phocos CMLmppt Solar Charge Controller with MPPT User Manual

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Solar charge controller with MPPT
User Manual

Contents

CMLmppt Solar Charge Controller with MPPT

Dear Customer,
Congratulations on buying your Phocos product! Please read the instructions carefully and thoroughly before using the product. Your new CMLmppt controller is a “state-of-the-art” device which was developed in accordance with the latest available technical standards. It comes with a number of outstanding features, such as:

- Maximum Power Point Tracking technology, which increases the efficiency of your PV system
- Clear, readable display of the state of charge
- New housing design
- Acoustic signal when the state of charge changes
- Low voltage disconnect regulated by state of charge or voltage
- USB connector for mobile phone charging or small music players/devices
- Max. 16 mm connector binding posts (10 mm² stranded wire with cable end sleeves)
- Complete electronic protection

 IMPORTANT SAFETY INSTRUCTIONS

This manual contains important installation, setup, and safety operating instructions.
Please read the instructions and warnings in this manual carefully before beginning any installation.
Please do not disassemble or attempt to repair Phocos products. Phocos charge controllers do not contain user-serviceable parts.
Please observe all instructions with regards to external fuses/breakers as indicated.
The information contained in this manual must be observed in its full extent. The manual contains information regarding installation, setup, and operation.
Please read this manual carefully before using the product, and pay special attention to the safety recommendations in it.

Maintenance and installation notes
When installing or working on the PV system, please disconnect the PV (solar) modules from the charge controller first, to prevent any damages to the charge controller!
Please verify that all cable/wire connections are done properly and well insulated and that no water or humidity

can ingress in order to avoid any bad or loose connections that would result in excessive heating or further damage.
Please install a fuse or breaker near the battery before installing or adjusting the controller!

High voltage risks
Never touch any electrical conductors to avoid electrical shock.
Never work on live (energized) electrical equipment.
When working around a battery, do not allow tools to bridge the battery terminals, or short-circuit any part of the battery.
Use only tools with insulated handles.
Operation of this device may produce a high voltage which could cause severe injuries or death in case of improper installation or operation of the device.
PV modules can generate high DC voltages!

Mains and charging current risks
Make sure the cables are always connected to the correct terminal. An electrical shock can be lethal. In general, any electric shock can be dangerous to your health.

CE labeling
The product is CE-compliant.

Description of Functions

- The charge controller protects the battery from being overcharged by the solar array and from being deep discharged by the loads. The charging characteristics include several stages with automatic adaptation to the ambient temperature.
- The charge controller adjusts itself automatically to 12V or 24V system voltage.
- The charge controller has a number of safety and display functions.

