Bulk Storage Systems

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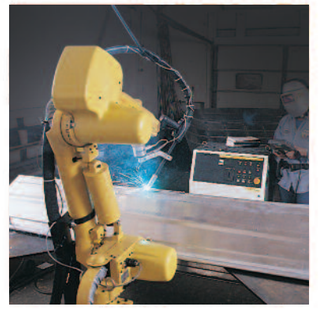


Ensuring cryogenic supply capabilities.
Any application - Any time.

Production Facility
New Prague, MN

Our Bulk Storage Systems Advantage

Chart's Bulk Storage Systems are engineered and manufactured to the highest quality standards providing you with the safest and most reliable system available. Driven by innovation since 1963, our Bulk Storage Systems lead the industry in performance. Experience from understanding our customer's specifications and the end-use applications made Chart the industry standard in bulk storage. When you want the best in cryogenic bulk storage, our wide range of products are certain to satisfy your requirements while providing the lowest cost of ownership in the industry.

Engineering Design

Our Bulk Storage advantage is based on a system that incorporates patented and proven innovative technologies. Every component is designed, built and tested to create the safest and most reliable Bulk Storage System available today.

Quality Manufacturing

Our experience and code compliant ISO 9001 certification ensures that our Bulk Storage Systems are manufactured to high quality standards and on schedule.

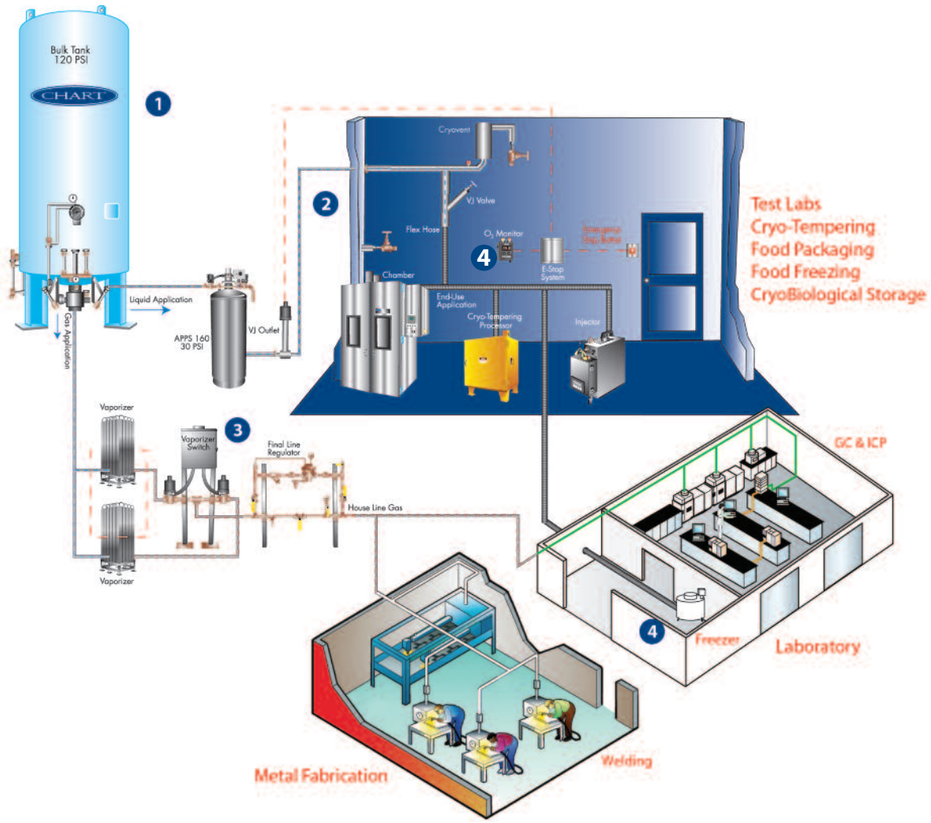
Installation Ready

Only Chart allows you to custom build a Bulk Storage System to match your customer's application and budget. With nine sizes and five pressures, there's a bulk tank to match your business strategy.

When you choose Chart, you get single-source accountability from the engineered solution through post-installation service.

The Chart Bulk Storage Systems Advantage

Chart's Bulk Storage Systems are custom engineered to meet your application's specifications. Chart's complete system solution package ensures quality liquid or gas to keep your processes operating at peak efficiency. Built for long-term integrity and industry-leading efficiency, these systems give you the highest performance at the lowest operating cost.



1. Liquefied gases are stored at ultra-cold temperatures in a vacuum insulated tank. Controls on the tank keep the pressure of the liquid at optimum levels to assure proper liquid delivery to the application.

2. Vacuum insulated pipe connects the tank's liquid withdrawal to the application equipment. The pipe is the foundation for the system's heat-loss efficiency and long-term integrity. It must be engineered to work with the associated controls and accessories.

3. Chart manufactures equipment that controls and provides gas to other applications within the facility. Our engineers can help provide proper sizing for vaporizers, control manifolds, etc. to serve both a liquid and gas application from a single bulk tank liquid source.

4. The application equipment is designed to utilize liquid or gas at specific properties. The system design must take careful consideration of these requirements so the equipment meets the user's performance specifications.

Bulk Storage Systems Meet the Needs of Any Application

Metal Fabrication

Welding – GMAW/MIG, GTAW/TIG and Laser Beam Welding

Metal fabrication uses many different welding processes for the wide range of materials, thickness and product applications. Many of these unique and specialized welding processes use inert shielding gas or the combination of gases to obtain the maximum weld quality and optimized productivity. For single gas requirements, Bulk Storage provides you with a continuous supply of quality gas. And for mixed gas applications, a mixer solution provides on-site gas blending directly from bulk storage for the most accurate mixture available and at the lowest cost.

Cutting – Laser, Oxy Fuel and Plasma

All thermal cutting techniques utilize gases to assist in the cutting process. High-pressure nitrogen and oxygen are used as an assist gas to rapidly remove the molten metal from the cut zone or burn it away during the laser cutting process. To maintain maximum laser uptime and achieve the best cut quality, it is critical that the gas supply be uninterrupted and the required pressures and flows for the material and thickness being cut are maintained. Oxy Fuel and Plasma cutting processes have similar requirements. Only Chart offers an engineered “High-Pressure, High-flow Package” to customize your Bulk Storage System for these demanding applications.

Aerospace

Space Fuels

Chart’s Bulk Storage and vacuum insulated pipe systems are used on launch pads delivering extremely high flow rates of liquid hydrogen and oxygen to fuel today’s demanding space programs. Aerospace applications are extremely precise, requiring higher pressures and intense analysis of engineering stress and heat leak. Additionally, Chart is able to meet the precision clean requirements common to these applications.

Medical / Laboratory

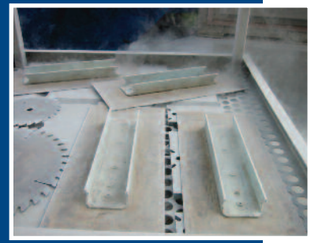
Bulk Biological Storage and Research

A sufficient supply of high-quality liquid nitrogen is needed to keep valuable biological samples stored indefinitely. Today’s top medical research facilities depend on a reliable liquid nitrogen supply to find cures for tomorrow’s diseases. Any interruption in supply can result in the loss of many years of research. Chart’s experience in the biological container market makes us the first choice in Bulk Storage Systems for these applications.

Medical Oxygen Therapy • O.R.

Medical applications have some of the most stringent gas requirements and the Bulk Storage Systems meet these requirements with NF grade capability. Liquid oxygen for respiratory therapy is easily and safely dispensed from bulk storage into smaller systems to lower distribution costs. Similarly, the bulk storage and a reserve tank is an excellent solution as the main oxygen gas supply for hospitals. NF grade nitrogen can also be supplied for gas applications to operate pneumatic surgical tools and supply liquid for medical uses such as cryotherapy.

Metal Processing



Heat Treating • Cryotempering • Thermal Spray Coating

Heat treating and cryotempering processes are dependent on the quality of the nitrogen gas and liquid supply to maintain production at peak performance. With our Bulk Storage System directly piped to the equipment, these applications are assured of a consistent supply of nitrogen with minimal operator intervention. In the thermal spray coating process, oxygen or argon gas is used at high pressure and high flows. With optional packages, your gas supply will exceed these requirements and provide long-term trouble-free service.

