SmartGen

MAKING CONTROL SMARTER

BCM4

CHARGER CONTROLLER

USER MANUAL

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Table 1 Software Version

Date	Version	Content
2025-08-06	1.0	Original release.

CONTENTS

1 OVERVIEW

BCM4 Charger Controller display part adopts graphic LCD, which not only can display parameters like input/output voltage, current and power, but also can record charging process and draw related charging curve to realize real-time monitoring of charging process. Related parameters can be configured from front panel and language can be chosen between English and Chinese. It is simple to operate and reliable to run.

2 PERFORMANCE AND CHARACTERISTICS

BCM4 is compatible with single-phase power supply chargers, such as BACM2410, BACM2420, etc.

BCM4-S01 is compatible with three-phase three-wire power supply charger BACM2440.

The controller's characteristics are as below:

a) 132×64 LCD display with backlight, optional language (English, Chinese), easy operation.
b) Collect and display parameters like input AC voltage, input AC current, input power, output DC voltage, output DC current, ouput power, etc.
c) Record and display current charging completion time.
d) Screen backlight duration can be set.
e) Monitor battery charging process, so as to track battery charging stage and display battery charged voltage with icons.
f) Record charging voltage/current and draw charging curves accordingly.
g) With communication failure, charging failure and mains failure alarm display function.
h) Users can select automatic two-stage charging or automatic three-stage charging as needed. Both ways are designed according to charging characteristics to prevent overcharging and significantly prolong battery lifetime.
i) Compatible with chargers including BACM2410, BACM2420, BACM2440, etc.
j) It can be used for 24V batteries by default, which can also be configured via parameter settings for 12V batteries application. Additionally, the self-adaptive function can be set to automatically detect the battery voltage type.

3 CHARGING PRINCIPLE

3.1 DESCRIPTION OF THREE-STAGE CHARGING

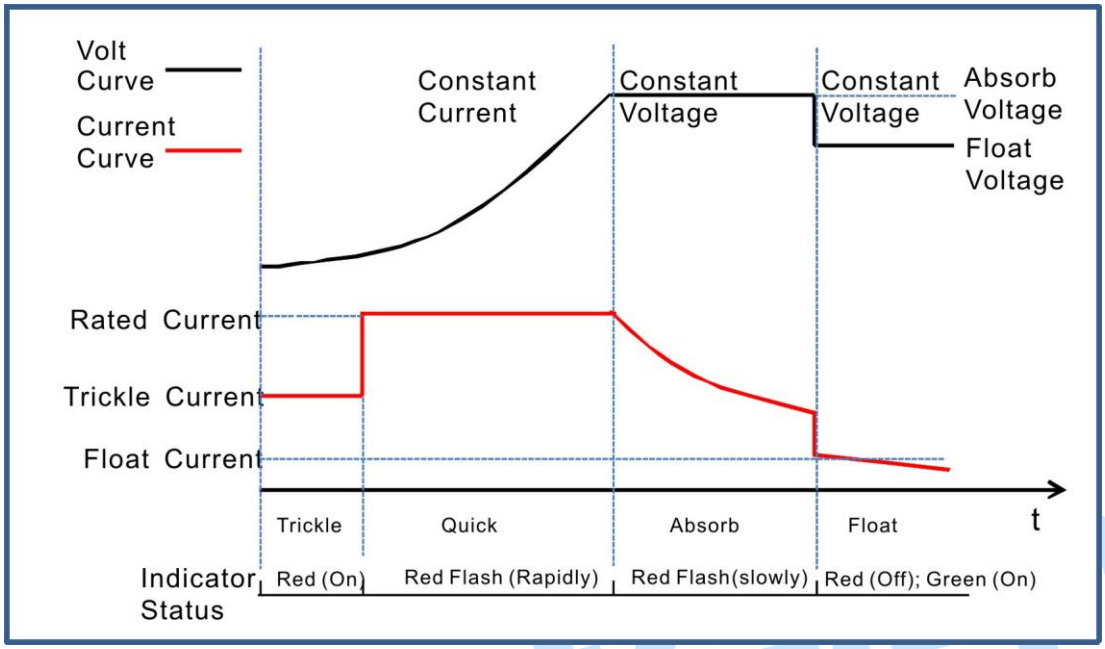


Fig.1 Three-stage Charging Curve

According to the battery charging characteristics, the charger will use three-stage mode as follows.

