

40A DC-DC

ON-BOARD BATTERY CHARGER

model: RBC40D1S

Version 1.0



IMPORTANT SAFETY INSTRUCTIONS!

This manual provides detailed instructions; however, it may not encompass all potential conditions and situations. Users are therefore urged to exercise common sense and caution.

General Safety Guidelines:

- This product is not suitable for individuals with reduced physical, sensory, or mental capabilities, or those lacking experience or knowledge. Children must be supervised to prevent any unauthorized use of the product.
- Routinely examine the charger for any signs of damage. If any damage is detected, refrain from using the battery charger until it has been duly repaired.
- When operating electrical equipment or handling lead acid batteries, ensure that someone is nearby to provide assistance in case of emergencies.
- Always wear appropriate personal protective equipment, including comprehensive eye protection and gloves, to safeguard against potential hazards.
- Prolonged exposure to extreme heat or freezing temperatures can diminish the product's lifespan. Avoid subjecting the unit to such conditions.
- This product is not designed for use with life support systems or any other medical equipment or devices.
- Before cleaning or modifying the circuit, disconnect the product from the battery to prevent accidents.
- Install and store the product in a dry and cool environment. Keep it away from any liquids, and refrain from exposing it to direct sunlight or other sources of heat.
- Do not utilize the product if it displays any signs of physical damage or if its cables are visibly cracked. Contact the manufacturer's customer service to address potential safety concerns.
- Do not attempt to disassemble the charger, as doing so may result in damage to both the unit and the user, and will also invalidate the warranty.
- Ensure adequate ventilation during operation to prevent overheating and to maintain efficient charging.
- This product should only be repaired by qualified personnel.
- Always disconnect the charger before performing any maintenance or cleaning procedures.
- Avoid striking or throwing the product to prevent damage.
- Ensure all cables and connections are firmly secured to maintain optimal performance and safety.

Battery Safety Guidelines:

- The acid or fluid within a lead acid battery is corrosive and poisonous, capable of producing flammable and toxic gases during recharge, and may explode if ignited.
- ALWAYS wear goggles, gloves, or protective clothing when handling these batteries. Remove personal metal items such as rings, bracelets, necklaces, and watches. Ensure adequate ventilation in the working area.
- In case of spills, the acid can cause severe burning to eyes and skin, as well as corrosion to metals. Disconnect power from nearby appliances and promptly wash affected areas with water.

-
- Keep fresh water and soap readily available for immediate use in case of contact with battery acid. If acid comes into contact with eyes, cleanse with soap and water for at least 15 minutes and seek medical attention promptly.
 - In very cold weather, a discharged battery may freeze. NEVER attempt to charge a frozen battery, as gases may form, causing the case to crack and battery acid to spray out.
 - Use only rechargeable deep cycle batteries. NEVER attempt to charge a known faulty, frozen, defective, or non-rechargeable battery.
 - Ensure batteries are mounted and stored in areas with good ventilation to minimize the risk of gas buildup.
 - Periodically check batteries and charging systems to detect any potential faults or issues.
 - DO NOT place tools on top of a battery or allow them to fall onto the battery, as this could cause a short circuit and sparks.
 - DO NOT smoke or have any open sparks or flames near the battery.
 - Reverse protection is available for AGM, Gel, Calcium, and Lead Acid batteries, except for LiFePO4 batteries.

Installation Safety Precautions:

- DO NOT install this charger near heat sources such as fire, heaters, or where it may be exposed to flammable chemicals, vapors, corrosive gases, liquids, or materials.
- DO NOT mount the product in areas where there is a risk of a gas explosion.
- Ensure the product is firmly fastened to prevent it from falling down or tipping over.
- Before and during the charging process, ensure the area around the battery is well ventilated.
- It is recommended to mount this product as close as possible to your auxiliary battery to ensure maximum performance.
- DO NOT lay AC and DC cables in the same conduit, and avoid pulling on the cables to prevent damage.
- When setting up the connection to the DCDC controller, observe the following sequence: start by connecting the auxiliary battery, ensuring correct polarity, and then connect the input source.

