

# LACO TECHNOLOGIES

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## USER MANUAL



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DRY ICE TRAPS

# CONTACT US

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## 1. SCOPE

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This manual contains operation, cleaning and maintenance information for LACO dry ice traps. Our traps are designed to ensure safety when used properly. It is the responsibility of the user to follow safety-related warnings, cautions, notes, and other requirements described in this manual.

## 2. SAFETY

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**CAUTION** Dry ice gives off a significant amount of colorless and odorless carbon dioxide gas which is heavier than air causing it to sink to low areas, replacing breathable oxygen. This could cause suffocation and therefore should only be used in a well ventilated room.

**CAUTION** Carbon dioxide gas will expand in the chamber and thus the top acrylic cover must be able to move freely. Do not clamp or lay anything on top of this lid.

**CAUTION** Dry ice sublimates (solid into gas) at roughly a rate of 5 to 10 lbs every 24 hours and therefore should be purchased and used only when needed.

**CAUTION** Isopropyl alcohol is a flammable, colorless liquid. Please keep away from open flame, heated surfaces, some plastic surfaces, and rubber coatings.

## 3. OVERVIEW

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Water or other chemicals can shorten the life of a vacuum pump or limit its ability to reach its ultimate vacuum. The LACO Technologies Dry Ice Trap is used to condense and trap condensable vapors before they reach the vacuum pump.

The Dry Ice Trap contains a mixture of alcohol and dry ice that is combined in a small cooling container called the “cold well”. Placed inside a vacuum trap, the contents of the cold well can easily reach a temperature of -100°F, freezing many condensable gases that pass by it. As condensable gases flow by the cold well, they freeze and stick to the side of the well thus protecting the vacuum pump. See Table 1 for a list of common chemicals and their estimated vapor pressures.

### 3.1 DRY ICE TRAP FEATURES

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An acrylic cover is provided to monitor the dry ice/alcohol slurry. An additional outer acrylic ring is provided to view the accumulation of the trapped frozen gas on the outside surface of the cold well. The shell of the vacuum chamber has been electro-polished to ensure maximum vacuum performance and to enable easy clean up. The chamber is equipped with NW flanges for quick connecting to a vacuum pump and the vacuum

system. These flanges are offset to enable the gas to flow around the greatest amount of surface area for maximum pump protection.

### 3.2 LYOPHILIZATION

The LACO Dry Ice Trap can also be used in lyophilization, or what is commonly known as freeze drying. The trap would typically be used in the sublimation stage where ice is removed from a product and then condensed on the cold well. In this stage, a vacuum pump is connected to the dry ice trap, which is in turn connected to the lyophilizer. As the lyophilizer heats up slightly during this stage, ice is turned to vapor which flows downstream where it is caught by the trap, thus protecting the vacuum pump. Because the LACO Dry Ice Trap is much colder than the cold surfaces typically used in lyophilizers, the LACO trap provides a more efficient way to condense gases.

*Table 1: Common Solvents\**

SOLVENT	EST. VAPOR PRESSURE (TORR) @ -75°C
Water	.001
Acetone	.5
Methanol	.3
Isopropyl Alcohol	.1

*\*The data contained in this table is meant to provide general guidance on the use of the dry ice trap with common solvents. It is not to be relied upon for making any calculations.*

## 4. BASIC OPERATION

### 4.1 OPERATING A DRY ICE TRAP

1. Connect the vacuum pump and pumping chamber to the dry ice trap as shown below.
2. Add roughly 5 lbs (2.3 kg) of dry ice to the 3.5 quart (3.3 L) cold well. The dry ice should be crushed into small cubes.
3. Add approximately 2 pints (946.4 ml) Isopropyl alcohol. This should be enough to safely fill the majority of the cold well.

For the best slurry consistency, use Isopropyl alcohol of at least 90% strength. Do not use any other liquid such as acetone, methanol, water, or similar products. Initially, the dry ice/alcohol mixture will give off significant amounts of carbon dioxide gas and will eventually become a slurry that should typically last eight hours, depending on the length of trap operation and gas load quantity.

