CHART®

Liquid Nitrogen Dosing

DOSERS | SYSTEM DESIGN | MANUFACTURING | TRAINING | INSTALLATION | CONSULTING

Dosers Product & Services Catalog

www.chartdosers.com

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Dosing The World One Drop At A Time

Chart Inc. is the only global turnkey liquid nitrogen (LN_2) doser system supplier in the world. Chart is the technology leader in LN_2 doser design, controls, complete integrated system solutions, service and 24/7 after-sales support.

Chart Inc. has partnered with leading companies to deliver a precise amount of liquid nitrogen to products in many industry sectors including: non-carbonated soft drinks, alcoholic beverages and mixes, dairy products, automotive oils, powder and granular products, salad oils and vinegars, and bottled water to launch better products while reducing packaging costs and carbon footprints.

NitroFresh™ Sealed Inside

Chart offers complimentary use of this logo on your packaging.

We offer the following comprehensive solutions to meet your needs:

Engineering Design

Our sales and engineering teams will document your system specifications and propose the most efficient and economical solution that meets the system's performance requirements.

On Site Demonstrations

"How do I know it will work with my production line?" is the number one question we are faced with from potential customers. We prove it will work on YOUR production line by bringing the system and our trained staff to install the equipment for a real-time demonstration.

Quality Manufacturing

Our experience ensures that your job is completed to high quality standards and on schedule. Each and every system goes through rigorous quality control and assurance before shipping.

24/7 After Sales Service & Support

After sales service and support is available anytime, day or night. We're here to help with every production shift.

When you choose Chart, you get single-source accountability.

LN_2 Dosing Applications

Chart Inc. has been mastering liquid nitrogen (LN_2) dosing applications for over 25 years. Based on the physical characteristic that one part of liquid nitrogen warms and expands into 700 parts of gaseous nitrogen, Chart dosing systems are used to pressurize and/or inert (N_2 flush) products and its packaging. As new packaging technology and products evolve, so has a demand for refined dosing results. Chart has met the challenge with innovation, key partnerships and detailed application analysis.

How it works

LN_2 is supplied to the doser by a vacuum insulated hose and flows into the dosing head. A sensor detects the speed of the line (encoder compatible for higher speeds); a second sensor detects the presence of a container. When a container is detected, the dosing head opens and dispenses an exact amount of pure LN_2. A PLC (Programmable Logic Controller) is the brains behind integrating the sensors, controls and human interface via a touch-screen display.

Pressurization in Packaging Applications

A precise dose of liquid nitrogen is delivered immediately before capping or seaming. The trapped LN_2 quickly vaporizes, pressurizing the container. In hot fill applications, the nitrogen pressure counteracts the vacuum created when a hot product cools.

Key Benefits:
- Package Rigidity
- Eliminate Package Paneling
- Ease of Labeling
- Lighter Weight Packaging
- Glass to Plastic Transition
- Oxygen Reduction

Proven Applications:
- Bottled Water
- Energy Shots
- Flax Seed Oil
- Juices (Hot & Ambient Fill)
- Teas
- Vinegar

Case Study: *Lighter Weight Packaging*
Documented 9 gram reduction in PET bottle weight using Chart's MicroDose™ technology. This equates to ~$2.64MM annual savings for one production line running at 700 bottles/minute; assuming the cost of PET resin to be $0.80/lb.

Preservation Applications

An exact dose of liquid nitrogen is introduced seconds before the seamer or capper. The small dose of liquid nitrogen gasifies, 700 times its volume, in the process. The large volume of gaseous nitrogen pushes the oxygen out of the container.

Key Benefits:
- Oxygen Reduction
- Extended Shelf Life
- Efficient Nitrogen Consumption
- Stabilizing Organic Products

Proven Applications:
- Automobile Oil
- Beer
- Condiments
- Wine

Case Study: *Oxygen Reduction*
Documented extended shelf life studies show a 90-95% reduction in headspace oxygen content and a 59% reduction in total package oxygen when compared to a traditional gaseous nitrogen purge of headspace.

Case Study: *Extended Shelf Life*
Documented extended shelf life studies show an increase from 63 to 80 days providing larger batching flexibility at production runs, which improves overall costs.

Paso Robles Wine Country was named 2013 Wine Region of the Year by Wine Enthusiast Magazine. Our customer in that area states that it's "all because of the doser!"

Freezing Applications

A dose of liquid nitrogen is introduced to “lock in” and surface freeze the product (novelty ice cream) before it’s transferred to a traditional tunnel or spiral freezer. Recently, Chart has been partnering with retail ice cream shops to fast freeze customized desserts with liquid nitrogen to enhance the taste and texture.

Key Benefits:
- Maintain Product Integrity
- Aid in Packaging/Labeling
- Enable New Products to Market
- Enhance Flavor and “Smoothness”

Proven Applications:
- Dipped Ice Cream Cone
- iCream Café

Case Study: *Maintain Product Integrity*
Documented account of better overall aesthetics of the dipped ice cream cone due to liquid nitrogen flash freezing as it provides stability and support throughout the packaging process.

Modified Atmosphere Packaging (MAP) Applications

A large dose of liquid nitrogen is introduced into the package seconds before the seamer or capper. The dose of LN_2 gasifies, 700 times its volume, in the process. The large volume of gaseous nitrogen pushes the oxygen out of the container.

