# BACM2420

# BATTERY CHARGER

# USER MANUAL



**SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.**

**Chinese trademark**

**English trademark**

# SmartGen — make your generator *smart*

**SmartGen Technology Co., Ltd.**
**No.28 Jinsuo Road**
**Zhengzhou City**
**Henan Province**
**China**

**Tel:** 0086-371-67988888/67981888

   0086-371-67991553/67992951

   0086-371-67981000(overseas)

**Fax:** 0086-371-67992952

**Web:**   www.smartgen.com.cn

    www.smartgen.cn

**Email:** sales@smartgen.cn

Software Version

| Date | Version | Note |
|------|---------|------|
| 2016-11-24 | 1.0 | Original Release |
| 2017-03-01 | 1.1 | BACM2420 configuration item added 24V/12V self-adaption option. |
| 2017-09-27 | 1.2 | In "Parameters Specification" section, changed the "Efficiency" parameter to "Max. Efficiency". |
|  |  |  |

# CONTENT

## 1 OVERVIEW

BACM2420 battery charger is intelligent and multi-function which is specially designed for meet the charging characteristics of the lead-acid engine starter batteries. Suitable for 24V or 12V battery and the maximum charge current is 20A.

## 2 PERFORMANCE AND CHARACTERISTICS

1）Switch power supply structure, wide input AC voltage range, small size, light weight, high efficiency rate;

2) 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;

3) Built-in PFC circuit can calibrate the power factor above 0.99;

4) Battery voltage detection ports can detect the battery voltage in real time.

5) Battery low voltage output port; it will output low level immediately after the battery voltage has fallen below the set value for preset delay.

6) 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.

7) Mains failure port; It will output low level when the AC input is interrupted.

8) Standard RS485 communication port.

9) BACM2410 charger is suitable for 24V battery, or suitable for 12V battery after changing the configuration information；Rated current: 20A.

10) LED display: Full charged indication (Green light) and charging indication (Red light).
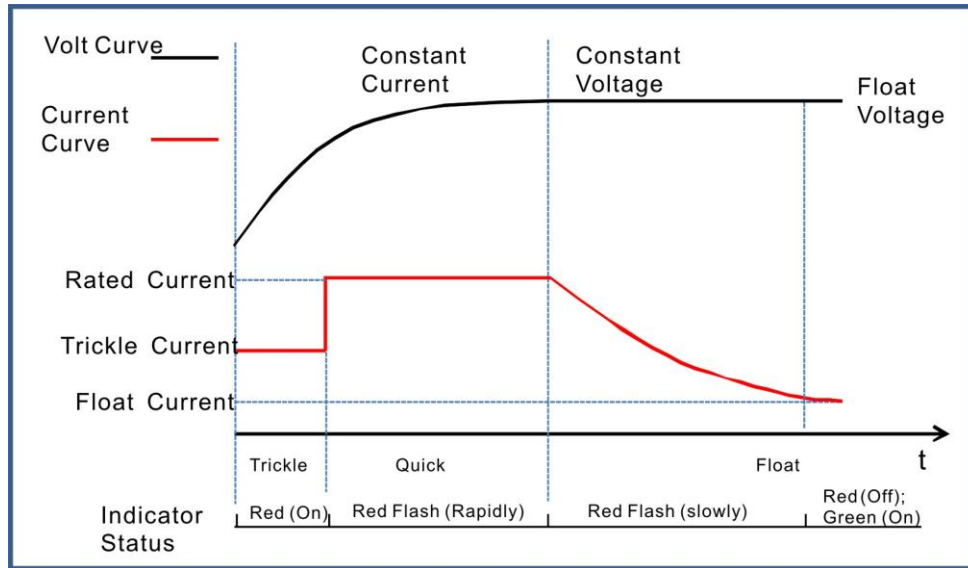
## 3 CHARGING PRINCIPLE

