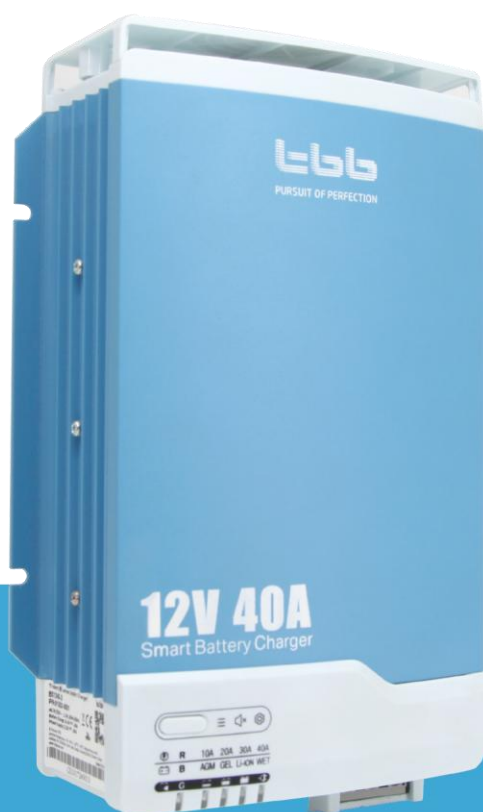




PURSUIT OF PERFECTION



Smart battery charger BS

A1.4



WARNING: HIGH VOLTAGE INSIDE

CAUTION: THE DC FUSE MUST HAVE BEEN TURNED OFF BEFORE SERVICING

MADE IN CHINA

Disclaimer

Unless specially agreed in writing, TBB Power Co., Ltd.

- Take no warranty as to the accuracy, sufficiency of suitability of any technical or other information provided in this manual or other documentation.
- Assumes no responsibility or liability for loss or damage, whether direct, indirect, consequential or incidental, which might arise out of the use of such information.
- TBB offers standard warranty with its products, taking no responsibility for direct or indirect loss due to equipment failure.

About this Manual

This manual describes our product features and provides procedure of installations. This manual is for anyone intending to install our equipment.

General Instruction

Thanks for choosing our products and this manual were suitable for battery charger and Solar Mate series MPPT.

This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

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1. General Safety information

- Before using the charger, read all instructions and cautionary markings on the charger, the batteries, and all appropriate sections of this manual.
- Use BS battery charger only for its use as intended purpose.
- Use BS battery charger only in well ventilated rooms. Do not expose the charger to rain, snow, spray, or bilge water. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the charger in a zero- clearance compartment.
- Always interrupt the power supply when doing repair work on the unit.
- Recommend that all wiring is done by a certified technician or electrician to ensure adherence to the local and national electrical codes applicable in your application.
- Always check that existing wiring is in good condition and that wire is not undersized. Do not operate the charger with damaged or substandard wiring.
- Always use socket which are earthed and secured by earth leakage circuit breaker.
- Batteries contain aggressive acids. Avoid the contact with the battery fluid agent. If a contact with battery fluid agent should occur, then rinse the affected parts of the body or clothing etc. with plenty cold water. It is imperative to seek medical treatment from a doctor with injuries caused by acid.
- DO NOT disassemble the charger by yourself, which may result in a risk of electrical shock or fire. Always refer to professional electrician or our local distributor for support.
- ALWAYS interrupt both the AC and DC connect when doing repair work.
- DO NOT expose lead acid batteries to a lit cigarette, sparks or flames because they produce flammable gasses and could explode.
- NEVER charge non-rechargeable battery.
- Never try to charge a frozen battery. There is danger of explosion. In this case, place the battery at a frost resistant location and wait until the battery has adapted to the ambient temperature. Only by then, start the charging process.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- Children should be supervised to ensure that they do not play with the appliance.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

2. Introduction

Batteries will be permanently damaged if they are overcharged or left discharged for a period of time. The BS range of smart battery chargers will continuously monitor and deliver the correct charging profile for all battery types and conditions. The built in battery management software ensures the batteries life expectancy is maximized.

Using the latest technology and our knowledge of batteries, the BS range of smart battery chargers are specifically designed for mobile and marine applications where on-board charging is required.

2.1 Features

- Active PFC featuring smaller and higher efficiency, max 88%
 - Multiple isolated outputs, including slave charger for starter battery
 - Sophisticated TBB premium II multiple stages charging algorithm for lead acid battery
 - Suitable for lithium batteries.
 - Automatic temperature compensation charging.
 - Automatic voltage compensation charging
 - Programmable with software
 - Special silent design
- TBB premium II multistage adaptive charging algorithm for lead acid battery
- Fitted with multistage charging algorithm (bulk-absorption-float-recycle), BS battery charger is designed to charge battery quickly and fully. Microprocessor controlled charging algorithm with variable absorption charging timer guarantee the optional charging for batteries of different discharged state.

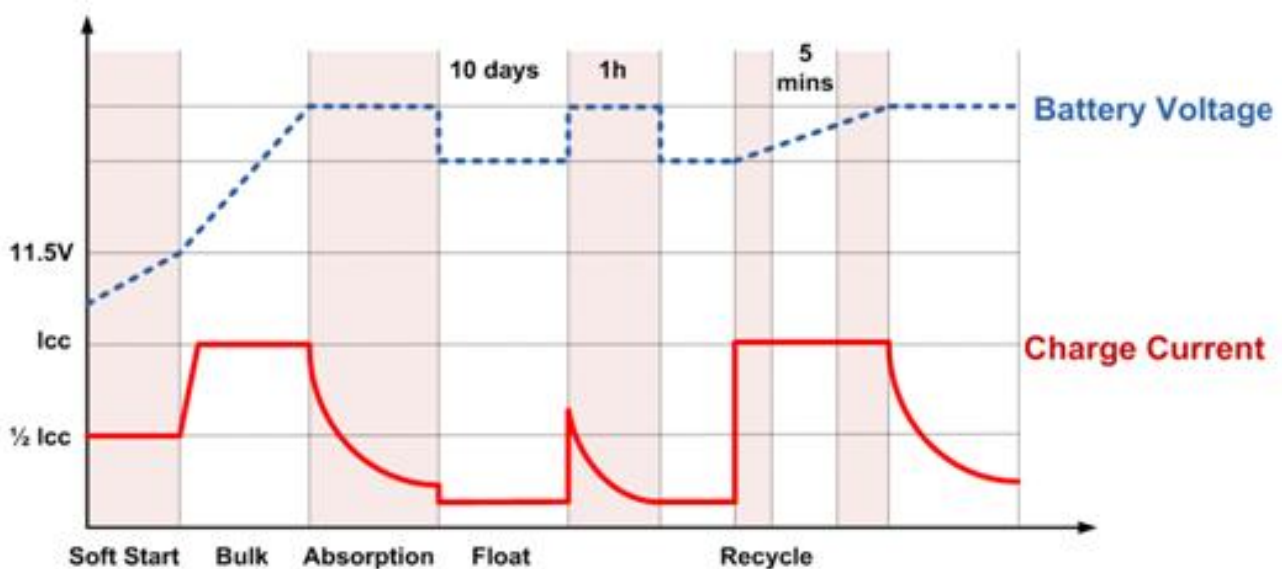


Figure 1-1 Multi stage sophisticated charging algorithm for lead acid battery

Float charging and recycle charging program guarantees your battery will be properly maintained in the event of long-time fixed installation.

