

# Tofflon

Biopharmaceutical Industry Chain Service Provider  
生物制药全产业链服务商

## [Programmable Cooler] 【程序降温仪】

Instruction  
说明书



东富龙生命科技有限公司  
Tofflon Life Science Co., Ltd.

## ABOUT US

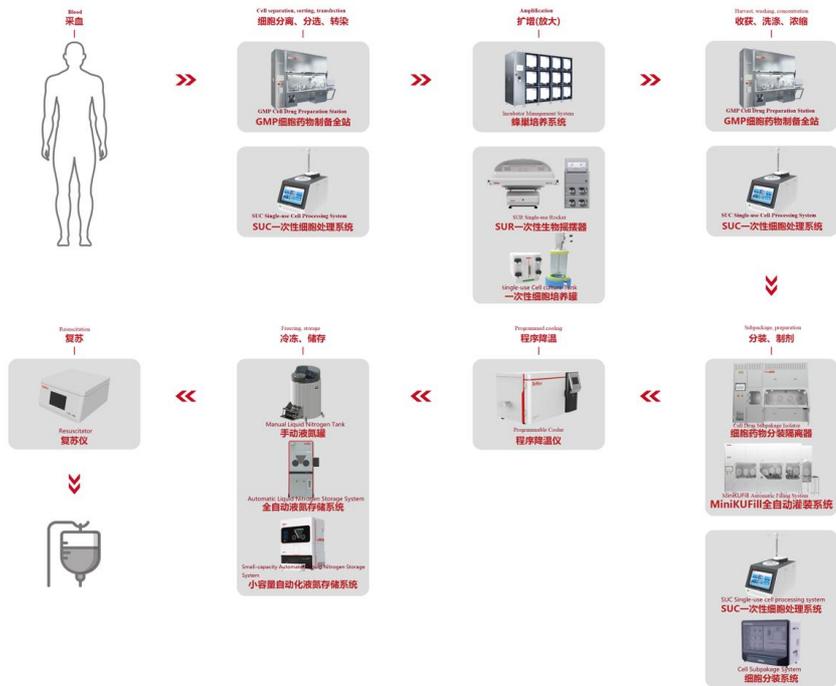
---

Tofflon Life Science Co., Ltd. focuses on the research and development of front-end technologies in the pharmaceutical and medical industries, forming a multi-dimensional one-stop service of instruments, equipment and consumables (including consumables, reagents, fillers, filtration, packaging materials, etc.).

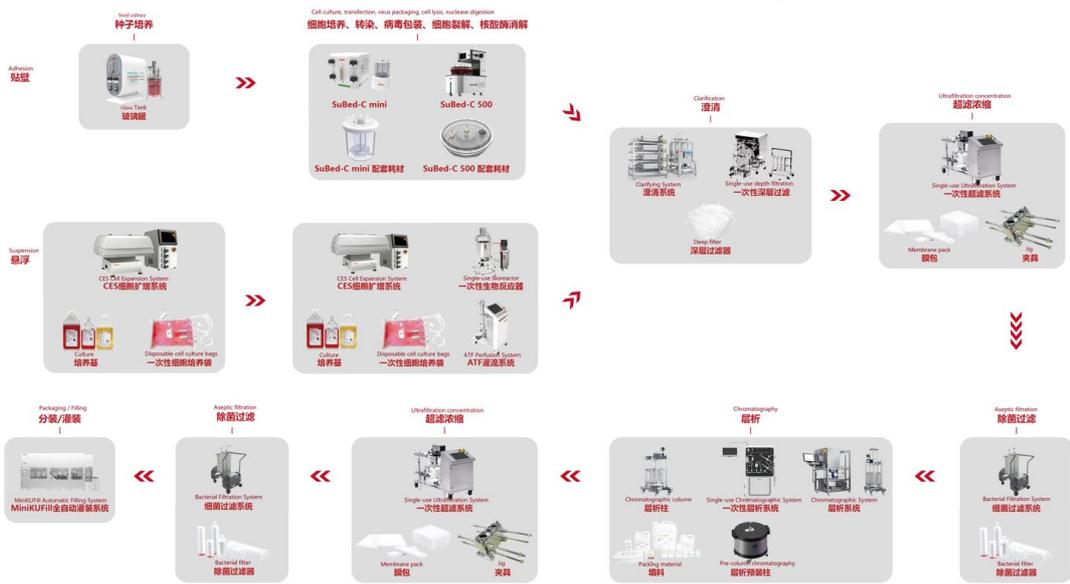
- In the field of **cell therapy**, we provide overall solutions for the preparation and production of immune cells, stem cells, tumor cell vaccines, etc.;
- In the field of **gene therapy**, we provide overall solutions for the R&D and industrialization of nucleic acid drugs (mRNA/DNA), viral vector drugs, etc.;
- In the field of **biobanks**, we have developed an automated sample storage and storage management system to provide overall solutions for cell and tissue sample banks;
- In the field of **consumables**, we have formed a perfect consumables program in disposable bags (reaction bags/liquid preparation bags/storage bags), reagents (culture media/cryopreservation protection solution), fillers, filtration (microfiltration/deep filtration/ultrafiltration/nanofiltration), and rigid packaging materials;
- In the field of **disinfection**, we are committed to air surface disinfection, infection control, terminal disinfection and multi-drug resistant bacteria disinfection, and provide overall solutions for environmental disinfection.

Relying on Tofflon Group's mature design, manufacturing, engineering construction and after-sales service capabilities covering the whole country, Tofflon Life Science Co., Ltd. can serve the biopharmaceutical industry more quickly and professionally.

## ● Cell Therapy System Solutions



## ● Adeno-associated Virus (AVV) Production Platform System Solutions



PURSUE EXCELLENT QUALITY AND SERVING HUMAN HEALTH  
 追求卓越品质 服务人类健康

## *Version History*

### **Version History**

<b>Version</b>	<b>Date</b>	<b>Content modification</b>
V1.0	2022.09	Initial issue

# Index

<b>Preface</b> .....	<b>1</b>
<b>1. Introduction</b> .....	<b>2</b>
1.1 Product name.....	3
1.2 Product model .....	3
1.3 Overview of Programmable Cooler .....	3
1.3.1 Equipment introduction.....	3
1.3.2 Principle of equipment .....	3
1.3.3 Structure introduction.....	3
1.3.4 Equipment feature .....	6
1.3.5 Specification.....	7
<b>2. Safety</b> .....	<b>8</b>
2.1 Safety identification specification.....	9
2.2 Liquid nitrogen safety .....	10
2.3 Safety precaution.....	10
2.4 Emergency advice .....	12
<b>3. Installation, commissioning</b> .....	<b>13</b>
3.1 Out of box audit.....	14
3.2 Installation requirement.....	14
3.3 LN <sub>2</sub> connection.....	15
3.4 Electrical connection .....	16
3.5 Sample thermocouple connection.....	16
<b>4. Operation/</b> .....	<b>17</b>
4.1 Main screen information .....	18
4.2 System operation .....	21

## Index

<b>5. Alarm and troubleshooting.....</b>	<b>34</b>
5.1 Shutdown alarm.....	35
5.1.1 Chamber thermocouple failure alarm.....	35
5.1.2 Sample thermocouple failure alarm.....	35
5.1.3 Freezer/sample over/below limit temperature alarm.....	35
5.1.4 Solenoid valve fault alarm.....	36
5.1.5 Heater failure alarm.....	36
5.2 Non-shutdown alarm.....	37
5.2.1 Power failure recovery alarm.....	37
5.2.2 Freezer/sample exceed/below limit temperature warning.....	37
5.2.3 Temperature tracking too high alarm.....	37
5.2.4 Temperature tracking too low alarm.....	37
5.2.5 Sample temperature control timeout alarm.....	37
5.2.6 End of operation alarm.....	38
5.3 Troubleshooting.....	38
<b>6. Maintenance.....</b>	<b>40</b>
6.1 Preventive maintenance.....	41
6.2 Equipment maintenance.....	41
<b>7. Appendix.....</b>	<b>43</b>
7.1 List of vulnerable parts.....	44
7.2 Warranty.....	45

## Preface

The purpose of introduction is for safe installation, operation and maintenance of the product.



All users must read and refer to this instruction before installing, operating or maintenance for production.

User must carry out the relevant operation with this instruction when make the production.

# 1. Introduction

## In this chapter

Section	See page
1.1 Product name	3
1.2 Product model	3
1.3 Overview of Programmable Cooler	3

## 1.1 Product name

Programmable Cooler

## 1.2 Product model

LNC180 / LNC340 / LNC520

## 1.3 Overview of Programmable Cooler

### 1.3.1 Equipment introduction

The Programmable Cooler is a sample preparation device for freezing samples at low temperatures or ultra-low temperatures (-80°C to -196°C). The device can control the temperature of sample cells and control the cooling process according to different cell characteristics to avoid the damage of cell samples caused by the sudden drop of temperature.

The cooling time of biological samples can be reduced to less than 2 hours by using Programmable Cooler, and the latent heat released by samples can be effectively offset by setting the cooling procedure, and the survival rate of samples can be increased. In addition, the temperature drop instrument can monitor and trace the whole cooling process.

### 1.3.2 Principle of equipment

- 1) The Programmable Cooler uses the access liquid nitrogen to cool down, and controls the amount of liquid nitrogen into the freezer by controlling the opening and closing frequency of the solenoid valve of the liquid nitrogen pipeline, so as to indirectly control the temperature of the freezer chamber.
- 2) Built-in heating tube, in the process of temperature control, the controller coordinated heating, refrigeration, so that the chamber temperature is close to the set temperature.
- 3) Open temperature probe interface, different cooling samples can use different sample temperature probe.
- 4) Electromagnetic lock can ensure that the door body will not be forced to open during the operation of the equipment to ensure the safety of the sample.

### 1.3.3 Structure introduction

- 1) **Insulation box:** the box adopts polyurethane foam as insulation layer, low thermal conductivity, can effectively maintain the temperature of the chamber.
- 2) **Exhaust port:** the left side of the equipment is equipped with an exhaust port, which can discharge the volatile nitrogen in the chamber during the refrigeration

## Introduction

process.

3) **Power switch:** the front side of the device is equipped with a power switch button, as shown in Figure 2.3.3.1.

4) **Touch screen:** the front of the device offers a 10-inch touch-screen user interface for controlling the device.

5) **Temperature probe interface:** the chamber is equipped with two temperature probes to monitor sample temperature and chamber temperature respectively. The chamber temperature probe is a built-in probe, and the temperature interface is connected with the sample temperature probe.

6) **Fans and coils:** the equipment is equipped with fans and coils to form strong convection, increase the uniformity of temperature in the chamber, accelerate the gasification of liquid nitrogen and accelerate the cooling of the chamber. See Figure 2.3.3.1.

7) **Electromagnetic lock:** electromagnetic lock is installed on the door side of the chamber to prevent the equipment from opening the door by mistake during operation.

8) **Chassis heat dissipation port:** the chassis heat dissipation port is used to prevent the chassis temperature from being too high.

