Qoltec®

USER MANUAL

PURE SINE WAVE VOLTAGE CONVERTER

Model: 52687, 52688, 52689, 52690, 52691, 52692, 52693, 52696, 52697, 52698

Introduction

Thank you for choosing the Qoltec Pure Sine Wave Voltage Converter. Our devices have been designed with high reliability, safety and user comfort in mind.

Before use, please read this user manual carefully, as it contains all the necessary information regarding correct installation, operation and safety guidelines.

If you have any questions or require technical support, please contact our customer service department.

About the product

The inverter converts direct current (DC) into sinusoidal alternating current (AC). Direct current (DC) is usually supplied by a battery. Thanks to the inverter, you can power devices requiring a standard 230 V domestic supply, completely independently of the mains grid. Due to their high output power and low energy losses, they are ideal for installation in high-quality motorhomes. Equipped with safety features, modern electronics and a microcontroller, ensuring high peak performance and operational reliability.

Important safety instructions

Warning: Incorrect installation or improper use of the inverter may pose a risk to the user or create hazardous operating conditions.

Warning: Pay attention to the input voltage!

The converter must only be connected to voltage sources approved for its intended use: 12V = 12V / 24V = 24V

Warning: Connecting a voltage higher than required will immediately blow the fuse and may result in damage to the converter.

Note: Do not connect any other power source, in particular an alternating current (AC) source. On all models, only the specially designed AC input may be connected to the mains. Failure to comply with this recommendation poses a risk to life and may cause immediate damage to the converter.

Warning: Take care with inrush currents!

When connecting inductive loads (e.g. a drill, a fridge, etc.), bear in mind that these often require 3–10 times the starting power indicated on the rating plate.

The maximum short-term power demand must not exceed the maximum power of the converter.

Note: Pay attention to the audible signals!

In the event of an overload, the inverter will emit an audible signal.

If the required power is not reduced to the maximum continuous power within a specified time, the unit will switch off automatically.

Further recommendations:

1. Install only on stable surfaces. For optimum performance, the inverter should be placed on a flat surface, such as the floor or another stable, solid surface.
2. Do not allow the inverter to come into contact with water or other liquids. Do not install the unit below or near the waterline in marine applications.
3. Ensure that the ventilation openings and air inlets and outlets are not obstructed. Ensure there is sufficient space around the inverter to allow for free air circulation. Do not place any objects on or above the converter whilst it is in operation. The fan is useful when the converter is operating at maximum power for a prolonged period. The unit switches off automatically when the internal temperature exceeds the permissible level and switches back on once it has cooled down.
4. Do not pull on wires or cables. When disconnecting, always hold the plug, not the cable.
5. To avoid the risk of electric shock, always disconnect the converter from the external power source before inserting the AC plug into the socket.
6. The device is intended for indoor use only. Avoid exposure to external heat sources, direct and prolonged sunlight, dust, corrosive substances and moisture. The optimum ambient temperature should be between 0°C and +40°C. Do not install the converter on or near equipment that generates temperatures higher than the ambient temperature.
7. The inverter heats up during operation — this is normal. Do not touch the device whilst it is in operation. Do not place the inverter in locations exposed to high temperatures or near heat-sensitive materials.
8. Do not drop the device or subject it to impacts or shocks.
9. Do not place any objects on the converter housing.

10. Always use only the cables and connectors supplied with the device. The use of other cables, connectors or accessories is considered misuse and may cause damage to the device.
11. Do not attempt to service, open or dismantle the device. Attempting to repair it yourself poses a risk of electric shock, including a life-threatening risk from contact with high voltage. In the event of any problems, stop using the device immediately and contact technical support.
12. Before cleaning the converter, switch it off and disconnect it from the power supply.
13. Before carrying out any work on circuits associated with the converter, disconnect all connections on the AC and DC sides. Setting the ON/OFF switch to the OFF position does not guarantee complete disconnection from hazardous voltage.
14. Store and use out of reach of children.

