

SMART1

MPPT Solar Charge Controller

Product Manual

Appendix

Display	
LCD display	Input, output parameter and output power etc (check the LCD display instruction)
LED display	3 LEDs indicates: Fault indicate light, charge indicate light, power source indicate light(check the LED instruction)
Software Control through PC (communication port)	RS232 (matching) or LAN(optional)
Protection	
Input Low Voltage Protection	Check the input characteristics
Input Overvoltage Protection	Check the input characteristics
Input Polarity Reversal Protection	yes
Output Overvoltage Protection	Check the input characteristics
Output Polarity Reversal Protection	yes
Short-circuit Protection	Recover after eliminating the Short-circuit fault, no problem for long term Short-circuit
Temperature Protection	95°C
Temperature Protection	Above 85°C, decrease the output power, decrease 3A per degree.
Other Parameters	
Noise	≤40dB
Thermal methods	Forced air cooling, fan speed rate regulated by temperature, when inner temperature is too low, fan ran slowly or stop; when controller stop working, fan also stop ran.
Components	World brand raw materials. Compliance with EU standards. All rated temperature of electrolytic capacitors not less than 105 °C.
Smell	No peculiar smell and toxic substances.
Environment Protection	Meet the 2002/95/EC, no cadmium hydride and fluoride
Physical	
Measurement DxWxH (mm)	270*185*90
N.G(kg)	3
G.N(kg)	3.6
Color	Blue/Green (optional)
Safety	CE 、PSE、 FCC、 EMC
EMC	En61000
Type of Mechanical Protection	IP21
Environment	
Humidity	0~90%(RH no condense)
Altitude	0~3000m
Operating Temperature	-20°C~+40°C
Storage Temperature	-40°C~+75°C
Atmospheric Pressure	70~106KPa

Introduction

This manual contains the contents of the installation, operation and usage of the controller. Please read it carefully before installation. Professionals should be responsible for the equipment operating in order to make sure normal running of the controller. Please take good care of this manual for future reference whenever necessary. The followings are some symbols and marks used in this manual:

Symbol and Signs

Following symbol and signs will be used in the manual.



Warning

If you violate the operation rules, it would endanger personal safety, affect the reliability of the equipment or cause loss of data.



Danger

If you violate the operation rules, it would endanger personal safety, affect the reliability of the equipment or cause loss of data.



Attention

► Indicating additional data and information

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Appendix

11.Technical Parameter

Model:SMART1-DC12V/24V/48V-Series		40A		50A		60A			
Charge Mode		Maximum Power Point Tracking							
Method		3 stages: fast charge(MPPT),constant voltage, floating charge							
System Type		DC12V/24V/48V		Automatic recognition					
System Voltage		12Vsystem		DC9V~DC15V					
		24Vsystem		DC18V~DC30V					
		48Vsystem		DC36V~DC60V					
Soft Start Time		12V/24V/48Vsystem		≤10S					
Dynamic Response Recovery Time		12V/24V/48Vsystem		500us					
Conversion Efficiency		12V/24V/48Vsystem		≥96.5%,≤99%					
PV Modules Utilization Rate		12V/24V/48Vsystem		≥99%					
Input Characteristics									
MPPT Working Voltage and Range		12Vsystem		DC18V~DC150V					
		24Vsystem		DC34V~DC150V					
		48Vsystem		DC65V~DC150V					
Low Voltage Input Protection Point		12Vsystem		DC16V					
		24Vsystem		DC30V					
		48Vsystem		DC60V					
Low Voltage Input Recovery Point		12Vsystem		DC22V					
		24Vsystem		DC34V					
		48Vsystem		DC65V					
Max DC Voltage		12V/24V/48Vsystem		DC160V					
Input Overvoltage Protection Point		12V/24V/48Vsystem		DC150V					
Input Overvoltage Recovery Point		12V/24V/48Vsystem		DC145V					
Max. PV Power		12Vsystem		570W		700W		900W	
		24Vsystem		1130W		1400W		1700W	
		48Vsystem		2270W		2800W		3400W	
Output Characteristics									
Selectable Battery Types (Default type is GEL battery)		12V/24V/48Vsystem		Sealed lead acid, vented, Gel, NiCd battery (Other types of the batteries also can be defined)					
Constant Voltage		12V/24V/48Vsystem		Please check the charge voltage according to the battery type form.					
Floating Charge Voltage		12V/24V/48Vsystem							
Over Charge Protection Voltage		12Vsystem		14.6V					
		24Vsystem		29.2V					
		48Vsystem		58.4V					
Rated Output Current		12V/24V/48Vsystem		40A		50A		60A	
Current-limiting Protection		12V/24V/48Vsystem		44A		55A		66A	
Temperature Factor		12V/24V/48Vsystem		±0.02%/℃					
Temperature Compensation		12V/24V/48Vsystem		14.2V-(The highest temperature -25℃)* 0.3					
Output Ripples(peak)		12V/24V/48Vsystem		200mV					
Output Voltage Stability Precision		12V/24V/48Vsystem		≤±1.5%					

