I N S T R U C T I O N S

Bel-Art SP SCIENCEWARE™

Frigimat® EZ Dry Ice Maker

Catalog No. H38878-0010

WARNING

Because of the pressures and temperatures involved when working with liquid and/or solid carbon dioxide (CO_2), always wear safety glasses and insulated gloves. Do not tamper with the inlet or relief valve. Return the unit to the factory for any repairs other than replacing the O-rings or filter. The units are factory set for the greatest efficiency and safety.

INTRODUCTION

Although the operation of the Frigimat® EZ Dry Ice Maker is standardized, each unit will exhibit certain individual characteristics in use. It is important to recognize these individual characteristics and note them in order that all personnel may use the instrument with equal ease and convenience.

For example, the inlet valve, which controls the entrance of liquid CO_2, may perform most efficiently at some particular setting (1/4 open, 1/8 open, etc.). The average

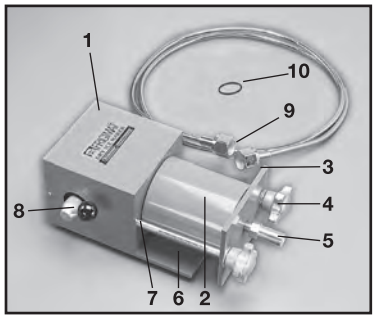
filling time of the unit at that particular setting should be noted. The unit should not be stored in excessively warm areas, nor should the CO_2 cylinders.

Please review the information in this brochure for assurance of satisfactory

performance and convenience when using the Frigimat® EZ Dry Ice Maker.

NOTE:

When ordering cylinders of CO_2 from your supplier, specify cylinders equipped with a dip tube. These cylinders can be used in an upright position. If the cylinder does not have a dip tube, lay the cylinder on its side with the valve lower than the cylinder.



INSTRUCTIONS

The Frigimat® Dry Ice Maker is shipped completely assembled, however before attempting to operate the unit, it is advisable to recheck the assembly as follows:

To Disassemble:

Loosen the two clamping knobs (4); slide the front end plate (3) foward, and then remove the dry ice chamber with O-rings (2).

To Reassemble:

A. Place the chamber (2) on the base (6) between the clamping screws rods (7) making sure that contact is made with O-rings.

B. Slide the front end plate (3) against the dry ice chamber (2).

C. Make Sure that the slide hole in the relief valve (5) faces downward.

D. Tighten the two clamping knobs (4).

OPERATION:

A. Attach one end of the pigtail assembly (connecting tube) to the inlet connector (1) on the side of the dry ice maker using a coupling (9) and Washer (10). Tighten with a wrench.

B. Attach the other ends in the same manner to the CO_2 cylinder and tighten with a wrench. Note: On Europeon and Japanese models, connect the end marked CO_2

C. Close the inlet valve (8) on the Frigimat® Dry Ice Maker. Then open the valve on the CO_2 cylinder and check for leaks at the two connections.

D. Move the inlet valve handle (8) approximately 1/8 to 1/4 turn counterclockwise. Liqiud CO_2 will then enter the dry ice maker and vaporize. There will be an escape of gas around the inlet valve handle and inlet tube. This is normal and is no cause for concern. In about 1 to 2 minutes, the volume of gas escaping will diminish, indicating that the dry ice chamber is full.

E. Turn the inlet handle (8) clockwise to shut off the CO_2.

F. Allow a few seconds for venting excess gas. Dissasemble dry ice chamber as described and remove dry ice block from the chamber.

PRINCIPLES OF OPERATION:

The Frigimat® Dry Ice Maker utilizes the Joule-Thomson effect to produce solid CO_2 from liquid CO_2. The liquid CO_2 enters the cavity through a valve and orifice. It reaches the valve at cylinder pressure, which is in excess of 850 psi, and is then allowed to vaporize at essentially atmospheric pressure. The chamber and body and entire system are cooled by the vaporizing CO_2. The expanded cold gas is exhausted around the external portion of the orifice and throttling valve to further cool the incoming liquid. The result is a progressive chilling of both the incoming liquid and the dry ice maker until a temperature is reached at which the incoming liquid is directly converted to hard-packed carbon dioxide snow. As more liquid is frozen, the snow is compressed inside the chamber to produce the solid dry ice cake.

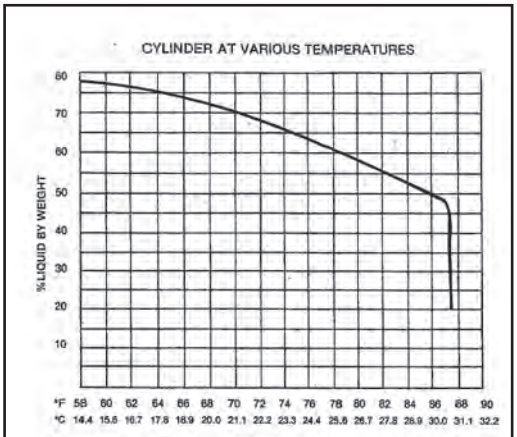
VARIATIONS OF LIQUID CONTENT IN CO_2:

When CO_2 cylinders are filled with gas, the cylinder pressure is maintained at between 700 and 850 psi. Under this pressure, approximately 30 percent of the cylinder volume is filled with gas while the remainder contains liquid.

The Frigimat® EZ Dry Ice Maker will produce dry ice only from liquid CO_2. The amount of dry ice which can be made is a function of the amount of liquid present in the cylinder. This in turn, is a function of the temperature of the cylinder.

A cooler cylinder contains more liquid and thus can produce more dry ice. As the

following chart indicates at 60°F (15.6°C) approximately 77% by weight of the CO_2 is liquid. At 70°F (21°C) liquid content has decreased to 70%, while at 80°F (26.7°C) it is only 58%. If the temperature of the cylinder is above 88°F (31°C), the critical temperature, only gas is present and dry ice cannot be made.



PARTS LIST FOR FRIGIMAT® DRY ICE MAKER

NUMBER	DESCRIPTION
93887-8602	Aluminum Long Barrel Chamber
90378-0607	Relief Valve
93887-8610	Cylinder Valve S/A
99919-0250	Pigtail Assembly, Chrome-plated (USA)
90378-0620	Pigtail Assembly, Chrome-plated (Europe)
90378-0823	Pigtail Assembly, Chrome-plated (Japan)
99919-0280	Washer for Pigtail Assembly
93887-8606	Filter
99932-0420	O-ring

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