

# Smart String Grid Forming ESS

Applicable product models: LUNA2000-(4472, 5015) Series

2025

# Quick Maintenance Guide





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# Device Description

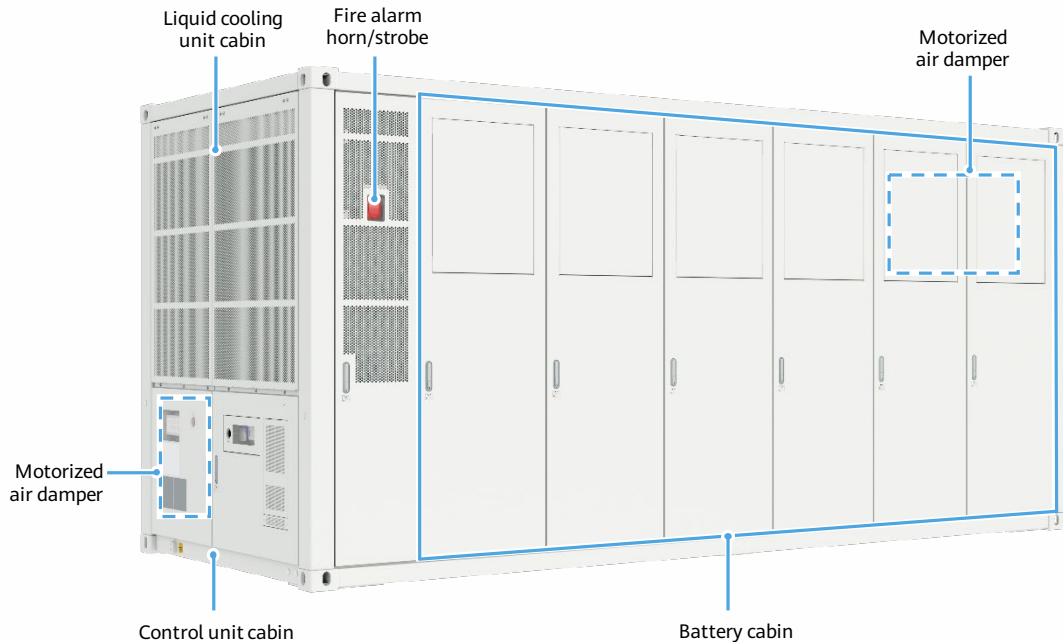
Device Appearance

Layout of Key Components

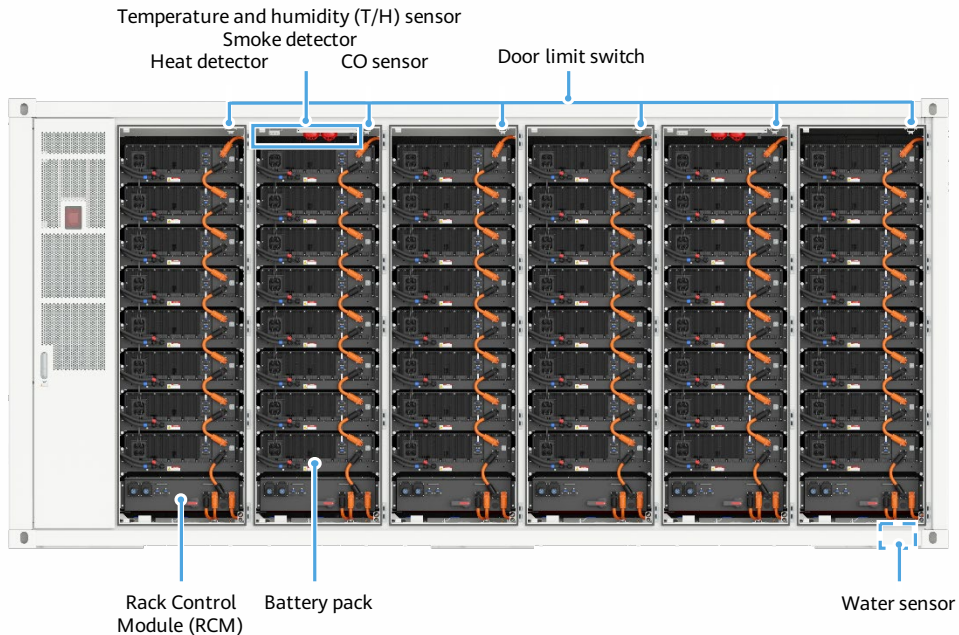
Layout of Liquid Cooling Pipes

Layout of the Fire Suppression System

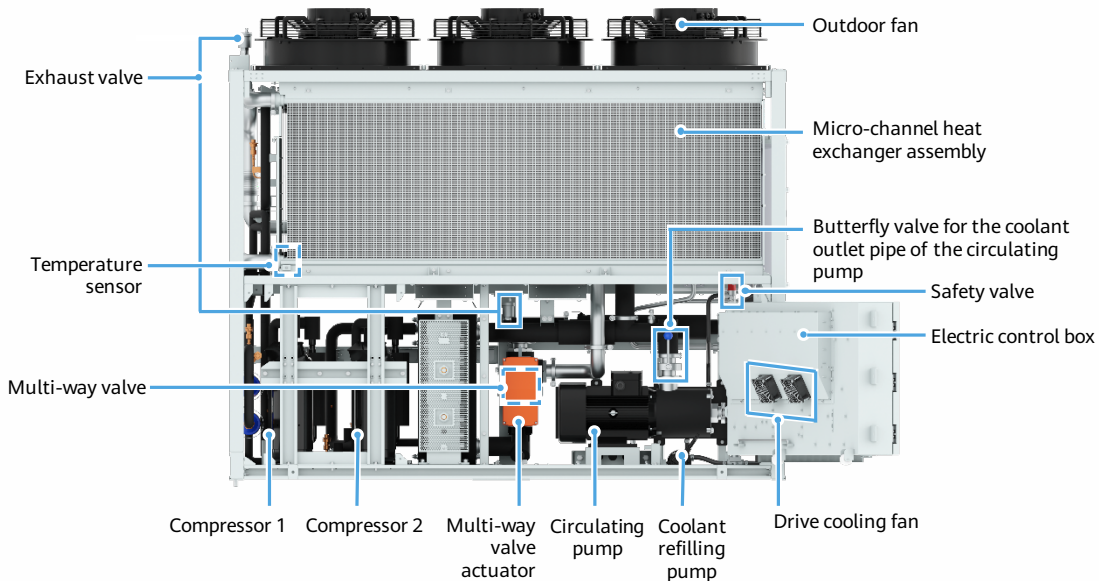
**Note: The figures in this document are for reference only.**