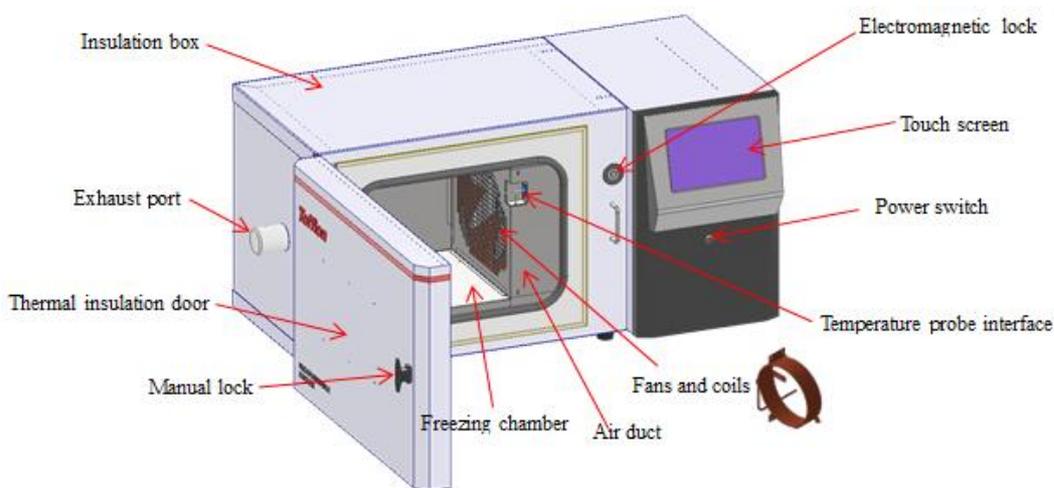


Figure 2.3.3.1

9) **Network port:** users can connect to external network cables.

10) **USB interface:** users can connect to external U disk.

11) **Power protection switch:** turn on the switch after connecting the power supply to

turn on the device.

12) **Power cord socket:** connect the power cord, the power supply is required to be 220v.

13) **Liquid nitrogen input interface:** use liquid nitrogen supply hose to connect liquid nitrogen tank for liquid nitrogen input.

14) **Refrigerating safety valve:** used for liquid nitrogen pipeline pressure relief.

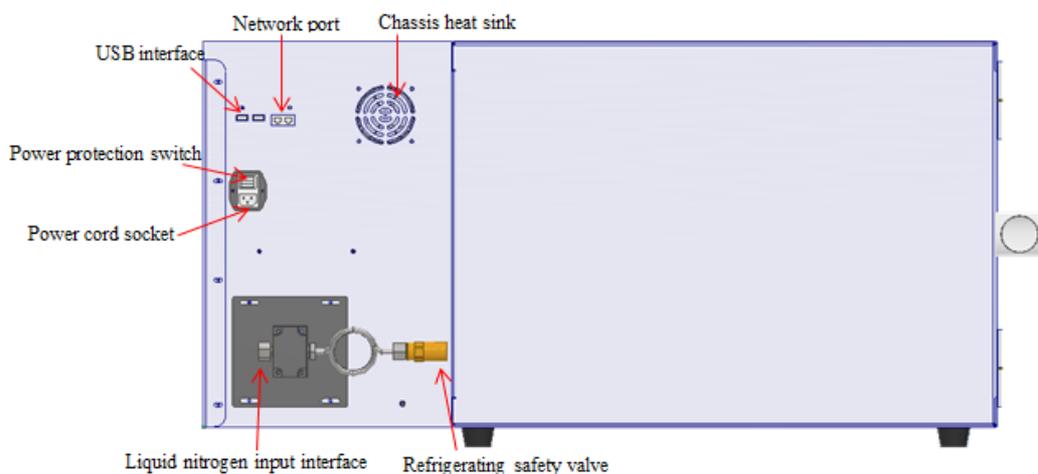


Figure 2.3.3.2

15) **Low temperature solenoid valve:** used to control liquid nitrogen injection volume.

16) **Liquid nitrogen pipeline:** used for liquid nitrogen input.

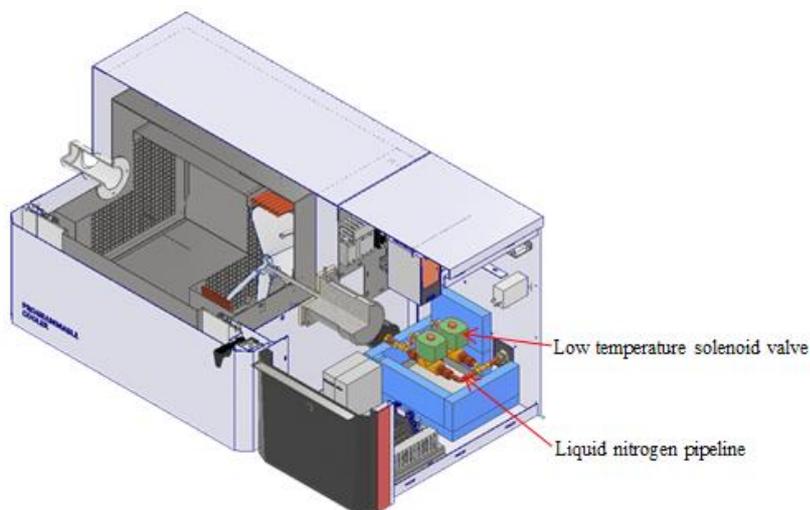


Figure 2.3.3.3

## *Introduction*

### **1.3.4 Equipment feature**

#### **1、 Easy to operate and traceable process data**

- 1) Touch screen display can easily set, operate and query operation data.
- 2) Six standard preset cooling programs, users can also customize the cooling program according to the program, unlimited number of editing each program.
- 3) User rights password protection, to ensure data security, can customize the corresponding user groups and user rights.
- 4) The cooling process curve and related data can be exported through USB interface for convenient analysis and archiving.
- 5) Through the communication interface, the equipment can upload real-time data to Tofflon Biological Sample Database Information Management System (BIS) or a third-party management system, or remotely control the equipment through this interface.
- 6) Support code scanning gun access, accurate input of order information.
- 7) Supports audit tracing and monitors device dynamics in real time.

#### **2、 Real-time monitoring of sample protection**

- 1) Chamber and sample temperature is monitored by thermocouple, real-time monitoring, real-time control according to the program during operation, fast response, high control precision.
- 2) Standard alarms to alert users of thermocouple failures, heater failures, high/low temperature limits, temperature tracking, power failures, can be equipped with UPS, power outages to ensure complete completion of the current task.

#### **3、 Reliable temperature control performance**

- 1) High quality solenoid valve for liquid nitrogen can stably control the injection amount of liquid nitrogen and reduce temperature control deviation.
- 2) Consistent temperature control and uniformity are achieved through air handling systems and liquid nitrogen injection rings.
- 3) Adopt environmental and efficient insulation layer technology, make the insulation effect of the equipment more significant, save the amount of liquid nitrogen.
- 4) Compatible with VHP cleaning technology.

## 1.3.5 Specification

Technical parameters of Programmable Cooler				
Items/Indicators	Unit	Related parameters		
Model	/	LNC180	LNC340	LNC520
Cooling medium	/	Liquid nitrogen		
Overall dimension	mm	985×640×550	1140×640×550	1320×640×550
Internal size		185×330×305	340×330×305	520×330×305
Volume	L	18	34	52
Net weight	Kg	80	100	120
Power supply	/	220V/50Hz		
Display screen		10 inch touch screen		
Temperature control range	°C	-180~50		
Cooling speed	°C/min	0.1~70		
Heating up speed		0.1~10		
Noise	dB (A)	<60		
Temperature control deviation	°C	<2		
Temperature sensor	/	Double temperature control probe Detect the temperature in the cavity and sample respectively		
Program control	/	Control cavity temperature based on cavity temperature Control sample temperature based on sample temperature		
Control mode	/	Microcomputer control		
Number of programming	/	Unrestricted quantity		
Alarm function	/	Chamber thermocouple failure alarm		
		Sample thermocouple failure alarm		
		Freezer/sample over/below limit temperature alarm		
		Solenoid valve fault alarm		
		Heater failure alarm		
		Power failure recovery alarm		
		Freezer/sample over/below limit temperature warning		
		High temperature tracking alarm		
		Low temperature tracking alarm		
		Sample temperature control timeout alarm		
End of operation alarm				

## 2. Safety

### In this chapter

Section	See page
2.1 Safety identification specification	9
2.2 Liquid nitrogen safety	10
2.3 Safety precaution	10
2.4 Emergency advice	12

## 2.1 Safety identification specification

When operating **Programmable Cooler**, you must follow the safety instructions in this instruction book. The user must review all security considerations before operating and maintaining the system.

### Safety signs

	<p><b>WARNING</b></p> <p><b>WARNING</b> refers to a dangerous situation that, if not avoided, could result in death or serious injury. Do not start work until all specified environmental requirements are clearly understood and met.</p>
	<p><b>CAUTION</b></p> <p><b>CAUTION</b> refers to a dangerous condition that, if not avoided, could result in minor or moderate injury. Do not start work until all specified environmental requirements are clearly understood and met.</p>
	<p><b>NOTICE</b></p> <p><b>NOTICE</b> refers to the instructions that must be followed to avoid damage to the product or other equipment.</p>

## 2.2 Liquid nitrogen safety

**Warning: Severe frostbite may occur with liquid or frozen nitrogen in contact with skin or eyes.**

When handling liquid nitrogen in cryogenic freezers and dewar tanks, be aware of the potential dangers of liquid nitrogen. Two important properties of liquid nitrogen are potentially dangerous:

- 1) Liquid nitrogen is ultra-cold. The boiling point of liquid nitrogen at normal atmospheric pressure is  $-196^{\circ}\text{C}$ .
- 2) A very small amount of liquid nitrogen volatilizes to form a large amount of nitrogen gas. 1L of liquid nitrogen can form  $0.7\text{m}^3$  of nitrogen gas. Nitrogen is colorless, odorless and tasteless, so it cannot be detected. In enclosed areas, excess nitrogen can reduce the concentration of oxygen, which can cause asphyxia. Inhaling air with less than 18% oxygen can cause vertigo, resulting in loss of consciousness and even death.

## 2.3 Safety precaution



**Warning:** This symbol indicates the presence of a hazardous voltage and the possibility of electric shock.



**Warning:** Equipment in maintenance or operation must be shut down or locked to avoid possible damage.



**Warning:** This symbol indicates that the device contains parts and components that are easily damaged by electrostatic discharge.



**Warning:** This symbol indicates risk of hypothermia and frostbite. Body parts should not come into contact with exposed metal or samples without any protective measures.



**Warning:** This symbol indicates a possible choking hazard. This device should be kept in a well-ventilated room.



**Warning:** This symbol indicates the need to wear gloves during the execution of the specified program.

Wear protective gloves when performing decontamination procedures.

Wear protective gloves when handling samples and using liquid nitrogen.



