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MAKING CONTROL SMARTER

BACM2440 BATTERY CHARGER USER MANUAL



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Table 1 Software Version

Date	Version	Note
2025-05-10	1.0	Original Release.
2025-11-27	1.1	Modify the dimensions of housing opening and bracket.

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1 OVERVIEW

BACM2440 battery charger is intelligent and multi-functional battery charger designed for the charging characteristics of various battery types, including lead-acid, lithium-ion, and nickel-cadmium, for engine starting applications. This charger is compatible with 24V or 12V battery systems, delivering a maximum output current of 40A. Additionally, it can function as a DC power supply, providing stable power to DC24V or DC12V equipment.

2 PERFORMANCE AND FEATURES

- 1) Switching mode power supply structure allows for wide AC input voltage range, small size, light weight, and high efficiency;
- 2) Users can select two-stage or three-stage automatic charging mode as needed. Both are designed according to battery charging characteristics to prevent overcharging of lead-acid batteries and ensure optimum battery service life;
- 3) Built-in power factor correction (PFC) circuit can calibrate the power factor up to over 0.9;
- 4) Battery voltage detection ports can precisely detect the battery voltage;
- 5) Temperature sensor input port allows for monitoring the battery temperature in real time, and temperature compensation function can prevent high battery temperature effectively;
- 6) Auxiliary output port that supports combined output of alarms for battery under voltage, over voltage, and charging failure, with this port outputting low level signal;
- 7) Mains failure output port will output low level signal immediately when the AC power input is interrupted;
- 8) The charger is suitable for 24V battery under default setting, and it can charge 12V battery after modifying configuration. The maximum rated charge current is 40A;
- 9) LED indicators on the panel to show the charging status: fully charged (green) and charging (red);
- 10) RS485 and CAN communication ports;
- 11) Bluetooth communication function allows the charger to connect to the app on the smartphone, which can set the charge parameters, such as voltage or current, and monitor the charge status;
- 12) It features a corrosion-resistant metal enclosure, vertical screw mounting, and a compact size for easy installation.

3 SPECIFICATIONS

Table 2 Product Parameters

Items	Contents	Parameters			
		24V		12V	
Input Characteristics	Nominal AC Input Voltage	AC (300~500)V (Three Phase /Two Phase)			
	Rated AC Input Voltage	AC 380V (Three Phase /Two Phase)			
	AC Input Frequency	50Hz/60Hz			
	Max. Input Active Power	1450W		750W	
	Max. Input Current	5A		3A	
	Max. Efficiency	91%		83%	
	Power Factor Calibration	AC 340V >0.9	AC 500V >0.85	AC 340V >0.86	AC 500V >0.72
Output Characteristics	Max. No-load Output Voltage	32V, Error±1%		16V, Error±1%	
	Float Charge Voltage	27.00V		13.50V	
	Absorption Charge Voltage	28.20V		14.10V	
	Rated Charge Current	40A, Error±2%			
	Max. Output Power	1280W		640W	
Insulation Performance	Insulation Resistance	Between input and output, input and enclosure are: $R_L \geq 50M\Omega$ @ DC 500V-1min			
	Withstand Voltage	Between input and output, input and enclosure: Leakage current: $I_L \leq 3mA$ @ AC 3000V/50Hz-1min Between output and enclosure: Leakage current: $I_L \leq 3mA$ @ AC 500V/50Hz-1min			
Working Condition	Working Temperature	(-30~+55)°C			
	Storage Temperature	(-40~+85)°C			
	Working Humidity	20%RH~93%RH (No condensation)			
Overall Structure	Weight	3kg			
	Dimension	150mm×139mm×158mm (length*width*height)			

Table 3 Charge Parameters

Battery Type	Absorption Charge Voltage	Float Charge Voltage
Lead-Acid Battery	28.2V	27.0V
Lithium-ion Battery	29.4V	27.0V
Nickel-Cadmium Battery	29.0V	28.2V
Calcium-Calcium Battery	31.2V	27.6V

