SmartGen

MAKING CONTROL SMARTER

PDC2420A

BATTERY CHARGER

USER MANUAL

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Table 1 Software Version

Date	Version	Note
2025-04-09	1.0	Original Release
2025-11-05	1.1	Modify the parameter configuration descriptions and add the troubleshooting.

CONTENT

1 OVERVIEW

PDC2420A battery charger is an intelligent and multi-function charger, which is specially designed to meet the charging characteristics of the lead-acid, lithium-ion, nickel-cadmium engine starter batteries. It is suitable for 24V or 12V battery pack and the maximum output current is 20A.

2 PERFORMANCE AND CHARACTERISTICS

It has the following characteristics:

a) Switch power supply structure, wide DC voltage input range, small size, light weight, high efficiency;
b) Users can select automatic two-stage charging process or automatic three-stage charging process according to needs. Both two charging processes are carried out according to storage battery charging characteristics, which can prevent overcharging and significantly prolong battery lifetime;
c) Built-in multi-protection circuits effectively safeguard the charging during output over/under voltage, over current and over temperature, with auto recovery output after the elimination of these phenomena;
d) Built-in multiple battery charging curves. After selecting the battery via the host computer, the charging system automatically charges according to the battery's characteristics without requiring manual parameter adjustment;
e) Isolated design for input and output, isolated voltage is DC4.2kV;
f) With standard RS485 serial communication port applying MODBUS communication protocol;
g) Digitized parameters, all parameters can be set and monitored via the RS485 communication port by connecting to a host PC;
h) LED power indicator will illuminate for power-on, flash in fault protection;
i) Horizontal screw installation is adopted, simple and easy to install it.

3 CHARGING PRINCIPLE

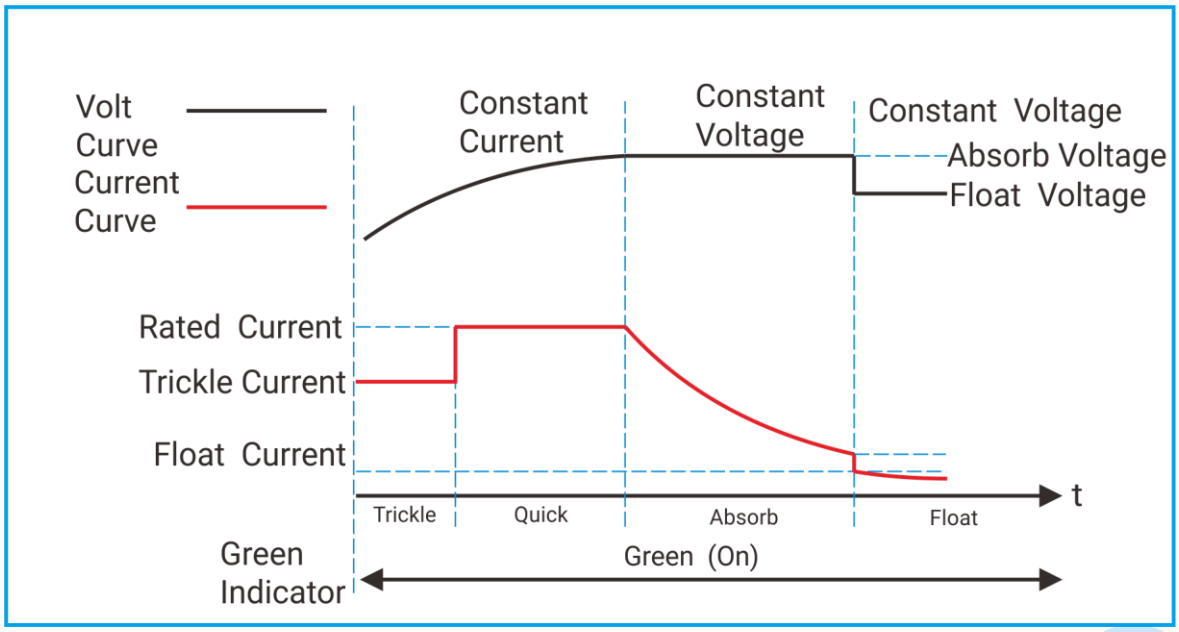


Fig. 1 Three-stage Charging Curve

Three-stage charging method is used according to the battery charging characteristics.