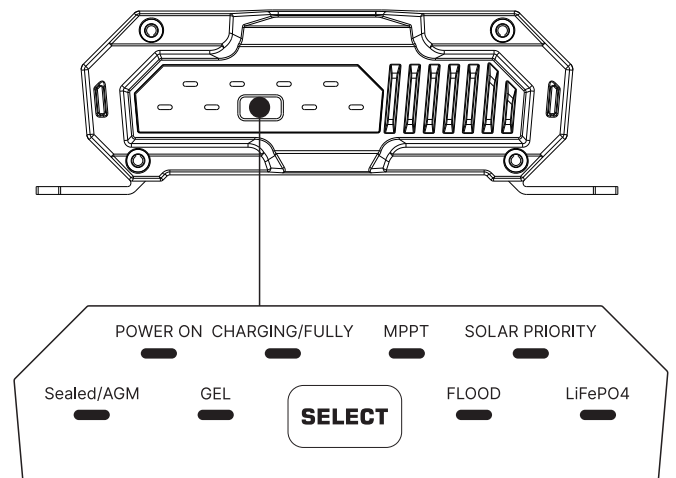
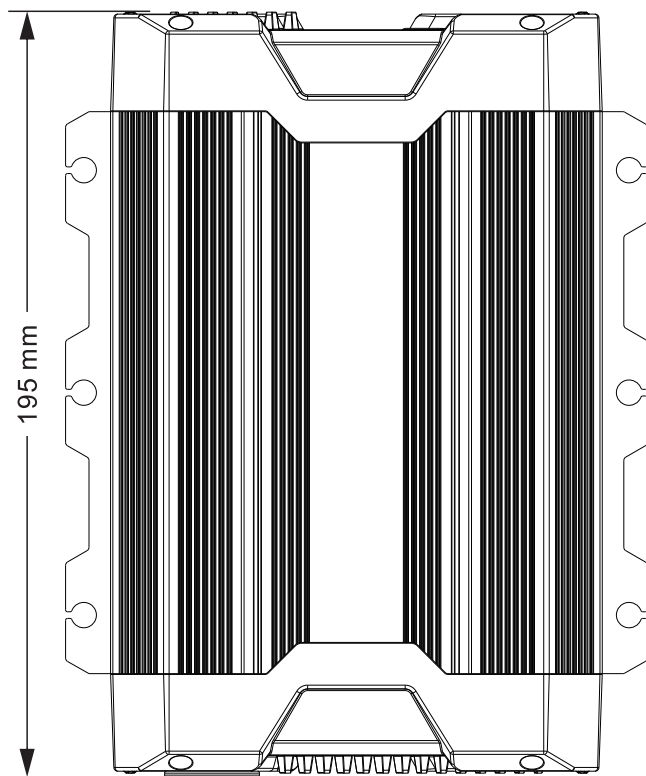
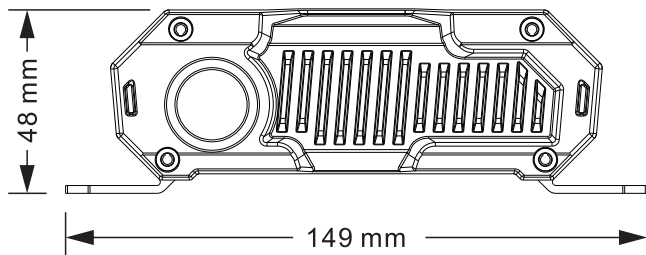
Operation Safety Guidelines:

- Avoid dropping any metal tool or object on the battery, as this could create a spark or short circuit. Such incidents could lead to explosions or damage to electrical tools.
- DO NOT operate in salty, wet, or damp environments, or in areas with corrosive fumes or combustible materials. Avoid locations with risks of explosions.
- Be aware that parts of this product may continue to produce voltage even after disconnection or fuse activation.
- DO NOT disconnect cables while the product is operating to prevent potential hazards or damage.