➤ **Battery temperature compensation**

Battery temperature is a key factor in correct charging, the charging formula must be adjusted (automatically and in real time) according to the actual battery temperature to ensure that battery is fully charged but not overcharged or undercharged.

All charging voltages recommended by battery manufacture are in fact only applied at 20°C - 25°C.

The battery temperature and voltage sensor supplied with BS charger measures the temperature of battery and automatically adjusts in real time to properly charge your batteries at compensation rate of $-4\text{mv} / ^\circ\text{C} / \text{cell}$.

In case the battery temperature sensor is not present, BS charger will use 25°C as default setting.

➤ **Voltage compensated charging**

Through the battery temperature and voltage sensor, BS charger will automatically adjust its output, compensating the voltage drop on the cable ensuring the correct charging current and voltage is delivered the battery.

➤ **Charging current adjustable**

Using the multifunctional smart button, user can choose the different charging current according the battery capacity. We recommend the charging current set as 10%-20% of battery capacity ($I=0.1C/0.2C$) for lead acid battery and 30% of battery capacity for lithium battery.

➤ **Slave battery charger for starter battery (Not available for BS1210)**

Along with a powerful charger for stationery/service battery, BS battery charger also offers a slave charger of max 3A to keep starter battery charged.

➤ **Special silent design**

User-friendly special silent design. The fan of charger will stop working after the charging current drop to a predetermined level for a period of them. And it will then automatically resume working if internal temperature increases.

Using the Silent button on the remote control (optional accessory), the BS battery charger will automatically to reduce the output of the charger and stop the fan.

