

Version: 1.30.0004

# KCG3 SMART BATTERY CHARGER

## USER MANUAL

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# 1. Introduction

KCG3 smart battery charger is the upgrade of our KCG2 automatic battery charger. The inside micro-controller, PIC18F of Microchip Corp., controls the whole charge procedure. Friendly user interface, LCD display and key input, makes it easy to use. KCG3 supports different charge curves, makes a complete charge and long battery life and has all-around protections.



**KCG3-120A/24V-3G**

KCG3 is high frequency switching mode charger. IGBT/MOSFET and PWM controller are the main components. For single-phase input, Active power factor correction circuit makes a high power factor. And Soft switching technology (resonant zero voltage switching and zero current switching) increases the efficiency and reduces electromagnetic interference.



**KCG3-200A/E80V-3G**

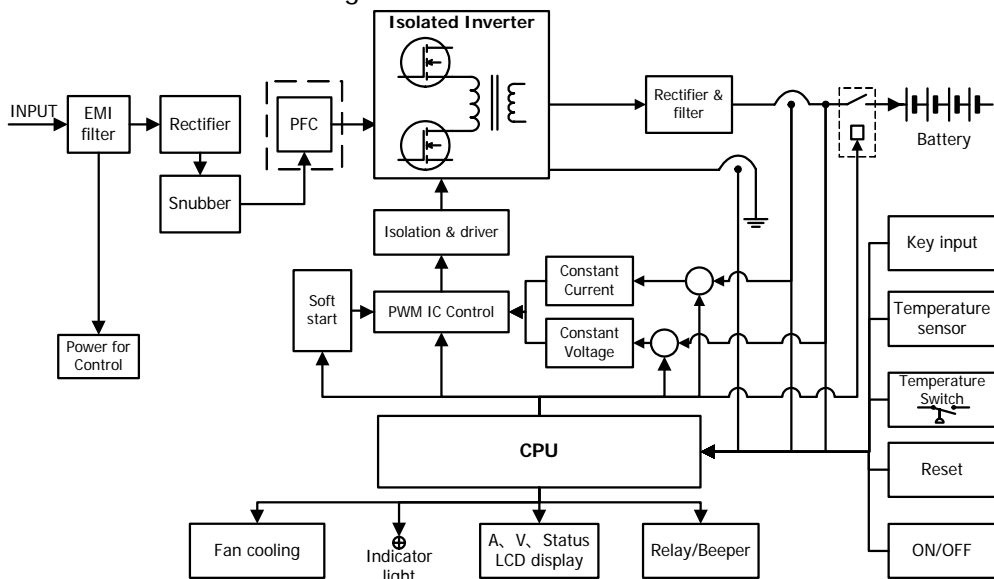


Diagram 1. Block diagram of KCG3

KCG3 charger can be widely used in Marine, e-forklift, railway vehicle, and many other places for all kinds of storage batteries. It also can be used as a DC power supply.

## 2. Technique Specifications

(1) Power supply:

1 or 3 phase, 220VAC, 380VAC, 440VAC, etc. -10%~+10%, 50/60Hz

(2) Outputs:

Rated output power = Equalize constant voltage (E. CV) \* constant current (CC);

Different battery requires different E. CV, Floating CV (F. CV) and CC values;

e.g. 24V battery:

LA battery, we set 28.2V as E. CV and 26.7V as F. CV;

Alkaline battery, we set 31-36V as E. CV and 27.2V as F. CV;

Maximum output power: **20KW**. See Appendix 1, 2. Support LA, GEL. See Appendix 3.

(3) Set charging parameter precision:

voltage: 0.1V; current: 1A

(4) Charge curve (programmable for any charge curve.):

(4-1) 3-stage charge

A: limited current / Boost, B: Constant Voltage, C: floating

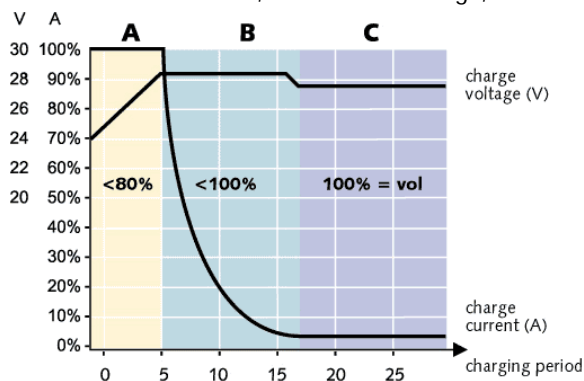


Diagram 2. 3-stage recharge voltage/current curve.