Recommended battery cables and battery capacity

(Batteries are not included)

Model	Input voltage	Recommended cable cross-section from 80cm	Recommended cable cross-section from 150cm	Recommended cable cross-section from 200cm	Recommended cable cross-section from 300 cm	Battery capacity
52687	12 V	4 mm²	10 mm²	16 mm²	25 mm²	≥100 Ah
52688	12 V	6 mm²	16 mm²	25 mm²	35 mm²	≥100 Ah
52689 52696	12 V	10 mm²	25 mm²	35 mm²	50 mm²	≥160 Ah
52690	12 V	16 mm²	35 mm²	50 mm²	70 mm²	≥250 Ah
52691 52697	12 V	25 mm²	50 mm²	70 mm²	100 mm²	≥320 Ah
52692	12 V	35 mm²	50 mm²	70 mm²	100 mm²	≥400 Ah
52693 52698	12 V	35 mm²	70 mm²	95 mm²	140 mm²	≥480

Model	Input voltage	Recommended cable cross-section from 80cm	Recommended cable cross-section from 150cm	Recommended cable cross-section from 200cm	Recommended cable cross-section from 300 cm	Battery capacity
						Ah

* The values given are for guidance only.

Note: Ensure sufficient capacity! If the recommended total battery capacity is exceeded, performance may be reduced or usage severely limited due to voltage drops.

Warning: The cross-section of the battery cables may also be larger than recommended to further limit power losses. Failure to comply with this may cause overloaded cables and connections to overheat easily, which could lead to a dangerous cable fire.

Connecting the converter to the battery

Figure 1

Converter design

Models: 52687, 52688, 52689

Figure 2

Model: 52690, 52691, 52692

Figure 3

Description for models: 52687, 52688, 52689, 52690, 52691, 52692, 52693, 52696, 52697

A. Power ON/OFF (Power switch)
B. USB Type-C port
C. USB Port 5V 2.1A
D. Remote control (Remote control socket)
E. Vent outlet
F. 230V power socket
G. AC Output Terminal

Model: 52693

Figure 4

Terminal for direct connection (diagram showing terminals L – L – G – I – N – N)

Figure 5

Note: Pay attention to the maximum power of the connected loads!

For currents above 15 A, loads must be connected directly to the terminal designated for direct connections.

Model: 52696

Figure 6

Model: 52697

Figure 7

Model: 52698

Figure 8

A. Power ON/OFF (Power switch)

B. USB Type-C port

C. USB 5V 2.1A port

D. Remote control (Remote control socket)

E. Vent outlet

F. 230V power socket

G. AC Output Terminal

H. AC input

LCD display on the converter

Figure 9

A) Battery charge level indicator (Battery indication)

B) Input voltage from the battery (Battery voltage)

C) AC output operation / Internal temperature

D) Current load of connected devices (Power consumption)

E) Fan operation indicator

Figure 10

A) Battery indicator

B) Battery voltage

C) AC output running

D) Power consumption

E) AC output voltage

F) Internal temperature

G) Fan operation

Installation

1. The converter should be installed near the battery(ies).
2. The supplied battery cables are approx. 80 cm long.
3. The installation site should be clean and dry.
4. To ensure optimal cooling of the unit, ensure that the ventilation openings and fans are not obstructed.
5. A minimum of 25 cm of free space must be maintained around the unit, including around the ventilation openings and fans. If the inverter is to be installed in an enclosed space, it must be adequately ventilated to ensure proper air exchange with the surrounding environment.
6. The installation should be carried out on a flat, hard and non-flammable surface.
7. You can also use rubber components to reduce vibrations.

Note: Ensure that the inverter is switched off before connecting it to the battery.

Note:

1. Reversing the polarity will blow the fuse or damage the converter. Damage resulting from incorrect connection is not covered by the warranty.

2. The converter must only be connected to batteries with a rated voltage of 12 V or 24 V.
3. Ensure adequate ventilation when using batteries — flammable gases may be produced during charging and discharging.
4. Sparks may be generated when connecting the converter to the battery, so ensure there are no flammable vapours in the vicinity.

Note: We do not recommend connecting loads whose power exceeds 90% of the inverter's rated power.

Installation

1. Ensure that the device's ON/OFF switch is set to "OFF".
2. Connect the red wire (+) to the positive terminal (marked red) of the converter.
3. Connect the other free end of the red wire to the battery (positive terminal) via a fuse.
4. The fuse should be placed as close to the battery as possible.
5. Connect the black wire (–) to the negative terminal (marked in black) of the inverter.
6. Connect the other free end of the cable to the battery (negative terminal).
7. Once both battery cables have been connected to the DC connectors on the inverter, fit the two covers (red and black).
8. Fit the red cover over the open end of the red cable and screw it to the unit using the screws provided.
9. Then fit the black cover over the black cable and also secure it to the unit using the screws provided.

Figure 11

Note: To prevent cable fires, a fuse must be installed between the converter and the battery on the PLUS cable! The fuse should be placed as close to the battery as possible.