1) The first stage is named as Constant Current Charge: a) Trickle Charge: when the battery terminal voltage is relatively low, then the charging current is low likewise which can prevent the battery damage due to high temperature. During the stage, “Charging: Trickle” is displayed on the screen, and the charging indicator is flashing. b) Quick Charge: When the battery terminal voltage is relatively high, the charging current will rise to the rated value. Large current charging operation will increase the battery capacity quickly. During the stage, “Charging: Quick” is displayed on the screen, and the charging indicator is flashing.
2) The second stage is named as Boost (Absorption) Charge: after the first stage, the battery voltage will rise to absorption charge value rapidly, and the charger output voltage will keep constant. The battery terminal voltage will stabilize at the absorption charge value while the charging current decreases slowly. During the stage, “Charging: Boost” is displayed on the screen, and the charging indicator is flashing.
3) The third stage is named as Float Charge: after the two stages above, the battery is close to being fully charged, the charger output voltage automatically switches to float voltage and the charging current reduces to float charging current. “Charging: Boost” is displayed on the screen, and the charging indicator is flashing. The charging current will decrease slowly to compensate the battery self-discharge later. When float charging current falls below 0.5A, “Charged: Float” is displayed on the screen, and the charging indicator is always on. After that, the charging current will

compensate the battery self-discharge later. And long-term charging won't be harmful to the battery, as the charger can keep the battery fully charged and guarantee a long lifetime of the battery.

