Felicitysolar SCCM4548 Solar MPPT Controller SCHM Series User Guide

Contents

Felicitysolar SCCM4548 Solar MPPT Controller SCHM Series

ABOUT THIS MANUAL

1. **Purpose**
   This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations. Keep this manual for future reference.
2. **Scope**
   This manual provides safety and installation guidelines as well as information on tools and wiring.
3. **SAFETY INSTRUCTIONS**

WARNING: This chapter contains important safety and operating instructions. Read and keep this manual for future reference.

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
3. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
4. CAUTION – Only qualified personnel can install this device with battery.
5. NEVER charge a frozen battery.
6. For optimum operation of this charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this charger.
7. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
8. Please strictly follow installation procedure when you want to disconnect PV or battery terminals. Please refer to Installation section of this manual for the details.
9. GROUNDING INSTRUCTIONS -This charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this charger.
10. NEVER cause short-circuited on battery output.

11. Warning!! Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this charger back to local dealer or service center for maintenance.

INTRODUCTION

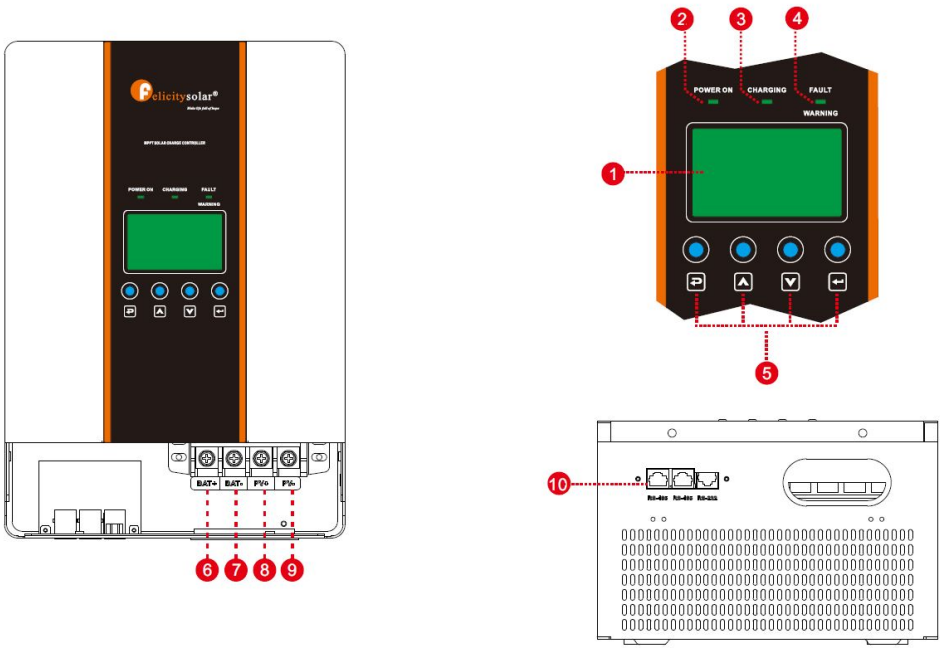
Thank you for selecting this solar charge controller. This solar charge controller is an advanced solar charger with maximum power point tracking. Applying intelligent MPPT algorithm, it allows solar charge controller to extract maximum power from solar arrays by finding the maximum power point of the array.

The MPPT battery charging process has been optimized for long battery life and improved system performance.Self-diagnostics and electronic error protections prevent damage when installation errors or system faults occur. The charger also has a multi-functional LCD and communication port to monitor controller status.

Features

- Intelligent Maximum Power Point Tracking technology increases efficiency 25%~30%
- Compatible for PV systems in 96V~ 384V(from 8 packs to 32 packs)
- Three-stage charging optimizes battery performance (Two-stage charging in lithium battery mode)
- Maximum charging current up to 25/ 50A
- Maximum efficiency up to 98%
- Supports lithium battery and various lead-acid batteries, AGM and gel battery
- Integrated intelligent slot compatible with MODBUS communication

