Taylor-Wharton Harsco

INSTRUCTIONS FOR

XL-70 PB-CE, XL-120-CE, XL-120 PB-CE, XL-160-CE, XL-180/20-CE, XL-180/26-CE, XL-180/26 PB-CE, XL-240-CE, XL-240 PB-CE

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 this instructions, contact your supplier for further information.

Contents

1. Container safety

Pressure Hazard – The containers covered by this literature contain liquefied gas under pressure. 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 build up 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 cover your skin when handling the container or transferring liquid, or in any instance where the possibility of contact with liquid, cold pipes, 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 liquid is extremely cold and will be at temperatures below minus 184°C under normal atmospheric pressure.

Keep Equipment Well Ventilated – Although 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 can cause dizziness, unconsciousness, or even death. These gases cannot be detected by the human senses and will be inhaled normally as if they were air. Ensure there is adequate ventilation where these gases are used and store liquid containers outdoors or only in a well ventilated area.

Replacement Parts Must be Clean to Prevent Contamination – Use only Taylor-Wharton recommended spare parts, and be certain parts used are properly cleaned to prevent contamination of stored product. For information on cleaning, consult the Compressed Gas Association (CGA) pamphlet[1] G-4.1, “Cleaning for Oxygen Service” or equivalent industrial cleaning specifications.

Install Relief Valves in Cryogenic Liquid Lines – When installing or fill hose assemblies, make certain a suitable safety relief valves 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.

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 Compress Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

And to
-Accident-prevention-rule VBG 17 - pressure-gas "
-Accident-prevention-rule VBG 61 - gas "

Both publications are published from the main-association of the industrial occupation-cooperative and are available at the Carl Heymann publishing house, Köln/Berlin.

2. Product description

XL-70 - XL-240 are vacuum-isolated containers, designed for the storage and the transportation of cryogenic liquid nitrogen. The containers are approved acc. to the European Directive for portable pressure vessels TPED, 1999 / 36 / EC

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 service ability.

3. Specification

Model	XL-70PB-CE	XL-120-CE / XL-120 PB-CE	XL-160-CE	XL180/20-CE	XL-180/26 – CE / XL-180/26 PB – CE	XL-240-CE / XL-240 PB-CE
Dimensions						
Diameter	508 mm	508 mm	508 mm	508mm	660 mm	660 mm
Height	1065 mm	1300 mm	1464 mm	1280 mm	1200 mm	1510 mm
Gross Capacity	70 l	126 l	163 l	186 l	189 l	250 l
Net Capacity	67 l	120 l	160 l	180 l	181 l	240 l
Weight						
Empty	71 kg	82 kg	104 kg	115 kg	116 kg	137 kg
Full with LN_2	125 kg	179 kg	234 kg	260 kg	263 kg	332 kg
Nominal Evaporation Rate*						
[% of Net capacity/day]	3,1 %	2,2 %	1,5 %	1,3 %	1,4 %	1,4 %
Relief valve setting	1,5 barg	1,5 barg	1,5 barg	1,5 barg	1,5 barg	1,5 barg
Inner vessel burst disc	12 barg	12 barg	12 barg	12 barg	12 barg	12 barg
Setting of pressure building regulator (PB version only)	1,0 barg	1,0 barg	--	--	1,0 barg	1,0 barg

Specifications are subject to change without notice. *Vented N.E.R. based on Useable Liquid Capacity

4. Handling The Container

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

When fully loaded, the XL in nitrogen service will contain up to 195 kg (XL240PB). While moving a full container, you may be handling up to 332 kg, and you should treat the load accordingly. The attachment points provided on the XL-160/XL-180 will allow you to use a hand truck, or 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 store the unit in a vertical or upright position.
When loading or unloading the container from a truck, use a lift gate, a crane, or a parallel loading dock. Never attempt to manually lift from 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 support posts, and use a portable lifting device that will handle the weight of the container.

