TW-289

Instructions for XL-65 and XL-65HP

with Dual Regulator

Do not attempt to use or maintain this unit until you read and understand these instructions. Do not permit untrained persons to use or maintain this unit. If you do not fully understand these instructions, contact your supplier for further information.

Taylor-Wharton

CONTAINER SAFETY

Pressure Hazard – The containers covered by this literature may contain pressures up to 350 psig (24 bar/2412 kPa). Sudden release of this pressure may cause personal injury by issuing cold gas or liquid, or by expelling parts during servicing. Do not attempt any repairs on these containers until all pressure is released, and the contents have been allowed to vaporize to ensure no pressure buildup can occur.

Extreme Cold-Cover Eyes and Exposed Skin – Accidental contact of the skin or eyes with any cryogenic liquid or cold issuing gas may cause a freezing injury similar to frostbite. Protect your eyes and over your skin when handling the container or transferring liquid, or in any instance where the possibility of contact with liquid, cold popes and cold gas may exist. Safety goggles or a face shield should be worn when withdrawing liquid or gas. Long-sleeved clothing and gloves that can be easily removed are recommended for skin protection. Cryogenic liquids are extremely cold and will be at temperatures below -300°F (-184°C) under normal atmospheric pressure.

NOTE:
For detailed information on the handling of cryogenic liquids, refer to the Compressed gas Association publication: P-12 "Safe Handling of Cryogenic Liquids" available from the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202

Keep Equipment Well Ventilated – Although some of the gases used in these containers are non-toxic and non-flammable, they can cause asphyxiation in a confined area without adequate ventilation. An atmosphere that does not contain enough oxygen for breathing will cause dizziness, unconsciousness, or even death. These gasses cannot be detected by the human senses and will be inhaled normally as if they were air. Ensure there is adequate ventilation where these gasses are used and store liquid containers outdoors or only in well ventilated are.

Replacement Parts Must be "Cleaned for Oxygen Service" – Some materials, especially non-metallic gaskets and seals, can be a combustion hazard if used in oxygen or nitrous oxide service, although they may be acceptable for use with other cryogenic liquids. Use only Taylor-Wharton recommended spare parts, and be certain parts used on oxygen or nitrous oxide equipment marked "cleaned for oxygen service". For information on cleaning, consult the Compressed Gas Association (CGA) pamphlet G-4.1, "Cleaning for Oxygen Service" or equivalent industrial cleaning specifications.

Install Relief Valves in Cryogenic Liquid Lines - When installing piping of fill hose assemblies, make certain a suitable safety relief valve is installed in each section of plumbing between shut-off valves. Trapped liquefied gas will expand as it warms and may burst hoses or piping causing damage or personal injury.

GENERAL INFORMATION

The XL-65 and XL-65HP are vacuum-insulated, stainless steel containers designed to store and transport cryogenic liquid oxygen, nitrogen, argon, carbon dioxide, and nitrous oxide. Built to DOT 4L standards, these containers may be used for over the road transportation of cryogenic fluids, as well as on-site storage and supply in a wide range of applications.

As rugged, long holding time, self-contained gas supply systems, these cylinders are capable of providing continuous flow rates of up to 150 cfh (3.9 cu.m/h) in carbon dioxide service, up to 110 cfh (2.9 cu.m/h) in nitrous oxide service for the XL-65HP; up to 350 cfh (9.2 cu.m/h) in either Oxygen/Nitrogen/Argon gas services for both cylinders. The XL-65 and XL-65HP are designed to hold liquid with a relief valve setting of 350 psig (24 bar/2413 kPa) for the XL-65HP and 230 psig (16 bar/158 kPa) for the XL-65 kPa) for the XL-65.

SPECIFICATIONS

	XL-65	XL-65HP
Dimensions		
Diameter	26 in. (660 mm)	26 in. (660 mm)
Height*	59 1/4 (1505 mm)	59 1/4 (1505 mm)
Weight, Empty		
5 Caster Base	375 lb. (170 kg)	465 lb. (211 kg)
4 Caster Base	445 lb. (202 kg)	535 lb. (243 kg)
Capacity, Gross	250 liters	247 liters
Capacity, Usable Liquid	240 liters	240 liters
Weight of Contents Maximum		
Based on DOT Relief Valve Setting		
Carbon Dioxide	N/A	516 lb. (234 kg)
Oxygen	539 lb. (176 kg)	505 lb. (229 kg)
Nitrogen	380 lb. (172 kg)	353 lb. (160 kg)
Argon	655 lb. (297 kg)	614 lb. (279 kg)
Nitrous Oxide	N/A	543 lb. (246 kg)
Normal Evaporation Rate**		
(% Capacity per Day)		
Carbon Dioxide	N/A	0.75%
Oxygen	1.0%	1.0%
Nitrogen	1.6%	1.6%
Argon	1.0%	1.0%
Nitrous Oxide	N/A	0.75%
Gas Flow Rate @ NTP (@ STP)		
Carbon Dioxide	N/A	150 cfh (3.9 cu.m/h)
Oxygen, Nitrogen, Argon	350 cfh (9.2 cu.m/h)	350 cfh (9.2 cu.m/h)
Nitrous Oxide	N/A	110 cfh (2.9 cu.m/h)
Relief Valve Setting	230 psig (16 bar/1586 kPa)	350 psig (24 bar/2413 kPa)
Inner Container Bursting Disc	380 psig (26 bar/2620 kPa)	525 psig (36 bar/3620 kPa)
Dual Pressure Building/ Economizer Regulator***		
Pressure Building Setting	125 psig (8.6 bar/862 kPa)	300 psig (20.7 bar/2069 kPa)
Economizer Setting	145 psig (10 bar/1000 kPa)	320 psig (22 bar/2206 kPa)
Design Specifications		
TC/DOT	4LM/4L	4LM/4L
Gaseous Capacity		
Based on DOT Relief Valve Setting @ NPT (STP)		
Carbon Dioxide	N/A	4511 cu.ft. (119 cu.m)
Oxygen	6511 cu.ft. (171 cu.m)	6100 cu.ft. (160 cu.m)
Nitrogen	5244 cu.ft. (138 cu.m)	4871 cu.ft. (128 cu.m)
Argon	6335 cu.ft. (166 cu.m)	5938 cu.ft. (156 cu.m)
Nitrous Oxide	N/A	5419 cu.ft. (142 cu.m)

Specifications subject to change without notice.

* 5 Caster base used for height measure; for 4 Caster square base with handle add approximately 1/2 in. (12.7 mm)

* 8 Vented N.E.R. based on Useable Liquid Capacity.

***Regulator has a pressure delta of 20 psig (1.4 bar/138 kPa).

CAUTION:
When using a hoist, always insert hooks into both lifting lugs. Failure to do so could result in personal injury or damage to the container.

Handling the Container

The XL Series containers are very rugged liquid cylinders. All cryogenic liquid containers have an inner container and an outer container with an insulated vacuum space between them. Any abuse (dents, dropping, tip-over, etc.) can affect the integrity of the containers insulation system.

When fully loaded, the XL-65HP in argon service will contain up to 614 lb. (279 kg) of product. While moving a full container, you may be handling up to 1149 lb. (521 kg), and you should treat the load accordingly. The attachment points provided on the XL65 and the XL65HP will allow you to use a hoist to handle these loads properly. Do not attempt to move these cylinders by any other means. When moving the cylinder, the following precautions should be observed:

Never lay the container on its side. Always ship, operate, and then store the unit in a vertical, or upright, position.

When loading or unloading the container from a truck, use a lift gate, crane or parallel loading dock. Never attempt to manually life the unit.

To move the container over rough surfaces, or to lift the container, attach an appropriate sling to the lifting points cut into the welded supports posts, and use a portable lifting device that will handle the weight of the container and its contents.

Never pull a cylinder downhill; this may cause the handler to lose control of the container and possibly cause personal injury.

