

# SmartGen

MAKING CONTROL SMARTER

## BCW10 BATTERY CHARGING BOX USER MANUAL



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**Table 1 Software Version**

Date	Version	Note
2022-06-10	1.0	Original Release

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## 1 OVERVIEW

**BCW10 Battery Charging Box** is intelligent and multifunctional, which is specially designed for meeting the charging characteristics of the lead-acid engine starter batteries. Suitable for 24V battery and the maximum charge current is 10A.

With graphic LCD, BCW10 can not only display parameters as input/output voltage, current and power, but also can record charging process and form related charging curve to realize real time monitoring for the battery charging. Parameters can be configured from front panel and language is optional for English and Chinese with easy operation and high reliability.

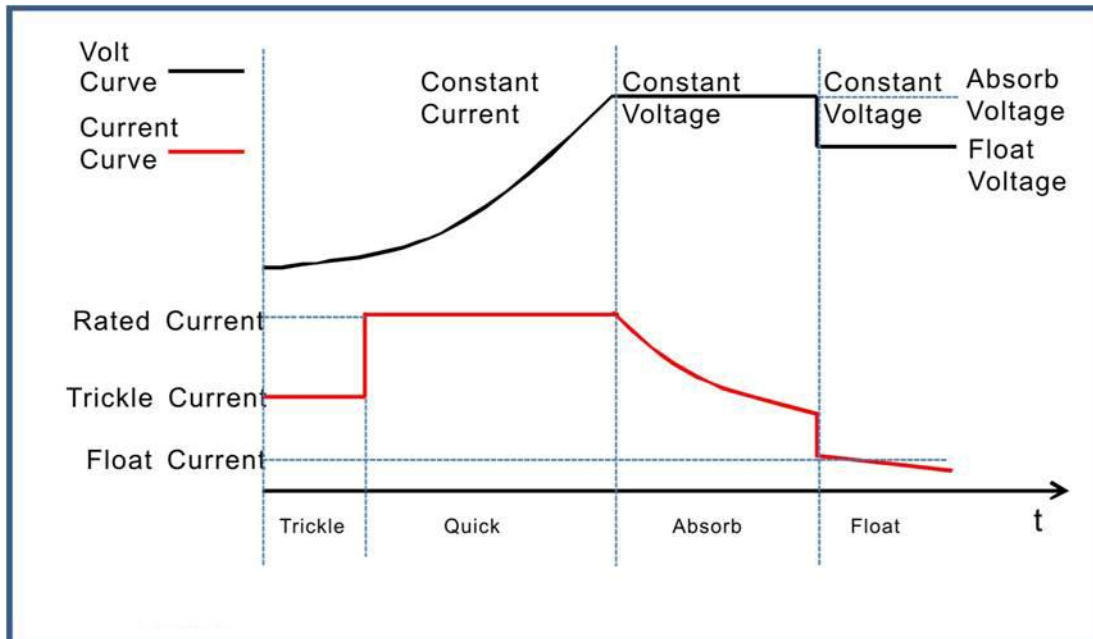
## 2 PERFORMANCE AND CHARACTERISTICS

BCW10 battery charging box is composed by BCM4 display module and BACM2410 battery charger.

- a) 132×64 LCD display with backlight, languages are optional(English, Chinese), easy operation.
- b) Collect and display parameters as input/output voltage, current, power and etc..
- c) Record and display battery charging time.
- d) Screen backlight duration can be set.
- e) Monitor battery charging process, so as to track battery charging stage and display battery voltage which has been charged by icon.
- f) Built-in output current protection circuit, it can effectively protect the charger when outputs overcurrent, short circuit and reverse connection and recovers output automatically after these phenomena are eliminated.
- g) With voltage detection interface, it can detect the voltage of battery charger in real time.
- h) Record charging volt/current and form charging curves according to the records.
- i) With abnormal communication, charging failure and mains failure alarms display function.
- j) Switching power supply structure with wide AC voltage range and high efficiency.
- k) Users can select automatic two-stage or three-stage automatic charging process as needed. Both the two charging process are carried out according to battery charging characteristics to prevent overcharging and significantly prolong battery lifetime.
- l) Built-in PFC circuit, the power factor calibration can reach 0.99.
- m) 10A rated charging current, and output current can be adjusted.
- n) Suitable for 24V battery pack.