Three-stage Method is as follows,
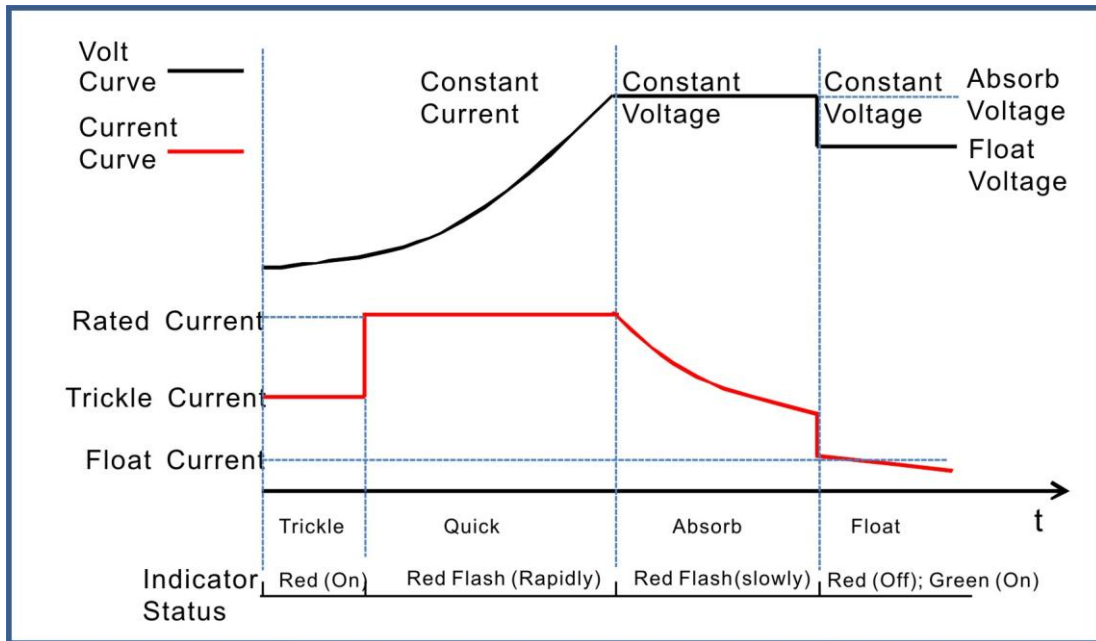


Charging is performed according to the battery charging characteristics using three-stage method.

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 is too high. The charging indicator (Red color) status is illuminated.  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 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 is 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.

Two-stage Method is as follows,



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 is too high. The charging indicator (Red color) status is illuminated. 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 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.

Charging Indicator Status is as follows,

| Mode | Indicator | Charging Status | | | | |
|------|-----------|-----------------|---|---|---|---|
| | | 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 PARAMETERS CONFIGURATION

| Items | Default | | Adjustable Range | | Description |
|---|---|---|---|---|---|
| | 24V | 12V | 24V | 12V | |
| Battery Type | 1 | | (0~2) | | 0:12V；1:24V；2:Self-adaption |
| Charging Stage | 3 | | (2~3) | | 2: Two Stage;  3: Three Stage |
| Max. Rated Current | 20.0A | | Nonadjustable | | Maximum charging current |
| Rated Current | 100% | | (0~100)% | | Maximum charging current percentage |
| Absorption Charge Voltage | 28.2V | 14.1V | (20~30)V | (10~15)V | The charging voltage of "Constant Voltage" |
| Absorption Charge Time | 1 | | (0~1) | | 0: Disable; 1: Enable |
| Absorption Charge Time 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 | 13.5V | (20~30)V | (10~15)V | The voltage of "Float Charge" |
| AUTO BOOST Voltage | 25.6V | 12.8V | (20~30)V | (10~15)V | When the charger is in "Float Mode", it enters into "Quick Charge" if the battery voltage has fallen below the set value. |
| Trickle Charge | 1 | | (0~1) | | 0: Disable; 1: Enable |
| Trickle Charge Voltage | 22.0V | 11.0V | (20~30)V | (10~15)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 | 11.50V | (16.0~30.0)V | (8.0~15.0)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 | 12.0V | (16.0~30.0)V | (8.0~15.0)V | The transition voltage from "under voltage" transfer to "normal voltage". |

