Laboratory Equipment Manufacturer
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Operation Manual for
Liquid Nitrogen Biological Containers
CRY/CRYC-Series

PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

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To Users

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Dear Users,

Thank you for your confidence in our company and for your purchasing the liquid nitrogen biological containers made by us.

Before you use these containers, you must carefully read this operation manual and operate them strictly according to the requirements described in the manual.

Thank you for your cooperation.

Contents

1. General

The liquid nitrogen container is widely used with liquid nitrogen (-196℃) as its refrigerant in the fields of animal husbandry, medicine and scientific research for transportation and storage of the frozen sperm, vaccine , cell and micro-organism as well as used in the departments of national defense, machinery building, medical treatment, electronics, metallurgy and energy.

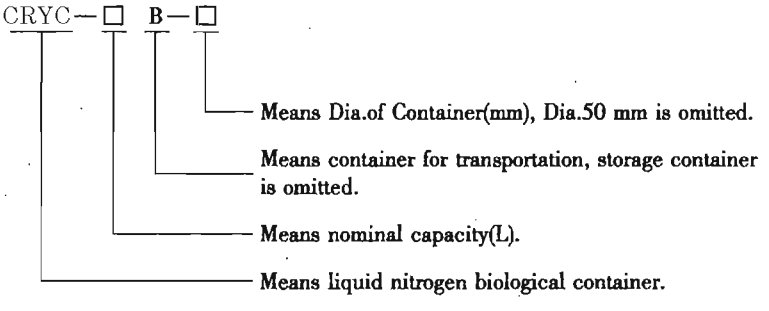
We warmly welcome customers from home and abroad to use our products .

2. Terminology (abstracted from GB/T5458-1997)

No.	Terminology	Definition	Unit
1	Geometric Volume	Volume of space defined by the geometric size of the inside wall of the inner vessel (excluding that of neck tube)	L
2	Caliber	Inside diameter of neck tube	mm
3	Outside Diameter	Outside diameter of outer shell (Excluding the rib)	mm
4	Height	Maximum axial length of the shell (excluding the plug and canister)	mm
5	Empty Weight	Weight of container with plug at the ambient temperature (without canister)	kg
6	Evaporation Period of Static Liquid Nitrogen	Days for the thorough evaporation of the statically stored liquid nitrogen in the fully re-filled container after being pre-cooled by liquid nitrogen and reaching its thermal balance (without canister)	d

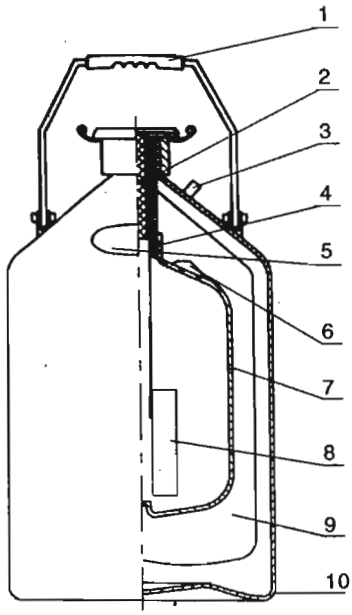
3. Instruction for Container Model

(in accordance with the standard GB/T5458-1997 "Liquid Nitrogen Biological Containers")



For example: CRYC-30 means the liquid nitrogen biological container with a nominal volume of 30L and a caliber of 50-mm, CRYC-50B-80 means the liquid nitrogen biological transporting container with a nominal of 50-L and a caliber of 80-mm.

4. Diagram of Container



1-Handle
2-Plug
3-Evacuating Nozzle
4-Neck Tube
5-Nameplate
6-Adsorbent
7-Inner Vessel
8-Canister
9-Multi-layer Insulation
10-Outer Shell

5. Main structure and Feature:

The container is mainly composed of outer shell, inner vessel, neck tube, multi-layer insulation and canister, etc. (For illustration, see the diagram in 4)

1) The outer shell and inner vessel are made of the aluminum alloy plate featuring light weight, high cryogenic strength and corrosion resistance.

2) The neck tube is made of glass-fiber reinforced plastics featuring high mechanical strength and low heat conductivity.

3) The multi-layer insulation is composed of the reflecting screen of aluminum foils with high reflectivity and insulation material with low heat

Specifications and Parameters of Storage Containers (Table 1)

