



samlexpower®

**Solar Charge
Controller**

SMC-20

**Owner's
Manual**

Please read this
manual **BEFORE**
installing your
solar charge
controller

SECTION 1 | Safety

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important Safety and Operating Instructions. Please read before using this unit .

These operating instructions are part of the product. Read these operating instructions carefully before use, keep them over the entire lifetime of the product, and pass them on to any future owner or user of this product.

Applicability

This manual describes the installation, function, operation and maintenance of the solar charge controller.

Further technical information is provided in a separate technical manual.

Users

These operating instructions are intended for end customers. A technical expert must be consulted in cases of uncertainty.

Description of symbols

Safety instructions are identified as follows:



CAUTION!

Type, source and consequences of the danger! Measures for avoiding danger.

SAFETY

Proper usage

The solar charge controller may only be used in PV systems for charging and controlling lead-acid batteries in accordance with this operating manual and the charging specifications of the battery manufacturer.

Improper usage

No energy source other than a solar generator may be connected to the solar charge controller. No mains devices, diesel generators or wind generators may be connected. Do not connect any defective or damaged measuring equipment.

General safety instructions

- Follow the general and national safety and accident prevention regulations.
- Never alter or remove the factory plates and identification labels.
- Keep children away from PV systems.
- Never open the device.

Other risks

1. Danger of fire and explosion:

- Do not use the solar charge controller in dusty environments, in the vicinity of solvents or where inflammable gases and vapours can occur.
- No open fires, flames or sparks in the vicinity of the batteries.

SECTION 1 | Safety

- Ensure that the room is adequately ventilated.
- Check the charging process regularly.
- Follow the charging instructions of the battery manufacturer.

2. Battery acid:

- Acid splashes on skin or clothing should be immediately treated with soap suds and rinsed with plenty of water.
- If acid splashes into the eyes, immediately rinse with plenty of water. Seek medical advice.

Fault behaviour

Operating the solar charge controller is dangerous in the following situations:

- The solar charge controller does not appear to function at all.
- The solar charge controller or connected cables are visibly damaged.
- Emission of smoke or fluid penetration.
- When parts are loose.
 - In these cases immediately remove the solar charge controller from the solar modules and battery.

SECTION 2 | Description

FUNCTIONS

The solar charge controller:

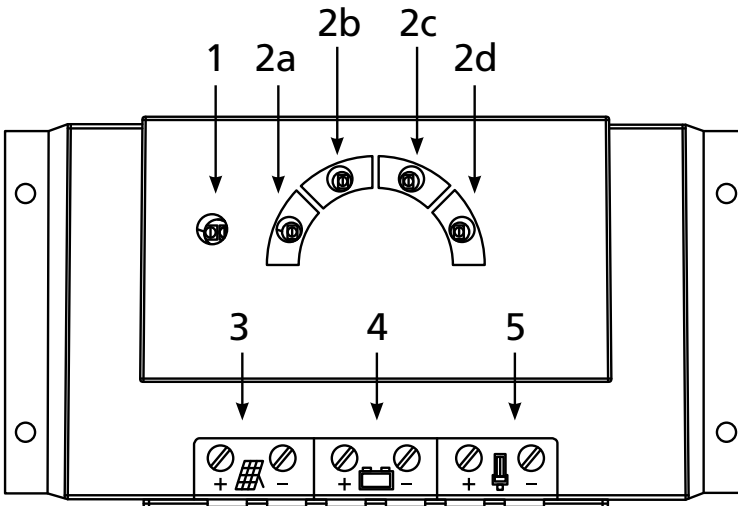
- Monitors the state of charge of the battery bank,
- controls the charging process,
- controls the connection/disconnection of loads.

This optimises battery use and significantly extends its service life.

A battery charging algorithm protects the battery from harmful states. Activation of the three deep discharge functions (LVW, LVD and LVR) is dependent upon the state of charge (SOC). The switching thresholds lie within the corresponding voltage window in accordance with the discharge or charging current.

CONSTRUCTION

The solar charge controller consists of the following components:



1. Info LED
2. 4 LEDs for displaying the State of Charge
(RED - 2a, YELLOW - 2b, GREEN - 2c & GREEN - 2d)
3. Terminal block for connecting solar module
4. Terminal block for connecting battery
5. Terminal block for connecting loads

SECTION 2 | Description

LED DISPLAYS

LED	STATUS	MEANING
Info LED (1)	Illuminates GREEN	Normal operation
	Flashes RED	A fault exists (see Section 6: Troubleshooting)
RED LED (2a)	Flashing quickly	Battery empty, State of Charge < 40%. When the battery continues to be discharged, the deep-discharge deactivation is triggered
	Flashing	Deep-discharge deactivation, State of Charge < 30%
YELLOW LED (2b)	Illuminates	Battery weak, State of Charge < 50%
	Flashing	Switch-on threshold after deep-discharge deactivation has not yet been reached, State of charge is 40% to 50%
GREEN LED (2c)	Illuminates	Battery good, State of Charge > 50%
GREEN LED (2d)	Illuminates	Battery full, State of Charge > 80%
	Flashing quickly	Battery full, charge regulation active, i.e. charging current reduced

SECTION 3 | Installation



WARNING!