| Items | Default | | Adjustable Range | | Description |
|---|---|---|---|---|---|
| | 24V | 12V | 24V | 12V | |
| 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 | 0.036 V/℃ | 0.18 V/℃ | (0.020~0.060) V/℃ | (0.010~0.030) V/℃ | The Compensation of every 1℃ change on 20℃ basis. |
| High Temp. Warn | 1 | | (0~1) | | 0: Disable; 1: Enable |
| High Temp. Set Value | 55℃ | | (0~80)℃ | | "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℃ | | (0~80)℃ | | 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 | | (0~4) | | 0、Not Used；<br>1、Shutdown：The battery charger enters into Standby Status if the input is active.<br>2、Enable Battery Detection：The battery charger enters into Standby Status if the input is active but there is no battery voltage signal.<br>3、Manual BOOST：The battery charger enters into BOOST if the input is active.<br>4、12V system: if input is active, charger will be in 12V system. |
| Auxiliary Input Port Delay | 2.0s | | (0~60.0)s | | The corresponding action will be active if the input is active. |
| Communication Address | 10 | | 1~254 | | RS485 Communication Address |
| Baud Rate | 0 | | (0~2) | | 0、9600；1、19200；<br>2、38400 (One Stop Bit) |

## 5  PARAMETERS SPECIFICATION

| Items | Contents | Parameters | | | |
|---|---|---|---|---|---|
| | | 24V | | 12V | |
| Input Characteristics | Nominal AC Voltage Range | AC (100~277)V | | | |
| | Max. AC Voltage Range | AC (90~305)V | | | |
| | AC Frequency | 50Hz/60Hz | | | |
| | Max. Active Power | 680W | | 340W | |
| | Max. Current | 7A | | 3.5A | |
| | Max. Efficiency | 87% | | 81% | |
| | Power Factor Calibration | AC 110V | AC 220V | AC 110V | AC 220V |
| | | >0.99 | >0.95 | >0.99 | >0.95 |
| Output Characteristics | No-load Output Voltage | 27V，Error±1% | | 13.5V, Error±1% | |
| | Rated Charging Current | 20A，Error±2% | | | |
| | Max. Output Power | 580W | | 290W | |
| Insulating Property | Insulation Resistance | Between input and output, input and shell all areDC500V1min,: insulation resistance $R_L \geqq 50M\Omega$ | | | |
| | Insulation Voltage | Between input and output, input and shell all are:  AC1600V 50Hz 1min leakage current: $I_L \leqq 3.5mA$ Between output and shell is: AC500V 50Hz 1min leakage current: $I_L \leqq 3.5mA$ | | | |
| Working Condition | Working Temperature | (-30~+55)°C | | | |
| | Storage Temperature | (-40~+85)°C | | | |
| | Working Humidity | 20%RH~93%RH(No condensation) | | | |
| Shape Structure | Weight | 2.2kg | | | |
| | Dimension | 265mm×156mm×68mm (length*width*height) | | | |