1) The first stage is named "constant current". a): Trickle Charge: when the battery terminal voltage is relatively low, the charging current is low likewise, which effectively prevents battery damage from too high temperature. 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 a rapid increase in the electrical quantity of the battery.

2) The second stage is named "absorption charge". After the first stage, the battery voltage rises 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.

3) The third stage is named "float charge": After the above two stages, the charging is basically completed and charger output voltage changes to float voltage automatically. Charging current decreases to floating charging current. Afterwards charging current neutralizes self-discharge of the battery. Even long-term charging doesn't do harm to the battery. That is, charger not only can keep the battery fully charged but also guarantee long lifetime of the battery.

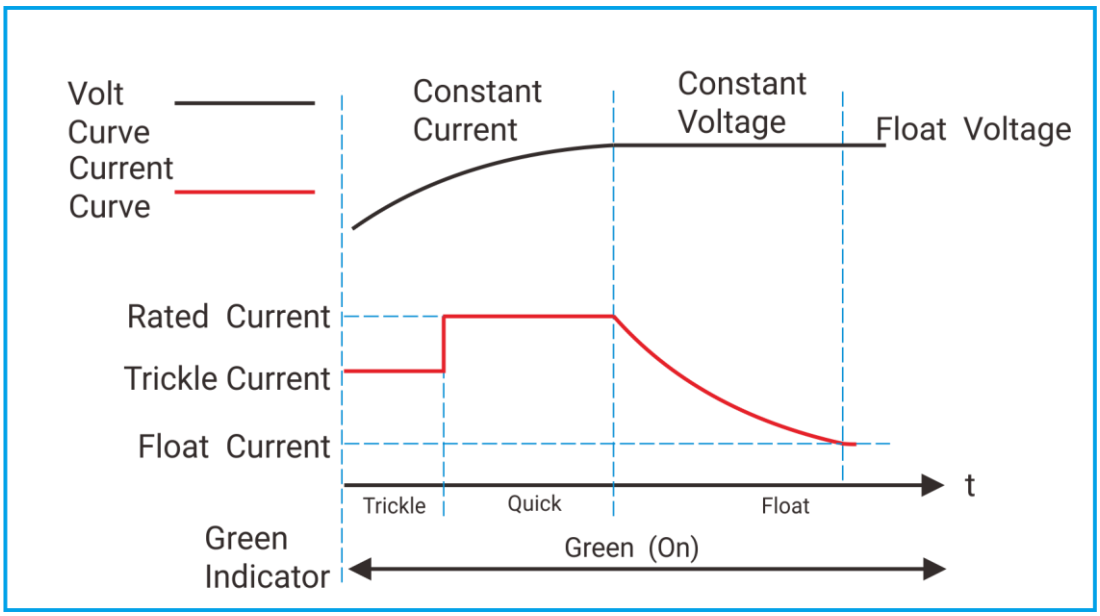


Fig. 2 Two-stage Charging Curve

Two-stage charging method is performed according to the battery charging characteristics.

1) The first stage is named "constant current". a): Trickle Charge: when the battery terminal voltage is relatively low, the charging current is low likewise, which can prevent battery damage from too high temperature. 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 a rapid increase in the electrical quantity of the battery.

2) The second stage is named "float charge". The charging current will decrease with the rising of battery electricity. As soon as charging current value falls below 0.5A, the battery is basically fully charged. 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 also guarantee long lifetime of the battery.