4 CHARGING PRINCIPLE

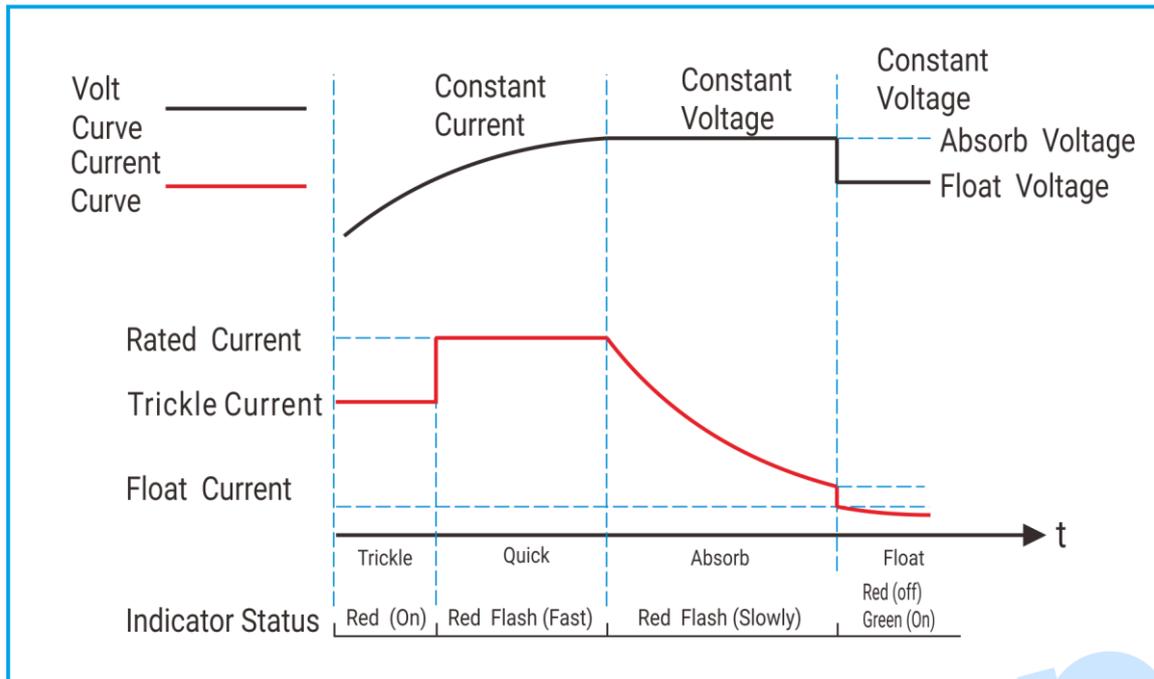


Fig.1 Three-stage Charging Curve

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. The charging indicator (red color) is always on.
 - 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. The charging indicator (red color) will flash rapidly (0.2s/per time).
- 2) The second stage is named as 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. The charging indicator (red color) will flash slowly (1s/per time).
- 3) The third stage is named as Float Charge: after the two stages above, the battery is close to being fully charged. When the charge current is lower than the absorption charge completion current, and the Float Charge is started automatically. In this stage, the charger output voltage reduces to float voltage and the charging current reduces to float value (red indicator will be off and the green indicator will be on). The charging current will decrease slowly to 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.

