

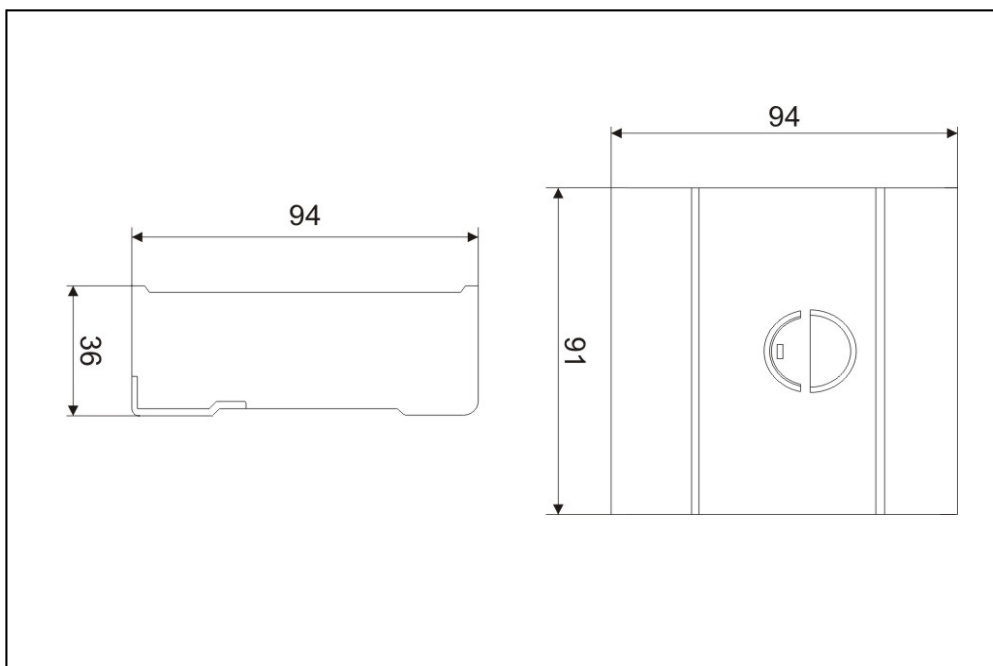
Handbook

SX 20 Solar Charge Regulator

Dear Customer,
thank you for choosing our Solar Charge Regulator.
To guarantee a correct use, please read carefully this handbook before using this product.



Product Dimension



General Characteristics

- Multifunctional LCD Display
- Protection for “low tension battery”
- To manage the switching on/switching off of the night-light
- Datalogger of 1st year-memory (optional)
- To manage the energy in excess for a better use of the solar system
- Complete electronic protection

Functions

- Battery protection from the overload of the photovoltaic panel – disconnection of the loading when the battery reaches the minimum level, which can be arranged – battery charging according to predetermined phases on the basis of the kind - automatic adaptation to the environment temperature.
- Automatic identification of the system tension: 12 – 24 V.
- Multifunctional button for the personalized setting of the functions/programs and manual On/Off of the loading.
- Auxiliary exit which uses the energy in excess to feed the additional loadings (optional).
- Serial Interface for Datalogger with adapter (SX-I optional).

Connection of the system



To correctly use the system, it's important to connect the devices in the following order:
Battery, Panel, Load.

The positive terminals of the charging regulator are internally connected to each other and so they have the same electrical potential.

A possible grounding must be connected to the regulator's positive potential.

Regulator starting

Auto test

Every time the regulator is supplied by the tension coming from the module and/or the battery, an automatic test which lasts about 2 seconds, it is made. A scroll bar on the display followed by symbols, which show the version of the Firmware, visualizing the test's progression.

After the test is done, the regulator comes back to the normal configuration.

Tension of the system

The regulator adjust itself automatically to 12 V – 24 V system voltage.

If at the moment of the connection with the panel the tension is over 20 V, the regulator adapts at 24 V.

If the tension of the battery is not inside the normal operation range (from 12 to 15.5 V or from 24 to 31 V), an error icon will show up on the display as shown in the DESCRIPTION OF ERRORS.

