



**Residential Energy Storage Unit  
6.4 EX Battery Pack  
For Photovoltaic Systems**

Installation Manual  
April 2015 | Edition 1

This manual describes how to safely install the RESU® 6.4 EX battery pack from LG Chem.

Read this manual thoroughly before you attempt to install the product, and follow the instructions carefully throughout the installation process.

If you are uncertain about any of the requirements, recommendations, or safety procedures described in this manual, contact LG Chem immediately for advice and clarification.

#### **NOTE**

The information included in this document is accurate at the time of publication. However, this product is subject to change without prior notice. In addition, the illustrations in this document are meant only to help explain system configuration concepts and installation instructions. The illustrated items may differ from the actual items at the installation location.

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# 1 Introduction

## 1.1 Features

The RESU® 6.4 EX battery pack has the following features:

**Photovoltaic system:** This battery pack is designed for household photovoltaic systems.

**Battery management system (BMS):** The battery pack's built-in BMS monitors its operation and prevents the battery from operating outside design limitations. See [Troubleshooting](#) on page 22.

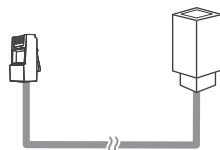
**Expandability:** This battery pack can be easily expanded by adding expansion battery packs. See [Expanding the Battery Pack](#) on page 17.

## 1.2 Package Items

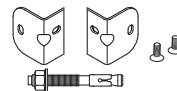
Items other than those listed below, such as a power cable, may be provided separately.



Battery pack



Communication cable  
adapter



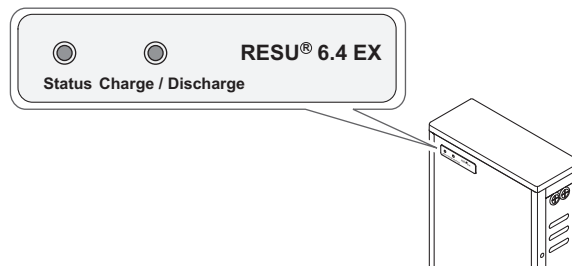
Mounting brackets

For details on how these items are used, see [Installation](#) on page 12.






**NOTE**

A tag is attached to the gender changer side of the provided cable adapter. The tag is labeled as TYPE-S or TYPE-N. TYPE-S adapters are supposed to be used with SMA inverters, and TYPE-N ones are supposed to be used with Nedap inverters. If the wrong cable adapter is identified, contact LG Chem or an authorized dealer.

### 1.3 LED Indicators



The LED indicators on the front of the battery pack show its operational state as follows:

- Standby** : When the battery pack is ready for operation, the Status indicator is lit in red.
- Normal operation** : When the battery pack is in normal operation, the Status indicator is lit in green.
- Charge in progress** : While the battery pack is charging, the Charge / Discharge indicator is lit in red.
- Discharge in progress** : While the battery pack is discharging, the Charge / Discharge indicator is lit in green.
- Alarm** : When the battery pack is in a warning or fault state, the Status indicator alternately flashes in green and orange. See [Troubleshooting](#) on page 22.

## 1.4 Specifications

### Dimensions and weight

Length	406 mm
Width	165 mm
Height	664 mm
Weight	60 kg



### Performance

Nominal voltage	51.8 V
Operating voltage	45.2 V to 58.1 V
Nominal capacity	126 A·h
Nominal energy	6.4 kW·h
Nominal charge current	42 A <sup>a</sup>
Nominal discharge current	42 A <sup>b</sup>
Maximum discharge current	110 A

<sup>a</sup>in constant-current/constant-voltage charging mode

<sup>b</sup>in constant-current discharging mode

### Cable requirements

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Power cable from inverter	4 AWG (21 mm <sup>2</sup> ) or thicker, UL 1283
Cable lug	M8

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### Environmental requirements

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Available operating temperature	0°C to 40°C
Optimal operating temperature	15°C to 30°C
Operating relative humidity	25% to 95%
Storage temperature	-30°C to 50°C
Storage relative humidity	25% to 95%

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### Communication interface

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Protocol	CAN 2.0B
Channel	1

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# 2 Safety

## 2.1 General Precautions for the Battery Pack

 **WARNING**

Failure to observe the precautions described in this section can cause serious injury to persons or damage to property.