3.2 DESCRIPTION OF TWO-STAGE CHARGING

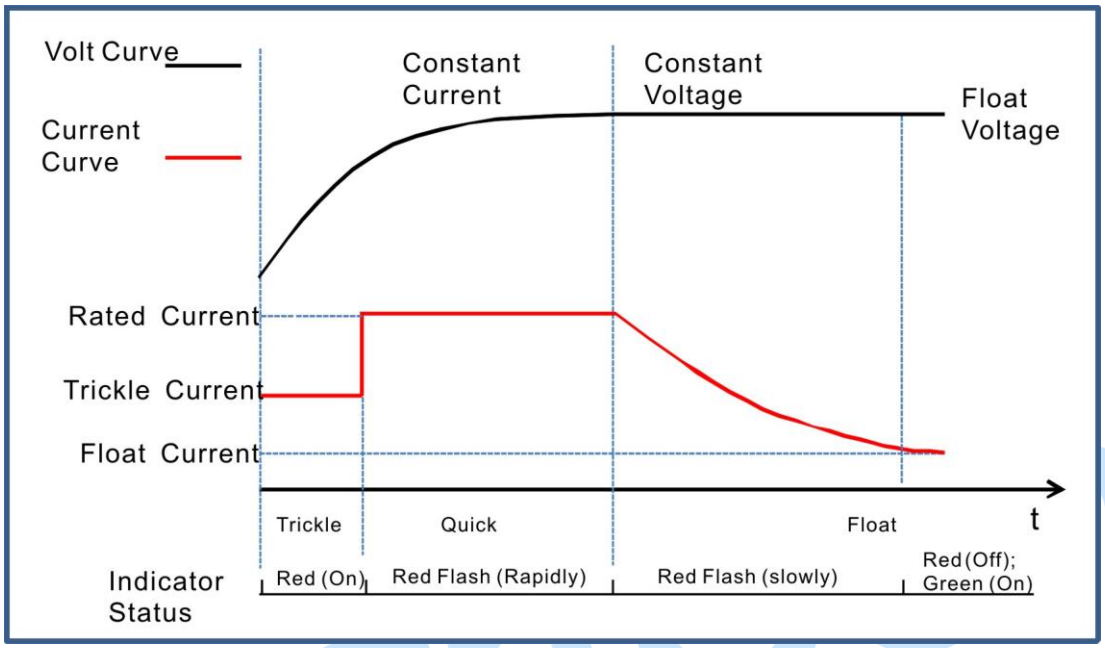


Fig.2 Two-stage Charging Curve

1) The first stage is named as Constant Current Charge: a) Trickle Charge: when the battery terminal voltage is relatively low, then the charging current is low likewise which can prevent the battery damage due to high temperature. During the stage, "Charging: Trickle" is displayed on the screen, and the charging indicator is flashing. b) Quick Charge: When the battery terminal voltage is relatively high, the charging current will rise to the rated value. Large current charging operation will increase the battery capacity quickly. During the stage, "Charging: Quick" is displayed on the screen, and the charging indicator is flashing.
2) The second stage is named as Float Charge: The charging current will decrease with the rising of battery capacity. "Charging: Float" is displayed on the screen, and the charging indicator is flashing. As soon as the charging current value falls below 0.5A, the battery is close to being fully charged. "Charged: Float" is displayed on the screen, and the charging indicator is always on. After that, the charging current will compensate the battery self-discharge later. And long-term charging won't be harmful to the battery, as the charger can keep the battery fully charged and guarantee a long lifetime of the battery.

4 OPERATION

4.1 KEY FUNCTION DESCRIPTION

Table 2 Key Description

Icon	Key	Description
	Manual Boost	When the charging box is in float charging stage, press it to enter boost (absorption) charging mode, and exit automatically after reaching boost (absorption) charging completion conditions.
	Current Adjustment	Press it to enter charging current adjustment interface so as to set charging current.
	Battery Type Select	Press it to select battery type that to be charged, if select self-adaption, charging box will automatically determine the connected battery types.
	Curve View	Press it to enter voltage curve record interface, and re-press it to enter current curve record interface.
	Homepage	Press it to return to homepage in main interface; Exit parameter setting and return to homepage in parameter setting interface. Hold and press for 3s to enter into lamp test function.
	Up/Increase	Screen scroll in main interface; Up cursor or increase value in setting menu; Left shift cursor in curve view interface.
	Set	Press it to enter menu interface; Shift cursor and confirm information in parameter setting; Change time coordinate and zoom the coordinate axis in curve view interface.
	Down/Decrease	Screen scroll in main interface; Down cursor or decrease value in setting menu; Right shift cursor in curve view interface.

4.2 CHARGING BOX PANEL

Fig.3 Charging Box Panel

NOTE: LED indicators description:

Alarm Indicator: It is flashing when there is alarm; and off when there is no alarm.

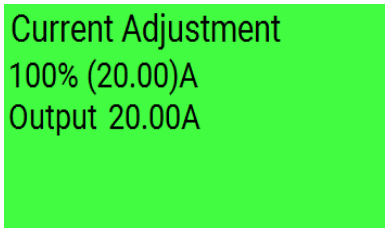
Charging Status Indicator: It is off without charging, flashing during charging, and always on when fully charged.

Boost Status Indicator: It enters Boost status after pressing "Boost" key, indicator keeps on; indicator will extinguish when not in Boost status.

12V Power Supply Indicator: When battery type is selected as 12V or 12V battery is judged after choosing self-adaption function, the indicator is always on.

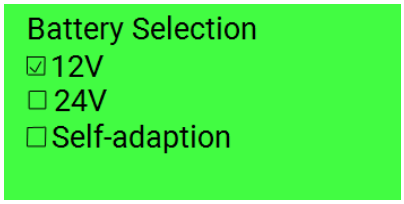
4.3 OUTPUT CURRENT SETTING OPERATION

Press A to enter charging current adjustment interface (showing as 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 position to be changed. When reach to the last one, press again to save the parameters, thus modifying the output current..



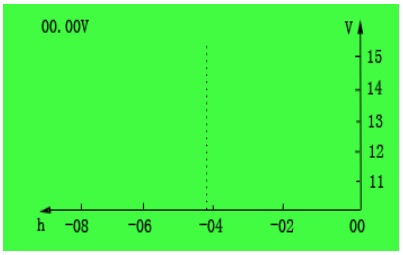
4.4 BATTERY TYPE SELECTION OPERATION

Press 12/24 to enter battery selection interface (showing as right picture), then press , the second line turns black, showing 12V battery type is selected, change the type 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.