4 CHARGING PARAMETERS

Table 2 Charging Parameters

Battery Type	Absorption Charge Voltage		Float Charge Voltage	
	24V	12V	24V	12V
Lead-acid battery	28.2V	14.1V	27.0V	13.5V
Lithium-ion battery	29.4V	14.7V	27.0V	13.5V
Nickel-cadmium battery	29.0V	14.5V	28.2V	14.1V

5 PARAMETERS SPECIFICATION

Table 3 Product Parameters

Type	Item	Parameters	
		24V	12V
Input Characteristics	Rated Voltage	DC 24V	
	Voltage Range	DC (18~72)V	
	Max Current	40A	
	Max Power	720W	
	Max Efficiency	92%	
Output Characteristics	No-load Float Voltage	27V, error ±1%	13.5V, error ±1%
	Max Absorb Voltage	32V, error ±1%	16V, error ±1%
	Rated Charging Current	20A	
	Rated Power	480W	240W
Protection	Input Undervolt	When any of these five abnormalities is triggered, the power supply will engage in self-protection and shut down the output voltage. It can auto-recover when the abnormality is resolved.	
	Output Overvolt		
	Output Undervolt		
	Output Overcurrent		
	Overtemp. Protect		
	Fan Cooling	Built-in DC fan forced cooling: operates at high speed when the load current exceeds 10A.	
Safety Requirements & EMC	Safety Requirements	IEC60255-27, CE certificate	
	Insulation Withstand Voltage	DC4.2kV 50Hz 1min for input and output, input and enclosure Leak current I_L≤3.5mA DC800V 50Hz 1min for output and enclosure Leak current I_L≤3.5mA	
	Insulation Impedance	DC 0.5kV 1min condition for input and output, input and enclosure Insulation resistance R_L≥50MΩ	
	EMI	Accord with IEC61000-6-4	
	EMS	Accord with IEC61000-6-2	
Working Environment	Working Temp.	(-30~+55)°C	
	Working Humidity	20%RH~93%RH (No condensation)	
	Vibration	(8~500)Hz, a=4g, 1 test for each three perpendicular directions	
Storage Environment	Storage Temp.	(-40~+85)°C	
Overall Structure	Weight	1.51kg	
	Overall Dimension	218.9mm×155mm×69mm (L×W×H)	
	Installation Dimension	143mm×130mm (L×W)	

6 PARAMETERS CONFIGURATION

Table 4 Parameter Configuration List

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	(20~32)V	(10~16)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	(20~32)V	(10~16)V	The voltage of “Float Charge”
Protection Restart Delay	5.0s		(5.0~600.0)s		Restart occurs after this delay following protection activation.
AUTO BOOST Voltage	25.6V	12.8V	(20~32)V	(10~16)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		When the battery voltage drops below the BOOST voltage and after the delay, it automatically switches to fast charging mode.
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”
Trickle Charge Current	50%		(0~100)%		Maximum charging current percentage
Output Under Voltage Warn	1		(0~1)		0: Disable; 1: Enable
Output Under Voltage Set Value	23.0V	11.50V	(16.0~32.0)V	(8.0~16.0)V	“Under voltage” alarm will be initiated if the output voltage has fallen below the set value.
Output Under Voltage Delay	120s		(0~3600)s		“Under voltage” alarm will be initiated if the output voltage has reached the set value and the delay timer has expired.
Output Under Voltage Return	24.0V	12.0V	(16.0~32.0)V	(8.0~16.0)V	The transition voltage from “under voltage” transfer to

Items	Default		Adjustable Range		Description
	24V	12V	24V	12V	
Value					“normal voltage”.
Output Under Voltage Return Delay	10s		(0~3600)s		“Under voltage” alarm will be removed if the output voltage has exceeded the return value and the delay timer has expired.
Output Over Voltage Warn	0		(0~1)		0: Disable; 1: Enable
Output Over Voltage Set Value	30.0V	15.0V	(16.0~32.0)V	(8.0~16.0)V	“Over voltage” alarm will be initiated if the output voltage has fallen below the set value.
Output Over Voltage Delay	120s		(2~3600)s		“Over voltage” alarm will be initiated if the output voltage has reached the set value and the delay timer has expired.
Output Over Voltage Return Value	27.6V	13.8V	(16.0~32.0)V	(8.0~16.0)V	The transition voltage from “over voltage” transfer to “normal voltage”.
Output Over Voltage Return Delay	10s		(0~3600)s		“Over voltage” alarm will be removed if the output voltage has exceeded the return value and the delay timer has expired.
Communication Address	10		1~254		RS485 Communication Address
Baud Rate	0		(0~2)		0: 9600bps; 1: 19200bps; 2: 38400bps