**Efficiency curve is as follows,**
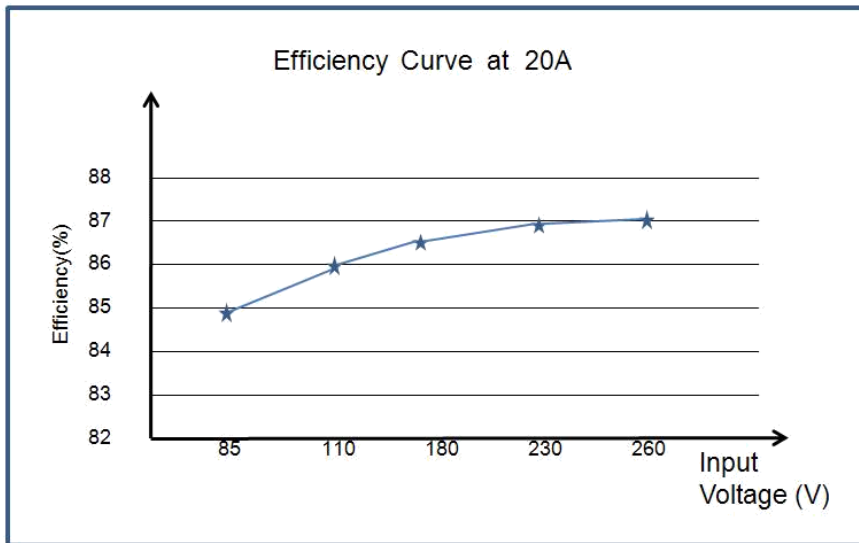
## 6  OPERATION



BACM2420 Mask

| Terminal | Function | Description |
|---|---|---|
| L | AC Terminals | Connect terminals L and N to AC voltage (100~240) V using greater than BVR 2.0mm$^2$ multi-strand copper line. |
| N | | |
| PE | GND Terminals | Connect to shell internally. |
| A(+) | RS485 Communication Port | Standard RS485 serial communication interface |
| B(-) | | |
| MF | Mains Failure Output Port | It will output low level immediately when the AC input is interrupted. |
| IN | Auxiliary input port | Low level is active. |
| BV | Battery Voltage Port | Connect to battery positive. |
| COM | Common Port | COM port of BV and temperature acquisition terminal. Connect to battery negative. |
| BT | Temperature Sensor Port | Connect to PT1000 sensor |
| BLV | Battery Low Voltage Alarm Output 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 4mm$^2$ multi-strand copper lines. |
| B+ | Battery Positive | Connect to battery positive using greater than BVR 4mm$^2$ multi-strand copper lines. |
| FULL CHARGED | Green LED Indicator | Full Charged Indicator |
| CHARGING | Red LED Indicator | Charging status Indicator |

⚠  **NOTE:**

**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.**

## 7 CONNECTION
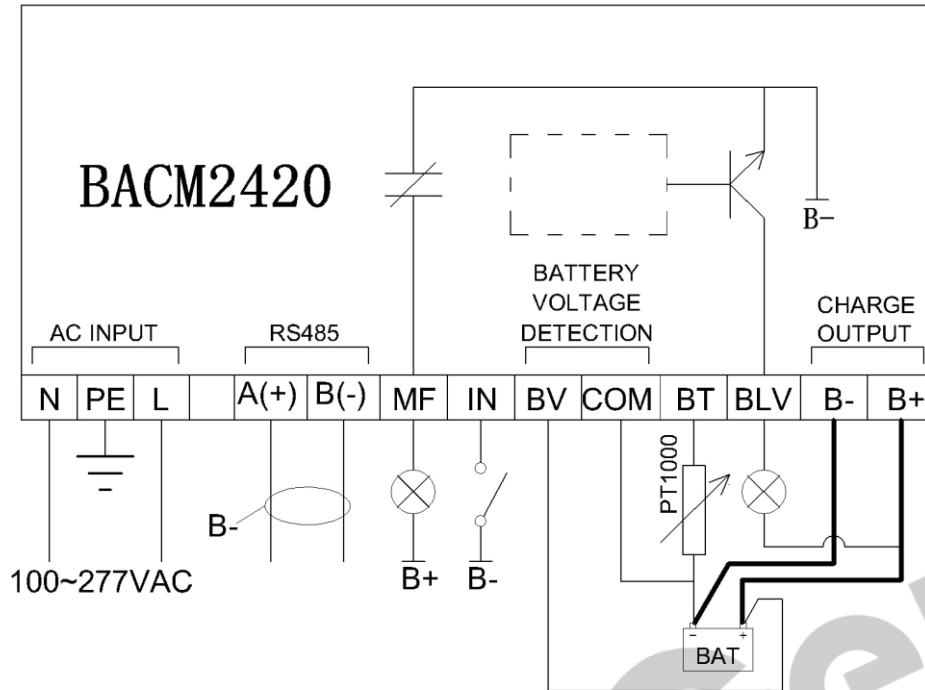


Wiring Diagram

## 8 CASE DIMENSIONS

Unit: mm