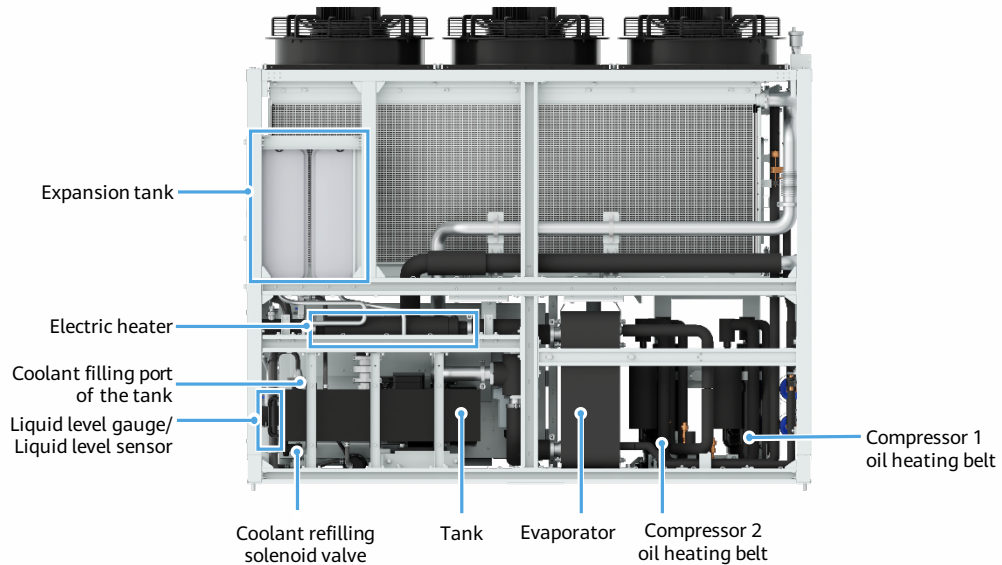
## Battery cabin



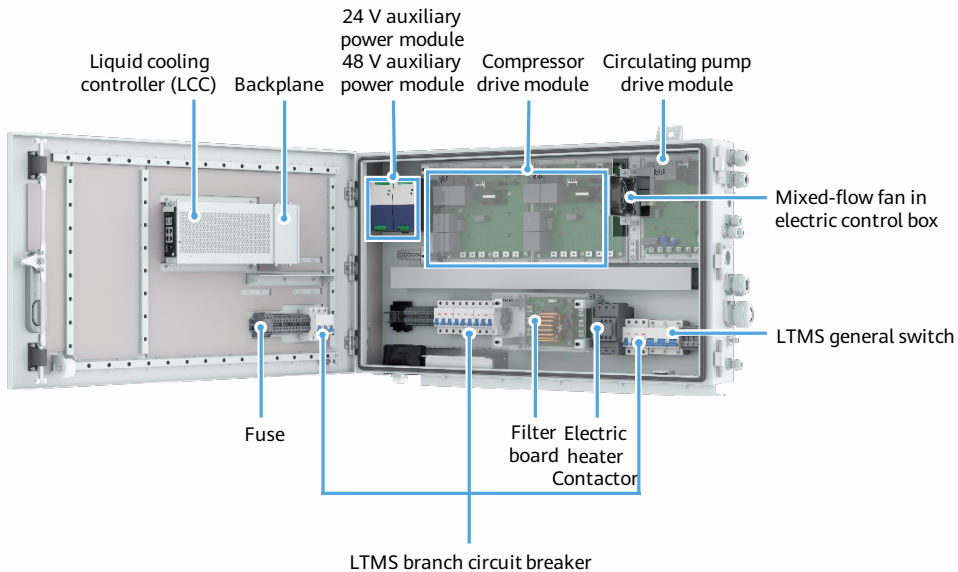
## Front view of the Liquid Thermal Management System (LTMS)