### 3 CHARGING PRINCIPLE

#### 3.1 THREE-STAGE CHARGING DESCRIPTION



**Fig. 1 Three-stage Method Drawing**

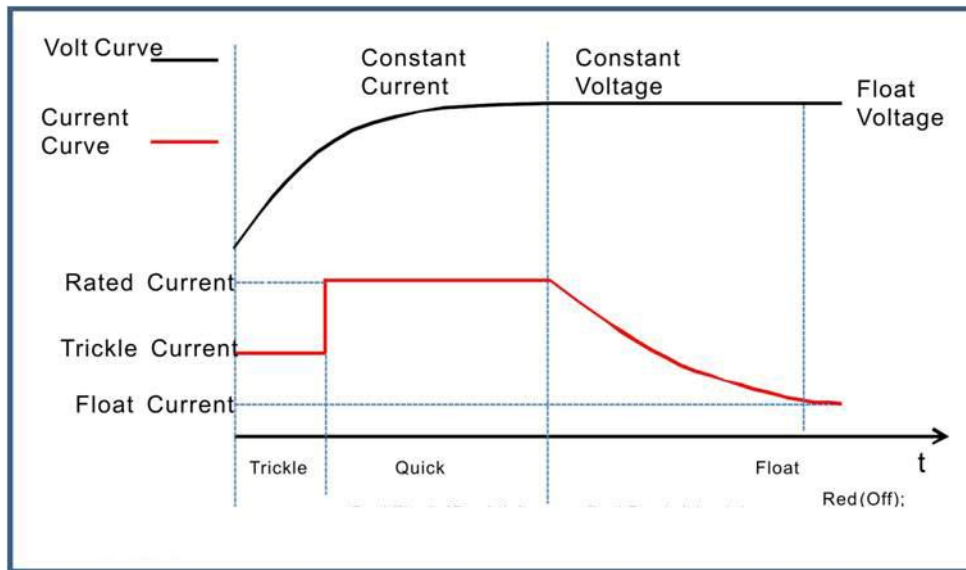
Charging is performed according to the battery charging characteristics using three-stage method.

1) The first stage is named as 'Constant Current': a) Trickle Charge: when the battery terminal voltage is relatively low, then the charging current is low likewise which can prevent the battery temperature being too high. The screen displays "Trickle charging" and charging state indicator flashes. b) Quick Charge: When the battery terminal voltage is relatively high, the charging current will rise to rated value. Large current charging operation leads to an increase in the electricity quantity of the battery. The screen displays "Quick charging" and charging status indicator flashes.

2) The second stage is named as 'Absorption Charge': after the first stage, the battery voltage rises to absorption charge value rapidly. The charger will keep constant voltage output and the charging current decreases slowly. The battery terminal voltage will stabilize in the absorption charge value. The screen displays "Absorption charging" and charging status indicator flashes.

3) The third stage is named as 'Float Charge': charging is basically completed after the two stages above. The charger will automatically switch to floating charging voltage, charging current will decrease to floating current, the screen displays "Float charging" and charging status indicator lights on. When float charging current is below 0.5A, screen displays: Charge complete: float charging". After that charging current will only neutralize the battery self-discharge, even long-term charging will not do harm to the battery. The battery can not only be maintained the fully state, but also the service life will be ensured.

### 3.2 TWO-STAGE CHARGING DESCRIPTION



**Fig. 2 Two-stage Method Drawing**

Charging is performed according to the battery charging characteristics using two-stage method.

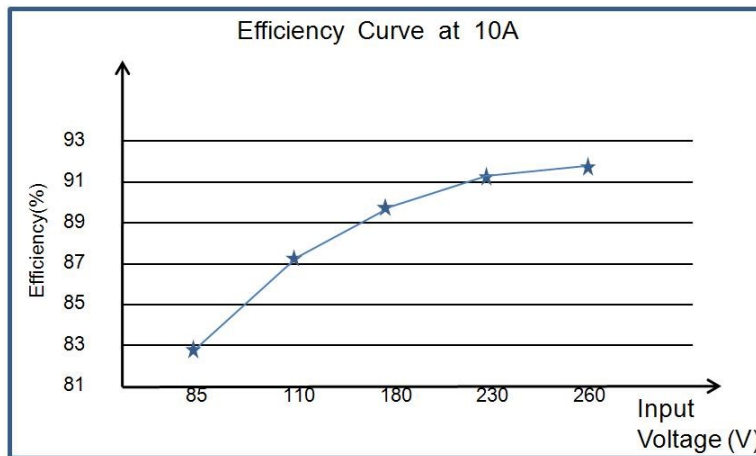
1) The first stage is named as 'Constant Current': a) Trickle Charge: when the battery terminal voltage is relatively low, then the charging current is low likewise which can prevent the battery temperature being too high. The screen displays "Trickle charging" and charging state indicator flashes. b) Quick Charge: When the battery terminal voltage is relatively high, the charging current will rise to rated value. Large current charging operation leads to an increase in the electricity quantity of the battery. The screen displays "Quick charging" and charging status indicator flashes.