Food and Beverage Packaging

In beverage packaging, CO_2 is used in carbonated drinks and liquid nitrogen is used to create a positive pressure in non-carbonated drinks to improve container rigidity for lower-cost handling. Additionally, this process eliminates oxygen to improve the products shelf life (MAP- Modified Atmospheric Packaging). For meat packaging, nitrogen gas yields the same benefits and when combined with carbon dioxide and carbon monoxide for processing meat, a longer shelf life of the desired red color is maintained. Our Bulk Storage Systems give you optimum control of your liquid and gas supply for maximum production uptime.

Food Processing

Food Freezing

Total system cost and efficiency is crucial in food freezing applications. Chart’s superior insulation technology delivers liquid nitrogen with more cooling capacity, using less nitrogen per pound of frozen product. With our experience and capabilities in providing complete Bulk Storage and vacuum insulated pipe system solutions, we help maintain the lowest total cost of ownership by supplying the most efficient system.

Purging and Blanketing

Inert purging and blanketing with nitrogen or argon gas is a common processing step in many manufacturing applications. These range from pharmaceutical to chemical to the wine industry, and they require a secure supply of gas for optimum processing results. With a dedicated Bulk Storage System and the optional telemetry system, you are assured of a continuous, oxygen-free gas supply.

General Processing

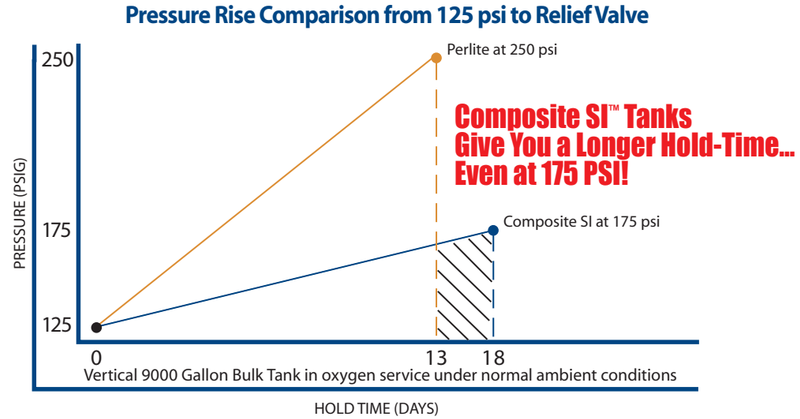
Electronic Manufacturing and Testing

Electronic grade manufacturing requires an Ultra High Purity gas stream void of contamination. Our electronic grade tanks are built with all stainless steel construction from the annular lines to the exterior plumbing to maintain gas purity. For electronic component testing, Chart works with today’s leading equipment manufacturers to design and manufacture Bulk Storage and vacuum insulated pipe systems that supply the flows demanded by today’s thermal stress environmental test chambers. As the leading manufacturer of LN_2 cooled chambers, Chart gets your entire system designed and built right the first time.

See the Difference

Since most liquid and gas applications require only 100-psi delivery pressure, why are ordinary tanks built with a 250-psig maximum allowable working pressure (MAWP)? The answer is simple-traditional Perlite insulation allows more heat into the liquid, driving the pressure up faster and reducing the hold-time. To compensate, Perlite tanks need a 150-psi "pressure buffer" to increase the hold-time and prevent unwanted, costly venting. So why pay for an outdated tradition?

Chart's Composite SI System VS. Competitor Perlite System



Clearly, the Composite SI-175 has it all.

COMPOSITE SI-175	Key Features	PERLITE-250
☑ $0	Price Difference (%)	❑ + 25
☑ 114	Diameter (in)	❑ 122
☑ 33,000	Tare Weight (lbs)	❑ 42,000
☑ 0.1	NER (%)	❑ 0.18
☑ 18	Hold Time (days)	❑ 13
☑ 1,036	Losses at MAWP (SCFD)	❑ 1,865

Note: All values based on a Vertical 9000 Gallon Bulk tank half-full in oxygen service at 125 psig under normal ambient conditions.
Published values posted on the Internet.
SCFD = Standard Cubic Feet per Day

At Chart, we have a great solution to those challenges: Composite Super Insulation (SI)™. Applying this state-of-the-art insulation technology to a lower cost 175-psig MAWP bulk tank, we build-in performance and value. Even at this lower pressure, the Composite SI clearly outperforms the Perlite insulation. This innovative insulation system is standard on all Chart Bulk Storage Systems.

Modular Piping Design

Chart's innovative modular piping system provides an Industry Standard Piping Configuration.

Modular Piping Advantages:

- Reduces your life-cycle costs by reducing the number of external piping joints, minimizing the risk of external piping leaks and the cost to repair.
- Simple by design yet robust and able to support a broad range of customer applications.
- Combination pressure building/economizer regulator for easy pressure adjustment and extended bonnet bronze control valves for ease of operation.
- Piping modules designed for ease-of-access to all operational control valves with stainless steel interconnecting piping for improved durability.

VS-01 SERIES

PREMIER STORAGE SYSTEMS

Pat No. 6,782,339 • 6,944,570

➤ Interchangeable gauge systems with digital telemetry capable gauge and flexible stainless-steel interconnection lines.

➤ Combination pressure building/economizer regulator for easy in-field adjustments.

➤ Long-life extended stem packing pressure builder and economizer isolating valves are standard on the VS-01 series.

Chart's VS-Series Storage Systems, available in liquid nitrogen, oxygen or argon service are offered in a wide range of sizes for applications requiring Maximum Allowable Working Pressures of 175 and 250 psig (12 and 17 bar) as standard.

Our proprietary composite insulation system gives you the competitive edge with high thermal performance, extended hold times, low life-cycle costs and lower weight to reduce operational and installation costs. Chart leads the industry with an innovative, modular piping system designed for performance, durability and low maintenance.

VS-Series Model 01 Storage Systems

VS-01 SERIES

PREMIER STORAGE SYSTEMS

Product Advantages

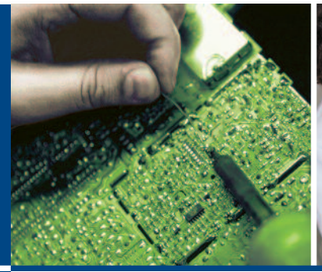
- Sizes, pressures and configurations to meet most applications
- Backed by an industry-leading 5-year warranty
- Leg design provides better access to anchor bolts for quicker installation
- Plumbing built to ASME B31.3 code and leak tested at 1.1 times the MAWP
- Long-life Hentzen urethane paint system

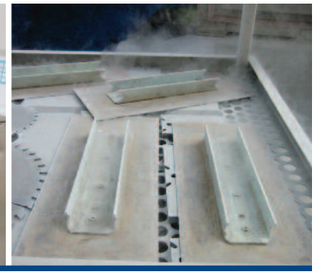
➤ High performance safety system with dual relief valves and rupture disks supplied as standard

➤ New, innovative vertical fin pressure building system improves performance, while reducing frost and ice build up to further reduce your maintenance costs

Model	Gross Capacity Gal	Gross Capacity Liters	Net Capacity Gal	Net Capacity Liters	MAWP* psig	MAWP* bar	Diameter in	Diameter mm	Height in	Height mm	Weight** lbs.	Weight** Kg	NER % /day in O_2	Flow Capacity*** SCFH	Flow Capacity*** nm^3/hr
VS-525SC	570	2,158	510	1,931	250	17.2	66	1,676	105	2,667	3,300	1,500	.55	9,000	237
VS-900SC	940	3,558	850	3,218	250	17.2	66	1,676	136	3,454	4,400	2,000	.45	9,000	237
VS-1500SC	1,640	6,208	1,580	5,981	250	17.2	66	1,676	196	4,978	6,200	2,818	.35	9,000	237
VS-3000SC	3,150	11,924	3,030	11,470	175 250	12.1 17.2	86	2,184	228	5,791	11,100 12,800	4,990 5,806	.25	18,000	473
VS-6000SC	6,010	22,750	5,770	21,842	175 250	12.1 17.2	86	2,184	383	9,728	19,900 21,500	9,026 9,752	.15	18,000	473
VS-9000SC	9,360	35,431	8,990	34,031	175 250	12.1 17.2	114	2,896	348	8,840	29,400 32,300	13,364 14,682	.10	42,000	1,104
VS-11000SC	11,410	43,192	10,960	41,488	175 250	12.1 17.2	114	2,896	407	10,338	35,200 38,700	16,000 17,591	.10	42,000	1,104
VS-13000SC	13,470	50,989	13,060	49,437	175 250	12.1 17.2	114	2,896	466	11,837	41,700 45,700	18,955 20,773	.10	42,000	1,104
VS-15000SC	15,520	58,750	15,060	57,008	175 250	12.1 17.2	114	2,896	525	13,335	48,000 52,600	21,818 23,909	.10	42,000	1,104

*MAWP - Maximum Allowable Working Pressure. 400, 500 psig tanks are available upon request. **Weights are for ASME design. ***Flow capacity rating down to a 20% contents level with a maximum fall off in tank operating pressure of 15 psig (1 bar). (NER) = Nominal Evaporation Rate





VS-DSS Series

Available in the 525, 900, 1500, 3000 and 6000 gallon (2000, 3400, 5700, 11,400 and 23,000 liter) models, these new VS-DSS Models feature the industry standard thermal performance. The modular plumbing system has been selectively optimized to meet the flow requirements of a complete range of liquid or gas applications. With a comprehensive set of plumbing features, each circuit has been carefully designed to match the demands placed on these vessel sizes. Dual safety-relief devices are now standard, and tank mounted vaporizers are optional on the 525, 900 and 1500 gallon sizes.

