



Product Manual

Cryo-Cyl® Liquid Cylinder 35/50 LP



Designed and Built by:

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Revision Log

Revision Level	Date	Description
A	07/06/2012	Original
B	02/01/2017	Reformat and update NER



Preface

General

The Cryo-Cyl 35 & 50 LP Liquid Cylinders are pressurized to allow you to transfer liquid nitrogen without pouring. These cylinders are constructed of stainless steel and have a convenient liquid contents gauge. The valving allows you to attach these cylinders to any equipment that requires liquid nitrogen.

Product Highlights

- Same rugged design as the larger Cryo-Cyl Liquid Cylinders
- Operates at 22 psig
- Complete with pressure and liquid level gauge
- 5-year vacuum warranty

Product Manual

This Liquid Cylinder Product Manual is designed to be used in conjunction with Cryo-Cyl 35 & 50 LP Liquid Cylinders. It should be thoroughly read and understood by anyone that operates, or is exposed to this equipment. If there are any questions regarding the operation of the tank, contact Chart's Technical Service division at 1-800-400-4683.

The Safety section discusses the safety requirements needed to operate the Cryo-Cyl 35 & 50 liquid cylinders. Additional safety information on oxygen deficient atmospheres and handling nitrogen is also available in this section.

The Instructions section will provide a general description of the cylinders, operation instructions and a general parts listing and description.

Terms

Throughout this manual safety precautions will be designated as follows:



Warning! *Description of a condition that can result in personal injury or death.*



Caution! *Description of a condition that can result in equipment or component damage.*

Acronyms / Abbreviations

The following acronyms / abbreviations are used throughout this manual:

BAR	Pressure (Metric)
CGA	Compressed Gas Association
CM	Centimeter
Kg	Kilogram
LN ₂	Liquid Nitrogen
LP	Low Pressure
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch (Gauge)



Safety

General

Liquid nitrogen is extremely cold and boils at -196°C (-320°F). To avoid injury due to frostbite, use extreme care whenever handling liquid nitrogen, liquid nitrogen storage or transfer vessels or any objects which have come in contact with liquid nitrogen.

- Leave no areas of skin exposed
- Use in well ventilated area
- Always wear proper safety attire over clothing; face shield, cryogenic gloves and apron
- Do not wear pants with cuffs
- Never overfill liquid nitrogen vessels
- Always keep liquid nitrogen vessels in an upright position
- Do not tightly seal liquid nitrogen containers or prevent nitrogen gas from escaping
- Use extreme care to prevent spilling or splashing of liquid nitrogen during transfer
- Immediately remove any clothing or safety attire on which liquid nitrogen has been spilled
- Read all filling instructions carefully
- Remove pressure and liquid nitrogen before working on vessel
- Get immediate medical attention for any frostbite injuries due to liquid nitrogen.



Warning! *The venting of nitrogen vapors will create a dilution of the air's oxygen concentration necessary to support life. Exposure to this diluted atmosphere can cause asphyxiation or even death. DO NOT store or use a liquid cylinder in areas that have poor ventilation. Place liquid cylinders outdoors or in a well ventilated area. Failure to comply with this warning may cause serious personal injury including death.*



Warning! *Extreme caution should be exercised in the handling of cryogenic liquids. Contact of the cryogenic liquid or cold gas may cause frostbite to unprotected areas of the body. Protect eyes and skin when transferring liquid. Insulated gloves that can be easily removed and long sleeves are recommended for arm protection. Pants without cuffs should be worn if the possibility of splashing liquid exists. Failure to observe this warning may lead to severe burns or eye injury.*



Warning! *Due to the extreme cold and pressure that is seen by the Cryo-Cyl 35 & 50 LP cylinders, caution should be taken when removing parts or fittings until the liquid has been removed from the container and the pressure has been safely released. Wear eye protection and insulated, loose fitting gloves when removing parts or fittings. Failure to comply with this warning may result in serious personal injury.*



Caution! *Replacement components must be cleaned for oxygen service. DO NOT use regulators, valves, gauges, hoses, etc. that have been used in compressed air service. DO NOT use parts that are marked for oxygen service in a compressed air atmosphere. Failure to observe this caution could cause serious damage to your container and possible personal injury.*

Safety Bulletin

Portions of the following information is extracted from Safety Bulletin SB-2 from the Compressed Gas Association, Inc. at www.cganet.com. Additional information on oxygen, nitrogen, and cryogenics is available in CGA Pamphlet P-9. Write to the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202..