Observe the following precautions:

- Risks of explosion
  - Do not subject the battery pack to strong impacts.
  - Do not crush or puncture the battery pack.
  - Do not dispose of the battery pack in a fire.
- Risks of fire
  - Do not expose the battery pack to temperatures in excess of 50°C.
  - Do not place the battery pack near a heat source such as a fireplace.
  - Do not expose the battery pack to direct sunlight.
  - Do not allow the battery connectors to touch conductive objects such as wires.
- Risks of electric shock
  - Do not disassemble the battery pack.
  - Do not touch the battery pack with wet hands.
  - Do not expose the battery pack to moisture or liquids.
  - Keep the battery pack away from children and animals.
- Risks of damage to the battery pack
  - Do not allow the battery pack to come in contact with liquids.
  - Do not subject the battery pack to high pressures.
  - Do not place any objects on top of the battery pack.

## 2.2 Tools

The following tools are required to install the battery pack:



Torque screwdriver



Phillips-screwdriver bit



Hex-key bit



Phillips-head screwdriver



Wire cutter

Use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces of the available tools, except their tips, with electrical tape.

It is highly recommended to use adjustable tools and measuring instruments that are certified for precision and accuracy.

## 2.3 Safety Gear

It is recommended to wear the following safety gear when dealing with the battery pack.



Insulated gloves



Safety goggles



Safety shoes



# 3 Installation

## 3.1 Installation Location

Make sure that the installation location meets the following conditions:

- The area is completely waterproof.
- The floor is flat and level.
- There are no flammable or explosive materials.
- The ambient temperature is within the range from 15°C to 30°C.
- The temperature and humidity is maintained at a constant level.
- There is minimal dust and dirt in the area.

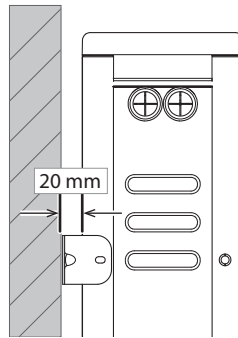
### CAUTION

If the ambient temperature is outside the operating range, the battery pack stops operating to protect itself. The optimal temperature range for the battery pack to operate is 15°C to 30°C. Frequent exposure to harsh temperatures may deteriorate the performance and life of the battery pack.

## 3.2 Installing the Battery Pack

### Mounting the battery pack to a wall

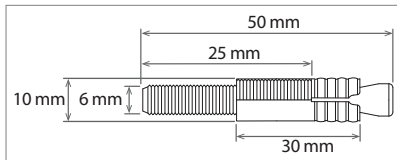
It is recommended to mount the battery pack to a wall. Make sure to leave a space of at least 20 mm between the battery pack and the wall.



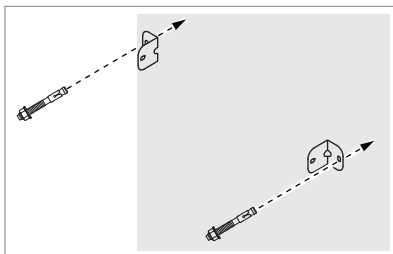
#### NOTE

Make sure that the battery pack stands on the floor when mounting it to a wall.

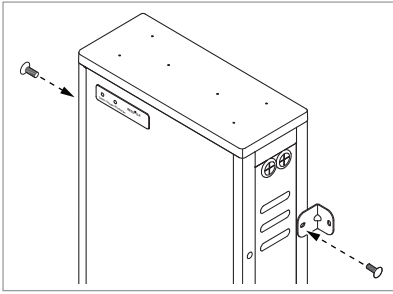
To mount the battery pack to a wall, take the following steps:



1. Drill holes to suit M6 ( $\frac{1}{4}$  in) anchor bolts in the wall. The drilling depth should be at least 33 mm.



2. Drive the anchor bolts through the mounting brackets into the holes.
3. Tighten the nuts to a torque of 6 N·m.



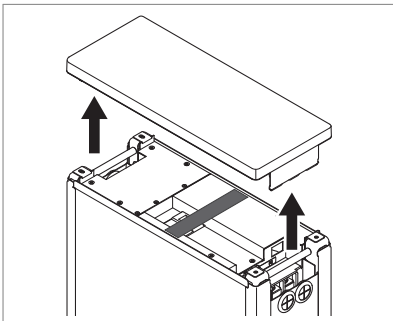
4. There are holes for mounting brackets on both edges of the back. Cut the removable pieces out of the holes using a wire cutter.
5. Secure the mounting brackets to the holes using the M5 screws. Tighten the screws to a torque of 4 N·m.

