise and sterile liquid nitrogen doses for aseptic filling lines, catering to a wide range of applications. This cutting-edge dosing solution guarantees efficiency, reliability, and safety while ensuring product quality throughout the dosing process.

Features and Benefits

Sterile and Low-Pressure Dosing: The Aseptic LN2 Doser offers aseptic and low-pressure liquid nitrogen dosing, making it ideal for a variety of industries, including pharmaceuticals, biotechnology, and food processing.

Continuous Stream Dosing: Designed to run in a continuous dose mode, the Aseptic LN2 Doser provides a constant stream of liquid nitrogen for uninterrupted dosing operations, ensuring optimal efficiency.

Precise Dosage Control: With an accuracy of $\pm 3\%$ in dose weight, the system ensures consistent and precise dosing, reducing waste and improving overall product quality.

Self-Monitoring and Alarm Outputs: The system features continuous self-monitoring, providing real-time data to operators and alerting them in case of any deviations or irregularities through alarm outputs and visual beacon indicators.

User-Friendly PLC Platform: CSM Aseptic LN2 Doser is equipped with a Siemens S7-1200 PLC platform, offering intuitive and efficient control over the dosing process, ensuring ease of operation and quick setup.

User Interface: The system is complemented with a Siemens 6" color touchscreen, providing operators with a user-friendly and informative interface for convenient control and monitoring.

Automatic CIP Protection: The Aseptic LN2 Doser is equipped with CIP (Clean in Place) process. This feature prevents moisture from entering the dosing head, minimizing the risk of freeze-ups and ensuring a smooth and hassle-free cleaning process. The nozzle is designed to withstand high-pressure washdowns and aggressive chemical cleanups, ensuring its longevity and reliability.

MiniDoser

The MiniDoser™ is an ultra-compact doser, requiring the smallest installation footprint, making it ideal for most food production fillers. When paired with a suitable Phase Separator or Degasser unit, it can efficiently dose large volumes of liquid nitrogen into inert containers with high-volume headspace.

This versatile MiniDoser holds significant value in food inerting processes, specifically for peanuts, potato chips, and snacks. Moreover, it has proven to be indispensable in beer fobbing and beverage nitrogenation applications. Its adaptability across multiple industries makes it an innovative solution for ensuring product freshness and quality.



- Frost-free nozzle – Self-generating GN2 for dosing head blanketing
- Consistent Container Pressure – delivers accurate dosing $\pm 3\%$
- Lowest LN2 Consumption – Discrete dosing, NO-container-NO dose capability
- Lowest LN2 Losses – Proprietary vacuum insulation with lowest heat leak 0.1 LPH
- Minimized Product Splash – Soft-dose nozzles prevent product splash, maintain line hygiene and reduce COP / CIP cleaning frequency
- Corrosion Resistant – 304L material grade of construction for doser body
- Highest Hygiene Design – All external surface has rounded corners and sloped design for easy wash-down
- Lowest Maintenance – Ultra long life cycle dosing valve > 30 million
- Ease of Installation – Compact size for easy installation in limited space
- Applications Flexibility – Compatible with soft-dose and micro-dose technology for hot fill, powder, and granular applications
- 5 years vacuum warranty – lowest cost of ownership