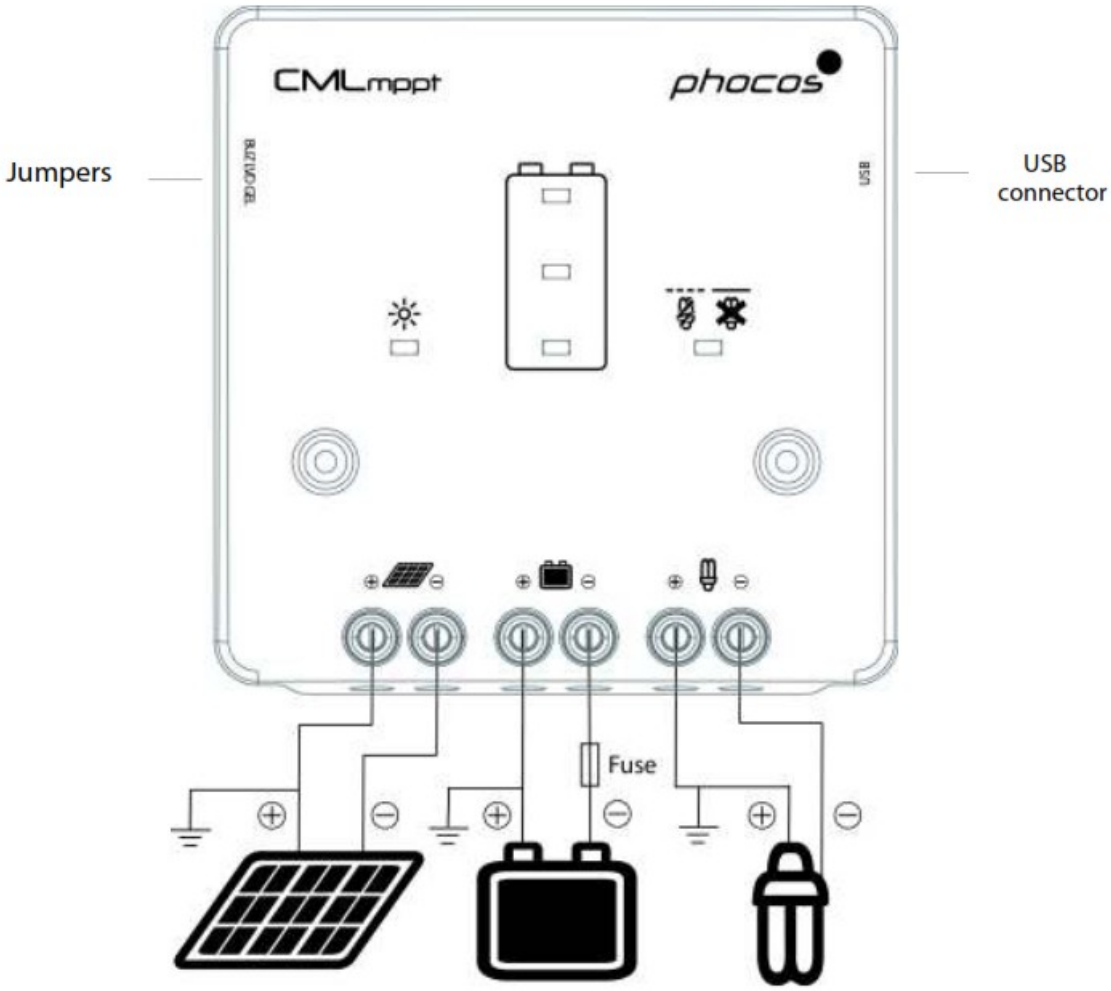
Connecting and Grounding

The controller is intended for indoor use only. Protect it from direct sunlight and place it in a dry environment. Never install it in humid rooms (like bathrooms). The controller measures the ambient temperature to determine the charging voltage. Controller and battery must be installed in the same room. The controller arms up during operation, and should therefore be installed on a nonflammable surface only.
Connect the controller by following the steps described below to avoid installation faults.

- Observe the following connection sequence when installing the system:
  1. Connect the battery to the charge controller – plus and minus.
  2. Connect the photovoltaic modules to the charge controller – plus and minus.
  3. Connect the load to the charge controller – plus and minus.

  Follow the reverse procedure when uninstalling!
- To avoid any voltage on the wires, first connect the wire to the controller, then to the battery, and to the photovoltaic modules. But for the load, first, connect the wire to the load, then to the controller.
- Recommended minimum wire size: CMLmppt 10: 6 mm ;
- Make sure the wire length between battery and controller is as short as possible.
- Be aware that all positive connections of the CMLmppt controller are common and therefore have the same electrical potential. If any grounding is required, always do this on the positive wire.

REMARK: If the device is used in a vehicle whose battery negative pole is connected to the chassis, please make sure that none of the loads connected to the controller has an electric connection to the car body. Otherwise the load will be short circuited, thus affecting the Low Voltage Disconnect function and the electronic fuse function of the controller.
REMARK: Mind the recommendations of your battery manufacturer. We strongly recommend



connecting a fuse directly to the battery to protect any short circuit at the battery wiring. The fuse must correspond to the nominal current of the charge controller: 15A for CMLmppt 10.

Starting up the controller

Self Test

As soon as the controller is supplied with power from the battery, it starts a self-test routine. Then the display changes to normal operation.

System Voltage

The controller adjusts itself automatically to 12 V or 24 V system voltage. As soon as the voltage at the time of start-up exceeds 18 V, the controller assumes a 24 V system. If the battery voltage is not within the normal operation range at startup, a status display according to the section ERROR DESCRIPTION occurs.