2.1 Principle Diagram

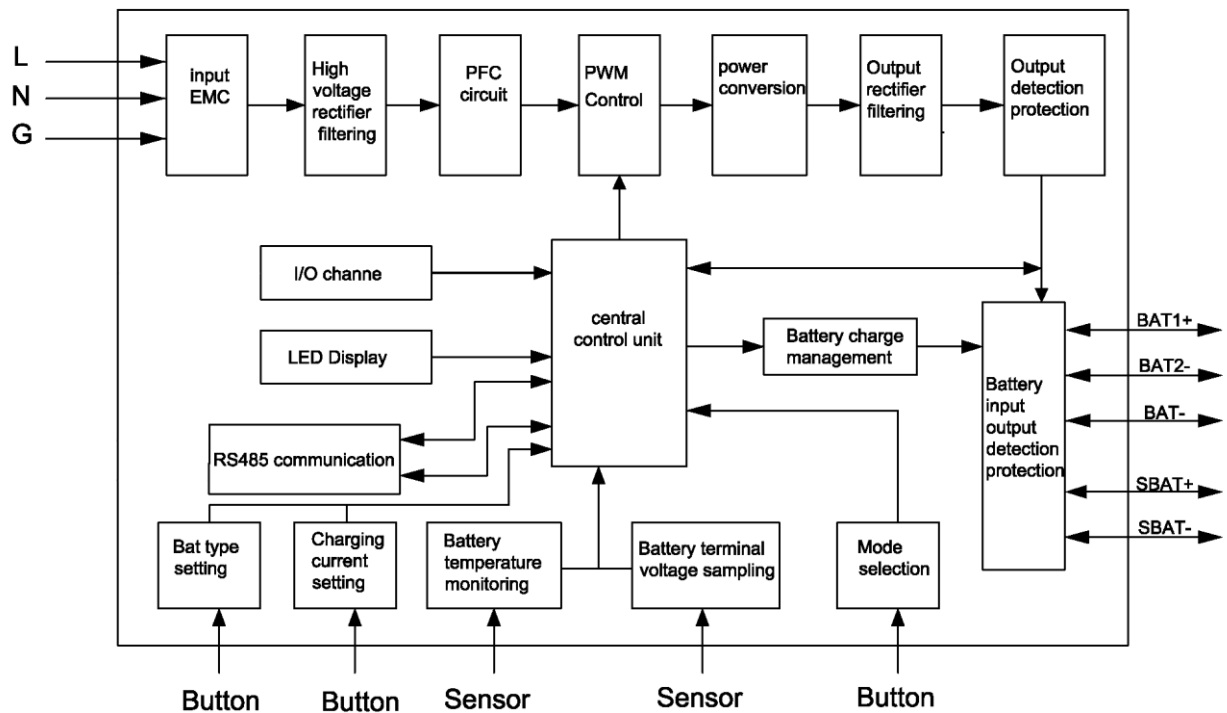


Figure 2-1 schematic diagram

2.2 Naming Rules

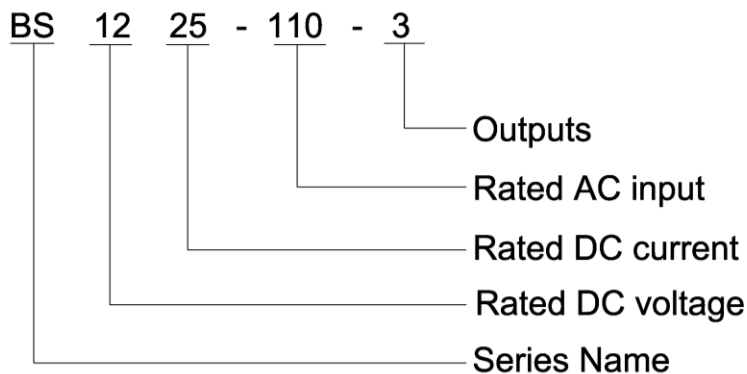
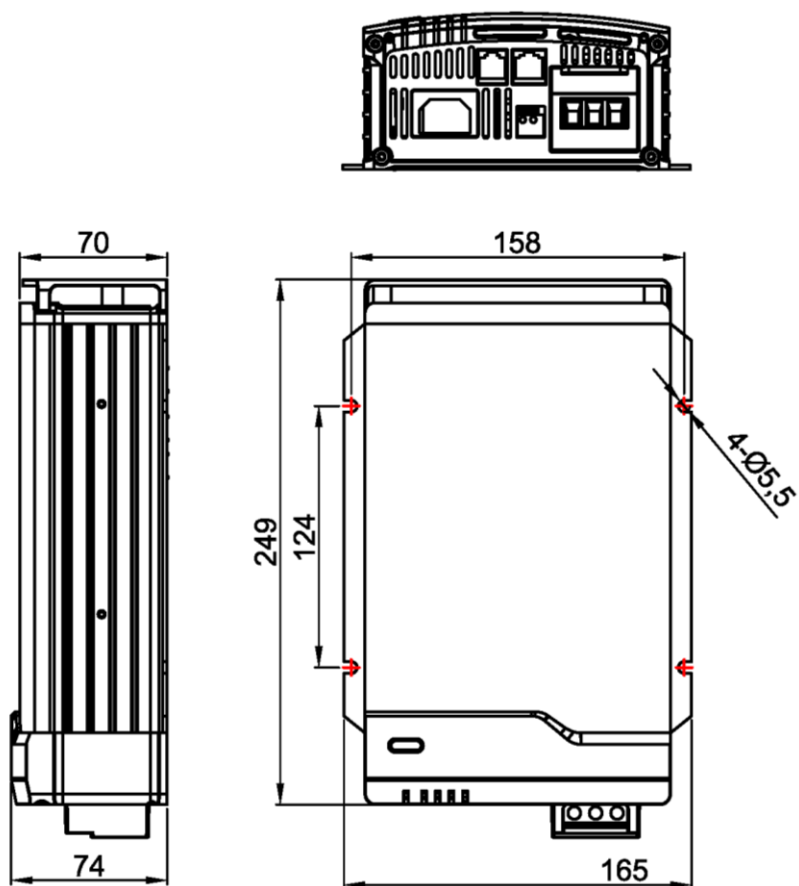


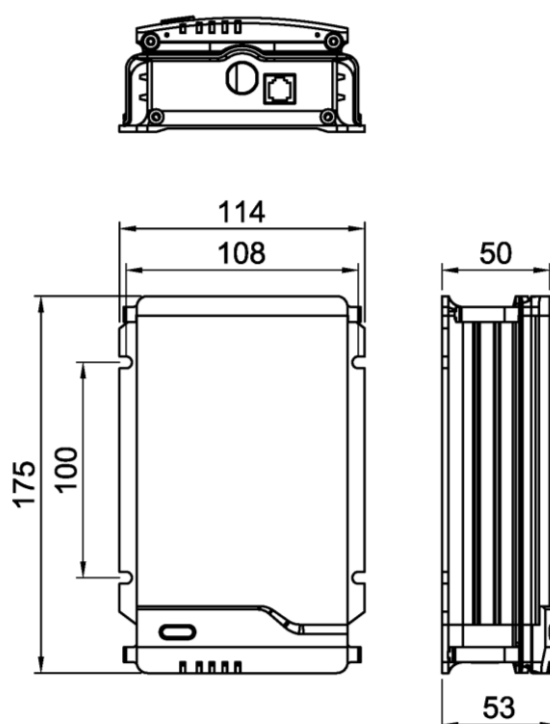
	figure	explanation
Series name	BS	BS battery charger
Rated DC voltage	12	12V
	24	24V
Rated DC current	10	10A
	12	12A
	20	20A
	25	25A
	40	40A
Rated AC input	N/A	220/230V
	110	110V
Outputs	N/A	1+1 outputs (1 for starter battery)
	3	2+1 outputs (1 for starter battery)

2.3 Product size

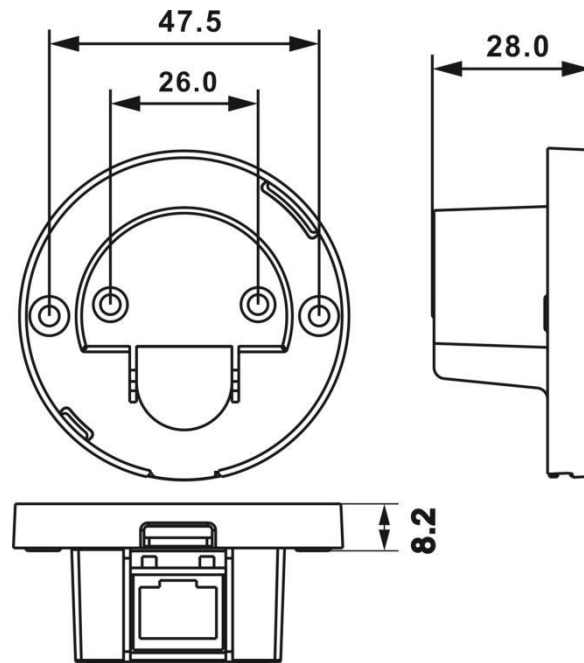
2.3.1 BS1225-3/BS1240-3/BS2412-3/BS2420-3