Oxygen Deficient Atmospheres



Warning! Nitrogen vapors in air may dilute the concentration of oxygen necessary to support or sustain life.

The normal oxygen content of air is approximately 21%. Depletion of the oxygen content in air, either by combustion or by displacement with inert gas, is a potential hazard and users should exercise suitable precautions.

One aspect of this possible hazard is the response of humans when exposed to an atmosphere containing only 8 to 12% oxygen. In this environment, unconsciousness can be immediate with virtually no warning.

When the oxygen content of air is reduced to approximately 15 to 16%, the flame of ordinary combustible materials, including those commonly used as fuel for heat or light, may be extinguished. Somewhat below this concentration, an individual breathing the air is mentally incapable of diagnosing the situation because the onset of symptoms such as sleepiness, fatigue, lassitude, loss of coordination, errors in judgment and confusion can be masked by a state of “euphoria” leaving the victim with a false sense of security and well being.

Human exposure to an atmosphere containing 12% or less oxygen leads to rapid unconsciousness. Unconsciousness can occur so rapidly that the user is rendered essentially helpless. This can occur if the condition is reached by an immediate change of environment, or through the gradual depletion of oxygen.

Most individuals working in or around oxygen deficient atmospheres rely on the “buddy system” for protection - obviously the “buddy” is equally susceptible to asphyxiation if he or she enters the area to assist the unconscious partner unless equipped with a portable air supply. Best protection is obtainable by equipping all individuals with a portable supply of respirable air. Life lines are acceptable only if the

area is essentially free of obstructions and individuals can assist one another without constraint.

If an oxygen deficient atmosphere is suspected or known to exist:

1. Use the “buddy system.” Use more than one “buddy” if necessary to move a fellow worker in an emergency.
2. Both the worker and “buddy” should be equipped with self-contained or airline breathing equipment.

Nitrogen

Nitrogen (an inert gas) is a simple asphyxiate. It will not support or sustain life and can produce immediate hazardous conditions through the displacement of oxygen. Under high pressure this gas may produce unconsciousness even though an adequate oxygen supply sufficient for life is present.

Nitrogen vapors in air dilute the concentration of oxygen necessary to support or sustain life. Inhalation of high concentrations of this gas can cause anoxia, resulting in dizziness, nausea, vomiting, or unconsciousness and possibly death. Individuals should be prohibited from entering areas where the oxygen content is below 19% unless equipped with a self-contained breathing apparatus. Unconsciousness and death may occur with virtually no warning if the oxygen concentration is below approximately 8%. Contact with cold nitrogen gas or liquid can cause cryogenic (extreme low temperature) burns and freeze body tissue.

Persons suffering from lack of oxygen should be immediately moved to areas with normal atmospheres. **SELF-CONTAINED BREATHING APPARATUS MAY BE REQUIRED TO PREVENT ASPHYXIATION OF RESCUE WORKERS.** Assisted respiration and supplemental oxygen should be given if the victim is not breathing. If cryogenic liquid or cold boil-off gas contacts worker’s skin or eyes, the affected tissue should be flooded or soaked with tepid water (105-115°F or 41-46°C). **DO NOT USE HOT WATER.** Cryogenic burns that result in blistering or deeper tissue freezing should be examined promptly by a physician.