Key Benefits:
- Oxygen Reduction
- Extended Shelf Life
- Reduce Nitrogen Consumption
- Stabilizing Organic Products

Proven Applications:
- Baby Formula
- Coffee
- Nuts
- Trail Mix

Case Study: *Reduce Nitrogen Consumption*
Documented nitrogen savings show a 46% reduction in nitrogen spend when using Chart’s liquid nitrogen dosing system compared to traditional gaseous nitrogen purging.

Aseptic Applications

Sterile doses of liquid nitrogen are introduced into a row of aseptic containers prior to the seamer or capper. The pure sterile liquid nitrogen gasifies and is either trapped in the containers to add rigidity or escapes with oxygen to inert the headspace.

Key Benefits of Sterilization Method:
- Eliminate Steam and Moisture Intrusion
- Reduce Overall Sterilization Cycle Time
- Reduce Nitrogen Consumption
- Thorough System Monitoring

Choose Your Doser

	CryoDoser®	UltraDoser®		
				
Model (Non-Aseptic)	**2K**	**2K**	**500S**	**150S**
Package/Container				
LN_2 Volume/Head Space	Medium	Small	Small	Small
Body				
Arm/Head Type	Flexible	Rigid	Rigid	Rigid
Quick Service Auto Defrost	✓			
Head Pressure	0.9 psi (0.06 bar)	0.45 psi (0.03 bar)	0.45 psi (0.03 bar)	0.45 psi (0.03 bar)
Controller				
Discrete Dosing cpm (cph)	2000 (120,000)	2000 (120,000)	500 (30,000)	150 (9,000)
Dose Duration (ms)	5.5-1000 (0.1 ms intervals)	5.5-1000 (0.1 ms intervals)	15-1000 (1 ms intervals)	10-1000 (1 ms intervals)
PLC Platform	Allen-Bradley or Siemens	Allen-Bradley or Siemens	Siemens	Siemens
Encoder Compatible	✓	✓		
Line Speed Auto Detect	✓	✓		
Electronic Dose Targeting	✓	✓	✓	
Fixed Delay Mode	✓	✓	✓	✓
Container Speed Compensated Mode	✓	✓	✓	
Multiple Languages	✓	✓		
Ethernet Ready	✓	✓		
Recipe Storage	✓	✓		
SoftDose™ Technology *(page 10)*	Option	Option	Option	Option
IntelliDose™ Technology *(page 10)*	✓	✓		
RemoteDose™ Web Technology *(page 11)*	Option	Option		
MicroDose™ Technology *(page 11)*	✓	✓		

Choose Your Doser

	Inerter™			LinearDoser™
				
Model (Non-Aseptic)	**2K**	**500S**	**150S**	**500S**
Package/Container				
LN_2 Volume/Head Space	Large	Large	Large	Large
Body				
Arm/Head Type	Rigid	Rigid	Rigid	Rigid
Quick Service Auto Defrost				
Head Pressure	≥3 psi (0.20 bar)	≥3 psi (0.20 bar)	≥3 psi (0.20 bar)	≥3 psi (0.20 bar)
Controller				
Discrete Dosing cpm (cph)	2000 (120,000)	500 (30,000)	150 (9,000)	500 (30,000)
Dose Duration (ms)	5.5-1000 (0.1 ms intervals)	15-1000 (1 ms intervals)	10-1000 (1 ms intervals)	15-1000 (1 ms intervals)
PLC Platform	Allen-Bradley or Siemens	Siemens	Siemens	Siemens
Encoder Compatible	✓			
Line Speed Auto Detect	✓			
Electronic Dose Targeting	✓	✓		✓
Fixed Delay Mode	✓	✓	✓	✓
Container Speed Compensated Mode	✓	✓		✓
Multiple Languages	✓			
Ethernet Ready	✓			
Recipe Storage	✓			
SoftDose™ Technology *(page 10)*	Option	Option	Option	Option
IntelliDose™ Technology *(page 10)*	✓			
RemoteDose™ Web Technology *(page 11)*	Option			
MicroDose™ Technology *(page 11)*	✓			

Doser Customization: Don't see the model you need in our standard products? Feel free to ask about Chart's ability to customize a doser to best suit your application. We encourage you to bring your ideas to us to help design a doser perfect for your needs.

AseptiDoser™ Sterile LN_2 Dosing System

The AseptiDoser is the premier multi-head liquid nitrogen (LN_2) dosing system for aseptic packaging. Chart engineers designed an ultra-efficient system to reduce the sterilization time and nitrogen consumption by 50% when compared to traditional aseptic dosing systems utilizing steam and liquid-to-gas-to-liquid nitrogen sterilization methods. Packaged with our proven non-aseptic LN_2 dosing technology, Chart provides a state of the art and economically sound solution for your aseptic dosing requirements.