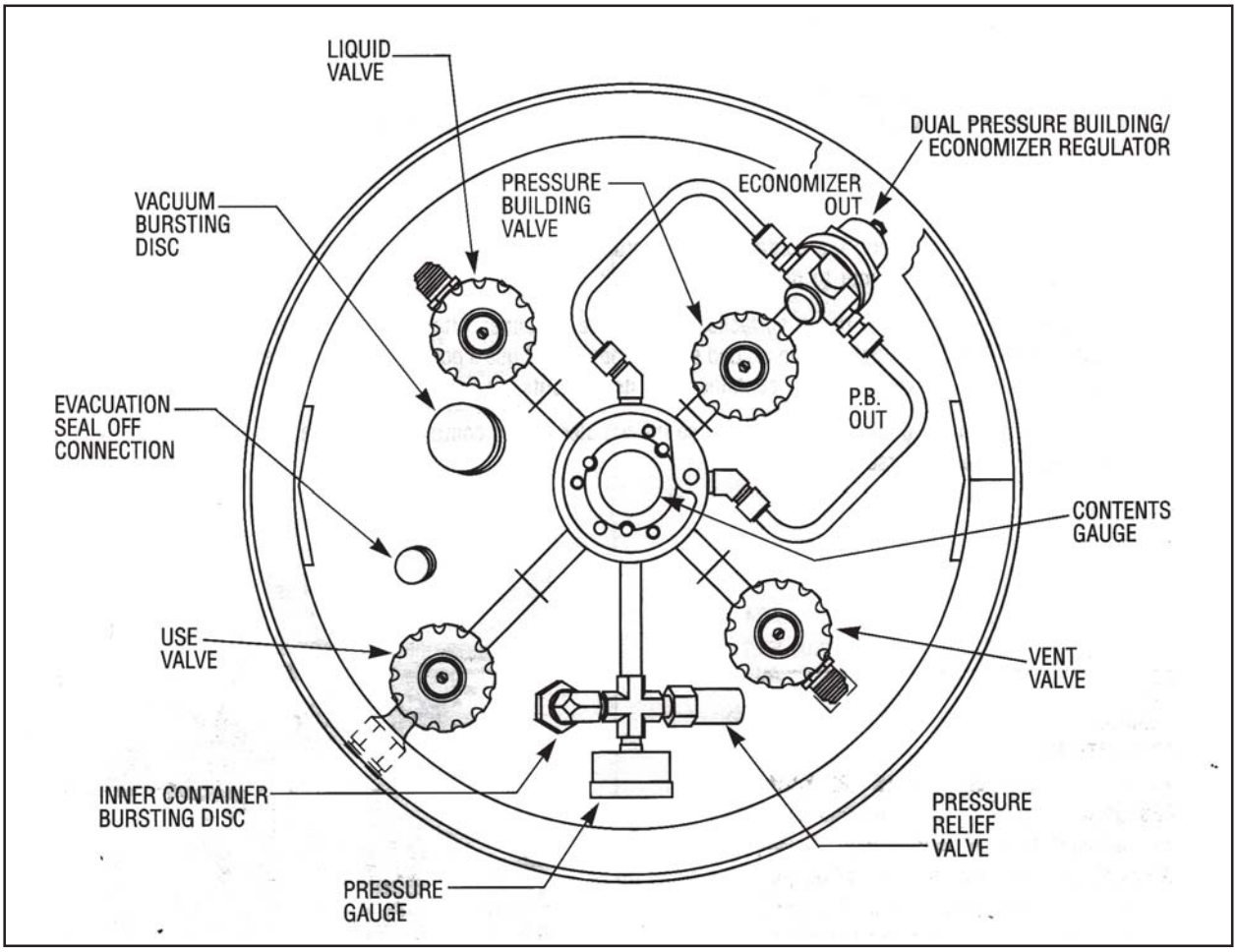
XL-65 and XL-65HP Containers

FREIGHT DAMAGE PRECAUTIONS

ANY FREIGHT DAMAGE CLAIMS ARE YOUR RESPONSIBILITY. Cryogenic liquid containers are delivered to your carrier from Taylor-Wharton's dock in new condition. When you receive our product you may expect it to be in that same condition. For your own protection, take time to visually inspect each shipment in the presence of the carrier's agent before you accept delivery. If any damage is observed, make an appropriate notation on the freight bill. Then ask the driver to sign the notation before you receive the equipment. You should decline to accept containers that show damage which may affect serviceability.

OPERATION

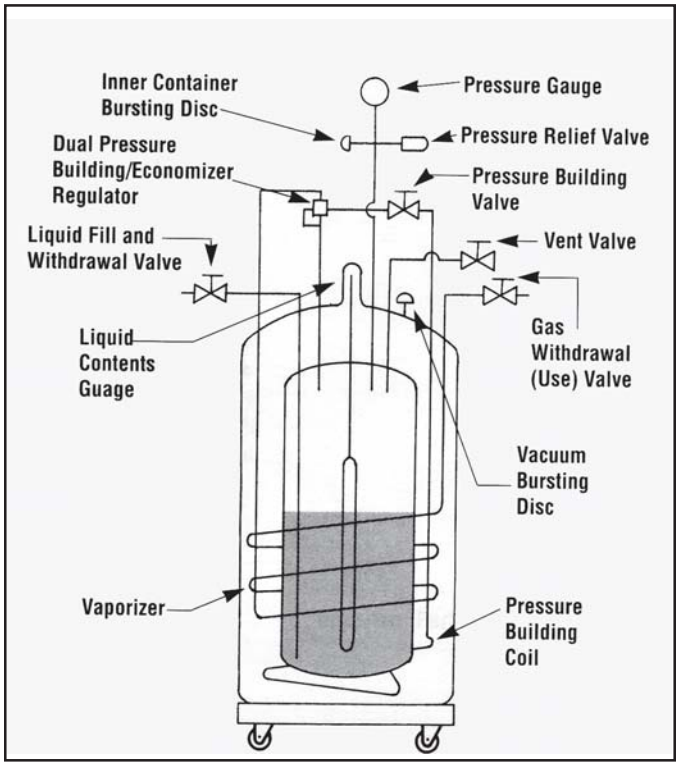
The XL-65/65HP will store up to 240 liters of product. The two cylinders can deliver either liquid or gas. The following component and circuit descriptions are pertinent to the operation of all the containers and should be read before attempting operation. The components may be identified on the Component Location Illustration.



XL-65 and XL-65HP Component Locations

Internal Vaporizer – A liquid container for gas service must have an internal heat exchanger that functions as a gas vaporizer coil to convert liquid product to gas continuously during withdrawal. The XL65-XL65HP utilize an internal heat exchanger that is inside the vacuum space attached to the container's outer casing. It provides a mean of introducing heat from outside the container's insulated jacket, to vaporize liquid as gaseous product is withdrawn. The capacity of this circuit is sufficient to vaporize at flow rates up to 350 cfh @ NTP (9.2 cu.m/h @STP). If a greater continuous demand is put on the vaporizer, an external vaporizer should be added to properly warm the gas and avoid malfunction, or damage, to gas regulators, hoses, and other downstream components.

Pressure Building – A Pressure Building circuit is used to ensure sufficient driving pressure during high withdrawal periods. This function is actuated by opening a hand valve that creates a path from the liquid in the bottom of the container, through the Pressure Building Regulator, to the gas space in the top. When the pressure building valve is open, and the container pressure is below the pressure building regulator setting, liquid taken from the inner container is vaporized in a heat exchanger which is inside the outer casing. The expanding gas is fed into the upper section of the container to build pressure. The resulting process will drive either the liquid or gas delivery system.



XL-65 and XL-65HP Flow Diagram

Note:
The economizer and pressure building functions are controlled by a single dual action regulator. The pressure delta between the pressure building setpoint and the economizer setpoint is approximately 20 psig (1.4 bar/138 kPa). This delta cannot be altered.

Pressure Building is not normally required unless container pressure drops below the gas output pressure desired. If, for example, the container pressure gauge reads 250 psig (17.2 bar/1724 kPa), and your gas pressure requirement is 270 psig (19 bar/1860 kPa), and the pressure building valve may be opened to build container pressure to 300 psig (20.7 bar/2068 kPa).

Economizer – An economizer circuit withdraws gas preferentially from the head space over the liquid container – gas that would otherwise be lost to venting. Excess pressure in the head space of the container is relieved by allowing gas to flow from this area directly to the USE valve outlets while gas is being withdrawn from the container; yet normal operating pressure is preserved to ensure uninterrupted product delivery. The economizer is automatic and requires no operator attention.

The USE Valve – This valve controls the gas outlet that allows product withdrawal through the internal vaporizer. It has the required CGA connection that matches the gas service for which the container is configured.

The LIQUID Valve – Liquid product is added or withdrawn from the container through the connection controlled by this valve. It has the CGA fitting that is required for liquid line connections. The valve is opened for fill or liquid withdrawal after connecting a transfer hose with compatible fittings to the LIQUID line connection.

The Pressure Building Valve – This valve isolates the liquid in the bottom of the container to the Dual Pressure Building/Economizer Regulator. This valve must be open to build pressure inside the container.

The VENT Valve – This valve controls a line into the head space of the container. It is used during the fill process. The VENT valve acts as a fill point during a pump transfer, or to vent the head space area while liquid is filling the inner container during a pressure transfer fill through the LIQUID valve.

The Pressure Gauge – The pressure gauge displays the internal container pressure in pounds-per-square-inch or in kiloPascals.

The Full View Contents Gauge – The container contents gauge is a float type liquid level sensor that indicates container liquid content through a magnetic coupling to a yellow indicator band. This gauge is an indication of approximate container contents only and should not be used for filling; liquid cylinders should be filled by weight.

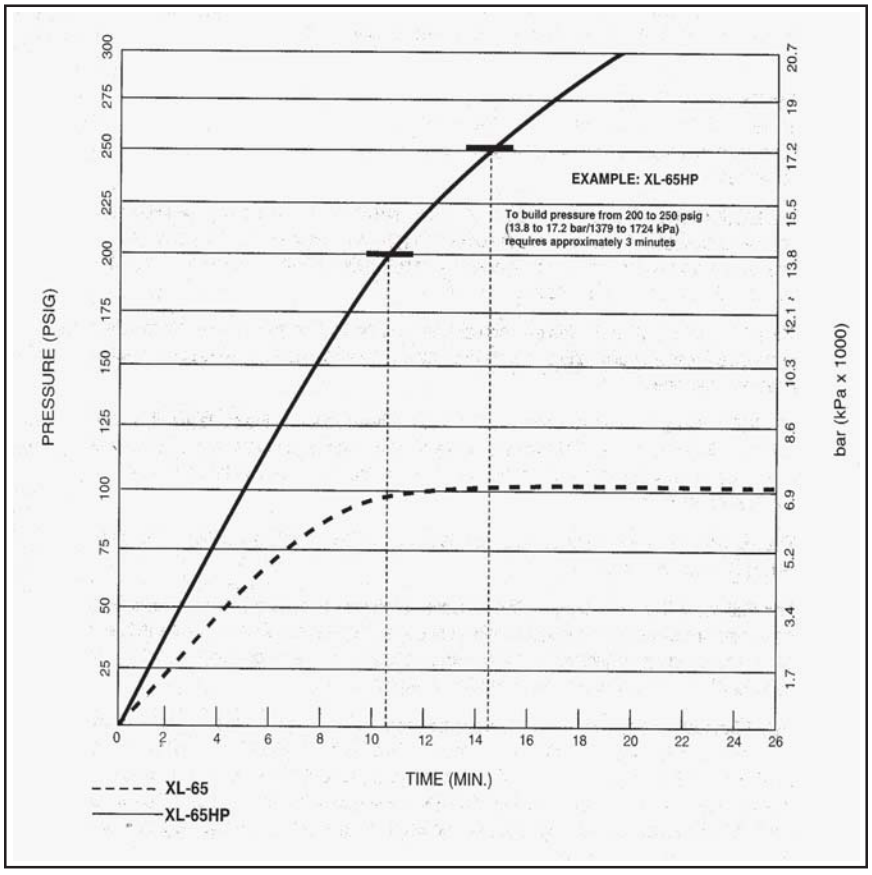
Relief Devices – This cylinder has a gas service relief valve and inner container bursting disc with settings of 350 psig (24 bar/2413 kPa) and 525 psig (36 bar/3620 kPa) respectively for the XL-65HP and 230 psig (16 bar/1586 kPa) and 380 psig (26 bar/2620 kPa) respectively for the XL-65. A relief valve of 22 psig (1.5 bar/153 kPa) is available if low pressure operation is desired. Alternate pressure building regulator and economizer settings are required if medium-pressure relief valves are installed.

