

SmartGen

MAKING CONTROL SMARTER

BACM2410D

BATTERY CHARGER

USER MANUAL



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Table 1 Software Version

Date	Version	Note
2024-12-29	1.0	Original Release.

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1 OVERVIEW

BACM2410D battery charger is intelligent and multi-functional which is specially designed for meeting the charging characteristics of the lead-acid, lithium and Ni-Cd engine starter batteries. It is suitable for 24V battery and the maximum charge current is 10A.

2 PERFORMANCE AND CHARACTERISTICS

- a) Wide input AC voltage range, small size, light weight, high efficiency;
- b) Users can select automatic two-stage charging process or automatic three-stage charging process as needed. Both the two charging process are carried out according to storage battery charging characteristics to prevent overcharging and significantly prolong battery lifetime;
- c) Built-in PFC circuit can calibrate the power factor up to 0.99;
- d) Built-in current protection circuit for over current protection, short-circuit protection and reverse connection protection. The output will recover automatically after the failure is removed;
- e) Battery voltage detection ports can detect the battery voltage in real time;
- f) Battery low voltage output port; it will output low level immediately after the battery voltage has fallen below the set value for preset delay;
- g) Temperature sensor port allows for monitoring the battery temperature in real time and temperature compensation function which can prevent the battery temperature is too high effectively;
- h) Mains failure port; It will output low level immediately when the AC input is interrupted;
- i) Standard RS485 communication port;
- j) BACM2410D charger is suitable for 24V battery, rated current is 10A;
- k) LED display: Full charged indication (Green light) and charging indication (Red light);
- l) Digital tube displays the current charging voltage and charging current in a loop;
- m) Multiple charging curves are selectable, users do not need to manually adjust the parameters, charging is automatically performed according to battery characteristics.