**Warning:** Device weighs up to 80kg.



**Warning:** This symbol indicates a surface that may become hot during use and may cause burns if the body part is touched unprotected.



**Warning:** This symbol indicates a potential biological hazard. Wear appropriate protective equipment and follow correct procedures.



**Handling of objects:** Always wear gloves when handling objects that are about to come into direct contact with or may have come into direct contact with liquid nitrogen. It is recommended to use cold protective gloves that are loose enough to be removed quickly in case of liquid nitrogen splashing. Use pliers to remove objects immersed in liquid nitrogen and handle objects with care.



**Wear protective clothing:** Masks or safety goggles can be worn to protect eyes; High top shoes are recommended for handling liquid nitrogen in open containers.



**Use special containers for cryogenic liquids:** Cryogenic containers are specially designed and made of special materials that can withstand the rapidly changing properties and extreme temperature differences of liquid nitrogen. Liquid nitrogen should be poured slowly to minimize internal stress due to material cooling and to avoid damage to the container.

## Safety



**Do not cover the opening of the freezer or dewar tank loaded with liquid nitrogen:** Do not obstruct gas discharge by using stoppers. Cryogenic liquid containers are usually designed to operate with little or no internal pressure. Poor venting may cause the gas pressure to be too high and cause the container to damage or burst.



**Use appropriate transfer equipment:** Use a three-phase separator or special injection funnel to transfer liquid nitrogen into or out of the dewar. Pour liquid nitrogen only in a dewar flask that is easy to hold. For larger containers, use cryogenic extraction equipment to transfer liquid nitrogen.



**Do not overfill liquid nitrogen:** Filling liquid nitrogen higher than the bottom of the neck tube (or the maximum specified level) will result in overfilling, and liquid nitrogen will overflow when the neck core cap is closed.



**Do not use a hollow rod or pipe as the liquid nitrogen detector:** When you insert a heated pipe into the liquid nitrogen, the liquid in the pipe rapidly expands due to vaporization, and the liquid nitrogen will shoot out from the top of the pipe.



**Warning:** When using liquid nitrogen storage equipment in a confined environment, it is strongly recommended that you use a personal O<sub>2</sub> concentration monitoring device.

## 2.4 Emergency advice

- 1) If people experience dizziness or loss of consciousness while using liquid nitrogen, move them to a well-ventilated area immediately. If you have stopped breathing, give mouth-to-mouth resuscitation. If people feel difficulty breathing, give oxygen and call a doctor.
- 2) If exposed to liquid or frozen nitrogen, the tissue should be returned to its normal temperature as soon as possible and the injured tissue should be treated with protective treatment to prevent further damage and infection.
- 3) Take off or unwrap the clothes that restrict blood circulation in the frostbitten area. Warm the injured tissue quickly with water of about 42 °C (the water temperature should not exceed 44 °C). Do not rub the frostbitten area before and after reheating, and seek medical advice in time.

## 3. Installation, commissioning

### In this chapter

Section	See page
3.1 Out of box audit	14
3.2 Installation requirement	14
3.3 LN <sub>2</sub> connection	15
3.4 Electrical connection	16
3.5 Sample thermocouple connection	16

## Installation, commissioning

### 3.1 Out of box audit

After receiving the product, please check whether the outer packing is damaged. If the outer package is damaged, carefully unpack the package and check whether the equipment and accessories are damaged.

If you find any damage, please keep the packing material and inform the manufacturer of the damage.

### 3.2 Installation requirement

A liquid nitrogen delivery line is included. Using a delivery hose of more than 2m will degrade the performance of the equipment, resulting in insufficient liquid nitrogen volume reaching the equipment to properly control the operation of the temperature curve.

The equipment should be placed within the length of the liquid nitrogen delivery hose and leave enough space for the replacement of the air source tank. Gauges showing the amount of gas in the tank should be legible and read before each run to ensure adequate liquid nitrogen. In order to obtain the best operation results, it is recommended to use a dedicated air source tank.

Equipment should be placed in a well-ventilated area of the laboratory. Place the device on a workbench that supports its weight and provides sufficient work space. Adequate clearance should be provided at the front door of the equipment, at the rear hose and power connection, and at the exhaust port on the left side of the equipment, as shown in Figure 4.2.

There is an overflow drain on the back of the equipment housing leading to a drain disk under the inlet solenoid. Most of the frost will evaporate in the drain tray as it melts, but a small amount of water may drip from the drain pipe.

Before using the device each time, ensure that the chamber and door are dry to prevent water on the sealing strip from freezing after the chamber temperature drops. As a result, the door cannot be opened properly.



**Warning:** Do not block or damage the exhaust pipe opening. Maintain sufficient space near the vent to allow air to escape freely, otherwise the increase in cabin pressure can cause the door to be forced open, damaging the integrity of equipment and samples.

	<p><b>Warning:</b> If water vapor overflows from the drain pipe, please immediately close the equipment and liquid nitrogen supply valve, and call for service immediately.</p>
---	---

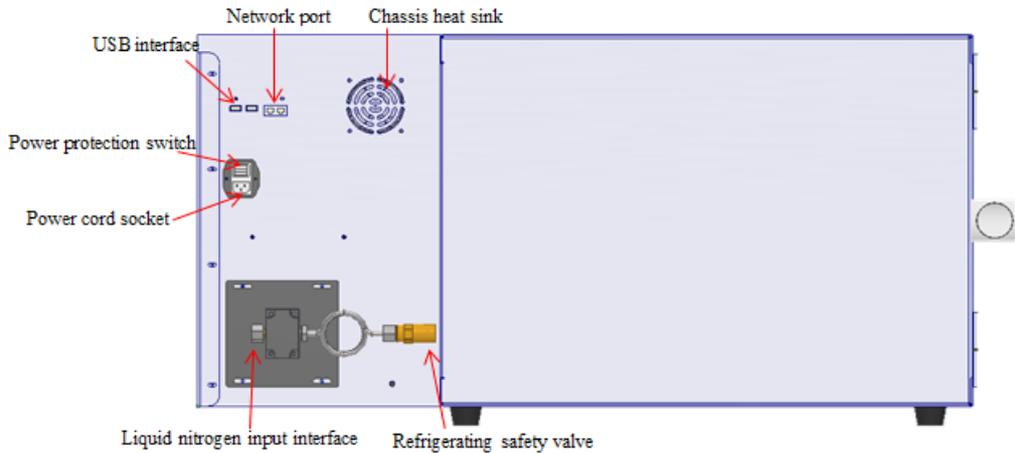


Figure 4.2

### 3.3 LN<sub>2</sub> connection

The equipment requires the user to purchase a clean liquid nitrogen supply device with a low pressure regulator (0.4Mpa  $\pm$ 30%). A pressure higher than the recommended value will degrade equipment performance by potentially keeping the filled solenoid partially open. There is a 0.4Mpa refrigerating safety valve at the back of the equipment, as shown in Figure 4.2.

Connect the low pressure liquid outlet of the liquid nitrogen tank with a delivery hose to the LN<sub>2</sub> supply inlet at the back of the unit (Figure 4.2). After connecting the conveying pipe, open the liquid nitrogen supply valve and check the interface for leakage.

	<p><b>Warning:</b> Do not use any sealant on the flaring joint at the end of the delivery hose. The use of tube outer wall coating or teflon tape may result in leakage of contaminated liquid nitrogen filling solenoid or hose joints due to inability to withstand extremely low temperatures in this application.</p>
---	---

	<p><b>Warning:</b> Do not disable or remove the refrigeration relief valve.</p>
---	---

### 3.4 Electrical connection

Please refer to the electrical specifications of the equipment.

- 1) Ensure that the power switch at the rear of the device is off.
- 2) Connect the appropriate power cord to the power connector on the back of the device.
- 3) Please connect the device to a special grounded circuit.



**Notice:** The power switch is the main circuit breaker of the equipment, please locate the equipment in a convenient position to operate the switch.

### 3.5 Sample thermocouple connection

- 1) Open the instrument door.
- 2) Find the thermocouple connector in the front upper right corner of the cabin.
- 3) Install the supplied sample thermocouple in the correct direction.
- 4) Close the instrument door.



Figure 4.5

## 4. Operation/

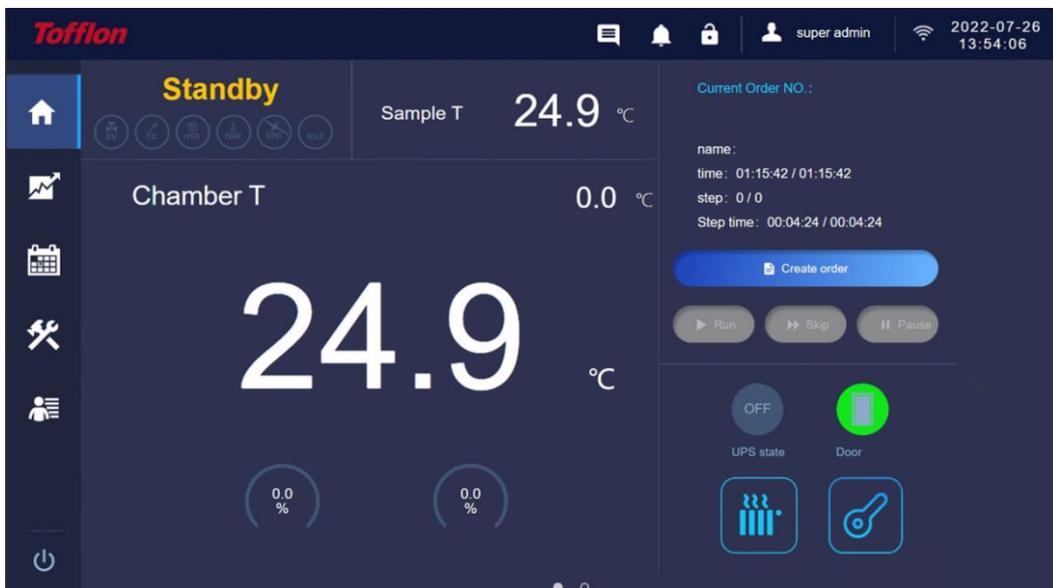
### In this chapter

Section	See page
4.1 Main screen information	18
4.2 System operation	21

## Operation

### 4.1 Main screen information

The home page of the main interface of the program temperature cooler is shown in the following figure.



#### 1) Top horizontal pane:

You can view operation logs and alarm list to lock the screen.

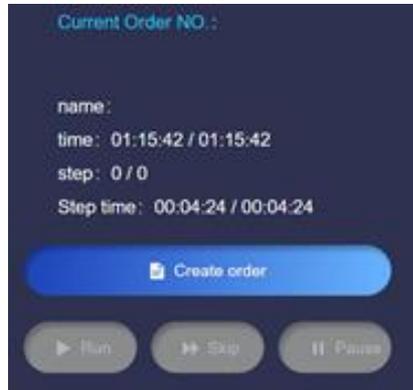


#### 2) Middle pane: display the current state of the equipment, sample temperature, chamber temperature, current setting temperature, heater and solenoid valve output ratio.