Danger of explosion from sparking! Danger of electric shock!

- The solar charge controller may only be connected to the local loads and the battery by trained personnel and in accordance with the applicable regulations.
- Follow the installation and operating instructions for all components of the PV system.
- Ensure that no cables are damaged.

MOUNTING THE SOLAR CHARGE CONTROLLER

Mounting location requirements

- Do not mount the solar charge controller outdoors or in wet rooms.
- Do not subject the solar charge controller to direct sunshine or other sources of heat.
- Protect the solar charge controller from dirt and moisture.
- Mount upright on the wall (concrete) on a non-flammable substrate.
- Maintain a minimum clearance of 10 cm below and around the device to ensure unhindered air circulation.
- Mount the solar charge controller as close as possible to the batteries (with a safety clearance of at least 30 cm).

Fastening the solar charge controller

- Mark the position of the solar charge controller fastening holes on the wall.
- Drill 4 x 6 mm holes and insert dowels.
- Fasten the solar charge controller to the wall with the cable openings facing down-wards, using 4 oval head screws M4 x 40 (DIN 7996).

CONNECTION

Preparing the wiring

The cross section of the connection cable depends on the power output of the solar charge controller.

CONTROLLER TYPE	LOAD/MODULE CURRENT	CROSS-SECTION	AWG	INSULATION
20A	20A	10 mm ²	8	85°C

The table above applies to the following cable lengths:

- 10 m solar module connection cable
- 2 m battery connection cable
- 5 m load connection cable

Consult a dealer if the specified cable lengths are inadequate.

SECTION 3 | Installation

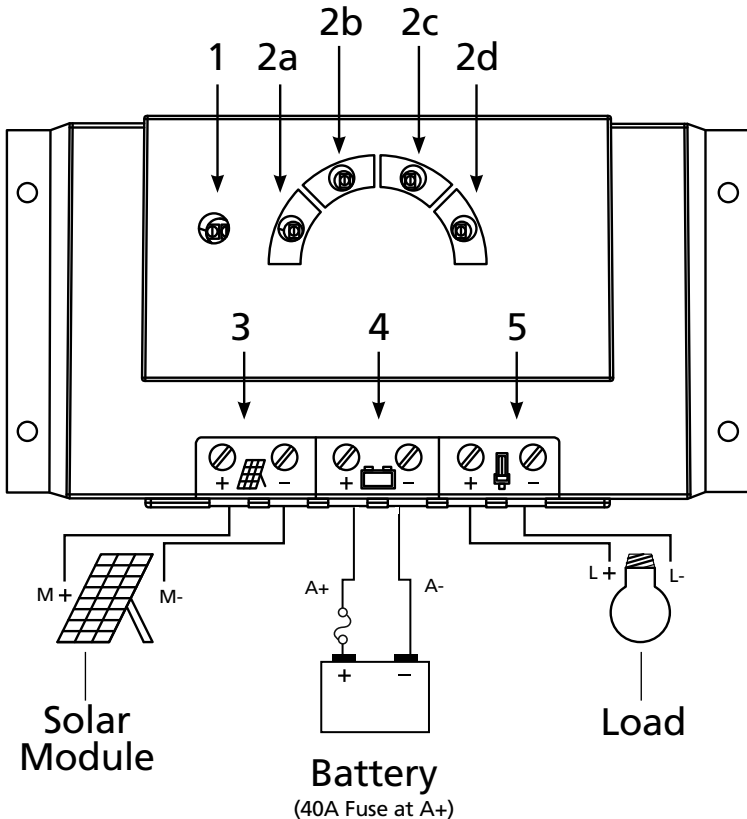
An additional external fuse (not provided) must be connected to the battery connection cable, close to the battery pole. The external fuse prevents cable short circuits. A 40A fuse can be used for all controller types.



WARNING!

Danger of explosion from sparking! Danger of electric shock! Solar modules generate electricity under incident light. The full voltage is present, even when the incident light levels are low.