Model	Geometric Volume (L)	Caliber (mm)	Outside Diameter (mm)	Height (mm)	Empty Weight (kg)	Static Holding Time (Day)	Canister		
							Qty	Caliber	Height
			≤			≥	mm		
CRYC-1-30	1	30	180	320	2.0	15	1	26	120
CRYC-2-30	2	30	217	365	2.9	30	3	19	120
CRYC-3	3.15	50	224	425	3.4	30	6	38	120
CRYC-6	6	50	287	445	5.0	60	6	38	120
CRYC-10	10	50	303	530	6.2	100	6	38	120
CRYC-10A	11	50	287	615	6.8	110	6	38	120/276
CRYC-15	16	50	355	600	8.2	155	6	38	120
CRYC-16	17	50	355	620	8.8	165	6	38	120/276
CRYC-20	20	50	409	655	11.4	202	6	38	120/276
CRYC-26	26	50	409	700	12.5	244	6	38	120/276
CRYC-30	31.5	50	446	670	12.6	295	6	38	120/276
CRYC-30-125	31.5	125	446	690	14.0	106	6	97	120/276
CRYC-35	35.5	50	473	670	14.5	308	6	38	120/276
CRYC-35-125	35.5	125	473	690	15.5	116	6	97	120/276
CRYC-35-200	35.5	200	473	675	15.7	63	/	/	/
CRYC-47-127	47	127	500	710	19.0	139	6	103	120/276
							7	82×84	300
CRYC-65-216	65	216	573	730	27.5	79	5	142×144	285
CRYC-120-216	121	216	573	1020	43.0	132	5	142×144	563
CRYC-175-216	175	216	676	1060	54.5	192	7	142×144	563

"A" means the high-efficiency container with added dimensions and long evaporation time of static liquid nitrogen.

Specifications and Parameter of Transporting Container (Table 2)

Model	Geometric Volume (L)	Caliber (mm)	Outside Diameter (mm)	Height (mm)	Empty Weight (kg)	Static Holding Time (D)	Canister		
							Qty	Caliber	Height
			≤			≥	mm		
CRYC-10B	10	50	303	570	6.8	55	6	38	120
CRYC-16B	17	50	355	655	9.1	94	6	38	120/276
CRYC-20B	20	50	409	695	12.5	110	6	38	120/276
CRYC-26B	26	50	409	725	12.8	134	6	38	120/276
CRYC-30B	31.5	50	446	690	13.3	159	6	38	120/276
CRYC-30B-80	31.5	80	446	705	13.8	119	6	63	120/276
CRYC-35B	35.5	50	473	705	14.3	179	6	38	120/276
CRYC-35B-125	35.5	125	473	730	16.4	91	6	97	120/276
CRYC-50B	50	50	500	805	20.7	252	6	38	120/276
CRYC-50B-80	50	80	500	805	21.4	189	6	63	120/276
CRYC-50B-125	50	125	500	805	21.5	129	6	97	120/276
CRYC-50B-200	50	200	500	800	22.0	77	/	/	/

"B" means the container with support on the bottom or the sides of the inner vessel, which doesn't fall down easily and enjoys long-transportation life.

conductivity and low gas-passing speed to reduce heat radiation.

4) The jacket between the outer shell and inner vessel is of high vacuum to prevent thermal convection. Moreover, an adsorbent with a high adsorbing capacity at the cryogenic temperature is used to ensure the long-term stable and reliable performance of the container.

6. Varieties, Specifications and Performance Parameters (see Table 1 & 2)

7. Operation

1) Before using the container, users should open the cases to check the outward appearance. If any defect is found on it, the material supply & marketing department of our company should be informed within 5 days of receiving the container. Then the sales agency or department shall solve the problem in accordance with the related clauses in the agreement.

2) The Nitrogen Biological Containers

are made of two categories—the storage container and the transporting container. The storage container is mainly used indoor for the static storage of frozen goods and nitrogen. It is prohibited to use the storage container for transporting. The transporting container with special anti-vibration design is used not only for indoor static storage of liquid nitrogen but also for transportation of liquid, but no bumping or sever vibration is permitted.

3) The container is specially designed for storing or transporting liquid nitrogen at the temperature of -10 ~ 40℃, so it is strictly prohibited to be filled with liquid oxygen.

4) New containers or de-frosted containers must be pre-cooled to reach the thermal balance (with no violent vaporization) before they are filled with liquid nitrogen. During filling liquid nitrogen, the pump or long-tube funnel is preferred for this purpose. The filling tube should reach near the bottom of the container with a gap left at the container

mouth as an outlet for gaseous nitrogen. The height of liquid nitrogen level filled in mustn't be higher than bottom of the neck tube. During the operation, caution must be taken against the contact of human body with the liquid nitrogen to avoid cold injuries.

5) Within 2 ~3 hours after the frozen goods are put into the container for the first time, a special person must be designated by the user to regularly observe whether there is condensed water or frost on the outer shell. If there is condensed water or frost, it means that the vacuum of the container has been deteriorated, which will cause liquid nitrogen to evaporate completely in a very short time. In this case, the container can't work normally. The possibility of this kind of phenomenon is small. It may be caused by the improper loading or unloading or transporting of the container. However, in order to avoid the loss of frozen matters, this kind of observation is very necessary.

6) The containers must be placed in a cool, ventilated and dry area. They must be checked to see if any frost or condensed water exists on the liquid level of nitrogen and the outer surface of the container during long-period storage.

7) The quantity of liquid nitrogen stored in the container may be measured by weighing or by inserting a thin wooden or bamboo stick into the container to see the height of its frosted part (i.e. the level of liquid nitrogen). It is prohibited to insert any hollow pipe into the container to prevent the liquid nitrogen from squirting out. During the operation, attention must be paid to making up liquid nitrogen in the container in time. The height of liquid mustn't be higher than the bottom of the neck tube. In the operation, putting in and taking out the frozen matters must be conducted gently and carefully.

