

## Operation manual

**Mobifreeze**

M 270



Manufacturer:

LAUDA DR. R. WOBSEER GMBH & CO. KG

Schulze-Delitzsch-Straße 4+5

30938 Burgwedel

Germany

Telephone: +49 (0)5139 9958-0

Fax: -

E-mail: [info@lauda.de](mailto:info@lauda.de)

Internet: <https://www.lauda.de>

Original operation manual

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# 1 Safety

## 1.1 General safety instructions for the device

### IMPORTANT:

- Always read the operating manual carefully before operating the device.
- This operating manual is part of the device. If the device is passed on, the operating manual must be handed over with it.
- The information in this operating manual must therefore be kept at hand in the immediate vicinity of the device.
- Be sure to carefully store this copy of the operating manual.
- The operating manual is available on our website (<https://www.lauda.de>).
- The device must only be operated as intended under the conditions stated in this operating manual. Any other mode of operation is considered to be unintended use and could compromise the protection provided by the device.
- The device is not designed for use in medical applications in accordance with DIN EN 60601-1 and IEC 601-1.



*If this operating manual is lost, contact LAUDA Service. You can find the contact information here ↗ Chapter 13.4 "Contact LAUDA" on page 71.*

When operating the device, there is a risk of injury from low temperatures, fire and the presence of electrical energy. These risks posed by the device have been mitigated in the design to the extent possible in keeping with the applicable norms. The remaining risk can be reduced using one of the following measures:

- Safety equipment is available for the device. This equipment is crucial for device safety and must be controlled by the user. All maintenance intervals must be observed and appropriate maintenance activities must be performed to ensure the functionality of the equipment.
- The safety equipment for the device is described in this "Safety" chapter.
- Various warning symbols are located on the device. These symbols must be observed without fail.  
The warning symbols on the device are described in this "Safety" chapter.
- Personnel and the protective equipment worn by personnel are also subject to specific requirements.  
These requirements are described in this "Safety" chapter.
- The device may only be operated by trained personnel.
- Transport and move the device carefully. Never tilt the device.
- Never put the device into operation if:
  - it is damaged,
  - it is leaking (for example, refrigerant is escaping),
  - the mains cable and/or other cables are damaged.
- Switch off the device and pull out the mains plug, see ↗ Chapter 6.2 "Switching the device on and off" on page 41:
  - before starting service work, maintenance work or repair work
  - when moving the device
  - when installing or removing modules or accessories



An overview of authorized personnel and protective equipment can be found in ↪ Chapter 1.15 “Description of personnel qualifications” on page 10 and ↪ Chapter 1.16 “Description of personal protective equipment” on page 11.



Refer to ↪ Chapter 1.20 “Structure of warnings” on page 14 for more information on the general structure of safety notices.

## 1.2 Obligations of the operator

The national regulations for operation applicable in the country in which the system is installed must be complied with.

In particular, the application of statutory regulations concerning operational safety must be observed.

The conditions for setting up the device must always be met. See also the information in the device specifications ↪ Chapter 12.4 “Device data” on page 69.

The device may only be used, maintained and repaired in accordance with the manufacturer's instructions. It must not be modified or fitted with attachments without ensuring that the device is still safe. The safety of the device must be guaranteed at all times.

## 1.3 EMC requirements

Table 1: Classification in accordance with EMC requirements

Device	Immunity requirements	Emissions class	Customer power supply
Mobifreeze M 270	Table 1 (Industrial) in accordance with EN 61326-1	Emissions Class A in accordance with EN 55016-2	within the EU Domestic connection value ≥ 100 A

## 1.4 Software versions

This operating manual is valid for devices with the following software versions or higher.

Software	Valid from version
Temperature controller	1.3.x
Control element	2.0.509
Main battery monitor	1.09

## 1.5 Intended use

- The LAUDA Mobifreeze M 270 is a mobile ultra low temperature chest freezer designed for industrial use.
- The temperature range extends from -50 °C to -86 °C.

- The device is designed exclusively for the temperature control, storage and transport of non-hazardous substances, such as chemicals, pharmaceutical substances and medications.
- Only the integrated mains plug or the internal main battery may be used to operate the device.
- The mobile ultra low temperature chest freezer may only be moved by hand.
- The ultra low temperature chest freezer is loaded and unloaded from above. The device lid must be opened and the goods inside secured to prevent them from sliding. Make sure that the contents are distributed evenly. Heavy loads should be placed at the lowest point possible in the interior, ideally on the floor of the compartment.
- The maximum permitted gradient or incline for mobile operation is two percent.

## 1.6 Unintended use

The following are considered examples of unintended use:

- Storage of highly flammable/self-igniting and/or explosive substances, acids and alkalis that are chemically unstable and/or release gases
- Medical applications (the device does not have medical device approval)
- Installation and operation in hazardous areas and outside the permitted ambient conditions
- Use for controlling the temperature of foodstuffs
- Use in aggressive or corrosive ambient conditions
- Storage of substances that attack the materials incorporated into the device, such as stainless steel, elastomers and sensors.
- Outdoor installation
- Storage of hazardous substances that emit harmful fumes
- Installation and operation in the vicinity of naked flames
- The presence or storage of animals or people in the refrigeration compartment

## 1.7 Foreseeable misuse

The following are considered cases of foreseeable misuse:

- Medical applications
- Transport of people/passengers
- Collision with other people and objects
- Exceeding the maximum permissible load
- Moving/pulling the device with a motorized vehicle.
- Exceeding the maximum gradient of two percent when moving the device
- Exceeding the permissible payload, see chapter "Technical data".

## 1.8 Type of power supply

- Electrical energy
  - When connected to the mains power supply to operate the device
  - To charge the main battery

## 1.9 Prohibition of modifications to the device

Any technical modification of the device by the user is prohibited. Any damage resulting from unauthorized modification is not covered by customer service or the product warranty. Service work may only be performed by the LAUDA Service department or a service partner authorized by LAUDA.

Only original spare parts may be used.

The installation of modules, such as an external data logger or monitoring system, is only permitted/possible in consultation with, and following approval from, the manufacturer, LAUDA. See ↗ Chapter 5.3 “Installing modules” on page 36 for more information.

## 1.10 Ambient conditions and operating conditions

Observe the following requirements when setting up the device:

- The installation site must be level and horizontal (maximum gradient of two percent) and suitable for supporting the weight of the device.
- Activate the dead man's brake.
- Activate the locking casters.
- The transport route must not be slippery, wet or icy.
- Only used inside buildings
- Use up to a maximum height of 2,000 m above sea level
- Maximum relative humidity 80 percent, non-condensing
- Fluctuations of the mains voltage up to  $\pm 10$  of the nominal voltage
- Overvoltage category II
- Pollution degree 2
- Positioned at a minimum distance of 150 mm away from walls or other devices so that the air drawn in for cooling can circulate freely.
- The condenser must not be covered or obstructed as air circulation must be guaranteed.
- In order to prevent an increase in the compartment temperature resulting from a reduction in cooling capacity, the ambient temperature (16-28°C) must not exceed 28°C.
- In smaller installation rooms, please ensure that the heat discharged from the device's active cooling system does not cause the ambient temperature (see technical data) to exceed the maximum limit.
- Ensure that the installation room has adequate ventilation and cooling.

Also observe the following requirements when using the device in mobile applications:

- In order to prevent an increase in the compartment temperature resulting from a reduction in cooling capacity, it is important to ensure that there is sufficient cooling (if necessary using air conditioning) in the transport vehicle so that the ambient temperature (16-28°C) does not exceed 28°C.
- The device must be secured properly during transportation.
- Activate the dead man's brake.
- Activate the locking casters.
- The dead man's brake handle must not be secured in the pulled position.
- The device must not come into contact with the vehicle walls or other cargo items.

- The contents of the compartment must be adapted to the transport conditions and filled/secured accordingly.
- Minimize the time that the chest freezer spends in cold ambient conditions.

### 1.11 Materials

All parts of the device are manufactured from high-quality materials adapted to withstand the operating temperature. The range of materials used includes high-quality stainless steels and high-quality, temperature-resistant plastics. The compartment is manufactured entirely from stainless steel.

### 1.12 Time limits

- The device is designed to operate continuously for 20,000 hours.
- Refer to the maintenance plan for information on maintenance intervals.

### 1.13 Natural refrigerant

The device operates using odorless, natural refrigerant. These refrigerants are flammable. There are no special installation requirements due to the low refrigerant charge and hermetically sealed design. The designation and refrigerant charge are specified on the type plate, see ↗ Further information on page 28 and also ↗ Chapter 5.1 “Installation” on page 31.

### 1.14 Application area

The device may only be used in the following areas.

- Logistics, production, quality assurance, research and development in an industrial environment
- Indoors
  - Exception: Properly secured in vehicle cargo holds
- Not installed outdoors
  - Exception: short routes in the open air in line with specified IP protection requirements

### 1.15 Description of personnel qualifications

#### Electrician

Electricians are able to perform work on electrical installations as well as identify and avoid potential dangers independently based on their professional training, knowledge and experience as well as knowledge of the relevant provisions.

Electricians are specially trained for the working environment in which they are active and know all the relevant standards and regulations.

Electricians must comply with the provisions of all applicable statutory accident prevention regulations.



## Forklift driver

The forklift driver must be 18 years old or over and have physical, mental and character-related qualities that are suitable for driving industrial trucks that have a driver's seat or driver's cab.

Furthermore, the forklift driver has been trained to drive industrial trucks that have a driver's seat or driver's cab.

The forklift driver has demonstrated to the operator his or her ability to drive industrial trucks that have a driver's seat or driver's cab, and the operator then commissions the driver in writing to drive the vehicles.

## Instructed person

The operator has informed the instructed person about the tasks assigned to them and the possible risks of improper behavior.

## Refrigeration specialist

Refrigeration specialists are specially trained and certified for the specialist field in which they are active and know all the applicable standards and regulations. The certification includes the expertise required to avoid emissions, recover fluorinated greenhouse gases and safely handle refrigeration equipment of the relevant type and size.

Refrigeration specialists are able to carry out work on refrigeration systems and independently recognize and avoid possible dangers based on their professional training and experience.

A certificate relating to (EU) No. 517/2014 and (EU) No. 2015/2067 must be available.

## Specialized personnel

Specialized personnel are able to perform the work assigned to them as well as identify and avoid potential dangers independently based on their professional training, knowledge and experience as well as knowledge of the relevant provisions.

## 1.16 Description of personal protective equipment



### Cold protection gloves

Cold protection gloves are leather safety gloves that are resistant to acid and cold.

Safety gloves are used to protect the hands when touching refrigerated components and small quantities of refrigerants.



### Protective gloves

Protective gloves are worn to prevent injuries when removing external protective panels.



### Safety glasses

Safety glasses are used to protect the eyes from flying parts and liquid splashes.



### Safety shoes

Safety shoes are worn to provide protection against heavy falling objects and prevent slipping on slippery surfaces. They also protect the feet when removing exterior protective panels.

## 1.17 Safety fittings on the device

### 1.17.1 Alarm message

In the event of a malfunction, an alarm is triggered.

Each alarm is indicated acoustically in the form of an alarm signal (1 second on – 1 second off) and visually on the Touch operating unit display.

All alarms that occur are saved in the internal data logger.

### 1.17.2 Sensor monitoring

The controller's temperature probe is continuously checked for short circuits and interruptions.

In the event of a malfunction, an alarm message is activated, see [Chapter 1.17.1 "Alarm message"](#) on page 12.

If the sensor develops a fault, the emergency program starts. The device cools alternately for 30 minutes with the compressor running, and then stops for 10 minutes.

Note:

- During the emergency program, the temperature may vary from the set temperature in the compartment.

### 1.17.3 Power failure / main battery failure

If a power failure occurs or the device is disconnected from the mains power, it switches to battery mode. This transition usually occurs without interruption.

If the user switches off the main battery or the battery is completely discharged, meaning that battery operation is no longer possible, an acoustic warning signal sounds after approximately 5 seconds (1 second on – 1 second off). The [power failure] fault message remains on the Touch operating unit display until it is acknowledged.

In the event of a complete power failure, the battery of the internal data logger will keep the Touch operating unit display and data recording (internal data logger) operational for approximately 35 hours.

### 1.17.4 Data logger battery alarm

If the battery in the internal data logger develops a fault, a corresponding message and the current temperature appear alternately in text form on the display.

An acoustic alarm also sounds (1 second on – 1 second off).

Always observe the legal regulations when disposing of a faulty battery from the internal data logger.

## 1.17.5 Overtemperature alarm

The overtemperature protection is a warning device that is activated when the temperature in the refrigeration compartment exceeds the specified upper limit.

This information is shown on the Touch operating unit display.

An acoustic alarm also sounds (1 second on – 1 second off).

## 1.17.6 Low temperature alarm

The low temperature protection is a warning device that is activated when the temperature in the refrigeration compartment falls below the specified lower limit.

This information is shown on the Touch operating unit display.

An acoustic alarm also sounds (1 second on – 1 second off).

## 1.18 Warning symbols on the device

### Cold surfaces



"Cold surface" warning symbols are affixed to the device. This symbol warns of cold surfaces on the device. These surfaces must not be touched during operation. Personal protective equipment must be worn before coming into contact with these surfaces during other operation phases such as servicing.

### Flammable



- The "Flammable" warning symbol is attached to devices filled with natural refrigerants.

This symbol warns of the flammability of natural refrigerant.

### LiFePO<sub>4</sub> battery



- The device is fitted with a LiFePO<sub>4</sub> battery.


## 1.19 Residual risks

The safety instructions/warning information in the operating instructions describe any residual risks on the device.

## 1.20 Structure of warnings


### Dangerous

- A warning of "dangerous" indicates an **immediately dangerous** situation.
- If this warning is not observed, then **death** or **severe, irreversible injury** could occur.

 <b>DANGER!</b> Type and source	
	Consequences of not following instructions
	<ul style="list-style-type: none"><li>● Measure 1</li><li>● Measure...</li></ul>


### Warning

- A warning of "warning" indicates a **possibly dangerous** situation.
- If this warning is not observed, then **death** or **severe, irreversible injury** could occur.

 <b>WARNING!</b> Type and source	
	Consequences of not following instructions
	<ul style="list-style-type: none"><li>● Measure 1</li><li>● Measure...</li></ul>


### Caution

- A warning of "caution" indicates a **possibly dangerous** situation.
- If this warning is not observed, then **minor, reversible injury** could occur.

 <b>CAUTION!</b> Type and source	
	Consequences of not following instructions
	<ul style="list-style-type: none"><li>● Measure 1</li><li>● Measure...</li></ul>

### Notice

A "notice" warns that dangers to property or the environment may exist.

 <b>NOTICE!</b> Type and source	
	Consequences of not following instructions
	<ul style="list-style-type: none"><li>● Measure 1</li><li>● Measure...</li></ul>

## 2 Unpacking the device

### 2.1 Safety information



**WARNING!**  
Leaks in the cooling circuit due to transport damage

Fire

If you discover that the transport packaging is damaged:

- Place/store the device in a well-ventilated location with no sources of ignition.
- Do not operate the device.
- Contact LAUDA Service.



**WARNING!**  
LiFePO4 battery damaged during transport

Fire, breakages, heat, leaks

- Protect the battery system from damage.
- Immediately disconnect a faulty device from the mains power.
- Switch off the battery system.
- If necessary, use a suitable extinguishing agent to extinguish a LiFePO4 battery fire.
- Contact LAUDA Service.



**CAUTION!**  
Transport damage

Cutting

- Closely inspect the device for transport damage prior to starting up.
- Never operate a device that has sustained transport damage.



**NOTICE!**  
Aids/lifting equipment used during unpacking

Impact, crushing, material damage

- Use suitable aids when unpacking.
- Use suitable lifting equipment.
- Have the device unpacked professionally by specialized personnel.