7 CURVE DIAGRAM

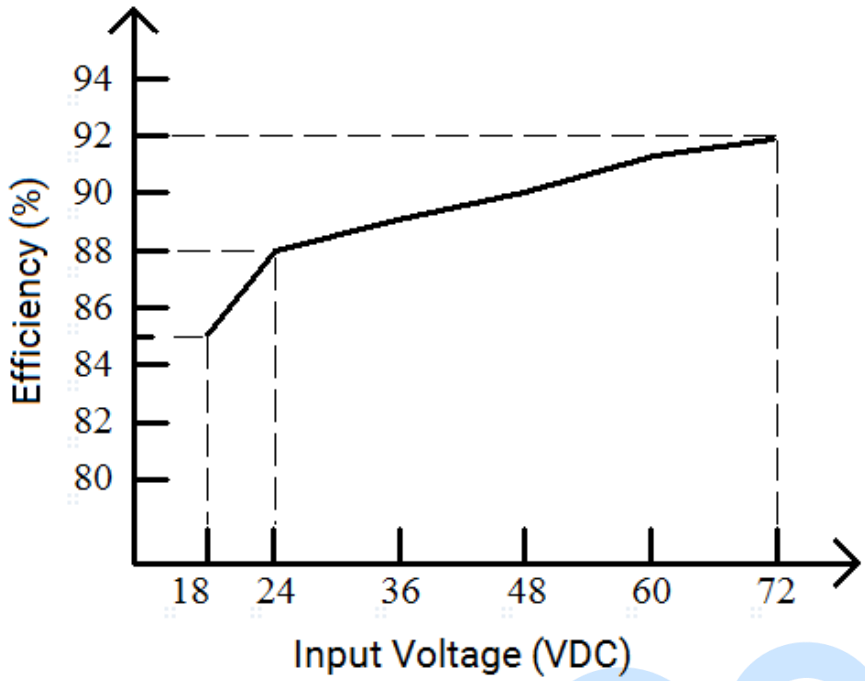
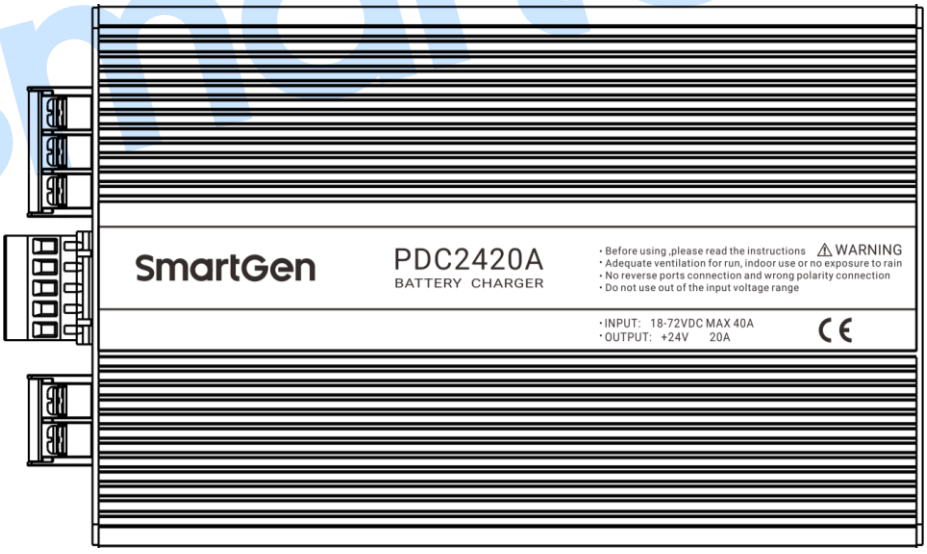