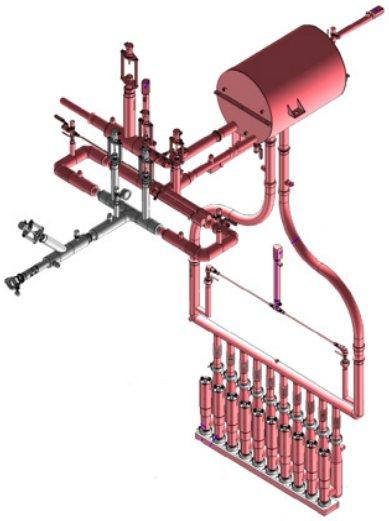
AseptiDoser Sterilization Process

Reduces total sterilization time by 50% from Traditional Aseptic Dosing Systems*

1. Pre Heat (30 min)

- System filters GN_2 through 0.2 micron filter
- System turns on six (6) gaseous nitrogen heaters and heating block
- Heat internal temperature to 300°F/149°C

2. Sterilization (30 min)



- Maintain minimum 300°F/149°C
- If temperature falls below 300°F/149°C, automatically restart 30 minutes regardless of % completion

Assumptions:

• Doser sterilization to run in parallel to filler sterilization.
• Doser sterilization exhaust into filler aseptic zone at all times during process.

AseptiDoser LN_2 Dosing Process

Reduces LN_2 consumption by 50% compared to Traditional Aseptic Dosing Systems*

1. High Pressure Storage

- Standard Liquid Nitrogen tank, set at 150 psi (10.3 bar)

2. Filter

- Filter Liquid Nitrogen through 10, 0.2, and 0.1 micron filters
- System includes parallel LN_2 feed lines for quick and easy change over, if needed

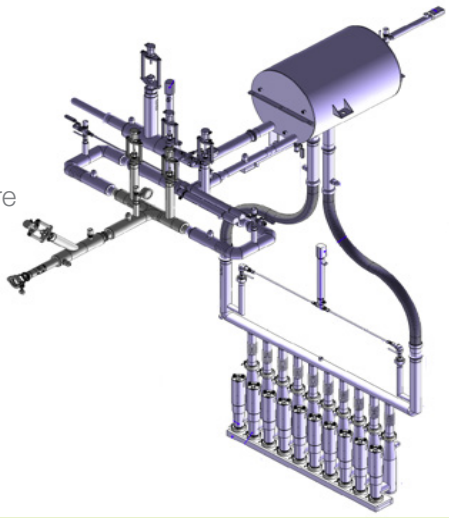
* Traditional Aseptic Dosing uses steam for sterilization and vaporizes LN_2, filters the N_2 gas, and reliquefies the N_2 gas for dosing.

AseptiDoser Features

- **Hot GN_2 Sterilization -** 10-log reduction equivalent of *Clostridium botulinum* achieved and validated by the National Food Lab
- **Pneumatic Actuated Valves –** automatically control the sterilization and liquid nitrogen flow with parallel configuration for quick and easy change over
- **Redundant Liquid Filtration –** multi-step 10, 0.2, and 0.1 micron filters to sterilize the liquid nitrogen
- **Little To No Hardware Penetration Into "Aseptic Zone" –** small footprint for easy integration to linear aseptic fillers
- **User Friendly and Intuitive HMI –** quickly identify the current mode of operation, sequence, and remaining time necessary for sterilization
- **Multi-Head Design –** customizable and adaptable to most linear aseptic filler

3. Cool Down (15 min)

- System turns off six (6) gaseous nitrogen heaters
- Reduce temperature of heating block to 150°F/65°C
- Reduce internal temperature to 150°F/65°C



4. Liquid Fill (10 min)

- Fill LN_2 holding reservoir with sterile LN_2
- Upon completion, system is ready to dose

3. Low Pressure Storage

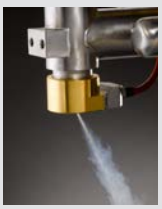
- Stores sterile Liquid Nitrogen under atmospheric pressure
- 0.1 micron filter at inlet of phase separator

4. Dosing

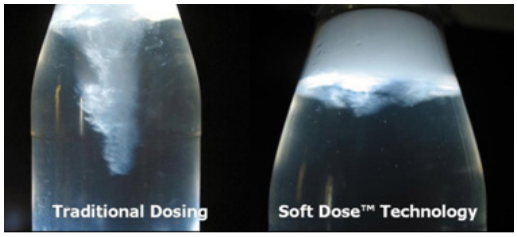
- Dose each container with low pressure sterile LN_2
- User can define on/off of specific heads

SoftDose™ Technology

The SoftDose places or sprays the liquid nitrogen on the surface of the product rather than penetrating the product surface essentially eliminating any product splash and delivering consistent container pressure. Various options are tailored to a specific product, package or application.

	Standard	Diverging	Ventelator	Regar	Hot Chute	Side Chute
						
Container Type	Narrow to wide mouth opening	Narrow to wide mouth opening	Narrow to wide mouth opening	Wide mouth opening	Narrow to wide mouth opening	Narrow to wide mouth opening
Recommended Dose Mode*	Discrete or Continuous	Discrete	Continuous	Discrete	Discrete	Continuous
Recommended Speed*	Any	Any	Any	Up to 900 cpm (54,000 cph)	Up to 400 cpm (24,000 cph)	Any
Recommended Application*	Non-carbonated ambient liquids	Hot fill liquids	Hot fill liquids	Dried goods	Limited space near capper	Powders, granular products
High-wattage Heater Package			Optional	Optional	✓	✓

* Chart recommendations only – actual application results and selection may vary based on other conditions or factors.



IntelliDose™ Technology

IntelliDose technology provides automatic dose adjustments at any line speed between low/high points as defined by the user.

RemoteDose™ Web Technology

RemoteDose technology was developed to confirm possible causes of errors to prepare for necessary actions and tools before running down to the point of the problem on a mobile device anywhere. You can check the status of a machine with the touch of a tablet or smartphone. Using the remote monitoring and operation functions, actions that previously required multiple staff for a large-sized machine or long-distance application can be easily accomplished by fewer operators.