2.3.2 BS1210



2.3.3 Optional remote control RBS

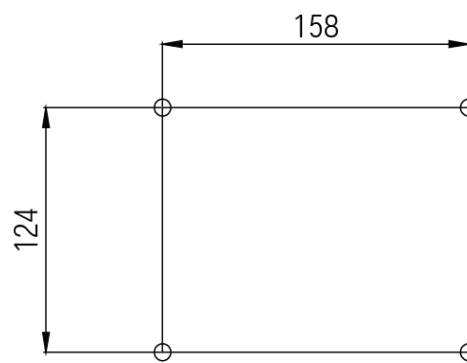
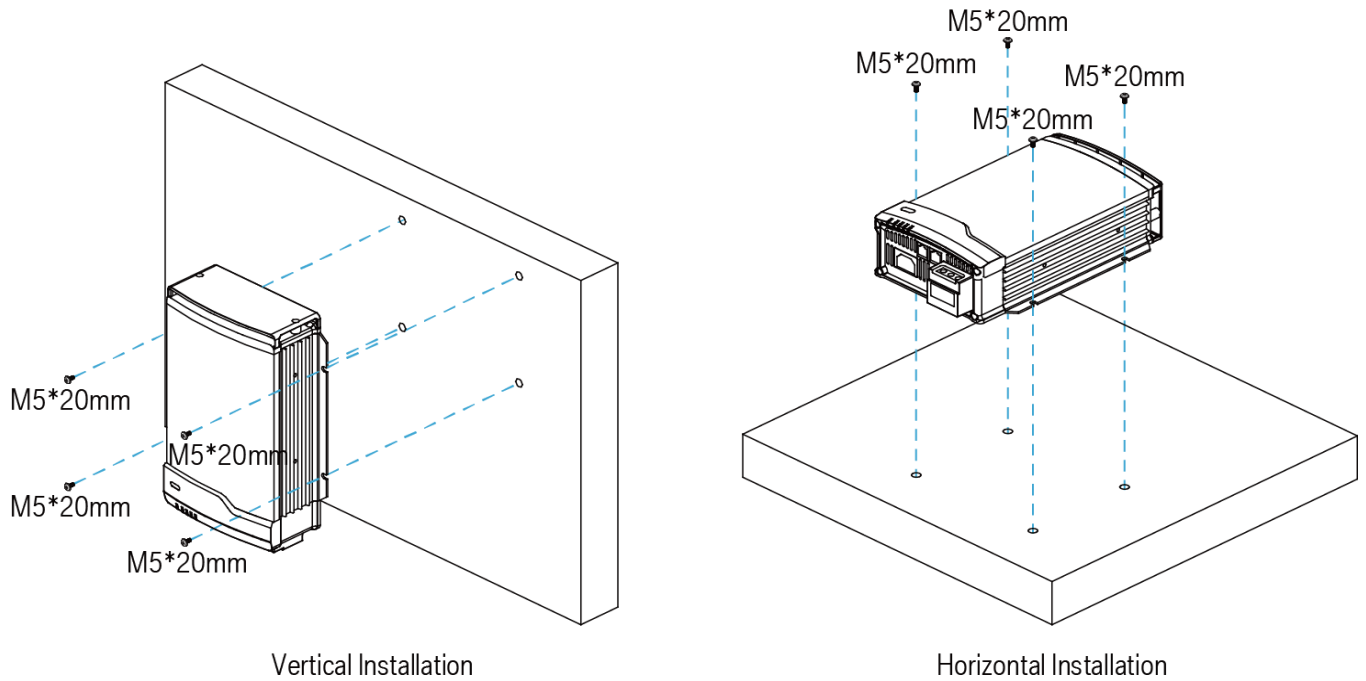


3. Installation

3.1 BS installation

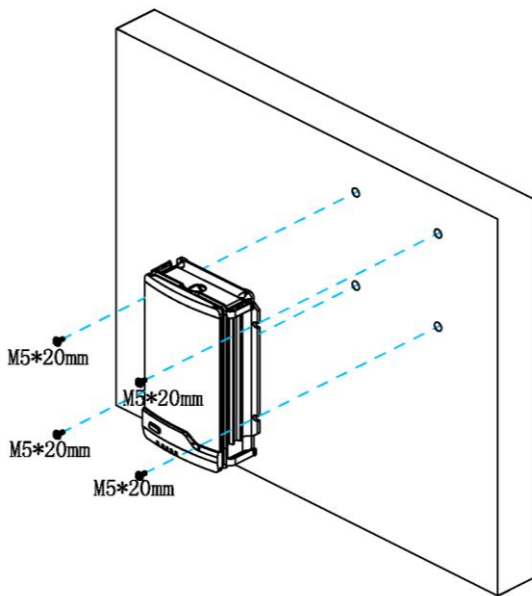
BS can be installed on a horizontal surface or vertically on a wall.

Please see following instructions:

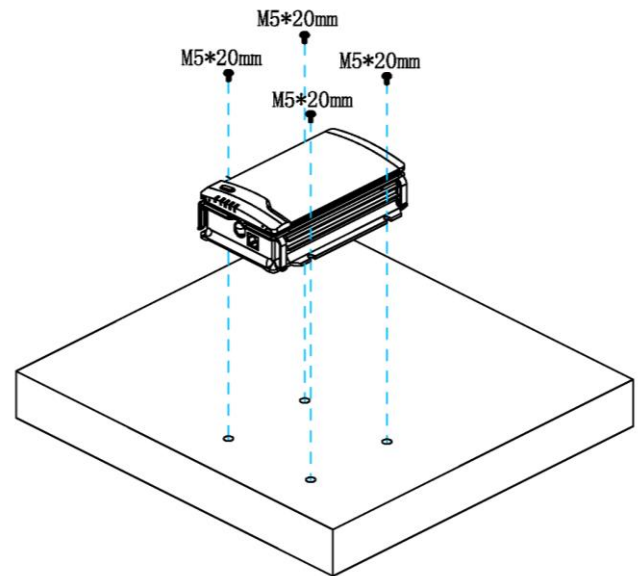


Hole size

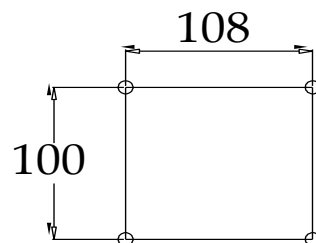
BS1225-3/BS1240-3/BS2412-3/BS2420-3



Vertical Installation



Horizontal Installation



Hole size

BS1210

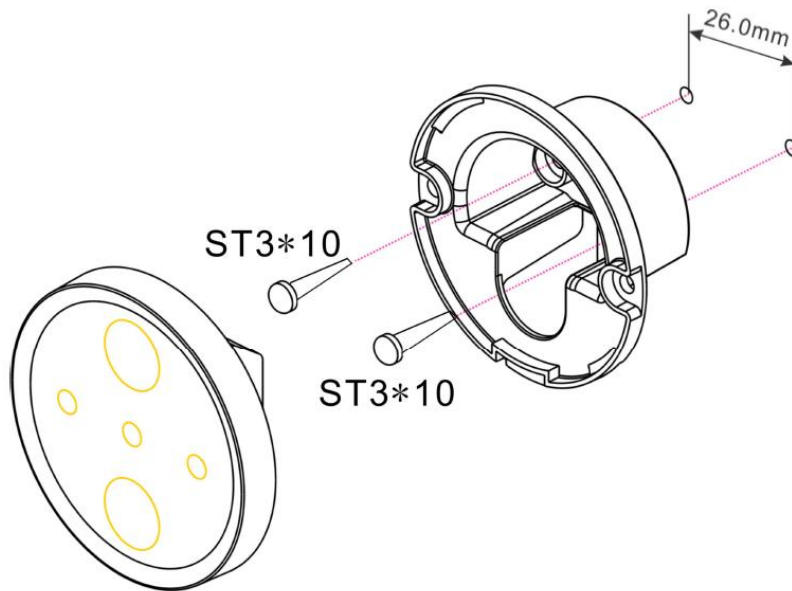


Ensure clearance on both sides of BS unit upon installation. A recommended clearance of 5cm on each side.