5. Safety devices

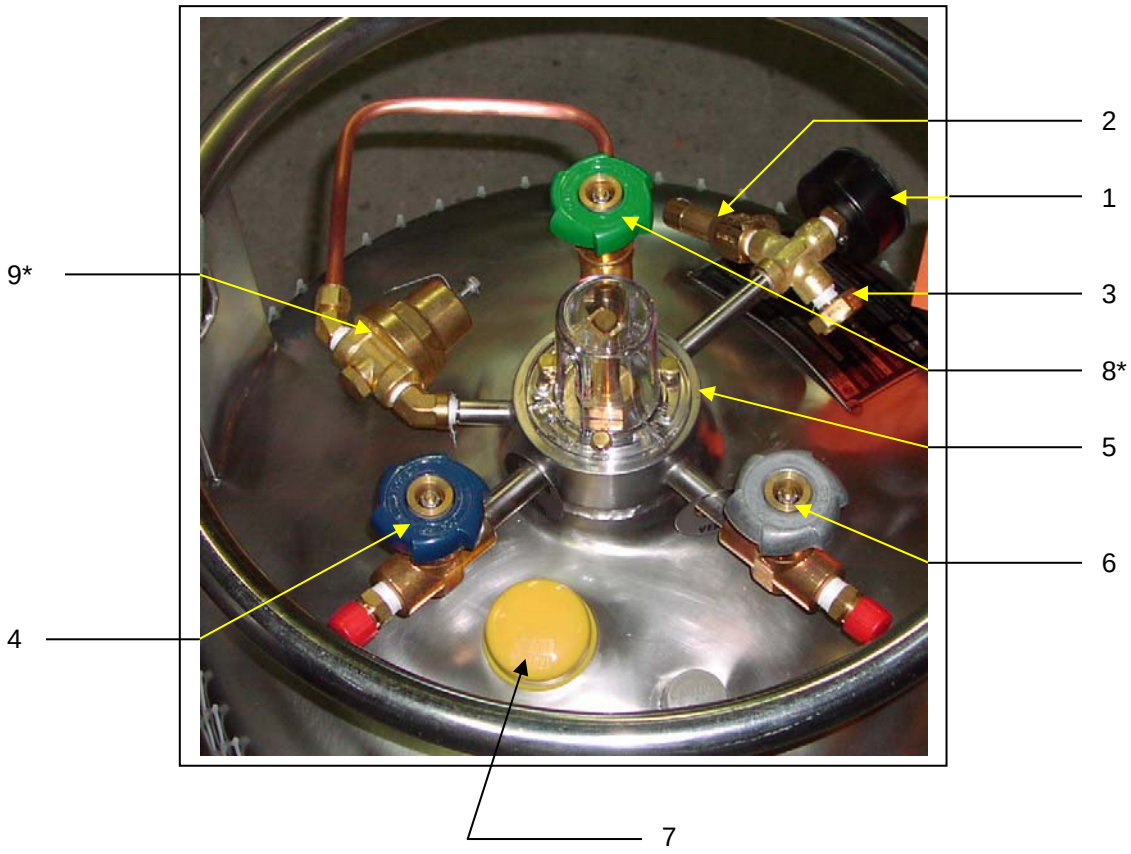
The XL - units are equipped with three safety devices:

1. Relief valve, set at 1,5 barg
2. Inner vessel bursting disc, set at 12 barg
3. Vacuum bursting disc, set at approximately 1,3 barg, protects the outer vessel against overpressure. This bursting disc is covered by a protection-cap.

6. Operation

The model numbers of these XL- units indicate their respective liquid storage capacities in litres of product. The cylinders are designed for liquid nitrogen service only. The following component and circuit descriptions are pertinent to these containers and should be read before attempting operation. The components may be identified on the Component Location illustration.

Component Description



1. Pressure gauge
2. Relief valve
3. Inner container bursting disc
4. Liquid Fill and Withdrawal Valve (blue hand wheel)
5. Liquid level gauge
6. Vent valve (grey hand wheel)
7. Bursting disc
8. Valve Pressure Building Circuit (green hand wheel)
9. Pressure Building Regulator

* Pressure Building Components only for units with Option PB

7. Component Description

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 connections. The valve is opened for fill or liquid withdrawal after connecting a transfer hose with compatible fittings. The containers contain liquefied gas under pressure. Sudden release of this pressure may cause personal injury by issuing cold gas or liquid, or by expelling parts during servicing