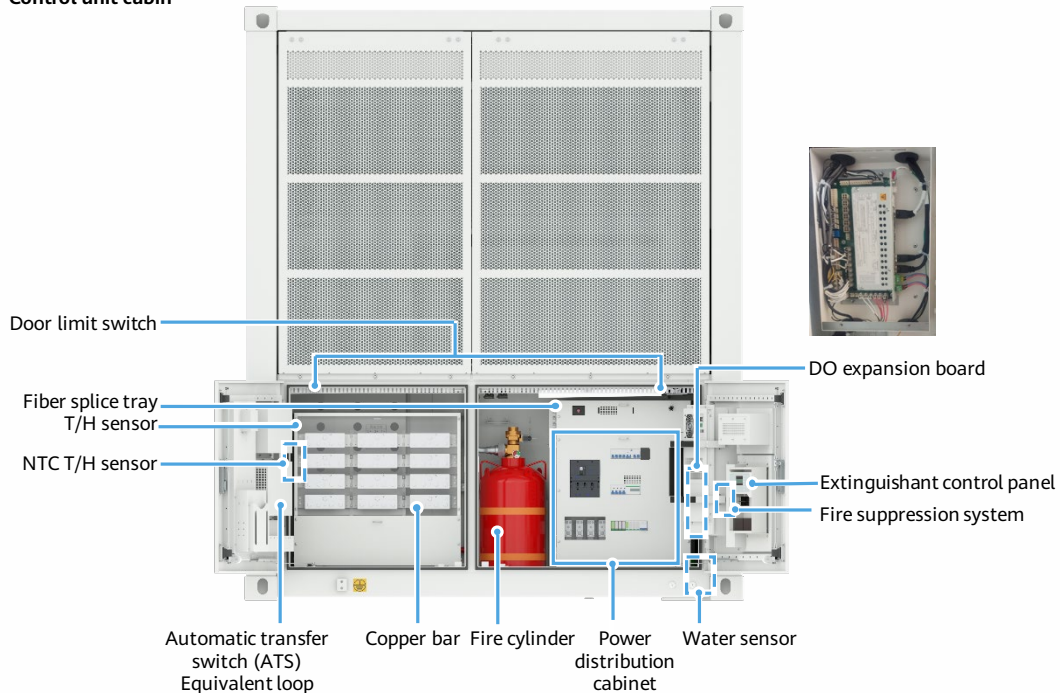
## Rear view of the LTMS



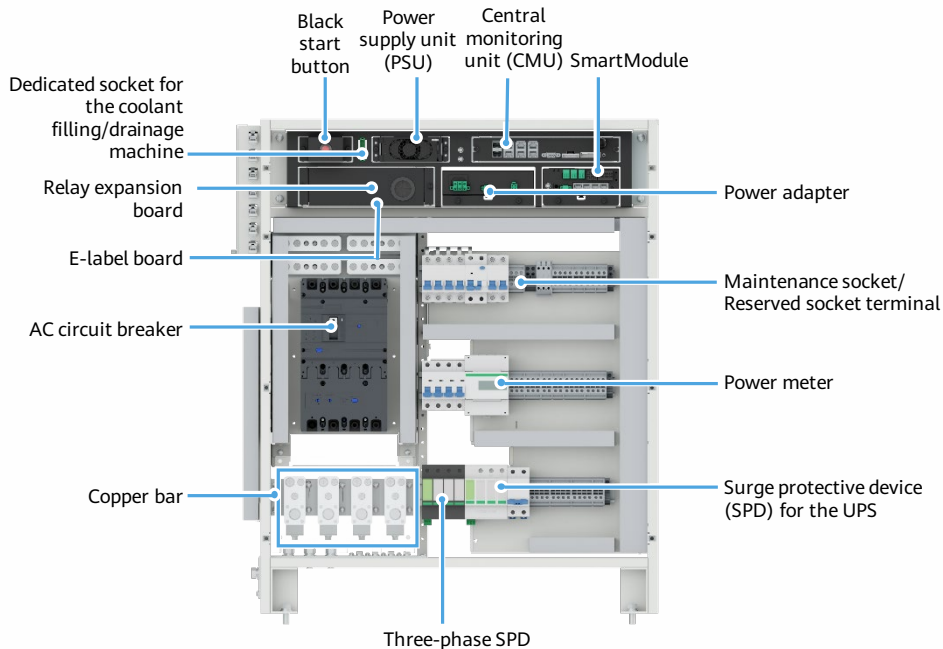
## LTMS electric control box

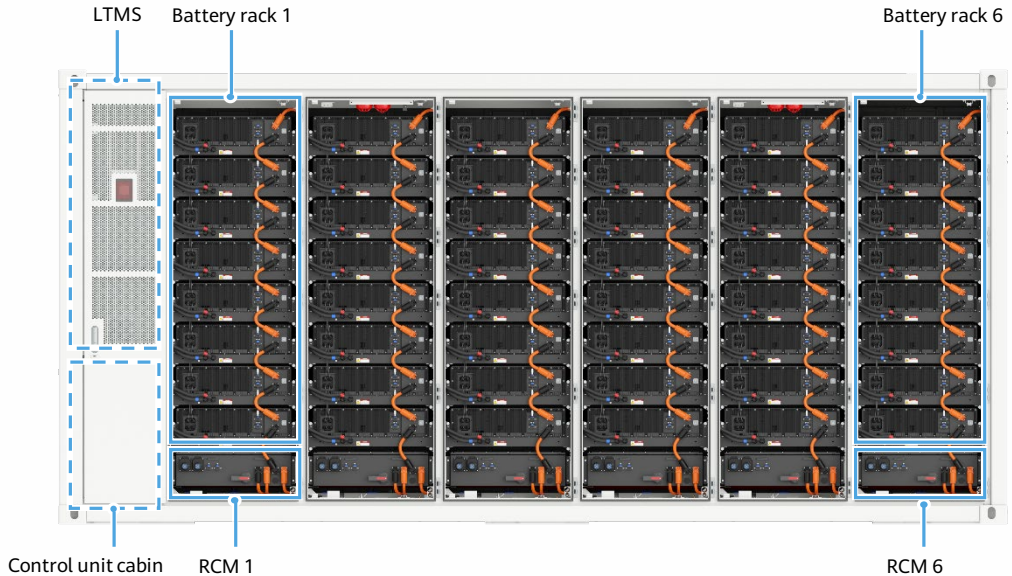