Instruction

General

The most prevalent cause of failure of liquid nitrogen storage vessels is mechanical. The vessel neck tube supports the full weight of the inner vessel and all liquid nitrogen it contains. A side or corner blow to the vessel causes the inner vessel to swing in a pendulum motion causing the neck to be damaged. Any storage vessel which has been exposed to an accident or has been dropped or lowered to hit on one corner will tend to fail more rapidly. The Cryo-Cyl 35 & 50 LP cylinders do have a support (top and bottom) but dropping or tipping over the vessel may cause functional damage.

Use caution before using your new Cryo-Cyl cylinder. Carefully inspect the vessel prior to use. Check for signs of damage which may have occurred in shipment. It is advisable to fill all new units with liquid nitrogen and watch liquid nitrogen loss rate for a few days. If there are any problems, contact Chart at 1-800-482-2473 as soon as possible.

Filling Instructions

To avoid damage to your cylinder, it is important that only the two following methods be used to fill the Cryo-Cyl 35 & 50 LP cylinders. Failure to follow each step may result in damage to your cylinder which is not covered by the warranty. Read all instructions carefully. If you have any questions call Chart at 1-800-482-2473 before proceeding.

Funnel Filling Method

Cryo-Cyl 35 & 50 LP cylinders can be filled by removing the brass plug on the top center of the tank and inserting a funnel in the hole. Liquid nitrogen can then be poured directly into the cylinder through this hole.

1. Open vent valve completely, releasing any pressure built up inside the cylinder.
2. Remove brass plug located on the top center of the cylinder.
3. Insert funnel into hole.
4. Pour liquid nitrogen into cylinder until level gauge reads 7/8 full or liquid nitrogen begins spitting from the vent valve.
5. Reinsert brass plug and tighten.
6. Close vent valve completely.



Warning! *Overfilling cylinders may result in damage to level and pressure gauges. If overfilling should occur, remove excess liquid nitrogen by opening the liquid nitrogen withdrawal valve immediately.*



Caution! *Always wear proper safety attire and stand clear of vent valve during filling.*

Filling from Low Pressure Liquid Nitrogen Supply

The Cryo-Cyl 35 & 50 LP liquid nitrogen cylinders can be filled from a pressurized source of liquid nitrogen by attaching a transfer hose to the liquid withdrawal valve on the Cryo-Cyl cylinders. The liquid nitrogen source pressure must not exceed 45 psi. Please read all instructions carefully before filling.

1. Attach transfer hose from liquid nitrogen source to the liquid withdrawal valve on the Cryo-Cyl cylinder.
2. Open withdrawal valve completely.
3. Open withdrawal valve on liquid nitrogen source. Liquid nitrogen source pressure must not exceed 45 psi or damage to gauges and relief valves may occur. Optimum filling pressure is 35 psi.
4. Open vent valve until the pressure gauge reads 22 psi.
5. Continue to fill until cylinder weight is 140 lb. for Cryo-Cyl 35 LP cylinder or 180 lb. for Cryo-Cyl 50 LP cylinder. If scale method is not possible, fill until liquid nitrogen begins spitting from vent valve.



Caution! *Always wear proper safety attire and stand clear of vent valve during filling.*

6. Shut liquid nitrogen source valve completely.
7. Shut liquid nitrogen withdrawal valve completely.
8. Carefully remove transfer hose from cylinder. Some liquid nitrogen will remain in hose under pressure after filling.
9. Close vent valve completely.



Caution! *Always wear proper safety attire when transferring liquid nitrogen into or out of a cylinder.*

Liquid Withdrawal

The Cryo-Cyl 35 & 50 LP cylinders are to be used only for low pressure liquid withdrawal. The primary relief valve is set at 22 psi from the factory. The secondary safety relief is set at approximately 35 psi. Transferring liquid at higher pressures increases the flash-off rate of the liquid.

To transfer liquid:

1. Attach the transfer hose or withdrawal spout to the liquid connection.
2. Slowly open the liquid valve to flow the liquid.
3. The liquid will vaporize at first until the transfer line or withdrawal valve cools down.
4. If using a transfer hose to extract liquid from the Cryo-Cyl cylinder into an open dewar a phase separator is recommended on the end of the transfer line.
5. Transfer pressure should be kept to a minimum. The normal evaporation of the liquid will usually maintain enough pressure for transferring.