Warning: When connecting the DC input voltage source, sparking may occur due to the charging of internal capacitors.

Earthing: The converter is fitted with an M5 earthing screw. This is used to connect the unit to the vehicle chassis when operating in a vehicle. The earthing

of the two output sockets (230 V) is already internally connected to this M5 earthing screw.

Warning! : Risk of electric shock! The device is fitted with safety features to protect against dangerous electric shock. However, to ensure maximum safety, the inverter's earth connection must be connected to the protective earth system (usually the yellow-green cable).

UPS mode

Applies to models: 52696 52697 52698

UPS mode (emergency power supply)

In UPS mode, also known as mains priority mode (MPC), the current discharging the battery is stopped. The unit is designed to automatically switch to mains power when shore power is available.

The switching time is less than 16 ms, which guarantees an uninterrupted power supply (UPS).

The 52696, 52697 and 52698 inverters can also operate using an external mains supply (shore power) connected to the vehicle.

The sockets in the unit serve a dual purpose:

• as a 230 V output when mains power is available,

• as a 230 V power output from the inverter itself when no external power is connected.

The unit is connected to a 230 V socket using the supplied mains cable (100 cm) with an IEC plug, which draws shore power from the vehicle's electrical system. The power cable must be fitted with a strain relief.

Switching between mains operation and inverter operation is fully automatic. If there is no external power supply, the unit operates solely as an inverter. An internal safety relay ensures that, once shore power is disconnected, the unit immediately switches back to battery operation.

Figure 12

Wiring diagram:

(diagram of battery and inverter connection — red wire to positive, black wire to negative, AC input connected to 230 V socket)

Note: In mains priority mode, 230 V loads may only be powered up to the inverter's load limit and must under no circumstances exceed its power rating!

The maximum permissible AC input load (AC IN) is 16 A for IEC plugs.

Higher values may cause the internal safety relay to fail.

Comply with applicable national installation regulations and safety rules regarding protection against electric shock.

Note: Battery chargers must never be powered by the mains priority circuit and must therefore not be connected to the inverter.

Recommended battery capacity

1. To ensure the inverter operates smoothly and without disruption, it is essential to use a battery with sufficient capacity.

- Small appliances draw a low current from the battery, whereas larger appliances – such as a hairdryer (1000–1200 W) – can draw a very high current (up to 100 A).
- When using a 12 V battery with a capacity of 100 Ah, a maximum of approx. 50% of its capacity can be utilised, i.e. around 50 Ah.
- This means that at a draw of 100 A, the battery will discharge in about 30 minutes.
- By comparison, lithium batteries can deliver almost their entire usable capacity – i.e. a full 100 Ah.

Note: The battery should have a minimum capacity of 90 Ah. This is the minimum requirement to ensure optimal operation of the device. The above information applies to lead-acid batteries.

Maximum power of connected devices

To ensure safe and trouble-free operation of the device, the total power of the connected loads (power specified in VA or W) must not exceed the inverter's rated power. The inverter's rated power includes:

• Maximum continuous AC power

• Peak power used during short-term increases in power consumption when AC devices are switched on

Factors for different types of loads

Load type	Factor
Air conditioning, fridge, freezer (compressor-based appliances)	5
Garden pump, submersible pump	4
Incandescent, halogen and quartz lamps	3
Switched-mode power supplies (SMPS) without power factor correction	2
Dishwasher, washing machine	3
Air compressor	4

Calculating the required inverter power:

Multiply the continuous power of the load (in W) by the appropriate factor to obtain the power rating that the inverter must provide.

Note: Values for individual devices may vary — the figures given are approximate.

Operating time

1. Batteries must supply between 10.5 V and 15.5 V DC (for 12 V inverters) and be capable of supplying the current required to power the load.
2. The power source should be a well-maintained, serviceable battery.
3. To estimate the current (in amps) that the battery must supply, simply divide the load power (in AC watts) by 10.

Example:

1. If the load is 100 W AC, the power source/battery must supply:

100 / 10 = 10 A

In larger installations, the power source may consist of several batteries connected in parallel.

2. It is important that the cables have a sufficiently large cross-section to minimise power losses.

3. This manual does not cover all possible battery configurations, charging methods or battery insulation.
4. We recommend using deep-cycle or LiFePO4 batteries.
5. If you see a low voltage alarm, recharge the battery immediately.
6. Once the battery is fully charged, you can use the inverter again.