## 2.2 Unpacking

- Personnel: ■ Specialized personnel
- Protective equipment: ■ Safety shoes  
 ■ Protective gloves

1. Place the device on a level surface.
2. Unpack the device.



*Keep the original packaging of your device for subsequent transportation.*

3. Check the device and accessories for completeness and transport damage immediately after delivery.



*If the transport packaging, device or accessories are damaged contrary to expectations, immediately inform the shipping company so that a damage report can be compiled and the transport damage inspected. Also notify the LAUDA Service department immediately. Refer to Chapter 13.4 “Contact LAUDA” on page 71 for contact details, and place/store the device in a well-ventilated location with no sources of ignition.*

Note on fire extinguishers suitable for extinguishing a LiFePO<sub>4</sub> battery fire:



*If the LiFePO<sub>4</sub> battery catches fire, use suitable fire extinguishers to extinguish the fire. These fire extinguishers should be designed specifically to extinguish battery fires. They can contain classic extinguishing agents such as CO<sub>2</sub> (powder or normal foam), or can be gel fire extinguishers or special lithium-X extinguishers.*

## 2.3 Operating manual catalog number

Device type	Designation	Language	Quantity	Catalog number
Mobifreeze M 270	Operating manual	German	1	Q4DT-E.13-013-DE
		English	1	Q4DT-E.13-013-EN
		French	1	Q4DT-E.13-013-FR
Mobifreeze M 270	Warranty card		1	----

## 3 Transport

### 3.1 Regulations when transporting devices containing LiFePO4 batteries

When transporting ultra low temperature chest freezers containing LiFePO4 batteries on a transport vehicle (truck or similar), observe the following regulations.

- The device/package must be marked with a danger label (or a corresponding sticker, size 10x10 cm) indicating "Hazard Class 9" and the identification number "UN3481".
- The test certificate of the LiFePO4 battery must be present. This certificate must be sent to the shipping company beforehand. The certificate can be found in the "General" chapter of this operating manual, see ↗ Chapter 13.7 "UN38.3 Test Report for LiFePO4 battery" on page 74, and downloaded in PDF format from [www.lauda.de](http://www.lauda.de) in the "Service" area: <https://www.lauda.de/en/services/download-center/filter/default/mobifreeze>.
- A "document for the transportation of hazardous goods by road" including number UN3481 and the gross weight of the device (net weight of the ultra low temperature chest freezer and corresponding payload) must be prepared and transported together with the ultra low temperature chest freezer.

### 3.2 Moving and transporting the ultra low temperature chest freezer



#### WARNING!

Operating error when pushing, rollover hazard due to casters

Risk of injury from rolling over, impacts

- Do not roll the device over your feet or other parts of your body.
- Move the device carefully, ask several people to help, if necessary.
- Wear safety shoes.
- Avoid collisions with other people and objects.
- Avoid foreseeable misuse, see ↗ Chapter 1.7 "Foreseeable misuse" on page 8.

Personnel: ■ Instructed person

Protective equipment: ■ Protective gloves

■ Safety shoes

Note the following when pushing/moving the device:

1. Disconnect the device from the mains power.
2. Wind up the mains cable.
3. Release the locking casters.

4. Pull and hold the dead man's brake handle, then push and maneuver the device using the push handle.



*Due to the net weight of the device and the payload, it makes sense to have several people push/move the ultra low temperature chest freezer.*

Note the following when parking the device:

1. Release the dead man's brake handle on the push handle.
2. Secure the locking casters.
  - ▶ Device can be connected to the mains power supply, for further information, see Chapter 6.1 "Establishing a mains connection" on page 40.

Note the following when parking the device inside a vehicle:



**WARNING!**  
Uncontrolled device movement during transport

Danger of injury, device damage

- Secure the load properly to prevent it from moving or sliding.
- Activate the locking casters.
- Activate the dead man's brake. The dead man's brake handle must not be secured in the pulled position.
- The load must not come into contact with the outer walls of the vehicle or any other cargo items.

1. Activate the dead man's brake.
2. Activate the locking casters.
3. Ensure the load is secured properly to prevent it from moving or sliding.
4. Make sure that the load cannot come into contact with the outer walls of the vehicle or other cargo items.



**CAUTION!**  
Transport damage

Cutting

- Closely inspect the device for transport damage prior to starting up.
- Never operate a device that has sustained transport damage.



	<b>NOTICE!</b> Setting up the device
	Equipment damage/material damage/malfunction

- The device must be at the permissible ambient temperature when started up. If not, the device must be acclimatized.

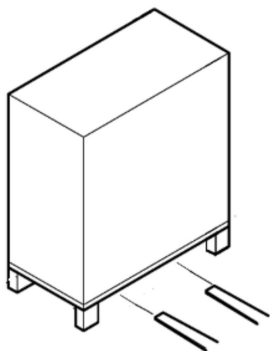
### 3.3 Transport with an industrial truck

The ultra low temperature chest freezer can be transported on an industrial truck under the following conditions:

- The device must be secured to the industrial truck (secure load).

Personnel: ■ Forklift driver

Protective equipment: ■ Safety shoes  
■ Protective gloves



- Only insert the forks of the industrial truck into the wider side of the device.
- Insert the forks so far that they protrude out of the opposite side.
- Make sure that the device cannot tip over if the center of gravity is off-center (secured load).
- Lift the device as gently as possible and start transportation. When driving over bumps and braking, ensure that the package cannot tip or slide.
- Always check the device for transport damage after each transport operation.

Fig. 1: Transport with an industrial truck

	<b>DANGER!</b> Transport damage
	Electric shock, fire

- Closely inspect the device for transport damage prior to starting up.
- Never operate a device that has sustained transport damage.
- Always place/store a device with transport damage in a well-ventilated location with no sources of ignition.

## 4 Structure and function

### 4.1 Functional description of the Mobifreeze M 270

The LAUDA Mobifreeze M 270 ultra low temperature chest freezer is a mobile, actively temperature-controlled ultra low temperature chest freezer that operates independently of the mains power supply and was designed for the internal or external transport of sensitive active ingredients or samples requiring storage at a constant, monitored temperature.

The integration of a powerful battery and optimized insulation ensures compliance with cold chain requirements in intralogistics and for "factory transport" in road logistics. With all-round impact protection, sturdy push handles, a braking system and heavy-duty casters, the ultra low temperature chest freezer is optimized for harsh logistics requirements. The ultra low temperature chest freezer can be freely adjusted to any temperature between -50°C and -86°C, and offers the same controlled storage conditions (e.g. temperature stability) as stationary ultra low temperature chest freezers.

The device operates with two high-performance compressors. The air-cooled condenser at the back of the device releases the heat extracted from the refrigeration compartment into the ambient air. The temperature controller keeps the preset temperature constant and has an internal data logger. The current temperature in the cooling chamber is shown on the controller display.

A separate display shows the charge level of the integral high-performance battery (main battery), which ensures mains-independent operation for a minimum of 4 hours. Flexible changeovers between mains operation and battery operation ensure a high level of product and transport safety.

Natural refrigerants are used to ensure environmentally-friendly, future-proof operation.

The device is optimized for operation at the respective maximum set temperature and also achieves maximum temperature stability (over time) at this temperature.

## 4.2 Design of the Mobifreeze M 270

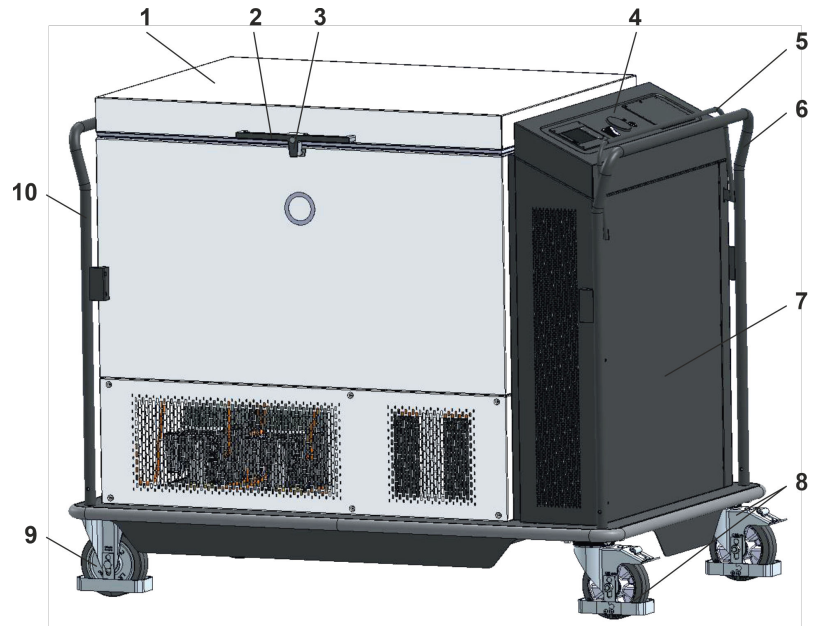


Fig. 2: View

1	Device lid, refrigeration compartment
2	Refrigeration compartment lid handle
3	Refrigeration compartment lock (key)
4	Operating console
5	Dead man's brake handle
6	Push handle
7	Device front cover/panel
8	Locking casters
9	Casters
10	Pull handle on the back of the device

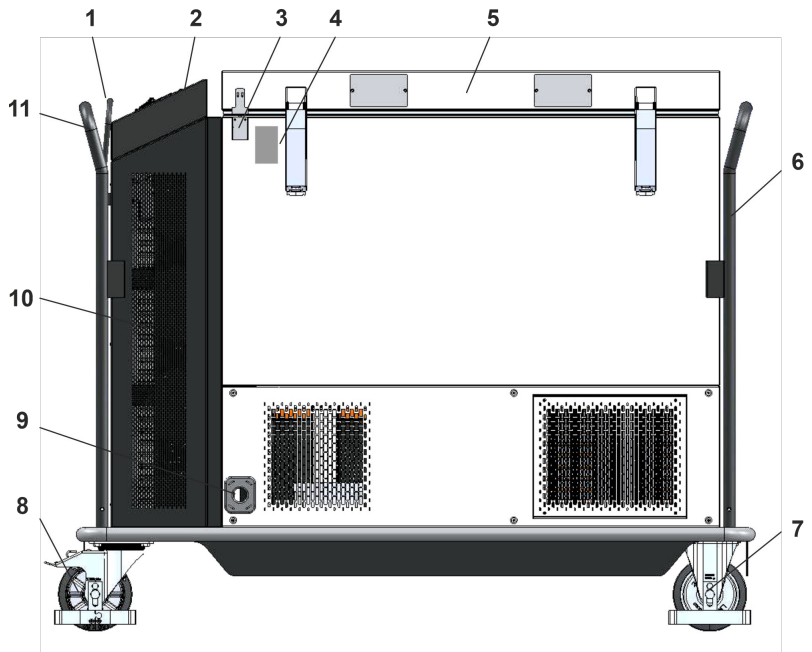


Fig. 3: View

1	Dead man's brake handle
2	Operating console on the front of the device
3	Device lid contact switch
4	Type plate
5	Device lid, refrigeration compartment
6	Pull handle on the back of the device
7	Casters
8	Locking casters
9	Mains plug with cable rolled up inside the chest
10	Front of device
11	Push handle on the front of the device

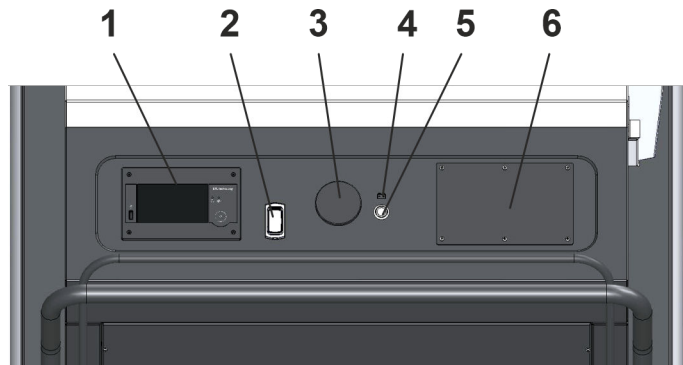


Fig. 4: Operating console

1	Touch operating unit
2	Mains switch
3	Main battery monitor
4	Battery symbol
5	Main battery switch
6	Blank cover (customer has option of connecting a monitoring system)

### 4.3 Touch operating unit

General overview of Touch operating unit

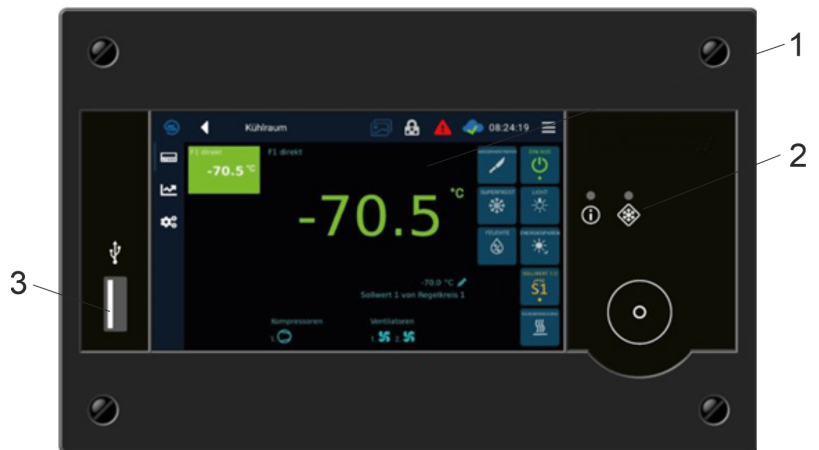


Fig. 5: Touch operating unit

1	Touch operating unit display
2	Status indicator LED
3	USB interface

## Touch operating unit display

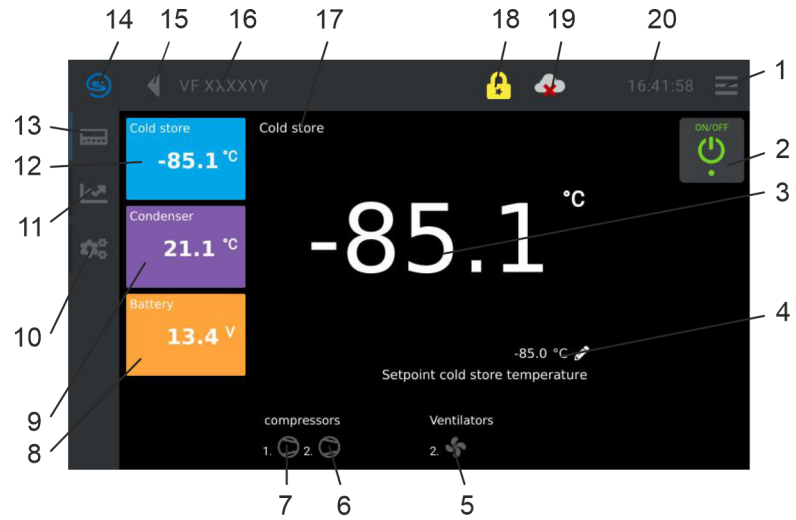
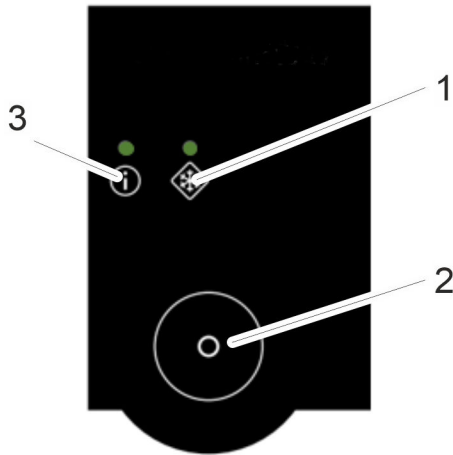


Fig. 6: Touch operating unit

1	Menu
2	ON/OFF status indicator
3	Current cooling chamber temperature display
4	Adjustment of the cooling chamber temperature set point
5	Fans, rotating symbols = fan on condenser is active
6	Compressor 2, two-stage, rotating symbols = compressor is active
7	Compressor 1, single-stage, rotating symbols = compressor is active
8	ACTUAL voltage of internal data logger battery
9	ACTUAL temperature at condenser
10	Settings/controller settings
11	Internal data logger, history
12	ACTUAL cooling chamber temperature
13	Controller
14	-
15	Previous screen
16	Type
17	Cooling chamber
18	Login and user profile display
19	Cloud connection
20	Date display

## Status indicator LED



1	LED 2, no function
2	Toggle button
3	LED 1, normal cooling (i symbol)

Fig. 7: Status indicator LED

## LED 1 (normal cooling)



Fig. 8: LED 1

LED status	Description
Green	Active, no errors/faults during normal cooling
Red	All other instances, such as: <ul style="list-style-type: none"> <li>- Connection failure</li> <li>- Collective fault</li> <li>- Standby</li> </ul>

## 4.4 Main battery monitor

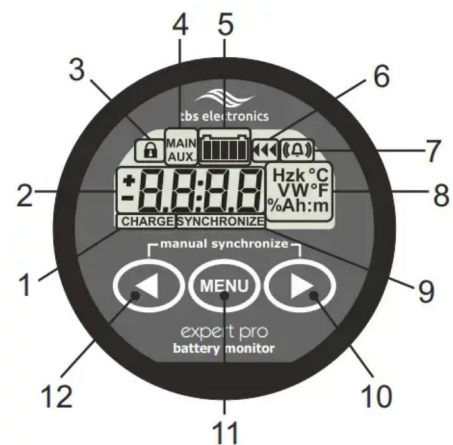


Fig. 9: Main battery monitor

1	"Battery charging" indicator
2	Numerical value display field
3	"Setup lock/master lock" indicator
4	"Main" battery indicator
5	Charge level progress bar
6	"Charging progress" indicator
7	"Alarm activated" indicator
8	Units
9	"Synchronization" indicator
10	Next value or right button
11	Menu button for service only
12	Previous value or left button

## 4.5 Operating elements

### 4.5.1 Mains switch



Fig. 10: Mains switch

The mains switch can be set to the following positions:

- Position [I] switches on the device under mains power. Mains voltage is supplied to the device and the main battery is charged provided that the mains cable is connected to the mains power supply.
- Position [O] switches off the device from the mains power. If the main battery switch is set to the [I] position, the device receives power from the main battery and can continue to operate. In this position, the main battery switch lights up green.