IN THE KIT

- 1 PC(s) RENOXY 40A DC-DC Charger
- 7 PC(s) Heat-shrink tubings
- 4 PC(s) self-tapping screws
- 1 PC(s) User Manual

IDENTIFICATION OF PARTS



INDICATOR	DESCRIPTION
POWER ON	Refer to the section of DC input conditions for detailed information.
CHARGING /FULLY	Flashes during charging, slows down during float charging, flashes quickly when activated, and remains steady when fully charged.
MPPT	Lights up during solar charging, goes off during generator charging.
SOLAR PRIORITY	Lights up during solar-powered operation, goes off during DC priority.
SEALED/AGM	Lights up when this mode is selected.
GEL	Lights up when this mode is selected (default setting).
FLOOD	Lights up when this mode is selected.
LiFePO4	Lights up when this mode is selected.

INSTALLATION

Location Considerations:

When selecting a location for the DC-DC charger, ensure it is positioned as close as possible to the auxiliary battery being charged. Possible mounting locations include the cabin of the vehicle, along a chassis rail, inner guard, behind the grille or headlight, or on the side of the radiator.

Choose a location that is not susceptible to moisture or other substances, and avoid areas with potentially high temperatures.

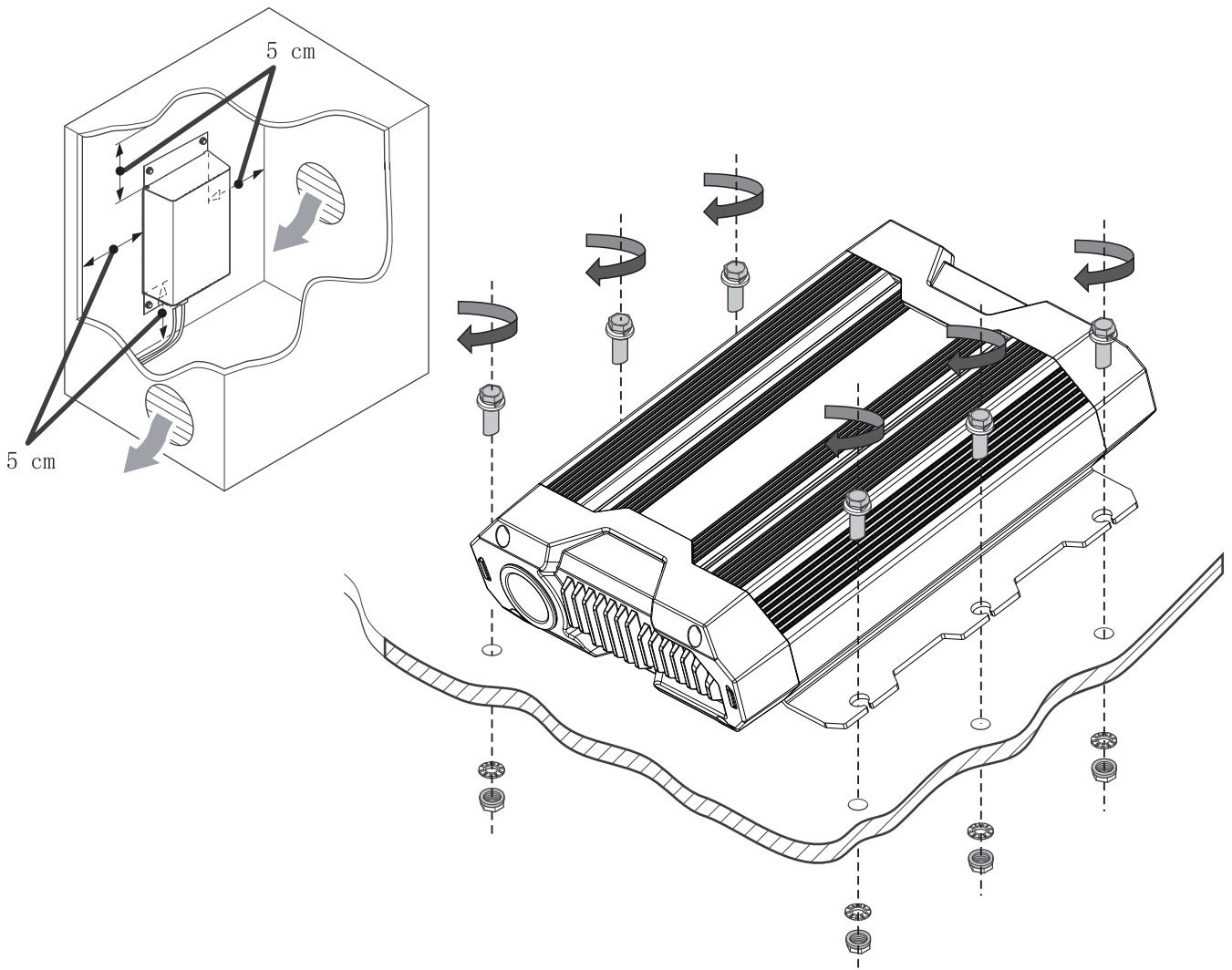
The battery charger can be installed horizontally or vertically, providing flexibility in installation. Install the device on a level and sturdy surface to ensure stability and optimal performance.