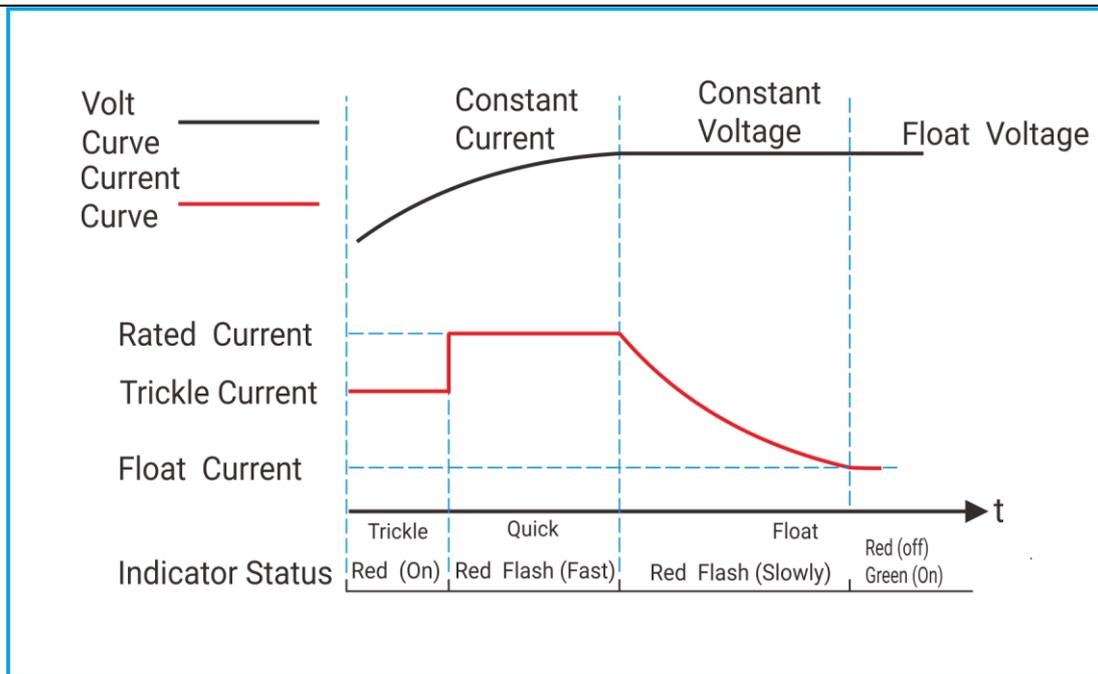


Fig.2 Two-stage Charging Curve

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. The charging indicator (red color) is always on.
 - 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. The charging indicator (red color) will flash rapidly (0.2s/per time).
- 2) The second stage is named as Float Charge: The charging current will decrease with the rising of battery capacity. The charging indicator (red color) will flash slowly (1s/per time). As soon as the charging current value falls below 0.3A, the battery is close to being fully charged (red indicator will be off and the green indicator will be on). The charging current will decrease slowly to 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.

Table 4 Charge Indicator Status

Mode	Indicator	Constant Current		Constant Voltage	Float Charge	Charging Failure
		Trickle Charge	Quick Charge			
Two-stage	Red	Always On	Flash (Rapidly)	None	Flash (Slowly)→ Off	Flash (Rapidly)
	Green	Off	Off	None	Off→Always On	
Three-stage	Red	Always On	Flash (Rapidly)	Flash (Slowly)	Off	Flash (Rapidly)
	Green	Off	Off	Off	Always On	

5 PARAMETERS CONFIGURATION

Table 5 Parameters Configuration

Items	Default		Adjustable Range		Description
	24V	12V	24V	12V	
Battery Type	0		(0~5)		0: Self-defined; 1: Pb-Acid Battery; 2: Li-ion Battery; 3: Ca-Ca Battery; 4: Power Supply; 5: Ni-Cd Battery.
Battery Selection	1		(0~2)		0: 12V; 1: 24V; 2: Self-adaptive (Automatically identifies 12V or 24V battery systems based on voltage).
Charging Mode	3		(2~3)		2: Two-stage; 3: Three-stage
Max. Rated Charge Current	40.0A		Nonadjustable		Maximum charge current
Rated Charge Current	100%		(0~100)%		The percentage of maximum charge current
Absorption Charge Voltage	28.2V	14.1V	(20~32)V	(10~16)V	The charge voltage of "Constant Voltage Charge"
Absorption Charge Delay	1		(0~1)		0: Disable; 1: Enable
Delay Setting	1.0h		(0.1~100)h		The charging time of "Constant Voltage Charge"
End of Absorption Charge Current	1		(0~1)		0: Disable; 1: Enable
End of Absorption Charge Current Setting	0.5A		(0.20~3.00)A		The transition current from "Absorption Charge" to "Float Charge"
Float Charge Voltage	27.0V	13.5V	(20~32)V	(10~16)V	The voltage of "Float Charge"
AUTO BOOST Voltage	25.6V	12.8V	(20~32)V	(10~16)V	When the charger is in "Float Charge" mode, it enters into "Quick Charge" mode automatically if the battery voltage has fallen below the set value
AUTO BOOST Voltage Delay	20s		(0~3600)s		If the battery voltage has fallen below the set value and the delay timer has expired, it enters into "Quick Charge" mode automatically
Trickle Charge	1		(0~1)		0: Disable; 1: Enable
Trickle Charge Voltage	22.0V	11.0V	(20~32)V	(10~16)V	The voltage of "Trickle Charge"