RELIEF VALVES AND RECOMMENDED REGULATOR SETTINGS

Relief Valve Setting	Pressure Building Setting	Economizer Setting	Normal Operating Range
22 psig 1.5 bar 152 kPa	N/A N/A N/A	N/A N/A N/A	0-22 psig 0-1.5 bar 0-152 kPa
230 psig 16 bar 1586 kPa	125 psig 8.6 bar 862 kPa	145 psig 10 bar 1000 kPa	125-230 psig 8.6-16 bar 862-1586 kPa
350 psig 24 bar 2413 kPa	300 psig 20.7 bar 2069 kPa	320 psig 22 bar 2206 kPa	300-350 psig 20.7-24 kPa 2069-2413 kPa

Part numbers for alternate valves and regulators are shown in the Spare Parts section of this manual.

Pressure Building Rates Graph



CAUTION:
When withdrawing gas from the cylinder, the capacity of the internal vaporizer can be exceeded. If gas is withdrawn at rates greater than the vaporizer capacity, liquid or very cold gas will be discharged. Severe damage to external equipment could result from the extreme cold.

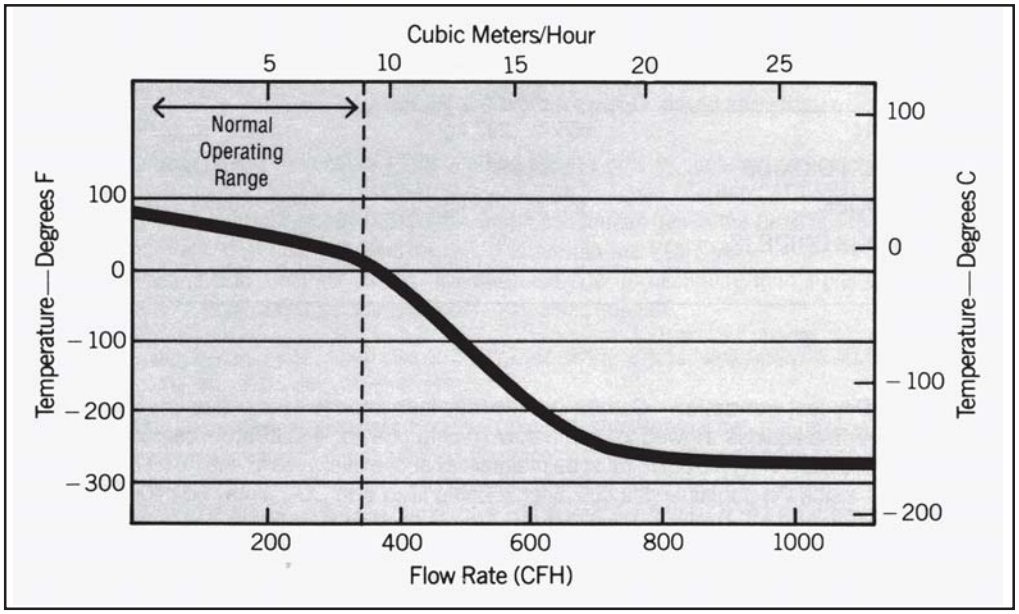
WITHDRAWING GAS FROM THE CONTAINER

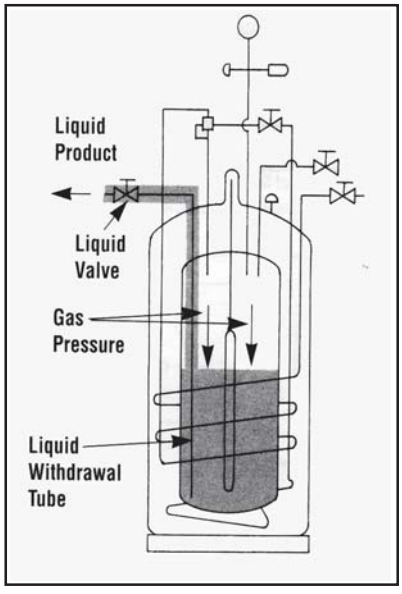
To withdraw gas from the XL-65/65HP connect a suitable pressure regulator to the USE connection, and the output of the regulator to your external equipment. Then open the USE and the PRESSURE BUILDING valves. When the container pressure reaches 125 psig (8.6 bar/862 kPa) for the XL-65, —or 300 psig (20.7 bar/2069 kPa) for the XL-65HP – set the pressure regulator for the desired delivery pressure.

Increasing Gas Supply Capacity – Two or more liquid containers may be manifolded together. Accessory manifolds are available for use in creating a higher capacity gas supply system. The XL-65/65HP can supply gas flow rates up to 350 cfh @NTP (9.2 cu.m/h @ STP) using only its internal vaporizer. At low rates, the gas supplied will be at near ambient temperatures. As the flow demand is increased, the gas will become proportionately colder. If greater vaporizing capacity is required, an accessory external vaporizer is available. When an external vaporizer is used, it must be connected to the USE valve and the regulator moved to the output of the external vaporizer.

WITHDRAWING LIQUID FROM THE CONTAINER

Vaporizer Performance Graph





Liquid Withdrawal

Attach a transfer hose to the LIQUID connection and open the adjacent LIQUID valve. The pressure in the container will drive liquid product out through the valve as long as the container pressure exceeds that of the receiver.

The rate of liquid withdrawal from these containers is variable depending on the gas phase pressure and the saturation temperature of the liquid.

CAUTION:
To avoid contamination, close the LIQUID valve on an empty container before disconnecting the transfer line.

FILLING THE CONTAINER

Cryogenic liquid containers must always be filled by weight to ensure there is enough gas head space (usage) for liquid to expand as it warms. Using the procedure below, first determine the proper filled weight of each container. The weight derived is then used in either the Pump Transfer of Pressure Transfer filling procedures that follow.

Determine Proper Fill Weight

NOTE:
The weight calculation includes the weight of residual liquid and is applicable to both Pressure Transfer and Pump Transfer filling methods.

1. Visually inspect the container. Do not attempt to fill containers with broken or missing components.
2. Move the container to a filling station scale and weight it both with, and without, the fill hose attached to determine the weight of the fill line assembly. The difference is the fill line weight.
3. To determine the weight, at which the fill should be stopped, add desired filling weight (from the table below), the transfer line weight, and the Tare Weight from the container's data plate.

FILLING WEIGHTS

	XL-65	XL-65HP
ARGON	655 lb. (297 kg)	614 lb. (279 kg)
CARBON DIOXIDE	N/A	516 lb. (234 kg)
NITROGEN	380 lb. (172 kg)	353 lb. (160 kg)
NITROUS OXIDE	N/A	543 lb. (246 kg)
OXYGEN	539 lb. (244 kg)	505 lb. (229 kg)

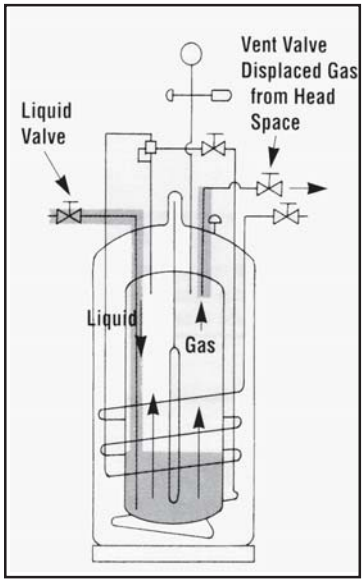
WARNING:
Filling operation should take place only in well ventilated areas. Accumulations of product gas can be very dangerous (refer to safety precautions in the front of these instructions). Maintain adequate ventilation at all times.

Solid CO_2 (Dry Ice) Formation – Carbon Dioxide may form into the solid phase (dry ice) if the pressure over the liquid is allowed to drop below 70 psig (4.8 bar/483 kPa). In carbon dioxide service, the pressure in an XL-65HP must be maintained above this valve to ensure a solid block will not form inside the container. If a container is being filled with CO_2, it may be necessary to pressurize the container with gaseous $CO_{2\ before}$ beginning the fill. If the pressure of the container is somehow lost, the dry ice block that forms may be thawed by pressurizing the cylinder to 280 psig (19.3 bar/1931 kPa) with carbon dioxide gas from an external source, and allowing several day at this pressure to thaw the cylinder.

Pressure Transfer Filling Method

Filing a liquid cylinder using the pressure transfer method is common for 22 psig (1.5 bar/152 kPa) service where the product is used for refrigerant purposes. This method may also be used for higher pressure cylinders to increase liquid holding time. A fill is accomplished by first establishing a pressure difference between the source vessel and the XL-65/65HP (higher pressure at the bulk vessel). The pressure differential will then push the liquid from the storage vessel to the container being filled. This method is employed when no transfer pump systems is available, or if greater control over the temperature is desired.

Filling the containers is accomplished through the LIQUID valve while the VENT valve is open of partially open to control product pressure. Careful control of pressure will control the amount of heat retained in the liquid. Lower pressure results in colder liquid transferred to the container and increases, or lengthens, product holding time.



Pressure Transfer Filling From a Low Pressure Source

CAUTION:
With carbon dioxide, pressure in the container being filled must be above 70 psig (4.8 bar/482 kPa) before the fill begins and at all times during the fill to prevent the product from freezing into dry ice.

Pressure Transfer Filling Procedure (Low Pressure Source) – Once you have determined the proper full weight for a container, connect a transfer hose to the LIQUID fitting from a low pressure source of liquid.

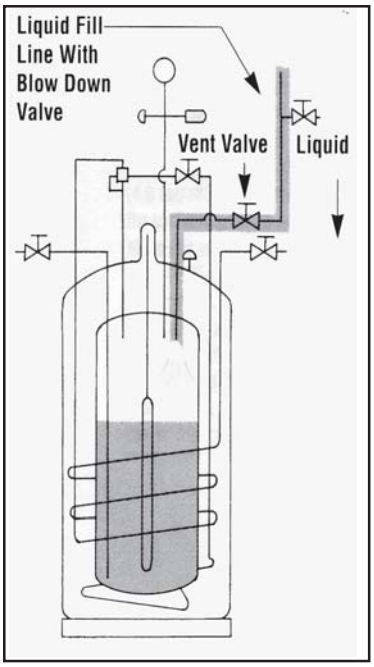
1. Open the supply valve. Then, on the XL-65/65HP, open the LIQUID and VENT valves to begin the fill.
2. During the fill, monitor the container pressure and maintain a pressure of 10-15 psig (0.7-1 bar/69-103 kPa) by throttling the VENT valve. Not for CO_2 service
3. When full weight is reached, close both the LIQUID and the VENT valves.
4. Close the liquid supply valve and open the dump valve on fill line assembly.
5. Disconnect the fill line from the container and removed the container from the scale.