Battery type

The regulator is preset to work with acid lead batteries with electrolytic liquid. If you want to use a battery of the type Gel (VRLA) you have to change the set through the [program 1](#).

Recommendations for use

The regulator gets warm during its normal working. If there is not enough ventilation, the system limits the current of recharging to prevent overheating.

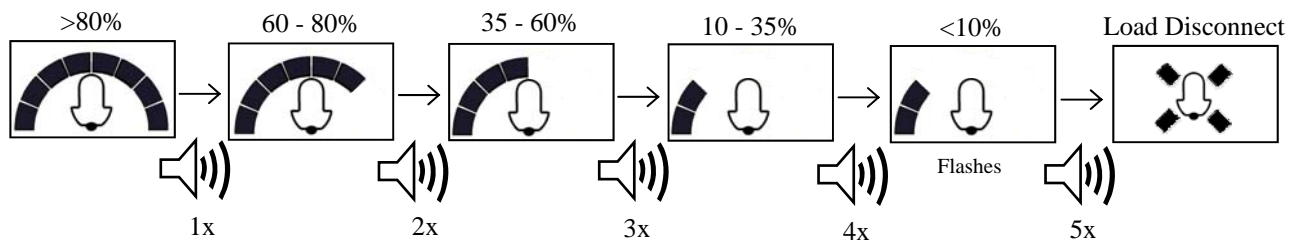
The regulator does not need any maintenance. You can eventually remove the dust using a dry cloth.

It's important that the battery gets completely charged very often. Otherwise it will be damaged.

Display's functions

During the normal working on the display is shown the level of the charging, that is the battery available energy. An acoustic signal shows the battery tension lowering.

The system condition is visualized through these symbols:

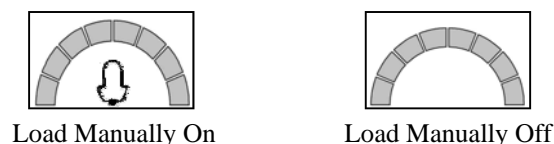


The percentages correspond to the quantity of available charging in the battery before it is disconnected.

While the photovoltaic panel is charging the battery, on the display a scroll bar, which alternates with the level of charging, appears.

In normal configuration (Night Function Off) the charging can be switched by shortly pressing the multi-functional button.

The situation of the charging is visualized through the following symbols:



Battery protection

The regulator has 5 different functions to protect the battery from the complete discharge.

Function 1: disconnect at 11,4 V (with connected load) and at 11,9 V (with disconnected load).

This way guarantees a good battery lifetime.

Function 2: disconnect at 11,0 V (with connected load) and at 11,75 V (with disconnected load).

This way uses as maximum the capacity of the battery, but it reduces its duration.

Function 3: disconnect from 11,0 V to 12,2 V. From the tension value of 12,2 V the regulator reduces the power on the load in according to the available battery charge.

This way guarantee the complete charging of the battery. Maximum lifetime.

Function 4: disconnect the charging at 11,5 V fixed value.

This way guarantees a good battery lifetime.

Function 5: disconnect the charging at 11,0 V fixed value.

This way uses at maximum the capacity of the battery, but it reduces its duration.

The default regulator is set in the **Function 1**.

If necessary use the Program 2 to change the set.

Datalogger (optional)

The regulator can also have a Datalogger which registers for 1 year the data item concerning the performances of the photovoltaic system. The registered data are:

- Maximum and minimum battery tension;
- Battery state of charge;
- Maximum charging current and maximum load current;

With these data it is possible to analyze the system performances, optimizing the photovoltaic system.