3 CHARGING PRINCIPLE

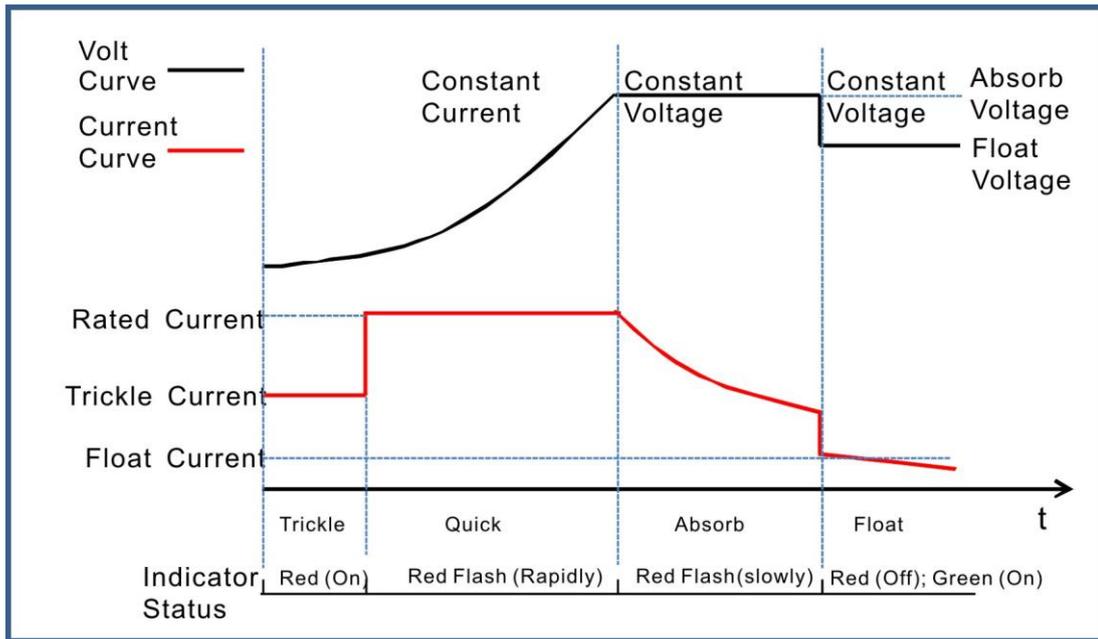


Fig.1 Three-stage Charging Curve

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

- 1) The first stage is named as Constant Current: 1): 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) status is always illuminated. 2): 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 charging indicator (Red color) status is flash rapidly (0.2s/per) as the battery power rising quickly.
- 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 voltage will keep constant. The battery terminal voltage will stabilize in the absorption charge value with the decreasing of charging current. The charging indicator (Red color) status is flash slowly (1s/per).
- 3) The third stage is named as Float Charge: After the above two stage, the charge is basically completed and the Float Charge is started automatically. In this stage, the charger voltage reduces to float voltage and the charger current reduces to float value (Red indicator will extinguish and the green indicator will be illuminated). After that charging current will only neutralize the battery self-discharge. Even long-term charging cannot harm the battery, as charger can keep the battery fully charged and so guarantee long lifetime of the battery.

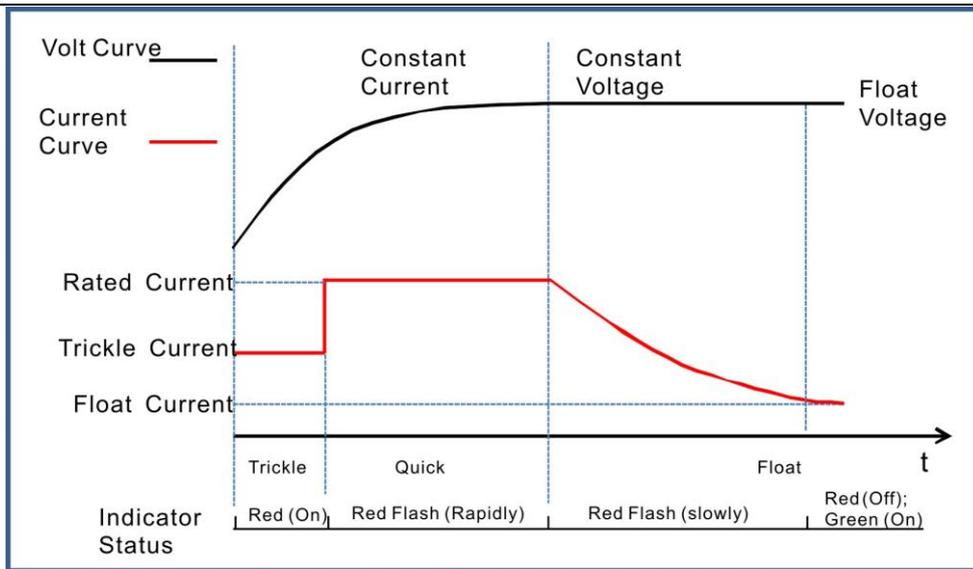


Fig.2 Two-stage Charging Curve

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

- 1) The first stage is named as Constant Current:
 - 1): Trickle Charge: when the battery terminal voltage is relatively low, then the charging current is low likewise which can prevent the battery temperature is too high. The charging indicator (Red color) status is illuminated.
 - 2): 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 charging indicator (Red color) status is flash rapidly (0.2s/per) as the battery power rising quickly.
- 2) The second stage is named as Float Charge: The charging current will decrease with the rising of battery electricity. The charging indicator (Red color) status is flash slowly (1s/per). As soon as charging current value falls below 0.3A, the battery is basically charged (Red indicator will extinguish and the green indicator will be illuminated). After that charging current will only neutralize the battery self-discharge. Even long-term charging cannot harm the battery, as charger can keep the battery fully charged and so guarantee long lifetime of the battery.