## Control unit cabin



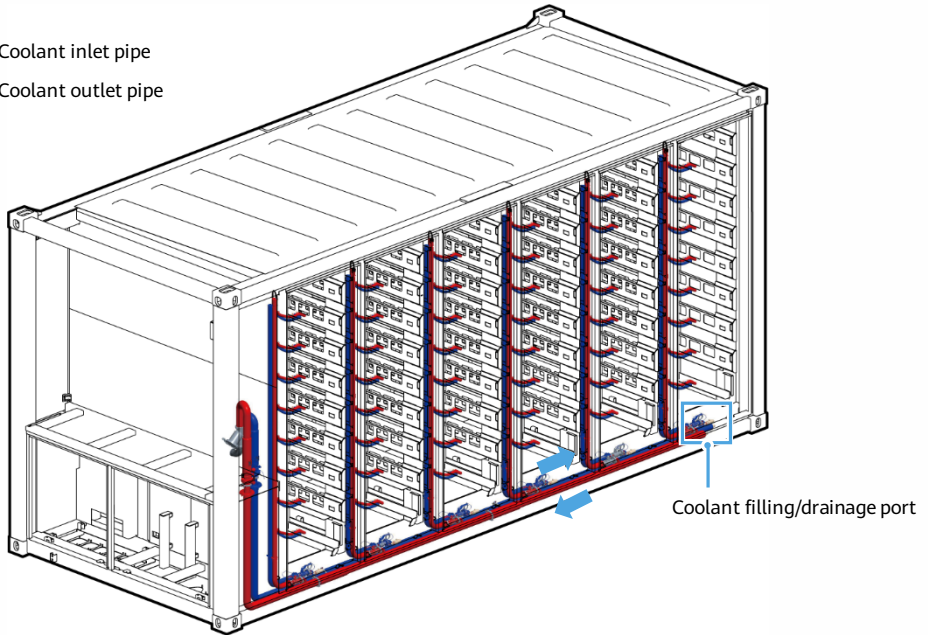
## Power distribution cabinet in the control unit cabin





## Battery cabin

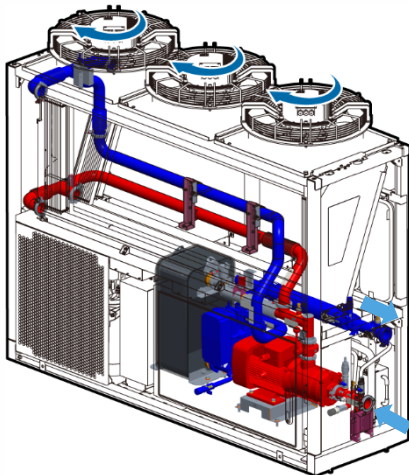
- Coolant inlet pipe
- Coolant outlet pipe