Pump Transfer Filling Method

When a pump is used for filing liquid containers, the fill may be accomplished through either the VENT valve of the LIQUID valve. Filling though the VENT valve recondenses gas in the area over the liquid cylinder and reduces product loss during the fill. This method will also result in the liquid near the saturation temperature of the supply vessel. Filling through the LIQUID valve may provide colder liquid and longer holding time before the liquid warms to the point where venting begins, but will require more frequent venting and greater product loss.

Pump Transfer Filling Procedure - This method applies only to containers in gas service that are equipped with a 230 psig (16-bar/1586 kPa) or 350 psig (24-bar/2412 kPa) relief valve. Liquid is admitted through the VENT valve and recondenses gas in the head space during the fill. The fill line is connected from the liquid supply to the VENT valve on the cylinder. Both the fill line and the container should be pre-cooled prior to beginning the fill process. Proper full weight is determined by the previously explained method.

1. Open the supply valve. Then, on the container being filled, open only the VENT valve to begin the fill. Start the pump at this time.
2. Observe the container pressure closely. If the pressure approaches the relief valve setting (or the pump pressure rating) stop the fill process at the supply, and open the fill line dump valve to vent excess pressure. As soon as the pressure has dropped to a level that will allow you to resume the fill, close the dump valve and restart the pump (or reopen the supply valve.)
3. When full weight is reached, close the VENT valve. Stop pump (when applicable), close liquid supply valve and open the dump valve on fill line assembly to vent trapped liquid.
4. Disconnect the fill line from the container and remove the container from the scale.

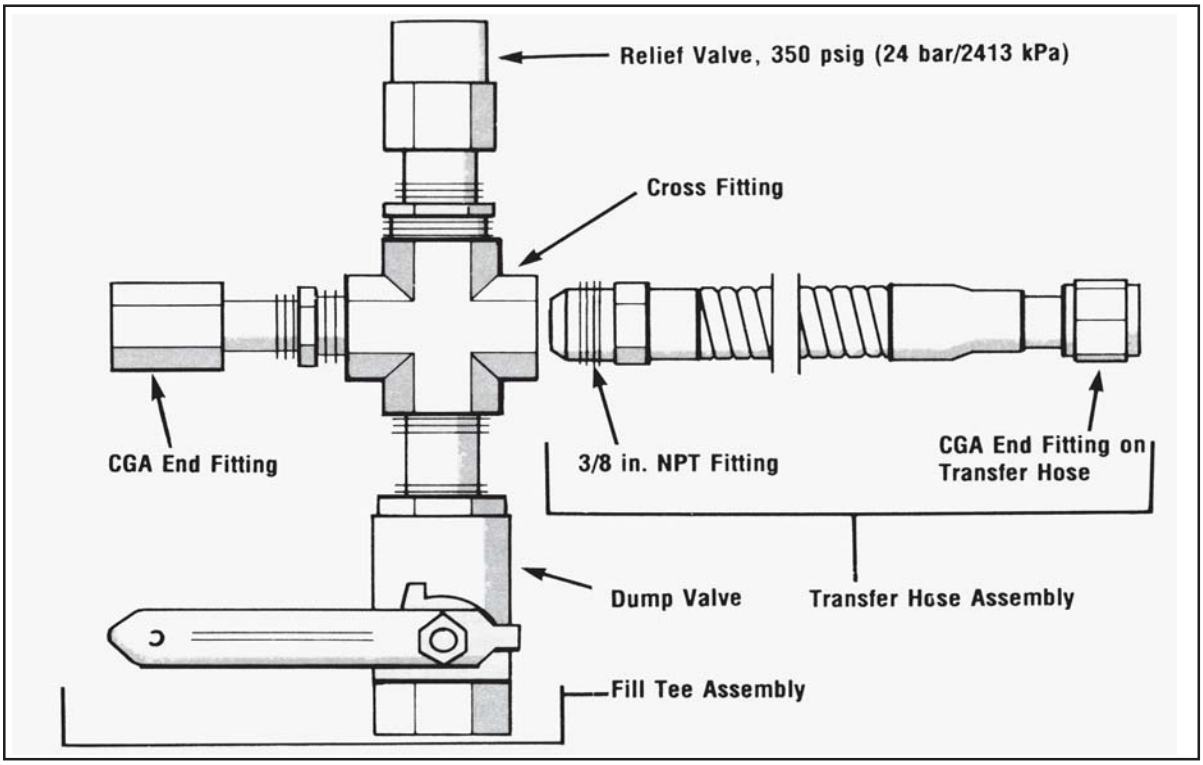


Pump Transfer Liquid Fill Through Vent Valve

Fill Hose Kits

Taylor-Wharton fill hose kits for the XL-65/65HP are designed to transfer specific liquefied gases to, or from, the containers. These accessories are comprised of a Fill Tee Assembly and a Fill Hose. Cryogenic transfer hoses are constructed of stainless steel for the transfer of cryogenic liquids, and are available in four of six-ft. (1.2 or 1.8 m) lengths with a 3/8 in. NPT fitting on one end and a CGA service-specific female fittings on the other. A Fill Tee Assembly consists of a cross fitting with a CGA end fitting, relief valve and manual dump valve.

Fill Hose Kits



In use, the CGA Tailpiece couples to the fill connection on the container being filled. The Relief Valve vents pressure over 350 psig (24 bar/2413 kPa) that builds up in the fill line due to trapped liquid. The Dump Valve is used to allow the operator to blow-don the receiving container during a pump fill, or to relieve residual pressure from expanding liquid trapped in the line before disconnecting the fill line.

Fill kits are available with different combinations of hose length and fittings for a specific gas service. The following chart identifies the available transfer hoses and fill tee assemblies.

TRANSFER HOSE CHART

Description (Service/Hose Length)	Cylinder Connections(s)	End Fittings	Part Number
Inert (N2,Ar) Service			
4 ft. (1.2 m) Stainless Steel	LIQUID or VENT Valve	CGA 295 to 3/8 in. NPT	1700-9C65
6 ft. (1.8 m) Stainless Steel	LIQUID or VENT Valve	CGA 295 to 3/8 in. NPT	1600-9C66
6 ft. (1.8 m) Stainless Steel	USE Valve	CGA 580 to 3/8 in. NPT	GL50-8C51
Oxygen Service			
6 ft. (1.8 m) Stainless Steel	LIQUID or VENT Valve	CGA 440 to 3/8 in. NPT	GL50-8C53
6 ft. (1.8 m) Stainless Steel	USE Valve	CGA 540 to 3/8 in. NPT	GL50-8C56
Carbon Dioxide Service			
6 ft. (1.8 m) Stainless Steel	LIQUID or USE Valve	CGA 320 to 3/8 in. NPT	HP50-8C51
4 ft. (1.2 m) Stainless Steel	VENT Valve	CGA 295 to 3/8 in. NPT	1700-9C65
6 ft. (1.8 m) Stainless Steel	VENT Valve	CGA 295 to 3/8 in. NPT	1600-9C66
Nitrous Oxide Service			
4 ft. (1.2 m) Stainless Steel	VENT Valve	CGA 295 to 3/8 in. NPT	1700-9C65
6 ft. (1.8 m) Stainless Steel	VENT Valve	CGA 295 to 3/8 in. NPT	1600-9C66

WARNING:
Never put any liquid cylinder into another service once it has been in CO_2 service.

VENT TEE CHART

The vent tee connects to a transfer hose to complete a fill line kit. Each assembly includes a 3/8 in. pipe connector to CGA fitting with a a 350 psig (24 bar/2413 kPa) relief valve, and a ball-type dump valve.

Service	CGA Connection	Part Number
Inert (N_2, Ar)	CGA 295	GL50-8c60

MAINTENANCE PROCEDURES

Read the Safety Precautions in the front of this manual before attempting any repairs on these containers. Also, follow these additional safety guidelines while performing container maintenance.

Never work on a pressurized container. Open the vent valve as a standard practice during maintenance to guard against pressure build up from residual liquid.

WARNING:
For O_2 System users: Residue of leak defectors solutions can be flammable. All surfaces to which the leak detector solutions have been applied must be adequately rinsed with potable water to remove all traces of residue. Reference CGA G-4. Section 4.9.

Use only repair parts cleaned for oxygen use. Be certain your tools are free of oil and grease. This is a good maintenance practice, and helps ensure you do not create a combustion hazard when working on containers for oxygen or nitrous oxide service.

Leak test connections after every repair. Pressurize the container with an appropriate inert gas for leak testing. Use only approved leak test solutions and follow the manufacturers recommendations. “Snoop” Liquid Leak Detector is one approved solution, it is available from: Nupro Co. 4800 E. 345th St., Willoughby, Ohio, 44094 U.S.A.

CONVERTING A CONTAINER TO A DIFFERENT GAS SERVICE

XL-65/65HP cylinders may be converted from one service to another within the confines of the argon, carbon dioxide, nitrogen, nitrous oxide, and oxygen service for which the containers are designed. Conversation consists of changing the end connections at the USE, LIQUID and VENT valves; then changing the liquid level gauge scale by changing its plastic cover; and revising product decals. Parts are available in kit form for each gas service as illustrated in the following table.

CAUTION:
Carbon dioxide may form into the solid phase (dry ice) if the pressure of liquid is allowed to drop below 70 psig (4.8 bar/483 kPa). Pressure in the container must be maintained above this value to ensure a solid block of CO_2 will not form inside of the container. Before performing maintenance on an XL-65HP in CO_2, the contents must be transferred to another container so that container pressure can be released.

Service Change Procedure

Before removing any parts, empty the container and open the vent valve to prevent any pressure build-up in the unit.

1. Remove the LIQUID, VENT and USE end fittings, one at a time, with standard wrenches. Install new fittings from the Gas Service Change kit, using Teflon tape or another oxygen-compatible thread sealant.

2. Remove the protective cover over the liquid level gauge. Replace the contents scale with the scale for the new gas service from the service change kit, then replace the protective cover.

CAUTION:
When changing gas service, install proper fittings – DO NOT use adapters. The following procedure address the physical changes to the container only. For detailed procedures on the decontamination of the container, itself, refer to CGA pamphlet C-10 "Changes of Service for Cylinders Including Procedures For Inspections and Contaminant Removal."