3) Right pane:

Display the current order information, you can create a new order, the current order "run" "jump" "pause" operation;

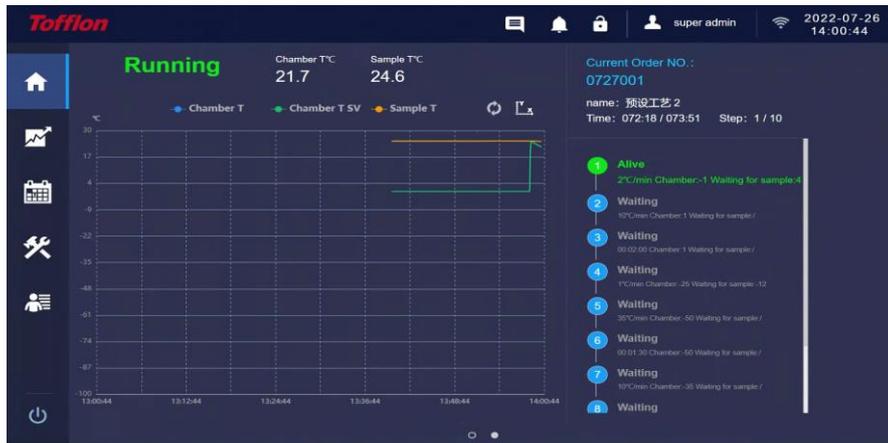


Display UPS status and door switch status. It can preheat the chamber and unlock the door.



## Operation

The second page of the main interface of the program temperature cooler is shown in the figure below.



1) Middle pane: displays real-time temperature information and curves.



2) The right pane: display the process information of the current order, the dynamic information of running steps and time.



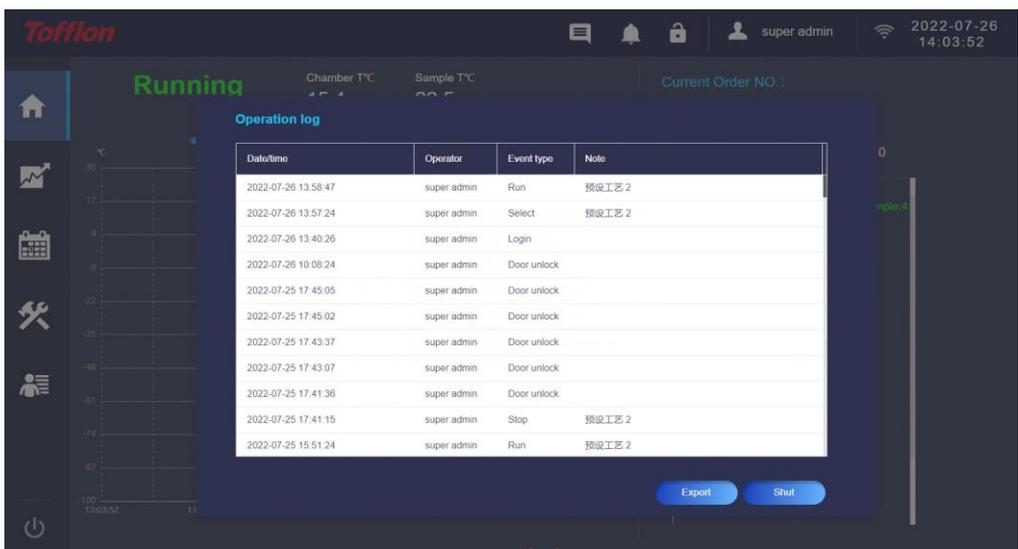
## 4.2 System operation

(I) During the initial startup, use the super administrator account to log in to the system. The initial password is **passw0rd**. After logging in for the first time, you need to change the initial password to facilitate management.

(II) The main screen is displayed after you log in to the system using your account and password.



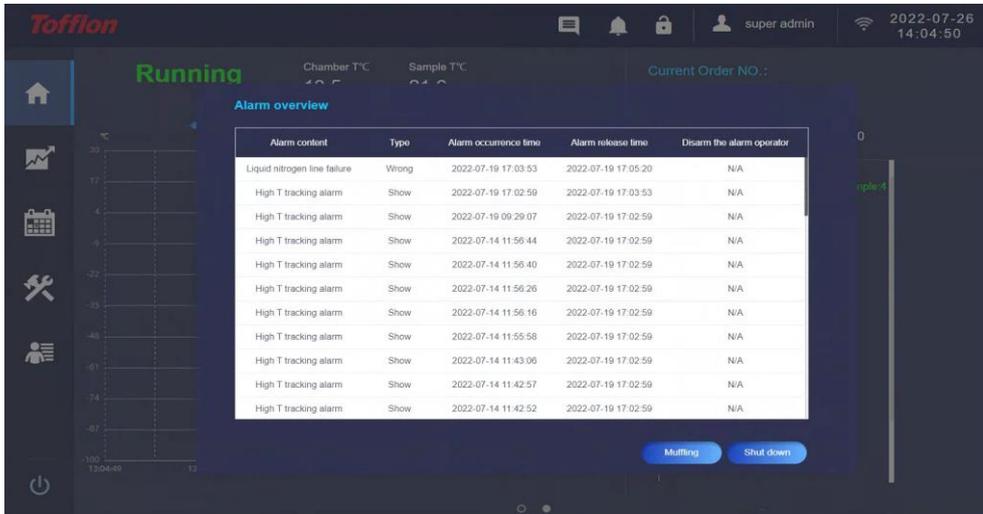
Click the icon  on the home screen to view and export operation logs in PDF or CSV format.



## Operation



Click the icon  on the main interface to view the list of recent alarms. The alarm should be muffled manually, otherwise the alarm sound still exists even if the alarm situation has been solved.



The screenshot shows the Tofflon interface with the "Alarm overview" table. The table contains the following data:

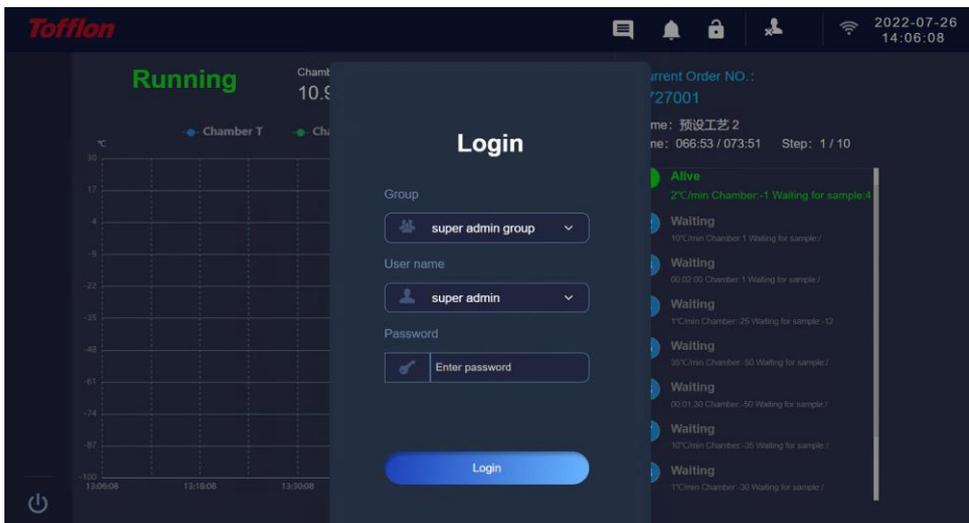
Alarm content	Type	Alarm occurrence time	Alarm release time	Disarm the alarm operator
Liquid nitrogen line failure	Wrong	2022-07-19 17:03:53	2022-07-19 17:05:20	N/A
High T tracking alarm	Show	2022-07-19 17:02:59	2022-07-19 17:03:53	N/A
High T tracking alarm	Show	2022-07-19 09:29:07	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:56:44	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:56:40	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:56:26	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:56:16	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:55:58	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:43:06	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:42:57	2022-07-19 17:02:59	N/A
High T tracking alarm	Show	2022-07-14 11:42:52	2022-07-19 17:02:59	N/A



Click the icon  on the home screen to lock the screen. Click again to enter the user name and password to unlock the device.



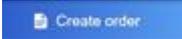
Click the icon  on the main interface to log in and out.



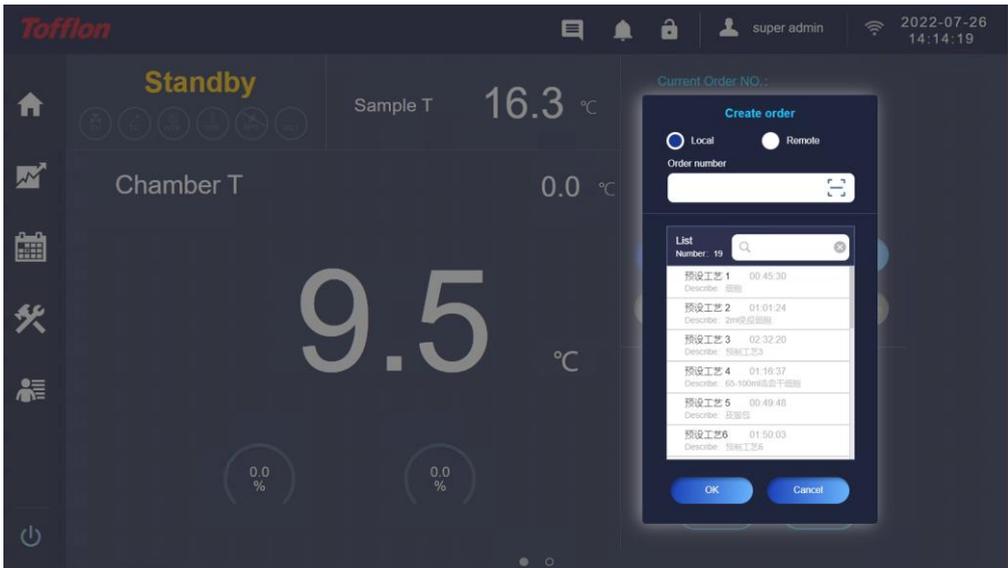
The screenshot shows the Tofflon interface with the "Login" screen. The login form includes the following fields:

- Group: super admin group
- User name: super admin
- Password: Enter password

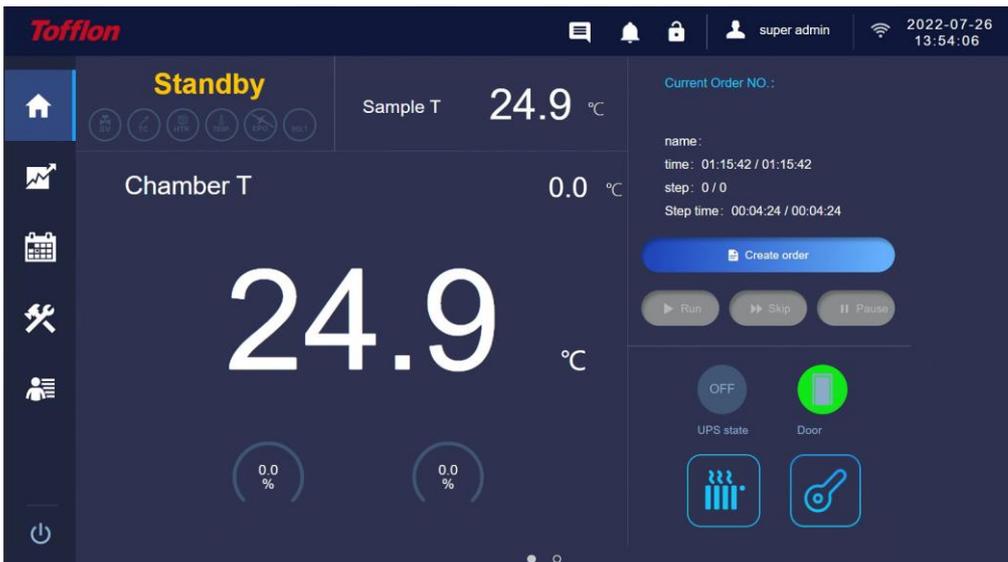
The "Login" button is visible at the bottom of the form. The background shows a "Running" status with a temperature graph and a "Current Order NO.: 27001" displayed on the right.