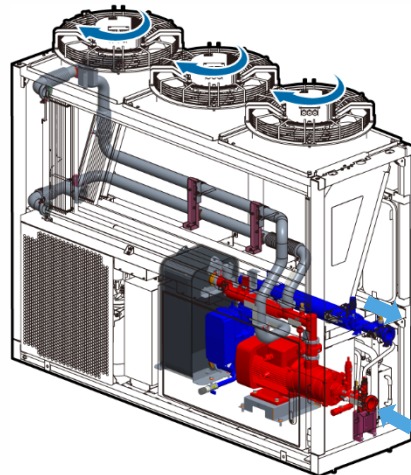
## LTMS

■ Pipe not in use

Natural cooling mode



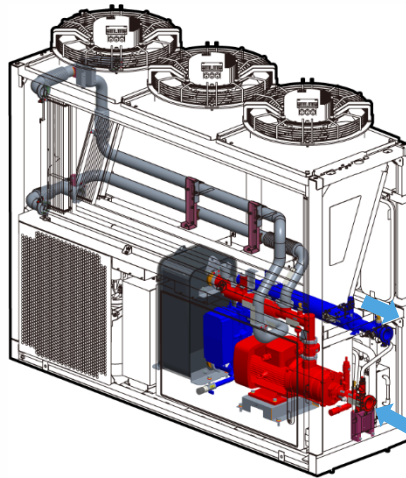
Active cooling mode

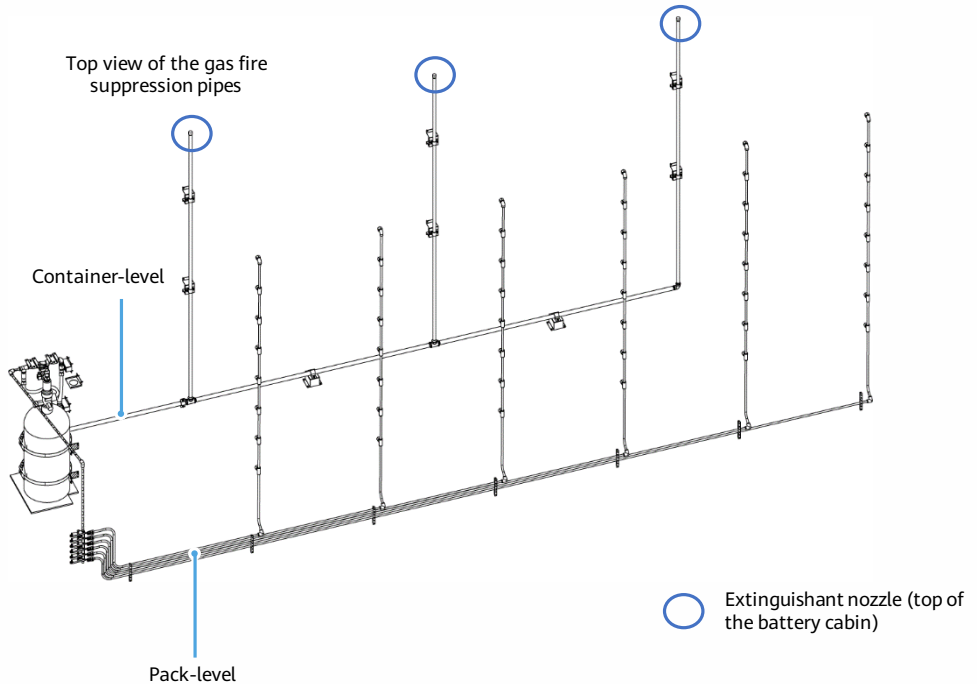


## LTMS

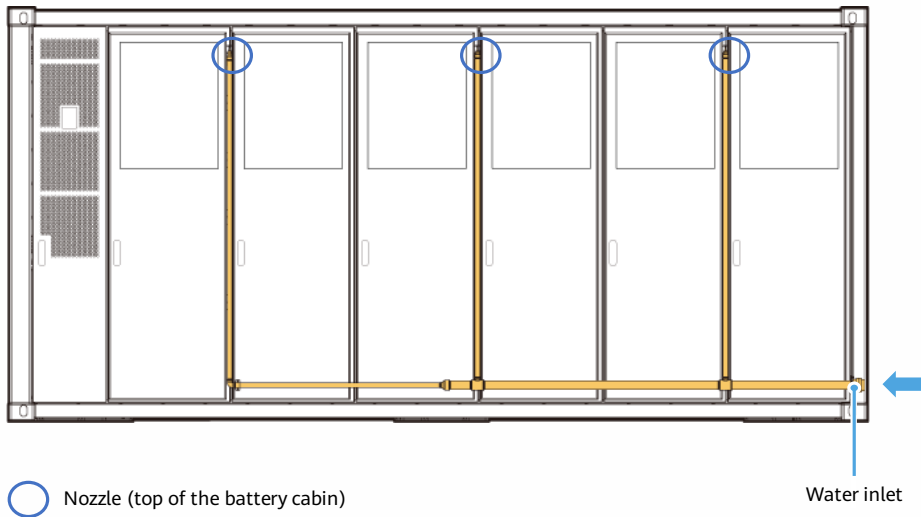
■ Pipe not in use

PTC heating/Self-circulating mode





Front view of the water sprinkler system



# Maintenance and Emergency Handling

Main Maintenance Items

Emergency Handling

**Note:** When checking and maintaining the equipment, comply with the safety requirements of the equipment as well as local laws and regulations.

The following table lists the main maintenance items and criteria. For details, see [HUAWEI LUNA2000-\(4472, 5015\) Series Smart String Grid Forming ESS Maintenance Manual](#).

Category	Item	Criteria
Routine maintenance	Alarm	No major or minor alarm is generated.
Quarterly maintenance	Container	The air vents are free from sand and dust buildup and not blocked by foreign matter.
	LTMS	<ul style="list-style-type: none"> <li>The outdoor fans have no visible leakage.</li> <li>The outdoor fans rotate smoothly without abnormal sound.</li> </ul>
	Control unit cabin	The external fans of the air conditioner rotate smoothly without abnormal sound.
Annual maintenance	Cable connection of battery packs	<ul style="list-style-type: none"> <li>No obvious paint peeling or rust exists.</li> <li>The connection terminals are not loose or disconnected.</li> <li>The screws are secured.</li> </ul>
	Fire suppression system	<ul style="list-style-type: none"> <li>The indicators of smoke detectors and heat detectors blink properly.</li> <li>The pressure gauge pointer of the fire cylinder is in the green area.</li> <li>No alarm is generated on the extinguishant control panel, and no alarm or fault information is displayed on the monitor.</li> <li>The mute, reset, and manual/automatic switch buttons on the extinguishant control panel are normal.</li> <li>The emergency startup button functions properly.</li> </ul>
	Liquid cooling system	<ul style="list-style-type: none"> <li>The coolant does not leak or have visible impurities, and the color does not change obviously.</li> <li>The compressor and circulating pump do not generate abnormal sound during operation.</li> </ul>
	Dehumidifier	The drainage is smooth, and there is no obvious water accumulation.

### Extinguishant Release or Fire

- Suggestions for onsite O&M personnel:
  1. When a fire occurs, evacuate from the building or equipment area, press the fire alarm bell, and immediately call the fire emergency service. Notify the professional firefighters and provide them with relevant product information, including but not limited to battery pack types, ESS capacity, and battery pack location and distribution.
  2. After calling the fire emergency service, remotely power off the system while ensuring your own safety.
  3. Before professional firefighters arrive, do not enter the affected building or equipment area, and do not open the doors of the ESS. Isolate and monitor the site. Keep irrelevant personnel away from the site.
  4. After professional firefighters arrive, provide relevant product information, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.
  5. After the fire is extinguished, the site must be handled by professionals in accordance with local laws and regulations. Do not open the doors of the ESS without permission.
  6. Post-disaster product maintenance: Contact the Company's service engineers for evaluation.
- Suggestions for professional firefighters:
  1. For product information, see the information provided by O&M personnel, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.
  2. Do not open the doors of the ESS before it is deemed safe by professionals.
  3. Follow local fire fighting regulations.