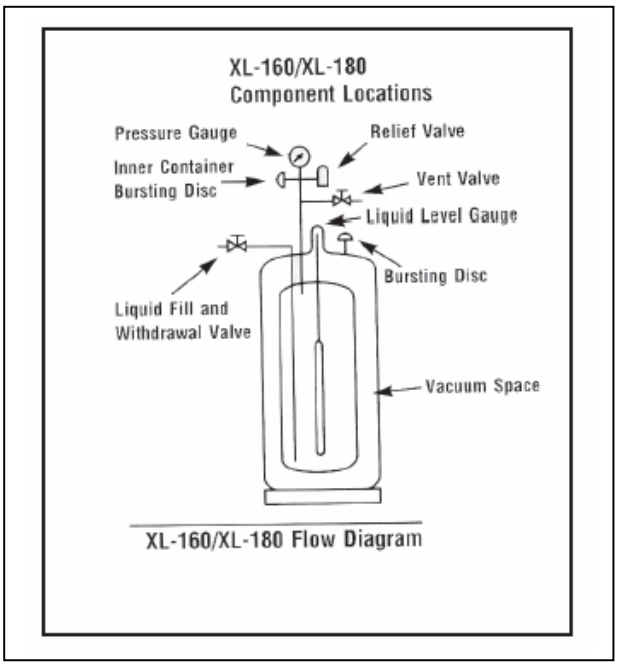
The Pressure Gauge – The pressure gauge displays the internal container pressure in bar or in kPa.

The Vent Valve - This valve controls a line into the headspace of the container. It is used during the fill process. The VENT valve is opened to vent the headspace area while liquid is entering the inner container during a pressure transfer fill through the LIQUID valve.

The Contents Gauge - The container contents gauge is a float type liquid level sensor that indicates container liquid content through a magnetic coupling to an indicator band. This gauge is an indication of approximate container contents only and should not be used for filling. If the level indicator does not move when container is filled, it may indicate that the magnetic field between the level indicator and the gauge has been uncoupled. The level indicator should recouple itself as the container is emptied.

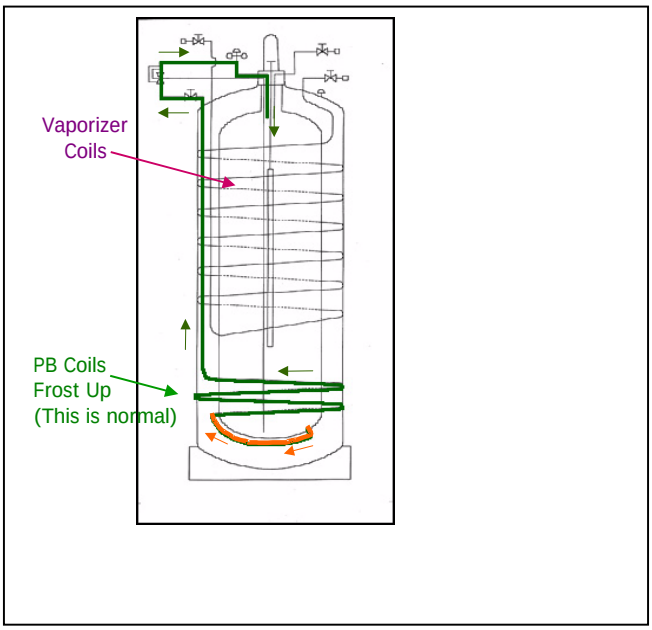
Relief Devices - These cylinders have inner container relief valves set at 1.5 barg /152kPa) and inner container bursting disc that will rupture at 12 bar.

Flow diagram XL



1. Pressure gauge
2. Relief valve
3. Inner container bursting disc
4. Liquid Fill and Withdrawal Valve
5. Liquid level gauge
6. Vent valve
7. Bursting disc

8. Pressure Building Valve – An automatic pressure building circuit is featured by the units with option PB. This circuit is used to provide sufficient driving pressure above the liquid in the container during high withdrawal periods. The pressure building (P.B.) function is actuated by opening the P.B. hand valve to create a path from the liquid in the bottom of the container to the gas space in the top. When the P.B. valve is open, and the container pressure is below the pressure-building regulator setting (0,9 – 1,2 barg) liquid taken from the inner container is vaporized in a heat exchanger, which is between the inner and outer casing. The resulting gas is fed into the upper section of the inner container to build pressure. When the pressure in the container is above the P.B. regulator setting the regulator closes and the circuit is inoperative.

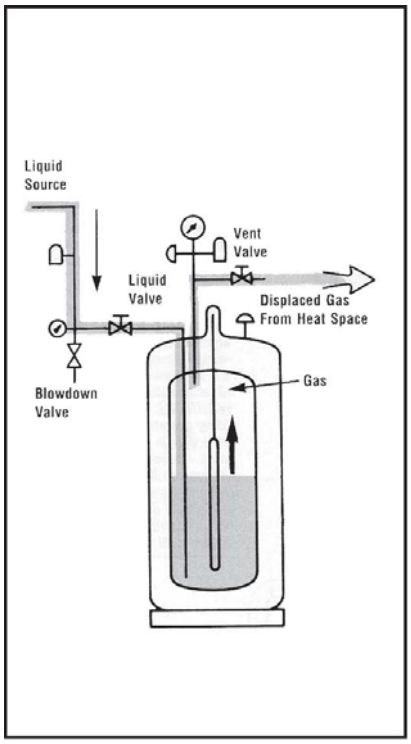


Flow diagram PB (Example)