4.5 CURVE VIEW OPERATION



Press A/V to enter voltage curve interface (showing as right picture), and re-press it to enter current curve interface. In curve interface, short press ▲ or ▼ will left/right shift vertical cursor one-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 curve boundary, abscissa of the curve will left/right move one unit time automatically, thus users can check the earlier record. In curve interface, press ⚙ can change the length of unit time, such as 2h can be changed as 4h, 6h, 8h, and 12h, aiming to compress the curve to show a curve for a wider time period.

5 WARNING

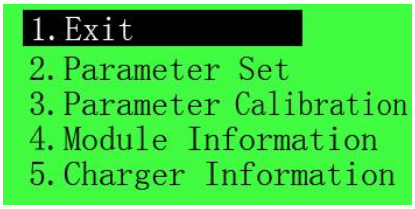
Table 3 Warning

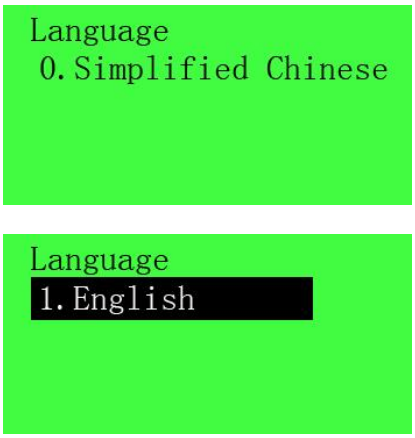
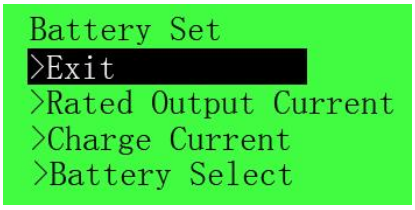
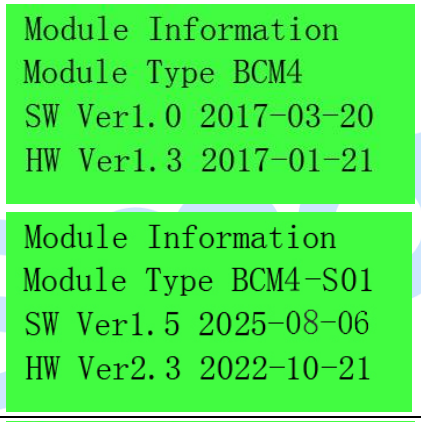
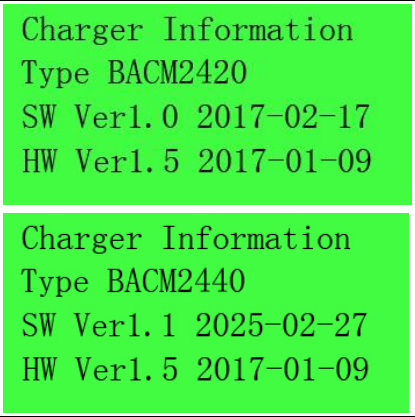
No.	Type	Description
1	Comm. Failure	When display module cannot receive the charger data, alarm indicator will flash and "Communication Failure" will be displayed in LCD.
2	Mains Failure	When output terminal of charging box does not connect with battery, mains will switch off and charging box will stop working; When connecting with battery, charger detects mains switch off, it will continue to work if mains recover in 30s; otherwise, alarm indicator will flash and "Mains Failure" will be displayed in LCD.
3	Charging Failure	When charging box is in boost (absorption) charging stage or quick charging stage, simultaneously, output current is detected below 100mA for 30s, then charging fails and alarm indicator will flash, "Charging Failure" will be displayed in LCD.

6 PARAMETER SETTING

Press to enter parameter settings menu.