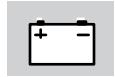
- Protect the solar modules from incident light during installation, e.g. cover them.
- Never touch uninsulated cable ends.
- Use only insulated tools.
- Ensure that all loads to be connected are switched OFF. If necessary, remove the fuse.
- Connections must always be made in the sequence described below.



SECTION 3 | Installation

1ST STEP: CONNECT THE BATTERY

- Label the battery connection cables as a plus cable (A+) and a minus cable (A-).
- Lay the battery cables in parallel between the solar charge controller and the battery.
- Connect the battery connection cable with the correct polarity to the middle pair of terminals on the solar charge controller (with the battery symbol).
- Remove any external 40A fuse in battery connection cable A+.
- Connect battery connection cable A+ with 40A fuse to the Positive pole of the battery.
- Connect battery connection cable A- to the Negative pole of the battery.
- Replace the external fuse in the battery connection cable A+.
- If the connection polarity is correct, the info LED illuminates green.



2ND STEP: CONNECT THE SOLAR MODULE

- Ensure that the solar module is protected from incident light.
- Ensure that the solar module does not exceed the maximum permissible input current.
- Label the solar module connection cables as a plus cable (M+) and a minus cable (M-).
- Lay both solar module connection cables in parallel between the solar module and the solar charge controller.
- First connect the M+ solar module connection cable to the correct pole of the left pair of terminals on the solar charge controller (with the solar module symbol), then connect the M- cable.
- Remove the covering from the solar module.



3RD STEP: CONNECT LOADS

Notes:

- Deep Discharge Protection (also called Low Voltage Disconnect or LVD) is only provided for loads < 20A that are connected to the Load Terminals (5).
- Critical loads like emergency lights, radios, etc. that require un-interrupted power source are connected directly to the battery through fuse – close to the battery to protect battery cables against short circuit.
- Loads drawing > 20A should be connected directly to the battery, preferably through separate Low Voltage Disconnect (LVD). Appropriate fuse should be used close to the battery to protect battery cables against short circuit.
- Other loads drawing < 20A should be connected to the Load Terminals (5) as follows:
 - Label the load connection cables as a plus cable (L+) and a minus cable (L-).
 - Lay the load connection cables in parallel between the solar charge controller and the load
 - First connect the L+ load cable to the correct pole of the right pair of terminals on the solar



SECTION 3 | Installation

- charge controller (with the lamp symbol), then connect the L- cable.
- Replace the load fuse or switch on the load.

4TH STEP: FINAL WORK

Fasten all cables with strain relief in the direct vicinity of the solar charge controller (clearance of approx. 10 cm).

GROUNDING

The components in stand-alone systems do not have to be grounded – this is not standard practice or may be prohibited by national regulations (e.g.: DIN 57100 Part 410: Prohibition of grounding protective low voltage circuits). Consult the technical manual for more information. In case grounding is mandatory, ground **ONLY** the Negative Battery Terminal.

LIGHTNING PROTECTION

In systems subjected to an increased risk of overvoltage damage, we recommend installing additional lightning protection / overvoltage protection to reduce dropouts. Consult the technical manual for more detailed information.

SECTION 4 | Operation

The solar charge controller immediately begins operation once the battery is connected or the external fuse is inserted.

The displays of the solar charge controller show the current operating mode. User intervention or user settings are not required.

PROTECTION FUNCTIONS

The following integrated protection functions of the solar charge controller ensure that the battery is handled as gently as possible.

The following protection functions are part of the basic function of the controller:

- Overcharge protection
- Deep discharge protection
- Battery undervoltage protection
- Solar module reverse current protection

The following installation faults do not damage the controller. After correcting the fault, the device will continue to operate correctly:

- Protection from solar module short circuits / incorrect solar module polarity¹⁾
- Protection from short circuits at the load output or excessive load current
- Protection from battery connection with incorrect polarity
- Protection from solar module overcurrent
- Protection from device overtemperature
- Protection from overvoltage at the load output
- Protection from the wrong connection sequence

¹ The reverse-polarity protection of the solar module in a 24V system is only provided up to an open-circuit module voltage of 36V.

SECTION 5 | Maintenance

The solar charge controller is maintenance-free.

All components of the PV system must be checked at least annually, according to the specifications of the respective manufacturers.

- Ensure adequate ventilation of the cooling element.
- Check the cable strain relief.
- Check that all cable connections are secure.
- Tighten screws if necessary.
- Terminal corrosion.