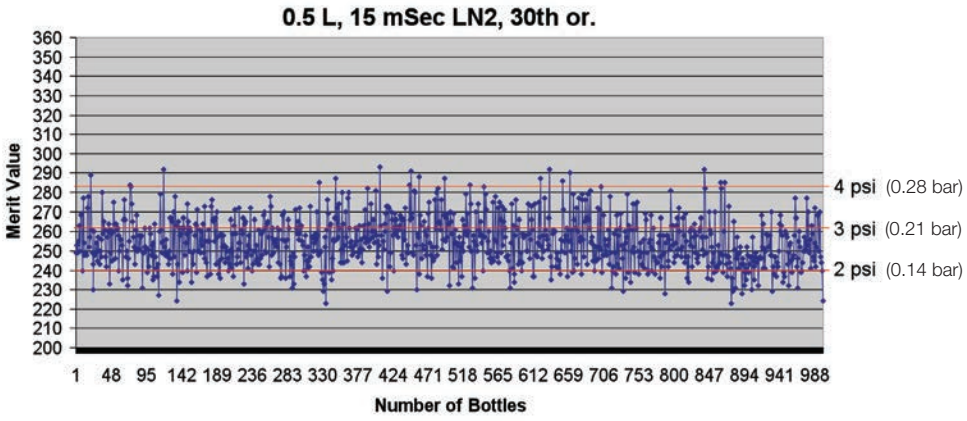
Troubleshooting before running to troubled machine

You can confirm possible causes of errors to prepare for necessary actions and tools before running down to the point of the problem on a mobile device anywhere.

* Requires a Wireless Router.

MicroDose™ Technology

MicroDose technology was developed in response to market demands to precisely dose LN_2 into ultra light weight packaging to comply with tight container pressure specifications. Utilizing various sensors to detect filling line speed, pocket detection, bottle presence, inputs independent of the filler and electronic adjustments for fine tuning, 3 +/-1 psi (0.21 bar +/- 0.07 bar) internal bottle pressure is achieved at the 99% level.



Results:
Sample size 1,000
99% - 2 to 4 psi (0.14 – 0.28 bar)
56% - 3 psi (0.21 bar)