The following table shows the relation between the level and volume of liquid nitrogen in the container (only for reference).

Liquid Level Table

Model	Liquid Level(cm)				
	Full (100%)	3/4 (75%)	1/2 (50%)	1/4 (25%)	L/cm
CRYC-1-30	11	8.1	5.6	3.1	0.11
CRYC-3	21	15.1	10.4	5.7	0.16
CRYC-10	27.5	19.4	13.5	7.6	0.39
CRYC-15	29.0	21.0	14.2	7.6	0.615
CRYC-20	31.6	22.5	16.0	9.3	0.788
CRYC-30	34.0	25.2	17.0	8.8	0.96
CRYC-30B	34.0	25.2	17.0	8.8	0.96
CRYC-35	36.6	25.1	18.3	10.4	1.157
CRYC-47-127	40.0	29.3	20.1	11.1	1.38
CRYC-50B	42.8	30.9	21.5	12.1	1.38

8) If it is necessary to clean the containers, the cleaning must be done with a neutral detergent and then the cleaned container must be rinsed with warm water at a temperature not higher than 40℃. After cleaning, the inner vessel must be dried (preferably by blowing warm gas at a temperature not higher than 40℃) and cooled to the ambient temperature before filling liquid nitrogen.

9) The neck tube is the channel for liquid nitrogen and frozen matters and must be carefully protected. No scratch on the wall of the neck tube is allowed.

10) If the making-up of the liquid nitrogen is conducted indoor, all the windows and doors must be opened to avoid the severe lack of oxygen to cause suffocation of the operator.

11) The inner vessel generally works under the normal pressure and no pressurization is permitted at random and no sealing of the vessel mouth is allowed in operation.

12) Attention must be paid to the fact that the outer shell of the container is under the atmospheric pressure in the transportation and operation, so if any serve bumping or heavy pressing occurs, the outer surface of the container will be dented to cause damage or ineffectiveness to the container.

13) The container is made with many special technologies, so all the examination and reparation of the container must be done in our company in case of trouble.

8. Quality Guarantee

If the liquid nitrogen biological container is operated correctly, my company guarantees that we will solve any problem arising from inferior fabrication of the container within one year calculated from the day when the user receives the inferiorly manufactured container as per the following manners:

1)5 – year vacuum guarantee.

2) If the outer surface of the container is found to have a great deal of condensed water or frost and cannot contain liquid nitrogen after it is filled with liquid nitrogen for the first time, our company will repair or change the container for free.

3) When the container is filled with liquid nitrogen for the first time, our company will repair or replace the container for free if the evaporation period of the static liquid nitrogen is shorter than the stipulated time.

4) Within one year, my company will examine the quality problem or repair the container for free due to the inferior fabrication quality.

5) If reparation or replacement of the container occurs, the container will be shipped back to my company with all the documents, including the quality certificate with the corresponding number and the packing list.

If any of the following occurs, my company shall not be held respon-

sible:

1) The containers with the sealing label for the evacuating nozzle missing or broken.

2) The damage caused to the storage container filled with liquid nitrogen or frozen matters due to its being used as the transportation container.

3) The damage caused to the container due to operating not in accordance with the operation manual and requirements, such as the scratch on the inner wall of neck tube, corrosion of inner vessel, deformation due to inner pressure, denting of outer surface and lack of documents and protection sleeves.

9. Methods of Testing and Calculating Evaporation Period of Static Liquid Nitrogen

1) The testing must be conducted at the ambient temperature of 20 ±3℃ and under the normal pressure. At the same time, this can't be done at a direct ventilating place.

2) The container to be tested shall be at least 50% filled with liquid nitrogen (the container with a capacity of less than 3 liters may be fully filled with liquid nitrogen) with no canister and covered with the plug. After the liquid nitrogen being statically stored in the container for 48 hours, the average daily boil-off (q_m) within three days shall be measured by means of weighing.

3) The minimum grade or display value of the weighing apparatus (such as the lever-type balance, electronic digital balance, platform scale, etc.) should not be more than 0.02kg when the weighing method is used.

4) The Evaporation Period of Static Liquid Nitrogen(t) may be calculated as per the following equation:

$$t = (m-m_e)/q_m$$

where:

t—— Evaporation Period of static liquid nitrogen, d;

q_m——average daily boil-off of tested liquid nitrogen , kg/d;

m——total mass of container fully filled with liquid nitrogen, kg;

m_e——weight of empty container

Note: The calculated value may be slightly different from the actual value when the ambient temperature and pressure or the minimum grade or display value of the weighing apparatus are different.

10. Enclosures and Others

The container is packed with one copy of the operation manual, the certificate of inspection and the packing list. So please check if the documents are complete and if there is any deformation caused to outer surface when the case is opened. If there is any question, please inform us of it (For means of contact, see the back cover).