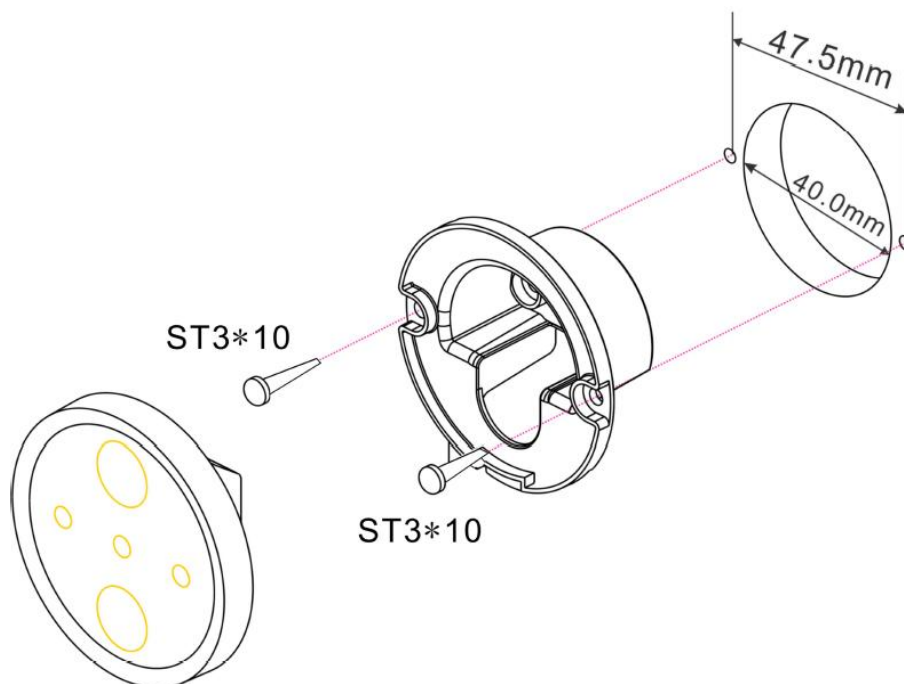
3.2 Optional remote control RBS installation

RBS can be installed by surface mounting or wall mounting.

Please see following instructions:



Surface Mounting Installation



Wall Mounting Installation

4. Operation

4.1 Front Panel

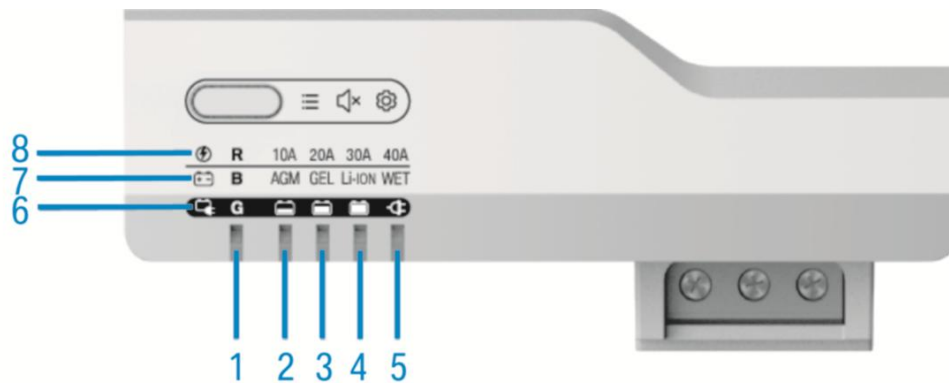


Figure 4-1 BS1225/BS1225-3/BS1240/BS1240-3

BS2412/BS2412-3/BS2420/BS2420-3

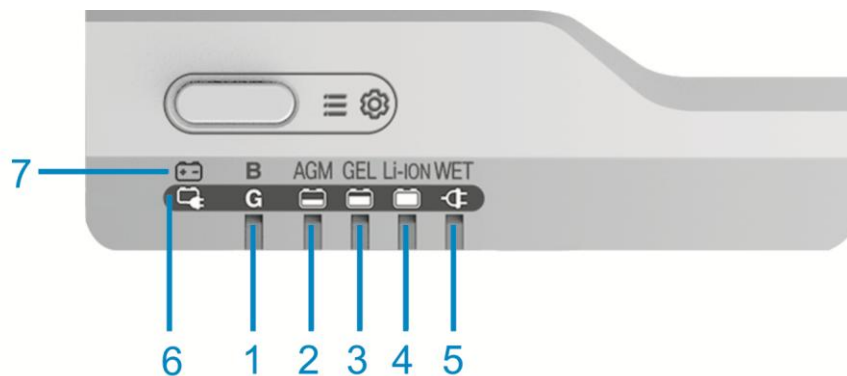


Figure 4-2 BS1210

LED2 ~ 5 represents different status of the units combined with the LED 1.

When LED1 is slow flashing, the BS charger is in the setting status.




When LED1 is quick flashing, the BS charger is in the fault indicator.

When LED1 is ON, they are the working status indicator.

No	LED	Color	Status	Description
1	LED 1	Green	ON	Charging status indication
			Slow flashing (flash once every second)	Working mode setting
		Blue	ON	Battery type indication
			Slow flashing (flash once every second)	Battery type setting
		Red	ON	Charging current indication (In addition to 12V10A model)
			Slow flashing (flash once every second)	Charging current setting
			Quick flashing (flash twice every second)	Fault status indication

NO	LED	Color	Status	LED1 status	Description
2	LED2	Green	ON	ON, Green	Bulk charging
			ON	ON, Blue	Battery type is AGM
			ON	ON, Red	Charging current is 10A (12V40A) Charging current is 10A (12V25A) Charging current is 5A (24V20A) Charging current is 3A (24V12A) (In addition to 12V10A model)
			ON	Quick flashing, Red	Output over voltage alarm
			ON	Slow flashing, Blue	Battery type is set to AGM
			ON	Slow flashing, Red	Charging current is set to 10A (12V40A) Charging current is set to 10A (12V25A) Charging current is set to 5A (24V20A) Charging current is set to 3A (24V12A) (In addition to 12V10A model)
3	LED3	Green	ON	ON, Green	Absorption charging
			ON	ON, Blue	Battery type is GEL
			ON	ON, Red	Charging current is 20A (12V40A) Charging current is 15A (12V25A) Charging current is 10A (24V20A) Charging current is 6A (24V12A) (In addition to 12V10A model)
			ON	Quick flashing, Red	Battery charger over temp alarm
			ON	Slow flashing, Blue	Set the battery type to GEL
			ON	Slow flashing, Red	Charging current is set to 20A (12V40A) Charging current is set to 15A (12V25A) Charging current is set to 10A (24V20A) Charging current is set to 6A(24V12A) (In addition to 12V10A model)
4	LED4	Green	ON	ON, Green	Floating charging
			ON	ON, Blue	Battery type is LFP
			ON	ON, Red	Charging current is 30A (12V40A) Charging current is 20A (12V25A) Charging current is 15A (24V20A) Charging current is 9A (24V12A)) (In addition to 12V10A model)
			ON	Quick flashing, Red	Output short circuit alarm
			ON	Slow flashing, Blue	Set the battery type to LFP