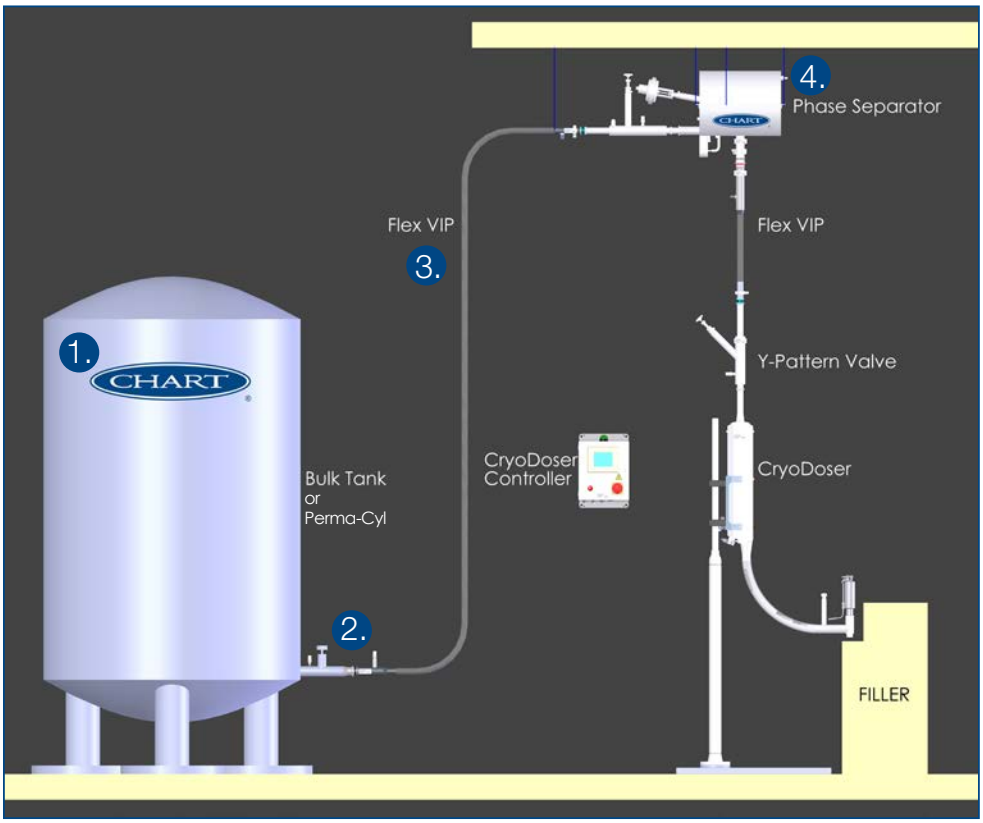
Heated Purge Kits

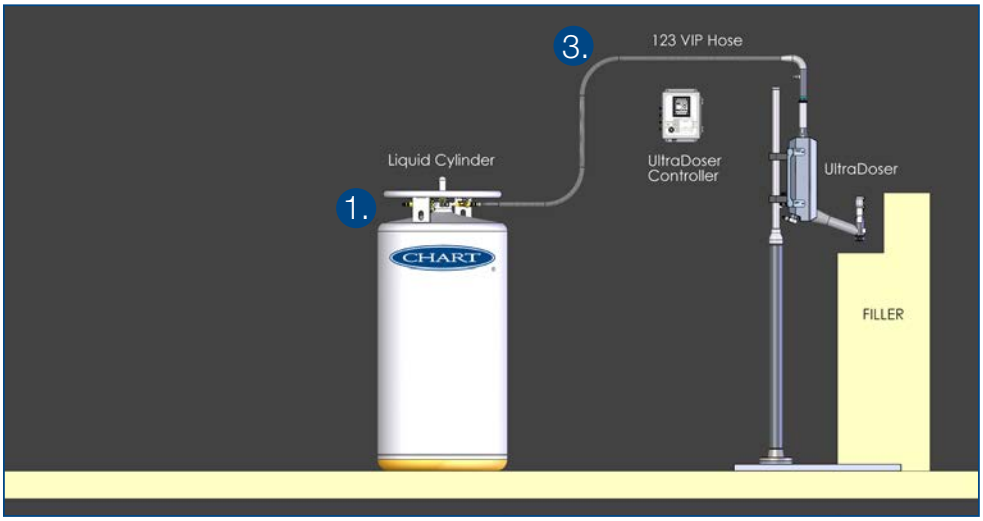
Heated Purge Kits are available for both bulk tank and liquid cylinder based systems. They are manual on/off kits that heat customer-supplied GN_2 to minimize down time due to system freeze ups by accelerating the drying time.

Engineered for Efficiency—Built to Last

A Turnkey Approach

Chart engineers work closely with our customers to ensure that the total system is designed properly, making the dosing system as effective as possible. Chart's turnkey approach ensures consistent, quality liquid to keep your doser operating at peak efficiency. Built for long-term integrity and industry leading efficiency, these systems give our customers the highest performance at the lowest operating cost, while having a single point of contact.





Choices of Liquid Supply:
Bulk Tank, Perma-Cyl® or Liquid Cylinder

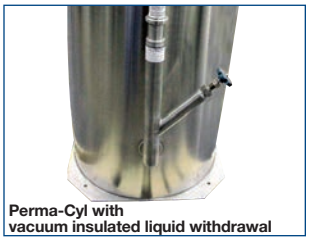
1. Vacuum Insulated Storage

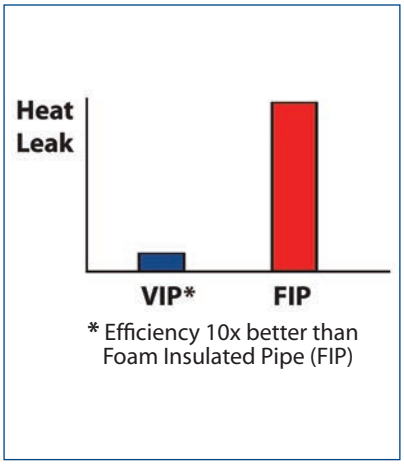
Chart offers the most comprehensive line of liquid nitrogen storage systems available today. From bulk tank storage to Perma-Cyl® MicroBulk Storage Systems (MicroBulk.com) to Dura-Cyl® Liquid Cylinders, we have the right LN_2 supply solution for your dosing needs. Our equipment is thermally efficient with reliable controls for long-term trouble-free operation. See more on pages 14 & 15.

2. Vacuum Insulated Withdrawal

Cryogenic pipe systems often require valves to properly control the liquid flow to the application. Strategically located valves control flow to a branch of the system or into a use-point. A vacuum insulated valve has the benefit of extremely low heat leak for minimum gas boil-off, and it eliminates unsafe ice build-up and dripping water issues.


Bulk tank with
vacuum insulated liquid withdrawal


Perma-Cyl with
vacuum insulated liquid withdrawal



3. Vacuum Insulated Pipe

Vacuum insulated pipe (VIP) is the foundation for a system's heat loss efficiency and long-term integrity. Chart offers a complete line of both MVIP Pro™ flexible and rigid vacuum insulated pipe that provides the most efficient and diverse method of transferring quality liquid nitrogen to ensure peak doser performance. See more on pages 16 & 17 or visit MVIPpro.com


MVIP Pro™ Flex Pipe


MVIP Pro™ Rigid Pipe

4. Phase Separator

Chart's vacuum insulated Phase Separator provides extremely high quality, low pressure liquid nitrogen on demand. The level of liquid nitrogen inside is controlled automatically. The reservoir is vented to atmosphere at all times ensuring the pressure inside is equal to atmosphere. This results in a continuous supply of unsaturated liquid nitrogen at a precise pressure. See more on page 17.