(4-2) Other curves as customer's requirement. E.g., 4-stage charge

**A:** Constant current 1, **B:** Constant Voltage 1, **C:** C.C. 2, **D:** C. V. 2

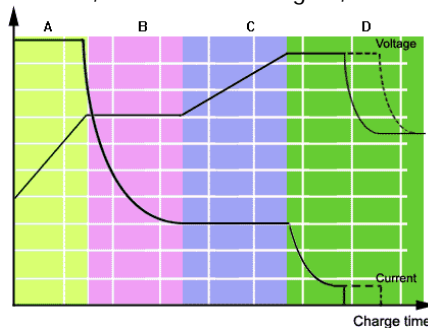
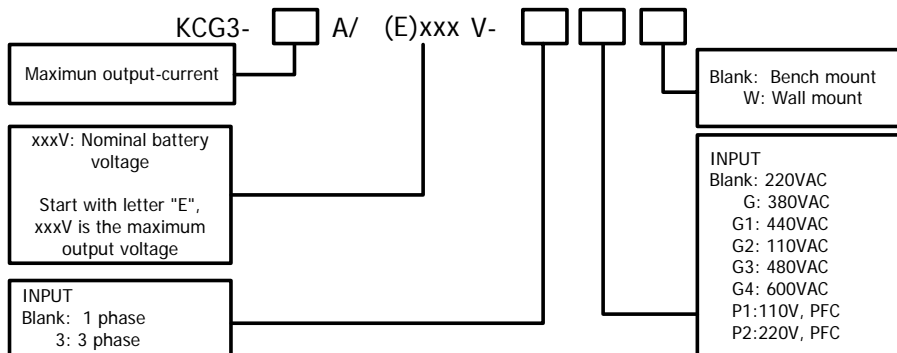


Diagram 3. 4-stage recharge voltage/current curve.

- (5) Protection and Alarm:
  - Over voltage protection, Over load protection,
  - Input voltage low protection,
  - Input fuse protection.
  - Battery reverse connection protection with output fuse; for larger than 3KW,
  - DC contact (**optional**) can protect and eliminate battery connecting spark.
  - Output power limitation,
  - Temperature control fan cooling (about 45 )
  - Reduce output power (about 75°C -78°C), resume (about 65°C)
  - Over temperature protection (about 80°C -85°C) (stop and auto restart).
- (6) Low ripple, 0.3% of the charge voltage  
voltage display precision: 0.1V; amps display precision: 1A
- (7) Password for parameter setting (**optional**).
- (8) PFC (**optional**). APFC for single phase input,  $\cos \phi = 0.99$ ; Passive PFC for 3-phase input,  $\cos \phi > 0.93$ .
- (9) Parallel running, droop characteristic, load share deviation 5% (**optional**)
- (10) Battery temperature compensation (**optional**)
- (11) PC remote control with RS-232, RS-485 or CAN bus (**optional**)
- (12) Charge efficiency: Higher than 85%
- (13) Operating temperature range: 0~50°C (32~122°F)
- (14) Design for marine.
- (15) Safety class: IP20, IP44.

### 3. Naming



## 4. Operating panel

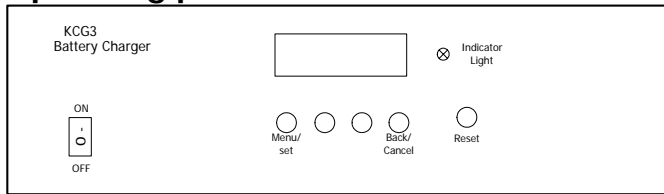


Diagram 4.  
User control interface.