Items	Default		Adjustable Range		Description
	24V	12V	24V	12V	
Trickle Charge Current	50%		(0~100)%		The percentage of maximum charge current
Battery Voltage Detection	0		(0~1)		0: Disable; 1: Enable
Battery Under Voltage Alarm	1		(0~1)		0: Disable; 1: Enable
Battery Under Voltage Threshold	23.0V	11.50V	(16.0~32.0)V	(8.0~16.0)V	"Battery Under voltage" alarm will be initiated if the battery voltage has fallen below the threshold
Battery Under Voltage Delay	120s		(0~3600)s		"Battery Under Voltage" alarm will be initiated if the battery voltage has fallen below the threshold and the delay timer has expired
Battery Under Voltage Return Value	24.0V	12.0V	(16.0~32.0)V	(8.0~16.0)V	The "Battery Under Voltage" alarm will be cancelled when the battery voltage reaches this value
Battery Under Voltage Return Delay	10s		(0~3600)s		"Battery Under voltage" alarm will be cancelled if the battery voltage reaches the return value and the delay timer has expired
Battery Over Voltage Alarm	1		(0~1)		0: Disable; 1: Enable
Battery Over Voltage Threshold	30.0V	15.0V	(16.0~32.0)V	(8.0~16.0)V	"Battery Over voltage" alarm will be initiated if the battery voltage has exceeded the threshold
Battery Over Voltage Delay	120s		(0~3600)s		"Battery Over Voltage" alarm will be initiated if the battery voltage has exceeded the threshold and the delay timer has expired
Battery Over Voltage Return Value	27.6V	13.8V	(16.0~32.0)V	(8.0~16.0)V	The "Battery Over Voltage" alarm will be cancelled when the battery voltage reaches this value
Battery Over Voltage Return Delay	10s		(0~3600)s		"Battery Over voltage" alarm will be cancelled if the battery voltage reaches the return value and the delay timer has expired
Over Voltage Inhibit Charging	0		(0~1)		0: Disable; 1: Enable When it is enabled, if battery over voltage alarm occurs, the charger stops output.

Items	Default		Adjustable Range		Description
	24V	12V	24V	12V	
Temperature Sensor	1		(0~1)		0: Disable; 1: Enable
Temperature Compensation	1		(0~1)		0: Disable; 1: Enable
Temperature Compensation Set Value	0.036V/°C	0.018V/°C	(0.020~0.060) V/°C	(0.010~0.030) V/°C	The voltage compensation of every 1°C on the basis of 20°C
High Temp. Alarm	1		(0~1)		0: Disable; 1: Enable
High Temp. Threshold	55°C		(0~80) °C		“High Temp.” alarm will be initiated if the battery temperature has exceeded the threshold
High Temp. Delay	0.5s		(0~60.0)s		“High Temp.” alarm will be initiated if the battery temperature has exceeded the threshold and the delay timer has expired
High Temp. Return Value	50°C		(0~80)°C		The “High Temp.” alarm will be cancelled when the battery temperature reaches this value
High Temp. Return Delay	1.0s		(0~60.0)s		“High Temp.” alarm will be cancelled if the battery temperature has fallen below the return value and the delay timer has expired
Auxiliary Input Port	3		(0~4)		0: Not Used; 1: Shutdown: The battery charger enters into Standby Status if the input is active. 2: Enable Battery Voltage Detection: The battery charger enters into Standby Status if the input is active but there is no battery voltage signal. 3: Manual BOOST: The battery charger enters into BOOST mode if the input is active. 4: 12V Setting: The battery type will be set as 12V if the input is active.
Auxiliary Input Port Delay	2.0s		(0~60.0)s		The corresponding action will be initiated if the input is active and the delay timer has expired.

Items	Default		Adjustable Range		Description
	24V	12V	24V	12V	
Auxiliary Output Port	7		(0~7)		0: Not Used; 1: Under voltage 2: Over voltage 3: Charging failure 4: Under voltage or over voltage 5: Under voltage or charging failure 6: Over voltage or charging failure 7: Under voltage, over voltage or charging failure (It is active when outputting low level signal if any one above is met)
Communication Address	10		1~254		RS485 Communication Address
Baud Rate	0		(0~2)		0: 9600bps; 1: 19200bps; 2: 38400bps.