	Dura-Cyl® - Footring				
All data for N_2	Dura-Cyl 160	Dura-Cyl 180	Dura-Cyl 180	Dura-Cyl 200	Dura-Cyl 200
Pressure	MP	LP	MP	LP	MP
Dimensions					
Diameter	20”	20”	20”	20”	20”
Height[1]	59.8”	64.3”	59.8”	66.6”	66.6”
Tare Weight (lbs)	250	210	260	210	280
Full Weight (lbs)	517	540	557	559	597
Thermal Performance (NER %/Day)	2.0	1.5	1.9	1.85	1.85
Storage Capacity (Net/DOT)[2][3]					
Gal	44	49	49	52	52
Liters	165	185	185	196	196
Gas Flow					
SCFH	350	–	350	–	400
Nm^3/h	9.2	–	9.2	–	10.5
Design Specification					
DOT/CTC Rating	4L200	4L100	4L200	4L100	4L200
MAWP (psig)	230	22	230	22	230
Standard Design Features					
Internal Pressure Builder	X	X	X	X	X
Liquid Withdrawal	X	X	X	X	X

[1] All dimensions are measured from the floor to the top of the sight gauge protector.
[2] Gas capacities at DOT4L limits. See manual P/N 10642912 for details.
[3] Most of the Dura-Cyl models are available with permanently installed CGA fittings for medical applications. Contact Customer Service for details.

	Dura-Cyl® - Caster Base						
All data for N_2	Dura-Cyl 120 RB	Dura-Cyl 230 RB	Dura-Cyl 230 RB	Dura-Cyl 230 SB	Dura-Cyl 230 SB	Dura-Cyl 265 RB	Dura-Cyl 265 SB
Pressure	LP	LP	MP	LP	MP	MP	MP
Dimensions							
Diameter	20”	26”	26”	26”	26”	26”	26”
Height[1]	51.0”	57.2”	57.2”	56.8”	56.8”	59.9”	59.5”
Tare Weight (lbs)	177	296	311	325	340	330	360
Full Weight (lbs)	377	697	675	726	704	748	778
Thermal Performance (NER %/Day)	2.0	1.5	1.8	1.5	1.8	2.0	2.0
Storage Capacity (Net/DOT)[2][3]							
Gal	29	61	61	61	61	70	70
Liters	110	230	230	230	230	265	265
Gas Flow							
SCFH	–	–	400	–	400	400	400
Nm^3/h	–	–	10.5	–	10.5	10.5	10.5
Design Specification							
DOT/CTC Rating	4L100[4]	4L100	4L200	4L100	4L200	4L200	4L200
MAWP (psig)	22	22	230	22	230	230	230
Standard Design Features							
Internal Pressure Builder	X	X	X	X	X	X	X
Liquid Withdrawal	X	X	X	X	X	X	X

[1] All dimensions are measured from the floor to the top of the sight gauge protector.
[2] Gas capacities at DOT4L limits. See manual P/N 10642912 for details.
[3] Most of the Dura-Cyl models are available with permanently installed CGA fittings for medical applications. Contact Customer Service for details.
[4] Dura-Cyl 120LP is not TC approved.

	Perma-Cyl®			
All data for N_2	Perma-Cyl 1000	Perma-Cyl 1500	Perma-Cyl 2000	Perma-Cyl 3000
Pressure	HP	HP	HP	HP
Dimensions				
Diameter	42”	48”	48”	59”
Height	82”	92”	118.5”	122”
Tare Weight (lbs)	1500[3]	2200[4]	2600[4]	3300[4]
Thermal Performance (NER %/Day)[1]	1.0	1.0	1.0	1.0
Storage Capacity (Net/ASME)[2]				
Gal	251	385	515	715
Liters	950	1455	1945	2707
Gas Delivery Rate				
SCFH	320.0	450.0	450.0	450.0
Nm^3/h	9.0	12.7	12.7	12.7
Design Specification				
ASME	X	X	X	X
MAWP (psig)	350	350	350	350
Standard Design Features				
Internal Pressure Builder	X	X	X	X
VJ Liquid Withdrawal – ½"	X	X	X	X

[1] Values are based on gross capacity.
[2] Values are based on net capacity at 0 psig (0 barg) for ASME vessels
[3] Weights do not include lab base option. (base option: 265 lbs)
[4] Weights include lab bases.

	Bulk Storage			
All data for N_2	VS-525-DSS	VS-900-DSS	VS-1500-DSS	BulkLite 1400
Orientation	Vertical	Vertical	Vertical	Horizontal
Dimensions				
Diameter	66”	66”	66”	72”[2]
Height	105”	136”	196”	69”
Tare Weight (lbs)	3300	4400	6200	4800
Thermal Performance (NER %/Day)	.89	.73	.56	.45
Storage Capacity (Net/ASME)				
Gal	510	850	1580	1320
Liters	1931	3218	5981	4996
Gas Flow Capacity[1]				
SCFH	9000	9000	9000	2000[3]
Nm^3/h	237	237	237	56.6
Design Specification				
ASME	X	X	X	X
MAWP (psig)	250	250	250	250
Standard Design Features				
External Pressure Builder	X	X	X	X
VJ Liquid Withdrawal – 1"	X	X	X	X

[1] Flow capacity rating down to a 20% contents level with a maximum fall off in tank operating pressure of 15 psig (1 bar).
[2] Tank width @ forklift brackets. Length = 187"
[3] Eight hours continuous flow @ 80% duty cycle in room temp. with LN_2.

Which MVIP™ Option is right for you?