VS-DSS SERIES
DISTRIBUTOR STORAGE SYSTEMS

➤ Tank mounted vaporizer optional on 525, 900 and 1500 models

Chart's VS-DSS (Distributor Storage System) Series of vertical bulk storage stations are engineered for superior performance, durability and value. Equipped with our proprietary composite Super Insulation (a light-weight system offering better thermal performance than Perlite), VS-DSS Models provide reduced product losses and a slower rate of pressure rise during periods of non-use. Backing up this performance is a competitive 2-year warranty.

VS-DSS SERIES
DISTRIBUTOR STORAGE SYSTEMS

Product Advantages

- Sizes, pressures and configurations to meet most applications
- Backed by our standard 2-year warranty
- Leg design provides better access to anchor bolts for quicker installation
- Lower tare weight reduces freight and pad costs
- Long-life Hentzen urethane paint system with optional zinc-rich primer
- Plumbing built to ASME B31.3 code and leak tested at 1.1 times the MAWP

➤ High performance safety system with dual relief valves and rupture disks supplied as standard

➤ New, innovative vertical fin pressure building system improves performance, while reducing frost and ice build up to further reduce your maintenance costs

➤ Dual regulator economizer and pressure builder supplied as standard.

➤ Full-trycock and economizer valves come standard with non-extended packing

Model	Gross Capacity Gal	Liters	Net Capacity Gal	Liters	MAWP* psig	bar	Diameter in	mm	Height in	mm	Weight** lbs.	Kg	NER % /day in O_2	Flow Capacity*** SCFH	nm^3/hr
VS-525-DSS	570	2,158	510	1,931	250	17.2	66	1,676	105	2,667	3,300	1,500	.55	9,000	237
VS-900-DSS	940	3,558	850	3,218	250	17.2	66	1,676	136	2,354	4,400	2,000	.45	9,000	237
VS-1500-DSS	1,640	6,208	1,580	5,981	250	17.2	66	1,676	196	4,978	6,200	2,818	.35	9,000	237
VS-3000-DSS	3,150	11,924	3,030	11,470	250	17.2	86	2,184	228	5,791	12,800	5,806	.25	18,000	473
VS-6000-DSS	6,010	22,750	5,770	21,842	250	17.2	86	2,184	383	9,728	21,500	9,752	.15	18,000	473

*MAWP - Maximum Allowable Working Pressure. **Weights are for ASME design. ***Flow capacity rating down to a 20% contents level with a maximum fall off in tank operating pressure of 15 psig (1 bar).
(NER) = Nominal Evaporation Rate

The HS-Series Bulk Stations are engineered and built with the same quality you have come to expect from Chart. They have standard features along with pre-engineered options sure to satisfy all of your requirements. Chart's HS Series Bulk Stations are designed to ASME code and available in 175 and 250 psig (12 and 17 bar) as standard (other pressures available upon request).

Our composite insulation system gives you the competitive edge with high thermal performance and extended hold times, resulting in low life-cycle costs. In addition, the light weight design reduces your installation costs.

HS-SERIES
BULK STATIONS

Product Advantages

- Piping modules designed for ease-of-access to all operational control valves with stainless steel interconnecting piping minimizes the number of connections, reducing maintenance and cost of ownership
- Component selection to improve operational performance – combination pressure building/economizer regulator for easy pressure adjustment and extended bonnet bronze control valves for ease of operation
- High performance safety system with dual relief valves and rupture disks supplied as a standard
- New, innovative vertical fin pressure building system improves performance, while reducing frost and ice build-up to further reduce your maintenance costs
- Backed by an industry-leading 5-year warranty

HS-SERIES
BULK STATIONS

Interchangeable gauge systems with digital telemetry capabilities and flexible stainless steel interconnection lines.

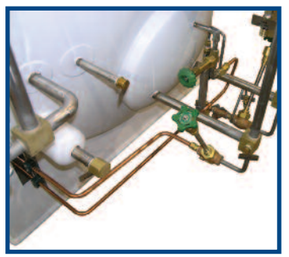


Chart leads the industry with an innovative modular piping system designed for performance, durability and low maintenance.

Model	Gross Capacity Gal	Gross Capacity Liters	Net Capacity Gal	Net Capacity Liters	MAWP* psig	MAWP* bar	Width in	Width mm	Height in	Height mm	Length in	Length mm	Weight** lbs	Weight** Kg	NER %/day in O_2
HS-1500SC	1,640	6,208	1,580	5,981	250	17.2	68	1,728	80	2,032	201	5,105	6,800	3,084	.56
HS-3000SC	3,150	11,924	3,030	11,470	175 250	12.1 17.2	86	2,184	95	2,413	233	5,918	10,900 11,900	4,944 5,398	.32
HS-6000SC	6,010	22,750	5,770	21,842	175 250	12.1 17.2	86	2,184	95	2,413	386	9,804	20,400 22,000	9,253 9,979	.22
HS-9000SC	9,360	35,431	8,990	34,031	175 250	12.1 17.2	114	2,896	126	3,200	348	8,839	29,400 32,300	13,336 14,651	.15
HS-11000SC	11,410	43,192	10,960	41,488	175 250	12.1 17.2	114	2,896	126	3,200	408	10,363	35,300 38,800	16,012 17,599	.15
HS-13000SC	13,420	50,989	13,060	49,437	175 250	12.1 17.2	114	2,896	126	3,200	467	11,862	41,400 45,400	18,779 20,593	.15
HS-15000SC	15,520	58,750	15,060	57,008	175 250	12.1 17.2	114	2,896	126	3,200	528	13,411	47,700 52,300	21,636 23,723	.15

*MAWP - Maximum Allowable Working Pressure. **Weights are for ASME design. (NER) = Nominal Evaporation Rate

CHART®

VSCO$_2$ & HSCO$_2$

VERTICAL AND HORIZONTAL BULK STATIONS

Our VS-CO_2 and HS-CO_2 Series of Bulk Carbon Dioxide Storage Tanks continue our pioneering of user-friendly engineered products. This product series offers strength and durability in an all-welded outer container, while maintaining lower life-cycle costs. Utilizing our proprietary composite insulation system along with superior vacuum technology, we are able to offer:

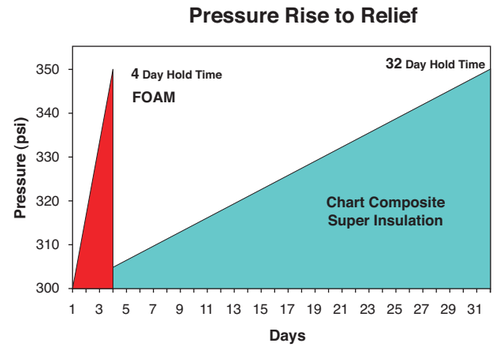
- An ultra-low heat leak, eliminating the need for a costly refrigeration system in most applications.
- No costly down time to refurbish water-soaked or deteriorated foam insulation.