*If the mains switch is set to the [O] position, the device does not receive power from the mains power supply and the main battery is not charged.*

*However, the device can still operate if the battery switch is set to the [I] position and it receives power from the main battery.*

### 4.5.2 Main battery switch



Fig. 11: Main battery switch not pressed

The main battery switch is not pressed:

- In the [O] position, the main battery is switched off and the device does not receive power from the main battery. If the device is not supplied from the mains power, it is not operational.
- In this state, the main battery switch does not light up.



Fig. 12: Main battery switch pressed

The main battery switch is pressed:

- In the [I] position, the main battery is connected. The device receives power from the main battery if no power is received from the mains supply.
- In this state, the main battery switch lights up.

### 4.5.3 Push/pull handle

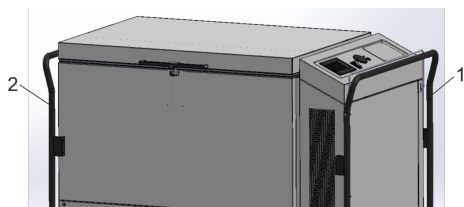
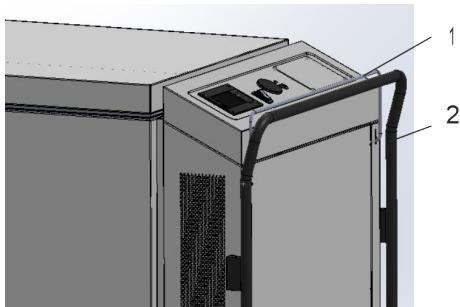


Fig. 13: Handles

- 1 Push handle on the operating console/front of the device
- 2 Pull handle on the back of the device



## 4.5.4 Dead man's brake with handle



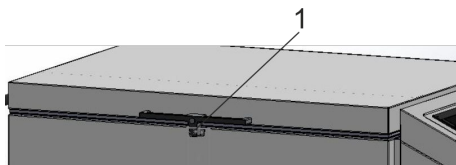
- 1 Dead man's brake handle
- 2 Push handle

When the device is moved using the push handle, the brake handle must be pulled at the same time. This releases the dead man's brake and allows the device to be moved. Letting go of the brake handle activates the dead man's brake and prevents the device from moving.

Note the following information, see ↗ Chapter 1.5 “Intended use” on page 7, ↗ Chapter 1.7 “Foreseeable misuse” on page 8 and ↗ Chapter 1.10 “Ambient conditions and operating conditions” on page 9.

Fig. 14: Dead man's brake

## 4.5.5 Refrigeration compartment lock



- 1 Refrigeration compartment lock

The refrigeration compartment can be locked with the key provided.

Never keep the keys near the device or within the reach of children or unauthorized persons.

Fig. 15: Refrigeration compartment lock

## 4.6 Main battery

The Mobifreeze M 270 is fitted with a rechargeable, high-performance lithium-iron phosphate battery. This main battery is designed to ensure mobile operation of the Mobifreeze M 270 for a minimum of 4 hours while disconnected from the mains power supply.

To use the device in mobile battery mode, disconnect the mains plug from the power socket and allow the cable to wind up. If the battery power supply is not yet active, switch on the supply with the battery switch. After a brief pause, the device will switch to battery mode.

The main battery monitor displays the charge level as a percentage and the remaining operating time to be expected until the battery is fully discharged. Please note that this value only represents the actual situation after the device has been operating on battery power for some time.

If the main battery charge level drops below 20 percent, an alarm bell will appear on the main battery monitor. [CHARGE] flashes on the battery monitor display and the cooling unit is switched off. The [mains power failure] alarm is reported to the Touch operating unit and an alarm sounds. To continue operation and recharge the main battery, connect the mains plug on the device to a power socket.

Please note:

The mains cable must be pulled out from the device and completely unrolled before connecting the mains plug to the power supply.

Then acknowledge the [mains power failure] alarm on the Touch operating unit.

Once the device has been connected to the power and the mains switch is set to "On" [I], the main battery will start charging regardless of the position of the battery switch (On/Off).

Once the charge level of the main battery exceeds 30 percent again, the alarm symbol on the battery monitor will disappear. When the main battery is fully charged, [FULL] will appear on the main battery monitor. The display then changes to 100 percent.

If the device is not in use, note the following:

If the device is not in use and is disconnected from the power supply, the main battery supply must be switched off at the battery switch. Otherwise, standby mode will drain the main battery within approximately 24 hours.

#### 4.7 Rating label



Fig. 16: Example of rating label

Specification	Example	Description
°LAUDA	Made in Germany	Manufacturer LAUDA, manufactured in Germany
Type:	M 270	Device type
Part No.:	L003678	Device item number
Serial no.:	S24xxxxxxx	Device serial number
Refrigerant I:	R 290	Refrigerant used in refrigerant circuit 1 of the appliance for cooling.
Filling charge I:	145 g	Filling weight of refrigerant 1 in g
Flammable refrigerant		Flammable refrigerant, "Risk of fire or explosion" warning symbol, see beneath the type plate
PS high pressure I:	23.8 bar	Maximum safety pressure in refrigerant circuit 1 in bar

Specification	Example	Description
Refrigerant II:	R 170	Refrigerant used in refrigerant circuit 2 of the appliance for cooling.
Filling charge II:	68 g	Filling weight of refrigerant 2 in g
Flammable refrigerant		Flammable refrigerant, "Risk of fire or explosion" warning symbol, see beneath the type plate
PS high pressure II:	23.8 bar	Maximum safety pressure in refrigerant circuit 2 in bar
Voltage:	230 V; 50 Hz	Mains voltage in V/ frequency in Hz
Current:	10.0A	Current consumption in A
Power consumption:	2.3 kW	Power consumption in kW
Protection class:	IP 22	Protection level / protection class
Temperature class	N (16-28°C)	Temperature class
Volume:	270 liters	Volume of refrigeration compartment in liters
Built date:	04/23	Date of manufacture, month/year
Weight (net):	325 kg	Net weight in kg
Payload (max)	100 kg	Maximum payload in kg

#### 4.8 Internal data logger

The internal data logger starts automatically and records:

- the refrigeration compartment temperature
- the voltage of the data logger battery
- the condenser temperature

every 120 seconds (which is a preset value).

Previous recordings from selectable time sequences can be loaded and viewed, see [↪ Chapter 7.9 "Internal data logger and history function"](#) on page 56.

The data logger is equipped with a 1 GB industrial SD card which is sufficient to record data for a period of up to 2 years.

Once the memory is full, the oldest data is always overwritten first.

We recommend backing up the data every six months or more frequently, depending on the importance of the data, see [↪ Chapter 7.7 "Data transfer via USB"](#) on page 55.

#### 4.9 Limit values USr user level, factory setting

A6	Alarm delay (device lid open)	Factory setting	60 seconds
A13	Lower limit 1 (absolute/relative) (low temperature)	Factory setting	-4.0 K
A15	Upper limit 1 (absolute/relative) (over-temperature)	Factory setting	4.0 K

C25	Hysteresis, sensor F1	Factory setting	Refer to the device card for the value
H11	Offset correction, sensor F1	Factory setting	Refer to the device card for the value

The device card is located on the inside of the device front cover/panel, see [↗](#) Chapter 4.2 “Design of the Mobifreeze M 270” on page 21.

## 5 Before starting up

### 5.1 Installation



#### WARNING!

A sloping floor may cause the device to fall over/roll away

Injury, crushing, impacts

- Do not tilt the device.
- Position the device on an even, non-slip surface with a sufficient load carrying capacity.
- Only maneuver the device over non-slip surfaces with a maximum incline of 2 percent.
- To park the device, let go of the dead man's brake handle and apply both locking brakes.
- Do not place heavy objects on the device.



#### WARNING!

Danger of overpressure from high ambient temperatures

Fire, injury, leaking refrigerant

- Note the permissible ambient temperature and storage temperature, see ↗ Chapter 12.4 "Device data" on page 69.



#### WARNING!

Bursting of the cooling circuit

Fire, impacts, cutting, device damage

- Always maintain the permissible ambient conditions specified in the technical data.
- In small areas, maintain the ambient temperature by providing additional room ventilation or cooling.



**WARNING!**  
Formation of a flammable atmosphere

Fire

In the event of a refrigerant leak and/or damage to the device, note the following:

- Only certified specialized personnel are permitted to intervene in the refrigeration system and handle flammable refrigerants.
- Switch off the device and disconnect from the main power supply.
- Place/store the device in a well-ventilated location with no sources of ignition.
- Contact LAUDA Service.



**NOTICE!**  
Setting up the device

Equipment damage/material damage/malfunction

- The device must be at the permissible ambient temperature when started up. If not, the device must be acclimatized.

Always observe the following:

- Note the electromagnetic compatibility (EMC) requirements of the device. Refer to ↗ Chapter 1.3 “EMC requirements” on page 7 for more information.
- Check the mains cable for damage prior to starting up.
- The device can be operated at an ambient temperature of 16°C to 28°C.
- During stationary or mobile operation, a higher ambient temperature has a negative effect on the device's cooling output.
- Only use the device in an acclimatized state, see ambient temperature ↗ Chapter 12.4 “Device data” on page 69.
- Keep the device away from objects and walls and do not cover the ventilation openings.
- Move/push the device with the help of several people, if necessary.
- Check the charge level of the main battery. If the main battery of the ultra low temperature chest freezer reaches a “deep discharge” state, it must be activated again, see ↗ Chapter 5.2 “Wake up function” on page 33.



*Refrigerant type and charge information is printed on the type plate or in the technical data.*

## 5.2 Wake up function



**DANGER!**  
Touching live parts

Electric shock

Before installing modules or intervening in the device:

- Disconnect the device from the mains power.
- Switch off the main battery.
- Only permitted by certified specialized personnel.
- Allow the device to cool down.

A deeply discharged main battery can be reactivated using a "wake up" technique.

To do so, an external voltage of between 22 volts and a maximum of 28.8 volts (24 volts is recommended) must be applied directly to the main battery poles for at least 15 seconds.

The ultra low temperature chest freezer can then be reconnected to the power supply (230 V mains voltage) and the external voltage source disconnected.

Personnel: ■ Electrician

Protective equipment: ■ Protective gloves

■ Safety shoes

1. Disconnect the ultra low temperature chest freezer from the power supply by pulling out the mains plug.
2. Switch off the main battery switch (1).
3. Unscrew the six screw connections and remove the device front cover/panel.

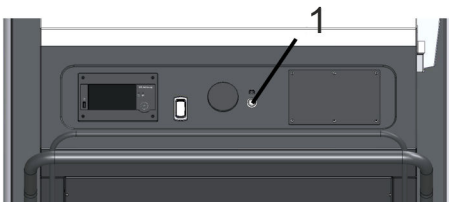


Fig. 17: Main battery switch

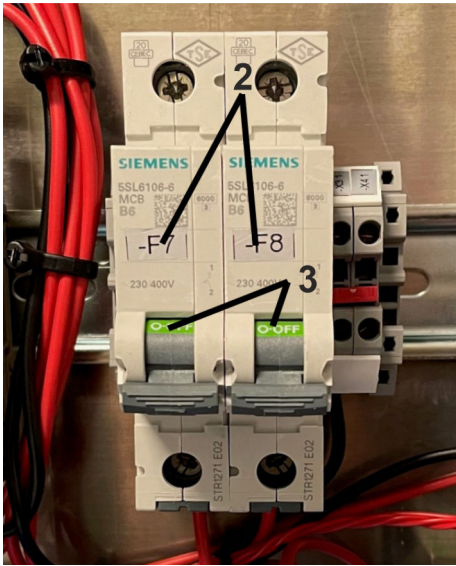


Fig. 18: F7 and F8 position "OFF"

4. Check that the circuit breakers (F7 and F8) (2) are set to the "OFF" position (3).



Fig. 19: R 1

5. Connect the "-" pole of the external voltage source to the shunt "-" pole (4) of the main battery "R1".



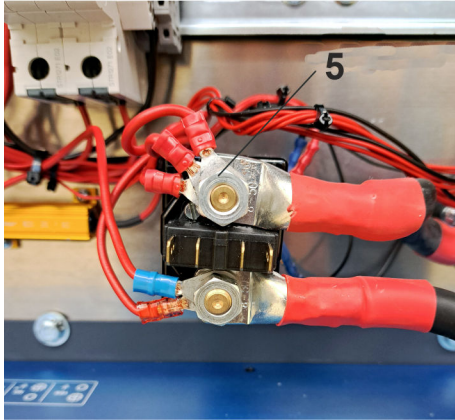


Fig. 20: Relay K5

6. Connect the "+" pole of the external voltage source to relay K5 (5).
7. Connect the external voltage source to the main battery for a minimum of 15 seconds.

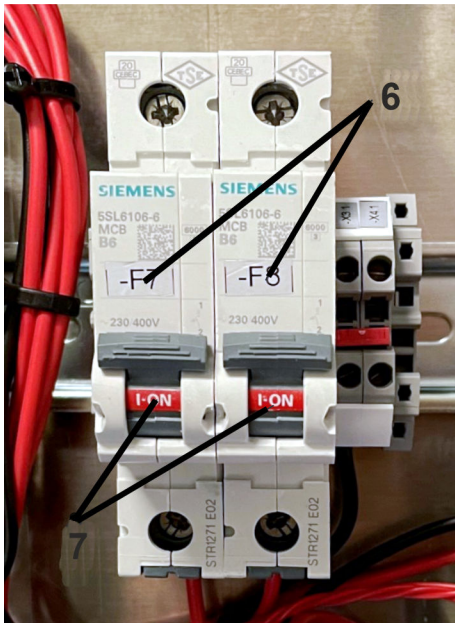


Fig. 21: F7 and F8 position "ON"

8. Set circuit breakers F7 and F8 (6) to the "ON" position (7) (if a monitoring system is used).
9. Insert the mains plug of the ultra low temperature chest freezer into the 230 volt mains voltage.
10. Switch on main switch S1
11. Disconnect the external power supply from the "-" pole (R1) and "+" pole (K5).
12. Refit the device front cover/panel by securing the six screw connections.
13. Switch on the main battery switch (1).

### 5.3 Installing modules



**DANGER!**  
Touching live parts

Electric shock

Before installing modules or intervening in the device:

- Disconnect the device from the mains power.
- Switch off the main battery.
- Only permitted by certified specialized personnel.
- Allow the device to cool down.

When installing modules such as an external monitoring system, the device must be switched off, see [Chapter 6.2 “Switching the device on and off”](#) on page 41, and unplugged from the mains power. Furthermore, the main battery must be switched off, see [Chapter 4.5.2 “Main battery switch”](#) on page 26.

#### Connections:

Two connection terminals F7 and F8 (1 and 2) with an unregulated nominal voltage of 25.6 V DC are available for connecting a monitoring system.

Connection F7 (1) can be used for both mains and battery operation. The battery charge level must be 20 percent or more.

Connection F8 (2) can only be used for mains operation.