**This document only lists some measures for emergency handling. For details about the emergency items and procedures, see [HUAWEI LUNA2000-\(4472, 5015\) Series Smart String Grid Forming ESS Maintenance Manual](#).**

# Troubleshooting

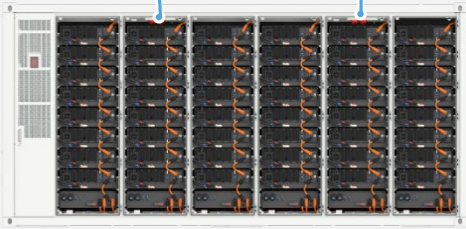
CMU Alarm Handling

BCU Alarm Handling

BMU Alarm Handling

**Note:** When checking and maintaining the equipment, comply with the safety requirements of the equipment as well as local laws and regulations.

Alarm ID	3893	Alarm Name	Fire Alarm
Possible Cause	Suggestion		
Cause ID = 1 The electrical circuit or battery is on fire.	<ol style="list-style-type: none"><li>1. Do not open the cabin doors, evacuate onsite personnel, and call the fire emergency service.</li><li>2. For details, see the "Emergency Handling" section in the maintenance manual.</li><li>3. Contact technical support.</li></ol>		

Alarm ID	3885	Alarm Name	High Concentration of Combustible Gas
Possible Cause	Suggestion		
Cause ID = 1, 2 1. The gas concentration is high. 2. The detector is faulty.	<ol style="list-style-type: none"><li>1. Monitor the system remotely for 30 minutes to check whether other exceptions (such as abnormal ambient temperature, battery voltage, and battery temperature) occur.<ul style="list-style-type: none"><li>• If yes, check whether the system is powered off. If the system is not powered off, remotely power off the system. During remote monitoring, do not approach the ESS or open the ESS cabin doors.</li><li>• If no other exception is found during remote monitoring, arrange trained personnel to go to the site and open the ESS doors to detect the gas source while ensuring safety. If there is smoke or fire, remotely power off the system, evacuate onsite personnel as soon as possible, and call the fire emergency service.</li></ul></li><li>2. If no exception is found during remote monitoring and onsite observation, open the ESS cabin doors and check and replace the combustible gas detector.</li></ol>		
			

Alarm ID	3894	Alarm Name	Exhaust Fan Faulty
Possible Cause	Suggestion		
Cause ID = 1 1. The fan power input or control feedback cable is abnormal. 2. The fan is faulty.	1. Check whether the power input cable and control cable of the exhaust fan are disconnected or whether the cable connectors are exposed. <ul style="list-style-type: none"><li>• If yes, reconnect the cable.</li><li>• If not, use a multimeter to check whether the cables are broken.</li></ul> 2. Check whether the fan is damaged or burnt. If yes, replace the fan. If the alarm persists after the fan is replaced, contact technical support.		

Alarm ID	3925	Alarm Name	Battery Rack Physical Location Failed
Possible Cause	Suggestion		
Cause ID = 1 The system fails to identify the physical location of the BCU.	<ol style="list-style-type: none"><li>1. Check whether the network connections between the BCUs are normal.</li><li>2. Check whether the network connections between the CMU and the first and last BCUs are normal.</li><li>3. Check whether the cable to the CON4 port on the rear panel of the first BCU is properly connected (whether two pins in the connector are short-circuited).</li><li>4. Check whether the cable to the power port connector of the first RCM is properly connected.</li></ol>		

Alarm ID	3610	Alarm Name	Power Phase Loss Alarm
Possible Cause	Suggestion		
Cause ID = 1 The power supply to the LTMS is abnormal.	Use a voltmeter to check whether the power supply to the LTMS is normal. If the power supply is abnormal, locate the cause and resume the power supply. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.		

Alarm ID	3633	Alarm Name	Coolant Low Pressure Alarm
Possible Cause	Suggestion		
Cause ID = 1, 2 The coolant is insufficient.	<ol style="list-style-type: none"><li>1. Check whether a leakage occurs in the LTMS or a pipe. If a leakage occurs, replace the corresponding component or pipe by referring to the maintenance manual.</li><li>2. Fill coolant into the coolant refill tank by referring to the corresponding guide in the maintenance manual.</li><li>3. If the fault persists, check for other causes.</li><li>4. If all possible causes have been ruled out, contact technical support.</li></ol>		
Cause ID = 1, 2 The data reported from the pressure sensor is abnormal.	<ol style="list-style-type: none"><li>1. Disconnect the power supply to the LTMS by referring to the maintenance manual.</li><li>2. Check whether the cable to the pressure sensor is disconnected or broken. If the cable is disconnected or broken, reconnect the sensor connector.</li><li>3. If the fault persists, replace the pressure sensor by referring to the corresponding replacement guide in the maintenance manual.</li><li>4. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li></ol>		

Alarm ID	3633	Alarm Name	Coolant Low Pressure Alarm
Possible Cause	Suggestion		
Cause ID = 1, 2 The coolant cannot be refilled properly.	<ol style="list-style-type: none"><li>1. Check whether the coolant refill tank, coolant refill pump, coolant refill solenoid valve, coolant refill ball valve, or pipes are blocked. If there is a blockage, replace the corresponding pipe or component by referring to the maintenance manual.</li><li>2. Fill coolant into the coolant refill tank by referring to the corresponding guide in the maintenance manual.</li><li>3. If the fault persists, check for other causes.</li><li>4. If all possible causes have been ruled out, contact technical support.</li></ol>		
Cause ID = 1, 2 The expansion tank has failed.	<ol style="list-style-type: none"><li>1. Check the pressure in the expansion tank and keep it within a normal range by referring to the maintenance manual.</li><li>2. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li></ol>		