Click the main interface  to create a local order or a remote order. The remote order is delivered by BIS system.

To create a local order, enter a new order number (one order number on the same device cannot be used repeatedly), select the cooling procedure, and click OK to create an order.



To create a remote order, enter the order number corresponding to the BIS system and match the corresponding order. See "BIS Remote Order Operation" for details.



## Operation

Click the button  to preheat and return the cabin temperature to ensure the consistency of initial chamber temperature.

After manually ending the process operation of the order, click the button  to open the cabin door.

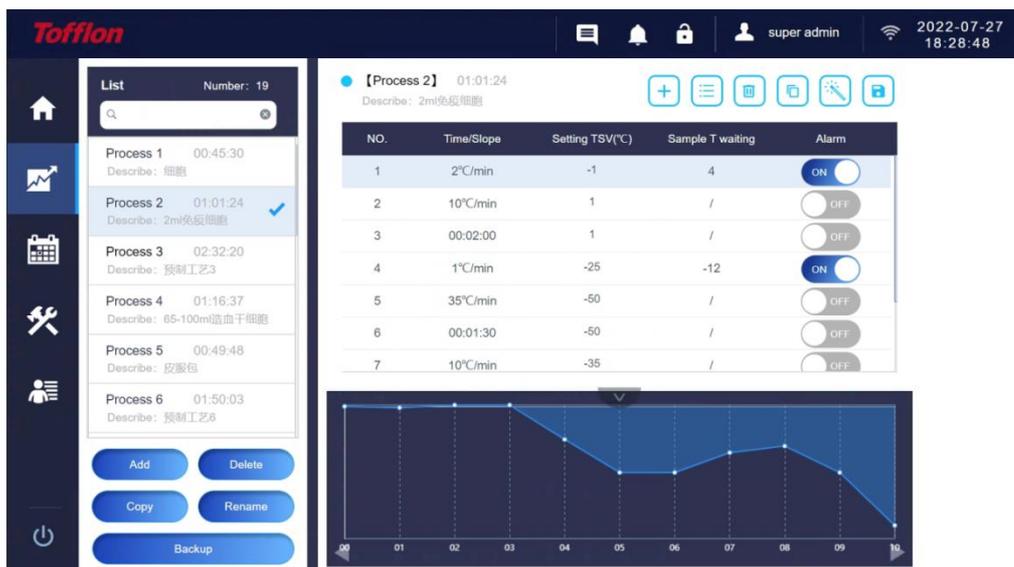
(III) Click  to enter the program list interface, where users can edit the cooling program process.

**Time/Slope:** Select the input slope value to indicate the change rate of the temperature; Select input time to indicate the constant temperature at the set temperature.

**Set Temperature (°C):** Set the target temperature of the chamber temperature.

**Sample temperature waiting:** When setting the sample temperature, after waiting for value judgment program will be based on the sample temperature, chamber temperature to set the rate of cooling to the set temperature, when the temperature reaches the set sample temperature, sample in the process of the program will execute the next step process, when the temperature of the chamber has reached the set temperature, sample temperature has not yet reached sample set temperature, the program will be a constant current chamber temperature, Wait for the sample temperature to reach the sample setting temperature before the end of this process step to carry out the next step.

**Alarm:** On indicates that temperature tracking alarm is enabled.



The screenshot displays the Tofflon software interface. On the left is a sidebar with navigation icons. The main area is divided into two panels. The left panel shows a 'List' of 19 processes, with Process 2 selected. The right panel shows a detailed view of 'Process 2' with a table of parameters and a temperature graph below it.

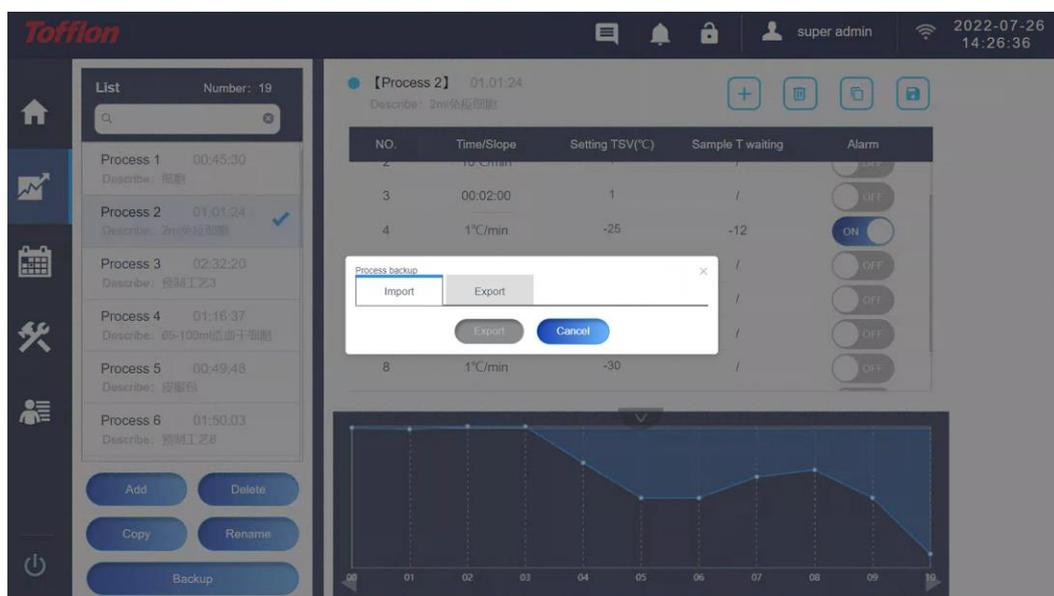
NO.	Time/Slope	Setting TSV(°C)	Sample T waiting	Alarm
1	2°C/min	-1	4	ON
2	10°C/min	1	/	OFF
3	00:02:00	1	/	OFF
4	1°C/min	-25	-12	ON
5	35°C/min	-50	/	OFF
6	00:01:30	-50	/	OFF
7	10°C/min	-35	/	OFF

## Operation

Users can create, delete, copy, and rename processes on this screen. Click  to add a step after the last process step, click  to add the same program after the selected step, click  to copy the selected process step, click  to overlay and paste the selected position, click  to delete the selected process step, and click  to save the process program.

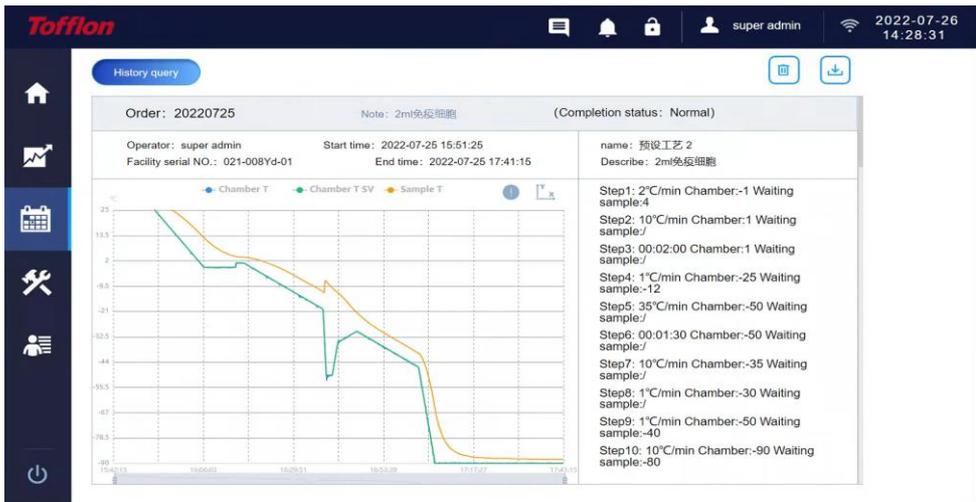
Click  to import and export process program from U disk or PC.

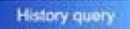
The six preset processes cannot be modified or deleted, but can be copied and modified.

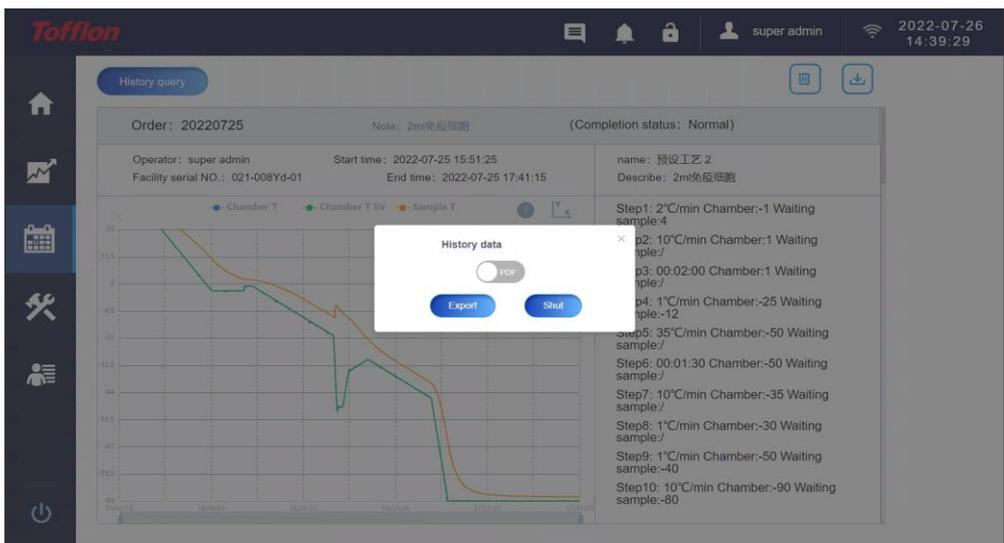


## Operation

(IV) Click  into the historical order query interface, you can view the order curve, alarm record, operation record, temperature record and other data. Click  to delete the current historical order data, and click  to export the current historical order data in PDF or CSV format.