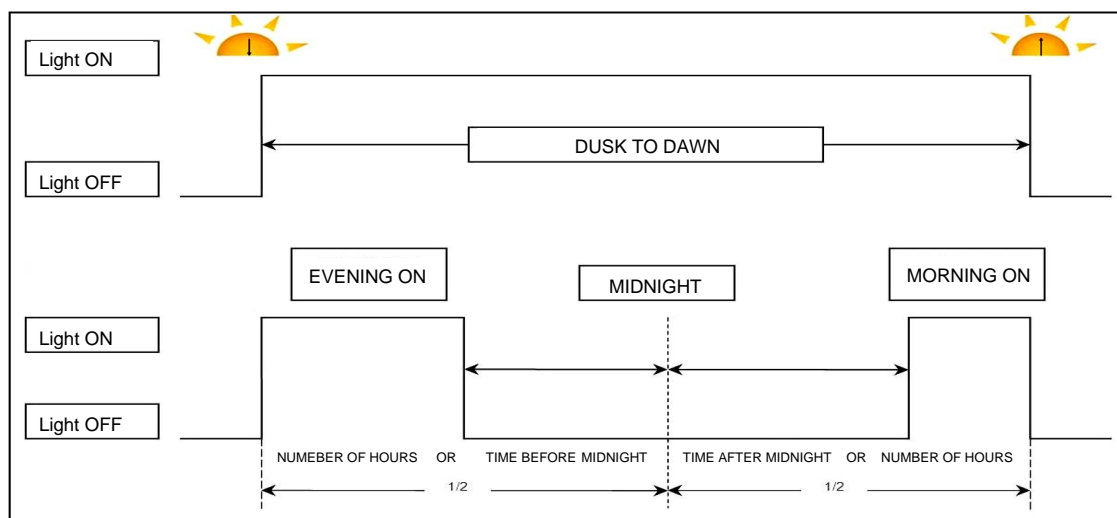
It is possible to connect the regulator SX with personal computer.

Night-light function

The regulator has a very sophisticated and largely programmable control of the lights. It has two ways of working:

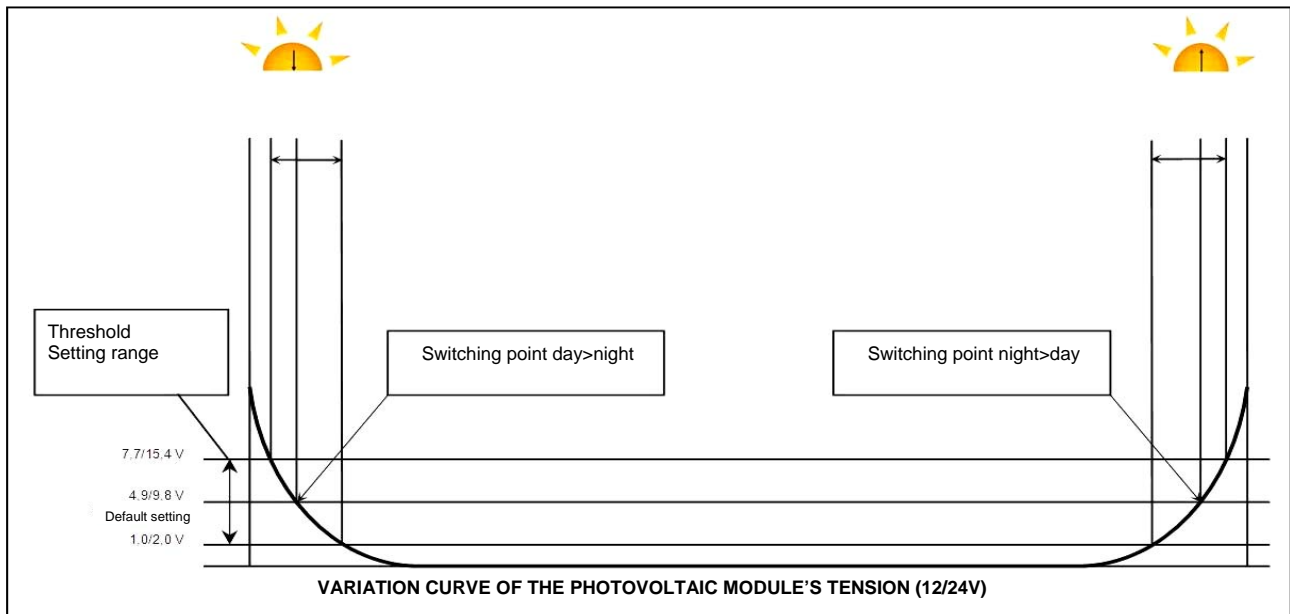
- Switching on from dusk to dawn (**Function from Dusk To Dawn**);
- Time of switching on evening and morning or time of switching before and after midnight (**Function Evening/Morning**).