Product Advantages

- Stainless steel piping for greater strength and durability
- Stainless steel ball valves standard on all fill and process lines
- Minimum number of piping joints, reducing potential piping leaks and maintenance costs
- CGA fill and return fittings with drain valves standard on all models
- Optimum piping design results in flexible equipment connection
- High performance safety system with dual relief valves and rupture disks supplied as standard
- Pressure Building and Vaporizer options available, inquire with Chart for more details
- Interchangeable gauge systems with a choice of analog or digital telemetry capable systems are available with flexible stainless-steel interconnecting lines
- Refrigeration systems including internal coil available as options

VSCO$_2$ & HSCO$_2$ Bulk Stations

Vacuum Jacketed vs. Foam CO_2 tanks



- Lowest life-cycle costs for bulk CO_2 storage
- Superior functional performance
- Increased reliability and ease of repair
- High-strength, dent resistant outer jacket eliminates deterioration of insulation, costly repairs, down-time
- Reduce potential of CO_2 solidification due to refrigeration failure (power failure)
- Eliminate product loss due to venting
- Hold time is 8 times longer than foam
- Refrigeration system not required for maintaining heat leak
- No monthly maintenance or electrical charge
- Two-year payback vs. foam tank
- Backed by an industry-leading 5-year warranty

VERTICAL

Model	Gross Capacity Ton	Gross Capacity Tonne	Net Capacity Ton	Net Capacity Tonne	MAWP* psig	MAWP* bar	Height in	Height mm	Diameter in	Diameter mm	Weight** lbs.	Weight** Kg
6 Ton	6.8	6.2	6.4	5.8	350	24.1	188	4,775	68	1,728	9,400	4,270
14 Ton	13.2	12.0	12.6	11.4	350	24.1	228	5,791	86	2,184	17,400	7,900
30 Ton	31.1	28.2	29.6	26.9	350	24.1	287	7,290	114	2,900	39,600	17,970
50 Ton	48.1	43.6	45.8	41.5	350	24.1	406	10,312	114	2,900	56,900	25,810

HORIZONTAL

Model	Gross Capacity Ton	Gross Capacity Tonne	Net Capacity Ton	Net Capacity Tonne	MAWP* psig	MAWP* bar	Width in	Width mm	Height in	Height mm	Length in	Length mm	Weight** lbs.	Weight** Kg
6 Ton	6.8	6.2	6.4	5.8	350	24.1	68	1,728	80	2,032	188	4,775	9,300	4,130
14 Ton	13.2	12.0	12.6	11.4	350	24.1	86	2,184	95	2,184	233	5,913	17,400	7,890
30 Ton	31.1	28.2	29.6	26.9	350	24.1	114	2,900	127	3,226	280	7,112	39,700	18,008
50 Ton	48.1	43.6	45.8	41.5	350	24.1	114	2,900	127	3,226	396	10,058	56,900	25,800

*MAWP - Maximum Allowable Working Pressure. **Weights are for ASME design. (NER) = Nominal Evaporation Rate

VS HIGH PRESSURE

HIGH PRESSURE BULK STATIONS

Features and Benefits

- All welded stainless steel piping modules
- Heavy duty bronze valves with extended bonnets
- Valve bonnet uniformity to reduce spare parts inventory
- Highest grade components for low to zero maintenance
- Separate pressure building and economizer regulators are standard on all 400 and 500 psig (27.6 and 34.5 bar) units
- High performance safety system with dual relief valves and rupture disks supplied as a standard

High flow pressure-building regulator and coil are standard.

Chart's VS High Pressure Bulk Stations are engineered for superior performance in high pressure applications. To support these demands, the VS High Pressure Bulk Station comes standard with a larger pressure-building regulator and coil. For more demanding applications with higher withdrawal rates, a remote pressure-building system is available.

Model	Gross Capacity Gal	Gross Capacity Liters	Net Capacity Gal	Net Capacity Liters	MAWP* psig	MAWP* bar	Diameter in	Diameter mm	Height in	Height mm	Weight** lbs	Weight** Kg	Flow Capacity*** SCFH	Flow Capacity*** Nm^3/hr	NER %/day in O_2
VS-900SC	940	3,558	850	3,218	400 500	27.6 34.5	66	1,676	136	3,454	5,100 5,800	2,313 2,631	5,200 3,100	137 82	.45
VS-1500SC	1,640	6,208	1,580	5,981	400 500	27.6 34.5	66	1,676	196	4,978	7,600 8,700	3,447 3,946	5,900 3,600	155 97	.35
VS-3000SC	3,150	11,924	3,030	11,470	400 500	27.6 34.5	86	2,184	228	5,791	15,100 15,100	6,849 6,849	6,400 3,800	168 100	.25
VS-6000SC	6,010	22,750	5,770	21,842	400 500	27.6 34.5	86	2,184	383	9,728	27,000 27,100	12,247 12,292	7,900 4,700	208 124	.15
VS-9000SC	9,360	35,431	8,990	34,031	400	27.6	114	2,896	348	8,840	38,900	17,645	7,500	197	.10
VS-11000SC	11,410	43,192	10,960	41,488	400	27.6	114	2,896	407	10,338	46,700	21,183	8,100	213	.10
VS-13000SC	13,470	50,989	13,060	49,437	400	27.6	114	2,896	466	11,837	55,100	24,993	8,600	226	.10
VS-15000SC	15,520	58,750	15,060	57,008	400	27.6	114	2,896	525	13,335	63,400	28,758	14,400	378	.10

*MAWP - Maximum Allowable Working Pressure. **Weights are for ASME design. ***Flow capacity rating down to a 20% contents level with a maximum fall off in tank operating pressure of 15psi (1 bar).
(NER) = Nominal Evaporation Rate

Cut Operating Costs

- Reduces deliveries by up to 36%
- Reduces delivery time by up to 33%
- Increases actual storage capacity by 27% or reduces needed tank size
- Reduces service calls and maintenance
- Telemetry ready
- Easy to configure and install

Improve Customer Satisfaction

- Reduces customer downtime by up to 86%... or to zero with optional fill assist unit
- Cuts blow-down and venting losses and increases holding time
- Builds operating pressure in minutes
- Provides precision pressure control and eliminates regulator pressure creep
- Reduces space required to provide the same gas flow rates
- Easy to adjust pressure settings and contents alarms – truly user-friendly
- Supplies warmer outlet gas

HP²™

HIGH PRESSURE – HIGH PERFORMANCE

An integrated state-of-the-art system, including an HP²™ tank, a multi-function vaporizer and advanced control technology for delivering high-pressure high-performance gas flow. With our performance, you get pressure building recovery in 10 minutes or less at 95% full. Pressure is easily adjustable to within 50 psi/3.4 bar of tank MAWP. Flow rates up to 12,500 scfh / 328 Nm^3H can be achieved. The rattler valve (attached to the vaporizer) ensures sustained vaporizer performance and the HP²™ is available in sizes from 900 gallons / 3,406 liters and larger.

Patent No. 6,799,429

HP²™ TANK (See VS High Pressure Bulk Station Literature)	Net Capacity* (gal / liters)	MAWP (psi / bar)
VS-900SC	850 / 3,218	400 / 27.6 or 500 / 34.5
VS-1500SC	1,580 / 5,981	400 / 27.6 or 500 / 34.5
VS-3000SC	3,030 / 11,470	400 / 27.6 or 500 / 34.5
VS-6000SC	5,770 / 21,842	400 / 27.6 or 500 / 34.5
Larger High-Pressure Tanks	Contact Chart	Contact Chart

MULTI-FUNCTION VAPORIZER (Ambient)**	3.5 K Model	7.5 K Model	12.5 K Model
Rated Flow Capacity (scfh / Nm^3H)***	3,500 / 92	7,500 / 197	12,500 / 328
Design Pressure (psi / bar)	600 / 41	600 / 41	600 / 41
Overall Height (in. / mm)	132 / 3,353	132 / 3,353	156 / 3,962
Length / Width (in. / mm)	35 x 27 / 889 x 686	35 x 50 / 889 x 1,270	47 x 50 / 1,194 x 1,270
Rattler Valve for Snow and Ice Removal	Optional	Included	Included

Footnotes: Specifications are subject to change without prior notification. *HP² tanks can be filled to 95% of gross capability. For traditional high-pressure bulk tanks the recommended fill level is only 75% of gross capability. **Components used in the HP² Retrofit Kit for converting existing high-pressure tanks to HP² technology. ***Flow rate based on nitrogen under standardized conditions with minimum 1" liquid feed and gas return lines.