Table 2 Charging Indicator Status

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

4 CHARGING PARAMETERS

Table 3 Charging Parameters

Types	Absorption Charge Voltage	Float Charge Voltage
Lead Acid Battery	28.2V	27.0V
Lithium Battery	29.4V	27.0V
Ni-Cd Battery	29.0V	28.2V

5 PARAMETERS CONFIGURATION

Table 4 Parameters Configuration

Items	Default	Adjustable Range	Description
Charging Stage	3	(2~3)	2: Two Stage; 3: Three Stage
Max. Rated Current	10.0A	Nonadjustable	Maximum charging current
Rated Current	100%	(0~100)%	Maximum charging current percentage
Absorption Charge Voltage	28.2V	(20~30)V	The charging voltage of "Constant Voltage"
Absorption Charge Delay	1	(0~1)	0: Disable; 1: Enable
Delay Setting	1.0h	(0.1~100)h	The charging time of "Constant Voltage"
Absorption Charge Complete Current	1	(0~1)	0: Disable; 1: Enable
Complete Current Setting	0.5A	(0.20~3.00)A	The transition current from "Absorption Charge" transfer to "Float Charge".
Float Charge Voltage	27.0V	(20~30)V	The voltage of "Float Charge"
AUTO BOOST Voltage	25.6V	(20~30)V	When the charger is in "Float Mode", it enters into "Quick Charge" if the battery voltage has fallen below the set value.
AUTO BOOST Voltage Delay	20s	(0~3600)s	The delay time when voltage has fallen below the BOOST voltage value.
Trickle Charge	1	(0~1)	0: Disable; 1: Enable
Trickle Charge Voltage	22.0V	(20~30)V	The voltage of "Trickle Charge"
Trickle Charge Current	50%	(0~100)%	Maximum charging current percentage
Battery Detection	0	(0~1)	0: Disable; 1: Enable
Battery Under Voltage Warn	1	(0~1)	0: Disable; 1: Enable
Under Voltage Set Value	23.0V	(16.0~30.0)V	"Under voltage" alarm will be initiated if the battery voltage has fallen below the set value.
Under Voltage Delay	120s	(0~3600)s	"Under voltage" alarm will be initiated if the battery voltage has fallen below the set value and the delay timer has expired.
Under Voltage Return Value	24.0V	(16.0~30.0)V	The transition voltage from "under voltage" transfer to "normal voltage".
Under Voltage Return Delay	10s	(0~3600)s	"Under voltage" alarm will be removed if the battery voltage has exceeded the return value and the delay timer has expired.
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	(0.020~0.060)V/°C	The output voltage falls (or rises) for every increase (or decrease) 1°C change on 20°C basis.
High Temp. Warn	1	(0~1)	0: Disable; 1: Enable

Items	Default	Adjustable Range	Description
High Temp. Set Value	55°C	(0~80)°C	"High Temp." alarm will be initiated if the battery temperature has exceeded the set value.
High Temp. Delay	0.5s	(0~60.0)s	"High Temp." alarm will be initiated if the battery temperature has exceeded the set value and the delay timer has expired.
High Temp. Return Value	50°C	(0~80)°C	The transition temperature from "High Temp." transfer to "Normal Temp.".
High Temp. Return Delay	1s	(0~60.0)s	"High Temp." alarm will be removed if the battery temperature has fallen below the return value and the delay timer has expired.
Auxiliary Input Port	3	(0~3)	0: Not Used; 1: Shutdown: The battery charger enters into Standby Status if the input is active. 2: Enable Battery 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 if the input is active.
Auxiliary Input Port Delay	2.0s	(1.0~60.0)s	The corresponding action will be active if the input is active and the delay timer has expired.
Communication Address	10	1~250	RS485 Communication Address
Baud Rate	0	(0~2)	0: 9600; 1: 19200; 2: 38400

6 PARAMETERS SPECIFICATION

Table 5 Parameters Specification

Items	Contents	Parameters	
Input Characteristics	Nominal AC Voltage	AC (100~277)V	
	Max. AC Voltage	AC (90~280)V	
	AC Frequency	50Hz/60Hz	
	Max. Active Power	340W	
	Max. Current	4A	
	Efficiency	AC 110V	AC 220V
		>86%	>88%
Power Factor Calibration	AC 110V	AC 220V	
	>0.99	>0.95	
Output Characteristics	No-load Output Voltage	27V, Error±1%	
	Rated Charging Current	10A, Error±2%	
	Max. Output Power	290W	
Displayed Data	Charging Voltage	Resolution 0.1V, Error±1%	
	Charging Current	Resolution 0.1A, Error±1%	
Insulating Property	Insulation Resistance	Between input and output, input and shell both are: DC500V 1min $R_L \geq 50M\Omega$	
	Insulation Voltage	Between input and output, input and shell both are: DC2400V 1min Leakage current: $I_L \leq 3mA$ Between output and shell is: DC800V 1min leakage current: $I_L \leq 3mA$	
Working Condition	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)	
Shape Structure	Weight	1.24kg	
	Dimension	205.5mm×131mm×55mm (length×width×height)	