You can set this working way with Program 3.



Function Dusk to Dawn

If this function is on (Program 3), the charging is switched on/switched off when the photovoltaic panel gives the regulator the selected levels of tension in Program 6.



The two tensions, which allow the switching on and the switching off of the load at dawn and in the dusk, are valid either for the systems at 12 V or 24 V.

To find the right value, you should measure the tension in an open circuit of the photovoltaic module in the twilight, or when the switching on of the load is required. So you have to set up in the regulator the value of tension concerning the [Program 6](#).

Attention: On/Off time of the load is delayed. On= 5 minutes. Off= 2 minutes 30 seconds

Function Evening/Morning – Switching on time

If the function **Evening/Morning** is selected in the [Program 4](#), it's possible to set up the time of switching on in the dusk (evening 1...5 hours) or the hours before midnight (midnight – 0...4 hours); in the [Program 5](#) you can select the time of switching on before dawn (morning 1...5 hours) or the hours after midnight (midnight – 2...6 hours).

Attention: the load is automatically switched off when the battery reaches the minimum level of programmed charging. The security low-tension function of the battery is prior in the control functions of the light.

Function Evening/Morning – Virtual Midnight

It is not necessary to set up the hour and the date in the regulator. The virtual midnight is automatically fixed by counting the time between dawn and dusk on the average of 4 days. This system is not particularly precise, but allows you to avoid the clock's regulation. The calculation of midnight may be different from the real time depending on the installation place.

Acoustic signal

The regulator has an acoustic signal which shows the changing of status of the regulator. This function can be disabled in [Program 7](#).

Usage serial interface

The regulator can be connected to a PC by the serial interface and an adapter (optionally supplied, model SX-I, see the relative handbook for other details). To program the parameters of the serial see [Program 8](#).

Day/Night Level

The regulator can recognize the day and the night on the basis of the value of module tension. In [Program 6](#) it is possible to modify the levels of Day and Night to correct the error caused by the place of installation.


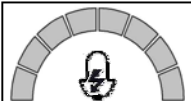


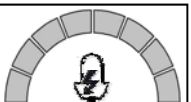
Security characteristics

The regulator is protected against correction errors.

| | At the terminals of module's connection | At the terminals of battery's connection | At the terminals of load connection |
|--|---|---|---|
| Battery regularly connected | Protected for unlimited time – no damage | Normal working | Protected for unlimited time – no damage |
| Battery connected with reversed polarity | Protected for unlimited time – no damage | Protect for unlimited time – no damage – acoustic signal | Protected for unlimited time – no damage |
| Polarity inversion | Protected, but not for the system at 24 V – acoustic signal | Protected – if only the battery is connected | The exit is protected. The load could have damage |
| Short circuit | Protected for unlimited time – no damage | Attention: the battery <u>must be</u> protected by a fuse | Protected for unlimited time – no damage |
| Over current | The regulator has a limit controller of current | Attention: the battery <u>must be</u> protected by a fuse | The regulator interrupts the charging |
| Over temperature | The regulator is electronically protected | Attention: the battery <u>must be</u> protected by a fuse | The regulator interrupts the charging |
| Over tension | Protection through varistor 56 V, 2,3 J | Max. 40 V | The regulator interrupts the charging |
| Under tension | Normal working | The regulator interrupts the load | The regulator interrupts the load |

Attention: the combination of different conditions of error may cause damage to the regulator. You always have to remove the error before going on with the connection of the system.