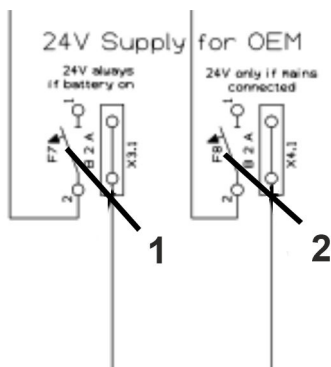




Fig. 22: Connections

Table 2: Electrical nominal values:

	Min. output voltage	Max. output voltage	Max output current.
F7/F8	21V	33V	5A

- Personnel: ■ Electrician
- Protective equipment: ■ Safety shoes  
 ■ Protective gloves

1. Disconnect the ultra low temperature chest freezer from the power supply by pulling out the mains plug.
2. Switch off the main battery at the main battery switch (1).

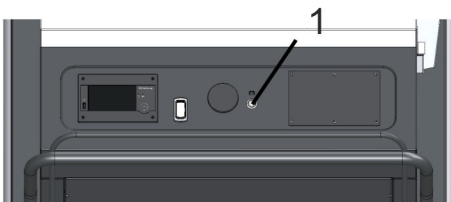


Fig. 23: Main battery switch

3. Unscrew the six screw connections and remove the device front cover/panel.
  - ▶ Caution, risk of short circuit!



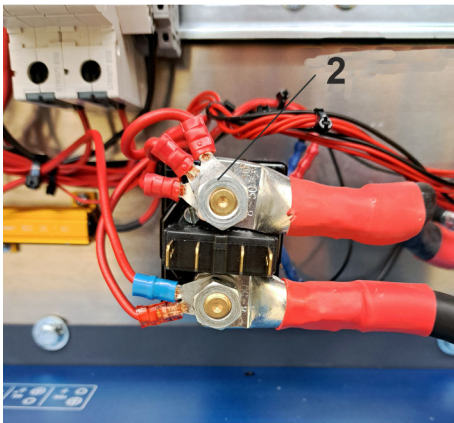
**CAUTION!**  
Risk of short circuit

Material damage

For work on live components, please note the following:

Work may only be performed by qualified electricians.

A voltage of approximately 25.6 V is present at point 2 (K5) and other open terminals.



4. Check that the circuit breakers (F7 and F8) are set to the "OFF" position (3).
5. Connect components to terminals F7 and F8 (4) and X3.1 and X4.1 (5), ground connection.

Fig. 24: F7 and F8, X3.1 and X4.1

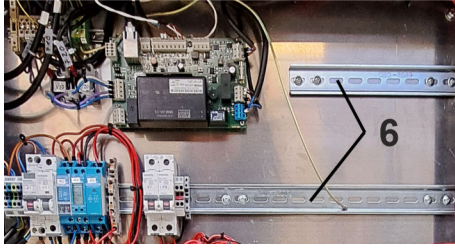


Fig. 25: Profile rail

6. The customer's own systems can be mounted/connected to the profile rails (6).
7. Set circuit breakers (F7 and F8) to the "ON" position.
8. Refit the device front cover/panel by securing the six screw connections.
  - ▶ Put the ultra low temperature chest freezer into operation.

## 6 Commissioning

### 6.1 Establishing a mains connection



#### **DANGER!** Transport damage

Electric shock

- Closely inspect the device for transport damage prior to commissioning!
- Never operate a device that has sustained transport damage!



#### **DANGER!** Risk of short circuit due to failure to observe the acclimatization time

Electric shock

- Allow a "cold" device to first acclimatize to the ambient temperature.
- Wait until the device reaches the ambient temperature before connecting it to the power supply and starting it up.
- Ambient temperatures, see chapter "Technical data".



#### **WARNING!** Contact with voltage conductors due to faulty mains cable and/or safety plugs

Electric shock

- Before using the mains cable and safety plug, check that they are in perfect condition.
- Never use a faulty mains cable or safety plug to power the device.
- The mains cable and safety plug must not come into contact with any refrigerated surfaces on the device, neither during operation nor after switching off.



#### **CAUTION!** Tripping over mains cables

Injuries, personal injury

Retract the mains cable when not in use.

- When operating with mains power, lay the mains cable in such a way that it does not pose a danger
- Check the mains cable every six months.



## NOTICE! Use of impermissible mains voltage or mains frequency

### Device damage

- Compare the type plate with the available mains voltage and mains frequency.
- Only connect to the power supply if the specifications are compliant.
- When operating the device from the mains, the power supply must be properly fitted with a protective earth conductor (PE).
- Local regulations must be observed.

Please note the following:

- Note for electric installation on site:
  - The devices must be protected with a 16 ampere circuit breaker, fitted during installation (mains fuse on site).
  - Refer to the type plate or technical data for connection values.
- Only connect the device to power sockets with a protective earth conductor (PE).
- Only use the retractable power cable with safety plug for the power supply.
- Always pull out the cable completely before operating the device.
- Operate the device according to local regulations.

## 6.2 Switching the device on and off

### Switching on the device



Fig. 26: Mains switch

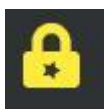


Fig. 27: User icon

1. Set the mains switch to the "I" position, see [↗ Chapter 4.5.1 "Mains switch"](#) on page 26.
  - ▶ Once the device has started up (after approximately 5 seconds), the overtemperature alarm [T<sub>max</sub> 1] is shown on the Touch operating unit display and the alarm signal sounds.

Note:

An alarm can only be acknowledged from the "User" user profile onward, see [↗ Chapter 6.5 "Selecting a user profile"](#) on page 45 and [↗ Chapter 6.4 "Defining user profiles"](#) on page 44.

2. Acknowledge the alarm message on the Touch operating unit display, [↗ Chapter 7.8 "Resetting an alarm"](#) on page 55.



Fig. 28: ON/OFF icon



Fig. 29: Main battery switch pressed

3. Press the [ON/OFF] tile on the Touch operating unit, see ↗ Chapter 4.3 “Touch operating unit” on page 23.

- ▶ The device is switched on.

Note:

For mains-independent operation, the main battery must also be switched on at the main battery switch.

4. Set the main battery switch to the “[I]” position, see ↗ Chapter 4.5.2 “Main battery switch” on page 26.

- ▶ Ultra low temperature chest freezer and main battery are switched on.



*When using the ultra low temperature device for long periods of continuous operation, it makes sense to leave the mains switch and battery switch in the (I) position.*

*As a result, the switch positions do not have to be changed.*

*The mains plug is pulled out to interrupt the mains power supply and commence mobile operation. The mains plug can then be connected again at any time to resume mains operation.*

### Switching off the device



Fig. 30: ON/OFF icon



Fig. 31: Mains switch

1. Press the [ON/OFF] tile on the Touch operating unit, see ↗ Chapter 4.3 “Touch operating unit” on page 23.

2. Set the mains switch to the [O] position, see ↗ Chapter 4.5.1 “Mains switch” on page 26.

- ▶ This will disconnect the mains power supply. However, the device remains switched on, even if the main battery switch is set to the (O) position. The device operates in battery mode and the main battery switch lights up green.

If the device is completely disconnected from the power supply, the main battery must also be actively switched off.

3. Set the battery switch to the [O] position, see ↗ Chapter 4.5.2 “Main battery switch” on page 26.

- ▶ The light on the main battery switch goes out and the device is no longer operational. The display remains illuminated for a short while.



Fig. 32: Main battery switch





When the device is switched off, the main battery switch should always be switched off to prevent the main battery from actively discharging.

## Instructions for switching off:



Fig. 33: ON/OFF icon

1. If you intend to switch off the device for longer periods, press the [ON/OFF] tile on the Touch operating unit.
  - ▶ [OFF] appears on the display
2. Set the mains switch to the "O" position, see ↗ Chapter 4.5.1 "Mains switch" on page 26.

If the device is switched off at the mains switch, the "power failure" alarm is triggered and the device records the temperature for approximately 35 hours, powered by the battery of the internal data logger.

## 6.3 Changing the user profile password

In a user profile, only the passwords for this level and the levels below can be changed.

"Admin 1" can change any password, while a "User" can only change the passwords for a subordinate "Guest".

The number of stars in the yellow padlock on the Touch operating unit display indicates which user profile is currently active.

User profile type	Number of stars in the padlock
Admin 1	3
Service	2
User	1
Guest	-

1. Press the [Menu] tile on the Touch operating unit.



Fig. 34: Menu icon

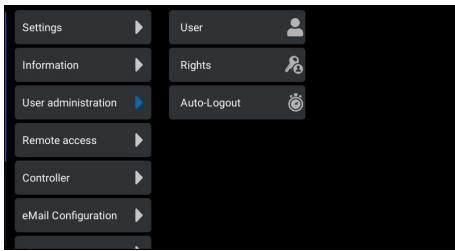


Fig. 35: HMI user administration – user

2. Press the [User administration] tile.
3. Press the [User] tile.
  - ▶ The "User" overview opens.

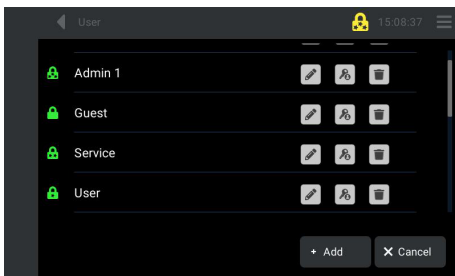


Fig. 36: Changing the password

5. Select the user.



Fig. 37: Input

6. Press the [Input] tile.
  - ▶ A keyboard appears.
7. Enter the "old" password using the keyboard and save.
  - ▶ The display switches to [Password].
8. Enter the "new" password using the keyboard and save.
9. Press the [Previous] tile twice.
  - ▶ The password has been changed.
  - ▶ The display switches to the "Home screen" view.



Fig. 38: Previous icon

## 6.4 Defining user profiles

### "Guest" user profile



Fig. 39: Guest icon

The device is started with the "Guest" user ID.

All data relevant to device operation can be accessed in this level.

The device cannot be switched on or off in this user level.

Settings cannot be changed in this level.

The default password is "Guest".

### "User" user profile

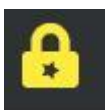


Fig. 40: User icon

Individuals logging in with the "User" user ID can change settings such as the set point of the cooling chamber temperature or the alarm delay for the door.

The default password is "User".

## "Service" user profile



Fig. 41: Service icon

Under the "Service" user ID, the operator/user can change more settings than in the "User" level including changing parameters or the limit of set point temperatures as well as transferring data via USB, for example.

The default password is "Service".

## "Admin 1" user profile



Fig. 42: Admin 1 icon

All settings can be modified under the "Admin 1" user ID, such as those required to integrate the device into the operator's IT landscape.

The default password is "Admin 1".

## 6.5 Selecting a user profile



Fig. 43: Login and user profile display

1. Press the [Login and user profile display] tile on the Touch operating unit.

▶ The display switches to the "User profile" view.

2. Select a user profile.

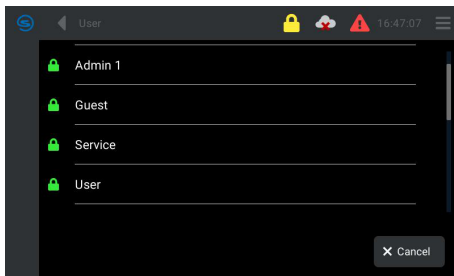


Fig. 44: User profiles

3. Use the keyboard to enter the password for the selected user profile.

4. Press the [Save] tile.

▶ The selected user profile is active.

▶ The display switches to the "Home screen" view.

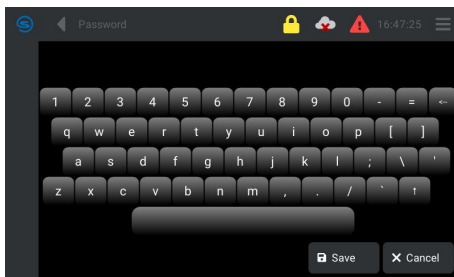


Fig. 45: Keyboard

For more information about the different user profiles, see [Chapter 6.4 "Defining user profiles"](#) on page 44.

## 6.6 Switching on the device after changing user profiles

### Switching on the device

If the user profile has been changed from "Service" to "User", for example, the Touch operating unit display switches to the "Home screen" view.



Fig. 46: ON/OFF icon

## 6.7 Activating auto logout

1. Touch the [Type description] tile on the Touch operating unit.
2. Press the [ON/OFF] tile on the Touch operating unit.
  - ▶ The temperature display and the "Collective alarm" are displayed.
3. Acknowledge the alarm message on the Touch operating unit display, see ↪ Chapter 7.8 "Resetting an alarm" on page 55.

When the "Auto logout" function is activated, the "Guest" user profile is automatically activated after an adjustable time period of between 1 and 60 minutes. For information about user profiles, see ↪ Chapter 6.4 "Defining user profiles" on page 44

The "Auto logout" function can only be activated from the "Service" and "Admin 1" user profiles.



Fig. 47: Menu icon

1. Press the [Menu] tile on the Touch operating unit.

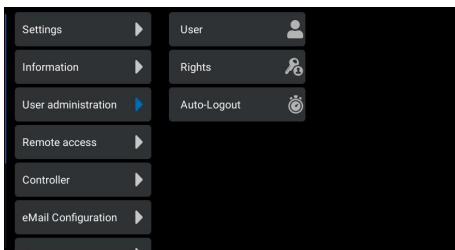


Fig. 48: HMI user administration – Auto logout

2. Press the [User administration] tile.
3. Press the [Auto logout] tile.
  - ▶ The "Auto logout" overview opens.

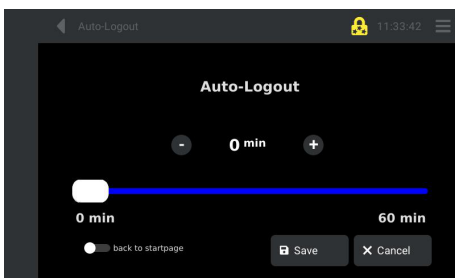


Fig. 49: Auto logout

4. Set the required time (1 to 60 minutes) by sliding the cursor or pressing the [+] and [-] symbols.
5. Press the [Save] tile.
  - ▶ "Auto logout" is activated.
  - ▶ The display switches to the "Home screen" view.
6. Press the [Type designation] tile on the Touch operating unit.
  - ▶ The display switches to the "Controller" view.

## 6.8 Selecting the menu language



Fig. 50: Menu icon

Note: The only languages currently available are German and English.

1. Press the [Menu] tile.

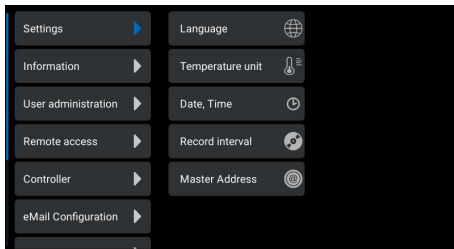


Fig. 51: HMI settings – Language

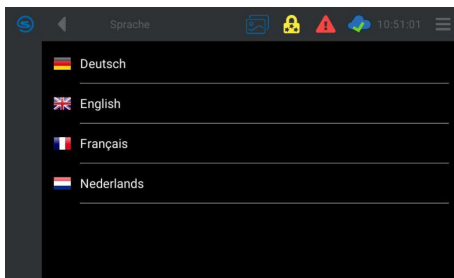


Fig. 52: Selecting a language

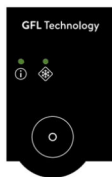


Fig. 53: Status indicator LED

## 6.9 Selecting and displaying control curves



Fig. 54: Data logger icon

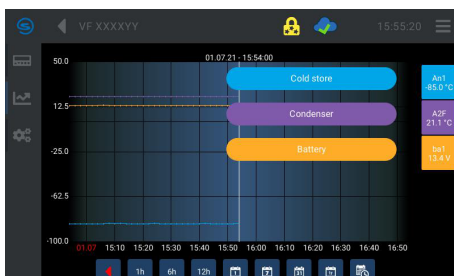


Fig. 55: Control curves – Control curve screen

2. Press the [Settings] tile.
3. Press the [Language] tile.
  - ▶ The language selection screen opens.
4. Select the language on the Touch operating unit display.
5. Press the toggle button on the status indicator LED to confirm the language selection.
6. Tap [Type designation] on the Touch operating unit display, see Chapter 4.3 “Touch operating unit” on page 23.
  - ▶ The selected language is active.
  - ▶ The Touch operating unit display switches to the "Home screen" view.

1. Press the [Data logger] tile on the Touch operating unit.
  - ▶ The control curve overview opens.

Briefly tap tiles [An1], [A2F] or [ba1] to display their designation to the left of the tiles.

All three control curves are selected by default.

To display only one control curve, the other control curves must be deactivated.

To deactivate a control curve, press and hold the corresponding symbol for approximately 3 seconds. The symbol will then turn white and the control curve will disappear.