Mounting Instructions:

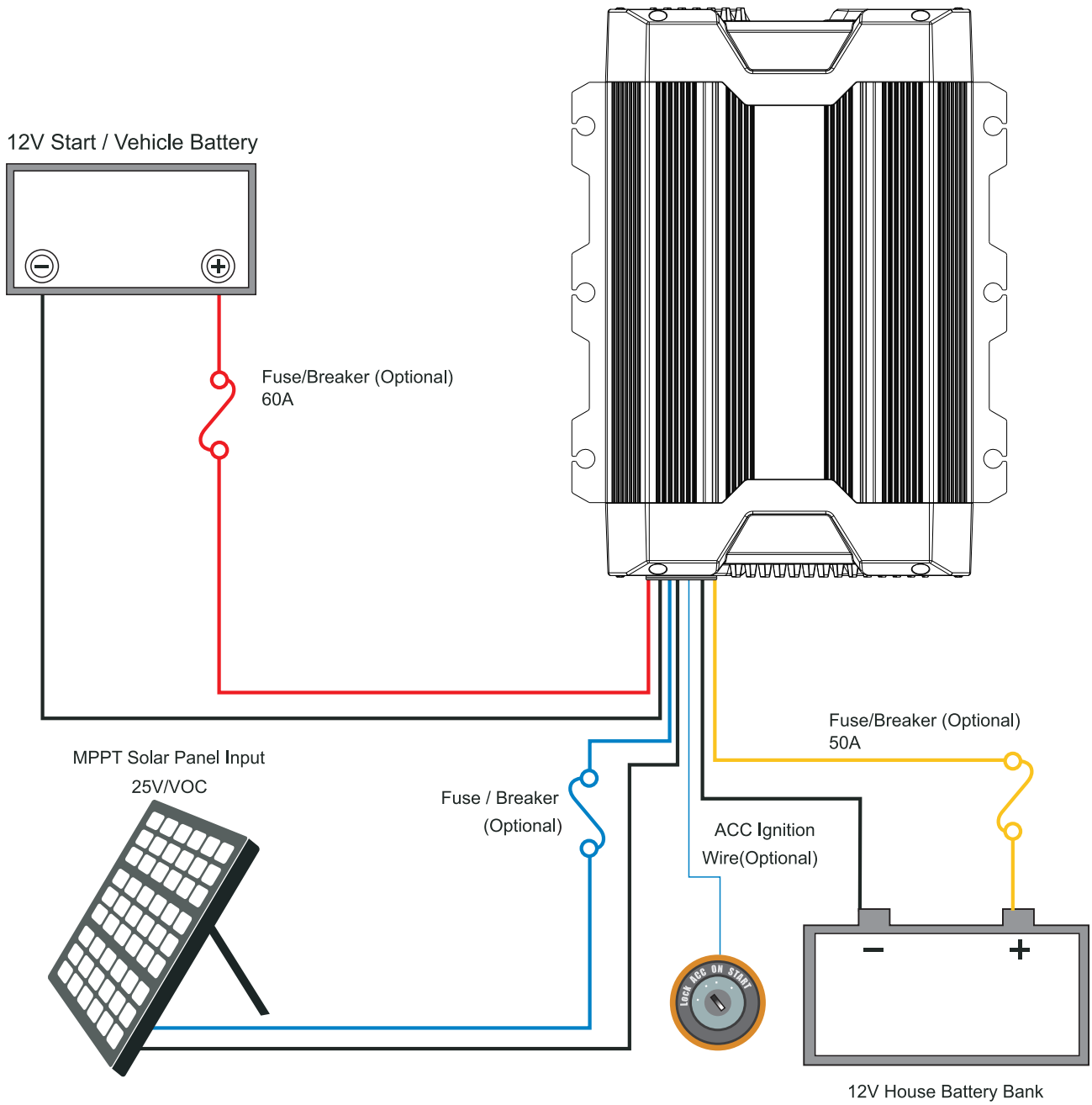
Maintain at least 5cm of clearance from all sides of the DC-DC charger to ensure proper ventilation for optimal performance.