### Connecting the battery pack to the inverter

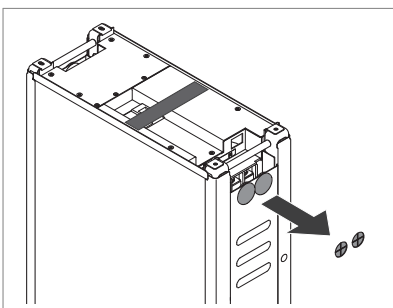
#### **WARNING**

Make sure that the inverter is turned off before connecting the battery pack to the inverter.

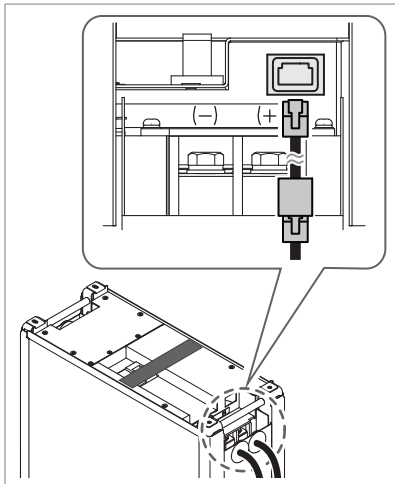
To connect the cables coming from the inverter to the battery pack, take the following steps:



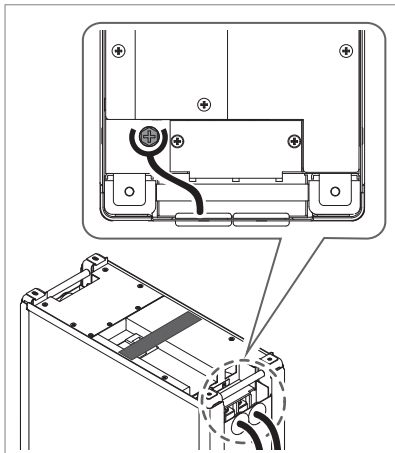
1. Remove the top cover. Hold both sides of the top cover and pull it upwards.



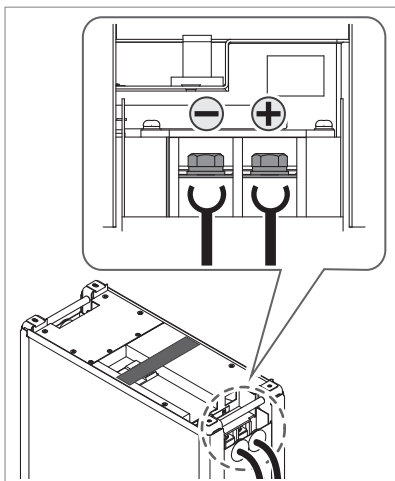
2. Cut the removable pieces out of the grommets on the upper part of the left side.



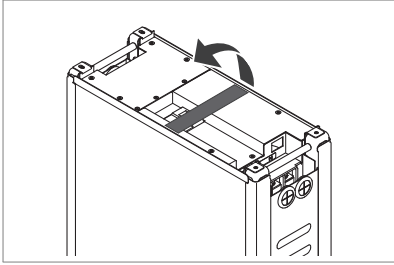
3. Connect the provided cable adapter to the communication port, and then connect the communication cable coming from the inverter to the cable adapter through the grommet.



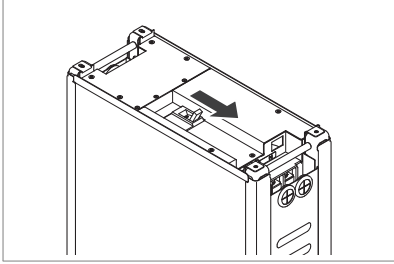
4. If the inverter has a ground wire, connect it to the ground screw through the grommet. The screw type is M6.