To activate the control curve, press and hold the deactivated white symbol for approximately 3 seconds until it changes back to its original color.

- Blue (An1) = Cold store (refrigeration compartment temperature)
- Violet (A2F) = Condenser (condenser temperature)
- Orange (ba1) = Battery (voltage of the internal second battery)

## 6.10 Setting alarm limit values

### 6.10.1 Setting the alarm delay limit value for the device lid



Fig. 56: Menu icon

Tap the menu symbol on the Touch operating unit. In the parameter level, scroll down to the USr user level and tap parameter A6, then select the required limit value and save. When the cover is opened, a timer starts. If the preset delay time is exceeded, the lid alarm is triggered. Alarm delay value, see [↗ Chapter 4.9 “Limit values USr user level, factory setting”](#) on page 29.

### 6.10.2 Setting a limit value for the overtemperature alarm



Fig. 57: Menu icon

Tap the menu symbol on the Touch operating unit. In the parameter level, scroll down to the USr user level and tap parameter A13, then select the required limit value and save. If the cooling chamber temperature exceeds the preset upper limit value, the overtemperature alarm is triggered. Default value, see [↗ Chapter 4.9 “Limit values USr user level, factory setting”](#) on page 29.

### 6.10.3 Setting a limit value for the low temperature alarm



Fig. 58: Menu icon

Tap the menu symbol on the Touch operating unit. In the parameter level, scroll down to the USr user level and tap parameter A15, then select the required limit value and save. If the cooling chamber temperature falls below the preset lower limit value, the low temperature alarm is triggered. Default value, see [↗ Chapter 4.9 “Limit values USr user level, factory setting”](#) on page 29.

## 7 Operation

### 7.1 Safety information

#### 7.1.1 General safety instructions



#### DANGER!

Fault, mechanical damage, electrical overload or manufacturing fault

Explosion, fire, release of toxic gases

- Protect the battery system from damage.
- In the event of a fault, immediately disconnect the device from the mains power supply.
- If necessary, use a suitable extinguishing agent to extinguish a LiFePO<sub>4</sub> battery fire.
- Contact LAUDA Service.



*If the LiFePO<sub>4</sub> battery catches fire, use suitable fire extinguishers to extinguish the fire. These fire extinguishers should be designed specifically to extinguish battery fires. They can contain classic extinguishing agents such as CO<sub>2</sub> (powder or normal foam), or can be gel fire extinguishers or special lithium-X extinguishers.*



#### DANGER!

Short circuit

Electric shock

- Prevent liquids from entering the electrical components inside the device.
- Protect the device from rain and/or splash water.
- If the device meets the specified protection level and protection class, the device can be moved outdoors for a short time, even in the rain.



#### WARNING!

Storage of dangerous goods

Personal injury, risk of explosion

- Do not store:
  - Acids and alkalis that can attack materials
  - Hazardous substances that emit harmful fumes
  - Substances that are highly flammable and/or explosive



**WARNING!**  
Risk of mechanical damage to refrigerant circuit

Leaking flammable refrigerant generates an explosive atmosphere

Explosion, burns, fire

- Ventilate the room thoroughly without delay.
- During this period, do not operate any switches on the device or anywhere else in the room.
- Do not ignite flames or sparks and refrain from smoking.



**CAUTION!**  
Risk of mechanical damage to refrigerant circuit

Hazard to health through inhalation (TLV values exceeded)

- Ventilate the room thoroughly without delay.
- During this period, do not operate any switches on the device or anywhere else in the room.
- Do not ignite flames or sparks and refrain from smoking.

## 7.1.2 Securing a device transported in a vehicle



**WARNING!**  
Uncontrolled device movement during transport

Danger of injury, device damage

- Secure the load properly to prevent it from moving or sliding.
- Activate the locking casters.
- Activate the dead man's brake. The dead man's brake handle must not be secured in the pulled position.
- The load must not come into contact with the outer walls of the vehicle or any other cargo items.



## 7.1.3 Pushing/moving the device



**WARNING!**  
Operating error when pushing, rollover hazard due to casters

Risk of injury from rolling over, impacts

- Do not roll the device over your feet or other parts of your body.
- Move the device carefully, ask several people to help, if necessary.
- Wear safety shoes.
- Avoid collisions with other people and objects.
- Avoid foreseeable misuse, see [Chapter 1.7](#) “Foreseeable misuse” on page 8.

## 7.1.4 Operating the device in fluctuating ambient temperatures



**DANGER!**  
Condensation on electronics

Electric shock

- Minimize the time that the device spends in cold ambient temperatures.
- Ambient temperatures, see chapter “Technical data”.

## 7.2 Adjustment of the cooling chamber temperature set point

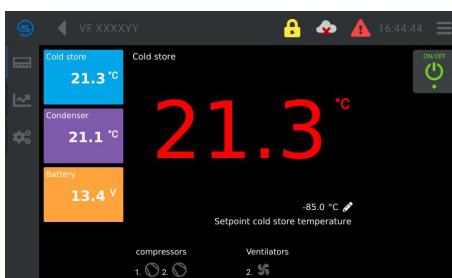


Fig. 59: Display set point

After the device is switched on at the mains switch, see [Chapter 4.5.1](#) “Mains switch” on page 26, on the Touch operating unit, see [Chapter 4.3](#) “Touch operating unit” on page 23, the display shows the current temperature in the cooling chamber.

The temperature controller switches the compressors on.

The cooling process starts to bring the temperature in the cooling chamber up to the set point.

The cooling chamber temperature indicator remains red until the set point is reached. When the set point has been reached, the indicator turns white. If there is a fault on the device, the indicator switches back to red.



Fig. 60: Cooling chamber temperature set point icon

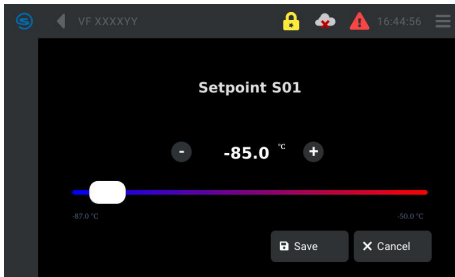


Fig. 61: Set point setting

1. Press the [cooling chamber temperature set point] tile.

▶ The window for setting the "Cooling chamber temperature set point" opens.

2. Set the required cooling chamber temperature by sliding the cursor or pressing the [+] and [-] symbols.

3. Press the [Save] tile.

▶ The set point has been set and saved.

### 7.3 Storing and retrieving refrigerated goods

**CAUTION!**  
Missing protective equipment

Personal injury, risk of frostbite

If the temperature in the refrigeration compartment is low, take the following measures:

- Always wear suitable cold protection gloves when storing and retrieving refrigerated goods.
- Arms must also be covered.

**CAUTION!**  
Individuals shorter than 1.70 m are not permitted to operate or set up the device

Personal injury, ergonomic impairment

- Use a step-up stool when storing and retrieving refrigerated goods.

Personnel: ■ Specialized personnel

■ Instructed person

Protective equipment: ■ Cold protection gloves


■ Safety shoes

■ Always wear safety gloves that protect the hands from cold temperatures when storing and retrieving refrigerated goods. Arms must also be covered.

■ Depending on your height, it may be necessary to use a step-up stool to load and unload refrigerated goods.

- Only store refrigerated goods that meet the requirements for intended use, see ↪ Chapter 1.5 “Intended use” on page 7.
- Do not store refrigerated goods that do not meet the requirements for intended use, see ↪ Chapter 1.6 “Unintended use” on page 8.


## 7.4 Switching between mains and battery operation

	<b>CAUTION!</b> Tripping over mains cables
	Injuries, personal injury
	Retract the mains cable when not in use. <ul style="list-style-type: none"> <li>● When operating with mains power, lay the mains cable in such a way that it does not pose a danger</li> <li>● Check the mains cable every six months.</li> </ul>

If you wish to transport the ultra low temperature chest freezer to another location, proceed as follows:

1. Disconnect the mains cable from the power socket and allow the cable to wind up.
  - ▶ The device switches automatically to battery operation and continues to cool
  - ▶ provided that the battery switch is set to "On".
2. After arriving at the installation destination, pull out the mains cable completely and connect to the power socket.
  - ▶ The device continues to cool and the main battery is charged,
  - ▶ provided that the mains switch is set to "On".

## 7.5 Dead man's brake handle

	<b>WARNING!</b> A sloping floor may cause the device to fall over/roll away
	Injury, crushing, impacts
	<ul style="list-style-type: none"> <li>● Do not tilt the device.</li> <li>● Position the device on an even, non-slip surface with a sufficient load carrying capacity.</li> <li>● Only maneuver the device over non-slip surfaces with a maximum incline of 2 percent.</li> <li>● To park the device, let go of the dead man's brake handle and apply both locking brakes.</li> <li>● Do not place heavy objects on the device.</li> </ul>

Design of the dead man's brake handle, see ↪ Chapter 4.5.4 “Dead man's brake with handle” on page 27.

Application limits for the dead man's brake, see Chapter 1.10 "Ambient conditions and operating conditions" on page 9.

1. Position the device in the installation location.
2. Let go of the dead man's brake handles.
3. Apply the locking brakes.

## 7.6 Alarm management



Fig. 62: Menu icon

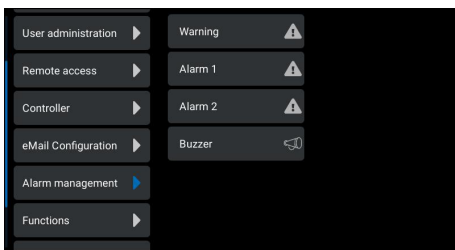


Fig. 63: HMI alarm management – Alarm 1

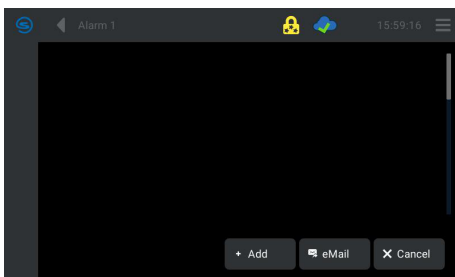


Fig. 64: Alarm\_1

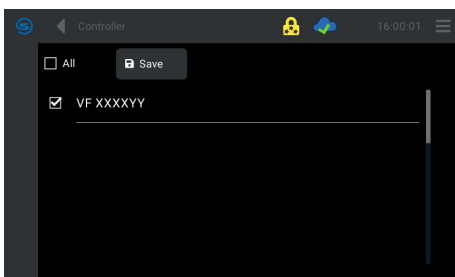


Fig. 65: Alarm – Controller

1. Press the [Menu] tile.
2. Press [Alarm management].
3. Select [Alarm 1] or [Alarm 2].
  - ▶ The display switches to the "Alarm 1" or "Alarm 2" view.
4. Press the [Add] tile.
  - ▶ The display switches to the "Controller" view.
5. Select the "Type".
6. Press the [Save] tile.
  - ▶ The display switches to the "New configuration" view.

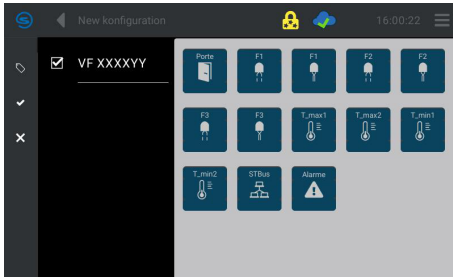


Fig. 66: Alarm – New configuration



Fig. 67: Alarm

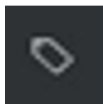


Fig. 68: Input

## 7.7 Data transfer via USB



Fig. 69: Menu icon

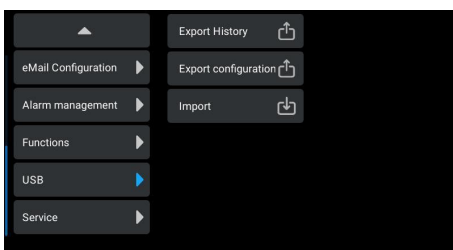


Fig. 70: HMI USB – Export history

## 7.8 Resetting an alarm

7. It is possible to select individual "alarms" or select all alarms by pressing the [Alarm] symbol.

8. Press the [Input] tile.

9. Enter a name and save.

▶ The display view opens with the created name.

Data can only be transferred via USB if the "Service" or "Admin 1" user profile is selected.

1. Press the [Menu] tile.

2. Press the [USB] tile.

3. Press the [Export history] tile.

4. Insert the USB stick.

▶ The system recognizes the USB stick.

5. Press the save icon.

▶ Data is transferred to the USB stick.

6. When the data transfer is complete, press the [Cancel] tile.

▶ Data is loaded to the USB stick.

▶ Remove the USB stick.

In the event of a malfunction, an alarm is triggered.

When an alarm is triggered, an acoustic alarm sounds and a visual alarm appears in an alarm window.

## Disabling the acoustic alarm and rectifying the cause of the alarm



Fig. 71: Alarm icon

1. Acknowledge the alarm in the alarm window.
  - ▶ The alarm screen closes.
  - ▶ A red alarm symbol is displayed at the top of the Touch operating unit.
  - ▶ The alarm symbol disappears automatically once the cause of the alarm has been rectified.

## 7.9 Internal data logger and history function



Fig. 72: Data logger icon

1. Press the [Data logger, history] tile.
  - ▶ "Controller 1" view opens.
  - ▶ Different views can be selected (1 h, 6 h, 12 h, 1 day, 7 days, 31 days, 1 year).

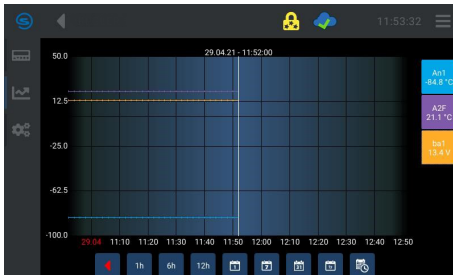


Fig. 73: Control curves – History



Fig. 74: History

2. To retrieve past records, press the [History] tile.
  - ▶ A window for setting the start date and end date opens.
3. Select the required date range and press [OK] to confirm.
  - ▶ The information for the selected period is displayed.
4. Press either the [Hour] or the [Day] tile.
  - ▶ The display reverts back to the current view.

## 7.10 Device operation with safety cooling

If the power supply from the mains supply and main battery fails, the set temperature can be maintained using dry ice (solid carbon dioxide (CO<sub>2</sub>)).



**DANGER!**  
Gas displaces atmospheric oxygen or negatively affects oxygen absorption

Danger of asphyxia

- Ventilate rooms adequately.

Personnel: ■ Refrigeration specialist

Protective equipment: ■ Cold protection gloves

■ Safety glasses

1. Open the refrigeration compartment lid on the device.
2. Fill with dry ice.
3. Close the refrigeration compartment lid on the device.



*The phase transition of solid carbon dioxide into gaseous carbon dioxide creates gage pressure in the device's refrigeration compartment. In order to dissipate this gage pressure in a controlled manner, the device has a pressure relief valve with a maximum trigger pressure of 0.2 bar.*

## 8 Maintenance

### 8.1 General safety instructions



#### **DANGER!** Contact with live or moving parts

Electric shock, impacts, cutting, crushing

- Before any maintenance work is performed, the device must be disconnected from the mains power and the main battery switch must be set to the [O] position.
- Only skilled certified personnel are permitted to perform repairs.



#### **DANGER!** Incorrect handling

Fire

- Only skilled personnel are permitted to perform service and repair work.
- Repair work on the refrigeration system may only be performed by skilled, certified personnel who are trained to handle flammable refrigerants.



#### **WARNING!** Uncontrolled leaking of refrigerant

Fire

- Never dispose of a cooling circuit that is still pressurized.
- Disposal tasks may only be performed by skilled, certified personnel who are trained to handle flammable refrigerants.



#### **WARNING!** Retracting spring hinge on the refrigeration compartment lid

Crushing of limbs

- Open the refrigeration compartment lid carefully.
- Wear personal protective equipment such as safety gloves.





**WARNING!**  
Risk of mechanical damage to refrigerant circuit

Explosion, fire

- Only trained personnel permitted to perform service work.
- Ventilate the room thoroughly without delay.
- During this period, do not operate any switches on the device or anywhere else in the room.
- Do not ignite flames or sparks and refrain from smoking.



**CAUTION!**  
Contact with hot or cold device parts and accessories

Scalding, hot or cold burns

- Allow device parts and accessories to reach room temperature before touching.