Note: The battery runtime depends on its capacity (Ah) and power consumption (W).

The method for calculating operating time is: Battery capacity (Ah) × Input voltage (V) ÷ Power consumption (W) = operating time (in hours)

Example: Battery capacity: 100 Ah × Input voltage: 12 V ÷ Power consumption: 180 W, then (100 Ah × 12 V) ÷ 180 W = 7 hours

Safety features

1. The inverter is equipped with various safety features that protect both the device itself and all connected components, such as the battery.
2. The inverter features, among other things, thermal and electrical protection against under- or over-voltage.
3. In the event of under- or over-voltage, the device disconnects the AC output and requires the ON/OFF switch to be turned off and on again before restarting.

Note: The device remains switched on even when the AC output is disconnected. Due to power consumption in standby mode, there is a risk of deep discharge of the connected batteries.

Note: In the following cases, the inverter disconnects the AC output:

1. **Internal temperature too high**
2. **Required load too high**
3. **Input voltage is too high or too low**

Reason	**12V**	**24V**	**Operation**
Low battery voltage	10.5V ± 0.2V	21V ± 0.4V	2 beeps, the inverter continues to operate
Battery voltage too low	10V ± 0.2V	20V ± 0.4V	3 beeps + **E-1**, AC output disconnected,

Reason	12V	24V	Operation
			automatic shutdown
Input voltage too high	15.5V ± 0.2V	31.0V ± 0.4V	4 beeps + **E-2**, automatic shutdown
Overheating	Internal temperature > 75°C		5 beeps + **E-3**, automatic shutdown
Overload	Regardless of model		Continuous beep + **E-4**, automatic shutdown
AC short circuit	Regardless of model		6 beeps + **E-5**, automatic shutdown
Reverse polarity (battery polarity reversal)	52687-93 52696-98		Fuse blows

Warning: The manufacturer accepts no liability for damage caused by incorrect connection due to reverse polarity or short circuits.

Troubleshooting – Error codes

Symbol	Description
E-1 Figure 13	**Low voltage protection**
E-2 Figure 14	**Over-voltage protection**
E-3 Figure 15	**Thermal protection – high temperature**
E-4 Figure 16	**Overload protection**
E-5 Figure 17	**Short circuit protection**

Note: Immediately rectify the cause of the fault and ensure that the source of the fault has been eliminated.

Switching the device on repeatedly whilst the problem remains unresolved may result in damage to the device. In particular, short circuits and reverse polarity must be avoided, as they may damage the device despite the protective measures in place.

Troubleshooting

Problem	**Possible cause**	**Solution**
Converter switched on No audible signal No voltage at the input	No voltage at the output	Check the battery voltage Check the input fuses Check all connections to the battery
	Fuses blown due to reverse polarity Note: Reverse polarity can damage the converter despite the fuse	Replace blown fuses and connect the wires correctly If the device still does not work after replacing the fuse, it is likely faulty. Contact customer service
1× beep	Receivers disconnected Short circuit on the receiver side	Check the connection Check for a short circuit
2 beeps	Low voltage reached – warning signal (see table)	Check the battery charge level, recharge if necessary Check the battery cable – if it is too thin, use a larger cross-section Check the conductive components (wires, terminals, cable ends) for damage
3 beeps	Critically low voltage reached – disconnection (see table)	Check the battery charge level and recharge if necessary Check the battery cable – if it is too thin, use a larger gauge Check the conductive components (wires, terminals, cable ends) for damage |
4 beeps	Input voltage is too high (see table of values)	Check the supply voltage Check for any unwanted voltage sources
5 beeps	The inverter is overheating	Check the fan operation; if faulty – contact the service department Check that the air inlets and outlets are

		not blocked Reduce the load
Audible signal multiple times (xx)	The inverter's maximum short-term power has been reached	Switch off the inverter Reduce the load Cool the unit
The charger is not working	Input voltage parameters are outside tolerance	Check the power source for correct voltage and frequency
The charger is supplying only a low current	Low input voltage No connection to the battery or the battery is faulty	Use the correct AC voltage Check all connections
No charging function despite shore power being connected	One or more batteries faulty Defective battery fuse Damaged or broken battery cable Faulty charger	Check the batteries and fuse; replace if necessary Check the cables, test them and replace if damaged Contact the manufacturer or retailer

Possible battery configurations

When using multiple batteries — depending on the inverter version (12 V or 24 V) — there are various ways to connect battery banks:

Series connection: Voltages add up, capacity remains unchanged.