Fig.3 Efficiency Curve

8 OPERATION



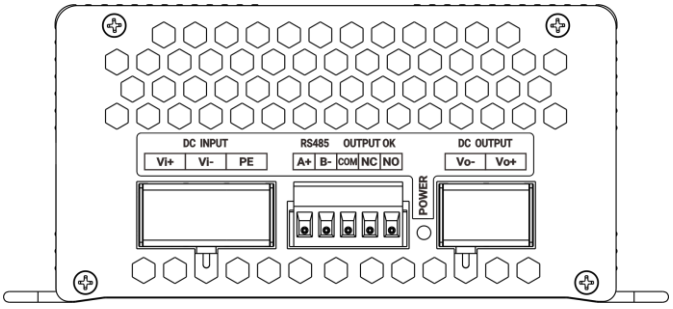


Fig. 4 PDC2420A Panel

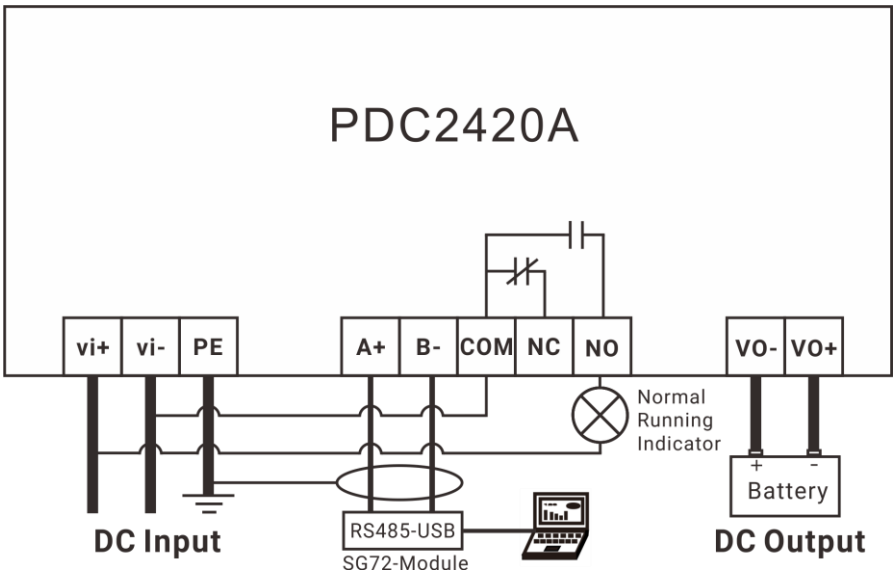


Fig. 5 Wiring Diagram

Table 5 Wiring Description

Sign	Function	Description
Vi+	DC Input Terminal	Terminal Vi+, Vi- connects (18~72)V, over BVR6.0mm^2 is recommended to use.
Vi-		
PE	Ground Terminal	Connect to enclosure internally.
A(+)	RS485 Comm. Port	Standard RS485 serial communication port, shielding wire is recommended with its single-end earthed.
B(-)		
COM	Common Port	Relay rated voltage: 5A 250VAC; When running normally, the relay's normally open contact is closed; Relay's normally open contact opens when over/under voltage, overcurrent, over temperature protection occurs.
NC	Normally Close	
NO	Normally Open	
Vo-	Output Negative	Connect to negative terminal of equipment to be powered. Over BVR4.0mm^2 is recommended to use.
Vo+	Output Positive	Connect to positive terminal of equipment to be powered. Over BVR4.0mm^2 is recommended to use.
POWER	Green LED Indicator	Power output normal indicator (always illuminated when output is normal, flashes when over/under voltage, overcurrent, over temperature protection occurs).