Use a pencil or pen to trace the mounting holes when placing the DC-DC against the desired mounting area.

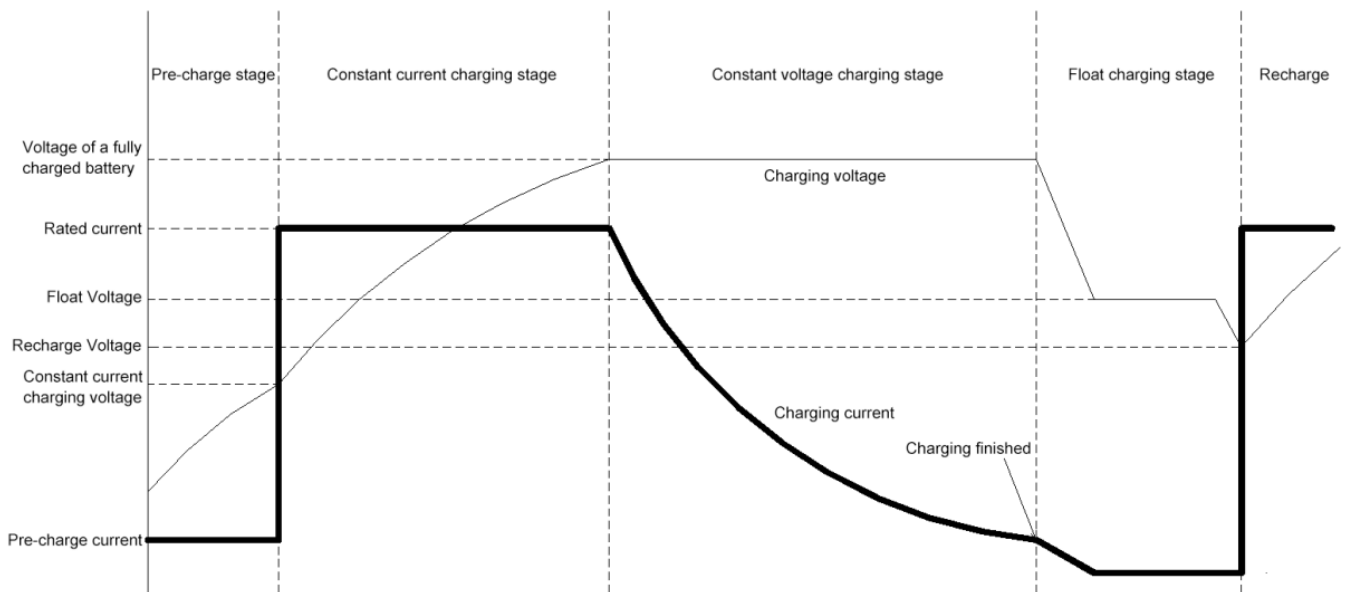
Use 6 screws to securely fasten the DC-DC charger onto the chosen surface, ensuring stability and reliability.



WIRING



CHARGING CONTROL



CHARGING STAGE DIAGRAM

This charger employs a standard four-stage charging control:

When the battery voltage is below the constant current charging voltage, it undergoes a small current pre-charge. The Charging/Fully indicator flashes (on for 1 second, off for 1 second).

When the battery voltage is higher than the constant current charging voltage, it undergoes constant current charging at maximum output current. The Charging/Fully indicator flashes (on for 1 second, off for 1 second).

When the battery voltage reaches the constant voltage charging voltage, it undergoes constant voltage charging, during which the charging current gradually decreases.

Charging complete criteria: During the constant voltage stage, charging is considered complete when the charging current is $< 4A$, and charging stops. The Charging/Fully indicator stays on continuously.