2) The second stage is named as 'Float Charge': The charging current will decrease with the rising of battery electricity. The screen displays 'Float charging' and charging status indicator flashes. As soon as charging current value falls below 0.5A, the battery is basically charged. The screen displays "Charge Complete: float charging" and charging status indicator lights on. After that charging current will only neutralize the battery self-discharge, even long-term charging will not do harm to the battery. The battery can not only be maintained the fully state, but also the service life will be ensured.

**4 SPECIFICATION**

**Table 2 Technical Parameters**

Category	Item	Parameter	
		24V	
Input Performance	Nominal Input AC Volt Range	AC (100~240)V	
	Max Input AC Volt Range	AC (90~280)V	
	AC Frequency	50Hz/60Hz	
	Max Input kW	340W	
	Max Input Current	4A	
	Efficiency	AC 110V	AC 220V
		>86%	>88%
Power Factor Calibration	AC 110V	AC 220V	
	>0.99	>0.95	
Output Performance	No-load Output Volt	27V, error±1%	
	Rated Charging Current	10A, error±2%	
	Max Output Power	290W	
Insulating Property	Insulation Resistance	Between input and output, input and shell all are DC500V 10s; insulation resistance $R_L \geq 1M\Omega$	
	Insulation Voltage	Between input and output, input and shell all are: DC3000V 50Hz 1min leakage current: $I_L \leq 3.5mA$ Between output and shell is: DC800V 50Hz 1min leakage current: $I_L \leq 3.5mA$	
Working Environment	Working Temperature	(-30~+55)°C	
	Storage Temperature	(-40~+85)°C	
	Working Humidity	20%RH~93%RH( No condensation)	
	Storage Humidity	10%RH~95%RH( No condensation)	
Overall Structure	Weight	About 6.2kg	
	Overall Dimension	330mm×120mm×270mm(L×W×H)	
	Mounting Dimension	280mm×322mm	
Fuse of Input End	Fusing Current	10A	



**Fig. 3 Efficiency Curve**

**5 OPERATION**

**5.1 KEYS FUNCTION DESCRIPTION**

**Table 3 Key Description**

Icon	Function	Description
	Manual Boost	When in float charging stage, press this key to enter into absorption charging mode, and exit absorption charge mode automatically after arriving at absorption charge finished conditions.
	Current Adjust	Press this key to enter into charging current regulation interface so as to set charging current.
	Battery Type Selection	Press this key to select battery type that to be charged, if select self-adaption, charging box will automatic identify the battery types. (Not applicable for BCW10)
	Curves Check	Press this to enter into voltage curves record interface, and re-press it to enter into current curves record interface.
	Home Page	Return to homepage when in main interface; Exit and return back to home page when in parameters setting interface. Hold and press for 3s to enter into lamp testing function.
	Up/Increase	Screen scroll in main interface; Up cursor and increase value in setting menu; Left shift cursor in curves checking interface.
	Set	Press this key to enter menu interface; Shift cursor to confirm in parameters setting menu; Change time coordinate and zoom the coordinate axis in curves checking interface.
	Down/Decrease	Screen scroll in main interface; Down cursor and decrease value in setting menu; Right shift cursor in curves checking interface.



## 5.2 CHARGING BOX PANEL



Fig. 4 Charging Box Panel

### ▲ LED Indicator Illustration:

**Alarm Indicator:** flash when alarms occur; won't illuminate when there is no alarm.

**Charging Status Indicator:** won't illuminate when there is no battery charging; flash while in charging; indicator is normally on when full charged.



**Boost Status Indicator:** press Boost key to enter into Boost status and the indicator besides the key is normally on, if not enter into Boost status, it won't illuminate.