Click  to query the historical content according to the program name, order code, time range and operator.



**Historical data query**

Find:  Time range:  Select date:

NO.	Order	Program name	Operator	Completion status
1	0727001	预设工艺 2-2022-07-26 13:58:48	super admin	Unfinished
2	20220725	预设工艺 2-2022-07-25 15:51:25	super admin	Finish
3	20220721	预设工艺 2-2022-07-21 11:39:51	super admin	Finish
4	eeert	m-2022-07-20 15:48:18	super admin	Unfinished
5	072003	m-2022-07-19 17:02:43	super admin	Finish

Result: 54/54 Amount of data: 3.3%

**Alarm list**

NO.	Alarm time	Alarm type	Content
No Data			

**Operation list**

NO.	Operating content	Operating time	Operator
1	Stop(预设工艺 2)	2022-07-25 17:41:15	super admin

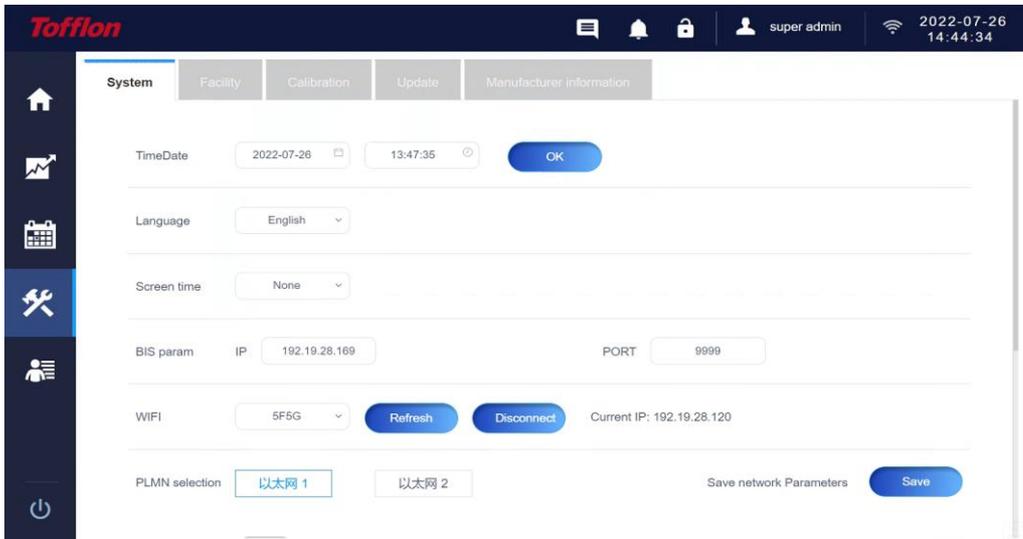
**Thermograph**

NO.	Time	Chamber T	Chamber T SV	Sample T
1	15:51:25	28.6	28.6	28.7
2	15:52:00	27.4	27.4	28.7
3	15:53:00	25.5	25.5	28.5
4	15:54:01	23.5	23.4	28
5	15:55:00	21.4	21.4	27.5
6	15:56:00	19.4	19.4	26.8
7	15:57:00	17.3	17.4	25.8
8	15:58:00	15.4	15.4	24.8
9	15:59:00	13.1	13.4	23.7
57	16:47:00	-30.4	-30.4	-22.1
58	16:48:00	-31.5	-31.4	-23.7
59	16:49:00	-32.4	-32.4	-25.2
60	16:50:00	-33.1	-33.4	-26.5
61	16:51:00	-34.3	-34.4	-27.7
62	16:52:00	-35.5	-35.4	-28.8
63	16:53:00	-36.1	-36.4	-29.9
64	16:54:01	-37.9	-37.4	-30.9
65	16:55:01	-38.4	-38.4	-32

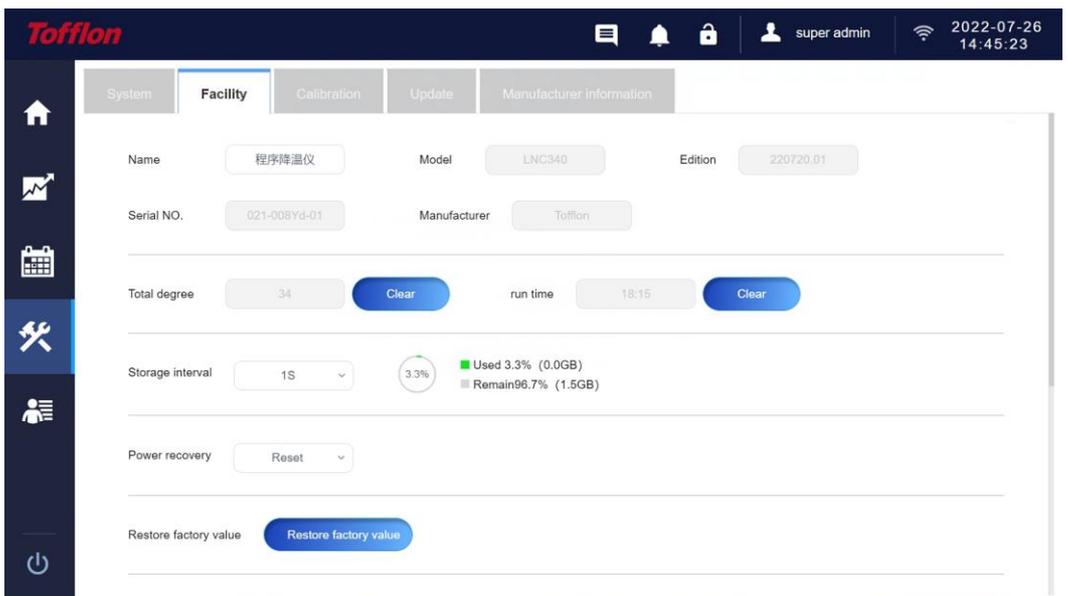
## Operation

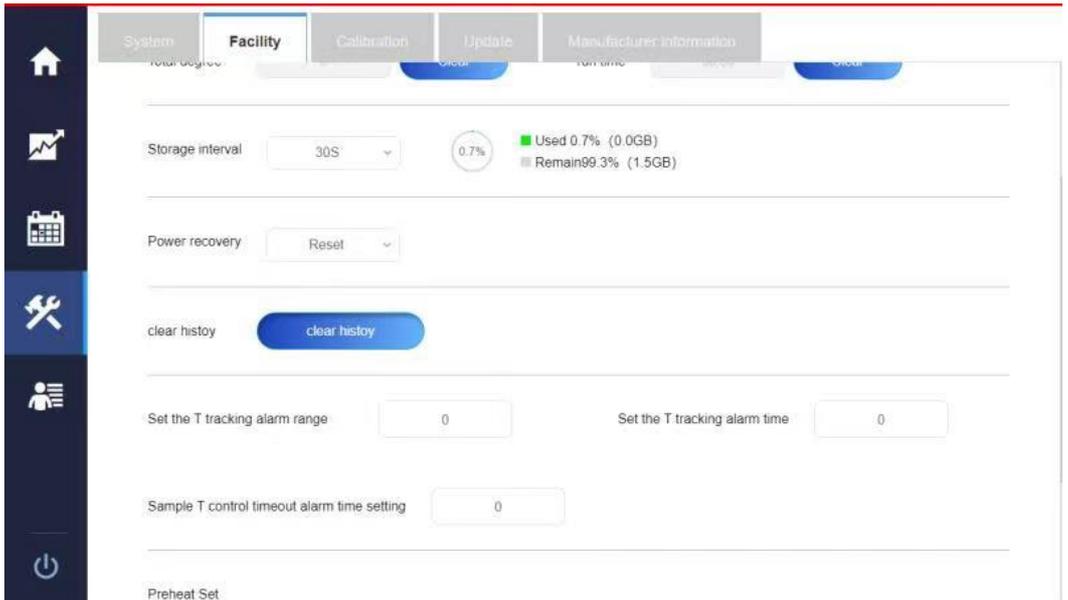
(V) Click  to enter the interface related to the device and system.

1、 System: You can set the system date and time on this page (do not set the operation when the machine is running the cooling program), screen out time, network connection mode, etc.



2、 Equipment related: alarm conditions can be set (the machine is running the cooling program is prohibited to set operation), clear historical data, preheating function settings.





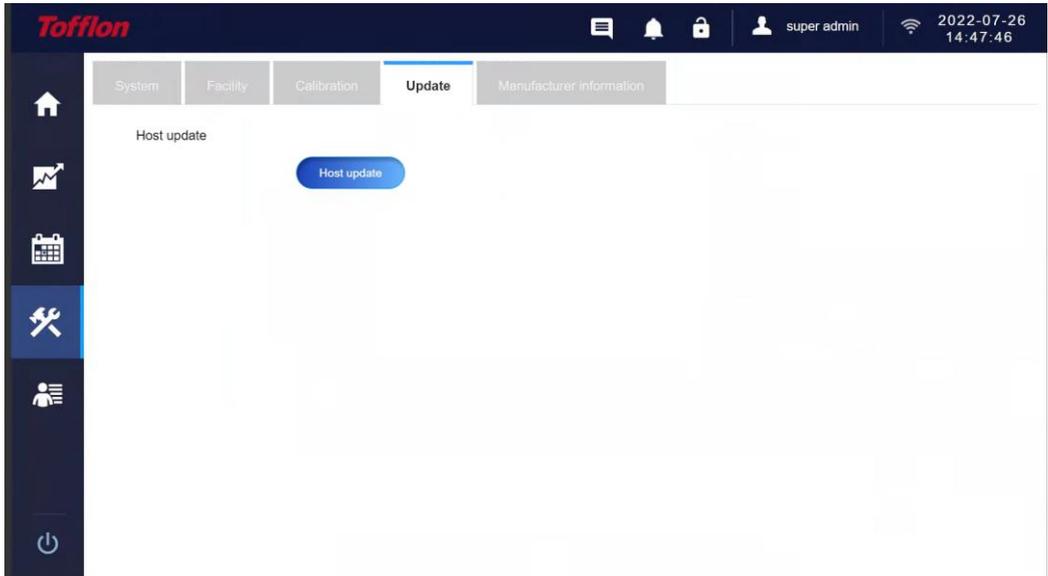
When the current main actuator solenoid valve is faulty, users can temporarily switch the main actuator solenoid valve on the setting interface to solve the current emergency use situation. When the device is standby, repair or replace the faulty solenoid valve in time.

3、 Equipment calibration: The third party temperature detection instrument can be used to calibrate the temperature of the equipment, and the temperature value of the temperature probe can be corrected by inputting different correction point temperature and correction value.