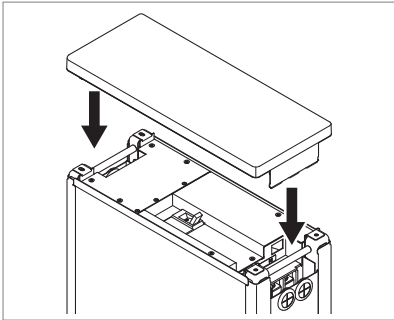
5. Connect the power cables to the terminal block through the grommet.
  - a) Remove the terminal cover plate, which is placed over the terminal block to protect it.
  - b) Connect the negative cable to the left terminal and the positive cable to the right terminal. Tighten the hex-socket screws to a torque of 6 N·m.
  - c) Restore the terminal cover plate.



6. Remove the protective tape that covers the circuit breaker switch.



7. Perform the pre-operation checks. See **Checking Before Operation** on page 20 and **Getting Started** on page 21.

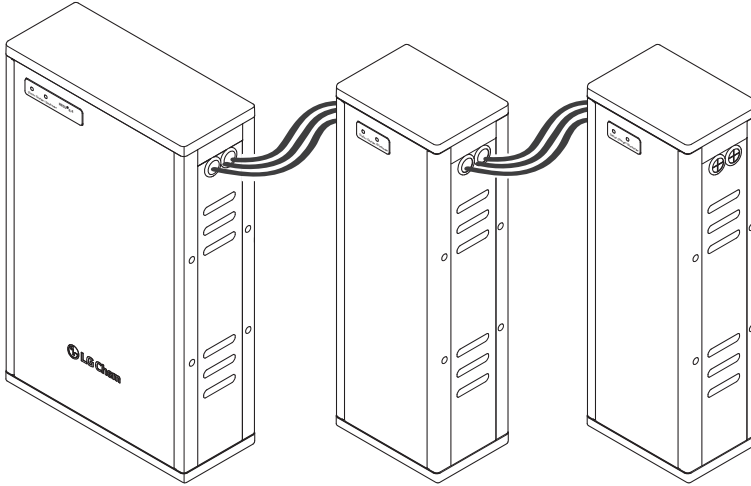


8. Restore the top cover. Press down on the top cover until it locks in place.



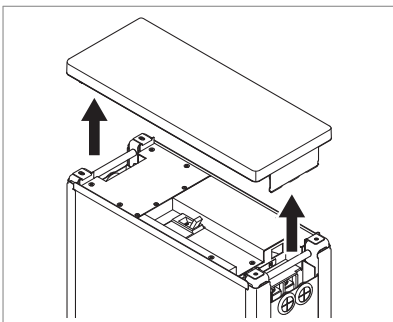
### 3.3 Expanding the Battery Pack

The battery capacity can be increased by adding expansion battery packs. At most two expansion battery packs can be added.

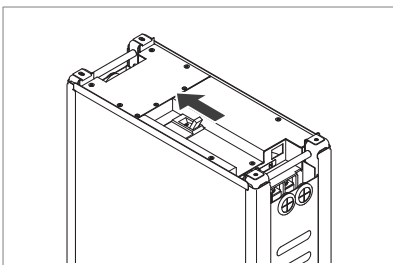


#### Connecting an expansion pack to the main pack

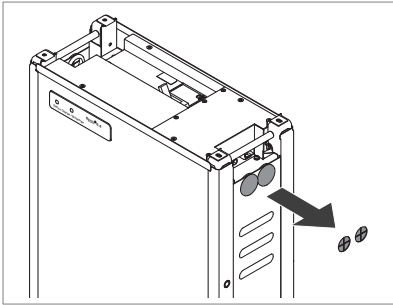
To connect an expansion battery pack to the main battery pack, take the following steps:



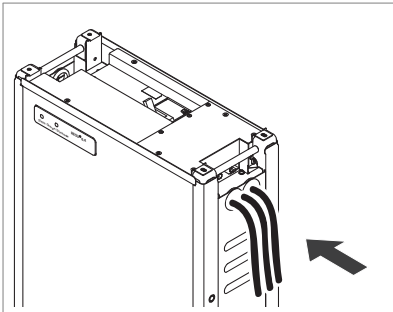
1. Remove the top cover.