**12V Battery Indicator:** if battery type is selected as 12V or controller judge battery is 12V after choosing self-adaption function, the indicator is always on. (Not applicable for BCW10, only for 24V-battery pack)

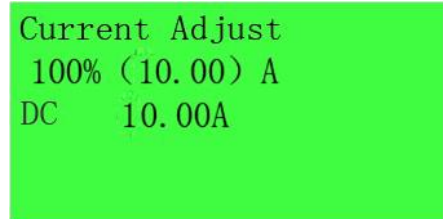
## 5.3 OUTPUT CURRENT SETTING OPERATION

Press  to enter into charging current regulation interface

(showing at right picture), then press  to select the number to

be changed and increase/decrease it via pressing  or .

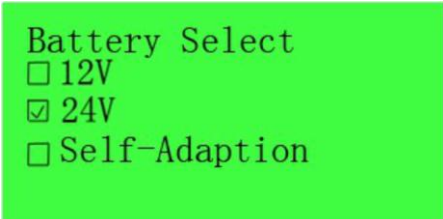
Re-press  to move to the next place to be changed. When reach to the last one, press  again to save the parameters and change the output current.







## 5.4 BATTERY TYPE SELECTION OPERATION







Press  to enter into battery selection interface (showing

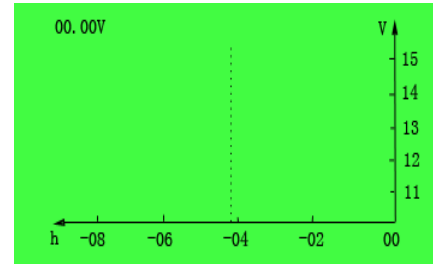
at right picture), then press , the second line 12V battery type



is selected and changed it via pressing  or . After battery type is selected, press  to save the option, and the symbol “” stands for the battery type following it has been selected. (Not applicable for BCW10, only 24V can be selected.)

### 5.5 CURVES CHECKING OPERATION

press  to enter into voltage curves interface (showing at right picture), and re-press it to enter into current curves interface. In curves page, press  or  will left/right shift vertical cursor step by step; hold and press  or  will continuously left/right shift vertical cursor. If cursor position is changed, the corresponding position's record value can be checked. When the cursor is moved to curved boundary, abscissa of the curve will left/right move one unit time automatically, thus users can check the earlier record. In curves interface, press  can change the length of unit of time, such as 2h can be changed as 4h, 6h, 8h, and 12h, aiming to compress the curve to show a wider period of time.



## 6 WARNINGS

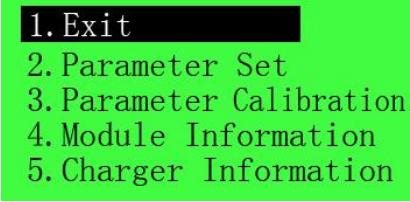





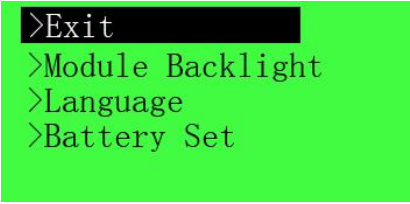














**Table 4 Warnings**







No.	Type	Description
1	Comm. Fail	If display module cannot receive the return data of battery charger, alarm indicator will flash and “Communication Fail” will be displayed in LCD.
2	Mains Fail	When output terminal of charging box does not connect with battery, mains will switch off and charging box will stop working; When connect with battery, controller detects mains switch off, charging box will continue to work if mains recover in 30s, otherwise, alarm indicator will flash and “Mains Fail” will be displayed in LCD.
3	Charging Fail	When charging box is in absorption charging status or quick charging status, simultaneously, output current is detected bellow 100mA for more than 30s, then alarm indicator will flash and “Charging Fail” will be displayed in LCD.

7 PARAMETER SETTINGS

Press  to enter parameter settings menu after start charging box.

Table 5 Parameter Setting Illustration

No	Interface	Operation
1		<p>Press  or  to page up or page down to select the content need to be set, and then press  to enter settings interface. Select 1. Exit and press  to return to the previous page, and then press  to go back to the main interface.</p>
2		<p>After selecting 2. Parameter settings of No.1 interface, press  or  to page up or page down to select the content need to be set, and then press  to enter settings page.</p>
3	 	<p>After selecting &gt;Module Backlight Set of No.2 interface, press  to enter. Cursor appears on the leftmost number after repressing . Press  again to right move cursor to select the content that needs to be changed, and increasing/decreasing number value through pressing  / . After the number is selected, press  to right move cursor until the cursor moves over the value group, and then repress  to finish the data setting. At last press  to return to the previous page, and then press  to go back to the main interface.</p>