CAUTION:
Carbon dioxide and Nitrous Oxide may contain contaminants such as hydrocarbons, that are not easily removed from cylinders, an associated components by conventional oxygen service cleaning procedures. Once a cylinder is placed into CO_2 or N_2O gas service, it should never be converted to another gas service. See CGA pamphlet C-10 for proper procedures.

NOTE:
One clockwise turn of the adjustment will raise the setpoint by approximately 30 psig (2 bar/207 kPa). See the chart below to determine the range of adjustment for the regulator you are servicing. Do not attempt to set the regulator to a pressure outside of its design range.

3. Install new fittings for the USE, VENT and LIQUID connections form the Gas Service Change Kit. Leak test the fittings you just replaced, and change the gas service decals to complete the conversion.

GAS SERVICE CHANGE KITS

Kit Part No.	Gas Service	Valve Name	Connection Designation
GL50-8C35	Oxygen	LIQUID VENT USE	CGA 440 CGA 440 CGA 540
GL50-8C30	Inert (nitrogen or argon)	LIQUID VENT USE	CGA 295 CGA 295 CGA 580
HP50-8C30	Carbon Dioxide	LIQUID VENT USE	CGA 320 CGA 295 CGA 320
HP50-8C35	Nitrous Oxide	LIQUID VENT USE	CGA 326 CGA 295 CGA 326

REGULATOR MAINTENANCE

A dual stage, spring loaded regulator is employed for the pressure building/economizer circuit. This regulator can be adjusted on the container, replaced, or checked and adjusted off the container in a readily fabricated bench adjustment fixture.

Regulator Adjustment – On Container

1. Fill the container with the appropriate liquid product.
2. Open the Pressure Building Valve and allow the container pressure to stabilize for about an hour. Note the point where the pressure stabilizes.
3. Adjust the screw on the top of the regulator to raise of lower the pressure to the desired point. When decreasing the setting, the pressure building valve must be closed and the container vented to a lower pressure. Then repeat step 2 to observe the change.

REGULATOR ADJUSTMENT RANGES

Part No.	Normal Setting	Range
6999-9018	300 psig 20.7 bar 2068 kPa	200 to 350 psig 13.8 to 24.1 bar 1379 to 2413 kPa
6999-9015	125 psig 8.6 bar 862 kPa	75 to 175 psig 5 to 12 bar 517 to 1207 kPa

Regulator Removal or Replacement Procedure

1. Close manual Pressure Building Valve.
2. Vent the container to atmospheric pressure. [2]
3. Loosen and remove both the tube connections on the pressure building and economizer output sides on the regulator.
4. Remove the regulator from the container by unscrewing the valve body and elbow from the output of the Pressure Building Valve.
5. Repair the regulator and readjust its setpoint using the bench test setup.
6. To install a replacement or re-adjusted regulator, apply Teflon apply Teflon tape to the elbow on the container and thread the valve body onto the elbow.
7. Reconnect the tube connections to the regulator and tighten.
8. Pressurize the container and check it for leaks.

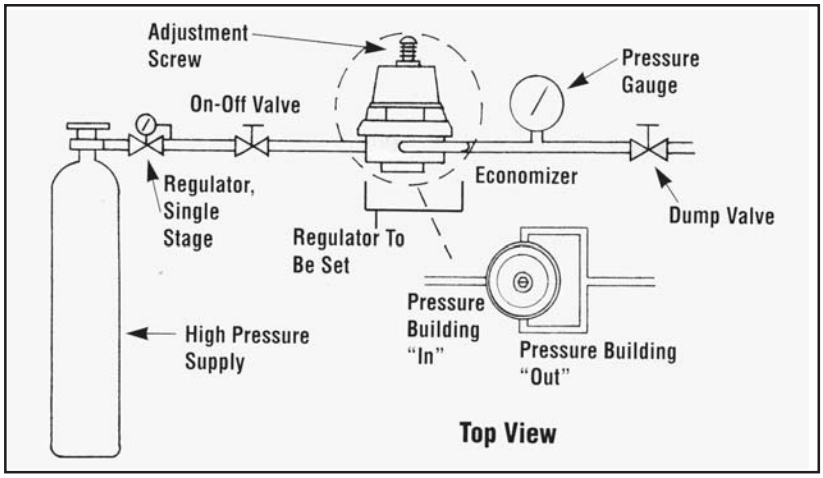
NOTE:
The regulator has directional gas flow. The arrow on the regulator body must point in direction indicated in the Bench Adjustment Fixture illustration.

Regulator Adjustment – Bench Procedure

Assemble the regulator adjustment fixture, and then the regulator to be adjusted, as shown in the accompanying illustration.

1. Leak test joints between the high pressure cylinder regulator and the dump valve. Joints must be leak free before proceeding.
2. Close the On/Off valve, and then the Dump Valve.
3. Slightly open the high pressure cylinder valve.
4. Set the high pressure regulator above the desired set point for the Pressure Building setpoint.
5. Slowly open the On/Off valve and observe the downstream pressure gauge.

Regulator Bench Adjustment Fixture



6. When the regulator under test closes, the P.B. set point may be read on the downstream pressure gauge.
7. Close the On/Off valve and open the Dump Valve.
8. To reset the regulator, loosen the lock nut on the adjusting screw. Raise the set point by turning the adjusting screw clockwise; lower the setpoint by turning the screw counterclockwise. After adjustment, repeat steps 5 & 6 to check the setting before reinstalling the regulator on the liquid container.

NOTE:
The economizer portion of the regulator will open approximately 20 psig (1.4 bar/138 kPa) higher than the pressure building setpoint.

[2] For units in CO_2 service, see caution for releasing pressure at the beginning of the Maintenance Section.

CHECKING CONTAINER PERFORMANCE

Cryogenic containers are two containers, one within the other. The space between the containers acts as a highly efficient thermal barrier including high technology insulation, a vacuum, and a vacuum maintenance system. Each serves a very important part in the useful life of the container. The high technology insulation is very effective in preventing radiated heat from entering the inner container. The vacuum prevents heat convection or conduction from reaching the inner container. Unfortunately, the prefect vacuum cannot be achieved since trace gas molecules being to enter the vacuum space from the moment of manufacture. The vacuum maintenance systems consists of materials which gather trace gas molecules from the vacuum space. The maintenance system can perform its function for years, but it has a limited capacity. When the vacuum maintenance system is saturated it can no longer maintain the vacuum integrity of the container. The change will be very gradual and may go unnoticed for several years. When the vacuum in the insulation space is no longer effective, the following symptoms may appear:

1. With liquid in the container and pressure building/vaporizer coil not in use, the outer casing will be much colder than comparative containers.
2. Frost, indicating the liquid level, may be visible on the outer casing of the container.
3. The container may appear to "sweat" if the air surrounding the container is hot and humid.
4. The relief valve will open continuously until the container is empty.
5. The container will hold pressure for several days but will not hold liquid.

NOTE:
Fill through the LIQUID valve with VENT valve open. The most Pressure Building valve must be closed during the NER test of P.B. operation will increase evaporation and invalidate test results.

NER Testing

If a loss of vacuum integrity is suspected, the container's Normal Evaporation Rate (NER) should be checked. The test measures the actual product lost over time so you can compare the results obtained to the NER value in the SPECIFICATIONS table. A test period of 48 hours is recommended, after the container is allowed to stabilize, but the formula given produces a Daily NER over any time period.

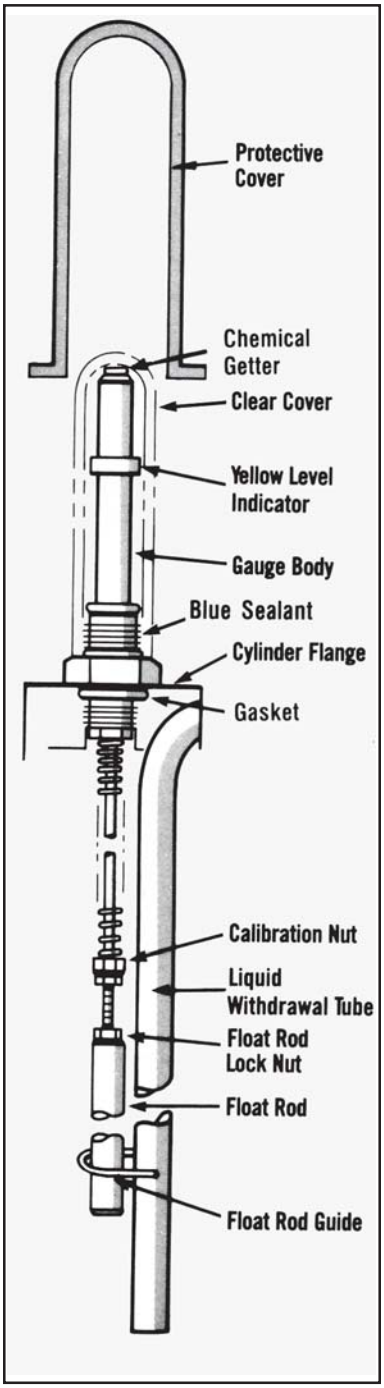
1. Fill the container with 125 pounds (57kg) liquid nitrogen.
2. Close the LIQUID valve and the PRESSURE BUILDING valve, leave the VENT valve open and allow it to remain open during the test.
3. Allow the container to stabilize for 24 hours, then reweigh it. Record the weight, time and date.
4. Reweigh 48 hours later. The test is more effective if container is not moved during this period.

The following calculation will provide the actual Normal Evaporation Rate in pounds-per-day. Daily normal evaporation is simply half the loss over 48 hours.

$$\text{Daily NER} = \frac{\text{Weight (Step 3)} - \text{Weight (Step 4)}}{\text{Time between Step 3 and Step 4 in hours}} \times 24$$

Compare the results of your test to the "as manufactured" NER value in the SPECIFICATIONS section of this manual. A container in service should maintain the NER value of less than two times the new specification. Any test result greater than two times the listed value is indicative of a failed, or failing vacuum. If NER is found to be high, contact Taylor-Wharton Customer Service at (334)443-8680 for disposition.

WARNING:
Cold surfaces should never be handled with bare skin. Use gloves and other protective clothing when performing this procedure.