Turnkey Solutions

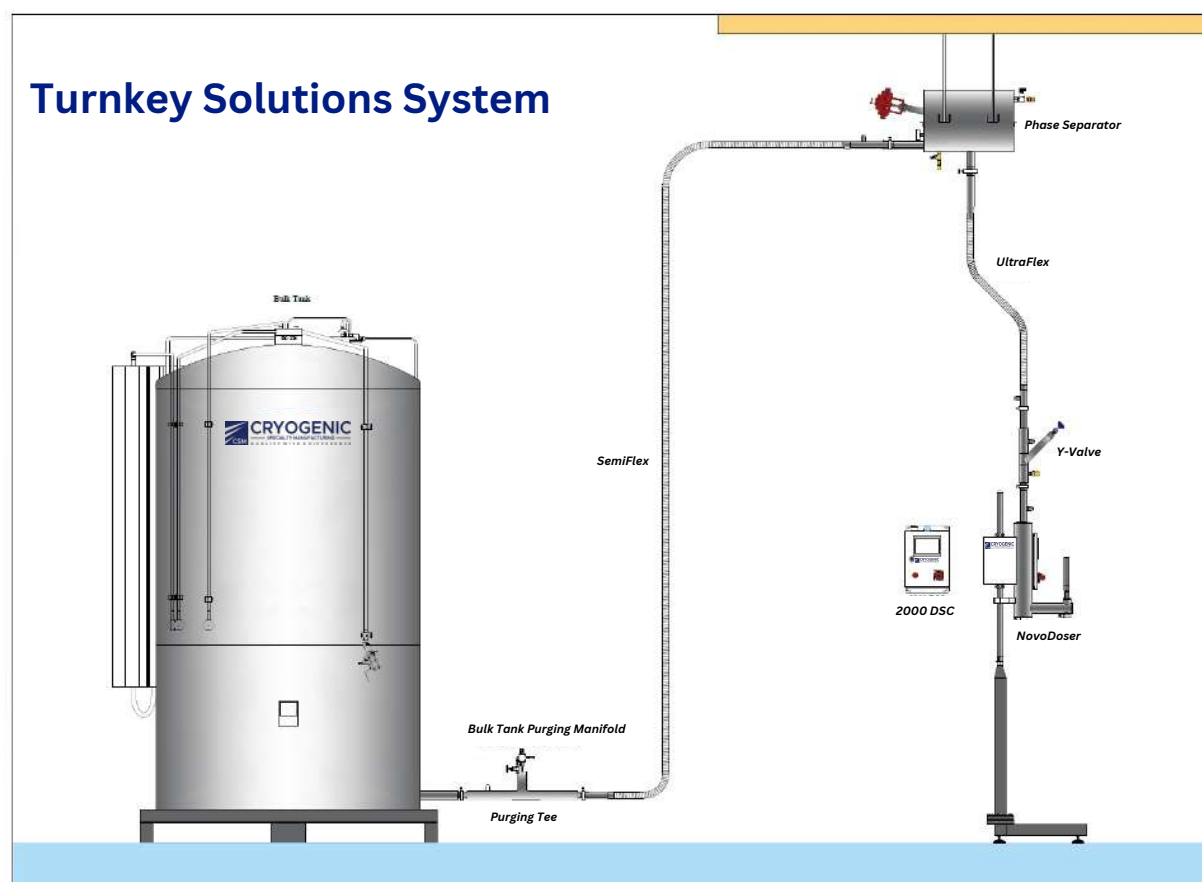
Benefits to customer

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

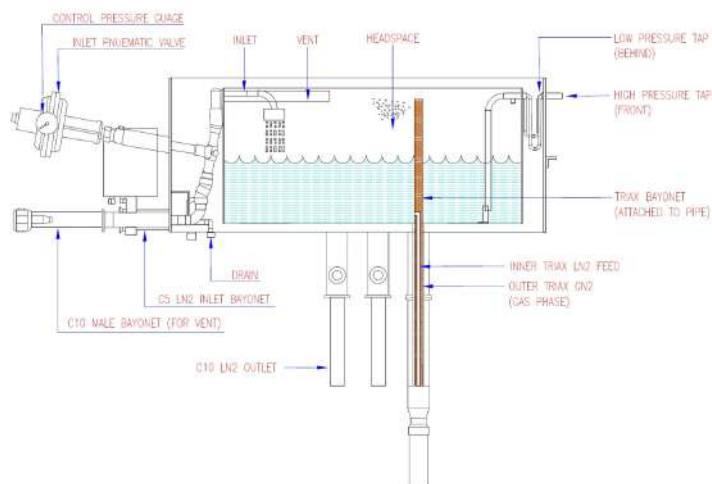


Phase Separator

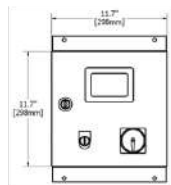
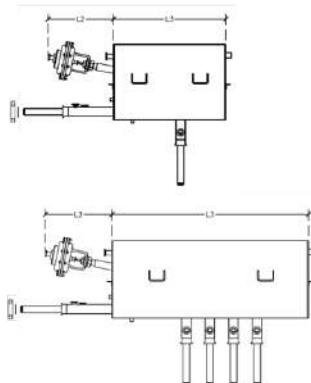
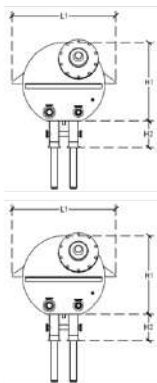
Atmospheric Pressure

A CSM atmospheric type of Phase Separator is mainly used in specialized applications that demand extremely high quality, low pressure liquid nitrogen. CSM Phase Separator is a vacuum insulated reservoir holding tank for liquid nitrogen with a differential pressure level control system that operates with a proportional inlet valve.