Parallel connection: Capacities add up, voltage remains unchanged.

Series-parallel connection: Both capacities and voltages are added together.

1. **Series connection (SERIES)**

Figure 18

12 V / 200 Ah + 12 V / 200 Ah + 12 V / 200 Ah + 12 V / 200 Ah

Voltage: 12 V + 12 V + 12 V + 12 V = 48 V

Capacity (Ah): remains 200 Ah

2. **Parallel connection (PARALLEL)**

Figure 19

12 V / 200 Ah || 12 V / 200 Ah || 12 V / 200 Ah || 12 V / 200 Ah

Voltage: remains 12 V

Capacity (Ah): 200 + 200 + 200 + 200 = 800 Ah

3. **Series-parallel connection (SERIES/PARALLEL)**

Figure 20

Two groups of batteries connected in series are then connected in parallel:

(12 V/200 Ah + 12 V/200 Ah + 12 V/200 Ah + 12 V/200 Ah)

||

(12 V/200 Ah + 12 V/200 Ah + 12 V/200 Ah + 12 V/200 Ah)

Voltage: 48 V

Capacity: 200 Ah × 2 = 400 Ah

Procedure for protecting the battery during periods of non-use

: **If the inverter is not going to be used for a prolonged period, follow the recommendations below to prevent the battery from discharging:**

1. Disconnect all loads from the inverter.
2. Disconnect the battery from the inverter.

Note: Unless the battery is completely disconnected, the inverter may continue to draw a minimal current.

Technical specifications

Model	**52587**	**52688**	**52689 52697**	**52690**	**52691 52697**	**52691**	**52693 52698**
Rated power	300W	500W	1000W	1500W	2000W	2500W	3000W
Peak power	600W	1000W	2000W	3000W	4000W	5000W	6000W
Battery voltage	12V						
Output voltage	230V						
Output frequency	50Hz± 1 Hz						

Waveform	Pure sine wave (THD < 4%) at rated input voltage						
Efficiency (70% load)	87–91%						
Current consumption in standby mode	Approx. 0.35A	Approx. 0.35A	Approx. 0.35A	Approx. 0.45A	Approx. 0.50A	Ca 0.50A	Ca 0.60A
Noise level (at full load)	60–70 dB						
Low voltage warning	21V±0.4V						
Shutdown at low voltage	20V±0.4V						
Overheating protection	>75°C						
USB port	2.1A/5V						
Switching time (UPS)	<0.16ms						
Output power as % of continuous power:	120% – 150% for up to 10 seconds 150% – 200% for max. 2 seconds						
AC voltage fluctuations:	max. 10%						
Battery compatibility	WET, AGM, GEL, VRLA, SLA, LifePO4						

Recommended environmental conditions:

Parameter	**Value**
Max. operating temperature	-15°C to +40°C
Max. storage temperature	-40°C to +85°C
Max. relative humidity	20% to < 90%
Operating range	12V 86% – 90% 24V 87% – 91%

* Actual efficiency depends on the type of connected load and usage. For example, the converter achieves its highest efficiency at a load of approximately 70%.

No-load current consumption / power consumption

Note: Standby current consumption!

When the inverter is not in use, it must be switched off at the main switch. Otherwise, the unit will draw current in idle mode, as shown in the table below. This protects the battery from damage caused by deep discharge.

Model	Rated power	12V	24V
52687	300W	approx. 0.55A	approx. 0.35A
52688	500W	approx. 0.65A	approx. 0.35A
52689	1000W	approx. 0.70A	approx. 0.35A
52690	1500W	approx. 0.90A	approx. 0.45A
52691/52697	2000W	approx. 1.00A	approx. 0.50A
52692	2500W	approx. 1.10A	approx. 0.50A
52693/52698	3000W	approx. 1.20A	approx. 0.60A
52694/52699	4000W	approx. 1.40A	approx. 0.70A

Measures relating to maintenance, disposal and servicing

1. Before cleaning or maintenance, disconnect the inverter from the mains and the battery.

2. Use a dry cloth for cleaning — do not use solvents, detergents or corrosive agents.

3. If you notice a burning smell, smoke, unusual noises or deformation of the casing, immediately disconnect the power supply and stop using the device.