			ON	Slow flashing, Red	Charging current is set to 30A (12V40A) Charging current is set to 20A (12V25A) Charging current is set to 15A (24V20A) Charging current is set to 9A (24V12A) (In addition to 12V10A model)
5	LED5	Green	ON	ON, Green	Power supply mode
			ON	ON, Blue	Battery type is WET
			ON	ON, Red	Charging current is 40A (12V40A) Charging current is 25A (12V25A) Charging current is 20A (24V20A) Charging current is 12A (24V12A) (In addition to 12V10A model)
			ON	Quick flashing, Red	Battery not connected or reverse polarity alarm
			ON	Slow flashing, Green	Set to power supply mode
			OFF	Slow flashing, Green	Set to battery charger mode
			ON	Slow flashing, Blue	Set the battery type to WET
			ON	Slow flashing, Red	Charging current is set to 40A (12V40A) Charging current is set to 25A (12V25A) Charging current is set to 20A (24V20A) Charging current is set to 12A (24V12A) (In addition to 12V10A model)

NO	Label	Description
6		Charging state
7		Battery type
8		Charging Current (In addition to 12V10A model)

4.2 Side panel

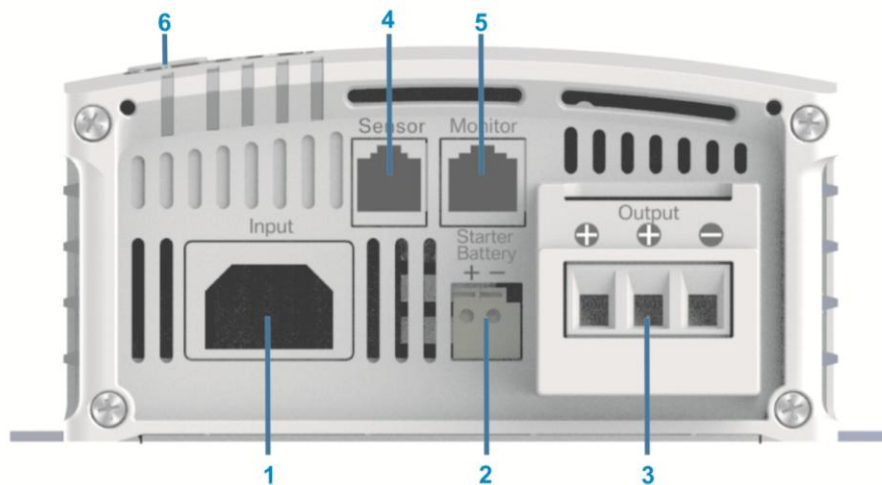


Figure 4-3 BS1225/BS1225-3/BS1240/BS1240-3/
BS2412/BS2412-3/BS2420/BS2420-3

No.	Label	Description
1	Input	AC input socket
2	Starter Battery	Starter battery connector
3	Output	Service battery connector
4	Sensor	Battery temperature and voltage sensor connector
5	Monitor	Remote panel connector
6	Setting/Select	Setting button

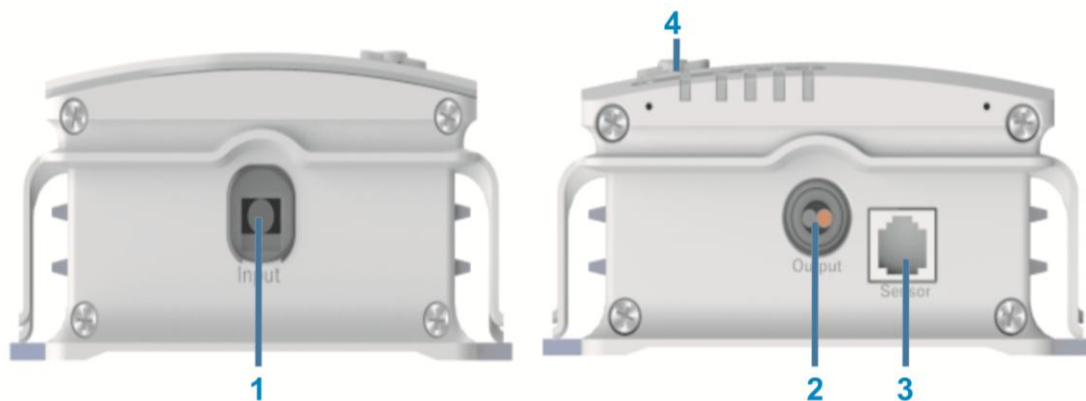


Figure 4-4 BS1210

No.	Label	Description
1	Input	AC input socket
2	Output	Service battery connector
3	Sensor	Battery temperature and voltage sensor connector
4	Setting/Select	Setting button

5. Configuration

There is a multifunction smart button for you to set the battery charger or check the settings. The LED displays the charging status by default, you can check the battery type and output current setting by short pressing the button.

Please follow the following steps to set the charger.

1. Please short press the button for entering into Battery Type Display mode or Charger Current Display mode.
2. Then, long press the main button for 3s, you can enter into the setting mode.
3. By pressing the button, you can set the battery type or charger output current.
4. After the setting, please long press the button to confirm the setting.

As a reminder, different colors of LED are designed for various setting.

BLUE = battery type setting (AGM, GEL, LFP, WET)
 RED = charging current setting (In addition to 12V10A model)
 GREEN = working mode setting, battery charger or power supply