6 CHARACTERISTIC CURVES

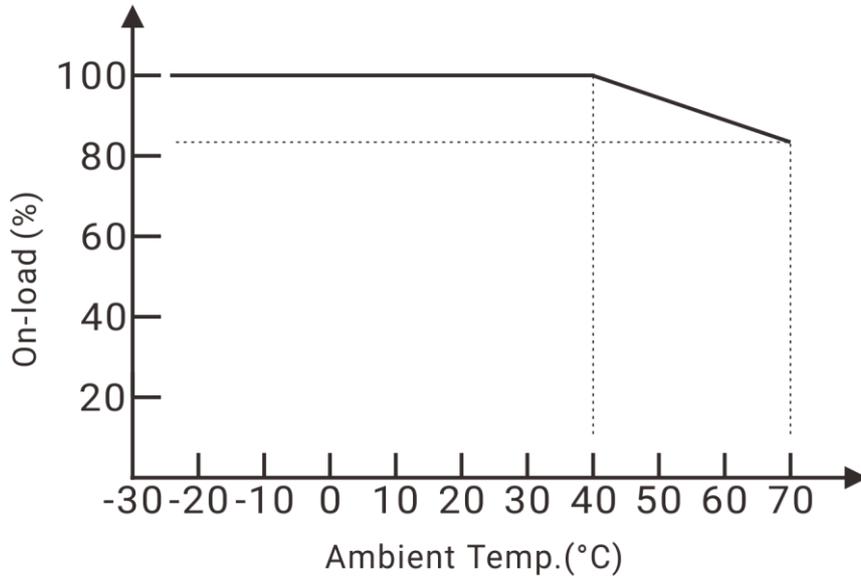


Fig. 3 Derating Curve

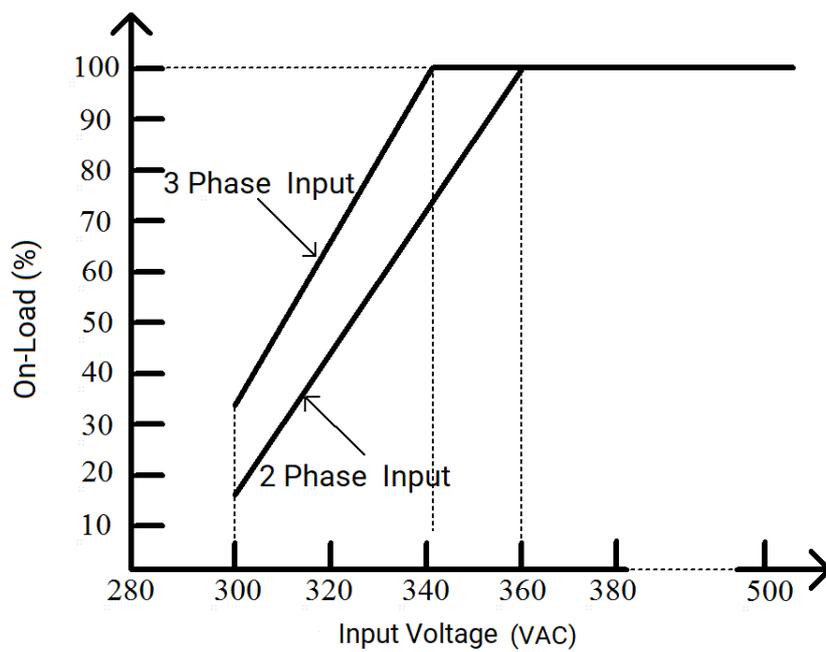


Fig.4 Static Input Curve

7 OPERATION

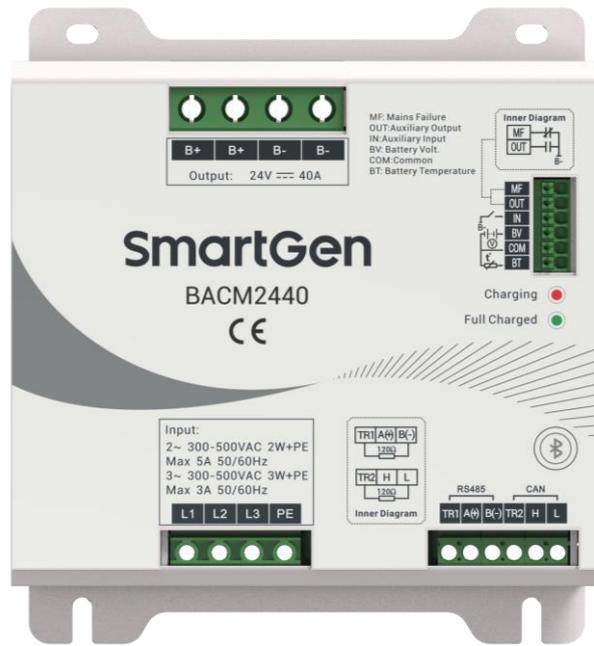


Fig.5 BACM2440 Front Panel

Table 6 Wiring Terminals Instruction

Terminal	Function	Description
L1	AC Input Terminals	Connect terminals of L1, L2 and L3 to AC input voltage of (100~240)V Three Phase / Two Phase, and multi-strand copper core BVR cable (greater than 2mm ²) is recommended. Two Phase: Any two terminals can be selected for connection.
L2		
L3		
PE	GND Terminals	Connect to the enclosure internally.
B-	Negative of Charger Output	Connect to the negative of battery, multi-strand copper core BVR cable (greater than 10mm ²) is recommended.
B+	Positive of Charger Output	Connect to the positive of battery, multi-strand copper core BVR cable (greater than 10mm ²) is recommended.
H	CAN Communication Port	Shielded cable with single-end grounding is recommended. After shorting Terminal TR2 and H, the resistance between H and L will be 120Ω.
TR2		
L		
A(+)	RS485 Communication Port	Shielded cable with single-end grounding is recommended. After shorting Terminal TR1 and A, the resistance between A and B will be 120Ω.
TR1		
B(-)		
MF	Mains Failure Output Port	It outputs low level signal when there is no AC input voltage.
OUT	Auxiliary Output Port	It can be set as combined output of under voltage, over voltage and charging failure alarms. Active when it outputs low level signal.
IN	Auxiliary Input Port	Active when there is low level signal.

Terminal	Function	Description
BV	Battery Voltage Port	Connect to the positive of battery.
COM	Common Port	COM port for terminals of BV and BT. Connect to the negative of battery.
BT	Battery Temperature Sensor Port	Connect to the PT1000 sensor.
FULL CHARGED	Green LED Indicator	Full Charged Indicator.
CHARGING	Red LED Indicator	Charging Status Indicator.
	Button of Bluetooth Function	Press and hold it for over 3 seconds to enable Bluetooth. Blue indicator is always on when Bluetooth is not connected. Blue indicator flashes when Bluetooth is connected. Press and hold it again to disable Bluetooth, then the blue indicator will turn off.

NOTE 1: Because there is diode and current-limiting circuit inside the charger, it can be installed together with the generator of genset in parallel, and there is no need to disconnect the charger when cranking.

NOTE 2: If the charger is installed together with the genset, the charge current will be so large that the voltage drop will occur in the charge cable, so it is recommended to connect the cable to the battery post separately to avoid disturbance on sensor sampling precision.