## 8.2 Maintenance plan

Interval	Maintenance task
Daily	Inspect the external condition of the device.
Weekly	Clean the device, see ↗ Chapter 8.3 “Cleaning the device” on page 59
Monthly	Apply talcum powder to the lid seals.
	Keep the condenser fins free of dust, see ↗ Chapter 8.4 “Cleaning the condenser fins” on page 60
As necessary	Defrost the refrigeration compartment, ↗ Chapter 8.5 “Defrosting the refrigeration compartment” on page 61
	Inspect the device for damage and stability after transport, whenever necessary or annually at the latest

## 8.3 Cleaning the device



**DANGER!**  
Liquid ingress during cleaning

Electric shock

- Clean with a damp cloth to prevent liquids from entering the electrical components.
- Avoid accumulations of liquid.
- Turn off the mains switch.
- Disconnect the device from the power supply before starting repair or cleaning work.

Personnel: ■ Instructed person

Protective equipment: ■ Protective gloves

Please also note the following:

- Only use water and detergent to clean the Touch control element and other surfaces. Do not use acetone or solvent as these substances will permanently damage the plastic surfaces.
- Ensure that the device is decontaminated after coming into contact with hazardous materials.
- It is forbidden to use decontaminants or cleaning agents that may react with parts of the device or materials contained in those parts and potentially pose a **hazard**.
- We recommend using ethanol as a decontaminant. If you are unsure whether decontaminants or cleaning agents are compatible with device parts or the materials contained in those parts, please contact LAUDA Service.

## 8.4 Cleaning the condenser fins

In order to ensure that the device operates efficiently, the condenser fins must be cleaned monthly or more often, if necessary, in dirty ambient conditions.



**WARNING!**  
Incorrect handling, refrigerant leaks

Fire, cutting

- Only open the ventilation grid when cleaning.
- Use suitable materials for cleaning such as a soft brush, a vacuum cleaner or compressed air.



**CAUTION!**  
Compressors and pressure lines reach temperatures of approximately 75 degrees

Burns

- Switch off the device and disconnect from the main power supply.
- Set the main switch and battery switch to the [O] position.
- Allow device parts and accessories to reach room temperature before touching.

- Personnel: ■ Instructed person
- Protective equipment: ■ Safety glasses  
■ Protective gloves

1. Switch off the device at the mains switch and battery switch, see ↗ Chapter 6.2 “Switching the device on and off” on page 41 and ↗ Chapter 4.5.2 “Main battery switch” on page 26.
2. Disconnect the mains cable from the power supply, and wind up.
3. Open the ventilation grid to access the condenser.
4. Clean the fins on the condenser with a brush or use a vacuum cleaner or compressed air to clean the fins. Do not apply pressure to, or damage, the fins.
5. Refit the ventilation grid.
6. Connect the device to the mains power supply, see ↗ Chapter 6.1 “Establishing a mains connection” on page 40.

## 8.5 Defrosting the refrigeration compartment

Defrost the refrigeration compartment of the device whenever necessary, or if there is heavy freezing.



### WARNING! Refrigerant leaks

Fire, device damage

- Allow the ice in the refrigeration compartment to defrost on its own.
- Do not place heating devices in the refrigeration compartment.
- Do not use sharp objects or chip/scrape off the ice.

- Personnel: ■ Instructed person
- Protective equipment: ■ Cold protection gloves

1. Switch off the device at the main battery, see ↗ Chapter 6.2 “Switching the device on and off” on page 41 and ↗ Chapter 4.5.2 “Main battery switch” on page 26.
2. Pull out the mains plug from the power socket and wind up the mains cable.



### NOTICE!

Make sure that liquids cannot enter the cable connections or the electrical components inside the device.

3. Open the refrigeration compartment on the device.
4. Remove the contents from the refrigeration compartment.
5. Allow the ice to defrost.

6. Continuously remove the melt water from the refrigeration compartment.
7. Allow the refrigeration compartment to dry or wipe dry with a soft cloth.
8. Once the refrigeration compartment is free of ice and dry, reconnect the device to the mains power supply, see ↪ Chapter 6.1 “Establishing a mains connection” on page 40 and ↪ Chapter 6.2 “Switching the device on and off” on page 41.

## 9 Faults

### 9.1 Alarms, warnings and errors

Additional display	Error text/fault text	Message with acoustic alarm	Acknowledge acoustic alarm	Description/meaning/comments	Corrective action
ErrL	Short circuit on sensor F1	Yes	Yes	Ohmic measured value of sensor 1 too low	Have sensor replaced by LAUDA Service.
ErrH	Cable break on sensor F1	Yes	Yes	Ohmic measured value of sensor 1 too high	Have sensor replaced by LAUDA Service.
ErrL	Short circuit on sensor F2	Yes	Yes	Ohmic measured value of sensor 2 too low	Have sensor replaced by LAUDA Service.
ErrH	Cable break on sensor F2	Yes	Yes	Ohmic measured value of sensor 2 too high	Have sensor replaced by LAUDA Service.
	Battery unsuitable (data logger battery)	Yes	Yes	Battery is unsuitable/battery values do not comply with the preset default values	Contact LAUDA Service and install the battery recommended by the manufacturer.
	Battery faulty or missing (data logger battery)	Yes	Yes	Battery defective or missing/battery missing according to q44	Contact LAUDA Service and install the battery recommended by the manufacturer.
	Battery operation/power failure (main battery)	Yes	Yes	No mains power and no power supply from the main battery.	Check whether the mains switch is on and the mains cable is plugged in.  In battery mode: Check whether the battery switch is on. If the main battery is discharged: Plug in the mains plug and turn on the mains switch to charge the main battery.
	Battery voltage low (data logger battery)	Yes	Yes	Battery voltage low/output in battery mode	Check the battery and, if necessary, have the recommended battery replaced by LAUDA Service.
	Door contact	Yes	Yes	Door contact error/door open or closed depending on parameterization b60-b63	Close door/cover.

Additional display	Error text/fault text	Message with acoustic alarm	Acknowledge acoustic alarm	Description/meaning/comments	Corrective action
	Limit value 1, low value	Yes	Yes	Temperature value is lower than A13/freely adjustable monitoring of process variables	Device too cold. The device may not yet be filled with refrigerated goods. Adjust the limit value. Goods stored in the device may be colder than the device's set point temperature. Acknowledge the alarm and wait until the refrigerated goods have reached the device's set point temperature. The second stage compressor may not switch off. Contact LAUDA Service.
	Limit value 1, high value	Yes	Yes	Temperature value is higher than A15/freely adjustable monitoring of process variables	Device too warm. The ambient temperature may be too high. Allow to cool. Condenser may be contaminated. Vacuum off the condenser or blow clean with compressed air (do not blow clean near smoke detectors as the disturbed dust may trigger the fire alarm). The device may be positioned too close to a wall. Ensure that the device is positioned 15 cm away from the wall. Warm exhaust air from another device may be blowing into the device's condenser. The device and motor compartment may be positioned next to a heater or heating pipes. Move the device to another location. The ventilator fan may have failed. Contact LAUDA Service. Have alarms such as the power failure or door contact alarms been previously triggered? Rectify the fault.
	Limit value 2, low value	Yes	Yes	Temperature value is lower than A23/freely adjustable monitoring of process variables	Device is too cold. Operation no longer possible.

Additional display	Error text/fault text	Message with acoustic alarm	Acknowledge acoustic alarm	Description/meaning/comments	Corrective action
	Limit value 2, high value	Yes	Yes	Temperature value is higher than A25/freely adjustable monitoring of process variables	Ambient temperature too high and/or the condenser is heavily contaminated. Clean the condenser and wait for 10 minutes before commissioning the device. Description: A fault in the condenser causes the compressors to continuously switch on and off against high pressure which may end up destroying the compressors.
	EPO Program error	Yes	Yes	Flash error, repair possible/possibly switch on/off (min. 10 seconds), otherwise see EP2	If necessary, replace the controller board. Contact LAUDA Service.
	EP1 Parameter error	Yes	Yes	Parameter configuration incorrect/correct parameters, otherwise EP2	If necessary, replace the controller board. Contact LAUDA Service.
	EP2 memory error	Yes	Yes	Flash error irreparable/reinstall software	If necessary, replace the controller board. Contact LAUDA Service.
F90	Controller not found	Yes	Yes		With 12 V emergency cooling, check the battery. Test the battery, install and connect a battery recommended by the manufacturer LAUDA.
F92	Internal communication issue	Yes	Yes	Possible switch on/off (min. 10 sec.)	Contact LAUDA Service.
F93	Memory error in operating unit/controller	Yes	Yes		Contact LAUDA Service.

## 10 Decommissioning

### 10.1 General information on decommissioning

Information on decommissioning

- Remove refrigerated goods from refrigeration compartment, see ↪ Chapter 7.3 “Storing and retrieving refrigerated goods” on page 52
- Download data from the device, see ↪ Chapter 7.7 “Data transfer via USB” on page 55
- Check the charge level of the main battery and charge if necessary, see ↪ Chapter 10.2 “Main battery after decommissioning” on page 66
- Switch off the device, see ↪ Chapter 6.2 “Switching the device on and off” on page 41
- Wind up the mains cable completely.
- Defrost the refrigeration compartment, see ↪ Chapter 8.5 “Defrosting the refrigeration compartment” on page 61.
- Clean the device, see ↪ Chapter 8.3 “Cleaning the device” on page 59.
- Note the storage temperature of the device, see ↪ Chapter 12.4 “Device data” on page 69.

### 10.2 Main battery after decommissioning

**!** **NOTICE!**  
Damage to the lithium iron phosphate battery due to deep discharge

- When not in use/decommissioned, charge the battery to between 70 and 100 percent.
- Check the charge level after 4 months at the latest and recharge, if necessary.

If the device is decommissioned or not in use, note the following:

- main battery must be charged 70 to 100 percent, ideally 90 percent.
- Switch off the main battery at the main battery switch, see ↪ Chapter 4.5.2 “Main battery switch” on page 26.
- Check the battery charge level every 4 months and recharge, if necessary.
- Observe the storage temperature (decommissioned device) of 5 to 43 °C, see ↪ Chapter 12.4 “Device data” on page 69.



## 11 Disposal

### 11.1 Disposing of refrigerant



**DANGER!**  
Incorrect handling

Fire

- Disposal work on the refrigeration system may only be performed by skilled, certified personnel who are trained to handle flammable refrigerants.



**WARNING!**  
Uncontrolled leaking of refrigerant

Fire

- Never dispose of a cooling circuit that is still pressurized.
- Disposal tasks may only be performed by skilled, certified personnel who are trained to handle flammable refrigerants.



*Refrigerant type and charge information is printed on the type plate or in the technical data.*

### 11.2 Disposing of the main battery



**NOTICE!**  
Environmental damage caused by incorrect disposal

- Dispose of the main battery and electronic components correctly in accordance with national regulations for LiFePO4 batteries or electronic components.

### 11.3 Device disposal



The following applies for EU member states: The device must be disposed of according to Directive 2012/19/EU (WEEE Waste of Electrical and Electronic Equipment).

### 11.4 Disposing of packaging

The following applies for EU member states: Disposal of the packaging must proceed according to regulation 94/62/EC.

## 12 Technical data



The device sound pressure level is below 70 dB. According to EC Directive 2006/42/EC the sound pressure level of the devices is therefore not specified further.

### 12.1 Touch operating unit data

Designation/details	Description/value	Unit
Display type	TFT color display, touch screen	---
Display size	4.3	Inches
Display resolution	480x272	Pixels

### 12.2 Main battery monitor data

Designation/details	Description or tolerance data	Unit
Display type	LCD, illuminated	---
Display resolution	Voltage: 0 to 35	+/- 0.01
	Current: 0 to 200	+/- 0.1
	Ampere hours: 0 to 200	+/- 0.1
	Charge level: 0 to 100	+/- 0.1
	Remaining time: 0 to 24 hours	+/- 1 minute
		-

### 12.3 Main battery and auxiliary battery data

#### Main battery

Designation/details	Value/designation	Unit
Main battery information	Main battery monitor	---
Main battery type	LiFePO4	---
Nominal capacity	100	Ah
Energy content	2560	Wh
Nominal battery voltage	25.6	V
Cycle lifetime	≥3000 at 90 percent DoD	---
Battery undervoltage cutoff	15 percent charge or 23.8 V	---
Battery display "Discharge alarm off"	Charge level above 30 percent	---
Manufacturer	Liontron	---

### Auxiliary battery

Designation/details	Value/designation	Unit
Manufacturer	Long	---

### 12.4 Device data

Designation/details	Value/designation	Unit
External dimensions (WxDxH)	1471x933x1217	mm
Internal dimensions of refrigeration compartment (WxDxH)	900x600x500	mm
Refrigeration compartment volume	270	Liters
Empty weight	325	kg
Maximum payload	100	kg
Temperature range	-50 to -86	°C
Temperature stability (over time)	+/- 3 K at -70°C	---
Maximum transport gradient	2	%
Temperature setting/temperature display	Touch operating unit	---
Mains voltage	230	V
Length of retractable cable	6	m
Power supply connector type	Safety plug (CEE7/7)	---
Mains voltage deviation	+/- 10	%
Frequency	50	Hz
Main fuse on site	T 16	A
Overvoltage category	II	---
Pollution degree	2	---
Protection level/protection class	IP 22	---
Power consumption at maximum cooling capacity while simultaneously charging battery	2.3	kW
Power consumption at maximum cooling capacity with fully charged battery	0.9	kW
Power consumption at -80°C with fully charged battery	0.5	kW
Power consumption on standby while battery is charging	1.0	kW
Maximum geographical altitude above sea level	2000	m
Maximum relative humidity	80% at 28°C	---
Ambient temperature	16 to 28	°C

Designation/details	Value/designation	Unit
Storage temperature (decommissioned device)	5 to 43	°C
Transport temperature (decommissioned device)	-20 to 43	°C

## 12.5 Refrigerant and filling charge

The device contains flammable refrigerants.

Table 3: R 290, 1st stage

	M 270	Unit
Refrigerant	R 290	---
Maximum filling weight	0.145	kg

Table 4: R 170, 2nd stage

	M 270	Unit
Refrigerant	R 170	---
Maximum filling weight	0.068	kg

## 13 General

### 13.1 Copyright

This manual is protected by copyright and only meant for internal use by purchasers.

The relinquishment of this manual to third parties, copying in any way whatsoever – even in the form of excerpts – and the utilization and/or conveyance of its content are not allowed, except for internal purposes, without written approval from the manufacturer.

Violation of this may obligate the violator to the payment of damages. Other claims reserved.

We point out that the designations and brand names of the respective companies used in the manual are generally subject to trademark, brand and patent protection.

### 13.2 Technical changes

The manufacturer reserves the right to make technical modifications to the device.

### 13.3 Warranty conditions

LAUDA guarantees a standard 12-month manufacturer's warranty from the date of the device's purchase.

### 13.4 Contact LAUDA

Contact the LAUDA Service department in the following cases:

- Troubleshooting
- Technical questions
- Ordering accessories and spare parts

Please contact our sales department for questions relating to your specific application.

#### Contact information

LAUDA Service

Phone: +49 (0)9343 503-350

Fax: -

Email: [service@lauda.de](mailto:service@lauda.de)



### 13.6 Product Returns and Clearance Declaration

#### Product Returns

Would you like to return a LAUDA product you have purchased to LAUDA? For the return of goods, e.g. for repair or due to a complaint, you will need the approval of LAUDA in the form of a *Return Material Authorization (RMA)* or *processing number*. You can obtain the RMA number from our customer service department at +49 (0) 9343 503 350 or by email [service@lauda.de](mailto:service@lauda.de).

#### Return address

LAUDA DR. R. WOBSE GMBH & CO. KG

Laudaplatz 1

97922 Lauda-Königshofen

Deutschland/Germany




Clearly label your shipment with the RMA number. Please also enclose this fully completed declaration.

RMA number	Product serial number
Customer/operator	Contact name
Contact email	Contact telephone
Zip code	Place
Street & house number	
Additional explanations	

#### Clearance Declaration

The customer/operator hereby confirms that the product returned under the above-mentioned RMA number has been carefully emptied and cleaned, that any connections have been sealed to the farthest possible extent, and that there are no explosive, flammable, environmentally hazardous, biohazardous, toxic, radioactive or other hazardous substances in or on the product.