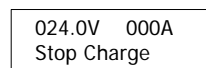
## 5. Installation and Operations:

- (1) Ensure a clearance of at least 10 cm around the battery charger to ensure adequate ventilation. The battery charger must not be installed in the vicinity of heat sources or exposed to water. Ventilation slots must not be obstructed.

- (2) The storage batteries should be connected correctly. Be careful and **don't reverse the poles "+" and "-"**.

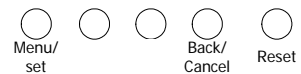


- (3) **The input wires and the GND should be connected correctly.** Then connect the AC power. The LCD will show voltage, current and status.

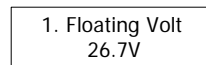


- (4) Set the charge parameters.

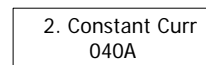
There are 5 buttons on the front panel. Press "Back/Cancel", when the LCD display abnormal. If not work, press "Reset".



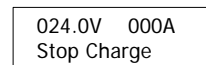
- (4.1) Press "Menu/Set" to enter the menu. Then  
Press \_\_\_\_\_ to choose item; or  
Press "Back/Cancel", quit the menu.



- (4.2) Choose an item, press "Menu/Set", the value will flash. Then

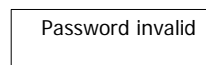
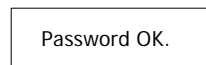
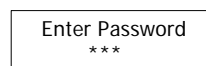


- Press \_\_\_\_\_ to increase or decrease the value. Then



- Press "Menu/Set", save the new value; or  
Press "Back/Cancel" back to menu without save.

- (4.3) If "Password" function is enable, password is required before enter the menu. If password is accepted, user can modify the values; if password is denied, user can view the values only. The default password is "000"



(4.4) 3-stage charge parameter set. (KCG3-40A/24V for example)

1. Floating Volt 26.7V	Set floating voltage.
2. Constant Curr 040A	Set the constant current. Automatic change according to the Equalize voltage.
3. Equalize Volt 28.2V	Set the constant/equalize voltage.
4. Curr to Float 008A	Set the current value to floating charge.
5. Delay time 01 Hours	Set the floating charge time. 0,1, 2, 3 hours or NO STOP.
If set "NO STOP", floating charge until equalize day (See 7.).	
6. Over Volt. 31.2V	Set the over voltage protection value
7. Equalize day 20 Days	Set the cycle of equalize charge. Set the Delay time "NO STOP" to enable.
8. Set Battery LA / GEL	Set voltage values for LA or GEL or AGM battery. See appendix 2.
9. Set default YES	Set all to default values (LA battery, 3-stage curve). See appendix 2.

**Optional functions:**

10. Charge Curve 3-stage curve	Choose charging curve 3-stage or 4-stage
11. Set Password ***	Set password, digit 0-9.
12. Nominal Volt 24.0V	Choose nominal voltage for different voltage battery. The charge voltage values (Equalize/Floating/Protect voltage) will change automatically.
13. T. Compenst. DISABLE	Enable / Disable the temperature compensation function. Range: 0.01V-0.20V/

For example: set at 0.02V/C. If the temperature is 10 , the floating voltage will rise  $(25 - 10) * 0.02V/$  , that is 0.3V.

Set parameters when the charger is in the status: Stop Charge.

(5) Turn on the **control switch**. The charger is going to work.

LCD shows output voltage, current in the first line and the status of charger in the second line. The charge stage and charging time depend on the battery.

024.0V 000A Stop Charge	⊗
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Status	Display	Indicator	
Constant current	Equalize charge	Yellow flash	3-stage
Constant voltage	Constant voltage	Yellow light	
Floating charge	Floating charge	Green flash	
Charge complete.	COMPLETED	Green flash	
Over volt protection	OVER VOLTAGE	Red flash	Manually restart
Over Load protection	OVER HEAT		Auto restart
Over temperature protection (80°C -85°C)	OVER LOAD		(If restart 3 times in 1 minute, manually restart.)
AC input voltage low protection	INPUT ABNORMAL		
Stop charge	STOP CHARGE	Green light	

Table 1. Charger status list

(6) Press **key** to see the time of charge. The time will be clean when turn off the "ON/OFF" switch.