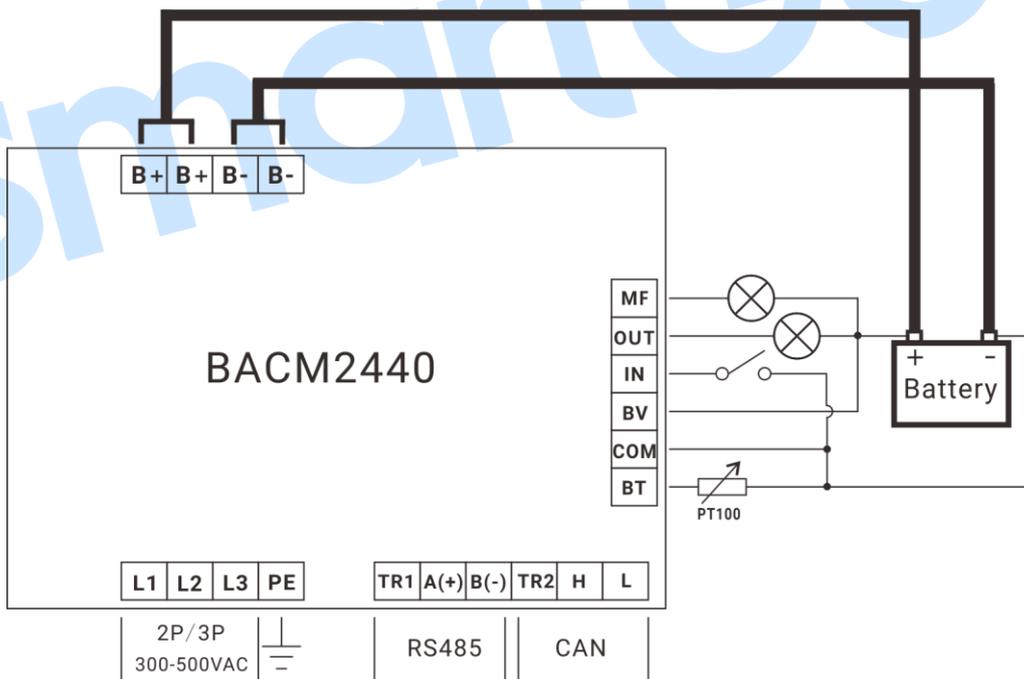


Fig.6 Connection Diagram

8 CURRENT BALANCING IN PARALLEL CONNECTION

1. The parallel wiring connection is as follows (B- B- and B+ B+ are connected in parallel).
2. The output voltage difference between every charger should be less than 0.2V (adjusted and calibrated via the host computer).
3. The maximum total output current equals total rated current, which equals the sum of every charger rated current.
4. All charger output terminals shall be connected to the DC busbar using cables of identical length. Refer to the table below for cable specifications.

Table 7 Requirements for Cable

	Cable Length in Parallel < 3m	3m < Cable Length in Parallel ≤ 6m
Cable Specifications	BVR 10mm ² multi-strand copper cable	BVR 16mm ² multi-strand copper cable

5. During parallel operation under light load conditions, uneven current may occur due to voltage or cable diameter variations, which is a normal phenomenon and will not affect the charging functionality.