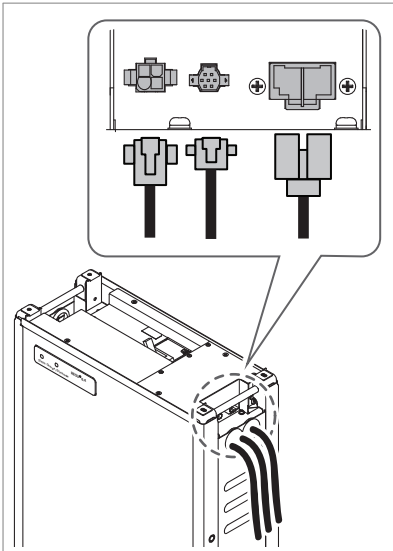
2. Switch off the circuit breaker.



3. Cut the removable pieces out of the grommets on the upper part of the right side.



4. Insert the cables to be connected to the expansion pack into the main pack through the grommets.



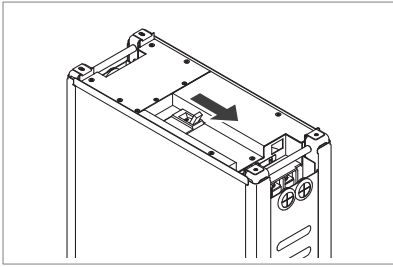
5. A terminal resistor is attached to the communication port in the middle. Remove it from the port.

6. Connect the cables to the connectors.
  - The connector on the left supplies power to the expansion pack for operation.
  - The main pack communicates with the expansion pack through the port in the middle.
  - The expansion pack charges and discharges through the connector on the right.

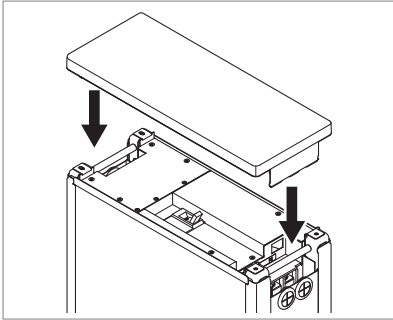
Connect the cables to the expansion pack in the same way described so far.

**NOTE**

Attach the terminal resistor detached from the main pack to the unused port on the right side of the expansion pack.



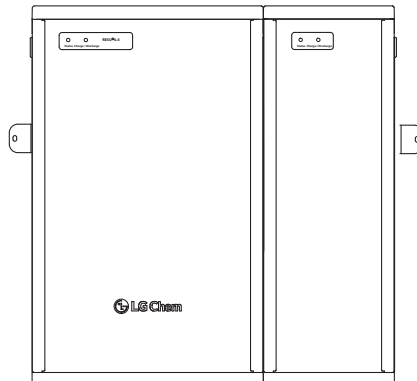
7. Switch on the circuit breaker.



8. Restore the top cover.

If another expansion pack is available, repeat the above process to connect the first expansion pack to the second expansion pack.

### Mounting an expansion pack to a wall



Adhere the expansion pack to the right side of the main pack, and then attach a mounting bracket to the right side of the expansion pack to mount it to the wall. If the expansion pack is additionally installed later, remove the bracket on the right side of the main pack. For details how to install mounting brackets, see [Mounting the battery pack to a wall](#) on page 13.

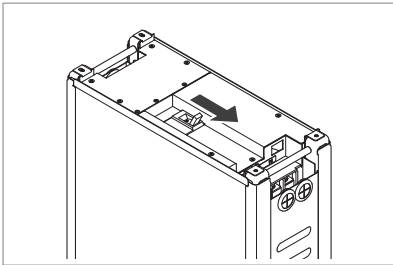
### 3.4 Checking Before Operation

There are things that need to be checked before starting the battery pack to ensure that it has no defects.