9 OVERALL AND INSTALLATION DIMENSIONS

Unit: mm

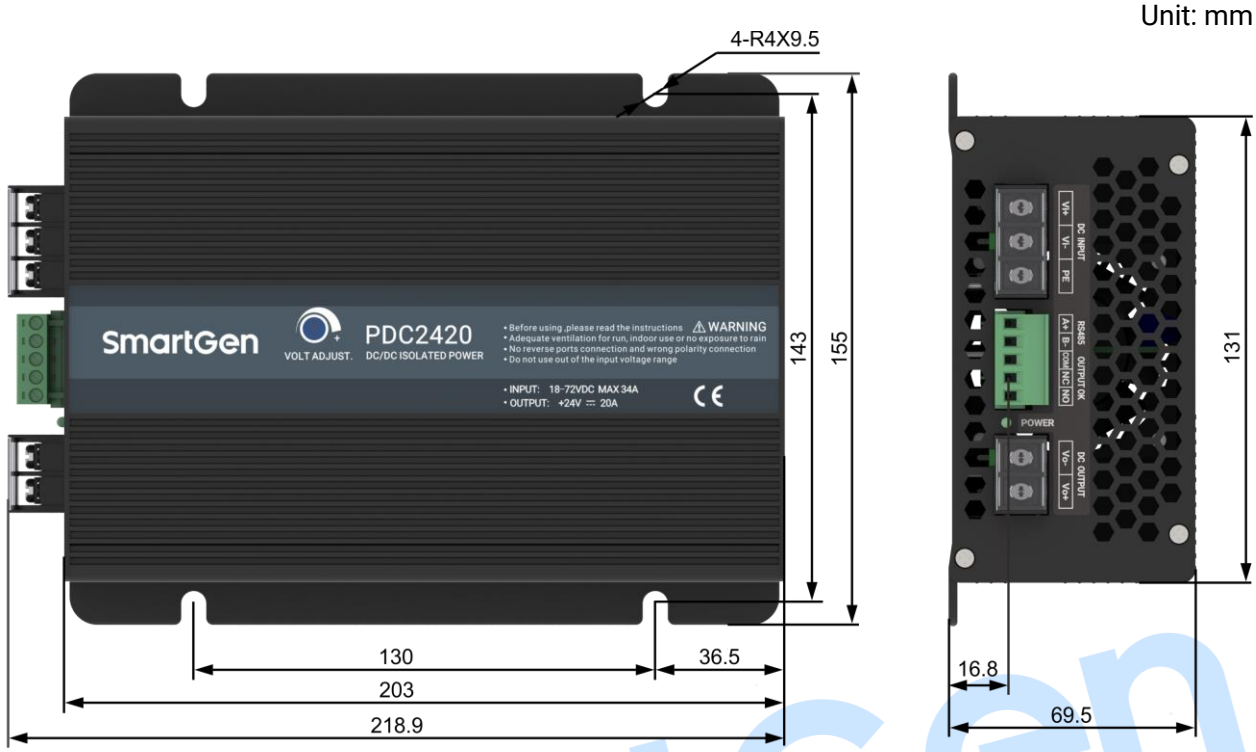


Fig.6 PDC2420A Dimensions

10 TROUBLESHOOTING

Table 6 Troubleshooting

Symptoms	Possible Measures
Output Voltage Fluctuation	The over/under voltage, and overcurrent thresholds on PC are improperly configured. Parameters can be reset by connecting to the PC software via RS485.
No Output Voltage	The input positive and negative are reversed, and the internal fuse is damaged. It needs to be returned to the factory for replacement; Ensure the input wire has a cross-sectional area of BVR 6.0mm² or above; Ensure the input port voltage is within the DC (18~72)V range.
RS485 Communication Failure	Incorrect communication port parameters (e.g., baud rate, stop bits) or device address settings; Check if the A and B terminals of RS485 are reversed; Incorrect PC communication port selection; It is recommended to add a 120Ω resistor between the A and B terminals of RS485.