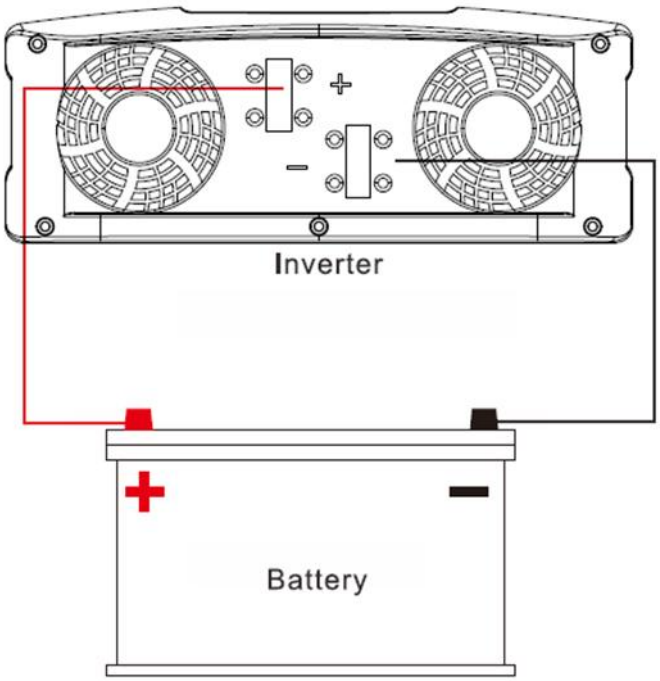
4. Repairs to the device may only be carried out by a qualified service centre. The converter contains no parts requiring user maintenance.

5. Store in a dry place at a temperature of –20°C to +45°C, protected from dust and moisture.

6. Do not dispose of used batteries in household waste — they must be taken to a disposal point compliant with the WEEE Directive.

Attachment 1

1



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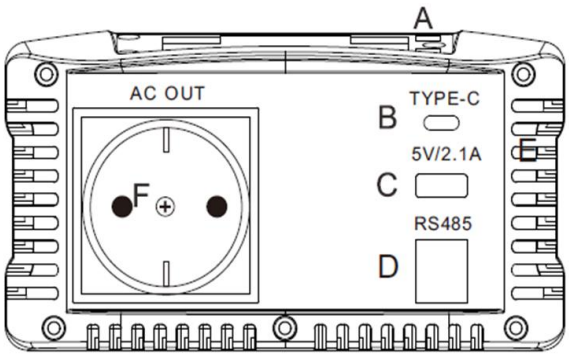

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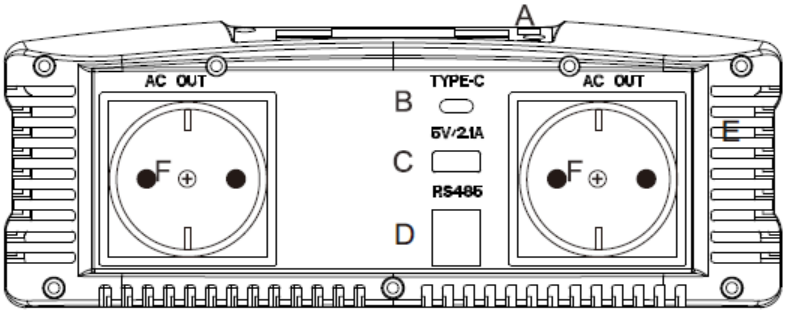

