



# Product Specification

VPL Motive Series  
Lithium Battery

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# Preface

## Overview

This document mainly introduces the product introduction, installation method, use instruction, precautions, fault treatment and maintenance of lithium ion battery, etc., to provide installation instruction, use instruction and technical support for on-site installation personnel, users, maintenance engineers and technical support engineer.





## Applicable Readers

This document mainly applies to the following people objects:

- Hardware installation engineer
- Technical support engineer
- Maintenance engineer
- Operator

## Symbol Stipulations

The following signs may appear in this article, and they represent the following meanings.

Symbol	Define	Explain
 <b>DANGER</b>	Dangerous	Hazards with a high risk of causing death or serious injury if not avoided.
 <b>WARNING</b>	Warning	Hazards of moderate risk that, if not avoided, may result in death or serious injury.
 <b>ATTENTION</b>	Attention	Hazards with low risk that may result in mild or moderate injury if not avoided.
 <b>NOTE</b>	Instructions	Supplementary statements to the main information in the text. "Instruction": Not a security warning message

## Revision History

The modification record accumulates a description of each document update. The latest version of the document contains updates from all previous versions of the document.

### **Document Version 01 (2022-10-25)**

The document is officially published for the first time.

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# 1 Safety Precautions

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Before conducting battery operations, you must carefully read the safety precautions and understand the correct installation and connection method of the battery.

- When handling the battery, it should be handled in the direction required by the battery, and it is strictly prohibited to turn it upside down, tilt or collide.
- Batteries should be placed horizontally and fixed.
- During the battery installation, pay attention to the positive and negative terminals. It is strictly prohibited to connect the positive and negative terminals of the battery short, otherwise it will cause a short circuit of the battery.
- Do not place installation tools on the battery during battery installation.
- During installation, maintenance and other operations, the battery circuit should be kept disconnected.
- Do not disassemble, squeeze, bend, deform, pierce, or shred the battery without the authorization of Vestwoods and its authorized dealers.
- Do not exceed the temperature range, otherwise the battery performance and safety will be affected.
- Do not modify the battery, do not immerse the battery in water or other liquids.
- Do not put a battery module into a fire.
- Please check the bolts at the connecting end of the battery regularly to make sure the bolts are tight and not loose.
- When checking the battery, you should wear goggles, rubber gloves and protective clothing to prevent the harm caused by electrolyte spillage.
- After the maintenance is completed, the used batteries should be returned to the maintenance office.

## 2 Overview

### 2.1 Product Features

VPL48100 is a new power battery product developed and produced by Vestwoods based on market demand, which can provide reliable power supply for 48V vehicle power equipment.

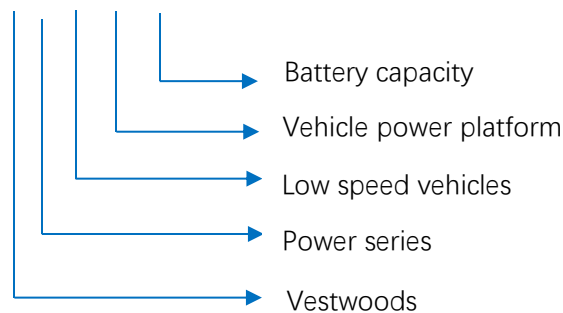
VPL48100 adopts an integrated installation structure, the product is easy to install, reliable connection, and has high-strength dust-proof and waterproof functions.

VPL48100 is equipped with an intelligent battery management system (BMS), which can effectively monitor and manage the voltage, current, temperature and other information of the battery. Professional battery management functions are provided to effectively extend the cycle life of the battery and optimize the use experience.

VPL48100 can optionally be equipped with Bluetooth /4G module, which provides users with local data viewing or positioning and remote monitoring functions, so that users can know the product information locally or remotely and master the product status.