VS-SIPHON 100

HIGH PRESSURE PUMP SYSTEM – FILLING LIQUID CYLINDERS

Chart has engineered the VS-Siphon 100 system to provide an economical, reliable and high performance pumping system for high pressure and liquid cylinder filling. Current cryogenic tank and pumping systems have worked for years, but increased efficiencies are now available with the VS-Siphon 100 system.

The VS-Siphon 100 system combines two revolutionary technologies in cryogenic bulk tanks. Its improved and patented "thermal-siphoning" system reduces and efficiently reprocesses the heat of pumping. Additionally, this system's composite insulation is 30% to 70% more efficient than Perlite in reducing the effects of heat from the atmosphere.

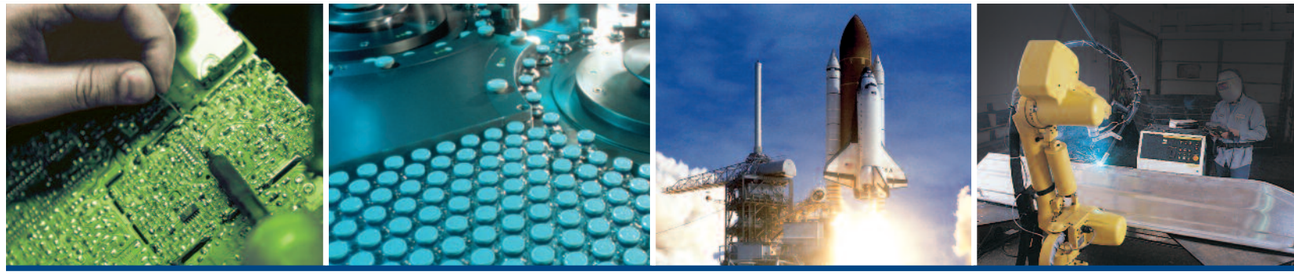
- Vacuum insulated piping assembly
- Backed by an industry-leading 5-year warranty

Features and Benefits

- Simple and reliable automatic pump start-up in three minutes with 100% product utilization
- Thermal-siphon design manages heat from pump cool down, keeping storage tank pressure down
- Pump priming at tank pressure of 10 psi (0.69 bar) or less without the necessity for pressure building
- Reduce liquid cylinder & ORCA filling losses
- Longer life of high-wear pump parts
- Capability to operate two pumps at once (liquid and HP pump)
- Adapters available to match all standard pumps

Model	Gross Capacity Gal	Gross Capacity Liters	Net Capacity Gal	Net Capacity Liters	MAWP* psig	MAWP* bar	Diameter in	Diameter mm	Height in	Height mm	Weight** lbs.	Weight** Kg	NER % /day in O_2
VS 3000SC	3,150	11,924	3,030	11,470	175	12.1	86	2,184	271	6,883	12,800	5,810	.25
VS 6000SC	6,010	22,750	5,770	21,842	175	12.1	86	2,184	425	10,795	21,300	9,660	.15
VS 9000SC	9,354	35,410	8,990	34,031	175	12.1	114	2,896	398	10,109	32,100	14,560	.10
VS 11000SC	11,410	43,192	10,960	41,438	175	12.1	114	2,896	457	11,608	37,900	17,191	.10
VS 13000SC	13,470	50,989	13,060	49,437	175	12.1	114	2,896	516	13,106	44,300	20,094	.10
VS 15000SC	15,520	58,750	15,060	57,008	175	12.1	114	2,896	575	14,605	50,600	22,952	.10

*MAWP - Maximum Allowable Working Pressure. **Weights are for ASME design. (NER) = Nominal Evaporation Rate



ENGINEERED TANKS

Chart's Engineered Bulk Tanks are designed and manufactured with the highest quality standards to satisfy the most stringent applications. Featuring the latest plumbing designs and technologies, Chart's Engineered Bulk Tanks are assembled with state-of-the-art fabrication techniques for maximum cleanliness and durability.

Product Advantages

- Premium materials, joint designs and fabrication methods minimize particle entrapment
- Vertical and horizontal tanks available from 1500 to 90,000 gallon (5678 to 340,200 liter) capacities
- Designed in accordance with ASME code, 175 to 250 psig (12.1 to 17.2 barg) or custom pressure
- Standard and custom grades available to comply with any specifications
- Internal cleaning and surface treatment options available
- Applications: Ozone, LNG, Hydrogen, Electronic Grade (pictured above), Air Separation Unit (ASU), and Engineered-To-Order

CHART®

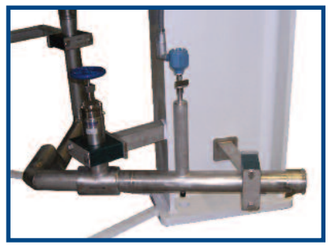
Features and Benefits

- Dynamic Pressure Builder System™ for precise saturated LN_2 supply regardless of liquid level
- Insulation Baffle with dedicated upper fill port for uninterrupted LN_2 supply during transport refill
- High performance two-stage ambient pressure builder vaporizer for maximum efficiency (20 gpm (4 tph) standard)
- PLC controlled with actual LN_2 storage temperature, pressure and level monitoring for precise tank pressure control (PB and Vent) with automatic desaturation capability
- High flow automatic pressure building valve improves response time and performance after a fill along with a tighter operating pressure dead-band
- Extended legs and vacuum insulated pod for increased head pressure aids in dampening LN_2 saturation pressure fluctuations

CHILLZILLA® LN_2

BULK LN_2 SUPPLY MANAGEMENT SYSTEM

Shown with optional 40 gpm (8 tph) PB coil



1½" Vacuum Vacketed Valve and Female Bayonet Standard for Liquid Supply

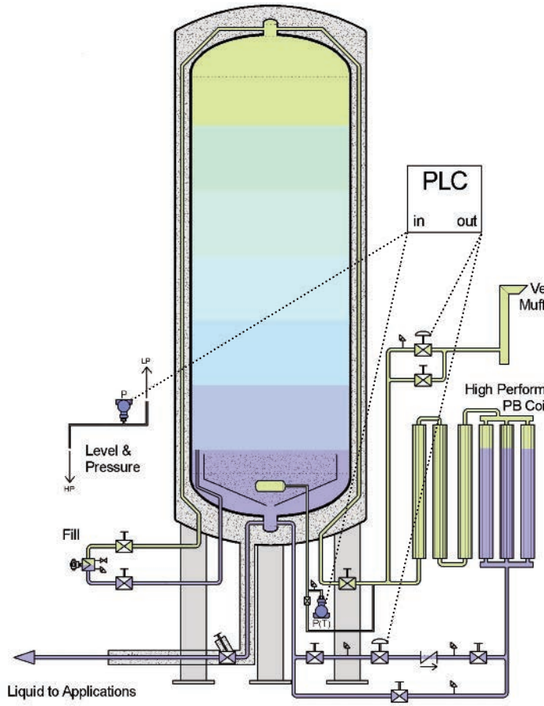
The ChillZilla® Bulk LN_2 Supply Management System is engineered to provide consistent liquid nitrogen for optimum equipment performance. Ideally suited for Individually Quick Frozen (IQF), LN_2 immersion freezers and cryobiological storage freezers, the ChillZilla LN_2 system features a Dynamic Pressure Builder™ for precise saturated liquid supply to the freezer *regardless* of the LN_2 liquid level. The ChillZilla incorporates an insulation baffle to inhibit the mixing of fresh liquid from a trailer load delivery with the liquid supply to the freezer for better liquid supply stability during the refill.

With the aid of a patented high performance two-stage ambient pressure building coil, the heat management of this circuit is optimized for fast pressure recovery and reduced heat transfer to the contents. Coupling these unique features with the temperature monitoring of the liquid supply, a Programmable Logic Controller (PLC), VJ feed valve with an extended VJ pod and extended legs, the ChillZilla LN_2 system *automatically* provides the *optimum* liquid nitrogen supply to any liquid application.

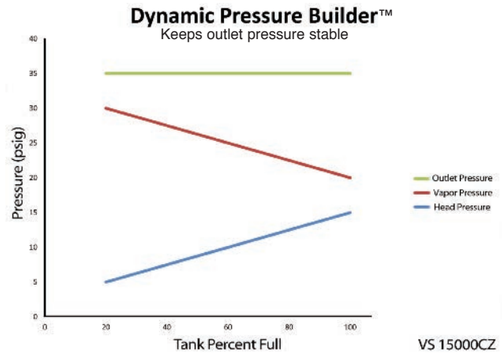
ChillZilla® LN_2

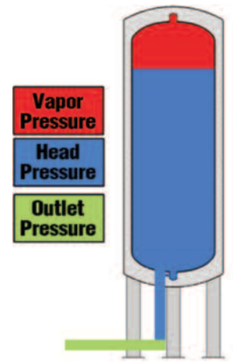
CHILLZILLA® LN_2

BULK LN_2 SUPPLY MANAGEMENT SYSTEM



Patent no. 6,799,429, & pending.