Storage and Disposal

9.Storage and Disposal

9.1 Store the charge controller in a dry place with ambient temperatures between -40 °C and +75 °C.

9.2 Disposal

Dispose of the solar charge controller at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time.

10. Recovery Processing and Warranty

10.1 Recovery Processing

When the controller mal-functions, please check the following questions and contact our customer service representative if you need assistance.

10.1.1 Controller failure mode:

Please check the fault tips in the failure mode, and then proceed to the appropriate troubleshooting.

10.1.2 When the controller does not start properly.

1. Check the controller external solar panels with the correct polarity.
2. Check Battery Connection.
3. Check Battery.
4. Check circuit breaker.
5. Check internal fuse.

If the problem persists, please contact customer service.

Please offer the following information:Equipment information: Model, Order No., serial-number (Stickers on the rear plate). Detailed description of the problem

(Type of system, occasionally/frequent problems, indicator light, data display, and so on).

10.2Warranty

Within the warranty period, it is free to repair for the non-human fault. Otherwise, the cost of repairs would be charged.

Notes on this Manual

1.Notes on this Manual

This manual describes how to install and service your Aims Power MPPT solar charge controller.

1.1 Validity

This manual applies to MPPT solar charge controller models produced by our company:

1.2 Target Group

This manual is intended for the installer and the operator.

1.3 All manuals for the device and installed components should be stored in the immediate vicinity of the charge controller and must be accessible at all times.

1.4 Symbols Used

The following types of safety messages and general information appear in this document:



Warning!

WARNING indicates a hazardous situation which, if not avoided, could result in machine stoppage or serious injury.



Warning!

WARNING indicates a hazardous situation which, if not avoided, could result in machine stoppage or serious injury.



Note!

In order to operate this device well, please read the operation instructions carefully.

Safety Instructions

2.Safety Instructions

2.1 General Safety Instructions

Warning!

The input voltage of this device may be extremely high and life threatening.

- All work on the charge controller must only be carried out by an electrically skilled person.
- The Controller is not to be used by children or persons with reduced physical sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children should be supervised to ensure that they do not play with the appliance.

Caution!

Surface may be extremely hot and may cause burns.

- Do not touch the enclosure of the charge controller during operation. If possible keep in a cool environment.




Caution!

Unit may emit some radiation which may be harmful.

- Do not stay within 1 foot of controller for any extended period of time.

2.2 Explanation of Symbols

- Below is the explanation for all the symbols shown on the device and label.

Symbol	Explanation
	Risk of electric shock Energy stored in capacitors will remain for 5 minutes; don't touch within this period after disconnecting Both input and output lines have power, disconnect both and don't operate for at least 5 minutes after disconnection
	No self-serviceable parts are inside the enclosure, don't attempt to remove the cover. Only qualified persons are permitted to operate and maintain the equipment. Only insulated tools are permitted for use to reduce risks of hazard to individuals.
	Beware of hot surface. The solar charge controller can become hot during operation. Avoid contact during operation. Never put any goods onto the controller.

Maintenance and Cleaning

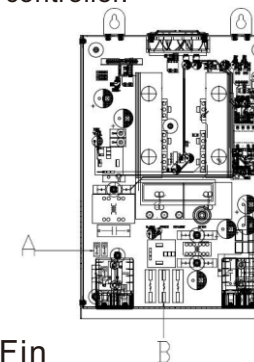
8.Maintenance and Cleaning

8.1 Replacing the Thermal Fuses

Using incorrect thermal fuses may irreparably damage the solar charge controller.