9. Filling the Container

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

Filling the Container by Pressure Transfer



1. Visually inspect the container. Do not attempt to fill containers that have broken or missing components.
2. Connect a transfer hose to the LIQUID fittings from A low-pressure source of liquid, and close the Pressure Building Valve.
3. Open the supply valve. Then, on the XL, open the LIQUID and VENT valves to begin the fill.
4. When liquid begins to spit from the VENT valve, quickly close the LIQUID valve and then the VENT valve. Both Valves must be closed before the container relief valve opens.
5. Open the dump valve on fills line assembly to vent the fill line assembly.
6. Disconnect the fill line from the container.

CAUTION: To avoid contamination, close the LIQUID valve before disconnecting the transfer line.

Filling the Container by Weight of Contents

Using the procedures below, first determine the proper filled weight of each container. The weight derived is then used in the filling procedure that follows.

1. Visually inspect the container. Do not attempt to fill containers that have broken or missing components.
2. Move the container to a filling station scale and weigh 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 the desired filling weight, the transfer line weight, and the Tare Weight from the container's data plate.
4. Once you have determined the proper fill weight for the container, connect a transfer hose to the LIQUID fitting from low-pressure source of liquid.
5. Open the supply valve. Then, on the XL open the LIQUID and VENT valves to begin the fill.
6. During the fill, monitor the container pressure and maintain a pressure of 10-15 psig (0.7 - 1bar / 69-103 kPa) by throttling the VENT valve.
7. When full weight is reached, close both the LIQUID and the VENT valves.
8. Close the liquid supply valve and open the dump valve on the fill line assembly.
9. Disconnect the fill line from the container and remove the container from the scale.

CAUTION: To avoid contamination, close the LIQUID valve before disconnecting the transfer line.

NOTE: The fill weight calculation includes the weight of residual liquid. The weights shown in the Specifications are for liquid saturated at atmospheric pressure. The actual fill weight for your application depends on the saturation temperature of liquid in your storage tank, and may be determined by weighing.

10. Withdrawing Liquid From The Container

To use the container in liquid delivery service, 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 container pressure and the saturation temperature of the liquid. With liquid saturated at 1.5 bar/152 kPa withdrawal rate of up to 6 litres/min can be obtained.

11. Maintenance

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.
- **Use only repair parts for oxygen service.** Be certain your tools are free of oil and grease. This is a good maintenance practice and helps ensure you do not introduce any contaminants to the plumbing of the container.
- **Leak test connections after every repair.** Pressurize the container with an appropriate inert gas for leak testing. Use only approved leak test solutions.

12. 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, 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 or solid conduction from entering the container; the vacuum prevents heat convection from reaching the stored product. Unfortunately, the perfect vacuum cannot be achieved since trace gas molecules begin to enter the vacuum space from the moment of manufacture. The vacuum maintenance system consists of materials, which gather gas molecules from the vacuum space. The maintenance system can perform its function for years, but 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. When the container is filled with liquid, the outer casing will be much colder than normal.
2. The container may appear to “sweat” if the air surrounding the container is hot and humid.
3. The relief valve will open continuously until the container is empty.
4. The container will hold pressure for several days, but will not hold liquid

13. 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 150 pounds (68 kg) of liquid nitrogen.
2. Close the LIQUID valve, open the VENT valve and allow it to remain open during the test.
3. Allow the container to stabilize for 24 hours, and then weigh it. Record the weight, time and date.
4. Reweigh after the recommended 48 hours. The test if most effective if the container is not moved during this period, and if conducted in an area where ambient temperatures are consistent.
   The following calculation will provide the actual Normal Evaporation Rate.

   Daily NER = Weight Loss (Step 3-Step4) x 24 hours elapsed time (Hrs.)

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 an 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 or your distributor.

14. HAND VALVE REPAIR

The valves used on the XL's are soldered to the tank. In case of leakages we recommend to replace the internal parts of the valve by using a valve repair kit.

WARNING:

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

15. Accessories

Trolley	Trolley for XL-160-CE, XL-180/20-CE
1700-9C65	Withdrawal hose 1,2 m
1600-9C66	Withdrawal hose 1,8 m
1193-8C80	Phase separator, large

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