Place, date	Name in block letters	Signature

  <span style="float: right;">Version: V1.0</span>	
<h1>UN38.3 Test Report</h1> <h2>UN38.3 检测报告</h2>	
<b>Applicant's name</b> 委托方名称	LIONTRON GmbH & Co. KG
<b>Applicant's Address</b> 委托方地址	Industriestraße 1, D-41334 Nettetal, Germany
<b>Name of Sample</b> 样品名称	Rechargeable Lithium Iron Phosphate Battery 可充电磷酸铁锂电池
<b>Model</b> 型号	25.6V 100Ah
<b>Testing Laboratory</b> 测试实验室	Shenzhen TCT Testing Technology Co., Ltd. 深圳市通测检测技术有限公司 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China 中国广东省深圳市宝安区福永桥头亿宝来工业城 1 栋 1 层 B
<b>Report No.</b> 报告编号	TCT191231B118
<b>Date of Issue</b> 签发日期	2020. 07. 09
<b>Test Conclusion 测试结论:</b> The test results are qualified. 测试结果为合格。	
Tested by 主检人: <u>Carry Wang 王琴</u>	Approved by 批准人: <u>Alex Sin 蔡超</u>
Inspected by 审核人: <u>Amy Zeng 曾</u>	Seal of TCT 报告单位 (盖章) 
Report No. 报告编号: TCT191231B118 Hotline: 400-6611-140 Tel: 86-755-27673339 E-mail: tom@tct-lab.com <a href="http://www.tct-lab.com">http://www.tct-lab.com</a>	
Page 1 第 1 页	



# TCT 通测检测

TESTING CENTRE TECHNOLOGY

## I、Sample Description 样品描述

<b>Name of Sample</b> 样品名称	Rechargeable Lithium Iron Phosphate Battery 可充电磷酸铁锂电池	<b>Model</b> 型号	25.6V 100Ah		
<b>Manufacturer's name</b> 制造商名称	LIONTRON GmbH & Co. KG				
<b>Manufacturer's Address</b> 制造商地址	Industriestraße 1, D-41334 Nettetal, Germany				
<b>Manufacturer's Contact Telephone</b> 制造商联系电话	+49(0)2157 -1449070	<b>E-mail</b> 邮箱	info@liontron.de	<b>Web</b> 网址	https://www.liontron.de
<b>Trade Mark</b> 商标	LIONTRON	<b>Shape</b> 形状	Prismatic 棱形	<b>Size 尺寸</b> (L×W×T)	(390.0×282.0×260.0)mm
<b>Nominal Voltage</b> 标称电压	25.6V	<b>Rated Capacity</b> 额定容量	100Ah 2560Wh	<b>Charge Voltage</b> 充电电压	29.2V
<b>Nominal Charge Current</b> 标称充电电流	20A	<b>Maximum Charge Current</b> 最大充电电流	150A	<b>End of Charge Current</b> 结束充电电流	1A
<b>Discharge Cut-off Voltage</b> 放电截止电压	21.6V	<b>Nominal Discharge Current</b> 标称放电电流	20A	<b>Maximum Discharge Current</b> 最大放电电流	160A
<b>Cell Model</b> 电池型号	32650	<b>Cell Nominal Voltage</b> 电池标称电压	3.2V	<b>Cell Rated Capacity</b> 电池额定容量	5300mAh
<b>Cells Number</b> 电池数量	152PCS	<b>Start Testing Date</b> 开始测试日期	2019-07-24	<b>Completing Date</b> 完成日期	2019-08-07

## II、Test Standard 检测标准

UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS Manual of Tests and Criteria" Sixth revised edition Amendment 1 (ST/SG/AC.10/11/Rev.6/Amend.1)

联合国《关于危险货物运输的建议书 试验和标准手册》第六修订版修正 1 (ST/SG/AC.10/11/Rev.6/Amend.1)

### III、Test Item 测试项目

- |   |  |
|---|--|
| T.1. <input checked="" type="checkbox"/> Altitude simulation 高度模拟 | T.5. <input checked="" type="checkbox"/> External short circuit 外部短路                   |
| T.2. <input checked="" type="checkbox"/> Thermal test 温度试验        | T.6. <input checked="" type="checkbox"/> Impact / <input type="checkbox"/> Crush 撞击/挤压 |
| T.3. <input checked="" type="checkbox"/> Vibration 振动             | T.7. <input checked="" type="checkbox"/> Overcharge 过充电                                |
| T.4. <input checked="" type="checkbox"/> Shock 冲击                 | T.8. <input checked="" type="checkbox"/> Forced discharge 强制放电                         |

### IV、Test Method and Requirement 测试方法和要求

#### T.1. Altitude simulation 高度模拟

**Purpose 目的**

This test simulates air transport under low-pressure conditions.

本试验模拟在低压条件下的空运。

**Test procedure 测试程序**

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature ( $20 \pm 5$  °C).

试验电池和电池组应在压力等于或低于 11.6 千帕和环境温度 ( $20 \pm 5$  °C) 下存放至少 6 小时。

**Requirement 要求**

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

#### T.2. Thermal test 温度试验

**Purpose 目的**

This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

本试验评估电池和电池组的密封完善性和内部电连接。试验利用迅速和极端的温度变化进行。

**Test procedure 测试程序**

Test Cells and batteries are to be stored for at least six hours at a test temperature equal to  $72 \pm 2$  °C, followed by storage for at least six hours at a test temperature equal to  $-40 \pm 2$  °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ( $20 \pm 5$  °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

试验电池和电池组应先在试验温度等于  $72 \pm 2$  °C 的条件下存放至少 6 小时，接着再在试验温度等于  $-40 \pm 2$  °C 的条件下存放至少 6 小时。两个极端试验温度之间的最大时间间隔为 30 分钟。此程序重复进行，共完成 10 次，接着将所有试验电池和电池组在环境温度 ( $20 \pm 5$  °C) 下存放 24 小时。对于大型电池和电池组，暴露于极端试验温度的时间至少应为 12 小时。

**Requirement 要求**

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

## TCT 通测检测

TESTING CENTRE TECHNOLOGY

### T.3. Vibration 振动

#### Purpose 目的

This test simulates vibration during transport.

本试验模拟运输过程中的振动。

#### Test procedure 测试程序

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).

For cells and small batteries: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

For large batteries: from 7 Hz to a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 gn occurs (approximately 25 Hz). A peak acceleration of 2 gn is then maintained until the frequency is increased to 200 Hz.

电池和电池组紧固于振动机平台，但紧固程度不能造成电池变形以致不能准确传递振动。振动应是正弦波形，对数频率扫描从 7 赫兹到 200 赫兹，再回到 7 赫兹，跨度为 15 分钟。这一振动过程须对三个互相垂直的电池安装方位的每一方向重复进行 12 次，总共为时 3 小时。其中一个振动方向必须与端面垂直。

作对数式频率扫描，对总质量不足 12 千克的电池和电池组(电池和小型电池组)，和对 12 千克及更大的电池组(大型电池组)应有所不同。

对电池和小型电池组：从 7 赫兹开始，保持 1 gn 的最大加速度，直到频率达到 18 赫兹。然后将振幅保持在 0.8 毫米(总偏移 1.6 毫米)，并增加频率直到最大加速度达到 8 gn(频率约为 50 赫兹)。将最大加速度保持在 8 gn 直到频率增加到 200 赫兹。

对大型电池组：从 7 赫兹开始，保持 1 gn 的最大加速度，直到频率达到 18 赫兹。然后将振幅保持在 0.8 毫米(总偏移 1.6 毫米)，并增加频率直到最大加速度达到 2 gn(频率约为 25 赫兹)。将最大加速度保持在 2 gn 直到频率增加到 200 赫兹。

#### Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果试验中和试验后无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在第三个垂直安装方位上的试验后立即测得的开路电压不小于在进行这一试验前电压的 90%，电池和电池组即符合本项要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

### T.4. Shock 冲击

#### Purpose 目的

This test assesses the robustness of cells and batteries against cumulative shocks.

本试验评估电池和电池组对累积冲击效应的耐受程度。

#### Test procedure 测试程序

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

Each cell shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds.

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the



battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

试验电池和电池组用坚固支架固定在试验机上，支架支撑着每个试验电池组的所有安装面。

每个电池须经受最大加速度 150 gn 和脉冲持续时间 6 毫秒的半正弦波冲击。不过，大型电池须经受最大加速度 50 gn 和脉冲持续时间 11 毫秒的半正弦波冲击。

每个电池须经受的正弦波冲击的最大加速度取决于电池组的质量。小型电池组的脉冲持续时间 6 毫秒，大型电池组的脉冲持续时间 11 毫秒。以下公式用于计算合适的最低限度最大加速度。

每个电池或电池组须在三个互相垂直的电池或电池组安装方位的正极方向经受三次冲击，接着在负极方向经受三次冲击，总共经受 18 次冲击。

The formulas below are provided to calculate the appropriate minimum peak accelerations. 以下公式用于计算合适的最低限度最大加速度。

Battery 电池组	Minimum peak acceleration 最低限度最大加速度	Pulse duration 脉冲持续时间
Small batteries 小型电池组	150 gn or result of formula Acceleration(g <sub>n</sub> ) = $\sqrt{\frac{100850}{\text{mass}^*}}$ whichever is smaller	6 ms
Large batteries 大型电池组	50 gn or result of formula Acceleration(g <sub>n</sub> ) = $\sqrt{\frac{30000}{\text{mass}^*}}$ whichever is smaller	11 ms

\* Mass is expressed in kilograms.

\*质量用千克表示

#### Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

#### T.5. External short circuit 外部短路

##### Purpose 目的

This test simulates an external short circuit.

本试验模拟外部短路。

##### Test procedure 测试程序

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

This short circuit condition is continued for at least one hour after the cell or battery external case

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temperature has returned to  $57 \pm 4$  °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

The short circuit and cooling down phases shall be conducted at least at ambient temperature.

对于待试电池或电池组, 应加温一段必要的时间, 使从外壳测量的温度达到均匀的稳定温度  $57 \pm 4$  °C。这段时间的长短取决于电池或电池组的大小和设计, 对于这个持续时间应加以评估和记录。如无法进行这种评估, 则小型电池和小型电池组的暴露时间应至少 6 小时, 大型电池和大型电池组的暴露时间应至少 12 小时。然后, 电池或电池组应在  $57 \pm 4$  °C 条件下经受总外电阻小于 0.1 欧姆的短路条件。这一短路条件应在电池或电池组外壳温度回到  $57 \pm 4$  °C 后继续至少 1 小时, 或在大型电池组的情况下外壳温度降幅达试验中所观察到的最高温升幅的二分之一并保持低于该数值。

短路和降温阶段的温度应至少相当于环境温度。

### Requirement 要求

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

如果外壳温度不超过 170°C, 并且在试验过程中及试验后 6 小时内无解体、无破裂, 无起火, 电池和电池组即符合本项要求。

## T.6. Impact / Crush 撞击/挤压

### Purpose 目的

These tests simulate mechanical abuse from an impact or crush that may result in an internal short circuit. 本节的试验模拟撞击或挤压等可能造成内部短路的机械性破坏。

### Test procedure – Impact (applicable to cylindrical cells not less than 18.0 mm in diameter)

测试程序 – 撞击 (适用于直径不小于 18.0 毫米的圆柱形电池)

The test sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm  $\pm$  0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg  $\pm$  0.1 kg mass is to be dropped from a height of 61  $\pm$  2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or Channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.

The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm  $\pm$  0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

试样电池或元件电池放在平坦光滑的表面上。一根 316 型不锈钢棒横放在试样中心, 钢棒直径 15.8 毫米  $\pm$  0.1 毫米, 长度至少 6 厘米, 或电池最长端的尺寸, 取二者之长者。将一块 9.1 千克  $\pm$  0.1 千克的重锤从 61  $\pm$  2.5 厘米高处跌落到钢棒和试样交叉处, 使用一个几乎没有摩擦的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿与水平支撑表面呈 90 度落下。

接受撞击的试样, 纵轴应与平坦表面平行并与横放在试样中心的直径 15.8  $\pm$  0.1 毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。

### Test procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter)

测试程序 – 挤压 (适用于棱柱形、袋状、硬币/纽扣电池和直径小于 18.0 毫米的圆柱形电池)

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

- (a) The applied force reaches 13 kN  $\pm$  0.78 kN;
- (b) The voltage of the cell drops by at least 100 mV; or
- (c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.

Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed

for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

将电池或元件电池放在两个平面之间挤压，挤压力度逐渐加大，在第一个接触点上的速度大约为 1.5 厘米/秒。挤压持续进行，直到出现以下三种情况之一：

- (a)施加的力量达到 13 千牛顿  $\pm$  0.78 千牛顿；
- (b)电池的电压下降至少 100 毫伏；或
- (c)电池形变达原始厚度的 50%或以上。

一旦达到最大压力、电压下降 100 毫伏或更多，或电池变形至少达原厚度的 50%，即可解除压力。

棱柱形或袋状电池应从最宽的一面施压。纽扣/硬币形电池应从其平坦表面施压。圆柱形电池应从与纵轴垂直的方向施压。

每个试样电池或元件电池只做一次挤压试验。试样应继续观察 6 小时。试验应使用之前未做过其他试验的电池或元件电池进行。

**Requirement 要求**

Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire during the test and within six hours after this test.

如果外壳温度不超过 170 °C，并且在试验过程中及试验后 6 小时内无解体、无破裂，无起火，电池和电池组即符合本项要求。

**T.7. Overcharge 过充电**

**Purpose 目的**

This test evaluates the ability of a rechargeable battery or a single cell rechargeable battery to withstand an overcharge condition.

本试验评估可再充电电池组或可再充电单一电池电池组承受过度充电状况的能力。

**Test procedure 测试程序**

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) When the manufacturer's recommended charge voltage is not more than 18 V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22 V.

(b) When the manufacturer's recommended charge voltage is more than 18 V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

充电电流必须是制造商建议的最大持续充电电流的两倍。试验的最小电压如下：

(a)制造商建议的充电电压不大于 18 伏时，试验的最小电压应是电池组最大充电电压的两倍或 22 伏两者中的较小者。

(b)制造商建议的充电电压大于 18 伏时，试验的最小电压应是最大充电电压的 1.2 倍。

试验应在环境温度下进行。进行试验的时间应为 24 小时。

**Requirement 要求**

Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

充电电池组在试验过程中和试验后 7 天内无解体、无起火，即符合本项要求。

**T.8. Forced discharge 强制放电**

**Purpose 目的**

This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.

本试验评估原电池或充电电池承受强制放电状况的能力。

**Test procedure 测试程序**

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.



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The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

每个电池应在环境温度下与 12 伏直流电源串联在起始电流等于制造商给定的最大放电电流的条件下强制放电。

将适当大小和额定值的电阻负荷与试验电池串联，计算得出给定的放电电流。对每个电池进行强制放电，放电时间(小时)应等于其额定容量除以初始试验电流(安培)。

### Requirement 要求

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

原电池或充电电池如在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。

## V、General terms and definitions 一般术语与定义

Table 38.3.1: Mass loss limit

表 38.3.1: 质量损失限值

Mass M of cell or battery 电池或电池组质量 M	Mass loss limit 质量损失限值
M < 1 g	0.5%
1 g ≤ M ≤ 75 g	0.2%
M > 75 g	0.1%

In order to quantify the mass loss, the following procedure is provided:

$$\text{Mass loss (\%)} = (M_1 - M_2)/M_1 \times 100$$

质量损失的量化值，可用以下公式计算：

$$\text{质量损失(\%)} = (M_1 - M_2)/M_1 \times 100$$

Where M1 is the mass before the test and M2 is the mass after the test. When mass loss does not exceed the values in Table 38.3.1, it shall be considered as "no mass loss".

式中：M1 是试验前的质量，M2 是试验后的质量。如果质量损失不超过表 38.3.1 所列的数值，应视为“无质量损失”。

Leakage means the visible escape of electrolyte or other material from a cell or battery or the loss of material (except battery casing, handling devices or labels) from a cell or battery such that the loss of mass exceeds the values in Table 38.3.1.

渗漏是指可以看到的电解液或者其他物质从电池或电池组中漏出，或电池或电池组中的物质损失（不包括电池外壳、搬运装置、或标签），质量损失超过表 38.3.1 所列的数值。

Venting means the release of excessive internal pressure from a cell or battery in a manner intended by design to preclude rupture or disassembly.

排气是指按设计方式释放电池或电池组内部过高的压力，防止其破裂或解体。

Disassembly means a vent or rupture where solid matter from any part of a cell or battery penetrates a wire mesh screen (annealed aluminium wire with a diameter of 0.25 mm and grid density of 6 to 7 wires per cm) placed 25 cm away from the cell or battery.