- Only use the thermal fuses included in the scope of delivery

1. Open the solar charge controller as described in section "Opening the solar charge controller"
 2. Remove the broken thermal fuses from the sockets (A and B).
 3. Insert new thermal fuses (included in the scope of delivery).
 4. Close the solar charge controller as described in section "Closing the solar charge controller".
 5. Remember always connect the batteries before the solar panels or you will permanently damage the controller.
- Note: To clean simply wipe the outside with a lightly dampened cloth. If unit has been opened use an air spray such as a keyboard cleaner to blow out the internal dust that may accumulate inside the controller.



Cleaning the Cooling Fin

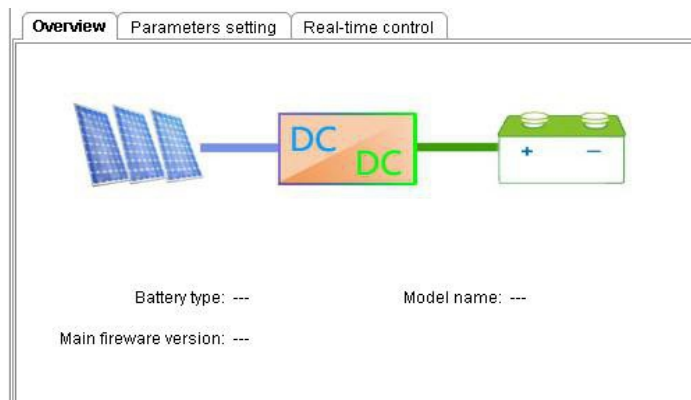
Clean the Fan air vents and internal cooling fan regularly by using a dry or slightly damp cloth to wipe.

Attention:

- Liquid detergent or corrosive solvent cleaning are forbidden.
- Liquid is not allowed in the device.
- Clear the air vent passage.
- Carefully remove dirt with a suitable soft brush if deemed necessary.

LED/LCD and Function Key

Step 4: Software can display battery type information and model name etc as below.



7.5 The controller has been pre-programmed to properly charge 4 battery types. See chart below. Any other types may be programmed using included software.

Pre-Programmed Charging Specs						
Battery Type	Bulk Voltage			Floating Voltage		
	12V	24V	48V	12V	24V	48V
Vented	14.2V	28.4V	56.8V	13.2V	26.4V	52.8V
Sealed	14.2V	28.4V	56.8V	13.4V	26.8V	53.6V
Gel	14.2V	28.4V	56.8V	13.7V	27.4V	54.8V
NiCd	14.2V	28.4V	56.8V	14.0V	28.0V	56.0V
Other	user-defined(Set by the microcomputer software)					

In the case battery type is not set, use the default battery type (Gel gel battery).

Safety Instructions

• Symbols Label

Symbol	Explanation
CE FCC CB ROHS mark ;	The controller complies with the requirements of the applicable CE FCC CB ROHS guidelines.

• Important Safety Instructions

When using the product, please do remember the below information to avoid fire, lightning or other personal injury:

Warning!	Ensure input DC voltage is no more than Max. DC voltage (Voc). Over voltage may cause permanent damage to solar charge controller or other losses, which will not be covered by the warranty! This chapter contains important safety and operating instructions. Read and keep this operation guide for future reference.
Warning!	Authorized service personnel must disconnect both DC and battery bank power from the solar charge controller before attempting any maintenance or cleaning or working on any circuits connected to the solar charge controller.

• Before using the solar charge controller, please read all instructions and cautionary markings on the solar charge controller, and all corresponding sections of this guide.

• Contact AIMS Power for any questions or concerns about your controller. Trying to modify or repair it may result in a fire, electric shock, or injury.

• To reduce risk of fire and electric shock, make sure that existing wiring is in good

condition and that all wire is properly sized. Do not operate the solar charge controller with damaged or substandard wiring.

• Do not disassemble the solar charge controller. It contains no user-serviceable parts.

See Warranty for instructions on obtaining service. Attempting to repair the solar charge controller by yourself may result in a risk of electric shock or fire and will void your warranty.

• To reduce the risk of electric shock, authorized service personnel must use insulating tools when connecting or working on the controller.

• Keep away from flammable, explosive materials to avoid fire.