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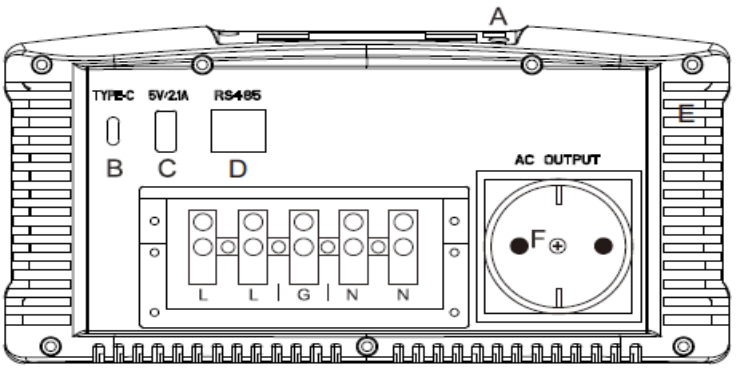
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D
E
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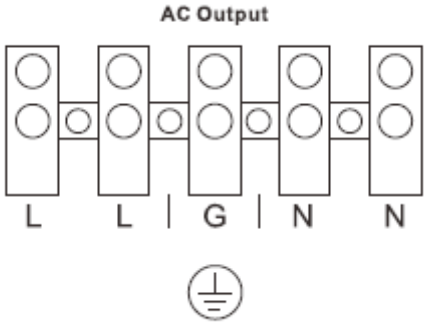
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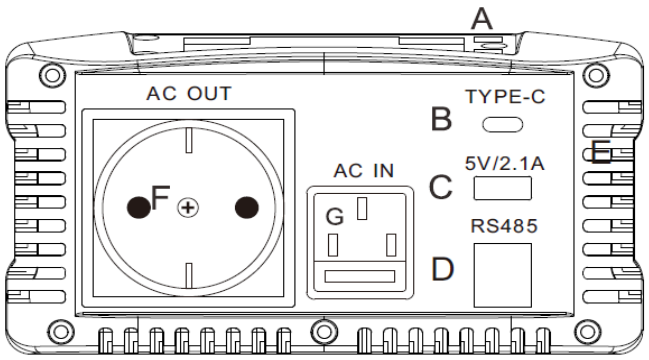
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AC IN
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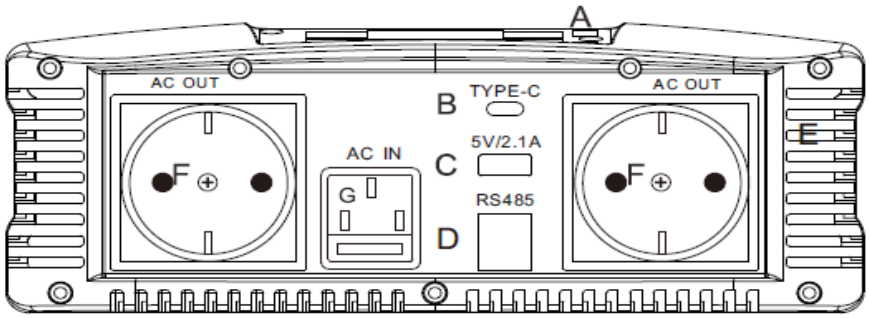
TYPE-C
C
5V/2.1A
RS485
D
E

7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5V/2.1A
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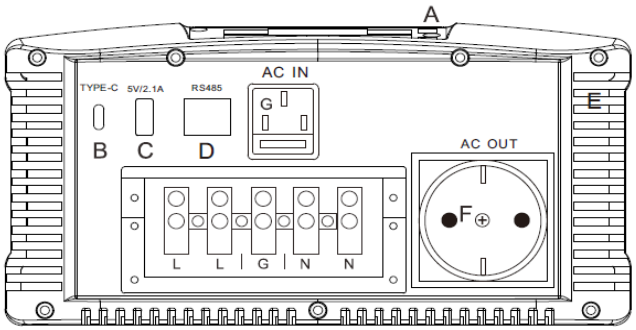
RS485
D
F

8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AC OUT
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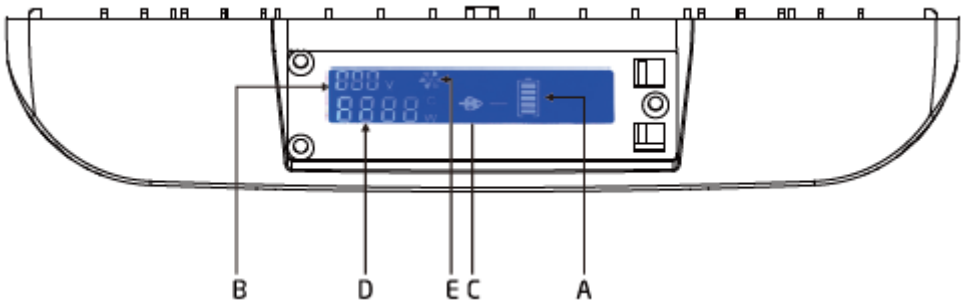
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C
A

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D
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1 W
230 V
E
G