解体是指排气或破裂使电池或电池组任何部分的固体物质穿过放在离电池或电池 25 cm 处的丝网筛（直径 0.25 mm 的软铝丝，网格密度每厘米 6 至 7 条铝丝）。

Rupture means the mechanical failure of a cell container or battery case induced by an internal or external cause, resulting in exposure or spillage but not ejection of solid materials.

破裂是指内部或外部原因引起的电池容器或电池组外壳机械损坏，造成内装物暴露或溢出，但无固体喷射。

Fire means that flames are emitted from the test cell or battery.

起火是指试验电池或电池组有火焰冒出。

**VI、Main Test Apparatus 主要测试仪器**

Serial No. 设备编号	Name of Equipment 设备名称	Model 型号	Calibration Date /Due Date 校准日期/到期日
TC-B01	Low Altitude Simulation Tester 低压高空模拟试验箱	GX-3020-Z	2019. 04. 16
			2020. 04. 15
TC-B04	Vertical Shock Test Instrument 垂直冲击试验台	SY10-2	2019. 04. 16
			2020. 04. 15
TC-B05	Vibration test instrument 振动试验台	ES-3-150	2019. 04. 16
			2020. 04. 15
TC-B07	Battery Test System 电池测试系统	CTS 20V/10A	2019. 04. 17
			2020. 04. 16
TC-B11	Crush Test Instrument 温控型电池挤压试验机	BE-6045T	2019. 04. 16
			2020. 04. 15
TC-B13	Battery Short Circuit Tester 电池短路试验机	GX-6055-B	2019. 04. 17
			2020. 04. 16
TC-B14	Electronic Balance 电子天平	PTT-A+300	2019. 04. 16
			2020. 04. 15
TC-B15	Data Collector 数据采集器	34970A	2019. 04. 16
			2020. 04. 15
TC-B18	DC POWER 直流源	PSW 80-27	2019. 04. 16
			2020. 04. 15
TC-B21	Battery Impact Tester 电池冲击试验机	BE-5066	2019. 04. 16
			2020. 04. 15
TC-B25	Digital Multimeter 数字万用表	15B	2018. 09. 11
			2019. 09. 10
TC-B30	Programmable high & low temperature test chamber 可编程高低温试验机	GX-3000-150	2018. 09. 20
			2019. 09. 19



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## VII、Test Data 测试数据

### T.1. Altitude simulation 高度模拟

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环 满电状态	1#	27120	27.36	27120	27.36	0.00	100.0	Pass 合格
	2#	27112	27.37	27111	27.35	0.00	99.9	Pass 合格
	3#	/	/	/	/	/	/	/
	4#	/	/	/	/	/	/	/
	5#	/	/	/	/	/	/	/
25th cycle, fully charged state 25次循环 满电状态	6#	27119	27.36	27118	27.36	0.00	100.0	Pass 合格
	7#	27119	27.37	27119	27.37	0.00	100.0	Pass 合格
	8#	/	/	/	/	/	/	/
	9#	/	/	/	/	/	/	/
	10#	/	/	/	/	/	/	/

**Notes** 注释: Ambient temperature 环境温度: 23.5 °C.

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

### T.2. Thermal test 温度试验

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环 满电状态	1#	27120	27.36	27110	27.21	0.04	99.5	Pass 合格
	2#	27111	27.35	27109	27.25	0.01	99.6	Pass 合格
	3#	/	/	/	/	/	/	/
	4#	/	/	/	/	/	/	/
	5#	/	/	/	/	/	/	/
25th cycle, fully charged state 25次循环 满电状态	6#	27118	27.36	27112	27.22	0.02	99.5	Pass 合格
	7#	27119	27.37	27111	27.21	0.03	99.4	Pass 合格
	8#	/	/	/	/	/	/	/
	9#	/	/	/	/	/	/	/
	10#	/	/	/	/	/	/	/

**Notes** 注释: Ambient temperature 环境温度: 23.4 °C.

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

**T.3. Vibration 振动**

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环 满电状态	1#	27110	27.21	27110	27.21	0.00	100.0	Pass 合格
	2#	27109	27.25	27107	27.23	0.01	99.9	Pass 合格
	3#	/	/	/	/	/	/	/
	4#	/	/	/	/	/	/	/
	5#	/	/	/	/	/	/	/
25th cycle, fully charged state 25次循环 满电状态	6#	27112	27.22	27112	27.20	0.00	99.9	Pass 合格
	7#	27111	27.21	27111	27.21	0.00	100.0	Pass 合格
	8#	/	/	/	/	/	/	/
	9#	/	/	/	/	/	/	/
	10#	/	/	/	/	/	/	/

**Notes** 注释: Ambient temperature 环境温度: 23.5 °C.

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

**T.4. Shock 冲击**

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环 满电状态	1#	27110	27.21	27108	27.21	0.01	100.0	Pass 合格
	2#	27107	27.23	27106	27.21	0.00	99.9	Pass 合格
	3#	/	/	/	/	/	/	/
	4#	/	/	/	/	/	/	/
	5#	/	/	/	/	/	/	/
25th cycle, fully charged state 25次循环 满电状态	6#	27112	27.20	27112	27.20	0.00	100.0	Pass 合格
	7#	27111	27.21	27110	27.19	0.00	99.9	Pass 合格
	8#	/	/	/	/	/	/	/
	9#	/	/	/	/	/	/	/
	10#	/	/	/	/	/	/	/

**Notes** 注释: Ambient temperature 环境温度: 23.6 °C.

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

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### T.5. External short circuit 外部短路

Test sample status 测试样品状态	No. 编号	Maximum external temperature (°C) 表面最高温度(°C)	Status 结果
first cycle, fully charged state 首次循环满电状态	1#	57.2	Pass 合格
	2#	57.4	Pass 合格
	3#	/	/
	4#	/	/
	5#	/	/
25th cycle, fully charged state 25次循环满电状态	6#	57.4	Pass 合格
	7#	57.6	Pass 合格
	8#	/	/
	9#	/	/
	10#	/	/

**Notes** 注释: Ambient temperature 环境温度: 23.4 °C。

Test sample external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

测试样品表面温度不超过 170 °C，测试中与测试后 6 小时内无解体、无破裂、无起火。

### T.6. Impact 撞击

Test sample status 测试样品状态	No. 编号	Maximum external temperature (°C) 表面最高温度(°C)	Status 结果
first cycle, 50% charged state 首次循环 50%充电状态	11#	32.6	Pass 合格
	12#	32.6	Pass 合格
	13#	36.7	Pass 合格
	14#	35.8	Pass 合格
	15#	34.7	Pass 合格
25th cycle, 50% charged state 25次循环 50%充电状态	16#	33.8	Pass 合格
	17#	35.4	Pass 合格
	18#	32.8	Pass 合格
	19#	33.6	Pass 合格
	20#	35.2	Pass 合格

**Notes** 注释: Ambient temperature 环境温度: 23.6 °C。

Test sample external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

测试样品表面温度不超过 170 °C，测试中与测试后 6 小时内无解体、无破裂、无起火。

**T.7. Overcharge 过充电**

Test sample status 测试样品状态	No. 编号	Status 结果
first cycle, fully charged state 首次循环满电状态	21#	Pass 合格
	22#	Pass 合格
	23#	Pass 合格
	24#	Pass 合格
25th cycle, fully charged state 25 次循环满电状态	25#	Pass 合格
	26#	Pass 合格
	27#	Pass 合格
	28#	Pass 合格

**Notes 注释:** Ambient temperature 环境温度: 23.5 °C。

There is no disassembly and no fire during the test and within seven days after the test.

样品在测试中和测试后 7 天内无解体、无起火。

**T.8. Forced discharge 强制放电**

Test sample status 测试样品状态	No. 编号	Status 结果
first cycle, fully discharged state 首次循环完全放电状态	29#	Pass 合格
	30#	Pass 合格
	31#	Pass 合格
	32#	Pass 合格
	33#	Pass 合格
	34#	Pass 合格
	35#	Pass 合格
	36#	Pass 合格
	37#	Pass 合格
25th cycle, fully discharged state 25 次循环完全放电状态	38#	Pass 合格
	39#	Pass 合格
	40#	Pass 合格
	41#	Pass 合格
	42#	Pass 合格
	43#	Pass 合格
	44#	Pass 合格
	45#	Pass 合格
	46#	Pass 合格
	47#	Pass 合格
	48#	Pass 合格

**Notes 注释:** Ambient temperature 环境温度: 23.5 °C。

There is no disassembly and no fire during the test and within seven days after the test.

样品在测试中和测试后 7 天内无解体、无起火。



# TCT 通测检测

TESTING CENTRE TECHNOLOGY

## VIII、Conclusion 结论

No. 序号	Name of test items 测试项目名称	Cause number of standard 标准条款号	Test Result 检查结果	Conclusion 结论	Remark 备注
1	Altitude simulation 高空模拟	38.3 Test T.1 38.3 试验 T.1	See Appendix T.1. Altitude simulation 见附表 T.1. 高度模拟	Pass 合格	/
2	Thermal test 温度试验	38.3 Test T.2 38.3 试验 T.2	See Appendix T.2. Thermal test 见附表 T.2. 温度试验	Pass 合格	/
3	Vibration 振动	38.3 Test T.3 38.3 试验 T.3	See Appendix T.3. Vibration 见附表 T.3. 振动	Pass 合格	/
4	Shock 冲击	38.3 Test T.4 38.3 试验 T.4	See Appendix T.4. Shock 见附表 T.4. 冲击	Pass 合格	/
5	External short circuit 外部短路	38.3 Test T.5 38.3 试验 T.5	See Appendix T.5. External short circuit 见附表 T.5. 外部短路	Pass 合格	/
6	Impact 撞击	38.3 Test T.6 38.3 试验 T.6	See Appendix T.6. Impact 见附表 T.6. 撞击	Pass 合格	/
7	Overcharge 过度充电	38.3 Test T.7 38.3 试验 T.7	See Appendix T.7. Overcharge 见附表 T.7. 过充电	Pass 合格	/
8	Forced discharge 强制放电	38.3 Test T.8 38.3 试验 T.8	See Appendix T.8. Forced discharge 见附表 T.8. 强制放电	Pass 合格	/

**According to the standard:**

依据标准:

UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS Manual of Tests and Criteria" Sixth revised edition Amendment 1 (ST/SG/AC.10/11/Rev.6/Amend.1).

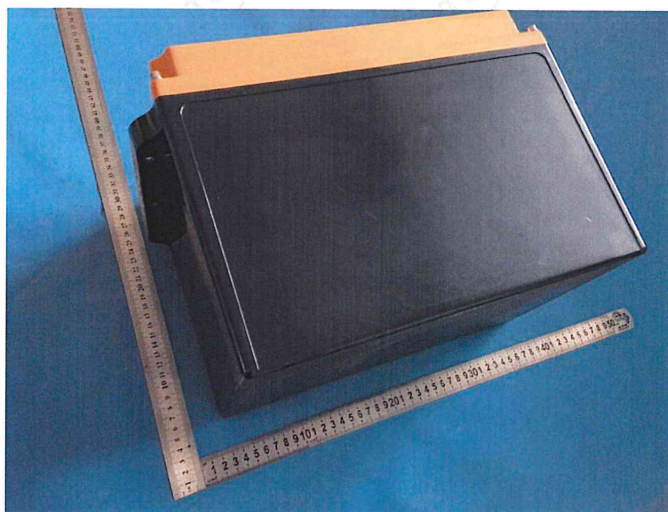
联合国《关于危险货物运输的建议书 试验和标准手册》第六修订版修正 1 (ST/SG/AC.10/11/Rev.6/Amend.1)。

**IX、Picture of the sample 样品图片**



**Picture 1. Battery view**

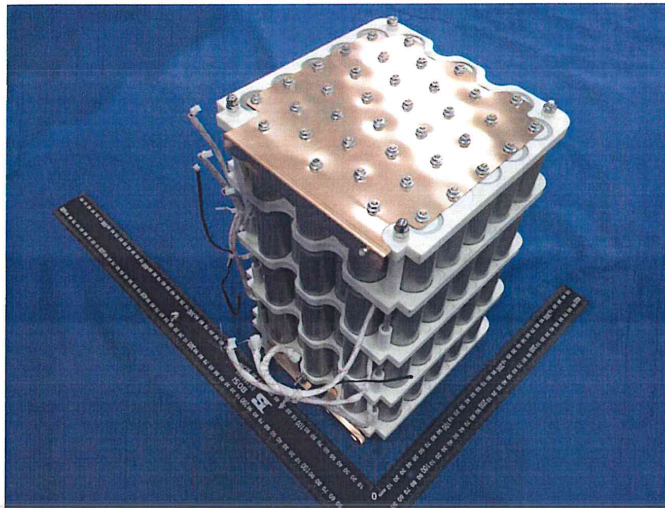
图片 1. 电池组视图



**Picture 2. Battery view**

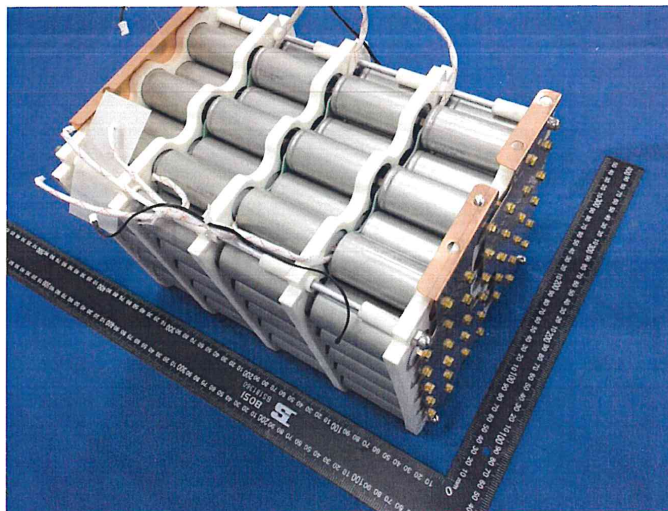
图片 2. 电池组视图

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TESTING CENTRE TECHNOLOGY



Picture 3. Cell view

图片 3. 电池视图



Picture 4. Cell view

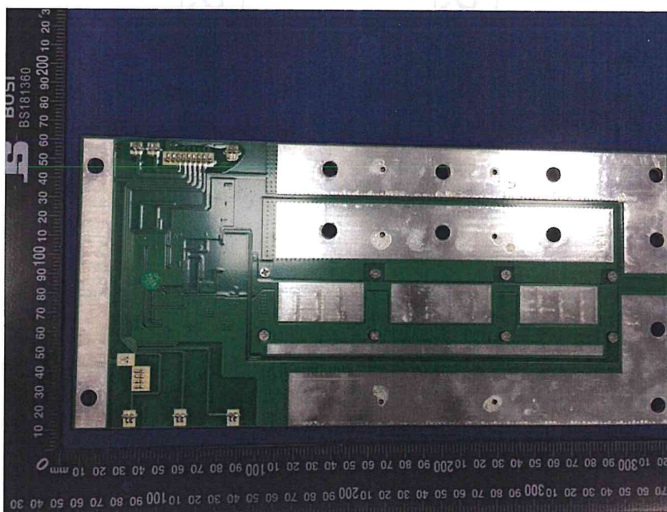
图片 4. 电池视图





Picture 5. Protection board view

图片 5. 保护板视图



Picture 6. Protection board view

图片 6. 保护板视图

\*\*\*\*\*End of Report 报告结束\*\*\*\*\*



## Important Notice

### 注意事项

1. The test report is invalid without the official stamp of TCT.  
本报告书无 TCT 盖章无效。
2. Nobody is allowed to photocopy or partly photocopy this test report without written permission of TCT.  
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4. The report is invalid when anything of following happens – illegal transfer, reproduce, embezzlement, imposture, modification or tampering in any media form.  
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5. Objections to the test report must be submitted to TCT within 15 days.  
对报告书若有异议，应于收到报告之日起 15 天内向本公司提出。
6. The test report is valid for the tested samples only.  
本报告仅对本次测试样品有效。
7. The Chinese contents in this report are only for reference.  
本报告中的中文内容仅供参考。
8. This report belongs to quote for the record, the reference test report TCT191121B020.  
此报告为报备案件，参考测试报告 TCT191121B020。

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Manufacturer:

LAUDA DR. R. WOBSE GMBH & CO. KG ° Schulze-Delitzsch-Straße 4+5 ° 30938 Burgwedel

Telephone: +49 (0)5139 9958-0

E-mail: [info@lauda.de](mailto:info@lauda.de) ° Internet: <https://www.lauda.de>