Product model: VPL48100

Product number: V-P-L-48-100



## 2.2 Products Structure

### 2.2.1 The external appearance

The external appearance of VPL48100 is as follows :



Figure 1 The external appearance

### 2.2.2 Product dimension

The three views of VPL48100 are as follows:

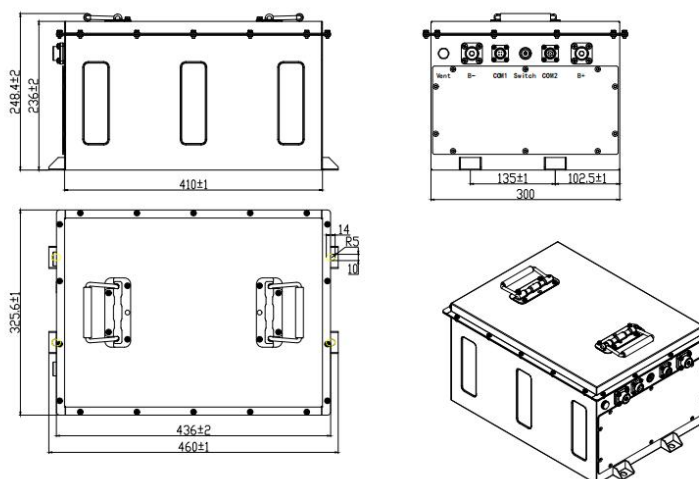


Figure 2 Three views of VPL48100 (mm)



The maximum size of the battery (including mounting holes) is as follows:

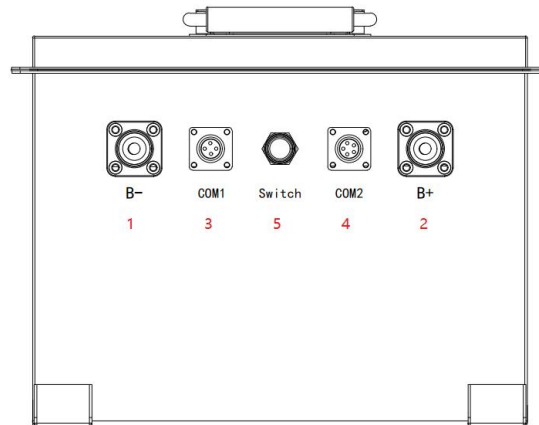
Length: 460mm

Weight: 250mm

Height: 326 m

### 2.2.3 Operation Panel

Battery operation panel display:



**Figure 3 Battery operation panel**

Functions of battery operation panel:

**Table 1 Description of functions**

No.	Name	Description	Note
1	B-	Positive terminal	200A-B, 1000V200A, black
2	B+	Negative terminal	200A-B, 1000V200A, red
3	COM1	Charger communication port	Weipu WS16-4
4	COM2	Vehicle communication port	Weipu WS16-9
5	Switch	Self-clock button	16mm self-clock button

COM1 (charger communication port):

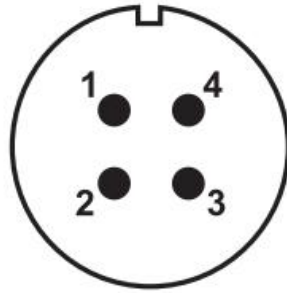


Figure 4 CMO1

Table 2 Description of CMO1 functions

No.	Name	Description	Note
1	External power awakes negative electrode	Connect 12V negative electrode of external charger.	Connect 12V negative electrode of external charger.
2	External power awakes positive electrode	Connect 12V positive electrode of external charger.	Connect 12V negative electrode of external charger.
3	CAN1-L	CAN1-L	
4	CAN1-H	CAN1-H	

COM2(Vehicle communication port):

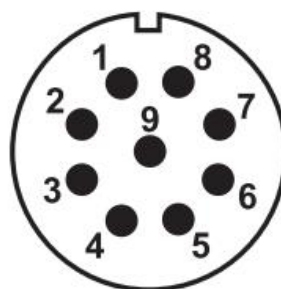


Figure 5 CMO2 (Vehicle communication port)

**Table 3 Description of CMO2 functions**

No.	Name	Note
1	connect with the key and the signal switch of negative electrode	Reserve: the port is connected with key signal externally
2	connect with the key and the signal switch of positive electrode	Reserve: the port is connected with key signal externally
3	CAN1-L	Vehicle communication port
4	CAN1-H	Vehicle communication port
5	RS485A	Bluetooth /4G module communication port
6	RS485B	Bluetooth /4G module communication port
7	DO2-	Bluetooth /4G module power supply negative communication port
8	B+	Bluetooth /4G module power supply positive communication port
9	NC	