Table 4 Parameter Setting Operation

No.	Interface	Operation
1		Press or to up or down to select the content needs to be set, and then press to enter setting. Select 1. Exit and press to return to the previous page, and then press to go back to the main interface.
2		After selecting 2. Parameter Set of No.1 interface, press to enter this interface; press or to select the content needs to be set, and then press to enter setting.
3	 	After selecting >Module Backlight of No.2 interface, press to enter this interface. Cursor appears on the leftmost number after repressing . Press again to right move cursor to select the content needs to be changed, and increase/decrease number value through pressing or . After setting, press to move cursor until the cursor moves to the last digit of 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.

No.	Interface	Operation
4		After selecting >Language of No.2 interface, press to enter this interface, 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.
5		After selecting >Battery Set of No.2 interface, press to enter this interface. Setting method is same as No.2, No.3 and No.4, and operation details please to see No.2, No.3 and No.4 operation.
6		After selecting 4. Module Information of No.1 interface, press to enter this interface to check controller's model, software/hardware version and the release date.
7		After selecting 5. Charger Information of No.1 interface, press to enter this interface to check charger's model, software/hardware version and the release date.

NOTE: Parameter setting please refer to the following *Parameter Setting Contents and Range Table*.

Table 5 Parameter Setting Contents and Range Table

Item	Parameter Range		Default Value		Description
	24V	12V	24V	12V	
Module Backlight Set	(0-60)min		3min		Always on for 0min.
Language	(0~1)		0		0: Simplified Chinese; 1: English
Rated Output Current	Non-adjustable		BACM2420(20.0A) BACM2440(40.0A)		Maximum charging current.
Charging Current	(0~100)%		100%		Maximum 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.
Boost Charging Voltage	(20~30)V	(10~15)V	28.2V	14.1V	Voltage value in constant voltage charging mode.
Float Charging Voltage	(20~30)V	(10~15)V	27.0V	13.5V	Voltage value in float charging mode.
Boost Charging Time Enable	(0~1)		1		0: Disable; 1: Enable
Boost Charging Time Set	(0.1~100)h		1.0h		Constant voltage charging time.
Boost Charging Completion Current Enable	(0~1)		1		0: Disable; 1: Enable
Boost Charging Completion Current Set	(0.20~3.00)A		0.5A		Current value when boost charging turns to float charging.
Auto BOOST Volt Set	(20~30)V	(10~15)V	25.6V	12.8V	When charger in float charging mode, battery turns to quick charging mode automatically as soon as battery voltage drops to this value.
Auto BOOST Volt Delay Value	(0~3600)s		20s		Battery enters BOOST delay when battery voltage drops to BOOST voltage.
Low-voltage Trickle Charging Enable	(0~1)		1		0: Disable; 1: Enable
Low-voltage Trickle Charging Voltage	(20~30)V	(10~15)V	22.0V	11.0V	Voltage value of trickle charging.
Low-voltage Trickle Charging Current	(0~100)%		50%		Max rated charging current percentage.

7 WIRING CONNECTION

The rear panel of BCM4 controller is as follows:

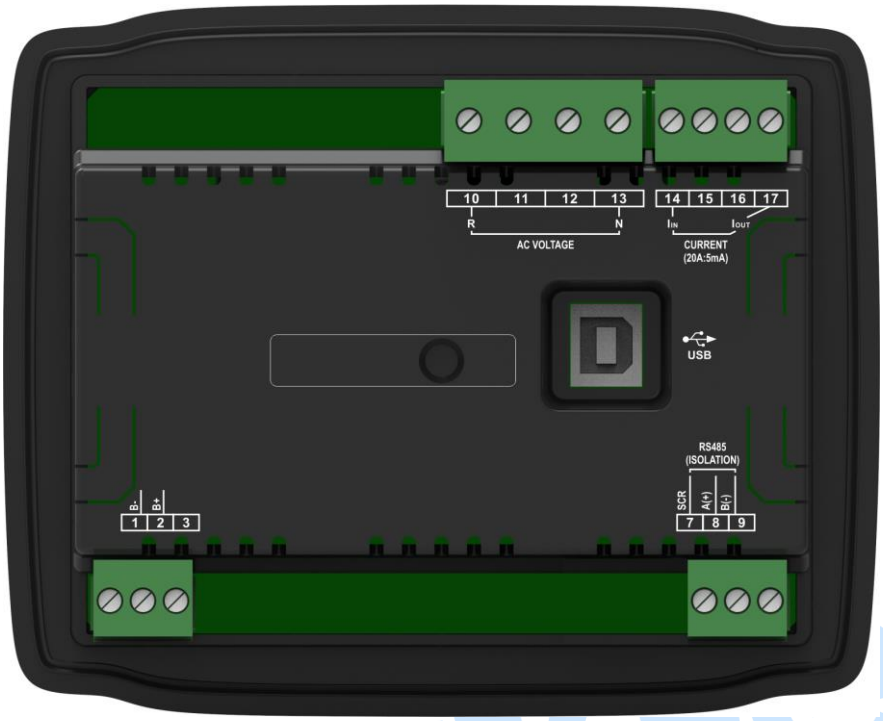


Fig.4 Controller Rear Panel

Table 6 Wiring Terminal Connection Description

No.	Function	Cable Size	Remark
1	B-	2.5mm²	Connect to negative of starting battery.
2	B+	2.5mm²	Connect to positive of starting battery; If wire length is over 30m, better to double wires in parallel. Max. 20A fuse is recommended.
7	RS485 SCR	/	Impedance-120Ω shielding wire is recommended with its single-end grounded.
8	RS485+	0.5mm²	
9	RS485-	0.5mm²	
10	Mains R Phase Volt Monitoring	1.0mm²	Connect to Mains R phase (2A fuse is recommended).
11	Mains S Phase Volt Monitoring	1.0mm²	Available for BCM4-S01. Connect to Mains S phase (2A fuse is recommended).
12	Mains T Phase Volt Monitoring	1.0mm²	Available for BCM4-S01. Connect to Mains T phase (2A fuse is recommended).
13	Mains N Wire	1.0mm²	
14	CT A Phase Monitoring	2.5mm²	Connect to CT secondary coil externally.
15	CT B Phase Monitoring	2.5mm²	Available for BCM4-S01. Connect to CT secondary coil externally.

No.	Function	Cable Size	Remark
16	CT C Phase Monitoring	2.5mm^2	Available for BCM4-S01. Connect to CT secondary coil externally.
17	CT COM	1.5mm^2	