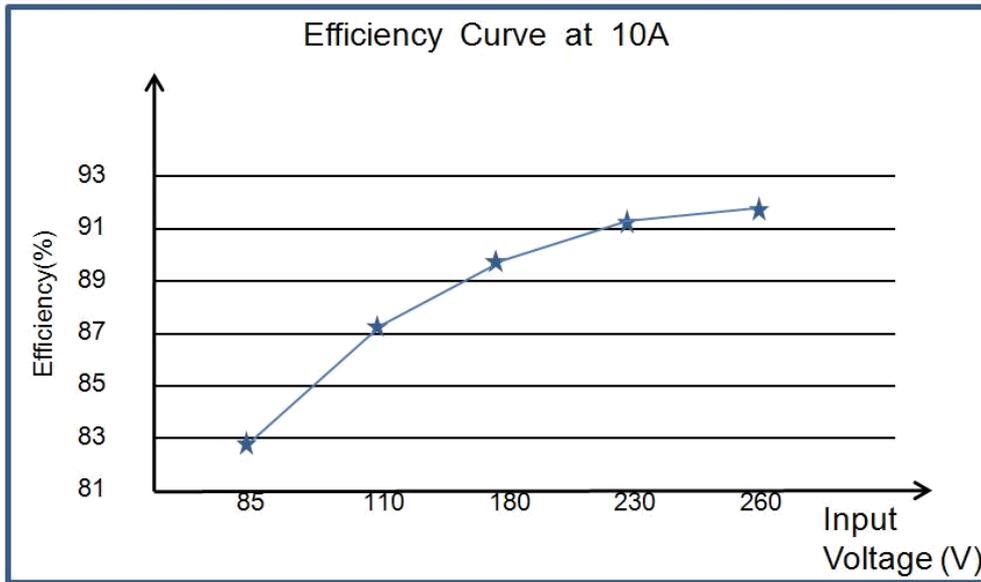


Fig.3 Efficiency Curve

7 OPERATION

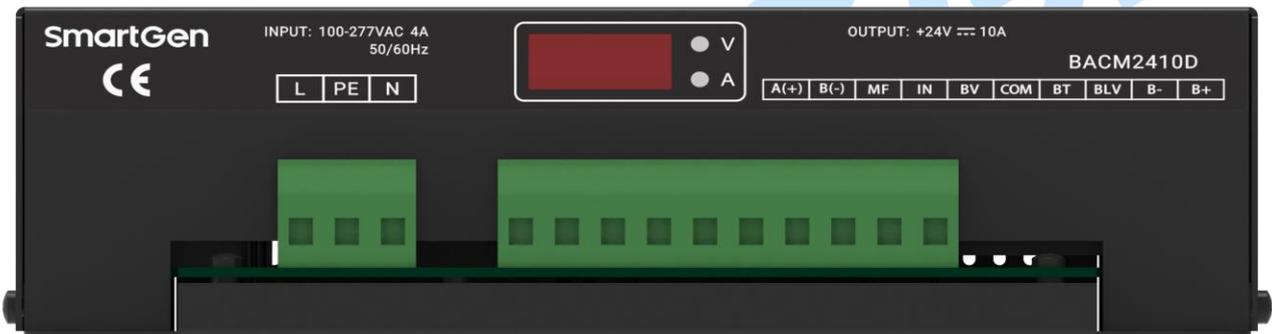


Fig.4 BACM2410D Terminal Definition

Table 6 Connection Instructions

Terminal	Function	Description
L	AC Terminals	Connect terminals L and N to AC voltage (100~277)V using greater than BVR 1.5mm ² multi-strand copper line.
N		
PE	GND Terminals	Connect to shell internally.
A(+)	RS485 Communication Port	Standard RS485 communication port
B(-)		
MF	Mains Failure Output Port	It will output low level immediately when the AC input is interrupted.
IN	Auxiliary input port	Active when level is low.
BV	Battery Voltage Port	Connect to battery positive.
COM	Common Port	COM port of BV and BT terminal. Connect to battery negative.
BT	Temperature Sensor Port	Connect to PT1000 sensor
BLV	Battery Low Voltage Port	It will output low level when the battery voltage has fallen below the set value.
B-	Battery Negative	Connect to battery negative using greater than BVR 2.5mm ² multi-strand copper lines.
B+	Battery Positive	Connect to battery positive using greater than BVR 2.5mm ² multi-strand copper lines.
FULL CHARGED	Green LED Indicator	Full Charged Indicator.
CHARGING	Red LED Indicator	Charging Indicator.

NOTES:

- 1) Because there is diode and current-limiting circuit inner the charger, it can be used together with charging generator, and there is no need to disconnect the charger when cranking.
- 2) During genset is running, high current will cause voltage drop in charging line, so recommend separately connecting to battery terminal to avoid disturbance on sampling precision.
- 3) When manually adjusting the system wiring, please operate after the charger is powered off, otherwise may cause the damage.