## 2.3 Technical parameter

### 2.3.1 Battery specification parameters

**Table 4 Description of battery specification parameters**

No.	Name	Description	Note
1	Nominal capacity	100 Ah	
2	Rated voltage	51.2V	Suitable for 48V vehicle power platform
3	Nominal energy	5120Wh	
4	Charging end voltage	58.4V	External charger/controller setting voltage
5	Rated charging current	50A	
6	Discharge cut-off voltage	40V	
7	Rated discharge current	100A	
8	Peak discharge current (120 seconds)	280A	
9	Instant discharge current (5 seconds)	400A	

10	External communication mode	CAN/RS485	RS485 is used to connect externally Bluetooth /4G modules.
11	Permissible operating temperature range of battery	Charging process: 0-60°C	Optimum operating temperature: 15-35°C
		Discharging process: -20-60°C	
12	Permissible working humidity range of battery	≤95% RH	Storage humidity
		≤85% RH	Operation humidity
13	Recommended storage temperature	15 ~ 35°C	
14	IP level	IP65	
15	Weight	44.5 kg approximately	

## 3 Installation


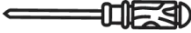
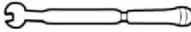






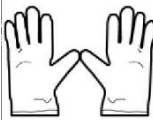
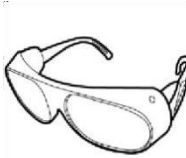

### 3.1 Tools Preparation

**⚠ ATTENTION**

Use insulated tools to avoid electric shock. If tools without insulation protection are used, it is necessary to wrap the exposed metal parts with insulating tape.

The following table describes the tools and instruments that may be used prior to the install operation

**Table 5 Installation tools**

Electric screwdriver	Cross screwdriver	Torque spanner	Claw hammer
			
Manual forklift	Multimeter	Protective gloves	Safety helmet
			
Insulated shoes	Anti-static gloves	Goggles	Insulating tape
			

## 3.2 Ooba (out of box audit)

- 1 Move the battery to the location where it was installed.

### ATTENTION

**Battery is heavy, if possible, please use tools to assist handling.**

- 2 Use a claw hammer to open the box and check if the items are complete.
- 3 Check the appearance of the battery for any breakages or scratches.

### NOTE

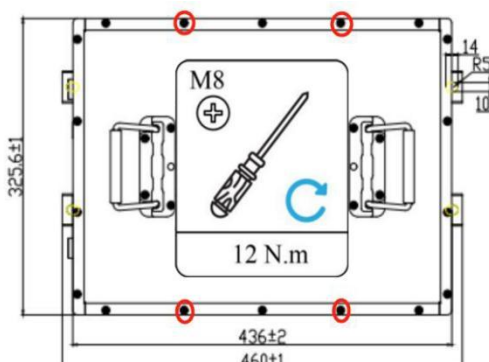
**If any damage or scratches are found in the battery, please do not proceed to the next installation. Please contact Vestwoods Technology or an authorized dealer in time.**

## 3.3 Install Battery

### ATTENTION

- Batteries should be installed by professionally trained personnel. Private installation is strictly prohibited.
- Insulated tools should be used during installation to avoid electric shock. If tools without insulation protection are used, it is necessary to wrap the exposed metal parts with insulating tape.
- The battery module is heavy and requires at least two people to carry and install it. If possible, please use tools to assist in handling.

- 1 Confirm that the battery is turned off or dormant.
- 2 Place the battery in the position corresponding to the golf cart, and the mounting hole is located at the bottom hanging ear.
- 3 Use four M8 combination screws to fix the two power lines of the battery and the battery compartment of the golf cart together. The torque of M8 screws is controlled at about 12NM, as shown in the following figure:



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 **ATTENTION**

Pay attention to the polarity of positive and negative battery, do not short/reverse connection.

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## 4 Operation Instructions

### 4.1 Normal Use

When the battery is installed and used for the first time, it may be in a dormant state and needs to be activated by pressing the self-locking button. Or use a charger to charge and activate. When the battery is activated, turn on the key switch, and the golf cart can run normally.

In daily use, the golf cart can drive normally by turning on the key switch of the cart. When the golf cart is parked, just turn off the key switch of the cart.