Full View Contents Gauge

FULL VIEW CONTENTS GAUGE MAINTENANCE

The content of these containers is measured with the Full View Contents Gauge. The device consists of the gauge assembly beneath a clear plastic protective cover. When the gauge is assembled, a level indicator ring is magnetically coupled to the top of a float rod and moves up or down with the changing level of liquid in the container. The clear cover over the gauge body and level indicator is sealed at assembly to resist fogging of the gauge. This seal should never need to be broken.

Removing the Full View Contents Gauge

1. Vent all pressure from container[3].
2. Remove the protective cover by removing three bolts from the base of the cover.
3. Unscrew the gauge body using a wrench on hex fitting at base of the indicator.
4. Lift the entire gauge assembly free of the container. The gauge assembly is long and may be very cold. Gloves should be worn to protect your skin.

Calibration Procedure for Liquid Level Contents Gauges

1. You will need a column of water approximately 4 ft (1.2 m) tall. A clear plastic tube 2.0 in. (51 mm) dia with a cap glued to one of is perfect. Place an oxygen service contents scale sleeve (P/N GL50-9C43) over the sight tube.

2. Support the gauge assembly by holding the base of the indicator tube. Care must be taken to prevent interference with the spring action or from misaligning the scale sleeve. Immerse the aluminum float road below the water level as illustrated. The gauge assembly must be held vertically and the rode must not touch the side of bottom of the tube. The yellow level indicator of the gauge should indicate a full level reading with the oxygen scale.

   If the gauge fails to indicate a full liquid level, the assembly is to be removed from the water, calibrated and retested.

To change calibration, loosen locking nut away from brass calibration nut and turn the threaded rod with respect to the calibration nut.

If the rod is turned clockwise (to the left) with respect to calibration nut, the exposed portion of rod becomes longer and the gauge yellow band will be lowered.

To raise the yellow band, turn rod counterclockwise. The exposed portion of rod becomes shorter. Once you have adjusted calibration, recheck for proper setting. (See illustration.) After proper setting has been obtained, lock down nut against calibration unit.

3. Once the gauge assembly has been calibrated to read in full water, it must be verified that it reads empty when the aluminum float rod is suspended in the air. The yellow indicator must be as close to the bottom as possible (inner rod will be firmly bottomed out).

   If calibration is required to make the gauge read empty in air, it must be rechecked in water.

4. After calibration, you will need to follow contents gauge installation to reinsert gauge. Be sure to dry the assembly before reinserting into the cylinder to prevent ice build-up that could restrict movement or catch on the guide ring inside the cylinder.

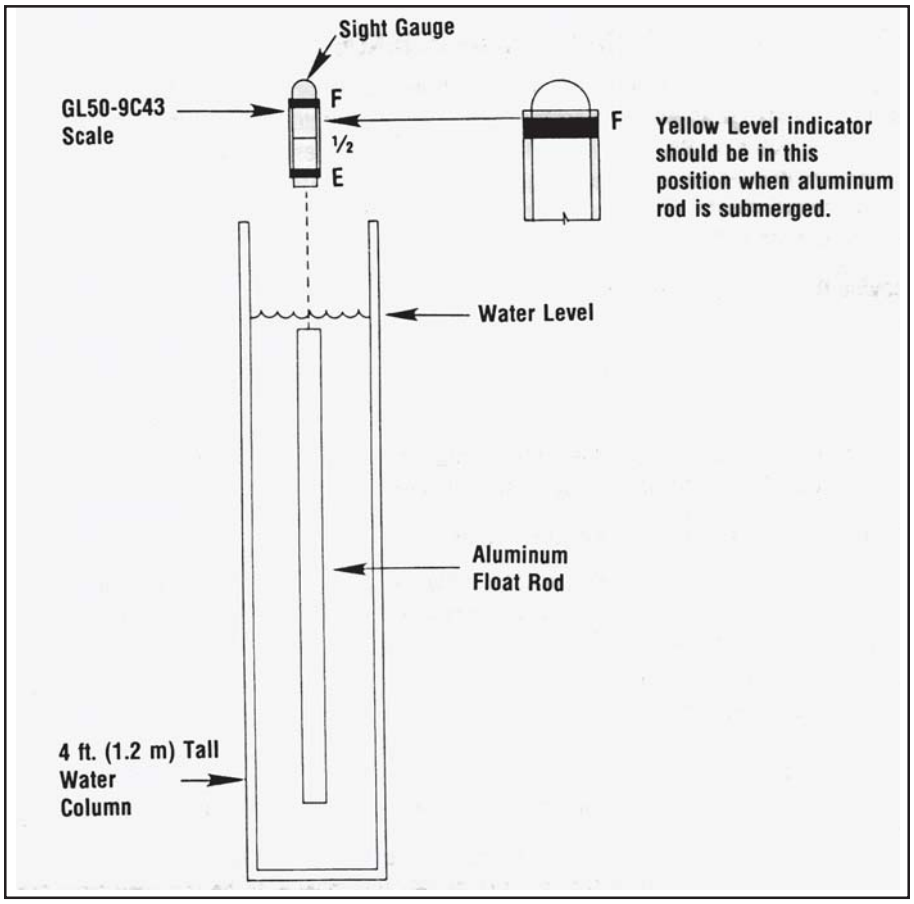
[3] For containers in CO_2 service, see caution on releasing container pressure at the beginning of the Maintenance section.

NOTE:
The yellow band will move approximately ¼ in. (6/4 mm) to each 10 turns on the rod.

NOTE:
Remember this procedure is performed with gauge in an upright (vertical) position.

NOTE:
Make sure that the Gauge Assembly is not bent or out of line before reinserting the gauge into the container.

Calibration for XL-65 and XL65HP



Contents Gauge Installation

Before installing a new or repaired gauge, inspect the gasket seals. If any damage is apparent, replace the gasket. (See following page for illustration.)

1. When inserting the gauge assembly, lower the float rod through the gauge opening until about 8 in. (203 mm) of the float rod remains above the container.

2. Grasp the clear cover portion of the gauge assembly with two fingers so that the assembly hangs free and “plumb.”

3. Lower the assembly about 4 in. (102 mm) slowly and try to keep the rod in the center of the threaded entrance hole as you do. If you are careful during this portion of insertion, you will drop the float rod straight through the guide ring inside the cylinder.

4. To confirm that the rod is correctly positioned in the cylinder, stop where you can still grasp the top of the rod (see illustration) and then try to swing the lower end from side to side.

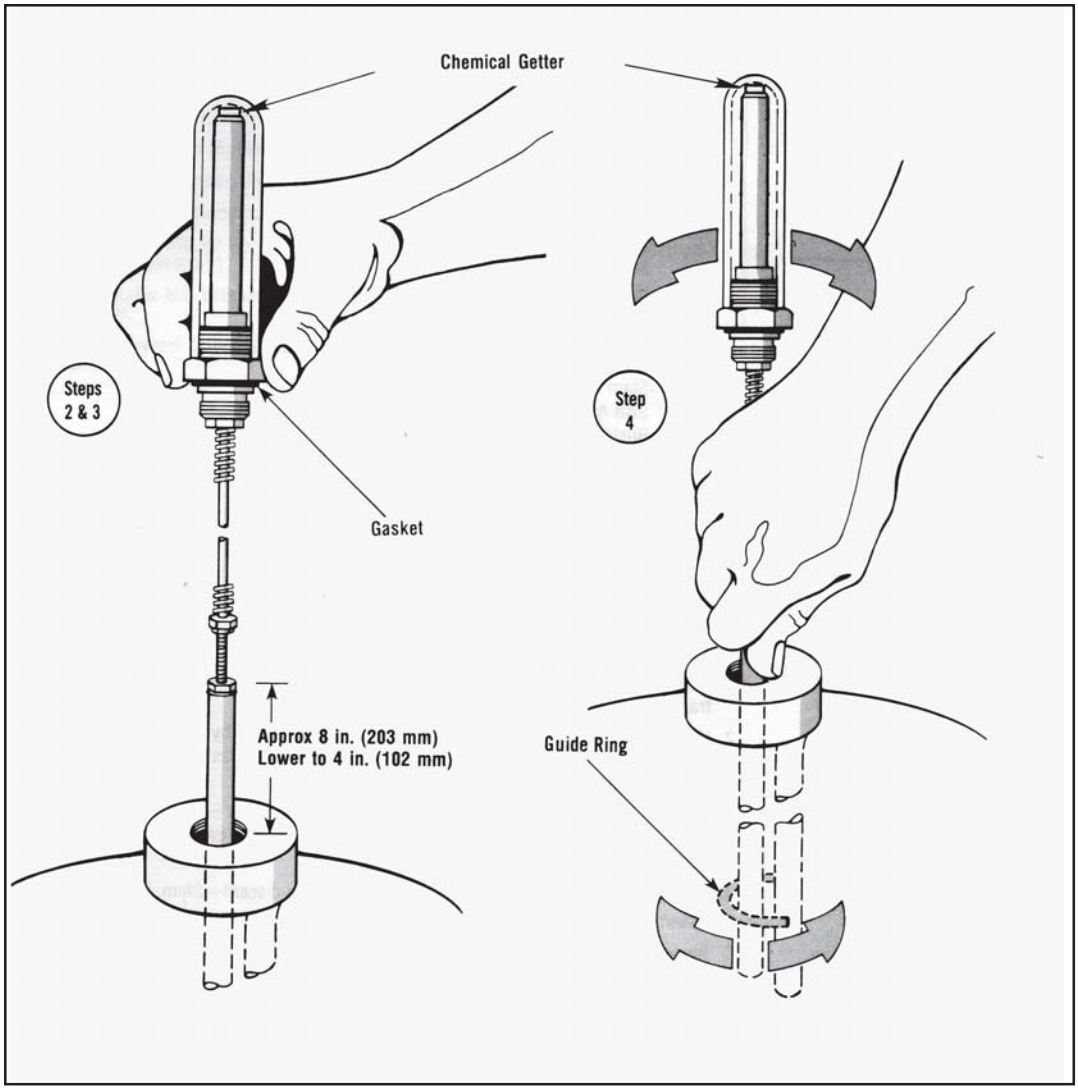
5. When the rod is engaged in the guide ring, the rod will be restricted to lower end movement of about ½ in. (12.7 mm); if you can feel greater movement, withdraw the rod to the point where its top is 8 in. (203 mm) above the gauge opening and try again.

