Haier

Smart Liquid Nitrogen Storage Container Operation Manual

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Haier Biomedical
Intelligent Protection of Life Science

Introduction

This product is a vacuum insulated storage container made with aluminum and glass fiber as constructional materials. It is designed for maximum efficiency for liquid nitrogen storage. Please be aware that liquid oxygen must not be used in the container as liquid oxygen can oxidize glass fiber materials. Sudden impact to the unit may cause a loss of vacuum in the unit. Please strictly follow this operation manual.

A. Safety

Be very careful to handle the liquid nitrogen (LN2) container as LN2 is extremely cold. Exposure of bare skins to LN2 can cause severe frost bite during LN2 filling, draining, transfer of products or handling any cold products that have been subjected to LN2 temperature.

- Do not expose any skins when handling the unit.
- When operating the machine, one should wear safety protections such as face mask, low temperature protection gloves, and low temperature protection apron.
- Do not overfill the container. The ideal LN2 level is below the container neck area.
- The container must be kept in vertical position at all times.
- Do not ever block the opening of the container as the built-up pressure can cause an explosion.
- When transferring LN2, avoid LN2 splashing and spilling.
- If LN2 is spilled on clothes, please remove the clothes immediately.
  Do not wear long boots as feet could get severely burn if LN2 spills into the boots.
- Remove frost and ice from the container opening and plug to keep the plug loose at all times.
- The cap is made with hard polyurethane foam. It is to reduce LN2 loss and to provide a point for picking up.
- Do not open the vacuum process port for the container. Once damaged, the vacuum insulation will be lost.

Warning: exhausted nitrogen gas in an enclosed space can reduce oxygen concentration. Death can be resulted due to suffocation. Do not place the container in a non-ventilated area. Do not use the LN2 container in a humid environment to avoid frost and water accumulation near the cap and the container opening, which can cause blockage to exhaust of gas.

B. LN2 Filling Instruction

Follow the instruction below to prefill LN2 and add LN2 to the container to avoid any potential damage or loss of vacuum insulation.

- Use a funnel to feed LN2 slowly into a container or a recovery container.
- Leave the LN2 in the container for two hours. Make sure the container is fully cold.
- After two hours soak, add more LN2 to the container to bring the liquid to the correct level.
- LN2 is transferred from a high pressure source, make sure the transferred fluid is at low pressure state.
- Be sure to wear protecting mask, gloves and apron.
- Do not overfill the system to cause LN2 spilling, which can cause rapid cooling in the container opening and may also cause a loss of vacuum insulation.

C. Measure liquid nitrogen amount

- Use a liquid ruler designed for LN2 container to measure the fluid level.
  Do not use hollow tube to measure the fluid level.
- When the ruler is pulled from the LN2 container, there is a frost line on the ruler.
  That is marking for the depth of the LN2 liquid.

D. Transfer LN2

- LN2 must be transferred with a LN2 pump or it should be poured out.
- Always wear protection mask, thermal gloves, and protection apron.

E. How to calculate liquid nitrogen validity

- Pullout the liquid container with the cap.
- Fill LN2 into the container no less than 50% full in accordance with instruction in B section.
  Fill the liquid to 100% full level in containers with 3 liters and smaller.
- Let the system sit for 48 hours then weigh the container.
- Weigh the container again after three days.
- NER (Net Evaporation Rate) equates the difference of the weight of the container divided by the days counted.

That will be the daily NER. The measurement and calculation should be performed at ambient of 20 C +/- 3 C and normal pressure.

Operation Manual

A. Illustration of Product

B. Product Description

Smart liquid nitrogen container resolves challenging difficulties when applying electronics and low power technologies at -196 C low temperature environment. State of the art technologies include real time recording and reporting of actual liquid level, temperature, cloud storage and sharing of data, and remote alarms with IM, email, and wechat. Smart lquid nitrogen container is the product of modern manufacturing techniques and sophisticated smart monitoring technologies. The unit is light weight in small foot print, yet has a large storage volume. Real time monitoring and alarm systems ensure stored samples safety.

Smart liquid nitrogen container is a medium capacity unit that consumes low LN2. It has a large ratio of storage volume to floor space occupied. It is therefore suitable for a variety of installations. All models include storage racks and PC boxes. The lid is lockable for sample safety.

C. Product features and characteristics

- Interior and exterior are both made with aluminum alloys. They are light-weight, high strength, and corrosion resistive.
- The opening of the container is madewith glass fiber, which has a high strength and low thermal conductivity.
- Radiation heat load is reduced by using multilayer insulation with high reflective aluminum foil.
- The jacket is in high level of vacuum in conjunction of low temperature absorbent, making sure the vacuum life is no less than five years.

D. Product Characteristics

- Real-time smart temperature monitoring using low temperature sensor PT100 with accuracy of +/- 0.1 C.
- Real-time LN2 fluid level monitoring using specialty LN2 fluid sensor with accuracy of +/- 5 mm.
- Low power lithium battery powers the display for expected life of one to two years. When the battery power is low, it can be replaced through your local distributor.
- State of the art design with dual locks structure for sample safety.