Model	Gross Capacity Gal	Gross Capacity Liters	Nominal Capacity Gal	Nominal Capacity Liters	MAWP* psig	MAWP* bar	Diameter in	Diameter mm	Height in	Height mm	Weight** lbs.	Weight** Kg	NER % /day LN_2
VS 9000CZ	9,354	35,410	8,990	34,031	175	12.1	114	2,896	398	10,109	32,100	14,560	.16
VS 11000CZ	11,410	43,192	10,960	41,438	175	12.1	114	2,896	457	11,608	37,900	17,191	.16
VS 13000CZ	13,470	50,989	13,060	49,437	175	12.1	114	2,896	516	13,106	44,300	20,094	.16
VS 15000CZ	15,520	58,750	15,060	57,008	175	12.1	114	2,896	575	14,605	50,600	22,952	.16

*MAWP - Maximum Allowable Working Pressure. **Weights are for ASME design. (NER) = Nominal Evaporation Rate

CHART®

Features and Benefits

- Compact, horizontal low profile: 69"H x 72"W x 187"L
- Integrated large forklift channels provide for easy mobility and secure mounting for an economical installation
- Forklift channels are 48" center to center (38-¾" min x 57-¼" max) and provide a stable and secure mounting base without the need for a concrete pad
- On-board high-efficiency gas use vaporizer provides up to 2000 SCFH
- Integrated flat fin pressure-builder with PCV-1 (combo regulator) with single pressure adjusting screw for easy changes to the pressure builder and economizer settings
- Durable, ergonomic plumbing with isolation valves for long service life, easy operation and field maintenance
- Low NER is ideal for low usage accounts with longer delivery cycles for low distribution costs
- Liquid withdrawal package option available: 1" vacuum-insulated female bayonet, vent connected back pressure regulator and low-range PCV-1 spring for low liquid loss and accurate tank pressure control

BULKLITE™ 1400

COMPACT HORIZONTAL BULK STORAGE

The new BulkLite™ 1400 is a compact horizontal bulk storage tank designed for economical turnkey installations. The tank can be installed on common precast concrete foundations, asphalt or directly on to class 5 gravel. The integrated forklift channels provide for easy mobility without a crane, further reducing the installation costs. The low profile and low cost installation is ideal for accounts that specify a height restriction and/or pad restriction due to property constraints. The BulkLite is also a good solution for temporary installations. The plumbing is conveniently located on one end of the vessel for easy access in tight locations and it can be filled from a standard transport or an Orca delivery system.

Model	Gross Capacity Gal	Liters	Nominal Capacity Gal	Liters	MAWP* psig	bar	Flow Rate** SCFH	m³/hr	Width in	mm	Height in	mm	Length in	mm	Weight*** lbs	Kg	NER %/day O_2 / Ar	N_2
1400	1400	5300	1320	4996	250	17.2	2000	56.6	72	1829	69	1753	187	4750	4800	2177	.28	.45

*MAWP - Maximum Allowable Working Pressure, Section VIII Div. 1 ASME code. ** Eight hours continuous flow @ 80% duty cycle in room temp. w/ LN_2. ***Weights are for ASME design. (NER) = Nominal Evaporation Rate

CHART®

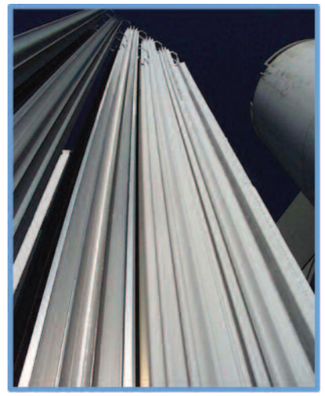
Features and Benefits

- Increased ground clearance further enhancing heat transfer by natural convection.
- High capacity fins measure 8 inches (203 mm) from tip to tip and provide high performance and longevity.
- Low pressure drop, full-bore passages in the elements provides more flow cross section.
- Heat transfer elements up to 40 ft (12 m) are available to meet a range of process demands. Standard assembly configurations and ratings are shown on the reverse side.
- MAWP – 580 psig (40 barg) for all aluminum construction.

AMBIENT AIR VAPORIZERS

CRYOQUIP WIDE-SPACED AMBIENT VAPORIZERS

Improved unitized construction yields the highest structural strength to cost ratio available and precludes the use of welds that cannot be heat treated, thereby maintaining the greatest structural integrity.



Employs the unique Cryoquip “spar” link design – an efficient attachment method that enhances load carrying capability, while maintaining the highest level of structural integrity available in the industry during all modes of transportation.

Can be deployed or redeployed with ease since these units are capable of resting on a flat bed trailer.

Designed in accordance with ASME Section VIII, Division 1 latest edition. Design capabilities to rate equipment to all the latest wind/seismic codes including ASCE and IBC, available on special request.

Standard Vaporizer Specifications

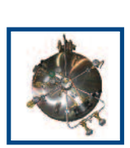
Chart Part Number	Cryoquip Model Number	Flow Rate* 8 hours, SCFH, Nitrogen	Inlet/Outlet Connection Size (inches)	Dimensions WxDxH (inches)	Weight (Lbs)	MAWP
20593705	VAI-H04-FB	1,700	3/4 MPT	20 x 21 x 131	150	580
20593706	VAI-H04-FBL12	2,600	3/4 MPT	20 x 21 x 179	150	580
20593707	VAI-H06-FBL10	3,900	3/4 MPT	23 x 34 x 155	325	580
20593708	VAI-H08-FBL3M	5,200	3/4 MPT	24 x 46 x 159	400	580
20594567	VAI-1208-FBL15	10,000	3/4 MPT	24 x 46 x 221	645	580
20593710	VAI-1212-FBL15	15,000	1-1/2 Mueller	34 x 45 x 221	925	580
20593711	VAI-1216-FBL20	25,000	1-1/2 Mueller	45 x 45 x 277	1,720	580
20593716	VAI-1224-FBL23	45,000	2 Mueller	45 x 67 x 317	2,800	580
20594568	VAI-1248-FBL23	90,000	2 Mueller	67 x 90 x 317	5,700	580

* For models to meet special requirements including other models for extended operating periods, low pressure drop requirements, etc.– consult Chart. The performance of ambient air vaporizers is subject to many factors. These include flow, duty cycle, ambient temperature, relative humidity, freeze period, altitude, wind, solar radiation, operating pressure and proximity to adjacent structures. Ratings are based on mean ambient conditions of 70°F (21°C) and 70% relative humidity. Special conditions may vary considerably for a particular application, thereby affecting performance.

VHR SERIES
HIGH PERFORMANCE STORAGE SYSTEM

The VHR Series high-performance storage system creates a competitive advantage with industry-leading hold times and a stainless steel, low maintenance outer shell.

The VHR liquid bulk systems are economical customer stations designed to receive and hold liquid oxygen at a low temperature and pressure. This low-cost storage system is ideal for applications requiring liquid or reserve suppliers, such as hospitals, nursing homes and health care facilities, or as back-up to membrane/PSA systems.