Alarm ID	3706	Alarm Name	Water Pump Function Abnormal
Possible Cause	Suggestion		
Cause ID = 2 The cable to the water pump is loose or damaged.	<ol style="list-style-type: none"><li>1. Disconnect the power supply to the LTMS by referring to the maintenance manual.</li><li>2. Check whether the cable to the water pump is disconnected or broken. If the cable is disconnected or broken, reconnect the cable.</li><li>3. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li></ol>		
Cause ID = 3 Air is sealed in the water pump.	<ol style="list-style-type: none"><li>1. Manually clear the alarm on the user interface and refill coolant by referring to the coolant injection process in the maintenance manual.</li><li>2. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li></ol>		

Alarm ID	3706	Alarm Name	Water Pump Function Abnormal
Possible Cause	Suggestion		
Cause ID = 4 The coolant pipe is blocked.	<ol style="list-style-type: none"><li>1. Replace the water pump by referring to the corresponding replacement guide in the maintenance manual.</li><li>2. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li></ol>		
Cause ID = 5 The coolant pipe is blocked.	<ol style="list-style-type: none"><li>1. Check whether a ball valve of the LTMS and pipes is not opened.</li><li>2. If yes, manually open the ball valve.</li><li>3. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li></ol>		

Alarm ID	3706	Alarm Name	Water Pump Function Abnormal
Possible Cause	Suggestion		
<p>Cause ID = 6 The data reported from the water pump outlet pressure sensor, battery supply water pressure sensor, or battery return water pressure sensor is abnormal.</p>	<ol style="list-style-type: none"> <li>1. Disconnect the power supply to the LTMS by referring to the maintenance manual.</li> <li>2. Check whether the pressure sensor cable is disconnected or broken.</li> <li>3. If the cable is disconnected or broken, reconnect the pressure sensor connector.</li> <li>4. If the fault persists, replace the pressure sensor by referring to the corresponding replacement guide in the maintenance manual.</li> <li>5. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li> </ol>		
<p>Cause ID = 7 The coolant is insufficient or overfilled.</p>	<ol style="list-style-type: none"> <li>1. Check whether the coolant pressure is within the normal range on the user interface.</li> <li>2. Fill coolant in the coolant tank until it is higher than the MIN line. For details, see the coolant refilling guide in the maintenance manual. Enter the diagnosis mode and manually start the coolant refill pump to refill coolant.</li> <li>3. If the coolant pressure is too high, withdraw an appropriate amount of coolant by referring to the maintenance manual.</li> <li>4. If the fault persists, check for other causes. If all possible causes have been ruled out, contact technical support.</li> </ol>		

Alarm ID	3364	Alarm Name	Cable Connection Abnormal
Possible Cause	Suggestion		
Cause ID = 1 The communications cable or power cable between the RCM and the PCS is incorrectly connected.	<ol style="list-style-type: none"><li>1. Check whether the communications cable and power cable between the RCM and the PCS are correctly connected.</li><li>2. Power off the ESS, rectify the connection of the communications cable and power cable between the RCM and the PCS, power on the ESS again, and check the cable connection on the user interface.</li></ol>		
Cause ID = 2 After the ESS is delivered or restored to factory settings, the BCU does not check the cable connection, or no PCS is detected during the cable connection check.	<ol style="list-style-type: none"><li>1. If the ESS is powered on for the first time, perform deployment operations on the SmartLogger WebUI to check the cable connection.</li><li>2. If the cable connection has been checked, check whether the wiring terminal between the PCS and the BCU is loose, disconnected, or incorrectly connected. If yes, reconnect the cable and check the cable connection again on the SmartLogger WebUI.</li><li>3. If the alarm persists, contact technical support.</li></ol>		

Alarm ID	3364	Alarm Name	Cable Connection Abnormal
Possible Cause	Suggestion		
Cause ID = 3 The power cable of a battery rack is incorrectly connected to another rack.	<ol style="list-style-type: none"><li>1. Check whether the power cable of a battery rack is incorrectly connected to another rack.</li><li>2. Check whether the positive and negative terminals of the PCS power cable in the rack are reversely connected.</li><li>3. Shut down the ESS and power off the system. Ensure that the BCU is powered off. Rectify the power cable connection between the rack and the PCS, start the ESS again, and check the cable connection on the user interface.</li></ol>		
Cause ID = 4 The rapid shutdown cable between the PCS and the ESS is not properly connected.	<ol style="list-style-type: none"><li>1. Shut down the ESS on the user interface.</li><li>2. After 5 minutes, start the ESS on the user interface.</li><li>3. If the alarm persists, contact technical support.</li></ol>		

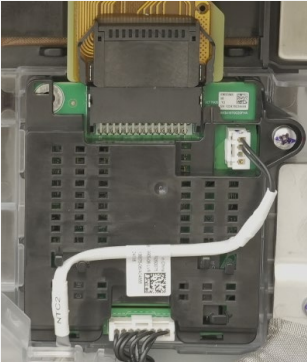
Alarm ID	3364	Alarm Name	Cable Connection Abnormal
Possible Cause	Suggestion		
<p>Cause ID = 5 The ESN of the connected PCS does not match the rack cable connection information stored in the BCU. Possibly the PCS or RCM has been replaced.</p>	<ol style="list-style-type: none"><li>1. If the PCS or RCM is not replaced, check the cable connection on the SmartLogger WebUI.</li><li>2. If the PCS has been replaced, perform device replacement operations on the SmartLogger WebUI.</li><li>3. If the RCM has been replaced, restore the BCU data on the FusionSolar app.</li><li>4. If the alarm persists, contact technical support.</li></ol>		