Battery Type

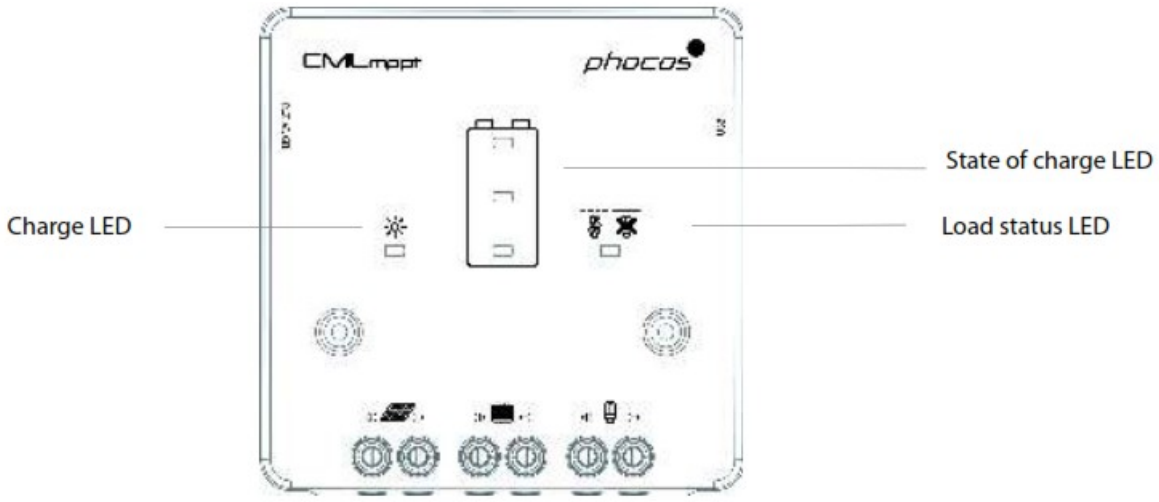
The controller is preset to operate with lead-acid batteries with solid electrolyte (GEL type or AGM type). If you intend to use a lead-acid battery with liquid electrolyte, you can adjust the charging characteristics (see “Settings”). The equalization charge modus is added then. In case of any doubts consult your local dealer.

Recommendations for Use

The controller warms up during normal operation.
The controller does not need any maintenance or service. Remove dust with a dry tissue.
It is important that the battery gets fully charged frequently (at least monthly). Otherwise, the battery will be permanently damaged.
If too much energy is being drawn during the charging process, a battery cannot be fully charged. Keep that in mind, especially if you install additional loads.

Display Functions in normal operation

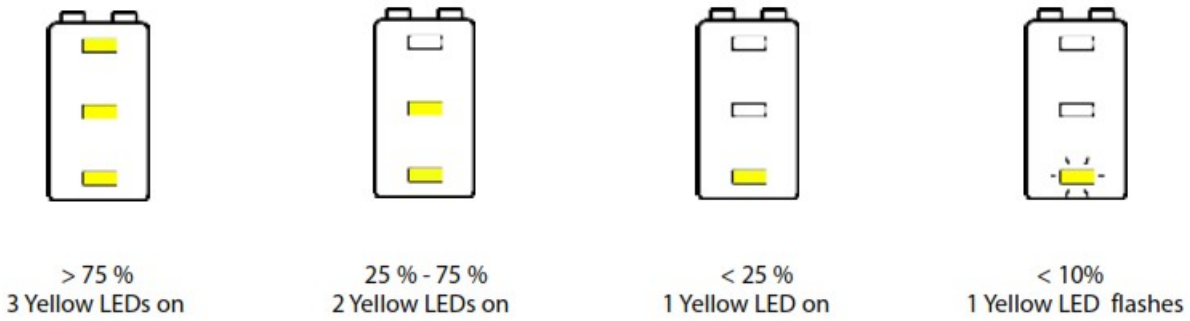
The controller is equipped with 5 LEDs and an acoustic warning signal.



In normal operation, the controller shows the state of charge of the battery and the solar panel activity. Any change of the state of charge (SOC) to a lower status is additionally signaled acoustically.

Charge display

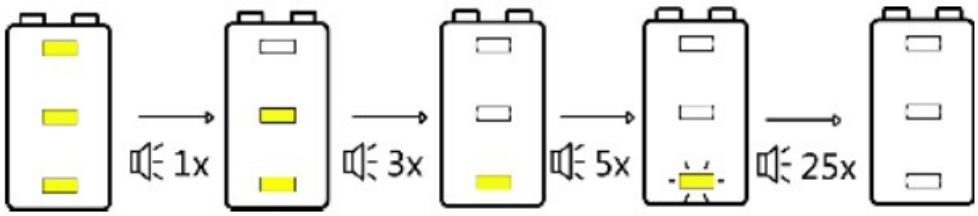
State of charge display



The percentage corresponds to the available energy until Low Voltage Disconnect with respect to a fully charged battery.