Product Overview



1. LCD display
2. Power On indicator
3. Charging indicator
4. Fault and warning indicator
5. Operation button

6. Battery Positive +
7. Battery Negative –
8. PV Positive +
9. PV Negative –
10. Communication Port

INSTALLATION

Unpacking and Inspection

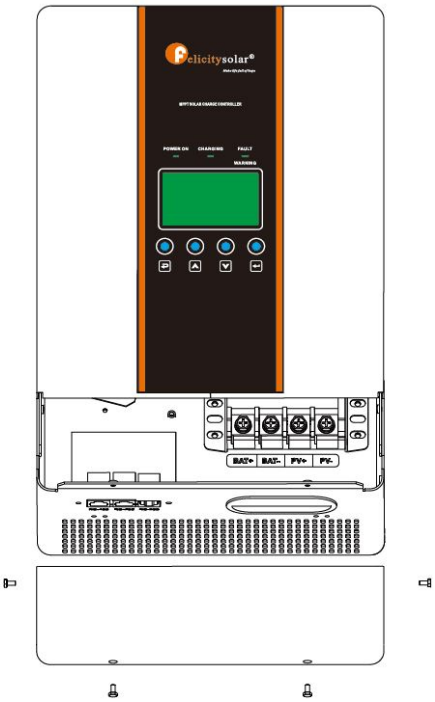
Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:

- Solar charge controller x 1
- User manual x 1
- Screw x n
- Guarantee card x 1

NO	NAME	SPECIFICATION	PICTURE
1	Screw	Mounting screw	
2	User manual	User manual	
3	Guarantee card	Guarantee card	

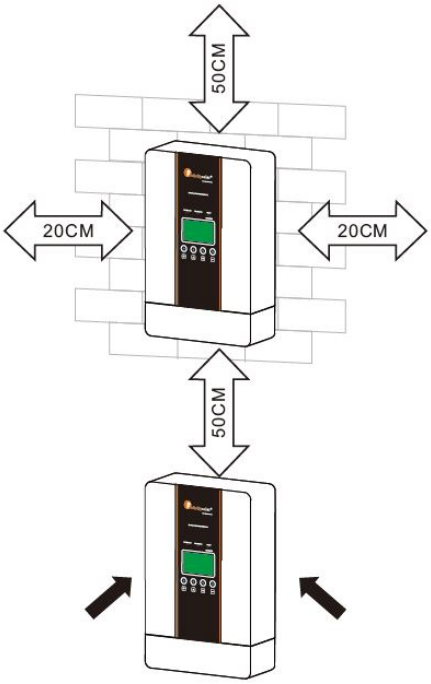
Preparation

Before connecting all wirings, please take off wiring box cover by removing screws as shown below.



Mounting the Unit

Consider the following points before selecting where to install:



- This solar charge controller is designed in IP20 for indoor applications only.
- Do not mount the unit on flammable construction materials.
- Mount on a solid surface
- Install this charger at eye level in order to allow the LCD display to be read at all times.
- For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.

Install the unit to the wall by screwing two screws.
Refer to right chart.

Power Connection

Wire size

The four large power terminals are sized for 14 – 2 AWG (2.5 – 35mm 2) wire. The terminals are rated for copper and aluminum conductors. Use UL-listed Class B 600Volt stranded wire for SCHM50240 model/1000Volt stranded wire for SCHM25384 model. Good system design generally requires large conductor wires for solar module and battery connections that limit voltage drop losses to 2% or less.

Minimum Wire Size

The table below provides the recommended minimum wire size allowed for the charger.
Wire types rated for 75°C and 90°C are listed.

Recommended wire size:

Typical Amperage	Wire Type	75° °C Wire	90° °C Wire
25A	Copper	8 AWG (10 m)	8 AWG (10 m)
	Aluminum	6 AWG (16 m)	6 AWG (16 m)
50A	Copper	4 AWG (25 m)	6 AWG (16 m)
	Aluminum	2 AWG (35 m)	4 AWG (25 m)

Overcurrent Protection and Disconnects

CAUTION: Circuit breakers or fuses must be installed in both battery and solar circuits.
The battery circuit breaker or fuse must be rated to 125% of the maximum current or more. The recommended breaker/fuse rating for use with the charger is listed in the below table.