026.7V 008A 00D 06H 15M
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(7) Stop and alarm

- When **over voltage** and **over load** protection occurs, the charger will stop and alarm. The indicator is red and flash.
- When **over temperature** or **AC input voltage low** protection occurs, the charger will stop and alarm. The indicator is red and flash. When resume, it will restart automatically.
- When **over load** or **AC input voltage low** protection acts, the charger will try to restart 3 times. If it still protects, it will not restart and try to auto restart once every hour. Press "Menu/Set" key to acknowledge the alarm and press "Back/Cancel" key to restart manually.
- When charge is **completed**, it will stop and alarm. The indicator is green and flash.

- Alarm relay output (3 wires. Red black green). Normally open: red and green. Normally close: red and black. Relay capacity: 0.3A, 110VDC/125VAC.

**Note:** Specifications is subject to change without notice.

Appendix 1. Standard types and dimensions.

C. \ V.	12V	24V	36V	48V	60V	72V	80V	96V	108V	192V	216V	324V
3A												
5A											B	B
10A				A	A	A	A	A	B	B	C	C
15A			A			B		B	B	C	C	D
20A		A		A	B	B	C	C	C	D	D	D
25A			A			C		C	C	D	D	E
30A		A		B	C	C	C	C	D	E	E	E
40A	A	A	B	C	C	C	D	D	D	E	E	F
50A	A	B	C	C	C	D	D	D	E	F	F	G
60A	A	B	C	C	D	D	D	E	E	F	F	G
70A	B	C	C	D	D	D	D	E	E	F	G	
80A	B	C	C	D	D	D	E	E	F	G	G	
90A	B	C	D	D	D	E	E		F	G		
100A	B	C	D	D	E	E	E	F	F			
120A	C	C	D	D	E	E	F	F	F			
130A	C	D	D	E	F	F	F	F	G			
150A	C	D	D	E	F	F	G	G	G			
180A	C	E	E	F	F	G	G	G				
200A	C	E	E	F	G	G	G					

	Dimensions (mm)	Weight (KG)	POWER(KW)
A	Bench mounted, 350 × 243 × 113 mm	6-7	1.2
	Wall mounted, 350 × 140 × 500 mm	10	
B	Bench mounted, 370 × 310 × 113 mm	8-9	1.8
	Wall mounted, 350 × 140 × 500 mm	12	
C	Bench mounted, 460 × 350 × 128 mm	12-14	3.6
D	Bench mounted, 520 × 380 × 150 mm	20-22	6.5
E	Bench mounted, 550 × 430 × 160 mm	25-28	10
F	Cabinet, 540 × 260 × 1000 mm	50-60	15
G	Cabinet, 600 × 320 × 1000 mm	65-75	20

**Appendix 2.** Choose charge voltage and current

**Voltage:** charging voltage per cell × number of cells;

For example, 9 pcs of 12V LA battery in series

Equalize constant voltage, 14.1V × 9 = 119.7V,

Floating constant voltage, 13.4V × 9 = 126.9V

**Current:** Battery capacity × charging factor.

If choose 0.1 as the factor, it will take no more than 16 hours to charge the completed discharged battery. If choose 0.2, it will take less than 8 hours to charge the completed discharged battery.

For example, 48V 630Ah battery, Constant current,

0.1 × 630 = 63A. So choose 60A or larger charger;

0.2 × 630 = 126A. Choose 120A or larger charger.

**Appendix 3.** Default voltage, for 3-stage charging curve.

Battery Nominal Voltage		12V	24V	48V	60V	72V	80V	216V
LA/VRLA/AGM	Floating	13.4V	26.7V	53.4V	66.5V	80.0V	89.3V	241V
	Equalize	14.1V	28.2V	56.4V	70.5V	84.6V	94.0V	254V
GEL	Floating	13.5V	27.0V	54.0V	67.5V	81.0V	90.0V	243V
	Equalize	14.3V	28.6V	57.2V	71.5V	85.8V	95.3V	257V

AGM: Absorbed Glass Matt

Note: If the temperature compensation function is enabled, the charging voltages set in the menu are voltages when the environment temperature is at 25 . The real output voltage changes according to the temperature.