The Phase Separator is continuously full of liquid nitrogen under atmospheric conditions. Typical applications include direct feed to a LN2 doser or closed Loop liquid nitrogen circulation system typically found in MBE (Molecular Beam Epitaxy) system application



Model	H1	H2	L1	L2	L3
C22	16.4" (417mm)	5.5" (140mm)	21.6" (549mm)	14.2" (361mm)	24.4" (620mm)
C46	16.4" (417mm)	5.5" (140mm)	21.6" (549mm)	14.2" (361mm)	41.7" (1060mm)



Controller Dimensions

Features and Benefits

- Differential pressure controls and a proportional inlet valve helps to maintain a constant liquid level at $\pm 5\%$
- Provides a ready supply of vapor free pure liquid nitrogen to critical applications
- Available in 22 and 46 litre operating capacity with bottom outlets from 2 to 12 outlets. Higher capacity for custom application available
- It comes with special designed universal outlet connections, which allow either connections interchangeable with liquid feed Triax pipes or vapor return Coax pipes. This feature improve installation flexibility in a multiple pairs of closed loop pipin system

Dewar Changeover

How it works?

Uninterrupted liquid nitrogen supply with LGC is achievable with a dewar changeover system. The station consist of two sides, one active supply and one standby. When the active supply is depleted, the operator only need to manually switch over the supply to the standby tank. Automatic changeovers is available as option for unattended operation.

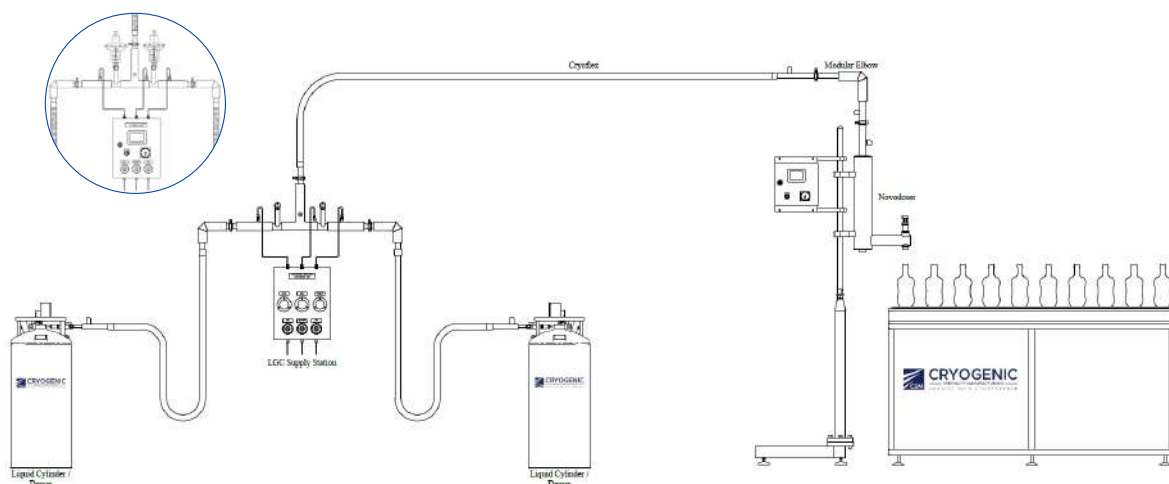
CSM dewar changeover system is fully vacuum insulated, guarantees extremely low heat leak compared to foam-insulated station – at least 20 times reduction in liquid boil-off. This ensures consistent liquid supply quality to point-of-use. Lower boil-off translates to savings in LN2 consumption, equivalent to at least 6 months period of equipment capital payback.