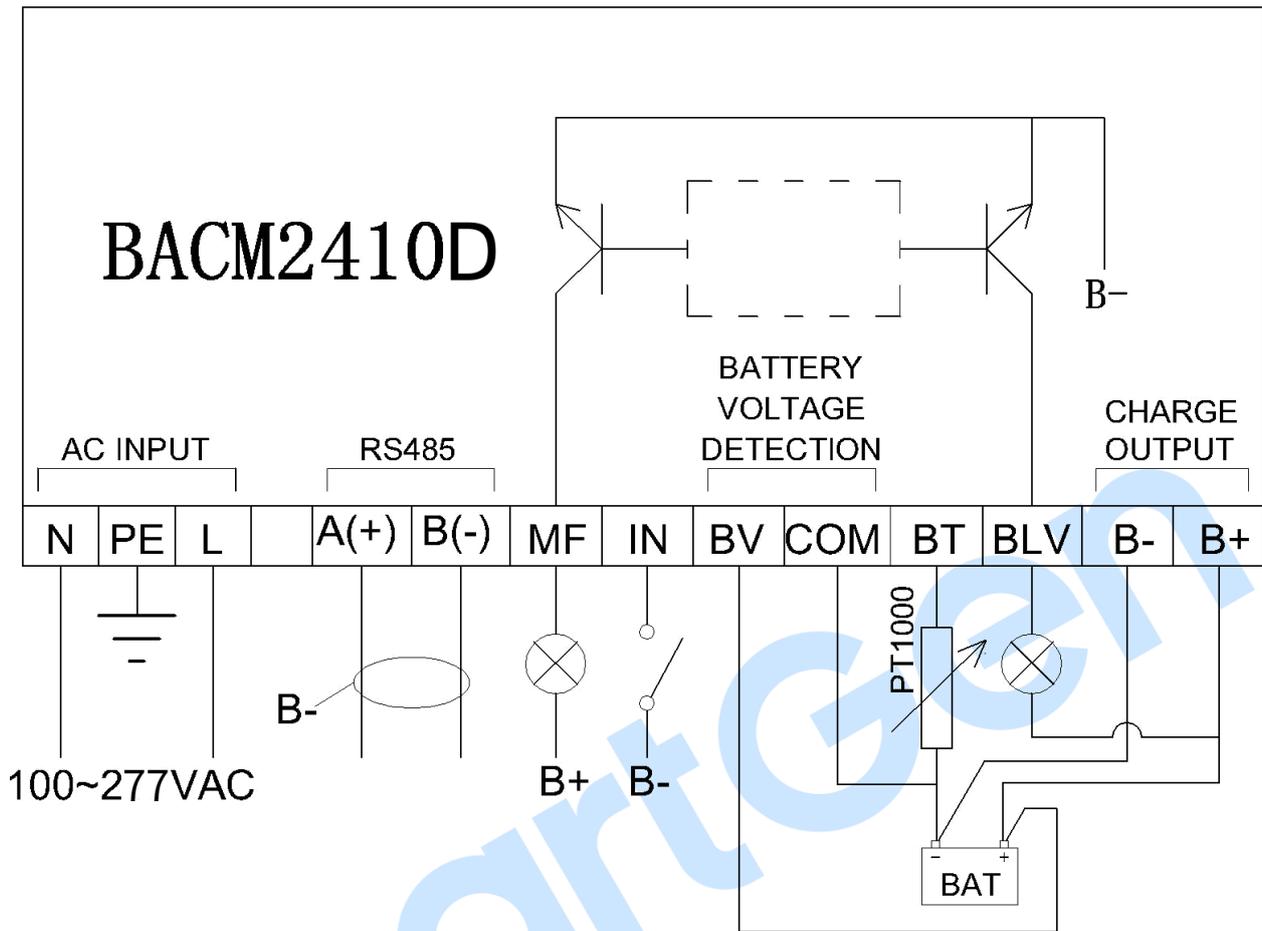


Fig.5 Connection Diagram