Examples

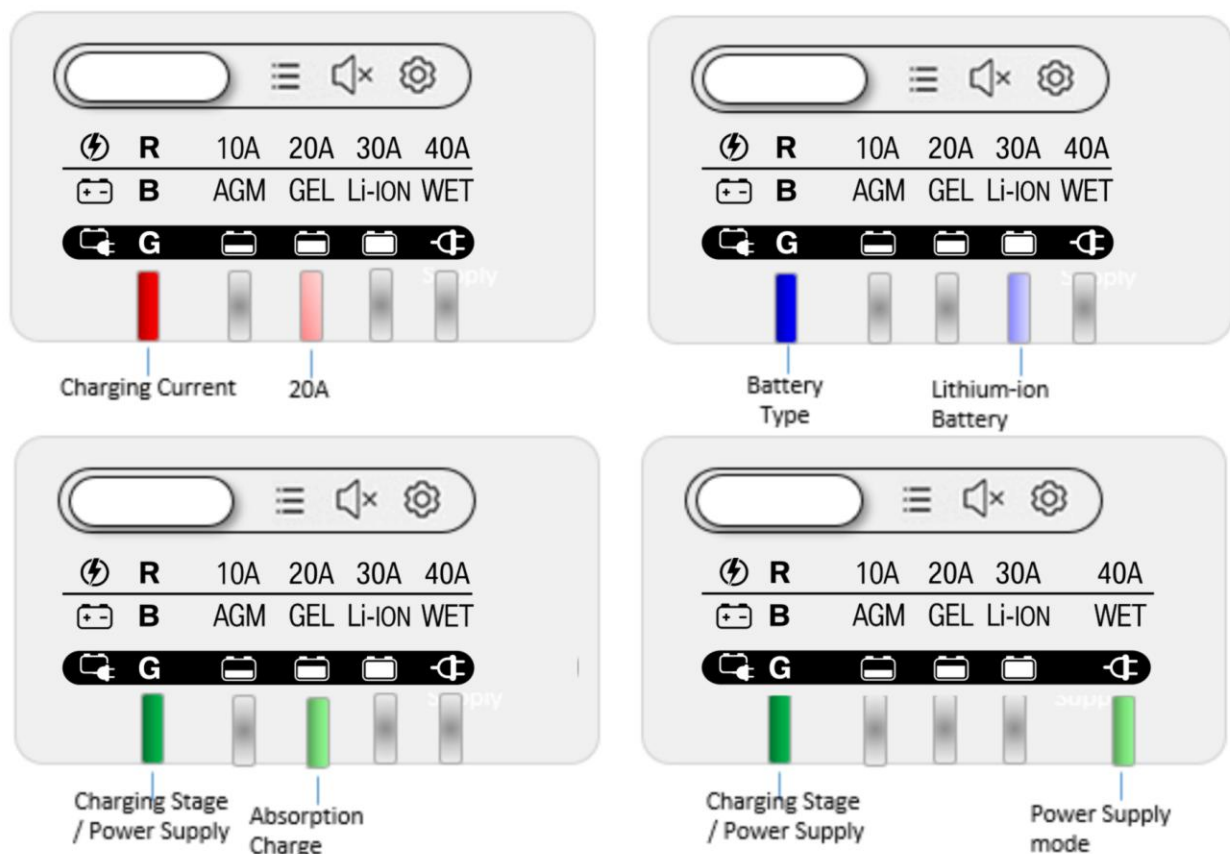


Figure 5-1 BS1225/BS1225-3/BS1240/BS1240-3

BS2412/BS2412-3/BS2420/BS2420-3

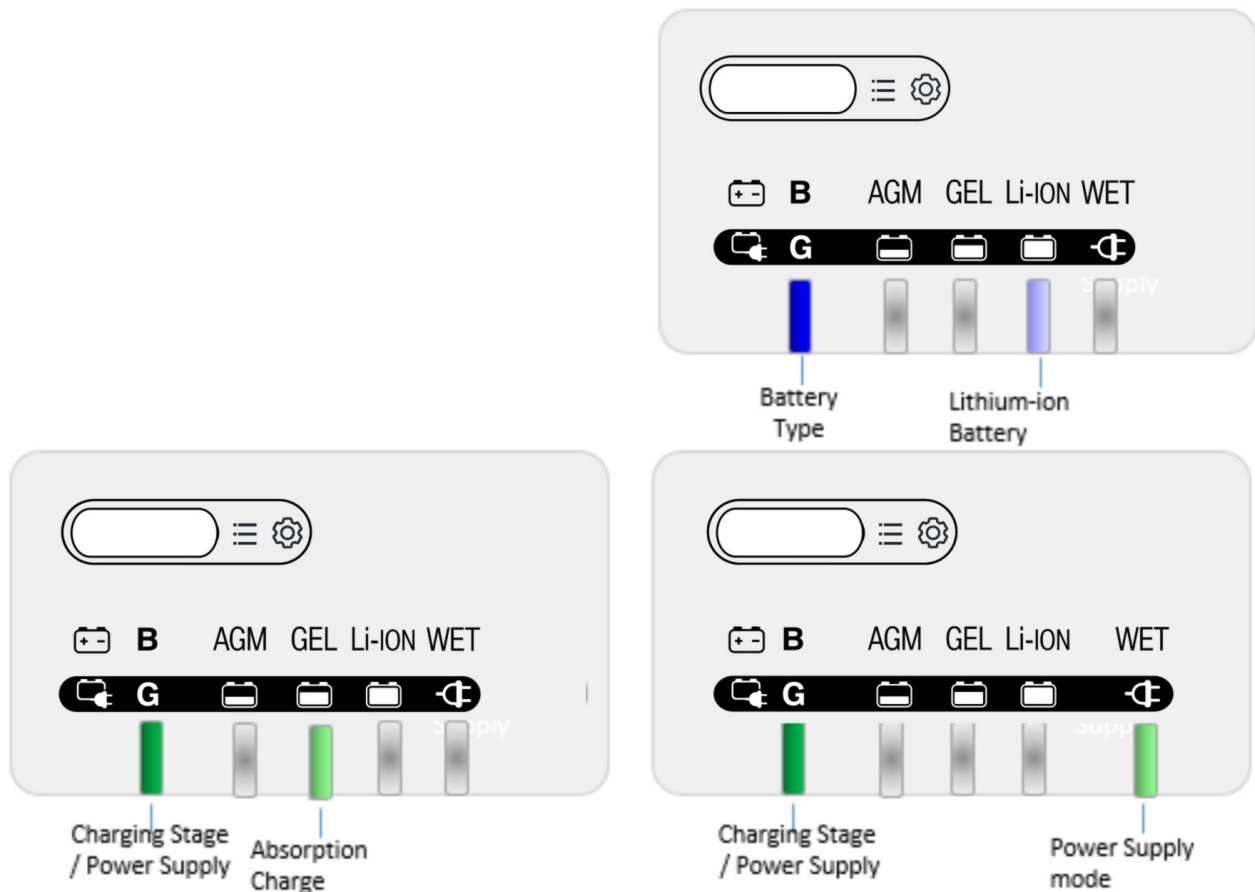


Figure 5-2 BS1210

When the LED1 is green, it is in the indication of charging status. You can also set this battery charger into a power supply by pressing this button for 3secs entering into setting mode.

Status	LED 1	LED2	LED3	LED4	LED5
	Green	Green			
Bulk	☼	☼	●	●	●
Absorption	☼	●	☼	●	●
Float	☼	●	●	☼	●
Power supply	☼	●	●	●	☼

If the LED1 is blue, it is in the indication of battery type. You can also set the battery type after long press the button for 3secs.