No	Interface	Operation
4	<p>Language 0.Simplified Chinese</p> <p>Language 1.English</p>	<p>After selecting &gt;Language of No.2 interface, press  to enter, and cursor appears after repressing . Select parameter needs to be changed, and press  or  to choose the target parameter. Then press  to finish the setting. At last press  to return to the previous page, and then press  to go back to the main interface.</p>
5	<p>Battery Set &gt;Exit</p> <p>&gt;Rated Output Current &gt;Charge Current &gt;Battery Select</p>	<p>After selecting &gt;Battery Set of No.2 interface, press  to enter. Setting method is the same as No.2.No.3 and No.4, and details please to see the operations.</p>
6	<p>Module Information Module Type BCM4 SW Ver1.2 2022-06-11 HW Ver1.3 2017-01-21</p>	<p>After selecting 4. Controller Information of No.1 interface, press  to enter into and check controller's model, software/hardware version, release date, LCD and MCU temperature. Press  to realize liquid crystal heating.</p>
7	<p>Charger Information Type BACM2410 SW Ver1.5 2022-06-14 HW Ver1.0 2022-06-15</p>	<p>After selecting 5. Charger Information of No.1 interface, press  to enter into and check charger's model, software/hardware version and the release date.</p>

▲ **Note:** parameter setting values please refer to the following Parameter Content and range Table.

**Table 6 Parameter Content and Range**

Item	Parameter Range	Factory Default	Description
	24V	24V	
Module Backlight Set	(0-60)min	3min	0min always lights on
Language	(0~1)	0	0: Chinese 1: English
Output Current	Non-adjustable	10.0A	Max charging current
Charging Current	(0~100)%	100%	Max rated charging current percentage.
Battery Selection	(1~3)	2	1: 12V; 2: 24V; 3: Self-adaption
Charging Stage	(2~3)	3	2: Two-Stage; 3: Three-Stage
Absorption Charge Volt	(20~30)V	28.2V	Voltage value in constant volt charging mode.
Float Charge Volt	(20~30)V	27.0V	Voltage value in float charging mode.
Absorption Charge Time Enable	(0~1)	1	0: Disable; 1: Enable
Absorption Charge Time Set	(0.1~100)h	1.0h	Constant volt charging time
Absorption Charge End Current Enable	(0~1)	1	0: Disable; 1: Enable
Absorption Charge End Current Set	(0.20~3.00)A	0.5A	Current value when absorption charge turns to float charge.
Auto BOOST Volt Set	(20~30)V	25.6V	When battery charger in float charging status, battery turns to quick charging mode automatically as soon as battery volt drops to this value.
Auto BOOST Volt Delay	(0-3600)s	20s	Battery enters BOOST delay when battery volt drops to BOOST volt.
Low volt Trickle Charge Enable	(0~1)	1	0: Disable; 1: Enable
Low Volt Trickle Charge Volt	(20~30)V	22.0V	Voltage value of trickle charging.
Low Volt Trickle Charge Current	(0~100)%	50%	Max rated charging current percentage.