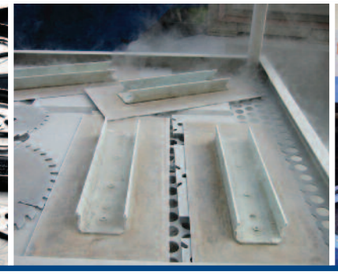


Product Advantages

- Dual relief and rupture disc vent system with a 3-way diverter valve
- Extended Stem Valve on all liquid lines
- Liquid level gauge with low level alarm
- Stainless steel inter-connecting piping
- All stainless steel outer vessel eliminates the need for paint and surface maintenance
- Internal product vaporizer saves pad space and reduces maintenance costs
- Super-insulation system provides industry leading NER performance and extended product hold time
- Optional Certified lab test reports for medical oxygen service available

Model	VHR-120	VHR-260	VHR-400
Capacity - Liquid (gal / liters)			
Net	112 / 424	255 / 964	387 / 1,479
Gross	118 / 447	268 / 1,015	407 / 1,553
Capacity - Gas @ 1 atm of 70°F (SCF / NM^3)			
Nitrogen	10,500 / 280	23,800 / 630	36,100 / 950
Oxygen	12,900 / 340	29,400 / 780	44,600 / 1,180
Argon	12,600 / 340	28,700 / 760	43,600 / 1,150
Dimensions (in / cm)			
Diameter	30 / 76	42 / 107	48 / 122
Height	80 / 203	94 / 239	100 / 254
Weight (lbs / kg)			
Tare	700 / 320	1,700 / 770	2,100 / 950
Nitrogen	1,400 / 640	3,500 / 1,590	4,800 / 2,180
Oxygen	1,710 / 780	4,200 / 1,910	5,800 / 2,630
Argon	1,950 / 890	4,700 / 2,130	6,600 / 2,990
Maximum Pressure (psig / bar)	250 / 17	250 / 17	250 / 17
Gas Delivery Rate (SCFHO_2 / NM^3h O_2)			
Normal*	340 / 10	620 / 18	790 / 22
Peak**	490 / 14	890 / 25	1,140 / 32
Evaporation Rate (% per day of O_2)	1.1%	0.62%	0.62%

*Normal flow rate is for eight hours with a minimum exit temperature of 32°F at an ambient temperature of 68°F.
**Peak flow rate is for one hour with a minimum exit temperature of 32°F at an ambient temperature of 68°F.



FINAL LINE
PRESSURE CONTROL MANIFOLDS

Product Advantages

- Industrial gas service pressure control manifold for oxygen, nitrogen and argon service
- Field adjustable mounting stand
- Oxygen compatible brass regulators
- High flow, quarter turn isolation ball valves
- Minimum design temperature: -40°F/-40°C
- Mounting slots (2): 9/16" x 1.5"/14.3 x 38.1 mm
- High pressure options available for up to 500 psi
- Low temperature shutdown options for low pressure manifolds set at -20°F/-29°C, provides temperature protection for downstream components
- Dual pressure regulator options available

Chart P/N	Flow Range scfh / Nm^3h	Connection Inlet / Outlet	Spring Range psi / bar	Factory Set psi / bar	Shipping L x H x W (in/mm)	Weight lb/kg
11562519	0-2,000 / 0-57	1/2" FNPT	40-110 / 2.8-7.6	100 / 6.9	36 x 30 x 12 / 914 x 762 x 305	40 / 18
11651440	0-2,500 / 0-71	3/4" FNPT	40-110 / 2.8-7.6	100 / 6.9	36 x 30 x 12 / 914 x 762 x 305	50 / 23
11651431	0-3,000 / 0-85	1" FNPT	40-110 / 2.8-7.6	100 / 6.9	36 x 30 x 12 / 914 x 762 x 305	50 / 23
High Pressure Manifolds						
11562498	0-2,000 / 0-57	12"FNPT	200-500 / 13.8-34.5	275 / 19	36 x 30 x 12 / 914 x 762 x 305	50 / 23
11744419	0-4,000 / 0-113	3/4" FNPT	100-600 / 6.9-41.4	275 / 19	36 x 30 x 12 / 914 x 762 x 305	70 / 32
Low Temperature Cutoff Manifolds						
11657921	0-2,000 / 0-57	1/2" FNPT	40-110 / 2.8-7.6	100 / 6.9	42 x 36 x 12 / 1067 x 914 x 305	60 / 27
11657930	0-2,500 / 0-71	3/4" FNPT	40-110 / 2.8-7.6	100 / 6.9	42 x 36 x 12 / 1067 x 914 x 305	70 / 32
11657948	0-3,000 / 0-85	1" FNPT	40-110 / 2.8-7.6	100 / 6.9	42 x 36 x 12 / 1067 x 914 x 305	70 / 32
Dual Regulator Manifolds						
11659281	0-2,000 / 0-57	1/2" FNPT	40-110 / 2.8-7.6	100 / 6.9	36 x 36 x 12 / 914 x 914 x 305	80 / 36
11724506	0-2,500 / 0-71	3/4" FNPT	40-110 / 2.8-7.6	100 / 6.9	36 x 36 x 12 / 914 x 914 x 305	90 / 41
11761665	0-3,000 / 0-85	1" FNPT	40-110 / 2.8-7.6	100 / 6.9	36 x 36 x 12 / 914 x 914 x 305	100 / 45

Adjustable Pressure Phase Separator (APPS)

The APPS-160 offers a convenient method of providing low-pressure liquid to an installation that is supplied from a bulk tank at higher pressure, without the cost of installing two bulk tanks.

APPS-160

ADJUSTABLE PRESSURE PHASE SEPARATOR

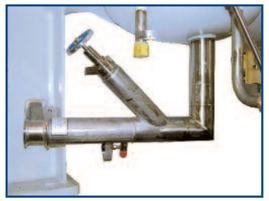
Product Advantages

- Tighter pressure control for the lower pressure liquid application
- Adjustable outlet pressure ranges
- Working capacity of 160 liters
- Bayonet outlet connection is standard

Vacuum Jacketed (VJ) Valves

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 drop. A vacuum insulated valve has the benefit of extremely low heat leak for minimum gas boil-off, and it eliminates ice build-up and dripping water.

VACUUM JACKETED VALVES



Vacuum Jacketed Valve Option

Product Advantages

- Available in many sizes and styles such as T or Y pattern.
- Actuators can be installed on valves for control from a remote location or signal. Standard pneumatic actuators are often used to control flow rate or open and close valves based on the state of a switch, control system, or oxygen system E-stop switch.
- Un-insulated economical brass valves are also available for applications that have in-frequent use.

T-Pattern Vacuum Insulated Globe Valve

Y-Pattern Vacuum Insulated Globe Valve

T-Pattern Non-Insulated Extended Stem Globe Valve

Features and Benefits

- Fully automated PLC controlled
- No downtime - system maintains pressure and flow when bulk tank is filled
- Cylinders switch by pressure instead of level to further reduce product loss and protect against pressure decay
- Robust design features streamlined all stainless steel piping with only five control valves
- Frame assembly features a protective top cover in a compact footprint with an elevated base for improved ventilation

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- Personalized account information
- Order history and shipment tracking
- Shopping cart stores your parts before you buy
- Parts available for all makes and models
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TRIFECTA® X-SERIES

LASER ASSIST GAS SUPPLY SYSTEM

The Trifecta® X-Series is the preferred solution for reliable and continuous laser assist gases for delivery pressures up to 550 psi and flow rates up to 15,000 scfh. Drawing liquid from a standard bulk tank, the Trifecta system boosts the liquid pressure by alternately feeding two liquid cylinders equipped with innovative multi-function pressure building vaporizers. The Trifecta solution has no down-time and minimal losses when compared with other laser assist gas solutions. This convenient solution eliminates high-pressure pumps, compressors, cylinder cradles and surge tanks.

Models X5, X10, X15

Easy To Locate Parts

Looking for a part? Search our entire inventory of parts and accessories in seconds. Locate your part by reviewing tank diagrams or search by keyword or part number.

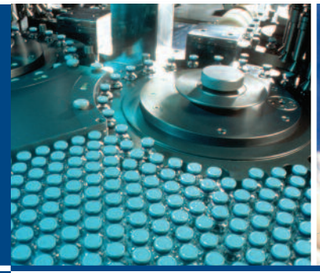
Account Information

Access shipment tracking, transaction history and personalized account information for convenient account management.

Personalized Service

Have a question about your order? We're ready to help! If you can't find what you're looking for, give us a call at 1-800-400-4683.

Tank-Tel & Tank-Tel² Gauges



CHART®

TANK-TEL™

Go digital with Chart's Tank-Tel® system, the industry leading hands-free tank monitoring solution. Forget the time and hassles of calibration charts associated with traditional analog tank monitoring. The Tank-Tel system brings you a low cost, reliable and user-friendly differential pressure (DP) gauge for industrial bulk tank applications.

Product Advantages

- Operates on 12 VDC (12 VDC required for telemetry) or batteries
- Standard on new Chart bulk tanks
- Improved level accuracy-program automatically adjusts for changes in liquid density
- Programmable to match most tanks up to 20,000 gallons
- Upgrade existing tank by adding to or replacing existing gauges
- Available in a low DP model for horizontal tanks

TANK-TEL²™

The Tank-Tel² has four, 2-way wireless communication options for complete geographical coverage. The advanced data logging supplies 24 data points per day. It also provides historical data to determine trends, forecasting, costs, charts and predicts customer delivery schedule.