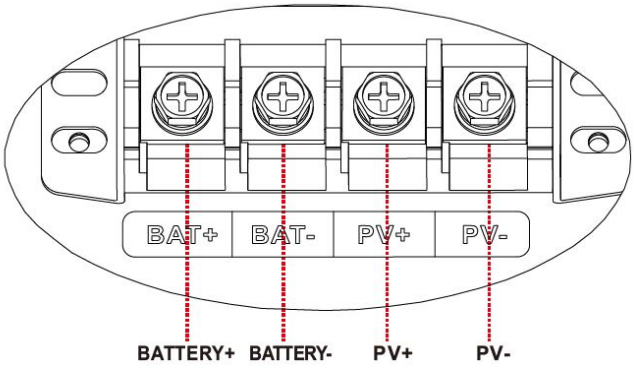
Recommended breaker rating:

Minimum battery circuit breaker/fuse rating	
1.25 x 25Amps = 31.3 Amps	1.25 x 50Amps = 62.5 Amps

A disconnect is required for the battery and solar circuits to provide a means for removing power from the charger. Double pole switches or breakers are convenient for disconnecting both solar and battery conductors simultaneously.

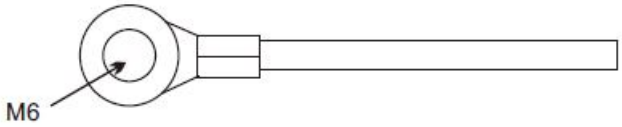
Connect the Power Wires
The solar modules can produce open-circuit voltages in excess of 100 Vdc when in sunlight. Verify if solar input breaker or disconnect has been opened (disconnected)before connecting system wires.

WARNING: Shock Hazard



Connect terminals by following below steps (Refer to diagram above):

1. Make sure that the system input and output disconnect switches are both turned off before connecting power wires to the charger. There are no disconnecting switches inside the charger.
2. Make 4 power wires first. M6 wiring terminal is selected.
   Refer to the chart below.



3. Pull all wires into the wiring box.

WARNING: Risk of Damage

Be sure that the battery connection is made with correct polarity. Turn on the battery breaker/disconnect and measure the voltage on the open battery wires BEFORE connecting to the controller. Disconnect the battery breaker/disconnect before wiring to the controller.

4. Connect positive terminal (+) of battery to the battery positive terminal (+) on the controller.
5. Connect negative terminal (-) of battery to the battery negative terminal (-) on the controller.

   WARNING: Risk of Damage

   Be sure that solar connection is made with correct polarity. Turn on the solar breaker/disconnect and measure the voltage on the open wires BEFORE connecting to the controller. Disconnect solar breaker/disconnect before wiring to the controller.
6. Connect positive wire (+) of solar module to the PV positive terminal (+) on the controller.
7. Connect negative wire (-) of solar module to the PV negative terminal (-) on the controller.
8. Screw four (4) power terminals tightly with 50 in-lbs torque. (5.65 Nm)

Grounding and Ground Fault Interruption
Use a copper wire to connect the grounding terminal in the wiring box to earth ground.The grounding terminal is identified by the ground symbol shown below that is stamped into the outside box on the right side of the terminal block:

The minimum size of the copper grounding wire is 8 AWG (10 mm2).

WARNING: Risk of Fire
DO NOT bond system electrical negative to earth ground at the controller.

OPERATION

Power-Up

WARNING: Risk of Damage

Connecting the solar module to the battery connector will permanently damage the controller.

- Confirm that the solar and battery polarities are correctly connected to the controller.
- A battery must be connected to the controller before operating it. The controller will not operate only with solar input. Solar input can trigger the controller to start up when the battery is connected without pressing the button.
- Turn on battery disconnect switch first, and then turn on solar disconnect switch. If the solar module is in full sunlight, the controller will begin charging.
- The number of battery must be seted according to actual needs in the first uesd (in seting program 05). Otherwise, the controller can’t work properly and 25 warning occur.

Operation and Display Panel
The operation and display panel, shown in below chart, is on the front panel of the controller. It includes three

indicators, four operation buttons and a LCD display, indicating the operating status and input/output power information.

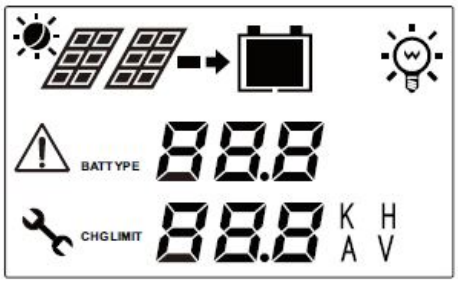
LED Indicator

LED Indicator			**Messages**
POWER ON	Green	Solid On	PV Voltage is OK
		Light off	PV Voltage is fault
CHARGING	Green	Solid On	Float stage
		Flashing	The controller is charging. Bulk charge stage: flashing every 0.5 second Absorption stage: flashing every 0.5 second Lithium battery wake-up: flashing every 0.3 seconds
WARNING/FAULT	Red	Solid On	Fault status
		Flashing	Warning status: flashing every 0.5 second