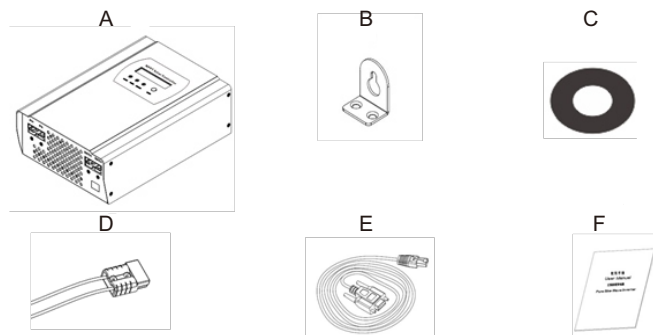
If at all possible keep away for excessively humidity to avoid corrosion.

• To reduce the chance of short-circuits, authorized service personnel must use insulated tools when installing or working on this equipment.

Unpacking

3.Unpacking

3.1 Parts List :



Object	Quantity	Description
A	1unit	Charge controller
B	2pcs & 4pcs	Hang bracket & screws
C	1pce	CD
D	2pce	PV input (blue), DC output (red)
E	1pce	RS232 to RJ45 comm cable
F	1pce	User manual

If there is any part missing, please contact your dealer.

3.2Check for Transport Damage


Check the charge controller for visible external damage, such as dents on the enclosure. Contact your dealer.

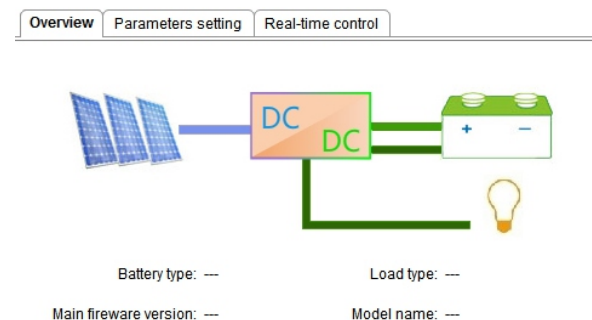
3.3Identifying the Charge Controller

You can identify the charge controller by the label. The label is in the enclosure.

LED/LCD and Function Key

7.4 MPPT and PC Connection

Step1:  overview: Access main interface as follows:



Step2: Parameters setting

The screenshot shows the Parameters setting interface. It has three tabs: Overview, Parameters setting, and Real-time control. The Parameters setting tab is active. It contains the following fields and buttons:

- Buck charge voltage: 0 V Apply
- Float charge voltage: 0 V Apply
- Machine address: 01 Apply
- Battery type: Vented Apply

Step 3: Battery type

The screenshot shows the Battery type selection interface. It has a dropdown menu for Battery type set to Vented, with an Apply button.

LED/LCD and Function Key

BAT Polar Error	Battery polar connect error
BAT Volt Error	Battery is not standard
Buck1 Fault	Buck1 circuit interrupted
Buck2 Fault	Buck2 circuit interrupted
Bat Temp High	Battery temperature too high
Enir Temp High	Environment temperature too high
Buck Temp High	Charge controller temperature is higher than 90 °C
PvVol Sensor Fail	PV voltage sensor interrupted
Bus Sensor Fail	Bus voltage sensor interrupted
Buck Sensor Fail	Buck voltage sensor fault
OutVol Sensor Fail	Output voltage sensor fault
OutCur Sensor Fail	Output current sensor interrupted
Battery Off	Battery cable interrupted

7.3 Types of battery can be set by function key.

Warning: NEVER disconnect the battery while charging. This will cause permanent damage to the controller and is not covered under the warranty. Always disconnect PV panels first.

Step 1:

Press the function key for 3 seconds, then LCD will display types of battery.

Step 2:

Press the key to choose the type of the battery that you need. When you press the function key once, LCD will display one type of battery.

Step 3:

After choosing the matched battery, you need press the function key for 3 seconds to set types of battery.

Assembly

4.Assembly

4.1 Operator : technical personnel;

4.2 Selecting the Mounting Location



Danger:

Possible fire and explosion hazard.

- The charge controller enclosure can become hot during operation.
- Do not mount the charge controller on flammable construction material.
- Do not mount the charge controller near highly flammable materials.
- Do not mount the charge controller in potentially explosive areas.
- Do not expose the charge controller to direct sunlight to avoid power loss due to overheating.



Caution:

Enclosure may become hot to the touch and may cause burns.

- Mount the charge controller in such a way that it cannot be touched inadvertently during operation.