Operational Instructure

1.Product Description

LN2 liquid level of temperature monitoring system is a patented product designed for monitoring LN2 aluminum storage container's liquid level and temperature. It consists of a high-tech capacity liquid level sensor and PT resistance temperature sensor that measure the liquid depth and temperature at the high point of the container. The information is displayed digitally. The system provides system level functions including protection for parameter settings, liquid level alarm, temperature alarm, modification of code, selection of display, capacitance setting for empty container, capacitance for full container, additional temperature value setting, additional height value setting, and correction of current temperature.

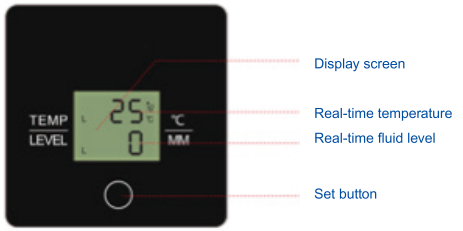
The power consumption of the system is very low. The built-in battery can last for one to two years. Battery can be installed directly and easily. The battery can support the screen work for long time for ease of checking up on fluid level and fluid temperature. When settings are complete, data will be saved in 15 seconds automatically. Because the system operates on a low power supply, flashing and audible alarms are not available. Remote alarms are possible through network systems such as IM, email, and wechat.

2. Product Parameter

Working ambient:	-20～40℃
Relative Humidity:	≤75%（℃）
Input voltage:	3. 6V
Fluid Level Sensor:	Capacitance
Temperature Sensor :	PT-100
Fluid level range:	160～570MM
Fluid level tolerance:	±5MM
Temperature measurement range :	-200～200℃
Temperature tolerance:	±0. 1℃
Built in battery:	1-2 years for normal application

3. System Operating

Main Menu : Screen can simultaneously display fluid level and temperature.



3.1 Inquire capacitance of fluid level senso

Press and hold the Set button for three seconds. Release the button to show the capacitance of the fluid level sensor.

3.2 Validation of code

1) Press and hold the set button. When the display shows 00, proceed to perform the validation process.

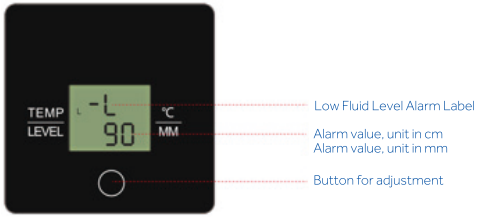
2) Enter your code, the code will flash for 15 seconds to confirm if the code is correct.

3) When the code is accepted, the system will switch the screen. Quickly push and hold the Set button to show the function screen in sequence. When erroneous codes are entered many times, the system will not accept even the correct code. Wait for 15 minutes before entering the code.

1 2 3

3.3 Low uid level alarm (L-L) Setting

After the correct code is entered for 15 seconds, display is switched to show the functions. Push and hold the Set button until the L-L (Low fluid alarm) appears. Release the Set button. When the number starts to flash, press the Set button again to increase the L-L value. When the maximum value is reached, the display will return to 0. When a number is selected, wait for 15 seconds, the value will be saved automatically. Please note the length of time for adjustment is 60 seconds after the code is accepted. If no action is performed, the code will become invalid.



3.4 Setting for Highfluid level alarm value H-H

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until H-H (high fluid level alarm value) appears. Release the Set button. When the value starts to flash, press the Set button. The H-H value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved.

3.5 Low temperature alarm value (L-L-1) Setting

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until L-L-1 (low temperature alarm value) appears. Release the Set button. When the value starts to flash, press the Set button. The L-L-1 value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved.

3.6 High Temperature Alarm Value（L-L-L-1）Setting

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until L-L-L-1 (high temperature alarm value) appears. Release the Set button. When the value starts to flash, press the Set button. The L-L-L-1 value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved.

3.7 Effective Fluid Measurement（L-H）Setting

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until L-H (Effective Fluid Measurement value) appears. Release the Set button. When the value starts to flash, press the Set button. The L-H value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved. Note the stored L-H value is preset at the factory. It should not be changed.

3.8 Buzzer Alarm Setting（51）

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until 51 (Buzzer Alarm) appears. Release the Set button. When the value starts to flash, press the Set button. The 51 value will change to reflect the alarm format, 0 for turnoff, 1 for one alarm per 5 seconds, 2 for one alarm per 10 seconds, 3 for one alarm per 20 second seconds, 4 for one alarm per 40 seconds, and 5 for dynamic adjustment. After a value is selected, wait for 15 seconds and the value will be saved. Note the stored L-H value is preset at the factory. It should not be changed. Please note that this function is locked out to save battery power.