### 4.2 Charging

If the battery is not used for a long time and is in a low power state (10%SOC~30%SOC), it should be charged every half month. The charging requirements are as follows:

Connect a pair of positive and negative power lines of the battery to the output interface of charger, and the other pair of positive and negative power lines to the motor controller of the vehicle.

Connect the CMO1 communication port of the battery to the CMO1 communication port of the charger, and the CMO2 communication port of the battery is connected to the CMO2 communication port of the vehicle. After the connection is confirmed, connect the charger plug to the mains electricity and start charging the battery. The specific charging procedure is as follows:

**Table 6 Battery Charging Procedure**

Storage temperature	Charging interval	Charging procedure
15°C -35°C	Every half month (10%-30%SOC)	Charge to 100% SOC with the matching charger, and disconnect the charger when the indicator light of the charger changes from flashing to green.

Meanwhile, charging the battery shall comply with the following requirements:

- Only use the battery with the standard 48V charger. The unqualified charger may damage the battery, and in severe cases, it may lead to fire or even explosion.
- It is recommended to use a standard 48V lithium battery charger to charge the battery. Meanwhile, the battery is also compatible with some lead-acid chargers. Please contact Vestwoods to confirm whether the lead-acid chargers can be used.
- Please try to charge in a ventilated condition.
- Before charging, clean up the accumulated water and sundries on the cover plate of the golf cart to keep the cover plate clean.



- Please check whether the cable connection between the battery and the golf workshop is firm before charging.
- Please check whether the cable connection between the battery and the golf workshop is firm before charging.
- When the indicator light of the charger changes from flashing to a normally green light, it indicates that the battery is fully charged, and the charger can be disconnected at this time. If the battery is equipped with a 4G module, or the golf cart is equipped with an instrument panel, the charger can be disconnected if the SOC of the APP or instrument panel shows 100%SOC.

### 4.3 Dormant state

BMS can be divided into two situations: under-voltage sleep and low power consumption:

- Under-voltage sleep, when the lowest voltage of the cell is  $\leq 3.1V$ , after standing for more than 1h, BMS enters undervoltage sleep.
- Low power consumption state, when the lowest cell voltage  $> 3.1V$ , charging and discharging are not carried out for 3h, BMS enters low power consumption state.

The battery is in a dormant state. When it needs to be used, it needs to be activated by pressing the self-locking button, or the 12V voltage terminal provided by the charger can make the system quickly enter the activated state. After the battery is activated, turn on the key switch and the golf cart can run normally.

### 4.4 Bluetooth function (optional function)

The system is externally connected with Bluetooth module, which can check the battery status through app or golf cart dashboard. The power supply of Bluetooth module is controlled by BMS of the battery.

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## 5 Maintenance and Storage

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### 5.1 Battery Maintenance

#### 5.1.1 Battery Maintenance Precautions

- Insulating tools or wrapping tools are required for battery maintenance.
- Do not place any debris on the top of the battery.
- Do not use any organic solvent to clean the battery.
- Do not smoke or use an open flame near the battery pack.
- After the battery is discharged, the battery should be charged in time to avoid affecting the service life of the battery.
- All maintenance work must be carried out by professionals.

#### 5.1.2 Routine Maintenance

When the battery is in use, the following operations should be carried out every month to maintain the battery:

- Check the appearance of the battery and make sure the appearance is clean and free of stains. No bruising, breaking or cracking around; No liquid leakage phenomenon; Shell without deformation, bulging phenomenon. If the appearance of the battery is abnormal, contact Vestwoods Technology and authorized dealers in time.
- Check whether the battery bolt is tight. If the battery bolt is loose, tighten it with an insulating tool.
- Check whether the battery cable is in good condition and no aging cracking phenomenon. If there is any abnormality, timely contact Vestwoods technology and authorized dealers.

## 5.2 Battery Storage

When the battery is not used for a long time, the battery should be stored in a clean and dry ventilated room, the storage temperature is 10°C ~ 35°C, and should be fire prevention and heat prevention, avoid contact with corrosive elements.