8 INTERNAL WIRING DIAGRAM

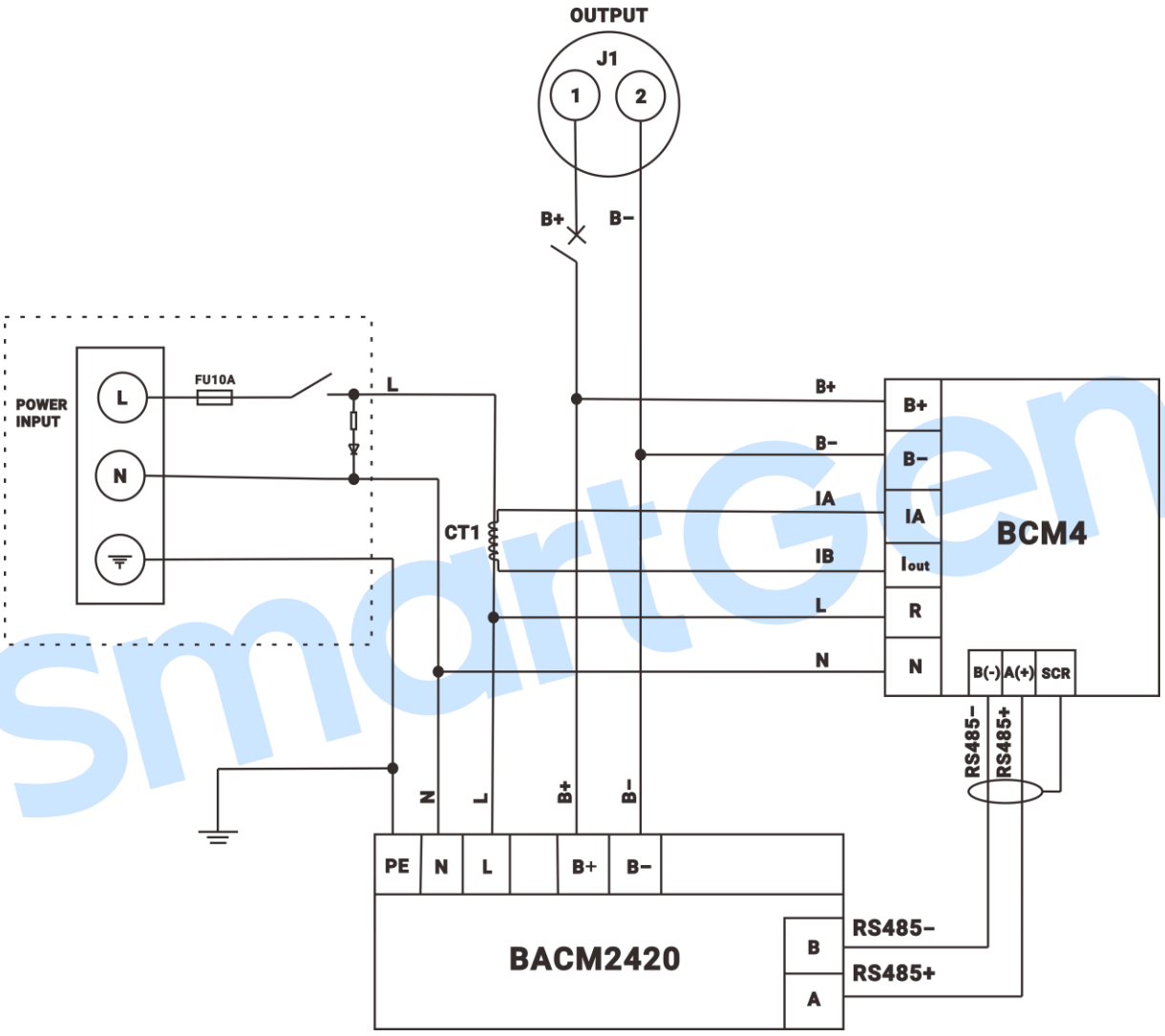


Fig.5 Internal Wiring Diagram of BCM4 for BACM2420

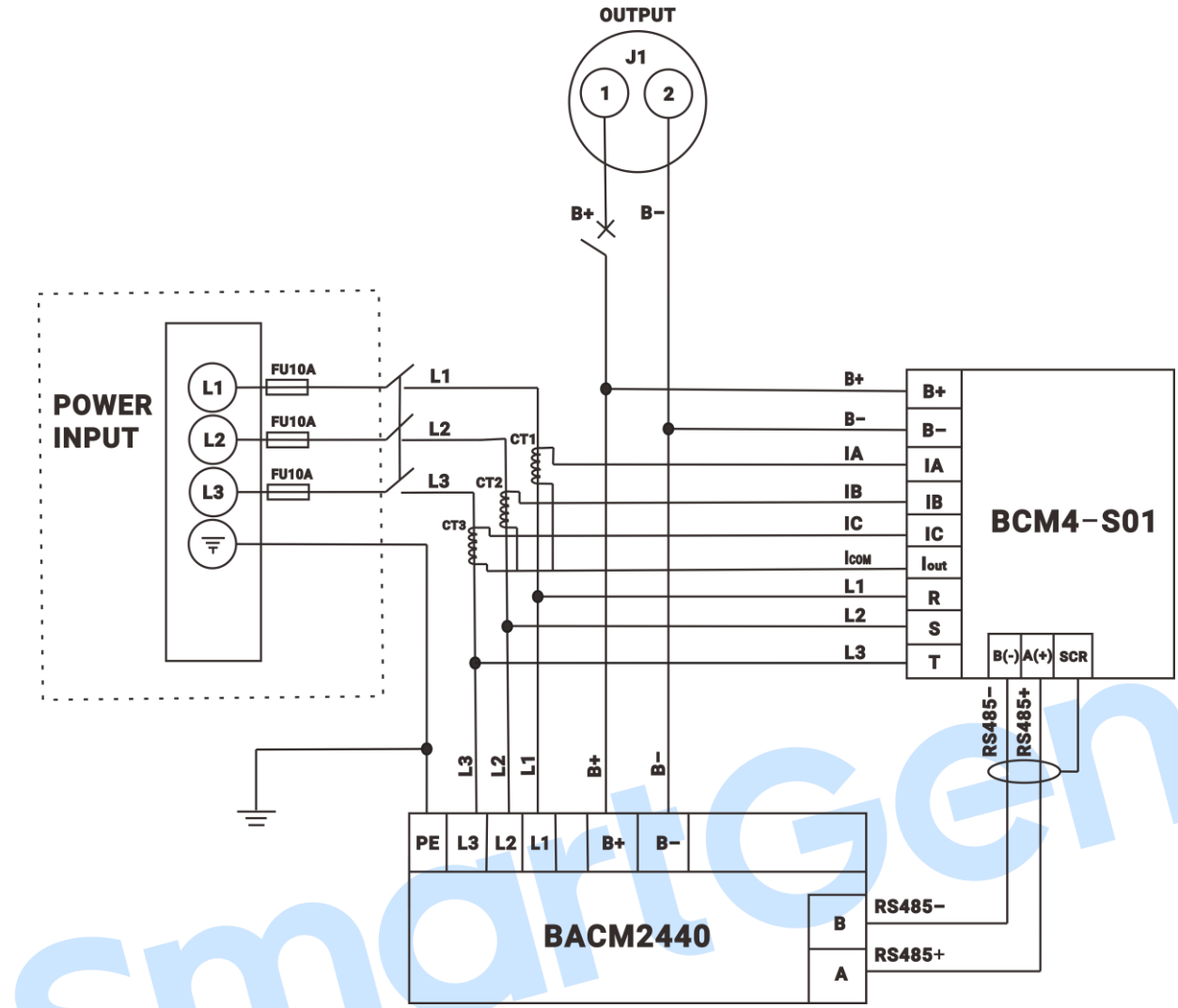