After reaching full charge, when the battery voltage drops below the float charge voltage, it undergoes float charge charging. The Charging/Fully indicator flashes (on for 1 second, off for 2 seconds).

When the battery voltage is lower than the recharging voltage, it enters the normal charging process. The Charging/Fully indicator flashes (on for 1 second, off for 1 second).

DC INPUT

STATUS	POWER ON		POWER OFF		DERATING
ACC VOLTAGE	>8.5V	<8V	>8.5V	<8V	/
DC INPUT VOLTAGE	>12V	>13.2V	<11.3V	<12.7V	<11.2V
BATTERY VOLTAGE	>7V	>7V	/	/	/

- The charger powers on when the input voltage meets the power-on conditions for continuously 15 seconds.
- During DC charging, the charger initiates a fast shutdown every 100 seconds. It checks the input voltage during shutdown to determine if it meets the power-off conditions, eliminating the effects of voltage drop during high-current situations. Shutdown detection is skipped when charging current is less than 5A.
- To prevent undervoltage during high-current charging, the controller will limit current in the undervoltage state to maintain the input voltage above approximately 11.2V. If this threshold cannot be sustained, an immediate shutdown is triggered.

SOLAR INPUT

STATUS	POWER ON	POWER OFF
SOLAR INPUT VOLTAGE	>13V	<12V
BATTERY VOLTAGE	>7V	/

- This controller is an MPPT controller, designed to maximize the efficiency of harnessing solar energy.
- In cases where both the solar panel and DC input meet power-on conditions simultaneously, the default priority is given to DC power. If set to solar priority, the charger continuously monitors the solar input even if DC input is already in the charging process. If solar conditions are met, it switches to solar power.

PROTECTIONS

Input Reverse Protection

Both the solar input and the DC input port are equipped with input reverse protection. Charging is not enabled in the event of reverse connection.

Input Overvoltage Protection

If the voltage at the solar input exceeds 30V or the DC input voltage exceeds 24V:

For DC input overvoltage, the 'Power On' indicator flashes once and pauses for 3 seconds.

For PV input overvoltage, the 'MPPT' indicator flashes once and pauses for 3 seconds.

Output Reverse Protection

Output port (battery port) is equipped with reverse polarity protection. If your polarity is reversed, the charger won't begin charging. It's important to note that in LiFePO4 mode, there is no output reverse protection, and connecting the battery with the wrong polarity may damage the controller.

Battery Overvoltage Protection

When the battery input port voltage exceeds 16V:

The battery type indicator flashes once and pauses for 3 seconds.

Release condition: Voltage drops below 15V.

Overtemperature Protection

When the circuit board temperature exceeds 70°C, the charging current is automatically reduced.

When the circuit board temperature exceeds 80°C, charging is halted. Charging resumes once the temperature drops below 68°C. The 'Power On' indicator flashes twice and pauses for 2 seconds.

Charging Timeout Protection

Charging is stopped if the constant current charging stage exceeds 12 hours. The battery type indicator flashes twice and pauses for 2 seconds. The charger is locked and requires a restart.

Lithium Battery BMS Protection

When the battery type is selected as a lithium battery, if the battery port voltage suddenly drops during the charging process, it is considered an overcharge protection by the lithium battery BMS, and charging is immediately stopped. The battery type indicator alarms. After five minutes, it reassesses whether to resume charging. Alternatively, a short press of the button can manually silence the alarm and restart charging. The battery type indicator flashes three times and pauses for 1 second.

TECHNICAL SPECIFICATIONS

MODEL	RBC40D1S
Product Dimensions	195*149*48mm
Product Weight	1.2KG
DC Input Voltage Range	11.2V-24V ^①
Solar Input Voltage Range	12V-30V ^①
Output Voltage	0V-16V ^①
Max. Output Power	584W
Max. Input Current	45A
Rated Output Current	40A
Voltage Accuracy	±200mV
Current Accuracy	±5%
Standby Current	<10mA
Typical Conversion Efficiency	93%
MPPT Maximum Tracking Efficiency	>99%
Charging Mode	4 Stages
Battery Compatibility	Sealed/AGM, GEL, Flood, LiFePO4
Waterproof Rating	IP-31
Operation Temperature	-20°C~45°C
Storage Temperature	-20°C~60°C
Humidity	0%~90% non-condensing

NOTE: ①Exceeding this maximum value may compromise the safety of the product.