Acoustic signals

A change in the state of charge (SOC) to a lower status is indicated by an acoustic signal.



The loads are disconnected approx. 1 minute after a series of 25 acoustic signals.

Load status display
In case of deep discharge or overload/short-circuit of load, the load output is switched off. This is indicated by:

Normal operation
Red LED off

Low voltage disconnect
Red LED on

Overload or short-circuit of load
Red LED flashing

Low Voltage Disconnect Function

The controller has 2 different modes to protect the battery from being deeply discharged:

1. State of charge controlled: Disconnect at 11.4 V/22.8 V (at nominal load current) up to 11.9 V/23.8 V (at no load current). Normal operation mode for safe battery protection.
2. Voltage controlled: Disconnect at 11.0 V/22.0 V fixed setting. Appropriate if bypass loads draw current directly from the battery. The controller is preset to mode 1 from the factory. Changing the mode setting is described below.

Settings

The controller can be configured for special operation. Three jumpers on the left side of the controller enable the configuration of the following settings:

Jumper closed (jumper inserted)

Jumper open (pulled jumper)

Jumper	BUZ	LVD	GEL
Function	Acoustic alarm signal	Function of low voltage disconnect	Battery type
Jumper closed	Alarm on	State of charge controlled	GEL (VRLA battery)
Jumper open	Alarm off	Voltage controlled	Flooded battery
Factory setting	Alarm on	State of charge controlled	GEL (VRLA battery)

Safety Features

	PV terminals	Battery terminals	Load terminals
Reverse polarity	Protected	Not protected (1)	Protected (2)
Short circuit (3)	Protected	Protected (4)	Switches off immediately
Over current	—	—	Switches off with a delay (5)
Reverse current	Protected	—	—
Overvoltage	Max. 50 V	Max. 50 V	Switches off above 15.5/31.0V
Under voltage	—	—	Switches off
Overtemperature	Reduces the charging current if overtemperature occurs and switches off the load if the temperature reaches a high level.		

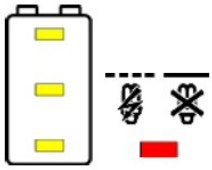
1. A battery fuse is necessary to protect the CMLmppt from getting damaged by reverse polarity connection on the battery terminals.
2. The controller can protect itself, but any connected loads might be damaged.
3. Short circuit: >4x – 6x nominal current.
4. The battery must be protected by a fuse, or it might be permanently damaged in case of short circuit.
5. >200% nominal current: disconnects with 3s delay

WARNING: The combination of different error conditions may cause damage to the controller. Always remove the fault condition before you continue connecting the controller!

USB Connector

USB connector for 5V supply to small appliances like for charging cell phones, compact portable computers, small music players; with up to 800 mA of current consumption.
Warning: Do not connect the charging device anywhere else! USB-negative contact is connected to load negative.