4.2.1 Dimensions

L * W * H: 10.63*7.28*3.54 in / 270mm*185mm*90mm

4.2.1 Net Weight

Weight: 6.6Lbs or 3kg

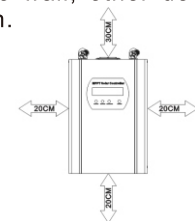
4.2.3 Ambient Conditions

- The mounting location and method must be suitable for the weight and dimensions.
- Mount on a solid surface.
- The mounting location must be accessible at all times.
- The charge controller must be easy to remove from the mounting location at any time.
- The ambient temperature should be between -20 °C and +60 °C to guarantee optimal operation.
- Do not expose the charge controller to direct sunlight to avoid power losses due to overheating.

4.2.4 Safety Clearance

Observe the following safety clearance to wall, other devices or objects to ensure sufficient heat dissipation.

Direction	Safety clearance
Sides	8in or 20cm
Top	12in or 30cm
Bottom	8in or 20cm



MPPT Controller Connection

5.MPPT Controller Connection

5.1 Safety



Danger!

High voltages are present and dangerous

- Disconnect the PV array using a disconnection unit and secure it against accidental reactivation.
- Disconnect the circuit breaker and ensure that it cannot be reconnected.
- Ensure that no voltage is present in the system.



Warning:

Risk of injury due to electric shock °

- If all cables with different voltages are routed in parallel, damaged cable insulations may lead to a short circuit.
- Route all cables separately if possible.

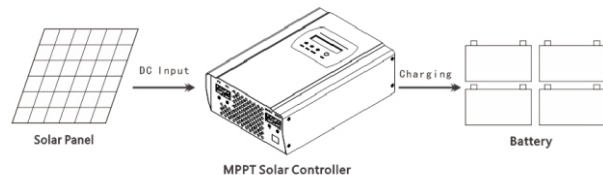


Warning:

Over voltage can destroy the system.

- Use an external over voltage protector in areas with an increased risk of lightning.

5.2Connections of the PV power system



5.2.1PV String

Solar charge controller device can be connected in parallels to charge the same battery bank. Please select PV modules with excellent function and reliable quality. Solar panels may be connected in series or in parallel. Open-circuit voltage (Voc) of module arrays connected in series should be less than Max. DC input Voltage (100V) of the e-Smart charge controller; operating voltage (Vmax) should conform to MPPT voltage range.

Please use PV cable to connect modules to the charge controller. It should be outdoor uv rated and we recommend 10Awg to prevent excessive losses due to distance. It is beneficial to increase the dc voltage to optimize performance and decrease inefficiencies.

LED/LCD and Function Key

Remarks : On this mode, shown the next page after each pressing of function key; when error occurred, enter the failure mode automatically.

Model 3 Display	Fault Mode
1	BAT CHG SYS
2	Firmware Ver
3	Machine ID
4	BAT Type
5	Fault Mode(See the fault type table)
6	Chg Cur
7	BAT Volt
8	Opt Power
9	PV Volt
10	Buck 1 Temp

Remarks: On this mode, shown the next page after each pressing of function key; when error removed, enter the other mode ;

Error mode

Error Mode	Description
PV Volt High	over voltage at DC input voltage
PV Volt Low	DC input voltage low (also at night and during periods with low solar irradiation)
In Relay Fault	Input relay interrupted
Out Volt Low	Battery voltage is lower than 9 V
Out Volt High	Short circuit, overload or over current at battery or PV array (also before first commissioning)
Out Cur Over	Over current at Output current
Out Relay Fault	Output relay interrupted
Output Short	Short circuit in the sensor cable

LED/LCD and Function Key

7.2 LCD explanation

7.2.1 The controller has the three -state mode:

Operating State	Information Display	Description
1	Checking	Check the system parameters , and compliance ;
2	Fault Mode	Charge cut down
3	Normal state	charging

7.2.2 Information from LCD display :

MPPT Information of LCD in different mode	
Model 1 Display	Boot Mode
1	mode\website
2	BAT checking
3	PV volt checking
4	In vol sen checking
5	Out vol sen checking
Remarks: Shown above automatically next page, according to system conditions, and then enter the normal operating mode or failure mode;	
Model 2 Display	Normal Mode
1	Display Model
2	Firmware Ver
3	Machine ID
4	BAT type
5	Chg Cur
6	BAT volt
7	Opt Power
8	PV volt
9	In Temp
10	Buck 1 Temp
11	CC Mode charging

MPPT Controller Connection



Note:

Do not connect the PV panel positive or negative to ground.