Battery type	LED1	LED2	LED3	LED4	LED5
	BLUE	Green			
AGM	☼	☼	●	●	●
GEL	☼	●	☼	●	●
LFP	☼	●	●	☼	●
WET	☼	●	●	●	☼





















If the LED1 is red, it is in the indication of battery charger power. You can also set the power after long press the button for 3secs. (In addition to 12V10A model)

Charging current percentage	LED1	LED2	LED3	LED4	LED5
	Red	Green			
25%	☼	☼	●	●	●
50%	☼	●	☼	●	●
75%	☼	●	●	☼	●
100%	☼	●	●	●	☼

6. FAQ

6.1 Fault indicator






When the LED1 is red and flashing, it is fault indication. Please refer the below table for details. If the user switch on the AC grid before the connection of battery, there will be “Battery not connected” indication. To exit this alarm, short press the main button after well connecting the battery.

Fault	LED	LED2	LED3	LED4	LED5
	Flash, Red	Green			
O/P over voltage					
Charger over temp					
O/P short circuit					
Battery not connected or reverse polarity					

7. Optional remote control RBS introduction

An optional remote control RBS can be connected to BS via a communication line, (In addition to 12V10A model) and there are 3 LEDs and 2 buttons to check and set the status of BS synchronously.



NO.	Character	Label	Description
1	LED1		Power Mode
2	LED2		Charge status
3	LED3		Fault indication
4	Silent Button		Silent Mode Setting
5	Power Switch Button		Power Switch

LED1 indicates the working mode of BS:

LED1: Green	Mode of BS
Always on	Battery charge mode
Flash once every other second	Power supply mode
Flash once every other three seconds	Silent mode

LED2 indicates the charging status of BS:

LED2 : Green	Charging status of BS
Off	No charging
Flash once every other second	Bulk and Absorption
Always on	Float

LED3 indicates fault of BS:

LED3: Red	Fault of BS
Quick flash once every other two seconds	Over voltage
Quick flash twice every other two seconds	Over temp
Quick flash three times every other two seconds	Short circuit
Quick flash four times every other two seconds	Battery no connected or reverse polarity
Quick flash five times every other two seconds	Communication lost

Power switch button:

If you press the power switch button when the charger is operating normally, the charger will shut down immediately with all LED go out. And charger will restart after you press the power switch button again or restart the AC power.

Silent button:

If you press the silent button, the charging current will be reduced to 50%, and fan will stall during silent mode. You can recognize the silent mode via the LED1 if it flashes once every other three seconds. Press the silent button again to exit silent mode.

8. Specification

Model	BS1225	BS1225-3	BS1240	BS1240-3
Electrical				
Output voltage (PS mode) (VDC)	13.5V±0.27			
Max Output current (A)	25	25	40	40
Nominal input voltage (VAC)	165-265VAC,50/60Hz			
Charge algorithms	5 steps. soft start, bulk, absorption, float, recycle			
Temperature compensation	Automatically			
Absorption voltage (VDC)	AGM:14.4V, GEL:14.1V, LFP:14.4V, WET:14.7V			
Floating voltage (VDC)	AGM:13.5V, GEL:13.5V, LFP:13.5V, WET:13.7V			
Charging current (A)	25	25	40	40
Min battery voltage (VDC)	2V			
Efficiency	88%			
Input connector	IEC socket			
Output connector	M4 Screw (16mm²)			
Output	1+1	2+1	1+1	2+1
Ripple noise	≤200mVp-p			
Regulation Accuracy	≤2%			
Cooling	Fan cooling			
Working Temperature	-20℃ ~ 60℃（40℃~60℃ reduce the current）			
Protection				
Short circuit	Shutdown output, automatically restart when short circuit is removed			
Reverse polarity	No charging			
Charger over temp	Shut down the charger			
Battery over temp	Shut down the charger			
Standards				
LVD	EN60335-1, EN60335-2-29, EN62233			
EMC	EN55014-1, EN55014-2, EN61000-3-2, EN61000-3-3			
Structure				
Out case	Aluminum + plastic			
Dimension(mm)	249*165*74			
Weight(kg)	1.6			
IP class	IP20	IP22	IP20	IP22

Model	BS2412	BS2412-3	BS2420	BS2420-3
Electrical				
Output voltage (PS mode) (VDC)	27.0V±0.5			
Max Output current (A)	12	12	20	20
Nominal input voltage (VAC)	165-265VAC,50/60Hz			
Charge algorithms	5 steps. soft start, bulk, absorption, float, recycle			
Temperature compensation	Automatically			
Absorption voltage (VDC)	AGM:28.8V, GEL:28.2V, LFP:28.8V, WET:29.4V			
Floating voltage (VDC)	AGM:27.0V, GEL:27.0V, LFP:27.0V, WET:27.4V			
Charging current (A)	12	12	20	20
Min battery voltage (VDC)	4V			
Efficiency	88%			
Input connector	IEC socket			
Output connector	M4 Screw (16mm²)			
Output	1+1	2+1	1+1	2+1
Ripple noise	≤200mVp-p			
Regulation Accuracy	≤2%			
Cooling	Fan cooling			
Working Temperature	-20℃ ~ 60℃（40℃~60℃ reduce the current）			
Protection				
Short circuit	Shutdown output, automatically restart when short circuit is removed			
Reverse polarity	No charging			
Charger over temp	Shut down the charger			
Battery over temp	Shut down the charger			
Structure				
Out case	Aluminum + plastic			
Dimension(mm)	249*165*74			
Weight(kg)	1.6			
IP class	IP20	IP22	IP20	IP22

Model	BS1210
Electrical	
Output voltage (PS mode) (VDC)	13.5V±0.27
Max Output current (A)	10
Nominal input voltage (VAC)	85-265VAC,50/60Hz
Charge algorithms	5 steps. soft start, bulk, absorption, float, recycle
Temperature compensation	Automatically
Absorption voltage (VDC)	AGM:14.4V, GEL:14.1V, LFP:14.4V, WET:14.7V
Floating voltage (VDC)	AGM:13.5V, GEL:13.5V, LFP:13.5V, WET:13.7V
Charging current (A)	10
Min battery voltage (VDC)	2
Efficiency	88%
Input connector	Cable of 1.5 meter with CEE 7/7 plug
Output connector	Fixed cable,2.5mm ² , 1 meter
Output	1
Ripple noise	≤200mVp-p
Regulation Accuracy	≤2%
Cooling	Self cooling
Working Temperature	-20℃ ~ 60℃ (40℃~60℃ reduce the current)
Protection	
Short circuit	Shutdown output, automatically restart when short circuit is removed
Reverse polarity	No charging
Charger over temp	Shut down the charger
Battery over temp	Shut down the charger
Structure	
Out case	Aluminum + plastic
Dimension(mm)	175*114*53
Weight(kg)	1.0
IP class	IP20

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