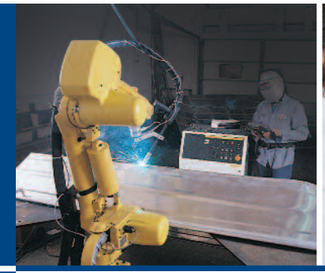
Product Advantages

- Solar/battery powered for easy, low-cost, maintenance free operation
- Increase tank capacity
- Eliminate product outages
- Online information & alarm management web service available
- Weather proof enclosures (NEMA 4X) for outdoor installation

Optional Tank-Tel² for wireless communication with DataOnline

Telemetry Systems

Telemetry Options



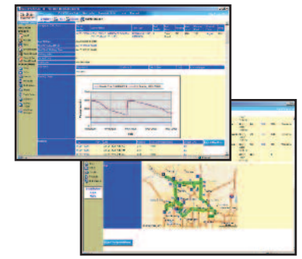
OnSite TELEMETRY

The OnSite Telemetry™ System is the only integrated telemetry solution for distribution. It provides distributors the access to levels, tank pressure, and line pressure at customer locations via the Internet. Centralized reports, information management tools and integrated fleet routing/scheduling software allows distributors to operate more efficiently.

Product Advantages

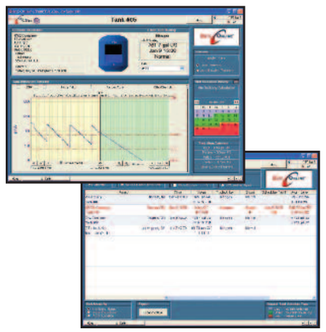
- Accurate, up-to-date measurements of liquid levels and pressure
- Self-administered system for maximum service and flexibility
- Account customization for best cost/benefit
- Up to four data ports per call
- Tank and line pressure readings for troubleshooting capabilities
- Email, pager or cell phone alarm capability
- Analog telephone line based
- Easy integration with other gas markets

OnSite Modem



DATAONLINE
REMOTE MONITORING SOLUTIONS

DataOnline provides information management services throughout the DataOnline web portal. With 24/7 availability, fault tolerance and redundancy over a secure Internet connection, DataOnline customers are assured that their data is managed via a safe and reliable platform.



Product Advantages

- Secure Internet based data service
- Automated data collection and reporting
- Fault tolerant and redundant system
- Advanced analysis and trending algorithms
- Email, fax or pager alarm notifications
- Data feeds into corporate SAP® system
- Integration with other data services

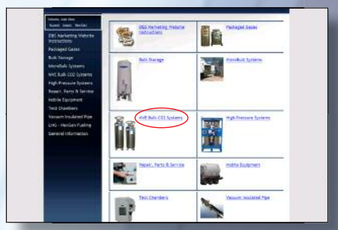
Chart Online Marketing Services

As Chart Inc. continues to provide distributors and customers with the best products and services in the industry, we would like to introduce you to an innovative marketing support tool designed to assist you in growing your business faster! Chart Online Marketing Services is like having your very own 24/7 marketing department providing you the marketing materials needed to drive customers to you. But this is much more than just a site to download product photos, you now have the ability to truly customize brochures, spec sheets and posters with your local contact information and company logo.

3 Easy Steps To Getting Onto Our Website To Order Marketing Materials!

1. Go to http://literature.chart-ind.com.

2. Enter your User ID and Password, click Log In.



3. Choose a category that you are interested in.

If you don't currently have an account set up, click on Sign Up, fill out your account details, and click Create. Chart will then have to approve access for you, and then a password will be sent to you to log in.

For All Your Marketing Needs...

literature.chart-ind.com

Densities at Various Saturation Pressures

	OXYGEN		NITROGEN		ARGON	
Saturation Pressure PSIG	Liquid Density Lbs/Ft^3	Gas Density SCF/Gal	Liquid Density Lbs/Ft^3	Gas Density SCF/Gal	Liquid Density Lbs/Ft^3	Gas Density SCF/Gal
0	71.17	115.10	50.44	93.11	87.51	112.50
5	70.42	113.72	49.62	91.55	85.77	110.89
10	69.80	112.73	49.00	90.40	84.77	109.60
25	67.86	109.59	47.50	87.63	82.46	106.61
50	65.55	105.86	45.69	84.18	79.90	103.31
75	63.76	102.97	44.19	81.53	77.90	100.71
100	62.43	100.82	42.88	79.12	76.15	98.45
150	59.80	96.57	40.70	75.08	73.16	94.59
200	57.62	93.05	38.76	71.51	70.28	90.87
250	55.60	89.79	36.83	67.95	67.79	87.65

Note: Density of water at 60°F = 62.30 lbs/cu ft

Conversion Data

Argon

	Weight		Gas		Liquid	
	Pounds (Lb)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm^3)	Gallons (Gal)	Liters (L)
1 Pound	1.0	0.4536	9.671	0.2543	0.08600	0.3255
1 Kilogram	2.205	1.0	21.32	0.5605	0.18957	0.7176
1 SCF Gas	0.1034	0.04690	1.0	0.02628	0.008893	0.03366
1 Nm^3 Gas	3.933	1.7840	38.04	1.0	0.3382	1.2802
1 Gal Liquid	11.630	5.276	112.5	2.957	1.0	3.785
1 L Liquid	3.072	1.3936	29.71	0.7812	0.2642	1.0

Nitrogen

1 Pound	1.0	0.4536	13.803	0.3627	0.1481	0.5606
1 Kilogram	2.205	1.0	30.42	0.7996	0.3262	1.2349
1 SCF Gas	0.07245	0.03286	1.0	0.02628	0.01074	0.04065
1 Nm^3 Gas	2.757	1.2506	38.04	1.0	0.4080	1.5443
1 Gal Liquid	6.745	3.060	93.11	2.447	1.0	3.785
1 L Liquid	1.782	0.8083	24.60	0.6464	0.2642	1.0

Oxygen

	Weight		Gas		Liquid	
	Pounds (Lb)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm^3)	Gallons (Gal)	Liters (L)
1 Pound	1.0	0.4536	12.076	0.3174	0.1050	0.3977
1 Kilogram	2.205	1.0	26.62	0.6998	0.2316	0.8767
1 SCF Gas	0.08281	0.03756	1.0	0.02628	0.008691	0.0329
1 Nm^3 Gas	3.151	1.4291	38.04	1.0	0.3310	1.2528
1 Gal Liquid	9.527	4.322	115.1	3.025	1.0	3.785
1 L Liquid	2.517	1.1417	30.38	0.7983	0.2642	1.0

SCF (Standard Cubic Foot) gas measured at 1 atmosphere and 70°F. Liquid measured at 1 atmosphere and boiling temperature.

Nm^3 (normal cubic meter) measured at 1 atmosphere and 0°C.

Carbon Dioxide

	Weight			Gas		Liquid		Solid
	Pounds (Lb)	Tons (T)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm^3)	Gallons (Gal)	Liters (L)	Cubic Feet (Cu Ft)
1 Pound	1.0	0.0005	0.4536	8.741	0.2294	0.11806	0.4469	0.010246
1 Ton	2000.0	1.0	907.2	17,483.0	458.8	236.1	893.9	20.49
1 Kilogram	2.205	0.0011023	1.0	19.253	0.5058	0.2603	0.9860	0.2260
1 SCF Gas	0.1144	—	0.05189	1.0	0.02628	0.013506	0.05113	0.0011723
1 Nm^3 Gas	4.359	0.002180	1.9772	38.04	1.0	0.5146	1.9480	0.04468
1 Gal Liquid	8.470	0.004235	3.842	74.04	1.9431	1.0	3.785	0.08678
1 L Liquid	2.238	0.0011185	1.0151	19.562	0.5134	0.2642	1.0	0.02293
1 Cu Ft Solid	97.56	0.04880	44.25	852.8	22.38	11.518	43.60	1.0

SCF (Standard Cubic Foot) gas measured at 1 atmosphere and 70°F. Liquid measured at 21.42 atmospheres and 1.7°F

Nm^3 (normal cubic meter) gas measured at 1 atmosphere and 0°C. Solid measured at -109.25°F.