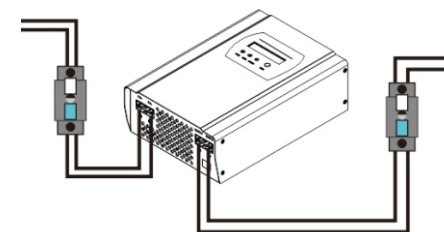
Warning:

PV module voltage may be very high! Electrical shock and fire may result due to improper connections. Please comply with electric safety rules when connecting.

5.2.4 Specification for cable and micro-breaker

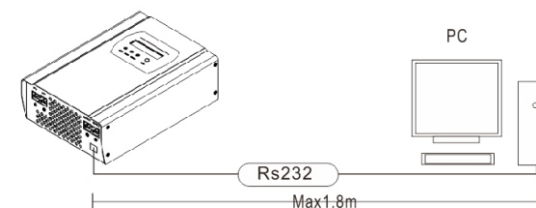
Model	40A	50A	60A
Cable (Cu)	≥4mm	≥4mm	≥4mm
Micro-Breaker	63A	63A	63A

Micro-breaker should be installed between DC input and outputs. Kindly check the following picture (we do not provide external breakers)



5.3 Solar charge controller and PC connection

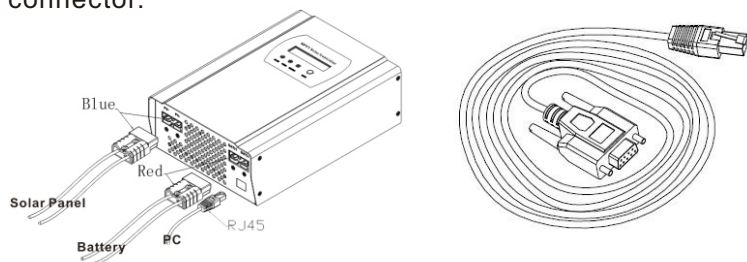
If PC has RS232 connector, check the following picture:



Steps for Commissioning or Shutdown

5.3.1 RS232 Communication

RS232 is one standard communication interface. It transmits the data between PC and one charger controller. One end of the cable is RJ45 connector, the other end is RS232 male connector.



5.3.2 Firmware(Solar Eagle)introduction

We have developed software that completely monitors and allows for many parameter changes via a computer.

6.Steps for Commissioning or Shutdown

6.1 MPPT controller work step

i Caution: Please follow the steps to ensure proper programming.

Please make sure the controller is properly wired.

Step 1: Close the battery breaker or make connection with the battery bank. Some led's and the lcd should illuminate.

Step 2: Now make the PV connection. If the PV module voltage is in the charging range, then the controller will start to work.

6.2 Steps for Proper Shutdown

i Caution: Follow the steps for shutdown to avoid damage.

Step 1: Open the PV breaker to disconnect panels from controller.

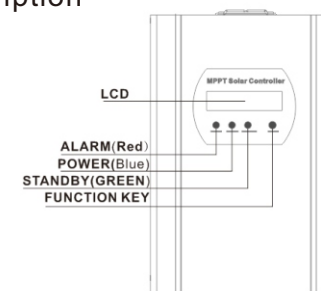
Step 2: Open the battery breaker or disconnect controller from battery bank. This will completely shut the controller to off.

! Warning: NEVER disconnect the battery while charging. This will cause permanent damage to the controller and is not covered under the warranty. Always disconnect PV panels first.

LED/LCD and Function Key

7. LED/LCD and Function Key

7.1 Panel Description



Meaning of LED and Function Key

ALARM (Red) ----- Alarm indicating a fault.

POWER(Blue) ----- Charging indicator.

STANDBY(GREEN)---- Power light (green).

FUNCTION KEY----- Function key.

LED information

Condition	Alarm(Red)	Power(Blue)	Standby(Green)
Power on	off	off	on
Charge	off	on	on
Fault	on	off	on
Bat Chose Type	off	off	off

7.1.1 Smart Charge Modes

This controller has 3 modes: Constant charging stage (CC Mode) , Constant voltage charging stage (CV Mode) , Floating charge stage (CF Mode) :

In CC Mode the blue led flashes every second.

In CV Mode the blue led flashes every 3 seconds.

In CF Mode the blue led stays on.

(Note: Charging Mode can also be checked via lcd or included s/w)