Categories	Pro	Select
Top Three Benefits	1. Easy – Use the online Modulator™ MVIP Ordering Software to configure, price and deliver your VIP modules and accessories. 2. Reliable – Long-term maintenance-free reliability that will not degrade, drip or leak with time. 3. High Performance – Reduce your LN_2 losses by a factor of 10 over foam insulated copper designs.	1. Ultimate Flexibility – Chart's five design platforms can be configured to meet your budget, performance and installation needs. 2. Capable – From molecular beam epitaxy to deep space simulation Chart vacuum insulated pipe is capable of meeting your application needs 3. High Performance – Chart's mantra is to protect the molecule by offering the ultimate radiation, convection and conduction performance available.
MAWP*	150 psig	Up to 400 psig**
Nominal Inner Diameters	½", 1", 1½", 2"	½" to 10"
VIP Price	$$	$$$
Installation Price	$	$$
Cool Down Relative Cost	$	$
Design Effort	Low	High
Connections	MVE "Shrink Fit" Bayonet	• MVE "Shrink Fit" Bayonet • "Close Tolerance" Bayonet • Field welded • Flange • Custom
Engineering Capability	Design your own system with the online Modulator. Inside Sales is available for consultation.	Experienced staff to handle cryogenic system solution of all levels of complexity including Sales Engineers, Field Technicians, Customer Service, Project Managers, Project Engineers, Staff Engineers and Designers.

* MAWP = Maximum Allowable Working Pressure

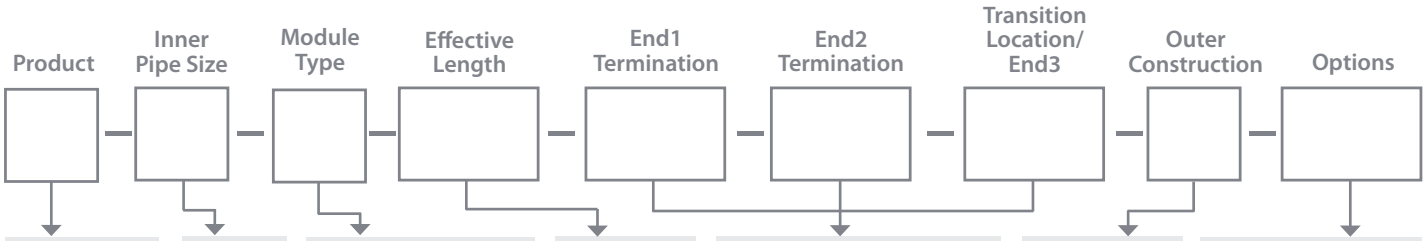
** Dependent upon overall pipe design.

Smart Numbering System MVIP Pro™ and MVIP Select™

Ordering Chart MVIP Pro™ and MVIP Select™ Vacuum Insulated Pipe modules is simple with Chart's smart numbering system. Smart model numbering allows for more integrated options. It also lets you be sure you have selected the options you want.

Each segment of the Smart Model Number refers to one attribute of the module, as shown below, including Pro or Select, the inner pipe size, the type of module, the effective length, the end terminations, the transition location, the outer construction, and the certifications.

The template below shows the option choices within each attribute. Visit MVIPpro.com for additional information.



MVIP Product (select one)

PR = Pro
SE = Select

Inner Pipe Size

08 = ½"
10 = ⅝"
16 = 1"
20 = 1¼"
24 = 1½"
32 = 2"

Module Type

PR = Plain Pipe Rigid
PF = Plain Pipe Flex
FE = Fixed Elbow
LE = Long Elbow
FT = Female Branch T
MT = Male Branch T
GT = Gas Trap
VY = Valve Y
VT = Valve T
CV = Cryovent
AD = Adapter
TK = Tee Kit
EK = Elbow Kit
SK = Straight Kit

Effective Length

XXX.X = in.
XXXXX = mm
NOTAP = Not Applicable

End Terminations & Transition Location / End3 (Tee Modules only)

MBXX = Male Bayonet
FBXX = Female Bayonet
BWXX = Butt Weld
MPXX = Male Pipe Thread
FPXX = Female Pipe Thread
NONE = None

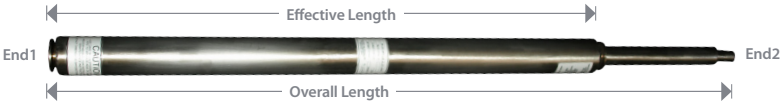
XX
08 = ½"(1)
10 = ⅝"(2)
16 = 1"(1)
20 = 1¼"(2)
24 = 1½"(1)
32 = 2"(1)

Outer Construction

R = Rigid
B = Braided
S = Spiral Wrap
C = Convoluted

Options (add as required)

X = X-Ray
P = Pressure Test
A = ASME Inspection
O = O_2 Clean
N = None
S = Special, Consult Factory
H = High Polished Outer



MVIP Select Flex Technical Information

Model	10	20
Inner Diameter (ID)	⅝" (15.875 mm)	1¼" (31.75 mm)
Outer Diameter (OD)	1.8" (45.7 mm)	2.6" (66.04 mm)
Minimum Flexible Bend Radius	18" (457.2 mm)	30" (762 mm)
Hole Required	3" (75 mm)	4" (100 mm)
Maximum Operating Pressure	200 psi (13.8 bar)	125 psi (8.6 bar)

(1) MVE "Shrink Fit" Bayonets only
(2) "Close Tolerance" Bayonets only

C-Flex Vacuum Insulated Transfer Hoses

Super flexible vacuum insulated liquid nitrogen transfer hoses are used in a wide variety of applications including tool connections and custom OEM applications. The coaxial bellowed construction allows for optimal flexibility. The use of lightweight stainless steel reduces cool-down loss to an absolute minimum. C-Flex hoses are protected by a stainless steel spiral wrap or a braided outer cover.