Fig.6 Internal Wiring Diagram of BCM4-S01 for BACM2440

9 OVERALL DIMENSIONS

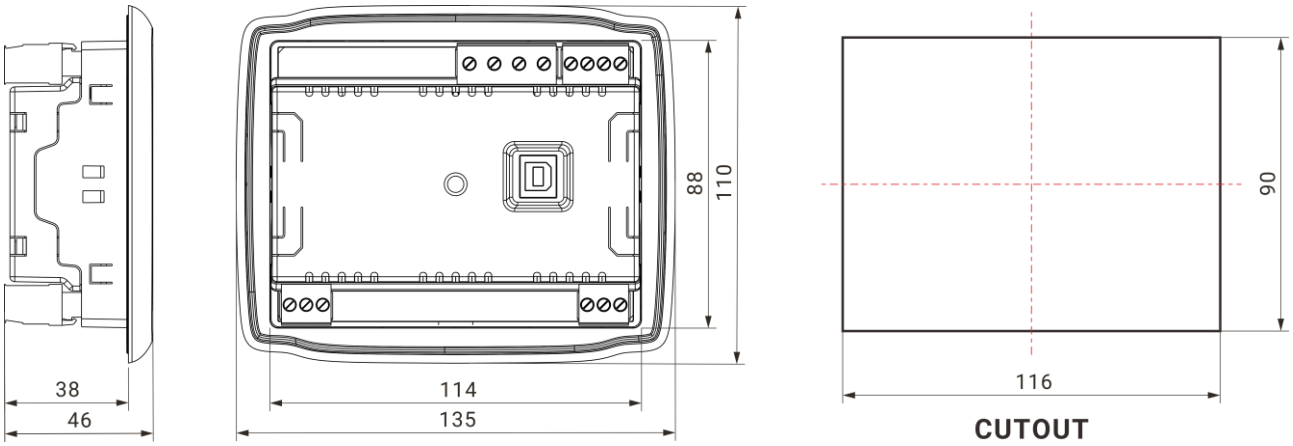


Fig.7 Overall Dimensions (Unit: mm)