Alarm ID	3366	Alarm Name	Battery Rack PCS Communication Failure
Possible Cause	Suggestion		
Cause ID = 1 Some PCS communications cables are disconnected.	Check whether the cable between the PCS and the BCU is loose, disconnected, or incorrectly connected. If yes, reconnect the cable. If not, contact technical support.		
Cause ID = 2 All PCS communications cables are disconnected.	<ol style="list-style-type: none"><li>1. Check whether the cable between the PCS and the BCU is loose, disconnected, or incorrectly connected. If yes, reconnect the cable. If not, export logs and contact technical support.</li><li>2. If the "Cable Connection Abnormal" alarm exists, handle the alarm first.</li></ol>		

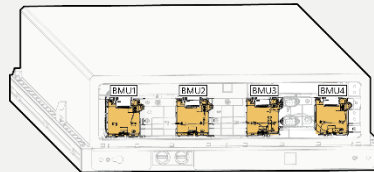
Alarm ID	3105	Alarm Name	Battery Pack Overtemperature
Possible Cause	Suggestion		
Cause ID = 1, 2 The Liquid Thermal Management System (LTMS) is faulty.	<ol style="list-style-type: none"><li>1. Check that the ESS is not charged and does not discharge. Wait for 30 minutes and check whether the alarm is cleared.</li><li>2. If the alarm persists, check whether an alarm related to an LTMS fault is reported.</li><li>3. After checking that the LTMS is normal, shut down the ESS on the user interface.</li><li>4. Check whether the battery cell NTC is faulty.</li></ol>		
Cause ID = 1, 2 The battery cell NTC is faulty, causing overtemperature.	<ol style="list-style-type: none"><li>1. Wear protective clothing and take protective measures. Open the front panel of the battery pack, remove the NTC terminal, and check whether the NTC impedance is normal.</li><li>2. After checking that the NTC impedance is normal, start the ESS on the user interface.</li><li>3. If the alarm persists, contact technical support.</li></ol>		

Alarm ID	3102	Alarm Name	Battery Pack Overvoltage
Possible Cause	Suggestion		
Cause ID = 1, 2, 3, 4, 5 The voltage of the battery pack or its cells is too high.	<ol style="list-style-type: none"> <li>1. Check that the ESS is not charged. Wait for 5 minutes and check whether the alarm is cleared.</li> <li>2. If the alarm persists, contact technical support.</li> </ol>		
Alarm ID	3103	Alarm Name	Battery Pack Undervoltage
Possible Cause	Suggestion		
Cause ID = 1, 2, 3, 4, 5 <ol style="list-style-type: none"> <li>1. The voltage of the battery pack or its cells is too low.</li> <li>2. The battery pack has been stored for extended periods of time when off-grid.</li> <li>3. The battery pack has been idle for a long time after grid connection.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check that the ESS does not discharge and check whether an alarm indicating abnormal battery sampling is generated. If yes, handle the alarm by referring to the alarm handling suggestions.</li> <li>2. If no alarm indicating abnormal battery sampling is generated, wait for 5 minutes and check whether the alarm is cleared.</li> <li>3. If the alarm persists, connect to the power grid and charge the ESS within 48 hours.</li> <li>4. If the alarm persists after the ESS is charged for 1 hour, export logs and contact technical support.</li> </ol>		

Alarm ID	3116	Alarm Name	PACK Thermal Runaway
Possible Cause	Suggestion		
<p>Cause ID = 1 The battery pack has thermal runaway risks.</p>	<ol style="list-style-type: none"><li>1. Observe the system remotely for 30 minutes to check whether other exceptions (such as abnormal battery voltage, battery temperature, and combustible gas concentration) occur. During the remote observation, do not approach the ESS or open the ESS cabin doors.</li><li>2. If no exception is found during the 30-minute remote observation, send trained personnel to the site and observe the system for 30 minutes from a safe distance. If there is smoke or fire, evacuate onsite personnel as soon as possible, call the fire emergency service, and provide firefighters with related product information, including the battery pack type, ESS capacity, and battery pack location.</li><li>3. Do not enter the affected building or equipment area under any circumstances, and do not open the ESS cabin doors. Isolate and monitor the site. Keep irrelevant personnel away from the site.</li><li>4. After calling the fire emergency service, remotely power off the peripheral devices (such as the Smart Transformer Station, Smart PCS, auxiliary power supply devices, and combiner box power supply) while ensuring your own safety.</li><li>5. After the fire is extinguished, the site must be handled by professionals in accordance with local laws and regulations. Do not open the ESS cabin doors without permission.</li></ol>		

Alarm ID	3229	Alarm Name	BMU Communication Failure
Possible Cause	Suggestion		
<p>Cause ID = 1</p> <ol style="list-style-type: none"><li>1. The communications cable is not properly connected.</li><li>2. The communication failed because the BMU is faulty.</li></ol>	<ol style="list-style-type: none"><li>1. Check whether the communications cable is loose, disconnected, or incorrectly connected. If yes, rectify the cable connection fault.</li><li>2. Check whether the BMU is powered on. If not, rectify the power supply fault.</li><li>3. If the alarm persists, replace the BMU.</li></ol> <div style="text-align: center;"></div>		

Alarm ID	3373	Alarm Name	Battery Pack Sampling Abnormal
Possible Cause	Suggestion		
Cause ID = 1, 2, 3, 4 A major fault has occurred on the internal circuit of the BMU.	1. Replace the BMU and clear the alarm on the alarm management interface. 2. If the alarm persists, contact technical support.		
Cause ID = 5 An NTC open-circuit or short-circuit fault has occurred inside the BMU.			



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