Warning! The container can become contaminated, once it is emptied, if the liquid or vent valve is not closed.

Valves

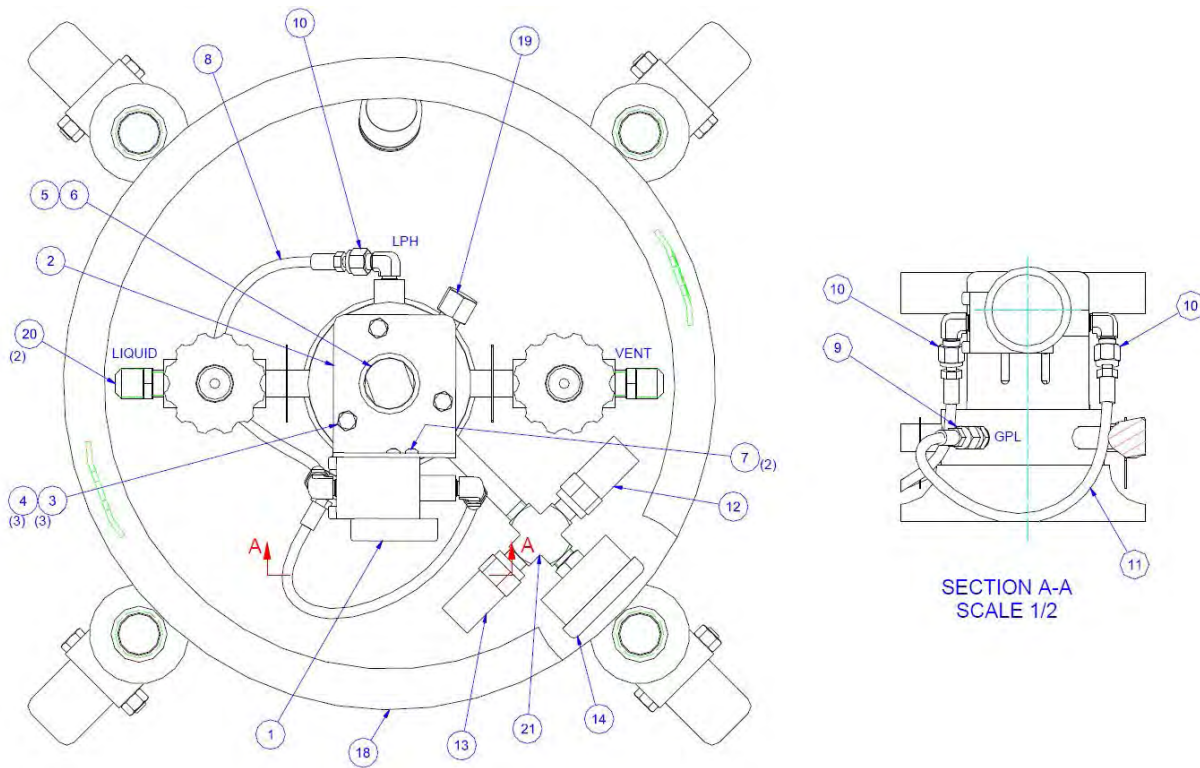
The valve that are used on the Cryo-Cyl 35 & 50 LP liquid cylinders have a spring loaded rotary stem. This automatically compensates for thermal shrinkage and wear.

When a defective valve is suspected, follow this procedure to repair it:

1. Void the tank of liquid product and release any pressure that is in the container.
2. If the valve to be repaired is the vent valve, allow it to warm up before it is disassembled.
3. Remove the valve handle screw, washer and retainer cap and spring assembly.
4. Remove the valve handle and Teflon thrust washer.
5. Unscrew bonnet to remove the stem and stem seal.
6. Pick out body insert and plug assembly.
7. Clean seat.
8. Replace parts as needed and reassemble in reverse order.