**⚠ WARNING**

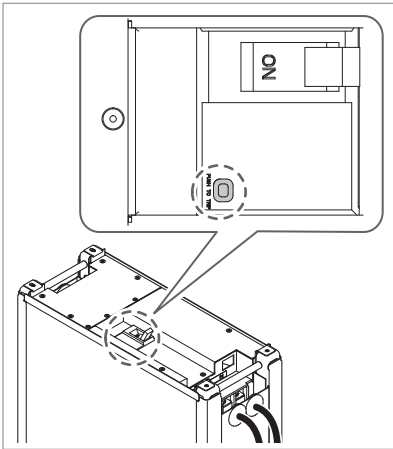
Make sure that the inverter is turned off while checking the battery pack.

#### Circuit breaker switch



Move the circuit breaker switch to the ON position. If the switch is on the Trip position between the ON and OFF positions, move it to the OFF position and then to the ON position. If the switch moves by itself to any of the other positions, contact LG Chem or an authorized dealer.

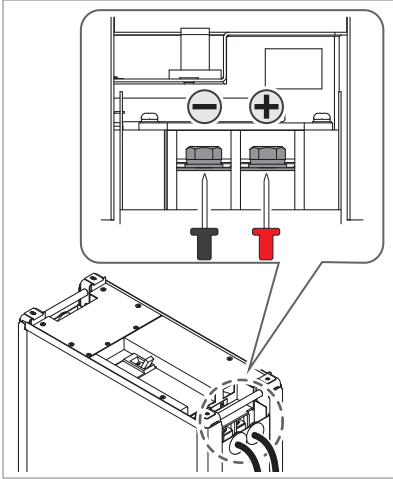
#### Circuit breaker's trip button



Make sure that the circuit breaker switch is put in the ON position, and then push the circuit breaker's trip button. If the circuit breaker switch has not moved to the Trip position, contact LG Chem or an authorized dealer.

## Voltage

Measure the voltage at the terminal block using a voltmeter.



1. Make sure that the circuit breaker switch is put in the Trip position, and then measure the voltage. If the voltage is higher than 0 V, contact LG Chem or an authorized dealer.
2. Move the circuit breaker switch to the ON position, and then measure the voltage. If the voltage is lower than 36 V, contact LG Chem or an authorized dealer.

## 3.5 Getting Started

Put the battery pack in operation by taking the following steps:

1. Make sure that the circuit breaker switch is in the Off or Trip position.
2. Move the circuit breaker switch to the ON position.
3. The Status indicator on the front turns on in red and then changes to green in 7 seconds.
  - If the Status indicator is lit in green, turn on the inverter to let the battery pack charge or discharge.
  - If the Status indicator stays red, contact LG Chem or an authorized dealer.

# 4 Troubleshooting

Check the indicators on the front of the battery pack to determine in what state the battery pack is.

Status	Charge/Discharge	
Red → Green <sup>a</sup>	Off	Successfully initialized
Red → Red	Off	Initialization failed <sup>b</sup>
Green	Green	Discharging in normal state
Green	Red	Charging in normal state
Green	Off	Waiting in normal state
Green/Orange	Green	Discharging in warning state
Green/Orange	Red	Charging in warning state
Green/Orange	Off	Waiting in warning state
Off	Off	Circuit breaker tripped <sup>b</sup>

<sup>a</sup>This should change in 7 seconds.

<sup>b</sup>Contact your distributor in this case.

A warning state is triggered when a condition, such as voltage or temperature, is beyond its design limitations.

The battery pack's BMS periodically reports its operational state to the inverter. There are two abnormal states:

**Warning:** When the battery pack is likely to become faulty, it goes into warning state. When a warning is reported, the inverter shows the warning message on its display but takes no action about it.

**Fault:** When the battery pack falls outside prescribed limits, it goes into fault state. When a fault is reported, the inverter immediately stops its operation and shows the fault message on the display.

The possible warning or fault messages are as follows:

- Battery Over Voltage
- Battery Under Voltage
- Battery Over Temperature
- Battery Under Temperature
- Battery Discharge Over Current
- Battery Charge Over Current

- BMS Internal Communication
- Battery Cell Voltage Imbalance

An abnormal state is released when the battery pack recovers its normal condition.