Button Operation

Function Key	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

LCD Display Icons



Icon	Function description	
888 88.8 A V	Indicates the PV input voltage, BAT charging voltage ,BAT charging current.	
⚠ 888	Indicates warning/fault codes.	
	Indicates battery level by 0-20%, 21-40%, 41-60%, 61-80% and 81-100% in charging status.	
	Flashing indicates battery disconnect	
	Disapper	PV voltage is too low
	Flashing	PV voltage is too hight
	Solid on	PV voltage is ok
	Indicates charging dynamics .	
Input/Output Information		
PU 294 V	Indicates PV voltage	
bU 247 V	Indicates battery voltage	
bC 10 A	Indicates battery current	
VEr 110	Indicates software version	

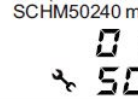
Battery Charging Status

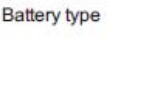
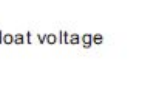
Status	Battery voltage	LCD Display
	< 2V/cell	Five bars will flash in turns.
Constant Current mode / Constant Voltage	2 ~ 2.055V/cell	The down bar will be on and the other four bars will flash in turns.
	2.055 ~ 2.11V/cell	The two down bars will be on and the other three b ars will flash in turns.
	2.11 ~2.167V/cell	The three down bars will be on and the other two b ars will flash in turns.
mode	> 2.167 V/cell	The four down bars will be on and the less bar will flash.
Floating mode	Batteries are fully charged.	5 bars will be on.

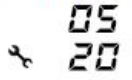
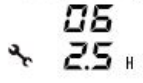
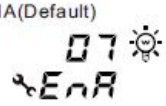
LCD setting

After pressing and holding “ENTER” button for 3 seconds, the unit will enter setting mode. Press “UP” or “DOWN” button to select setting programs. And then, press “ENTER” button to confirm the selection or ESC button to exit.

Seting Programs

Program	Description	Options	
00	Exit setting mode	Escape 	
01	Maximum charging current	25A(Default for SCHM25384 model) 	Short press "ENTER" button to enter the seting status, after that, shortly press "UP"or "DOWN" button to increase or decrease 1A each time, and after pressing "UP"or "DOWN" button for 2.5 seconds, it will increase or decrease 10A every 0.5 seconds.
		50A(Default for SCHM50240 model) 	

02	Battery type	Use-Defined(Default) 	If "Use-Defined" is selected, battery charge voltage can be set up in program 03 and 04 . If "Lib" is selected, battery charge voltage can be set up in program 03 . Note : Program 03,04 and 05 is designed for lead acid batteries, AGM batteries and gel batteries. If lithium batteries are used, ensure that the total charging voltage set by the controller is not greater than the rated charging voltage of lithium batteries.
		AGM 	
		Flooded  	
		LIB 	
03	Absorption voltage	14.4V (Default) 	If "Use-Defined" or "Lib" is selected in program 02, this program can be set up. The setting range is from 12.0V to 15.0V. This program and program 05 constitute the total charging voltage. For example, the absorption voltage is 14.4V, the setting value of program 05 is 20, and the total charging voltage is 288V =14.4V X20.
		 	Press "UP" or "DOWN" button to modify, increment of each short press is 0.1V, and after pressing for 2.5 seconds, it will charge 1V every 0.5 seconds. Once the value is achieved 15.0V, the value will jump back to12.0V.
04	Float voltage	13.6V (Default) 	If "Use-Defined" is selected in program 02, this program can be set up. The setting range is from 12.0V to 15.0V. If "Lib" is selected in program 02, this parameter is consistent with absorption voltage. This program and program 05 constitute the total float voltage. For example, the float voltage is 13.6V, the setting value of program 05 is 20, and the total charging voltage is 272V =13.6V X20.
		 	Press "UP" or "DOWN" button to modify, increment of each short press is 0.1V, and after pressing for 2.5 seconds, it will charge 1V every 0.5 seconds. Once the value is achieved 15.0V, the value will jump back to 12.0V.