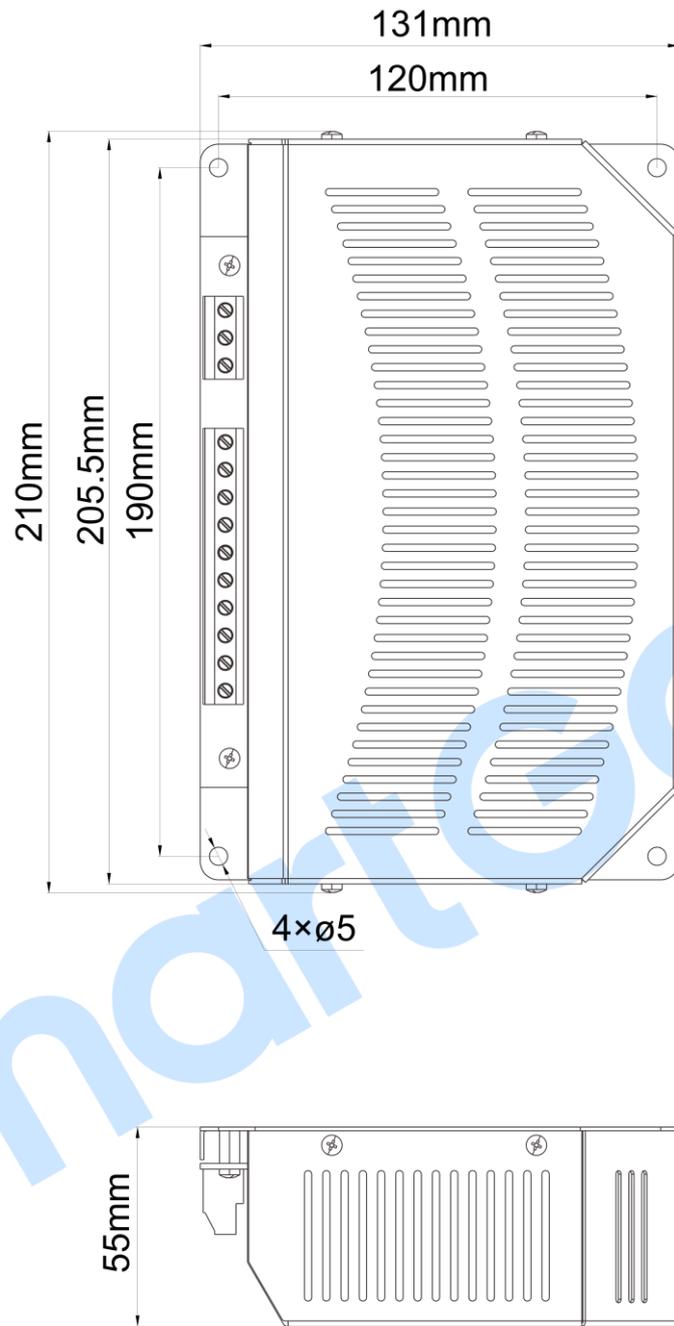


Fig.6 BACM2410D Case Dimensions