3.9 Modification of Code（52）

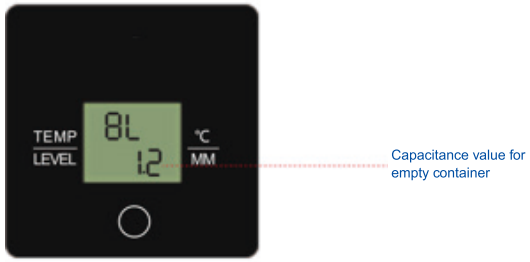
After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until code 52 appears. Release the Set button. When the value starts to flash, press the Set button. The value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved. Note the factory preset value is 0.

3.10 Liquid level and temperature setting（53）

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until code 53 appears. Release the Set button. When the value starts to flash, press the Set button. The value will switch from 0 to 1. 1 means to display temperature and liquid level. 0 means to show temperature only. After a value is selected, wait for 15 seconds and the value will be saved.

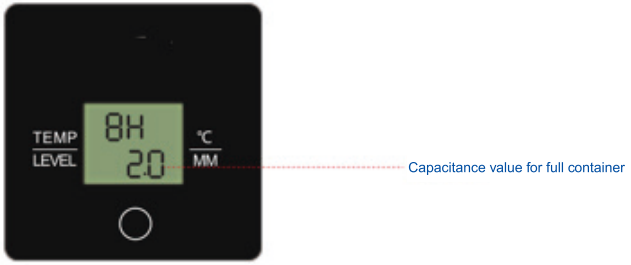
3.11 Capacitance Setting for Empty container（8-L）

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until 8-L (empty container capacitance value) appears. Release the Set button. When the value starts to flash, press the Set button. The 8-L value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved. Note the 8-L value is preset at the factory. It should not be changed. If temperature display is the only function chosen,8-L will not appear.



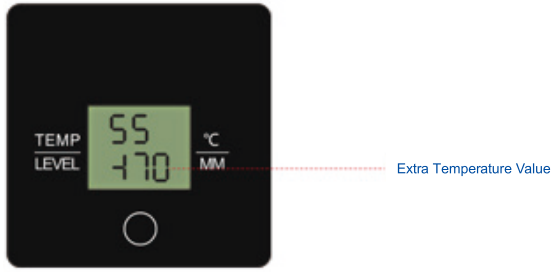
3.12 Capacitance Setting for full container（8-H）

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until 8-H (full container capacitance value) appears. Release the Set button. When the value starts to flash, press the Set button. The 8-H value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved. Note the 8-H value is preset at the factory. It should not be changed. If temperature display is the only function chosen,8-H will not appear. Capacitance for empty container cannot be greater than capacitance at full container. Therefore, capacitance for full container must be set first.



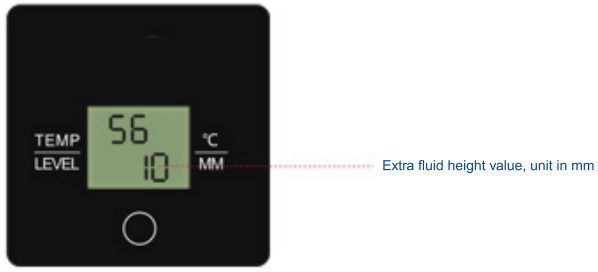
3.13 Extra temperature（55）setting

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until 55 code appears. Release the Set button. When the value starts to flash, press the Set button. The value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved.



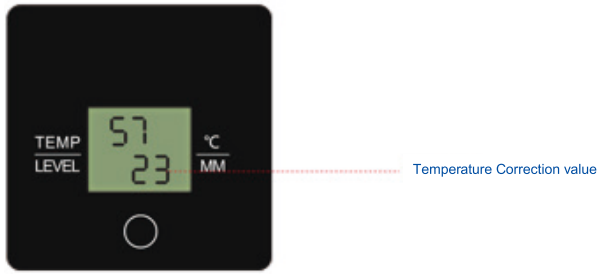
3.14 Extra Fluid Height（56）Setting

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until 56 code (extra fluid height) appears. Release the Set button. When the value starts to flash, press the Set button. The value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved.



3.15 Correction of current temperature（57）setting

After entering the code for 15 seconds, the system will be ready for setting change. Press and hold the Set button until 57 code appears. Release the Set button. When the value starts to flash, press the Set button. The value will increase until it reaches the maximum and then it will become 0. The number will repeat itself. After a value is selected, wait for 15 seconds and the value will be saved.



Trouble shooting guide

Abnormality	Possible causes	Solution
No display	Battery has no power Board issue Other issue	Replace battery Contact the factory
Temperature display is replaced by a letter code.	Temperature sensor is defective, E1. Temperature sensor is shorted, E2.	Replace temperature sensor Reconnect the terminals at the instrument end.
Fluid level display is replaced by a letter code	Fluid sensor is defective, EOL	Replace the capacitance style fluid level sensor.