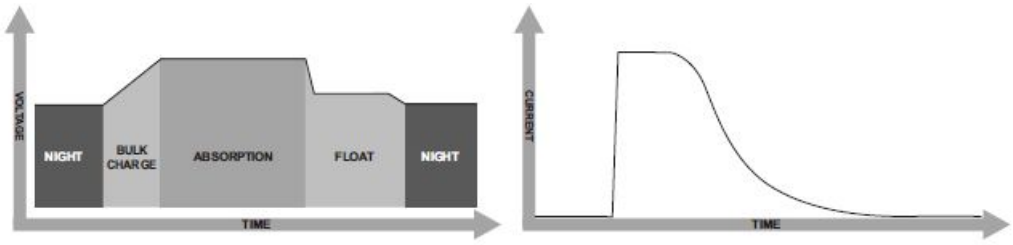
05	Number of battery	For SCHM50240 model  	Set the number of batteries in series according to actual use. The 50240 model setting range is from 8 packs to 20 packs (96V~240V) and the 25384 model setting range is from 20 packs to 32 packs (240V~384V). Note 1 : One pack corresponds to 12V. Note 2 : This program applies to lead acid batteries, AGM batteries and gel batteries. If 'Lib' is set in program 02, This program should be set according to the charging voltage of lithium battery and make sure the controller total charging voltage does not exceed the charging voltage of the lithium battery. For the calculation method of the total charging voltage of the controller, refer to program 03.
		For SCHM25384 model  	
06	Battery C.V. charging duration	2.5 hours(Default)  	The setting range is from 0.1 hours to 15 hours. Press "UP"or"DOWN" button to modify, increment of each short press is 0.1 hours, and after pressing for 2.5 seconds, It wil charge 1 hours every 0.5 seconds. It will jump back to 0.1hours after 15 is achieved.
07	Back light of LCD	ENA(Default)  	Setting the control of LCD backlight enable, LCD backlight will always-on. Setting the control of LCD backlight disable, have no operation the LCD backlight will go out after 60s.
08	Battery charging enable	ENA(Default)  	ENA: Charging enable DIS: Charging disable

Reference Code

Type	Code	Event
FAULT	01	Software detect over current fault
	02	Hardware detect over current fault
	03	Over temperature fault
	04	Heatsink1 temperature-variable fault
	05	Heatsink2 temperature-variable fault
	06	Battery voltage is too high
	07	Battery short
	08	Battery current senser fault
	09	Battery voltage senser fault
	10	PV is high loss
	11	IIC-eeprom fault
	12	NTC disconnect
	13	Software version and hardware version do not match
Warning	20	Output derating caused from high PV voltage
	21	Output derating caused from high temperature
	22	Fan1 failure
	23	Fan2 failure
	24	Fan3 failure
	25	Need to set the number of batteries in program 05 based on the actual numbe r of batteries

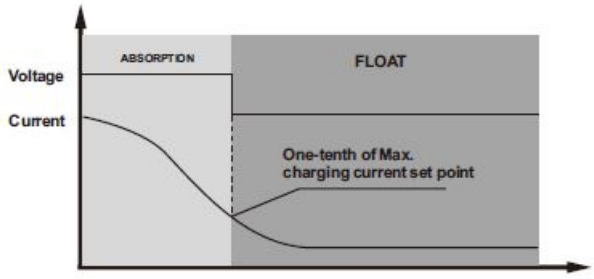
CHARGING LOGIC

1 3-stage Charging
In general, this solar charge controller is designed with 3-stage battery charging algorithm for fast, efficient, and safe battery charging. The following picture shows the sequence of charging stages.

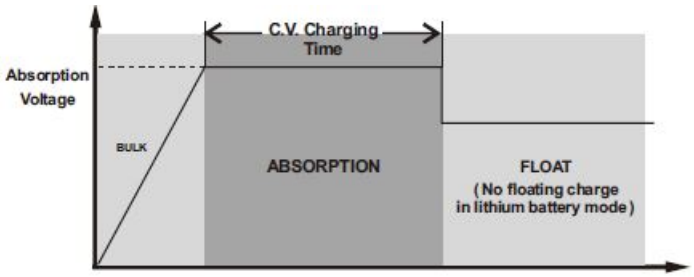


1. Bulk charge stage
   In bulk charge stage, charge current begins to flow, typically at the maximum rate of the charge source. The controller will supply solar power to charge battery as much as possible.
2. Absorption stage

When battery charging voltage is reached to Absorption voltage point, the charging stage changes from bulk charge to absorption. Constant-voltage regulation is used to maintain battery voltage at the absorption stage. If the charging current drops to one-tenth of the maximum charging current setting point, the charging status will change to float stage.