Specifications

Model		Cryo-Cyl 35	Cryo-Cyl 50
	Pressure	LP	LP
	Part Number	10980671	10980663
Capacity			
Liquid (Gross)	liters	35	50
Liquid (Net)	liters	N/A	N/A
Performance			
NER (LN ₂)	%/Day	4%	4%
Dimensions & Pressure Ratings			
Diameter	in / cm	16 / 40.6	16 / 40.6
Height	in / cm	34.75 / 88.27	40.5 / 103.51
Empty Weight	lb / kg	85.5 / 38.78	98.5 / 47.68
Relief Valve Setting	psig / bar	22 / 1.5	22 / 1.5
DOT/CTC Rating		N/A	N/A



Parts List

Item #	Part #	Description	Qty
1	2013709	DIFF PG 0-20"H2O FULL SCALE	1
2	5576961	BRACKET DIFF PG	1
3	2910501	HHMS SS 1/4-20X5/8"LG	3
4	2910601	WASHER SPLIT SS 1/4 18-8 B18	3
5	2300094	O-RING .924IDX1.130OD	1
6	10676485	PLUG KNUCKLE (7/8"-14UNF-1A)	1
7	2911401	PHPNHMS SS #8-32X3/8"LG	2
8	13842901	HOSE FLEX 1/4ODTX12"LG SS HIGH	1
9	11555440	CONN BRS 1/4ODTX1/4MPT	1
10	11200593	ELBOW BRS 90D 1/4ODTX1/8MPT	3
11	13842830	HOSE FLEX 1/4ODTX12"LG SS LOW	1
12	1810012	RV BRS 1/4MPT 22PSI	1
13	1810022	RV BRS 1/4MPT 35PSI	1
14	14932554	PG 2"DIAL 0-100PSI/BAR/KPA	1
18	10980962	LABEL CRYO-CYL 35LP	1
18	10980954	LABEL CRYO-CYL 50LP	1
19	1210752	CAP BRS HEX 1/4FPT	1
20	1110072	CONN BRS 1/2ODTX3/8MPT 45D FL	2
21	1212922	CROSS BRS 1/4FPT FORGED	1
ACC	9713159	TRANS HOSE 1/2"X4'OAL INERT	
ACC	9715759	KIT SPARE PARTS REGO VALVE	

Warranty

Chart Inc. (“CHART”) warrants to the purchaser of the Cryo-Cyl 35 & 50 LP Liquid Cylinders manufactured by CHART that for one (1) year after purchase said CHART manufactured equipment shall be free from any defects in workmanship and materials and that for five (5) years after the date of shipment to the original purchaser said CHART manufactured equipment will maintain all vacuum and performance standards for said equipment as published by CHART on the date of purchase.

Purchaser agrees that as a pre-condition to any CHART liability hereunder, purchaser shall fully inspect all goods immediately upon delivery to purchaser and shall give CHART written notice of any claim or purported defect within ten (10) days after discovery of such defect. As a further precondition to any CHART liability hereunder, purchaser shall return said purportedly defective equipment, freight prepaid, to the plant of the manufacturer. CHART shall inspect all returned equipment, and, if said equipment is found defective, shall, at its option as purchaser’s sole and exclusive remedy, repair or replace such equipment or any defective component or part thereof which proves to be defective, or refund the next purchase price paid by the original purchaser. Alterations or repairs by others or operation of such equipment in a manner inconsistent with CHART accepted practices and all operating instructions, unless pre-authorized in writing by CHART, shall void this warranty. CHART shall not be liable for defects caused by the effects of normal wear and tear, erosion, corrosion, fire or explosion.

CHART’s sole and exclusive liability under this Warranty is to the original purchaser and shall not exceed the lesser of the cost of repair, cost of replacement, or refund of the net purchase price paid by the original purchaser. CHART is not liable for any other losses, damages, or costs of delays, including incidental or consequential damages. CHART SPECIFICALLY MAKES NO WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, OTHER THAN OR WHICH EXTEND THOSE WARRANTIES EXPRESSED HEREIN.