SECTION 6 | Troubleshooting

ISSUE	CAUSE	REMEDY
NO LED DISPLAY	Battery voltage too low	Pre-charge the battery
	The external fuse in the battery connection cable has blown.	Replace the external fuse
	Battery is not connected	<ol style="list-style-type: none"> 1. Unclamp all connections 2. Connect a (new) battery with the correct polarity 3. Reconnect the solar module and loads
	Battery is connected with the wrong polarity	
Battery is defective		
INFO LED (1) FLASHES RED	Charging interrupted due to excessive charging current (> 20A)	Charging automatically continues as soon as the charging current lies within the permissible range
LOAD CANNOT BE OPERATED OR ONLY FOR A SHORT TIME + INFO LED (1) FLASHES RED	Load output is switched OFF due to excessive load current	<ul style="list-style-type: none"> - Reduce load current, if necessary switch OFF or disconnect loads - Check loads
	Load output is switched OFF due to short circuit at load output	<ul style="list-style-type: none"> - Disconnect loads - Correct the cause of the short circuit - Reconnect loads
	Load output is switched off due to overheating of the solar charge controller	<p>The load output automatically switches on again once the solar charge controller has cooled down</p> <ul style="list-style-type: none"> - Improve the cooling air circulation - Remove any other heat sources - Check the conditions of use and the mounting location
LOAD CANNOT BE OPERATED + INFO LED (1) FLASHES RED + RED BATTERY LED (2a) FLASHES	Load output is switched OFF due to too low battery voltage	<p>The load output automatically switches ON again as soon as the battery voltage lies within the permissible range</p> <ul style="list-style-type: none"> - Pre-charge the battery - Use additional Low Voltage Disconnect (LVD) for loads > 20A that are connected directly to the battery - Check the battery and replace if necessary

SECTION 6 | Troubleshooting

ISSUE	CAUSE	REMEDY
LOAD CANNOT BE OPERATED + INFO LED (1) FLASHES RED + GREEN LED (2d) FLASHES	Load output is switched OFF due to excessive battery voltage	The load output automatically switched on again as soon as the battery voltage lies within the permissible range
	Incorrect grounding	Check the grounding. Grounding is allowed only on the Negative Battery Terminal
	External charging source is not voltage-limited	- Check the external charging source - If necessary, switch OFF external charging source
LOAD CANNOT BE OPERATED + INFO LED (1) ILLUMINATES GREEN	Defective load or installation error	- Connect load correctly - Replace load
BATTERY IS NOT CHARGED	Solar module not connected	Connect the solar module
	Solar module connected with incorrect polarity	Connect the solar module with the correct polarity
	Short circuit at solar module input	Correct the cause of the short circuit
	Incorrect solar module voltage	Use a solar module of the specified voltage
	Solar module defective	Replace the solar module
BATTERY DISPLAY JUMPS QUICKLY	Large pulse current	Adjust the current consumption to match the battery capacity
	Battery is defective	Replace the battery

SECTION 7 | Specifications

SPECIFICATIONS	SMC-20
MAXIMUM MODULE INPUT SHORT CIRCUIT CURRENT AT 50°C	20A
MAXIMUM LOAD OUTPUT CURRENT AT 50°C	20A
TERMINAL SIZE (STRANDED / SOLID WIRE)	16/25 MM ² = 6/4 AWG
WEIGHT	345 g .76 LB.
DIMENSIONS (L X W X H)	187 X 96 X 45 MM 7.36 X 3.75 X 1.77 INCHES
ENCLOSURE PROTECTION CLASS	IP 32
SYSTEM VOLTAGE	12V / 24V
AMBIENT TEMPERATURE ALLOWED	-25°C TO + 50°C / -13°F TO + 122°F
MAXIMUM VOLTAGE OF SOLAR MODULE	47 V DC
TEMPERATURE COMPENSATION	- 4 mV / °K / Cell

SMC-20 SOLAR CHARGE CONTROLLER	12V SYSTEM	24V SYSTEM
PERMISSABLE BATTERY VOLTAGE RANGE*	9 - 17V	17.1 - 34V
DEEP DISCHARGE WARNING (SOC / LVW)	< 40% / 11.7V ~ 12.3V	< 40% / 23.4V ~ 24.6V
DEEP DISCHARGE PROTECTION (SOC / LVD)	< 30% / 11.2V ~ 11.6V	< 30% / 22.1V ~ 23.2V
RECONNECTION SET POINT (SOC / LVR)	< 50% / 12.4V ~ 12.7V	< 50% / 24.8V ~ 25.4V
END OF CHARGE VOLTAGE (FLOAT)	13.9V	27.8V
BOOST CHARGE VOLTAGE (BOOST)	14.4V	28.8V
EQUALISATION CHARGE (EQUAL)	14.7V	29.4V

NOTE:

Specifications that vary from the above are given on the device label. Subject to change without notice.

*If the battery voltage is less than 9 V, the controller switches off and cannot recharge the battery itself, even if sufficient power is available from the module.