If the battery is not used for a long time, it should be charged every once in a while. Charging requirements are as follows:

**Table 7 Requirements of storage charging**

Storage temperature	Charging interval	Charging program
10°C~30°C	Every 1 month	1. Charge at 0.2C to 14.4V.
0°C~10°C or 30°C~45°C	Every half month	2. Discharge at 0.2C to 10.8V. 3. Charge at 0.2C for 2~3 hours.

## 6 Fault Handling

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### 6.1 Emergency

#### 6.1.1 Battery Leakage

If the battery leaks, avoid contact with the leaking liquid or gas. If an individual is exposed to a leak and has any of the following conditions, please seek medical advice immediately:

- Inhaled gas: Please evacuate the leaking environment and seek medical advice at the first time.
- Eye contact: flush eyes with running water for 15 minutes and seek medical attention immediately.
- Skin contact: Wash contact area thoroughly with soapy water and seek medical advice immediately.
- Ingestion of liquid: induce vomiting and seek medical advice immediately.

When the battery leaks, it is strictly prohibited to continue to use, please contact Vestwoods technology or authorized dealers in time.

#### 6.1.2 Battery Fire

If a battery fire occurs, get away from the battery as soon as possible and evacuate people. Use water to extinguish the fire if surrounding conditions are available. And after the fire is extinguished, continue to use a lot of water to water the battery.

After the battery fire, it is strictly prohibited to continue to use, please contact Vestwoods Technology or authorized dealers in time.

#### 6.1.3 Battery Flooding

If the battery becomes wet or flooded, turn off the car key switch and power off the vehicle. When the battery is wet or immersed in water, it is prone to leakage. Do not contact the battery directly.

If the battery is wet or flooded, it is strictly prohibited to continue to use it. Please contact Vestwoods or authorized distributors in time.

#### 6.1.4 Damage Battery

If the battery has been damaged, it is strictly prohibited to continue to use, please contact Vestwoods Technology or authorized dealers in time.

## 6.2 Troubleshooting

### 6.2.1 Unable to Wake up from Standby

If the battery is not used for a long time, it will enter the dormant mode. If the battery is on standby for a long time, and can't be waked up by pressing self-locking button, please refer to the following operations to eliminate the abnormality:

- Recharge the battery. If the battery can charge normally, it means that the wake-up circuit inside the battery is abnormal. Please contact Vestwoods or authorized dealers for processing.
- Recharge the battery. If the battery cannot be charged normally, please contact Vestwoods or authorized dealers for processing in time.

### 6.2.2 Unable to discharge

**Table8 Troubleshooting of battery failure to discharge**

Malfunction	Problems	Solution
Turn on the key switch and the golf cart can't drive.	The connection between the discharge port of the battery and the motor controller of the golf cart is poor.	Check whether the connector of the discharge port is loose or the pin of the high-voltage terminal is withdrawn.
	The battery is in a dormant state.	Restart the self-locking switch or activate the charging.
	If the battery has not been used for a long time, the unit or total voltage will be under-voltage.	Press the self-locking button and connect the charger to charge the battery.
	The battery fuse is burnt out due to excessive discharge current.	The fuse shall be replaced and used strictly within the current limit required by the instruction manual.
	Low temperature of BMS protection board leads to system protection	The golf cart is placed in the environment above -20°C and used after the battery temperature rises.
	High temperature of BMS protection board leads to system protection	Put the golf cart in a ventilated or low temperature environment, and use it after the battery temperature drops.

If you can't solve the problem by referring to the above operation, please contact Vestwoods Technology or authorized dealer for treatment.

### 6.2.3 Unable to charge.

It is recommended to use a standard 48 V lithium battery charger to charge the battery. Meanwhile, the battery is also compatible with some lead-acid chargers. Please contact Vestwoods Technology to confirm whether the lead-acid chargers can be used.

**Table 8 Troubleshooting of Battery Failure to Charge**

Malfunction	Problems	Solution
Error reported by charger	The connection between the discharge port of the battery and the motor controller of the golf cart is poor.	Check whether the charger is a 48 V charger, if not, please replace it with a special charger for 48V lithium battery.
	Abnormal communication line connection	Check the connection between the charger and the battery charging port.
The charger indicator can't flash, and it doesn't charge.	Communication failure	Contact Vestwoods Technology to confirm whether the software program needs to be upgraded.
	Confirm whether the current temperature is lower than 0°C or higher than 60°C.	Place the golf cart above 0°C or in a ventilated or low temperature environment, and then charge it after the temperature is in a suitable range.