Error Description

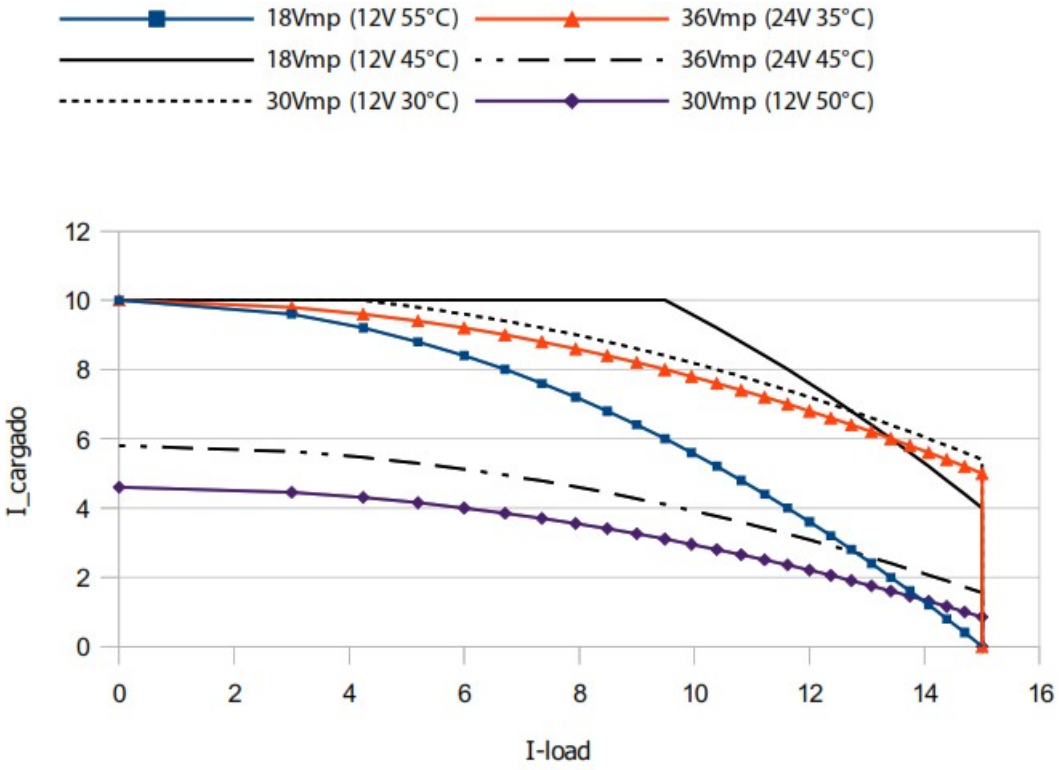
Error	Display	Reason	Remedy
Loads are not supplied Loads are not		Battery is low (Red LED on)	Load will reconnect as soon as battery is recharged.
supplied		Overcurrent/Short circuit of loads/ Overtemperature protection (Red LED flashing)	Switch off all loads. Remove short circuit. Controller will switch on load automatically after max 1 minute.
Loads are not supplied		Battery voltage too high (>15.5 / 31.0 V)	Check if other sources over charge the battery. If not, controller is damaged.
		Battery cables or battery fuse damaged, battery has high resistance	Check battery wires, fuses and battery.
Battery is empty after a short time		Battery shows low capacity (Red LED on)	Change battery
Battery is not being charged during the day		Solar array faulty or reverse polarity (Green LED off)	Remove faulty connection / reverse polarity

Technical Data

Note: The voltage levels before/after the slash are valid for 12 V and 24 V systems respectively.

Technical Data	CMLmppt 10
System voltage	12/24 V auto recognition
Max. charge current	10 A**
Max. load current	10 A**
Power conversion	Up to >98%
Float charge	13.8/27.6 V (25 °C)
Main charge	14.4/28.8 V (25 °C), 0.5 h (daily)
Boost charge	14.4/28.8 V (25 °C), 2 h Activation: battery voltage < 12.3/24.6 V
Equalization	14.8/29.6 V (25 °C), 2 h Activation: battery voltage < 12.1/24.2 V (at least once every 30 da ys)
Overvoltage protection	15.5/31.0 V
Deep discharge protection, Cut-off voltage	11.4-11.9/22.8-23.8 V by SOC 11.0/22.0 V by voltage
Reconnect level	12.8/25.6 V
Undervoltage protection	10.5/21.0 V
Max. panel voltage	42 V in 12 V system , 50 V in 24 V system , 18 Vmp (12 V), 36 Vmp (24 V)*
Max panel power	200 W @ 12 V system, 350 W @ 24 V system
Max. battery voltage	50 V
Temperature compensation (Charge volta ge)	–4.2 mV/K per cell
Self-consumption	< 10 mA
Grounding	Positive grounding
Ambient temperature	–40 to +50 °C
Max. altitude	4,000 m above sea level
Battery type	Lead acid (GEL, AGM, flooded)
USB port	5.0 V; 800 mA
Dimensions (WXHXD)	127 x 126 x 38 mm
Weight	260 g
Max. wire size for screw terminals	16 mm²
Type of protection	IP20

*: For derating information, please see below diagram.
**: At 60°C CMLmppt, 50/10 can only have full current on either panel or load, not simultaneously.



Liability Exclusion

The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

Subject to change without notice. Version: 20180514
Made in one of the following countries: Germany – China – Bolivia – India Phocos AG – Germany
www.phocos.com

ISO9001

CE RoHS

Documents / Resources

	phocos CMLmppt Solar Charge Controller with MPPT [pdf] User Manual CMLmppt Solar Charge Controller with MPPT, CMLmppt, Solar Charge Controller with MPPT, Charge Controller with MPPT, Controller with MPPT, MPPT