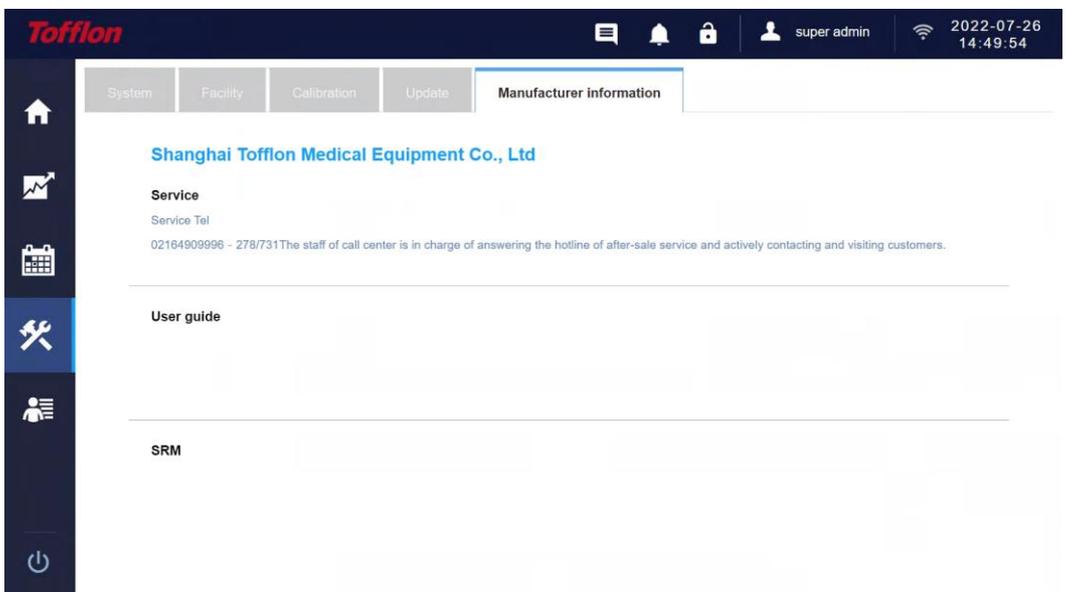


## Operation

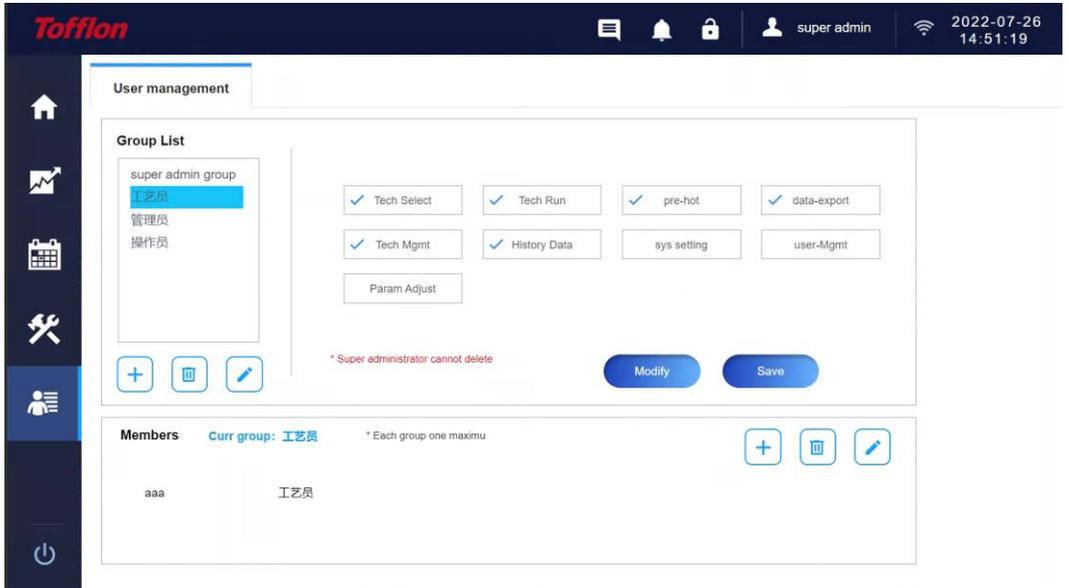
- 4、 Equipment update: Insert the U disk with update software package and click "Host Update" to update the equipment software.



- 5、 Manufacturer information: You can view the relevant service information, equipment usage instructions and equipment maintenance instructions provided by the manufacturer.

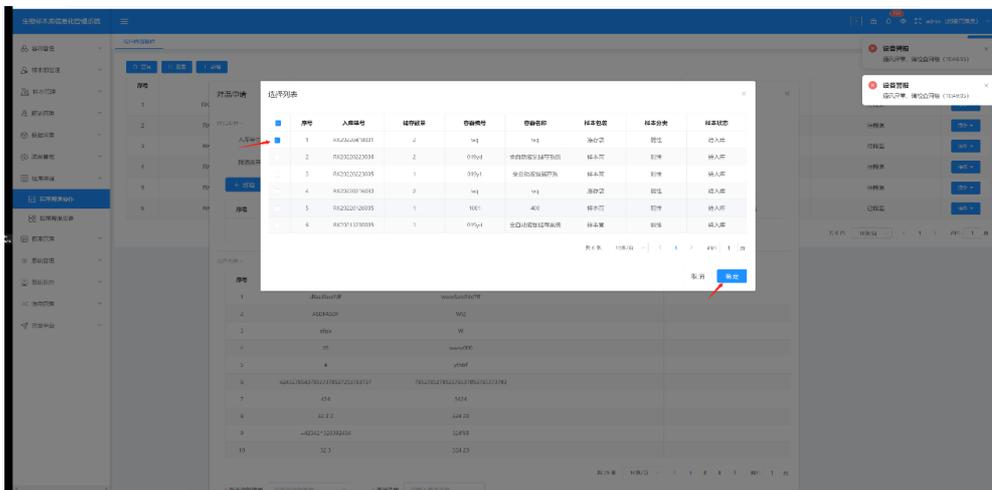


(VI) Click  to enter the user management page. On this page, users with management rights can set user groups and group permissions, add or delete group members, and set user login passwords.

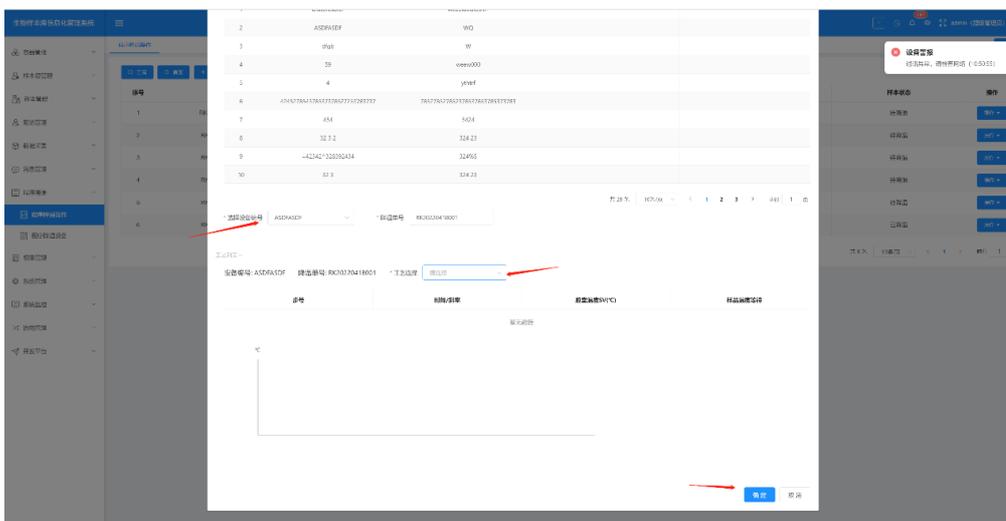


## Operation

(VII) BIS remote order operation, which requires users to use the BIS biometric database management software of our company:



- 1、 Select the batch number from the list of biological samples to be stored and confirm to add it to the program cooling list.



- 2、 After confirming the program cooling order number, select the running equipment and cooling process, click "OK", the order will be sent to the corresponding program cooling device. When the operator enters the same remote order on the corresponding program thermostat and places the corresponding biological sample in the thermostat, confirmation can execute the cooling procedure. After the order is completed, the order data will be automatically uploaded to the BIS server, which can be accessed and queried in BIS.

ID	姓名	性别	出生日期	联系电话	注册时间	注册时间	操作
1	张三	男	1990-01-01	13800138000	2023-10-11 10:00	2023-10-11 10:00	编辑
2	李四	女	1995-02-02	13900139000	2023-10-11 11:00	2023-10-11 11:00	删除
3	王五	男	1992-03-03	13700137000	2023-10-11 12:00	2023-10-11 12:00	添加
4	赵六	女	1998-04-04	13600136000	2023-10-11 13:00	2023-10-11 13:00	编辑
5	孙七	男	1993-05-05	13500135000	2023-10-11 14:00	2023-10-11 14:00	删除
6	周八	女	1997-06-06	13400134000	2023-10-11 15:00	2023-10-11 15:00	添加

**添加/编辑**

姓名:

性别:  男  女

出生日期:

联系电话:

注册时间:

操作:

ID	姓名	性别	出生日期	联系电话	注册时间	操作
1	张三	男	1990-01-01	13800138000	2023-10-11 10:00	编辑
2	李四	女	1995-02-02	13900139000	2023-10-11 11:00	删除
3	王五	男	1992-03-03	13700137000	2023-10-11 12:00	添加
4	赵六	女	1998-04-04	13600136000	2023-10-11 13:00	编辑
5	孙七	男	1993-05-05	13500135000	2023-10-11 14:00	删除
6	周八	女	1997-06-06	13400134000	2023-10-11 15:00	添加

## 5. Alarm and troubleshooting

### In this chapter

Section	See page
5.1Shutdown alarm	35
5.2Non-shutdown alarm	37
5.3Troubleshooting	38

## 5.1 Shutdown alarm

### 5.1.1 Chamber thermocouple failure alarm

If can't detect chamber thermocouple, the screen will issue "chamber temperature sensor fault" alarm, as shown in figure 6.1.1, at the same time issued a warning sound, click on the confirmation after, popups and alarm sound will disappear, but the screen red show status bar alarm icons, click on the figure label still can see alarm information, and equipment is in standby mode at the same time, prohibit operation function; Until the chamber thermocouple signal is detected, the alarm is completely removed, the icon returns to normal color, and all functions are restored.



Figure 6.1.1

### 5.1.2 Sample thermocouple failure alarm

If the sample thermocouple is not detected, the screen will send sample temperature sensor fault alarm, as shown in figure 6.1.2, send out alarm sound at the same time, click on the confirmation after, popups and alarm sound will disappear, but the alarm icon in the status bar is displayed in red, click on the figure label still can see the alarm message, equipment is in standby mode at the same time, prohibit operation function; Until the sample thermocouple signal is detected, the alarm is completely removed, the icon returns to normal color, and all functions are restored.



Figure 6.1.2

### 5.1.3 Freezer/sample over/below limit temperature alarm

When the chamber temperature or sample temperature reaches the upper or lower limit of the design (+50°C~-180°C) for a certain period of time, an alarm "temperature beyond the limit" will be issued, as shown in figure 6.1.3. Click mute, and the sound will disappear, but the alarm icon in the screen status bar will be displayed in red. When the temperature returns to the range, the alarm will be completely removed, but when the alarm lasts for ten minutes, the instrument will immediately disable all program functions and sound an alarm, switching to standby mode.