CAUTION:
When installing the gauge assembly, care must be taken to ensure that the float rod is inserted through "guide ring" located on the liquid withdrawal line from inside the container. If the gauge does not engage this ring, the contents indication will be inaccurate, or the gauge may be damaged in use.

Contents Gauge Insertion

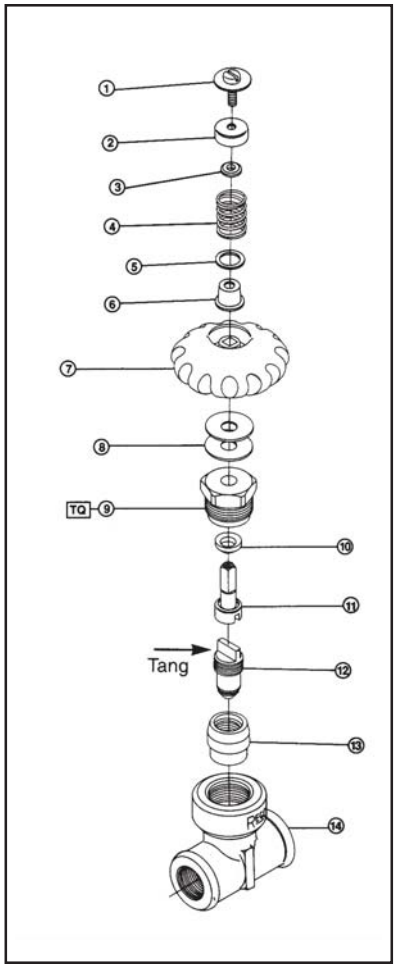
6. When you are satisfied that the float rod correctly installed, lower the assembly the rest of the way into the container until the top portion threads can be engaged.

7. Screw the gauge in place and hand torque to about 20 ft lbf (2.8 kgf m). Leak check the connection of gauge body to the flange.



HAND VALVE REPAIR

Hand valves are an integral par of the container and the valve bodies rarely need replacement. However, the handwheel and internal part of the valves are renewable. The illustration below are exploded views of the valves replaceable parts used on Taylor-Wharton liquid containers.



Hand Valve - Exploded View

Valve Repair Kit

Fits: 3/8 in. or ½ in. Rego Globe of 3/8 in. Sherwood Valves.

KIT PARTS - KIT P/N 1750-9C35

Item No.	Description	Qty.
1	Screw and Washer	1
2	Spring Retainer	1
3	Retainer Washer	1
4	Spring	1
5	Seal Washer	1
6	Seal	1
7	Handwheel	1
8	Bonnet Washer	2
9	Bonnet	1
10	Stem Gasket	1
11	Stem	1
12	Seat Assembly	1
13	Bushing	1
14	Body	*
TQ	Torque 80 ft. lbf (11 kgf m)	1

*Not available as a repair part

Valve Disassembly Instructions

1. Open valve by turning Handwheel counterclockwise as far as it will go to release any trapped gas in the system.

2. Using a screwdriver, remove Handwheel Screw and Washer by turning counterclockwise to allow removal of Spring Retainer, Washer, Spring, Seal Washer, Handwheel, and Bonnet Washers. Discard these parts.

3. Using the large adjustable wrench to hold valve body, remove Bonnet by turning counterclockwise with a 15/16 in. socket wrench that is capable of developing at least 80 ft lbf (11 kgf m) torque.

4. Remove the following parts from the valve body and discard – Stem, Stem Gasket, Seat Assembly and Bushing.

5. Inspect body and clean if necessary; be sure interior and seal areas are free from dirt, residue and foreign particles.

CAUTION:
Do not apply force after valve is fully open.

CAUTION:
Do not scratch or mar internal surfaces or valves.

Valve Replacement Instructions

CAUTION:
Hex section of Bonnet must be free of burrs or raised edges, and top of Bonnet must be absolutely flat to provide an effective seal with Bonnet gasket (8).

1. Partially thread Seat Assembly (12) (seat disc first) into large end of Bushing (13) leaving tan of nipple assembly exposed about 1/8 in. beyond top of Bushing.
2. Insert Seat Assembly (seat disc first) with attached Bushing, into valve body until properly seated.
3. Place Stem Gasket (10) carefully over Stem (11) cover side facing downward.
4. Inert slotted end of Stem into valve body, making sure that slot fully engages tang of Seat Assembly.
5. Place Bonnet over Stem while holding square end of Stem to keep it from turning, thread Bonnet (9) into valve body. Hold body with one wrench and using another wrench (15/16 in. socket), tighten Bonnet to 80 ft lbf (11 kgf m) torque.
6. Install Bonnet Washers over Stem on Bonnet.
7. Place Handwheel over Stem and on Bonnet.
8. Install Seal (6) over Stem into recess of Handwheel.
9. Install Seal Washer (5) over Seal at the bottom of Handwheel recess as shown.
10. With the flat side facing downward, place Retainer Washer (3) on top of Seal.
11. Align the holes of these parts and place Spring (4) over seat.
12. Place Spring Retainer (2) over assembly as shown, keeping center hole aligned with parts installed in steps 6-11.
13. Install Screw and Washer (1) over retainer. Tighten firmly with a screwdriver, turning clockwise.
14. Turn Handwheel completely clockwise to close valve. Re-pressurize container and leak check valve.

TROUBLESHOOTING

The following chart is provided to give you some guidance in determining the probable cause and suggested corrective action for some problems that may occur with cryogenic liquid containers. This chart is specifically tailored to your XL-65 or XL-65HP.

TROUBLESHOOTING CHART

Symptom	Possible Cause	Corrective Action
Consistently low operating pressure.	1. Relief valve open at low pressure. 2. Economizer side of P.B./Economizer Regulator stuck open. 3. Cold liquid.	1. Remove and replace relief valve. 2. Remove and replace regulator. 3. Open pressure building valve. With P.B. inoperative, the container will build pressure over time, or an external pressure source can be used to pressurize container.
No pressure shown on container pressure gauge.	1. Bad container pressure gauge. 2. Open inner container bursting disc. 3. Leaks in valves or plumbing. 4. Cold liquid.	1. Remove and replace bad gauge. 2. Remove and replace bursting disc. Pressurize container and check relief valve operation.[5] 3. Leak test and repair leaks. For valve repairs, see Maintenance section. 4. Open pressure building circuit.
No pressure showing but container is full by weight.	1. Pressure drop to below 70 psig (4.8 bar/483 kPa) has caused contents to freeze solid. Check pressure gauge ($C0_2$ only). 2. Broken pressure gauge. 3. Vent valve open/P.B. valve closed. 4. Faulty relief valve.	1. Re-pressurize with $C0_2$ gas and check for leaks. Repair leaks, re-pressurize to relief valve setting and allow to set until contents re-liquefy. 2. Replace pressure gauge. 3. Close vent valve, open P.B. valve. 4. Replace relief valve.
Container full by weight and Liquid Level Gauge but very low pressure	1. Liquid too cold. 2. Possible leak in vent valve. 3. Faulty relief valve.	1. Open P.B. valve or allow to stand. 2. Rebuild valve. 3. Replace valve.

[5] For containers in $C0_2$ service, see caution on releasing container pressure at the beginning of the Maintenance section.

TROUBLESHOOTING CHART

Symptom	Possible Cause	Corrective Action
Container is cold and may have ice or frost on outer casing. Will not hold liquid overnight. Relief valve is venting gas.	1. Vacuum loss. Check NER. 2. Defective P.B./Economizer regulator.	1. Consult with Taylor-Wharton for course of action. Do not attempt to put additional liquid in container. 2. Look for P.B. coil pattern in ice. Close P.B. valve. Replace or reset regulator.
Ice formation on bottom of container when P.B. valve is closed.	1. Pressure building valve not closing properly. 2. Leak in pressure building system topworks.	1. Replace or rebuild valve. 2. Leak test piping connections and tighten fittings if needed.
Container vents through relief valve when in use.	Pressure Building/ Economizer Regulator set above relief valve setting. Economizer side of regulator clogged or stuck open.	Remove and reset or replace regulator.
Container vents after fill but quits after awhile.	This may be caused by residual heat vaporizing some liquid inside container and is a normal condition.	Symptom should go away once container reaches operating temperature and the liquid reaches its saturation point at container operating pressure.
Container vents gas continuously through relief valve.	Heat leak may be too great.	Perform container performance evaluation test per Maintenance section to determine if container vacuum is adequate.
Level indicator stuck 1/2 full. Yellow indicator ring will not move.	Float rod stuck on or in float rod guide.	Reinstall. See Contents Gauge Installation.
Level indicator at bottom of gauge. Container full of product.	Indicator disengaged from gauge rod. Caused by dropping the container.	Recouple indicator using engagement ring.

REPLACEMENT PARTS

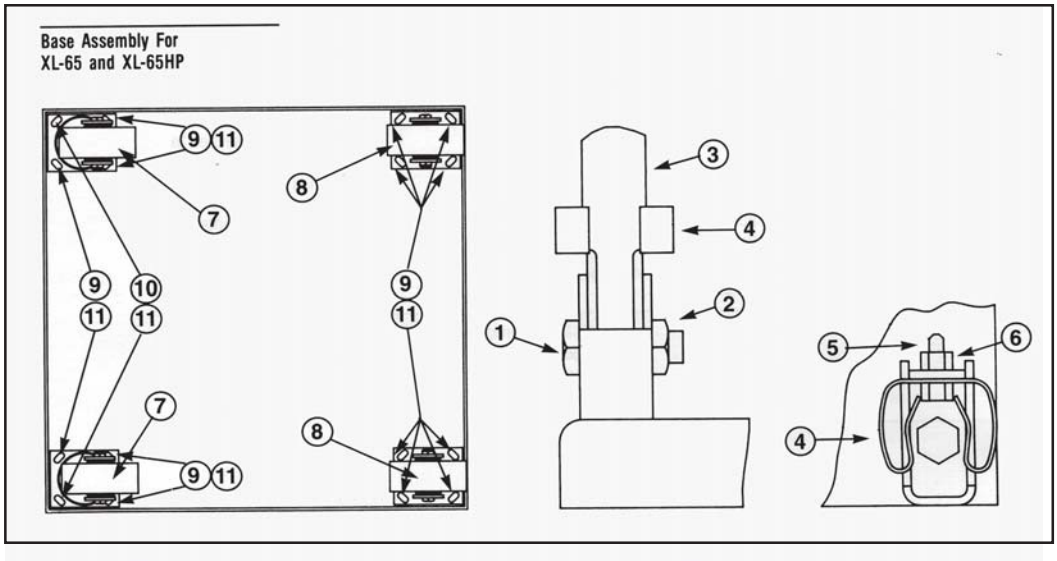
This replacement parts list includes a recommended inventory quantity which allows you to order parts on a timely basis to keep all your XL-65/65HP containers in service. When placing orders, please use the nomenclature and part numbers in this section and send written orders to:

Taylor-Wharton
4075 Hamilton Blvd.
Theodore, AL 36590
USA

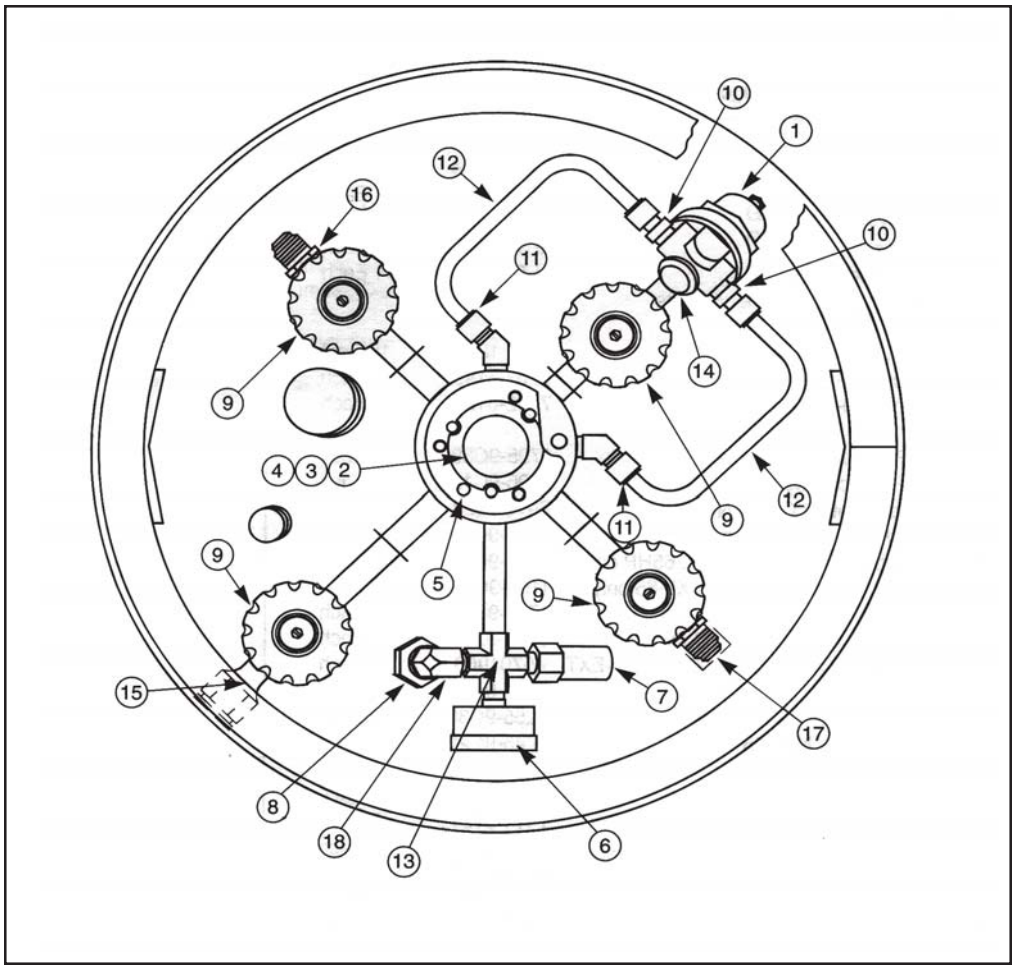
Fax: (334)443-2209
Call: (334)443-8680
1-800-898-2657 in U.S.A and Canada

Item No.	Description	Part No.	Recommended For 10 Units
1.	Capscrew, Hex Head S.S. ½ in.	6164-1753	10 each
2.	Hex Nut, Nylon Insert	6331-1183	10 each
3.	Handle XL-65	XL65-9C31	1 each
4.	Spring Clip Holder, Vinyl Coating	8958-0138	4 each
5.	Screw Mach. S.S.Hex Head ½ in.	6160-4752	10 each
6.	Self-Locking Hex Nut, S.S.	6368-2024	10 each
7.	Caster, Swivel 5 in. Dia Wheel C.S.	7300-8088	5 each
	Caster, Swivel 5 in. Dia Wheel S.S.	7300-8083	5 each
	*Caster Swivel 4 in. Dia Wheel C.S.	7300-9016	5 each
	*Caster Swivel 4 in. Dia Wheel S.S.	7300-8079	5 each
8.	Caster, Rigid 5 in. Dia Wheel C.S.	7300-8089	5 each
	Caster, Rigid 5 in. Dia Wheel S.S.	7300-8082	5 each
9.	Carriage Bolt S.S. 1.25 in. lg	6160-4762	10 each
10.	Hex Head, Capscrew 1.0 in. lg	6134-1133	10 each
11.	Elastic Stop Nut S.S.	6311-1042	10 each

* Used on the 5 caster base model



Component Locations for XL-65 and XL-65HP



ACCESSORIES

Accessories available for use with Taylor-Wharton XL Series containers are:

- Manifolds, Automatic and Manual
- Vaporizers adding up to 250 cfh (6.6 cu.m/h) each
- Transfer Hoses (O_2, N_2, AR, CO_2 and N_20)
- Fill Tee Assemblies
- Container Hand Trucks
- Cryogenic Phase Separators

For additional information concerning the accessory of your choice, please consult the separate manuals on accessories or call Taylor-Wharton.

Index No.	Description	Part No.	Recommended For 10 Units
1.	Dual Regulator, Pressure Building/Economizer 300 psig (20.9 bar/2068 kPa)	6999-9018	2 Each
	Dual Regulator, Alternate, Pressure Building/Economizer 125 psig (8.6 bar/862 kPa) - Not available for $C0_2$ service	6999-9015	2 Each
2.	Gasket, Glass Filled Teflon, Contents Gauge (Not Shown)	7701-0083	5 Each
3.	Contents Gauge Assembly (Includes Gauge and Spring)	GL50-9C40	1 Each
	* Float Rod	XL65-9C65	1 Each
4.	Contents Gauge Cover, Protective Clear	GL50-9C04	4 Each
	Contents Gauge Cover, Nitrogen	GL50-9C15	4 Each
	Contents Gauge Cover, Oxygen	GL50-9C16	4 Each
	Contents Gauge Cover, Argon	GL50-9C17	4 Each
	Contents Gauge Cover, Carbon Dioxide (Use GL50-9C04 for nitrous oxide with the contents scale HP50-9C44.)	GL50-9C18	4 Each
5.	Screw, Brass 1/4 in. - 20 UNC x 5/8 in.	6114-1087	10 Each
6.	Gauge, Pressure 0-400 psig (0-28 bar/0-2758 kPa)	7702-6196	2 Each
	Gauge, Pressure 0-600 psig (0-41 bar/0-4137 kPa)	7702-6197	2 Each
7.	Relief Valve		
	350 psig (24 bar/2413 kPa) - not for $C0_2$ or N_20	1705-9C39	5 Each
	350 psig (24 bar/2413 kPa) - for $C0_2$ or N_20	1706-9C12	5 Each
	**22 psig (1.5 bar/152 kPa) - not for $C0_2$ or N_20	6913-6223	5 Each
	**230 psig (16 bar/1586 kPa) - not for $C0_2$ or N_20	1700-9C39	5 Each
8.	Safety Head 525 psig (36 bar/3620 kPa)	1705-9C12	2 Each
	Safety Head 360 psig (24.8 bar/2482 kPa) - for XL-65 only	1190-9C21	2 Each
9.	Valve Repair Kit	1750-9C35	3 Each
10.	Elbow, Male, Brass 45° 3/8 in. ODT-comp x 1/4 in.	6814-9233	2 Each
11.	Connector, Male, Brass, 3/8 in. ODT-comp x 1/4 in. NPT-EXT	4570-1960	2 Each
12.	Tube, P.B./Economizer Line	GL45-9C20	2 Each
13.	Cross, Brass	GL55-9C30	2 Each
14.	Elbow, Male, 3/8 in. NPT x 1/4 in. NPT 45°	GL45-9C22	2 Each
End Fittings for Hand Valves			
15.	–USE (CGA 540) –oxygen	7114-0163	5 Each
	–USE (CGA 580) –argon/nitrogen	7114-0164	5 Each
	–USE (CGA 320) –carbon dioxide	7114-0181	5 Each
	–USE (CGA 326) –nitrous oxide	7114-0195	5 Each
16.	–LIQUID (CGA 440) –oxygen	6514-8992	5 Each
	–LIQUID (CGA 295) –argon/nitrogen	7355-4712	5 Each
	–LIQUID (CGA 320) –carbon dioxide	7114-0181	10 Each
	–LIQUID (CGA 326) –nitrous oxide	7114-0195	10 Each

Index No.	Description	Recommended Part No.	For 10 Units
17.	– VENT (CGA 440) – oxygen	6514-8992	5 Each
	– VENT (CGA 295) – argon/nitrogen	7355-4712	5 Each
	– VENT (CGA 295) – carbon dioxide	7355-4712	5 Each
	– VENT (CGA 295) – nitrous oxide	7355-4712	5 Each
*	Decal, Carbon Dioxide	GL55-9C54	A/R
*	Decal, Nitrogen	GL55-9C51	A/R
*	Decal, Oxygen	GL55-9C52	A/R
*	Decal, Argon	GL55-9C53	A/R
*	Decal, Nitrous Oxide	GL55-9C55	A/R
*	Decal, Warning	1700-9C07	4 Each
*	Decal, UN Number, Nitrogen	GL55-9C63	A/R
*	Decal, UN Number, Oxygen	GL55-9C64	A/R
*	Decal, UN Number, Argon	GL55-9C65	A/R
*	Decal, UN Number, Carbon Dioxide	GL55-9C66	A/R
18.	Elbow	6814-3998	2 Each

* Not illustrated.
** Optional/Not illustrated