**NOTE**

For a serious fault, if no proper corrective actions are taken by the inverter, the battery pack's circuit breaker automatically trips to protect itself. For example, if the **Status** indicator stays red for more than 5 minutes, the circuit breaker trips. Use the monitoring software on the inverter to identify what caused the fault.

# 5 Emergency Situations

The RESU 6.4 EX battery pack comprises multiple batteries that are designed to prevent hazards resulting from failures. However, LG Chem cannot guarantee their absolute safety.

## 5.1 Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If one is exposed to the leaked substance, immediately perform the actions described below.

**Inhalation:** Evacuate the contaminated area, and seek medical attention.

**Contact with eyes:** Rinse eyes with flowing water for 15 minutes, and seek medical attention.

**Contact with skin:** Wash the affected area thoroughly with soap and water, and seek medical attention.

**Ingestion:** Induce vomiting, and seek medical attention.

## 5.2 Fire

In case of fires, make sure that the following equipment is available near the battery pack.

- SCBA (self-contained breathing apparatus) and protective gear in compliance with the Directive on Personal Protective Equipment 89/686/EEC
- Novec 1230, FM-200, or dioxide extinguisher.

### NOTE

ABC extinguishers are not effective when the battery pack is on fire.

Batteries may explode when heated above 150°C. If possible, move the battery pack to a safe area before it catches fire.



### 5.3 Wet Batteries

If the battery pack is wet or submerged in water, do not let people access it, and then contact LG Chem or an authorized dealer for technical support.

### 5.4 Damaged Batteries

Damaged batteries are dangerous and must be handled with the utmost care. They are not fit for use and may pose a danger to people or property.

If the battery pack seems to be damaged, pack it in its original container, and then return it to LG Chem or an authorized dealer.

#### **NOTE**

Damaged batteries may leak electrolyte or produce flammable gas. If such a damage occurs, immediately contact LG Chem at +82-43-219-2720.

# 6 Warranty

## 6.1 Warranty Coverage

LG Chem protects this product under warranty when this product is installed and used as detailed in this manual. Violating the installation procedure or using this product in any way not described in this manual immediately voids all warranties on this product.

## 6.2 Limitation of Liability

LG Chem does not provide warranty coverage or assume any liability for direct or indirect damages or defects that result from the following causes:

- Transportation or storage
- Incorrect installation
- Operating the product in an inappropriate environment
- Incorrect or inappropriate operation
- Insufficient ventilation
- Failure to adhere to safety warnings or instructions
- Repairs or modifications performed by unauthorized personnel
- Rectifier failure or overcurrent.
- Force majeure events
- External influences, such as unusual physical or electrical stress.
- Use of a rectifier that fails to meet the requirements.

# A Technical Information

Nominal voltage	51.8 V
Operating voltage	45.2 V to 58.1 V
Nominal capacity	126 A·h
Nominal Energy	6.4 kW·h
Nominal charge current	42 A
Nominal discharge current	42 A
Maximum discharge current <sup>a</sup>	110 A
Peak power	5 kW
Faradic charge efficiency (25°C/77°F)	99%
Battery round-trip efficiency (C/3, 25°C/77°F)	95%
Expected lifetime at 25°C/77°F	More than 10 years
Cycle life (90% DOD, 25°C/77°F)	6000 cycles (EOL 60%)
Cycle life (80% DOD, 25°C/77°F)	10000 cycles (EOL 60%)
Communication interface	CAN 2.0B
Dimensions	406 mm × 165 mm × 664 mm
Weight	60 kg
Available operating temperature <sup>b</sup>	0°C to 40°C
Optimal operating temperature	15°C to 30°C
Storage temperature	-30°C to 50°C
Cooling	Natural convection
Battery pack safety	CE, (IEC 62619 in May, 2015)
Battery cell safety	IEC 62133
UN number	UN 3481
Hazardous materials classification	Class 9
UN transportation testing requirements	UN 38.3
International protection marking	IP21

<sup>a</sup>If the temperature inside the battery pack rises, the charging and discharging current may be derated to keep the battery safety and lifetime.

<sup>b</sup>As the degradation of battery products is accelerated in high temperatures, it is not recommended to place the battery pack in an area above 40°C.

Keep this manual for later use.

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LG Chem

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