Figure 6.1.3

#### **5.1.4 Solenoid valve fault alarm**

When the program sends the cooling command, chamber temperature unchanged within a certain period of time, there may be two reasons, one is the electromagnetic valve is not normally open, the second is no liquid nitrogen flow into. The judgment logic is refrigerating output = set refrigeration lower limit, every 5 seconds no drop in temperature 0.3°C, the last 1 min system will judge for electromagnetic valve failure. The alarm icon is shown in figure 6.1.4. At the same time, the device is in standby mode and the operation function is prohibited. The sound can be muffled manually, and the alarm can be eliminated after manual troubleshooting.



Figure 6.1.4

#### **5.1.5 Heater failure alarm**

When the program sends the heating instruction and the chamber temperature does not change within a certain period of time, it can be judged that the heater does not work properly and the system determines that the heater is faulty. The judgment logic is heating output = set the upper limit of heating and the heater fault alarm will be issued if the temperature does not rise 0.3°C every 5 seconds for 1min, as shown in figure 6.1.5. At the same time, the device is in standby mode, and the operation function is forbidden. The sound can be muffled manually, and the alarm can be eliminated after manual troubleshooting.



Figure 6.1.5

## **5.2 Non-shutdown alarm**

### **5.2.1 Power failure recovery alarm**

The UPS can supply power continuously, and the power failure signal needs to be recorded and corresponding alarm signal needs to be given, as shown in Figure 6.2.1.



Figure 6.2.1

### **5.2.2 Freezer/sample exceed/below limit temperature warning**

When the chamber temperature or sample temperature reaches the upper or lower limit of the design (+50°C~-180°C), an alarm "temperature exceeding limit" warning will be issued. Click Mute, the sound will disappear, but the alarm icon in the status bar of the screen will appear red, and the alarm will be lifted after the temperature returns to normal in a certain time.

### **5.2.3 Temperature tracking too high alarm**

During the operation of the cooling program, when the temperature of the chamber is higher than the preset program design temperature in a certain reservation time, a pop-up alarm "temperature is too high" will be issued. When the temperature of the chamber is normal, the alarm will be automatically eliminated. In addition, manually clicking confirm can also eliminate the alarm, which will not affect the operation of the program.

### **5.2.4 Temperature tracking too low alarm**

During the operation of the cooling program, when the temperature of the chamber is lower than the preset program design temperature in a certain reservation time, a pop-up alarm "temperature is too low" will be issued. When the temperature of the chamber is normal, the alarm will be automatically eliminated. In addition, manually clicking confirm can also eliminate the alarm, which will not affect the operation of the program.

### **5.2.5 Sample temperature control timeout alarm**

When the running time of sample temperature control exceeds the specified time set by the program, the screen will pop up the "sample temperature control timeout" alarm and emit an alarm sound at the same time. After clicking to confirm the alarm, the pop-up window and alarm sound will disappear, and the program will jump to the setting program in the next line for operation.

## Alarm and troubleshooting

### 5.2.6 End of operation alarm

After the program cooling operation of the sample is completed, the end of the program cooling alarm will be issued, and the screen will pop up the alarm of "end of operation", and the alarm sound will be issued. At the same time, the chamber temperature of the temperature drop instrument is always constant, and the constant temperature is the final target temperature of the program. Until the operator on the screen to confirm the alarm information, popup window and alarm sound disappeared, the Programmable Cooler into standby state.

### 5.3 Troubleshooting

Trouble shooting list			
Fault phenomenon	Possible causes	Method of verification	Solution
"Solenoid valve failure" alarm	LN <sub>2</sub> supply tank is empty	Verify that the supply tank contains sufficient liquid nitrogen	Replace/fill LN <sub>2</sub> tank
	LN <sub>2</sub> is under pressure	Confirm liquid nitrogen tank pressure (Regulator: Standard 22)	Replace liquid nitrogen tank/regulator
	LN <sub>2</sub> supply hose is too long	Whether 4 '6' hose is used for liquid nitrogen tanks or vacuum insulated lines	Replace/upgrade hoses/pipes
	LN <sub>2</sub> solenoid valve is damaged	After the run is complete, check the valve counter warning dialog	Contact maintenance department to replace the valve
Cabin temperature is unstable	LN <sub>2</sub> pressure is too high	Confirm liquid nitrogen tank pressure (Regulator: Standard 22)	Replace/fill LN <sub>2</sub> tank
	Cabin thermocouple installation error	Verify that the cabin temperature probe is properly fixed in the sleeve by verifying that the blue mark is flush with the frame	Adjust thermocouple position
Sample temperature is unstable	Sample thermocouple location	If using a press, make sure the sensor is oriented correctly to avoid metal contact	Correct sensor orientation so that it is not in contact with metal
Cabin temperature is	Calibration date	Verify that the interval between	Recalibrate probe

## *Alarm and troubleshooting*

not accurate		the last calibration date and the current date is less than 1 month	
	Incorrect calibration	Verify that the calibration value is reasonable	Recalibrate probe
Sample temperature is not accurate	Calibration date	Verify that the interval between the last calibration date and the current date is less than 1 month	Recalibrate probe
	Incorrect calibration	Verify that the calibration value is reasonable	Recalibrate probe
USB export	File system format of the drive	Verify that the drive is compatible with the file system format	The drive should be compatible
	Available memory	Verify that the drive has more than 1MB of memory	There should be memory space available in the drive
Ice around the door	The door is not bolted properly	Verify that the door is properly latched	Latch the door correctly and seal the gasket
		Verify that the gasket is completely sealed	

## 6. Maintenance

### In this chapter

Section	See page
6.1 Preventive maintenance	41
6.2 Equipment maintenance	41

## 6.1 Preventive maintenance

Your equipment has been fully tested and calibrated before delivery. Routine preventive maintenance is required to protect the proper operation of the equipment. The operator shall perform routine cleaning and maintenance of the equipment on a regular basis.

For necessary preventive maintenance, see the table below. The adjustment interval between cleaning and calibration depends on the usage, environmental conditions and required accuracy.

Preventive maintenance requirements					
Project	Use each time	Each day	Each week	Each month	Each year
Dry doors, cabin opening liners and insulation panels	✓				
Disinfection of cabin interior		✓			
Cleaning the equipment outside			✓		
Check the calibration of internal and sample probes				✓	
Check solenoid valve (professional service technicians only)					✓

## 6.2 Equipment maintenance



**Warning:** Be sure to turn off the device before starting any repair work.



**Notice:** Before using any cleaning or decontamination method other than the manufacturer's recommendation, the user must confirm with the manufacturer that this method will not damage the equipment.



**Notice:** Do not use strong alkaline or corrosive cleaners. Do not use sodium hypochlorite solution (bleach), which may cause pitting and rust.



**Warning:** Ethanol is volatile and flammable and should be used in well-ventilated areas without open flames. Do not expose any components that have been cleaned with ethanol to open flame. Make sure the ethanol is completely dry before turning on the power.

## *Maintenance*

- 1) **Dry gasket and heat shield:** Use a soft cloth to thoroughly dry doors, cabin opening gasket and heat shield after each run to prevent freezing from reducing the sealing effect of the door.
- 2) **Internal disinfection of Programmable Cooler:** Use appropriate disinfectant. All disinfected objects and surfaces must be thoroughly cleaned and dried.

Cleaning steps:

- ① Use the soft shutdown button to turn off the thermostat and disconnect the power plug.
  - ② The sample probe was pulled out and removed from the chamber, washed and dried with ethanol.
  - ③ Use a non-abrasive cloth and disinfectant to clean the inside of the box, working down from the top. Containers and doors must be rinsed with sterile water until completely removed with disinfectant. After rinsing the box, spray with 70% ethanol.
  - ④ The chamber door is kept open to allow the ethanol to evaporate.
  - ⑤ Plug in Programmable Cooler and turn on the power switch.
- 3) **External cleaning:** Use a damp sponge or a completely wrung out soft cloth to clean the outside of the temperature reducer with a mild detergent dissolved in water, and wipe dry with a dry soft cloth.
  - 4) **Solenoid valve maintenance:** It is recommended that all solenoid valves be cleaned regularly. The interval between cleanings depends on the operating environment and service conditions. Normally, if the coil voltage is normal, the valve should be cleaned when there is hysteresis, excessive noise or leakage.

## 7. Appendix

### In this chapter

Section	See page
7.1 List of vulnerable parts	44
7.2 Warranty	45

## Appendix

### 7.1 List of vulnerable parts

List of vulnerable parts		
No.	Parts code	Name
1	211901000023	Electromagnet
2	191001000033	Cartridge direct
3	191101000090	Copper direct head
4	211101000052	Press tightly handle lock
5	191103000017	All copper T joint
6	120102000029	Low temperature fluid solenoid valve
7	191001000026	Copper pipe clamp coupling
8	636399000254	Heating tube
9	636399000116	Door sealing strip
10	636399000123	Motor shaft seal
11	636399000081	PTFE gasket
12	636399000142	Box sealing strip
13	180101000260	T type thermocouple
14	180101000261	T type thermocouple
15	636399000178	External R1-4 to internal NPT3-8 connector
16	121001000007	Refrigerating safety valve
17	636399000203	External R1-4 to internal NPT1-4 connector

## 7.2 Warranty

- 1) During the warranty period, if the product has any failure, which is due to poor quality of the original device or production problem, it can be guaranteed free of charge.
- 2) Any failure or damage to vulnerable and consumable parts caused by improper operation, unauthorized maintenance and modification, operation against instructions or falling, etc. of the user shall not be covered by the warranty.
- 3) The warranty period is one year, starting from the date of purchase.

<b>【Manufacturer】</b> Tofflon Life Science Co., Ltd.
<b>【Manufacture address】</b> 139, DUHUI RD., SHANGHAI -201108 CHINA
<b>【Tel】</b> +86 21 64909996-338
<b>【Fax】</b> +86 21 64901123
<b>【Website】</b> <a href="http://www.tofflon-me.com">www.tofflon-me.com</a>

Please call the customer service hotline for replacement of parts due to equipment failure: +86 21 64901123.

The user shall specify the serial number and purchase date.



专业技术服务于生物医药  
Expertise In Bio-pharmaceutical

此样本版权属东富龙所有，任何个人或企业不得转载。部分图片，数据不一定与标准配置相同，东富龙保留更改权，欲了解更多信息，敬请登陆公司官方网站。



**Tofflon 东富龙** 东富龙生命科技有限公司

公司地址：上海市闵行区都会路139号二幢3楼  
邮政编码：201108  
联系电话：021-64909996-338  
官网网址：www.tofflon-me.com

Address: No.1509,Duhui Road,Shanghai,China 201108  
Tel: +86 21 6490 1123 / 6490 6201  
Fax: +86 21 6490 5148 / 6490 6202  
E-mail: info@tofflon.com(sales)  
service@tofflon.com(service)