Errors description

| Error condition | Display | Reason | Solution |
|---|---|---|---|
| Load are not supplied |  | Low battery | The load automatically reconnects just when the battery is charged again. |
| |  ⚡ It flashes | Over current/ Short circuit on the load | Turn off the system. Remove the short circuit. Switch on the system again, the exit will set up after a minute. |
| | | The regulator is in over temperature and it disconnected the load | Check the correct ventilation of the regulator. After cooling the regulator, the load automatically becomes active again. |
| | Battery voltage too high level (> 15,5 V / 31,0 V) | Check if other sources overload the battery. Otherwise the regulator may be damaged. | |
| |  | Battery cables are disconnected or the protection fuse is interrupted. The battery has a high resistance. | Check the battery, the cable and the fuse. |
| The battery discharges after little time |  | The battery has low capability of storage. | Change the battery |
| The battery does not charge during the day | The scroll bar of the display does not slide | Damage in the photovoltaic module, or inversed polarities | Check the module/modules and cables |
| The battery is connected with inverted polarities | Continuous acoustic signal | The battery is connected with inverted polarities | Restore the right connection |
| The regulator limits the current of the photovoltaic module |  ⚡ Flashes | The regulator is in over temperature | Improve the regulator's ventilation |
| | | The module supplied major current than the nominal current of the regulator | Check the current of the photovoltaic system |

Programming

By pressing the button for a long time you can enter in the programming modality.

The menu programming structure is described in Flow Chart attached at the end of the handbook.

When you enter the programming menu of the regulator, you can go out from it only after if you scroll the whole menu.

It is better to proceed with the programming after having noted on Flow Chart all the settings concerning the configuration of your system confirming them through the Program 9 (maintain the personal data).

All the settings are memorized in a permanent memory and they can't be lost even when you disconnect the battery.

To return to the fabric setting select Program 9. (Reset to the predefined data)

Multifunction button lock-out

To avoid the accidental data change, with the device in a normal working, press for 8 seconds the multifunctional button. Keep it pressed for other 8 seconds to go back to the programming modality. The block/unlock of the programming is signaled by an acoustic signal of about 2 seconds.

Security and use advices

Use destination:

- The solar charger is used in photovoltaic systems with nominal tension of 12 o 24 Vdc.
- The usage is expected just with GEL batteries (VRLA) and acid lead batteries with electrolytic liquid.

Security advices:

- We recommend to install a fuse on positive terminal of battery, dimensioned on the basis of its nominal current.
- Batteries produce inflammable gases, so keep them far from flames and sparks. Instal the battery in ventilated places.
- Avoid the short circuit between the battery and module terminal.
Attention: the tension in the cables can be twice the nominal tension of the battery. Use isolated tools and work on the system on a dry ground with dry hands.
- Observe the usage recommendations written in this handbook.

Exclusion of responsibility

The constructor won't be responsible:

- For damage, most of all of the battery, caused by a different usage from the one provided or given by this handbook;
- If the recommendations of the battery constructor are not observed;
- For damage caused by maintenance or repair of the system made by non-authorized personnel;
- For the installation, which was not done in a perfect way;
- For unusual usage or wrong or bad system design.

The guarantee declines whether one or more conditions mentioned above happen.

Technical Form

| | |
|--------------------------------------|---|
| Nominal voltage | 12/24 Vdc automatic switching |
| Desulfurization voltage | 14,4/28,8 V (25°C), 0,5- 2 h |
| Equalization voltage | 14,8/29,6 (25°C) 2 h |
| Maintenance voltage | 13,7/27,4 V (25°C) |
| Load disconnect voltage | 11.0 – 12,2 / 22,0 – 24,4 V on the basis of the set |
| Load reconnect voltage | 12,8 / 25,6 V |
| Temperature compensation | -4 mV /Cell *K |
| Max. module current | 20 A @ 25°C |
| Max. load current | 20 A @ 25°C |
| Dimensions | 92 x 94 x 36 mm |
| Weight | 180 gr |
| Maximum section of the cables | 6 mmq |
| Regulator consumption | 4 mA |
| Working temperature | -25°C ~ +50°C |
| Protection degree | IP22 |



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Flowchart