TROUBLESHOOTING

FAULT INDICATOR	CAUSE	SOLUTION
'Power On' Indicator Flashing 1 Time, Pausing for 3 Seconds	DC Power Source Overvoltage	Reconnect the DC power source correctly, ensuring the voltage is within the rated range.
'MPPT' Indicator Flashing 1 Time, Pausing for 3 Seconds	Solar Input Overvoltage	Reconnect the solar panel properly, ensuring the open-circuit voltage is within the rated range.
'Power On' Indicator Flashing 2 Times, Pausing for 2 Seconds	Charger Overtemperature	Install the charger in a well-ventilated environment.
'Power On' Indicator Flashing 3 Times, Pausing for 1 Second	Charger Self-Check Abnormality	Restart the charger; if the issue persists, replace the charger. This fault is locked and requires a power cycle to restart.
Battery Type Indicator Flashing 1 Time, Pausing for 3 Seconds	Battery Connection Abnormality (Overvoltage, Overcurrent)	Reconnect the battery wiring correctly.
Battery Type Indicator Flashing 2 Times, Pausing for 2 Seconds	Charging Time Too Long	Check if the battery capacity is excessively large or if the battery is malfunctioning. This fault is locked and requires a power cycle to restart.
Battery Type Indicator Flashing 3 Times, Pausing for 1 Second	Lithium Battery Protection Board Charging Protection	Ensure the lithium battery is functioning normally.

CHARGING STAGES

CHARGING STAGE	BATTERY VOLTAGE				CHARGING CURRENT
	SEALED / AGM	GEL (DEFAULT)	FLOOD	LiON (LiFePO4)	
TRICKLE CHARGE	<10V	<10V	<10V	<10V	20A
CONSTANT CURRENT	12.0V~14.6V	12.0V~14.2V	12.0V~14.6V	12.0V~14.4V	40A
CONSTANT VOLTAGE	14.6V	14.2V	14.6V	14.4V	<40A
FULLY CHARGED	14.6V	14.2V	14.6V	14.4V	<4A
FLOATING CHARGE	13.6V	13.6V	13.6V	/	<20A
RECHARGING	13.2V	13.2V	13.2V	13.6V	40A

Renogy reserves the right to change the contents of this manual without notice.

WARRANTY

Renogy ("Manufacturer") warrants to the original purchaser ("User") that its DC-DC charger, if purchased from the Manufacturer or an authorized distributor or dealer, will be free from defects in material and/or workmanship under normal application, installation, use, and maintenance conditions for a period of 2 YEARS from the date of sale (the "Warranty Period").

During the Warranty Period, subject to the exclusions listed below, the Manufacturer will repair, replace the defective DC-DC charger, or provide a refund at their discretion. If the charger is deemed irreparable, a new, similar product or a refund will be issued. This Limited Warranty is only applicable to the original purchaser and is not transferable to any other person or entity.

Exclusions:

This warranty does not cover defects caused by normal wear and tear, inadequate maintenance, transportation, storage, faulty repair, misuse, neglect, accident, abuse, modification, failure to observe installation and maintenance instructions, or improper installation. It is recommended that installation be performed by suitably qualified technicians, or the warranty will be voided.

Additionally, the warranty is void if the DC-DC charger:

- Is used for applications other than its intended purpose.
- Is disassembled or repaired by unauthorized personnel.
- Is damaged by adverse weather, extreme temperatures, physical damage, or force majeure events.
- Is not of the correct size or specification for the intended application.
- Is damaged due to non-observance of Renogy's instructions or mishandling by the user.

Claims:

Users must request return authorization before returning any product. No returns will be credited without authorization. In the case of returned products, the Manufacturer's exclusive liability for breaching any warranty on the product shall be to replace the DC-DC charger within the warranty period, in accordance with the terms of this limited warranty. The Manufacturer shall not be liable for any other losses or damages of any kind, including direct, incidental, consequential, exemplary, special, or otherwise, such as lost profits or expenses related to removal, shipping, or installation.