If you can't solve the problem by referring to the above operation, please contact Vestwoods Technology or authorized dealer for treatment.

## 7 Warranty Explain

Hangzhou Vestwoods Technology Co., Ltd. (hereinafter referred to as Vestwoods) promises that the products supplied are new and unused qualified products. Vestwoods guarantees the VPL48100 battery will be free from defects in workmanship and materials within the following specified period after delivery from Vestwoods, or within the whole period from the date of shipment; The product quality standards shall be implemented according to the requirements of relevant national technical standards and relevant laws, regulations and rules. For the following situations, We promise to provide reasonable warranty and maintenance to Vestwoods and its authorized dealers. This limited warranty only covers the original purchaser of the product, May not be transferred to any other individual or entity.

### 7.1. Warranty period

Vestwoods promises to provide quality assurance service for this product for 3 years or 3,000 cycles when the battery capacity declines by no more than 20% when the warranty conditions are met, Whichever comes first.

### 7.2. Warranty conditions

#### 7.2.1 Warranty conditions

- 1 The battery is under warranty.
- 2 The charging and discharging requirements of the battery must comply with the requirements of the Operation Manual of Vestwoods. For example, the maximum continuous charging current  $\leq 0.2C$ , the maximum continuous discharge current  $\leq 1.25c$ .
- 3 The ambient temperature in the process of battery charging and discharging must comply with the requirements of the Operation Manual.
- 4 Operation, storage and maintenance of batteries must comply with the requirements of the Operation Manual.
- 5 The application of the battery must follow the expected application size, design and capacity in the Operation Manual.

### 7.3. Claim

The warranty should provide the following information (including but not limited to) to determine whether the battery is covered by the warranty:

- 1 Battery nameplate and code.
- 2 Motor controller, description of motor model and specification.
- 3 Description of charger model and specification.

- 4 Site ambient temperature, if necessary, the manufacturer will also refer to the actual environment and site power supply.
- 5 Photo or video evidence when the fault occurs. If it is matched with Bluetooth APP, you can provide screenshots of the APP when the fault occurs.
- 6 When necessary, the battery must be returned according to the local transportation and packaging regulations.
- 7 For the returned products, the batteries must be packed with sufficient padding and appropriate cartons to eliminate the risk of damage during transportation.

## 7.4. Disclaimer

- 1 Since the date of purchase, beyond the warranty period, not covered by the warranty.
- 2 Battery failure caused by unauthorized disassembly and maintenance without authorization of Vestwoods Technology and authorized dealers is not covered by warranty.
- 3 The battery exceeds the warranty period promised in 7.1 and is not covered by the warranty.
- 4 Battery charging and discharging, storage, and maintenance fail to comply with the requirements of the Operation Manual of Vestwoods, and are not covered by the warranty.
- 5 The battery damage caused by overload and continuous work outside the electrical parameters of the battery is not covered by the warranty.
- 6 The battery installation fails to follow the installation instructions in the User Manual and is not covered by the warranty. Such as loose connecting terminals, too small cable size, battery reverse polarity connection, etc.
- 7 Battery damage caused by natural force, force majeure and uncontrollable factors, such as earthquake, typhoon, tornado, volcanic eruption, flood, lightning, heavy snow, war, etc. are not covered by the warranty.
- 8 If the serial number of the product is changed, blurred or torn, it is not covered by the warranty.
- 9 The application of battery failed to follow the expected application size, design and capacity in the Operation Manual of Vestwoods. If it is used or started under the bonnet, it is not covered by the warranty.
- 10 Battery damage caused by system or component failure of golf cart, including but not limited to: charger, instrument panel, motor or other product components not provided by Vestwoods, is not covered by warranty.
- 11 The only responsibility of Vestwoods is to replace the products according to the terms of the warranty within the warranty period. Under no circumstances will Vestwoods be responsible for any other kind of losses, whether they are direct, accidental or consequential, such as loss of profits, other special losses, relocation, transportation or installation costs, etc.

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 **NOTE**

**The final interpretation right belongs to the manufacturer.**

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