

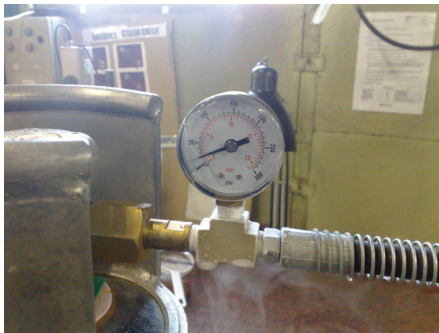
Dry Ice Maker

OPERATING INSTRUCTIONS

Important: This machine can only be used with a liquid CO₂ cylinder equipped with a built in siphon tube. When ordering CO₂ be certain to **get liquid CO₂ with a siphon**.



1. Firmly connect machine hose to CO₂ cylinder. Use plastic washer supplied for inside of hexagonal nut that attaches to cylinder.



2. Ensure nothing obstructs flow of CO₂ through hose. Attach end of hose firmly to top fitting on Dry Ice Machine.
3. Open CO₂ cylinder valve **no more than 1-2 small divisions** on inner scale (0-20) of gauge. This gives maximum number of ice blocks and does not waste CO₂. Be sure vapour escaping from vents of machine does not carry snow solids. If there are, close down valve slightly. After ice builds up in machine, speed up process by opening the valve another degree or two. If needle reaches 10 on inner scale turn valve off.



4. **Vapour will discharge through vertical filter slots as dry ice block is forming.** When vapour discharges from space between lid and body of machine (and sound changes), the dry ice block is formed. Immediately close cylinder valve.

The first 1-2 blocks will take slightly longer to process because the box and feed pipe are being cooled to proper temperature. Time then becomes shorter to produce additional blocks.



5. Open dry ice block machine by loosening latches and folding down sides. Remove block for use or storage. **Caution: always wear protective gloves** when handling dry ice; **can cause burns and frostbite**. Blocks can be stored in Dilvac Dewar Flasks.

- During and after making dry ice block, handle feed hose carefully. Hose will appear white and is frozen. If bent, pulled or twisted hose can be damaged or broken.

WARNING

- Gaseous CO₂ vapours can cause suffocation. Use machine only in well ventilated areas.
- Disconnect feed hose of machine from cylinder **when not in use**. Store cylinder indoors or in shade, away from any heat source. (See Helpful Information below)
- Use machine only on **level supporting surface** during operation. Never allow machine to hang from feed hose.
- Use safety glasses.
- Use cryogenic approved safety gloves.

| SPECIFICATIONS | MODEL A |
|---|----------------|
| Dimensions of dry ice | 80 x 110 x 180 |
| Weight of dry ice block | 1Kg ± 10% |
| Yield from 34Kg liquid CO ₂ cylinder at room temperature.* | 5 –6 blocks† |
| Total weight of dry ice | 6Kg ± 10%† |

* A 34Kg CO₂ cylinder at room temperature will contain approximately 30Kg of useable liquid CO₂, the balance is vapor which does not convert to solid dry ice. † Yield can be appreciably increased at lower temperatures i.e. @ 0°C approximately 1/3 more blocks will be produced.

HELPFUL INFORMATION

Conversion Weight: The usual 34Kg liquid CO₂ cylinder actually contains only 30Kg of liquid CO₂, the remaining 4Kg is vapour gas which **does not convert to solid dry ice**.

Weight Checks: Empty cylinder weight (Tare) is stamped on shoulder of cylinder below threaded fitting. Cylinder should read 65Kg ±1Kg Gas and filled should weigh 99Kg ±1Kg.

| TEMPERATURE | LIQUID CO ₂ | VAPOUR |
|-------------|------------------------|--------|
| 16°C | 72% | 28% |
| 21°C | 70% | 30% |
| 27°C | 61% | 39% |
| 31°C | 0% | 100% |

Above 31.1°C (the critical temperature) only vapour exists in the cylinder and no additional dry ice will be formed.

Storage: If possible, CO₂ cylinder, dry ice machine and feed pipe should be kept in a low temperature environment up to time of usage. This will increase the yield of dry ice.

Making Dry Ice from Liquid CO₂: Converting liquid CO₂ to solid dry ice blocks is accomplished by utilizing **Adiabatic Expansion Principle** (The Joule Thompson Effect).

When liquid CO₂ is released from cylinder through the supply valve and feed tube, it leaves at an environmental pressure of 838 PSI and is forced through the tube into the ice making unit, which is at atmospheric pressure.

It then vaporizes and expands to form snow which packs onto retaining walls lined with specialized filter pads whilst CO₂ gas escapes through ports and filters. The machine fills with dry ice within 1-2 minutes. The colder the components, the shorter the fill time.

At 21°C and 775-800PSI, the method described is 26.15% efficient. At 0°C and 290PSI efficiency is increased to 39%. The lower the temperature, the greater the yield of dry ice.