8 WIRING CONNECTION DIAGRAM

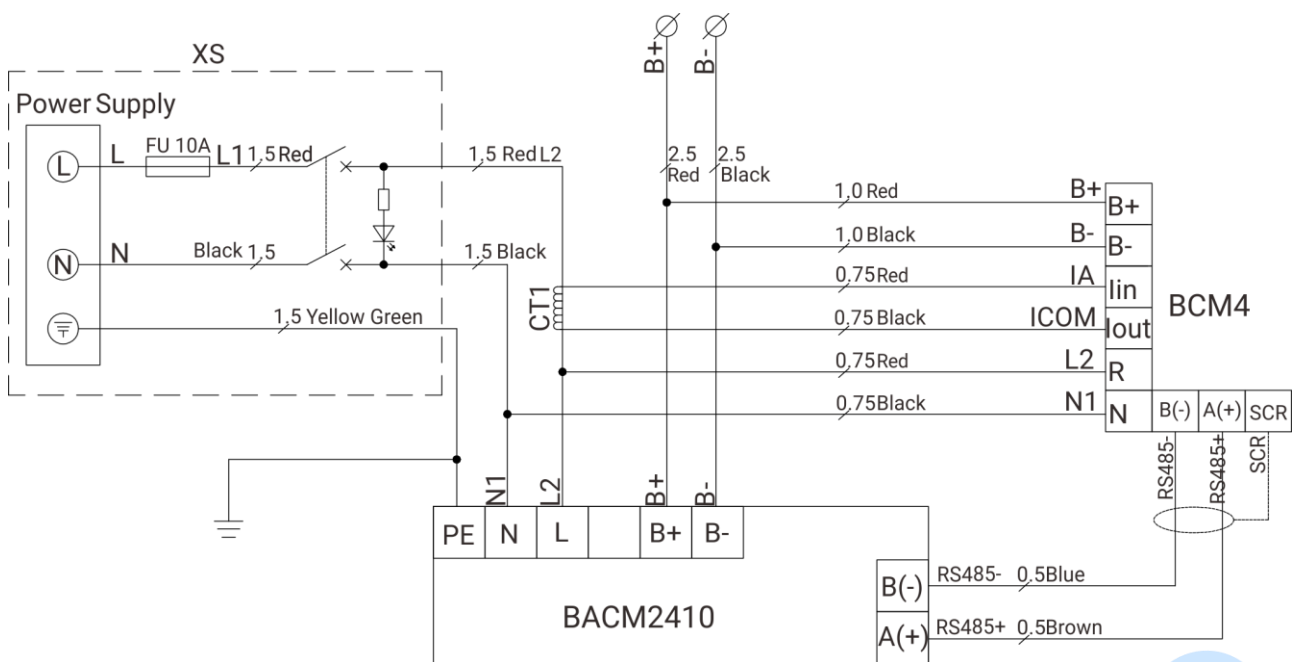


Fig. 5 Charger and Controller Internal Wiring Connection Diagram

9 OVERALL DIMENSION AND PANEL CUTOUT

Unit: mm

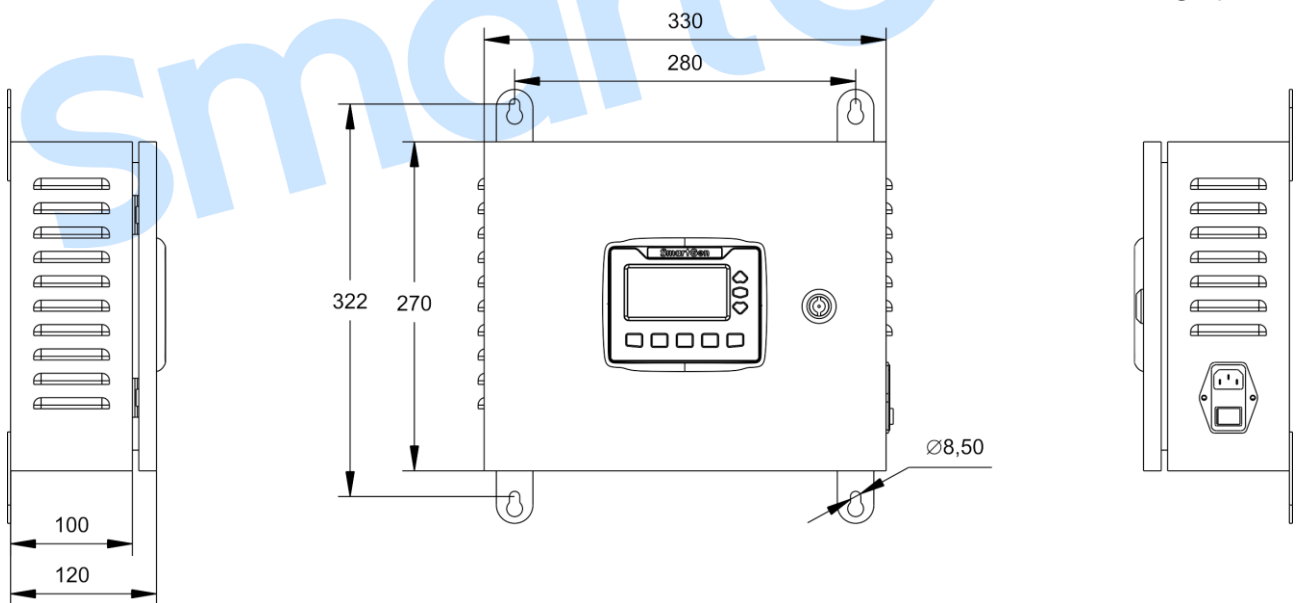


Fig. 6 Overall Dimension and Panel Cutout

**10 PACKING LIST****Table 7 Packing List**

No.	Name	Quantity	Remark
1	Charging Box	1	
2	AC Input Wire	1	Length: 1.5m Specification: 16A 250V
3	Pothook	1	
4	Certification	1	
5	User Manual	1	

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