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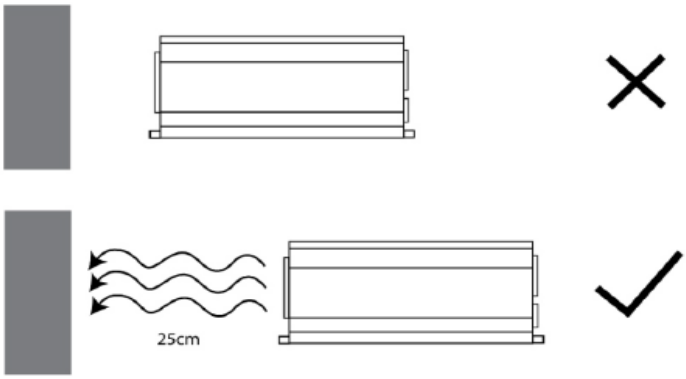
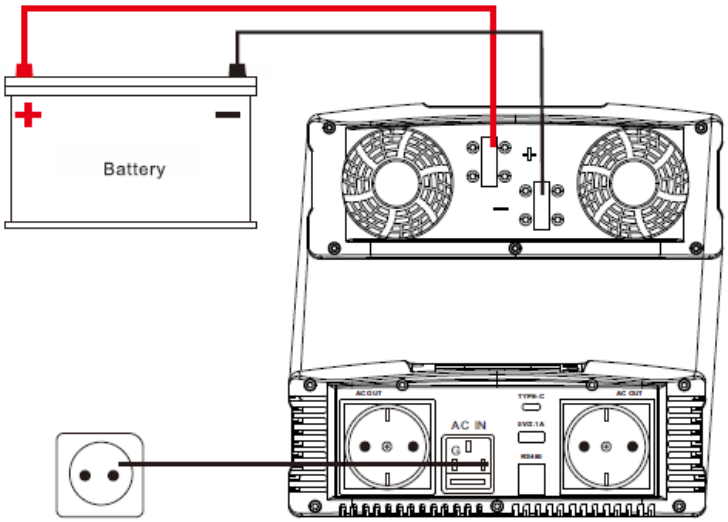

25cm

12


Battery
AC IN
AC OUT
AC OUT

13


E-1
FAULT
24°C
AC OUT
0000w 000v

14


E-2
FAULT
24°C
AC OUT
0000w 000v

15


E-3
FAULT
99 °C
AC OUT
0000 W 000 V

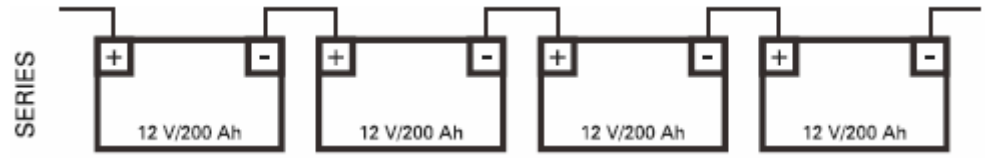
16


E-4
FAULT
28 °C
AC OUT
0000 W 000 V

17


E-5
FAULT
28 °C
AC OUT
0000 W 000 V

18


SERIES
+
-
12 V/200 Ah
12 V/200 Ah
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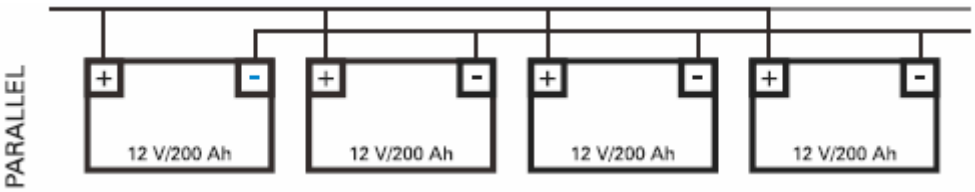
12 V/200 Ah

19


PARALLEL
+
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12 V/200 Ah
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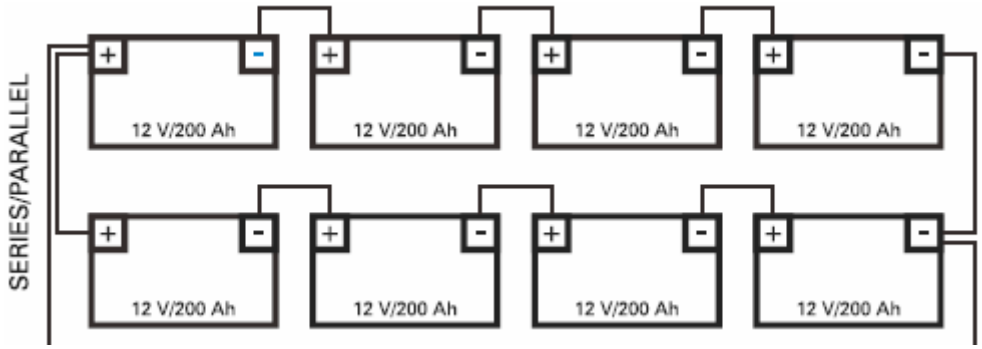
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12 V/200 Ah
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