Features and Benefits

- Minimal liquid supply downtime for higher productivity
- Available in 1x1, 2x2, 4x4 liquid cylinder configurations
- Frost-free and condensation free operation with vacuum insulation system.
- Prevent premature liquid cylinder changeouts through proper monitoring
- Compact size enables ease of installation in limited spaces

Typical Dewar Changeover System® for LN2 Supply



CSM Cryogenic Transfer Hoses

Semi-Flex Vacuum Insulated Transfer hoses



Semi-Flex



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. Available in sizes of DN16(1/2"), DN25(1"), DN32(1.25") and lengths ranging from 6m to 30m.

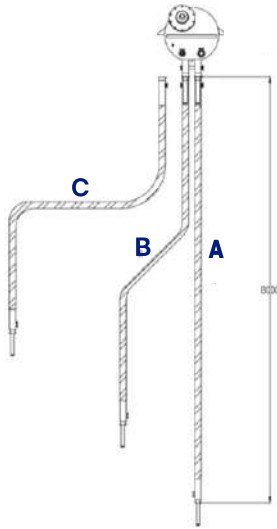
- Semi-Flex can be coiled for shipment by air freight, thus eliminate the need for expensive logistics
- Tees, elbows, bayonets and valves can be incorporated with Semi-Flex transfer hose for a customized LN2 piping system application
- Selected hoses are stock for immediate delivery
- Super insulation and proprietary chemical getters ensures long lasting vacuum integrity
- Each hose is evacuated (10⁻⁶ torr), helium leak checked (1 x 10⁻⁹ std cc/sec) and liquid nitrogen cold shock tested before shipping
- Vacuum insulation eliminates frost, ice and related safety hazards

Semi-Flex Specifications

Model	SF16	SF25	SF32
Inner Diameter	DN 16 ¾" (16.2 mm)	DN 25 1" (25.1 mm)	DN 32 1½" (34.2 mm)
Outer Diameter	DN 40 (52.1 mm)	DN 50 (62.8 mm)	DN 65 (81.2 mm)
Steady State Heat Leak	1.4 btu/hr/ft (1.3 watts/m)	1.5 btu/hr/ft (1.4 watts/m)	1.6 btu/hr/ft (1.5 watts/m)
Bayonet Heat Leak	4.0 btu/hr (1.2 watts)	8.1 btu/hr (2.4 watts)	8.1 btu/hr (2.4 watts)
Max. Operating Pressure	200 psig (13.8 bar)	200 psig (13.8 bar)	200 psig (13.8 bar)
Weight	1.0 lbs/ft (1.4 kg/m)	1.3 lbs/ft (1.9 kg/m)	3.0 lbs/ft (4.5 kg/m)
Min. Bend Radius (Static)	12" (30 cm)	16" (40 cm)	18" (45 cm)
Vacuum Insulation Type	Static or Dynamic Vacuum		
Maximum Length	Single Spool 59 ft (18.00 m)		
Protective Outer Covering	RFB - Regular Flex Braid		
Material Construction	Stainless Steel Series 300		
Standard Testing	Dimensional Check He leak checked 1 x 10 ⁻⁹ cc/s		
Optional	Pneumatic pressure test, Vacuum retention testing, LN2 cold shock, pre-material certs., X-ray, ASME B31.3 certification, CFOS cleaning for O2 services		

CSM Cryogenic Transfer Hoses

Hoses Selection Guide



Installation Method	Hose Type	
	Triax-Flex	Ultra-Flex
A	✓	✗
B	✓	✓
C	✓	✗

Hose Type	ID	OD	Bending Radius
Triax-Flex	DN16	DN40	300mm.
Ultra-Flex	DN8	DN25	152mm.
	DN12	DN32	152mm.

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.



Ultra-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 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.



Triax-Flex

RELATED PRODUCT:



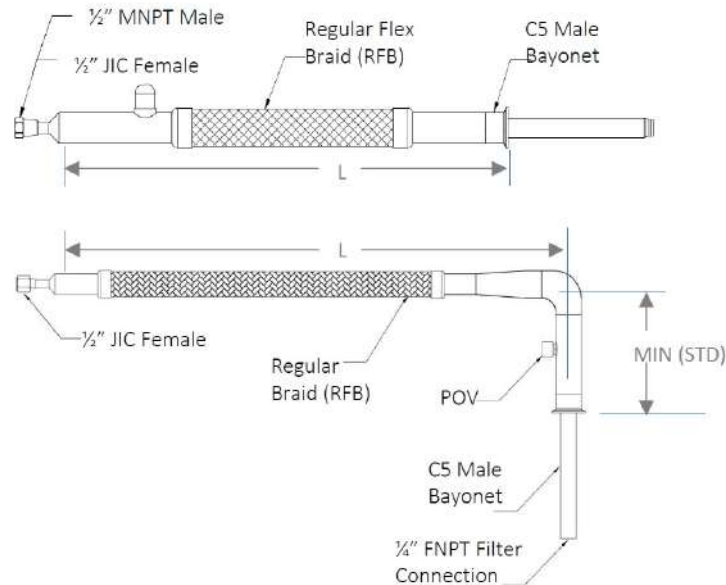
Modular Fittings

Modular Valves

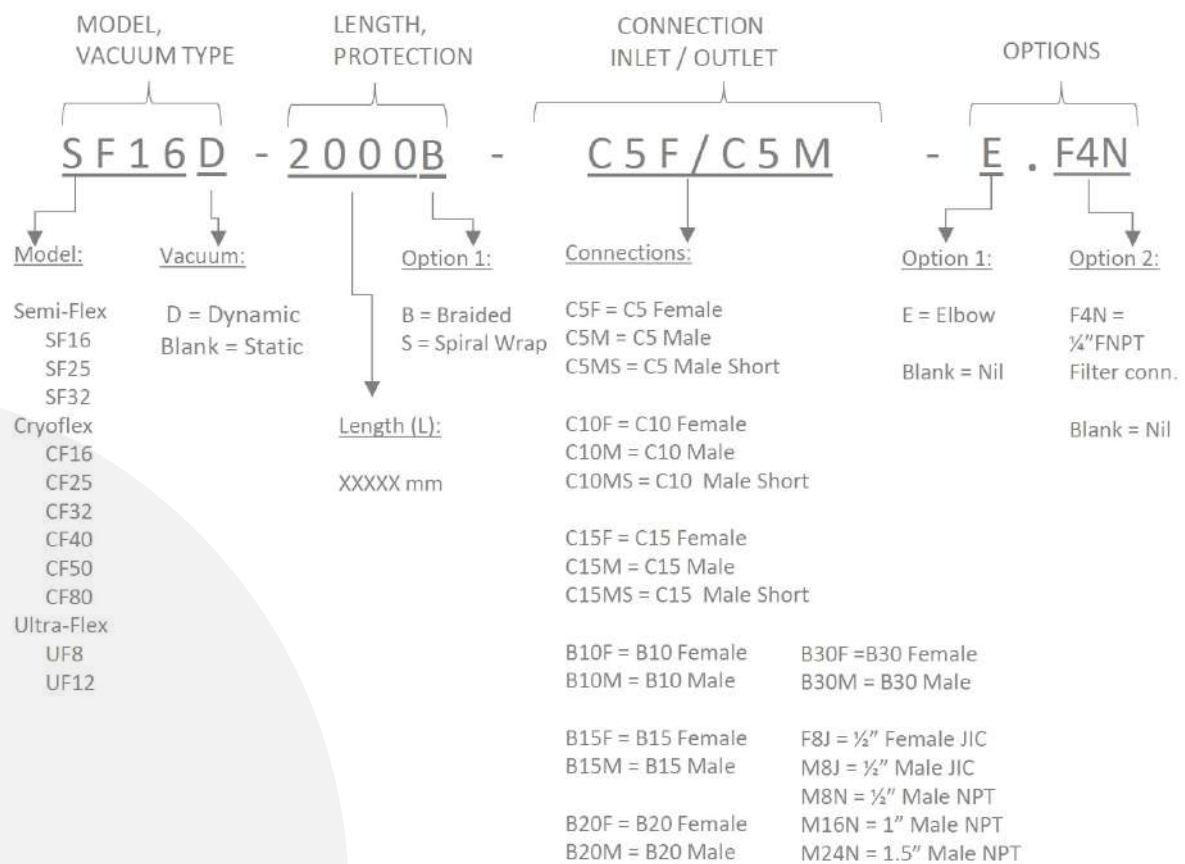
Modular Fittings

CSM Cryogenic Transfer Hoses

Hoses Selection Guide



How to Create Part Number



Worldwide Sales & Service



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