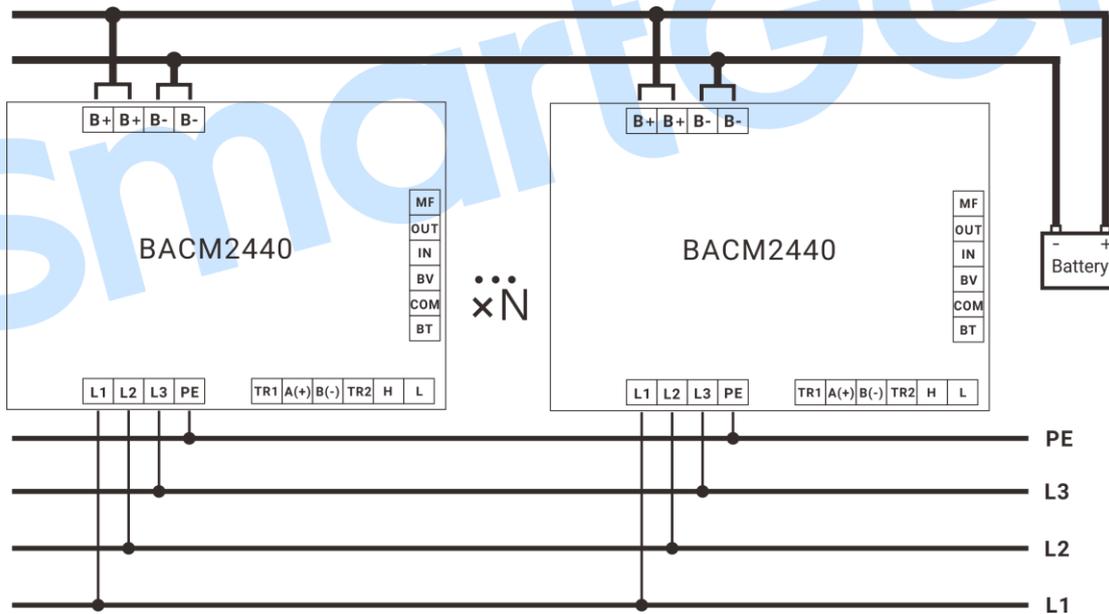


Fig.7 Parallel Connection Diagram

9 OVERALL AND INSTALLATION DIMENSIONS

Unit: mm

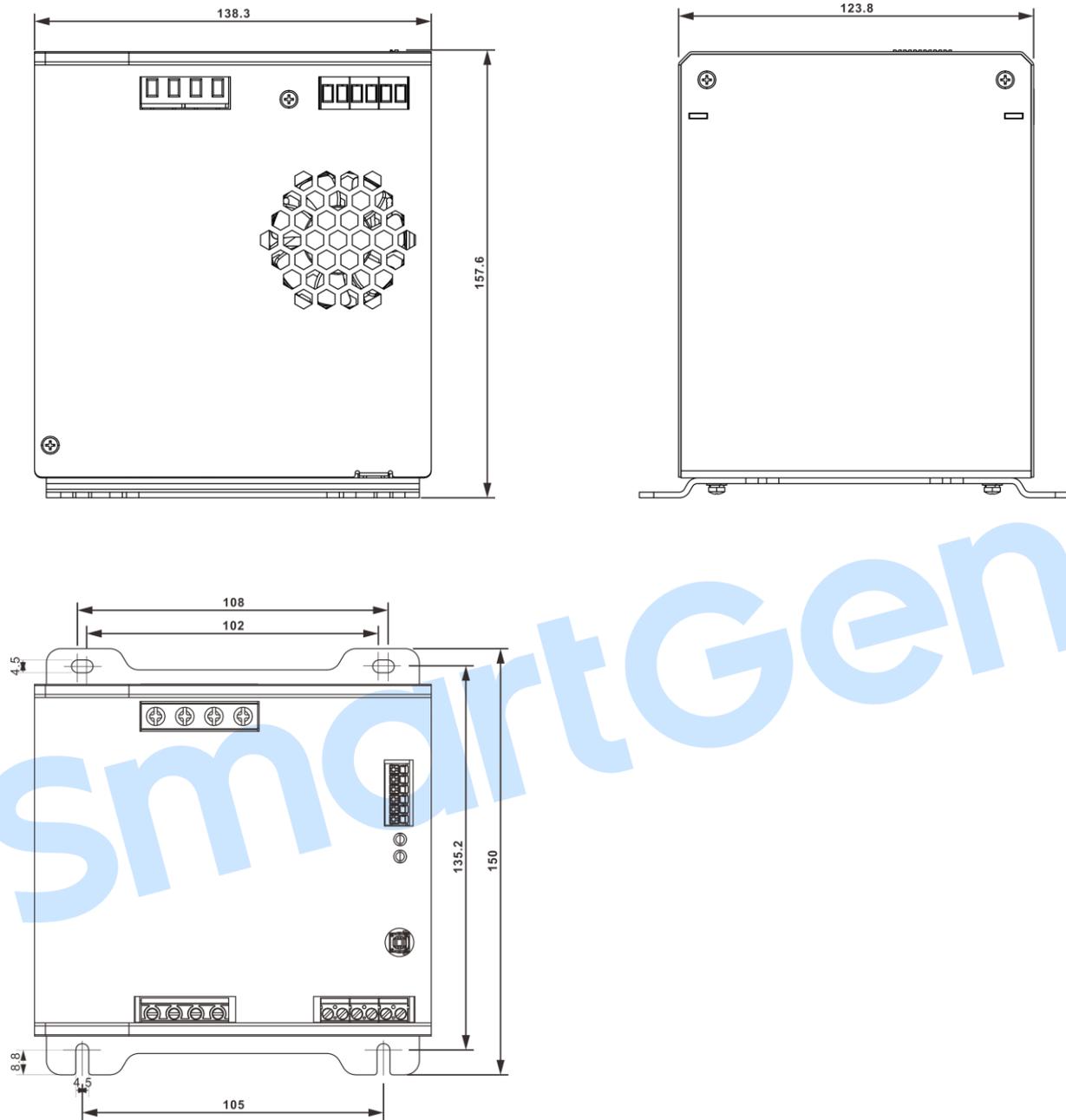


Fig.8 BACM2440 Overall and Installation Dimensions