If the elapsed time of absorption stage is over setting value for C-V charging time, it will also transfer to float stage.



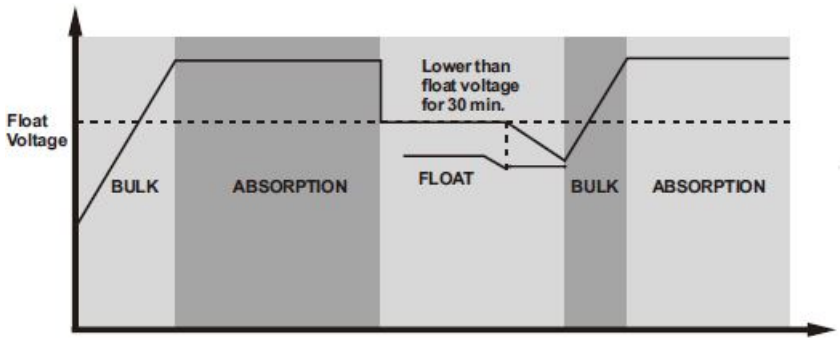
3. Float Stage

   After the battery is fully charged in the absorption stage, the controller will reduces the battery voltage to the setting point of float voltage. Once in float stage, constant-voltage regulation is used to maintain battery voltage at setting point of float voltage.

   In lithium battery mode: the charging logic has no floating charge stage

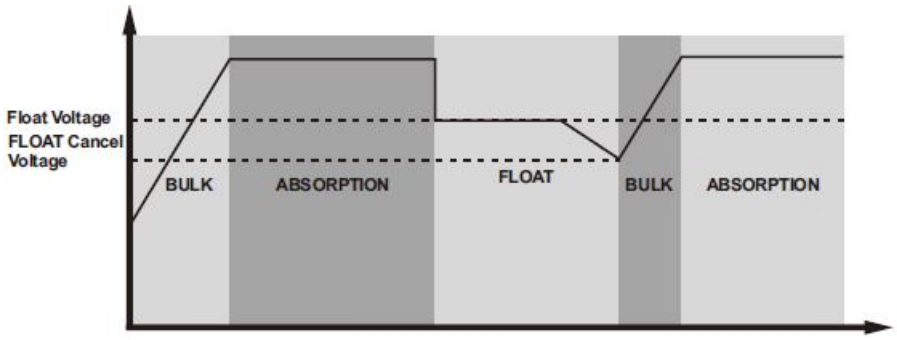
Float timeout

If the battery voltage remains lower than the float voltage for 30minutes, the controller will return to bulk charging stage.



Float cancel voltage

Once the battery voltage drops to setting point of float cancel voltage, the controller also returns to bulk charging stage. Float cancel voltage = floating charging voltage – (1V x battery numbers in series)



Setting Parameter and Default Value

Recommended and default parameter settings are listed below.

Parameter	Battery type	Absorp. Stage	Float Stage	Absorp. Time
Unit	–	Volt	Volt	hours
Option	AGM	14.4	13.6	2.5
Option	Flooded	14.6	13.8	2.5
Default	Customized	–	–	2.5
Option	LIb	–	–	–

TROUBLE SHOOTING

Situation		Situation
Fault Code	**Fault Event**	
01	Software detect over current fault	1. Restart the controller. 2. If the problem remains, please contact your installer.
02	Hardware detect over current fault	1. Restart the controller. 2. If the problem remains, please contact your installer.
03	Over temperature fault	1. Keep the controller in the cool environment. 2. If the problem remains, please contact your installer.
04	Heatsink1 temperature-variable fault	1. Check whether the fans is turning, and whether the air in let and outlet is blocked. 2. Restart the controller. 3. If the problem remains, please contact your installer.