- **Custom Manifolds Available** – utilize vacuum insulated tees, elbows, bayonets, and valves to custom tailor the configuration (Consult factory)
- **High Pressure Requirements** – optional inner braid for higher pressure applications (Consult factory)
- **Minimal Cool Down & Steady State Losses** – compared to standard non-insulated transfer hoses
- **Integrated pump out**

C-Flex Technical Specifications

Model	04S	06S	08S	08B
Inner Diameter (ID)	¼" (6.3 mm)	⅜" (9.5 mm)	½" (12.7 mm)	½" (12.7 mm)
Outer Diameter (OD)	1.25" (31.8 mm)	1.65" (41.9 mm)	1.90" (48.3 mm)	1.80" (45.72 mm)
Minimum Flexible Bend Radius	7" (177 mm)	8" (203 mm)	10" (254 mm)	10" (254 mm)
Minimum Static Bend Radius	5" (127 mm)	6" (152 mm)	8" (203 mm)	7" (177 mm)
Maximum Operating Pressure	150 psi (10.3 bar)	150 psi (10.3 bar)	150 psi (10.3 bar)	150 psi (10.3 bar)

S: Spiral wrap outer covering **B:** Braided outer covering
C-Flex hoses are available in standard or custom lengths up to 60 feet.

Smart Numbering System C-Flex

Inner Flex Diameter	Overall Length	Outer Wrap	End1 Termination	End2 Termination
04 = ¼" 06 = ⅜" 08 = ½"	XX = ft	S = Spiral B = Braided	8SE = ½" SAE 45 Female Flare 4PT = ¼" MPT 6PT = ⅜" MPT 8PT = ½" MPT 8T = ½" Smooth Tube 10PT = ⅝" MPT 20PT = 1¼" MPT NONE = NONE	

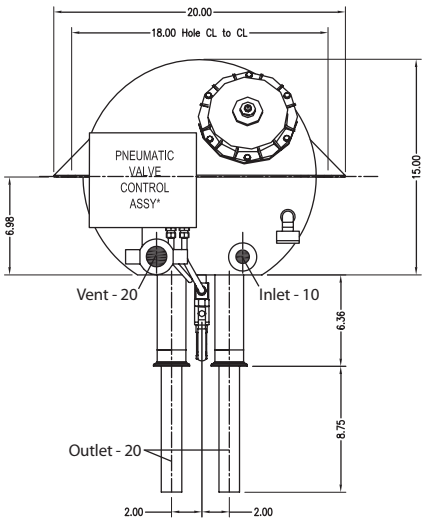
123 Vacuum Insulated Transfer Hoses

Inner Flex Diameter: ¼ in.
Standard Length: 10 ft.
Outer Wrap: Spiral
End1 Fitting: 45° Flare
End2 Fitting: 625 Bayonet @ elbow

123 Style Options:
Overall Length: Varied
End Fittings: Varied

Phase Separator Technical Specifications

Materials	Stainless Steel 300
Controller Dimensions	14"H x 6.5"D x 2.5"W (356 mm H x 165 mm D x 64 mm W)
Number of Outlets	2 to 10 (even increments) - 20 Size
Capacity/Operational Volume	2 & 4 outlets: 4.63 gallons (17.53 liters) 6, 8, & 10 outlets: 12.19 gallons (46.14 liters)
Weight	**Empty Condition:** 60 - 85 lbs (27.2 - 38.6 kg) **Full Condition:** 100 - 163 lbs (45.4 - 73.9 kg)
System Utilities	**Electricity:** 110 - 220VAC, 50 - 60Hz **Gaseous Nitrogen:** Minimum 50 psi (3.45 bar), maximum 100 psi (6.89 bar) **Liquid Nitrogen:** Maximum 125 psi (8.62 bar); 80 psi (5.52 bar) optimal
Certifications	NEMA 4X, CE
Options	Custom sizes, ASME coded pressure vessels, backpressure regulator (10 psi/0.7 bar max)



Single-Source Accountability

System Design Engineering

Our experienced sales engineers will document your system specifications and propose the most efficient and economical solution that meets your performance requirements.

Dosing Lab Services

Let us help you develop and improve your product packaging, aid in proof of concept, and share insight through our San Jose lab services. Send us your samples and we'll provide preliminary data, feedback, and consulting to assist with development work to help you realize the benefits of liquid nitrogen dosing.

Installation & Supervision

Our experienced technicians provide installation, start up, commissioning, and training to assure long-term trouble-free operation. Contact us for a site visit and free estimate.

24/7 Technical Support

Our technical support staff is one phone call away. Our trained technicians are available to respond to immediate technical inquiries, provide onsite assistance and training, perform system audits, and assist with plan preventative maintenance (PM) requirements.

Chart Inc.

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San Jose, CA 95134

www.chartdosers.com

Service Line:

408.371.4932

Hours of Operation (PST):

Monday thru Friday

6 a.m. – 8 a.m.: Technician on call

8 a.m. – 5 p.m.: Service Center open

5 p.m. – 11 p.m.: Technician on call

11 p.m. – 6 a.m.: Voicemail

Weekends and Holidays

8 a.m. – 8 p.m.: Technician on call

8 p.m. – 8 a.m.: Voicemail

International Alliances

Chart has aligned itself with strategic regional partnerships worldwide to provide knowledgeable, immediate customer service to our customers.

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