LACO recommends that the cold well be at least  $\frac{3}{4}$  full at all times to produce the best trapping results. The contents of the mixture can be viewed through the clear acrylic cover. Additional dry ice and alcohol can

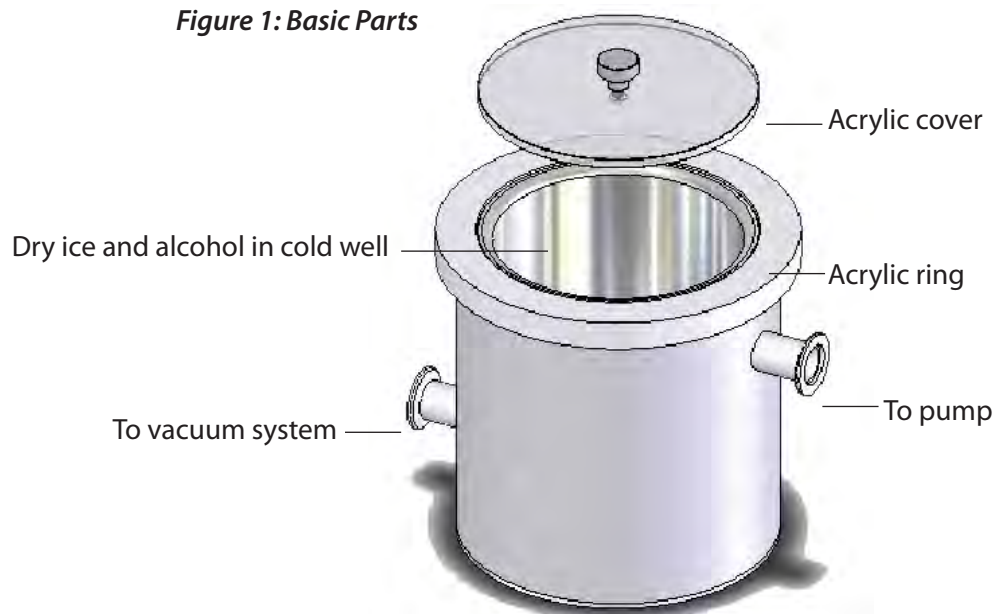
be added at any time. To increase the longevity of the slurry, do not remove the acrylic cover. As mentioned, the acrylic cover should be free to move.

For best trapping results, the dry ice/alcohol combination should be added to the dry ice trap and allowed to mix for a few minutes before the vacuum pump is turned on. This will allow the dry ice trap to become very cold.

**NOTE** Do not allow trap to warm up while pumping as this will cause contaminants to warm up, evaporate, or sublime and in turn contaminate the pump.

## 4.2 BASIC PARTS

*Figure 1: Basic Parts*



## 5. CLEANING

The operator can view the contaminants through the top of the large acrylic ring. Cleaning should occur as required or if a reduction in trap performance is noted. In addition, the trap should be cleaned between each slurry batch. The chamber shell, ports, and cold well are all stainless steel and can be cleaned easily with a water-dampened cloth or other compatible chemicals. Do not clean the cold well unless it has warmed to room temperature.

### To clean the Dry Ice Trap:

1. Turn off the vacuum pump and allow the Dry Ice Trap to come to atmospheric pressure by opening a venting valve.
2. Remove the center well from the chamber and dispose of the slurry
3. Allow the well come reach room temperature, then wipe down with water-damp cloth as noted above. (Most of the contaminants will melt off after reaching a sufficient temperature.)

4. Wipe the outside of the cold well to achieve its original sheen. Mild soap with water can also be used, but should be rinsed with clean or de-ionized water.

To clean the acrylic lid:

1. Use only a damp or dry cloth.
2. Do not use solvents on the acrylic lids.

To clean o-rings:

1. O-rings may occasionally require cleaning. Remove o-rings completely and wipe them down with a dry or damp cloth.
2. Apply a small amount of vacuum grease to the entire surface of the o-ring.
3. Remove excess with a lint-free cloth.

**NOTE** Do not use abrasive cleaners on any part.

## 6. MAINTENANCE

Centering rings on NW flanges should be periodically checked for cracks. Aluminum clamps should be tight to eliminate the possibility of leaks. Chamber and lid o-rings should be replaced at the first sign of wear.

**Table 2: Recommended Spare Parts List**

ITEM	PART NUMBER	DESCRIPTION
1	LMOR-443V70	Viton O-Ring (between Acrylic Ring and Shell)
2	LMOR-438V70	Viton O-Ring (between Acrylic Ring and Cold Well)
3	LMSA92068	Acrylic Cover Assembly
4	LMSA91174	Acrylic Ring

**Table 3: Accessories**

ITEM	PART NUMBER	DESCRIPTION
5	LVFGN25SV	Centering Ring, NW25
6	LVFCN25A	Clamp, NW25, Aluminum
7	LVODC150	Vacuum Grease

For additional accessories, please refer to [www.lacotech.com](http://www.lacotech.com) or contact a LACO sales representative.