05	Heatsink2 temperature-variable fault	1. Check whether the fans is turning, and whether the air in let and outlet is blocked. 2. Restart the controller. 3. If the problem remains, please contact your installer.
06	Battery voltage is too high	1.Check whether the rated output voltage of the battery is c orrect(Program 05), and then restart the controller . If the pr oblem remains, please contact your installer.
07	Battery short	1. Check the battery terminal and the output terminal of the controller to ensure that there is no short circuit, and then re start the controller. 2. If the problem remains, please contact your installer.
08	Battery current senser fault	1. Restart the controller. 2. If the problem remains, please contact your installer
09	Battery voltage senser fault	1. Restart the controller. 2. If the problem remains, please contact your installer.
10	PV is high loss	1. Verify that the pv array is correctly configured and that t he PV open-circuit voltage is within the specifications of the controller. 2. If the problem remains, please contact your installer.
11	IIC-eeprom failure	1. Restart the controller. 2. If the problem remains, please contact your installer.
12	NTC disconnect	1. Restart the controller. 2. If the problem remains, please contact your installer.
13	Software version and hardware version do not match	1. Restart the controller. 2. If the problem remains, please contact your installer.

SPECIFICATIONS

Table 1 Electrical Specifications

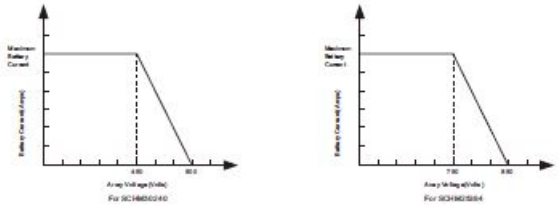
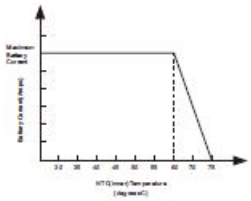
MODEL	SCHM50240	SCHM25384
Maximum Battery Current	50Amps	25Amps
Nominal System Voltage	96~240V	240~384V
Maximum Solar Input Voltage	500V	850V
PV Start-up Voltage	100V	230V
Vstart-pv	Vbat+30V	Vbat+30V
Vlow-pv	Vbat+10V	Vbat+10V
Maximum Input Power	10000W	
PV Array voltage & Battery current		
NTC(inner) temperature & Battery current		
Protections	Solar high voltage disconnect Solar high voltage reconnect Battery high voltage disconnect Battery high voltage reconnect High temperature disconnect High temperature reconnect	

Table 2 Battery Charging

MODEL	SCHM50240	SCHM25384

Charging algorithm	3-Step
Charging stages	Bulk, Absorption, Float
Temperature compensation coefficient	-5 mV / °C / cell (25 °C ref.)
Temperature compensation range	0 °C to +50 °C

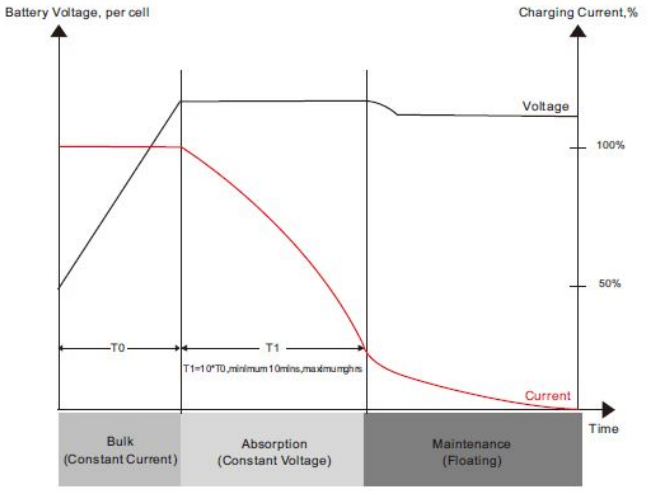
Charging curve	Battery Voltage, per cell T0 Bulk (Constant Current)		Maintenance (Floating)	Charging Current ,% Voltage 100%50 % Current Time

Table 3 Mechanical and Environment

Model	SCHM50240	SCHM25384
Product Size (W x H x D,mm)	365*250*164MM	
Product Weight (Kg)	11.5KG	
Ambient Temperature Range	0°C to +55°C	
Storage Temperature	– 40°C to 75°C	
Humidity	0%-90%RH(No condensing)	
Enclosure	IP20(indoor&vented)	

Documents / Resources

	Felicitysolar SCCM4548 Solar MPPT Controller SCHM Series [pdf] User Guide SCCM4548 Solar MPPT Controller SCHM Series, SCCM4548, Solar MPPT Controller SCHM Series, MPPT Controller, Controller