phocos CIS-N-MPPT 100 MPPT Solar Charge Controller User Manual

Phocos CIS-N-MPPT 100/30
MPPT Solar charge controller
User Manual

Dear Customer,

Congratulations on buying your Phocos product! Please read the instructions carefully and thoroughly before using the product. It comes with a number of outstanding features, such as:

- Maximum Power Point Tracking technology, which increases the efficiency of your PV system
- The CIS-N-MPPT 100/30 charge controller can optimally charge batteries from 60-cell PV panels that have primarily been designed for grid-connected systems. (One panel for 12V systems or two panels in series for 24V systems)
- Negative grounding
- Dimming function
- Case protection: IP68, in 1.5 m deep water 72 hours
- Control unit (CIS-CU) to configure CIS-N-MPPT 100/30 charge controller, via infra-red data link available as accessory (sold separately). CIS-CU required to modify the factory default settings.
- External temperature sensor for temperature compensation of charging voltages
- 4 stage charging (main, boost, equalization, float) for flooded battery; 3 stage charging (main, boost, float) for sealed battery
- Automatic recognition of system voltage 12/24 V · Widely programmable · LFP (LiFePO4) lithium battery wake-up function

Contents

General Safety Information

This manual contains important installation, set up, 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, set up, 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 that is 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.

Connecting and Grounding

- Connect wires in indicated order 1 2 3 4 5 6 7 to avoid any installation faults
- To avoid any damaging voltage on the wires, first connect the wire to the controller, then to the battery, panel or to the load
- Minimum recommended wire size: 10 mm²
- Make sure the wire length between battery and controller is as short as possible
- Be aware that all negative wires of CIS-N-MPPT 100/30 are connected together and therefore have the same electrical potential. If any grounding is required further to the casing, always do this on the negative wires.
- Grounding of the casing is done by the grounding post on the left side.
- The controller warms up during operation, and should therefore be installed on a non flammable surface only.
- When connecting inductive loads (motors, relays, etc.) a freewheel diode must be connected in parallel to the loads in the reverse biased direction.
- Inverters should always be connected directly to the battery due to their high inrush currents.

	Function	Cable marker	Wire size (cross section)	Color
1	Negative battery terminal	COMMON –	AWG 13 (2.5 mm2)	Black
2	Positive battery terminal	BATTERY +	AWG 13 (2.5 mm2)	Red
3	Negative panel terminal	COMMON –	AWG 13 (2.5 mm2)	Black
4	Positive panel terminal	SOLAR +	AWG 13 (2.5 mm2)	Yellow
5	Negative load terminal	COMMON –	AWG 13 (2.5 mm2)	Black
6	Positive load terminal	LOAD +	AWG 13 (2.5 mm2)	Orange
7	Dimming signal terminal	—	AWG 24 (0.25 mm2)	Black

Grounding post

Connect to dimming control terminal of LED Driver

Fuse
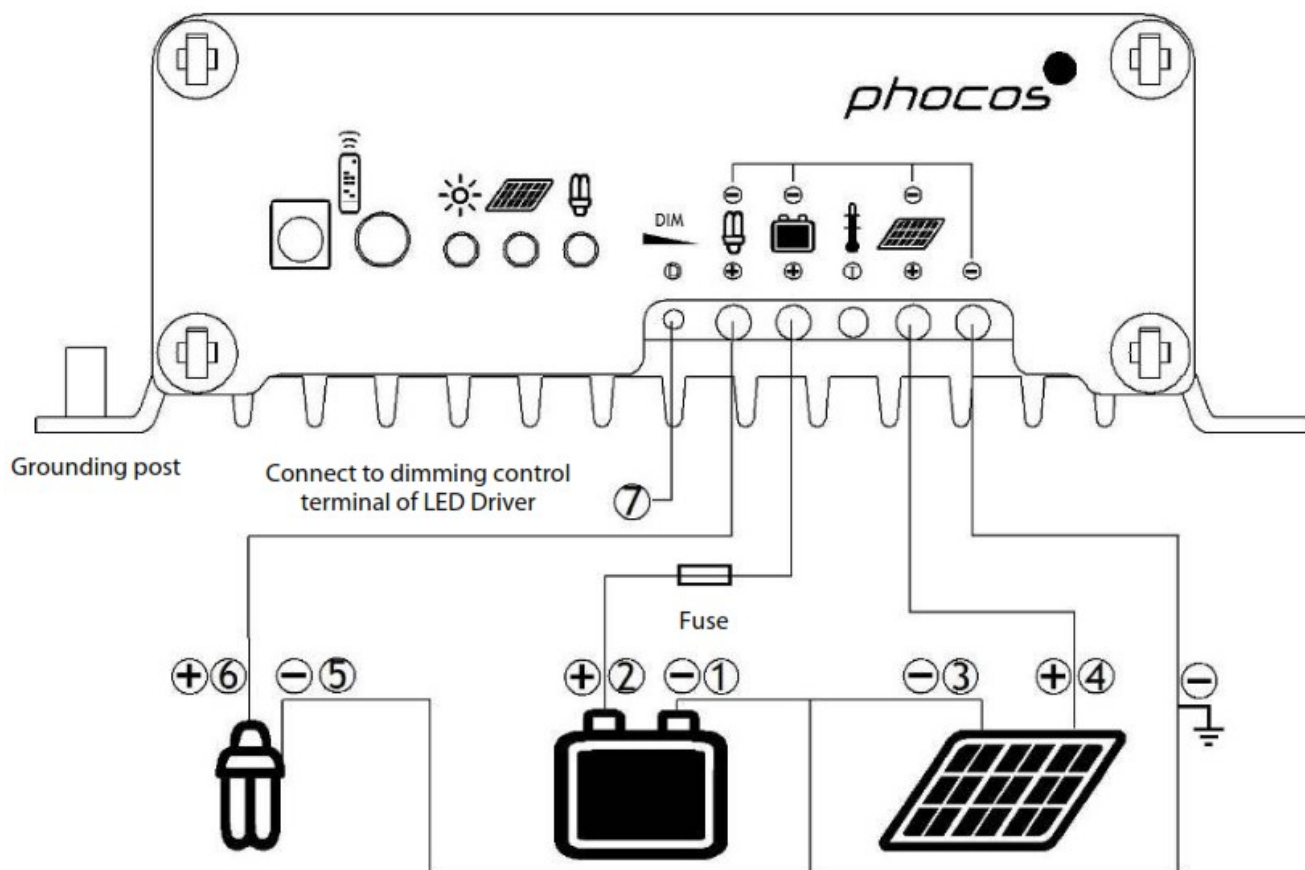
LED indications & warning functions

LED	Status	Function
	On	Controller connected to battery, night detected
	Flash	Controller connected to battery, day detected
	Off	No battery connected
	On	Charging failure (overvoltage / overcurrent)
	Off	Charging OK
	On	Load low/high voltage disconnect (LVD/HVD)
	Flash	Load overcurrent
	Off	Load OK
All LEDs	Green->Red->Green->	Programming

Nightlight Function

The CIS-N-MPPT 100/30 controller comes with a sophisticated nightlight function. It controls the load output at night and also is widely programmable. 3 operating modes are available: Standard Controller, Dusk to Dawn and Evening/Morning.
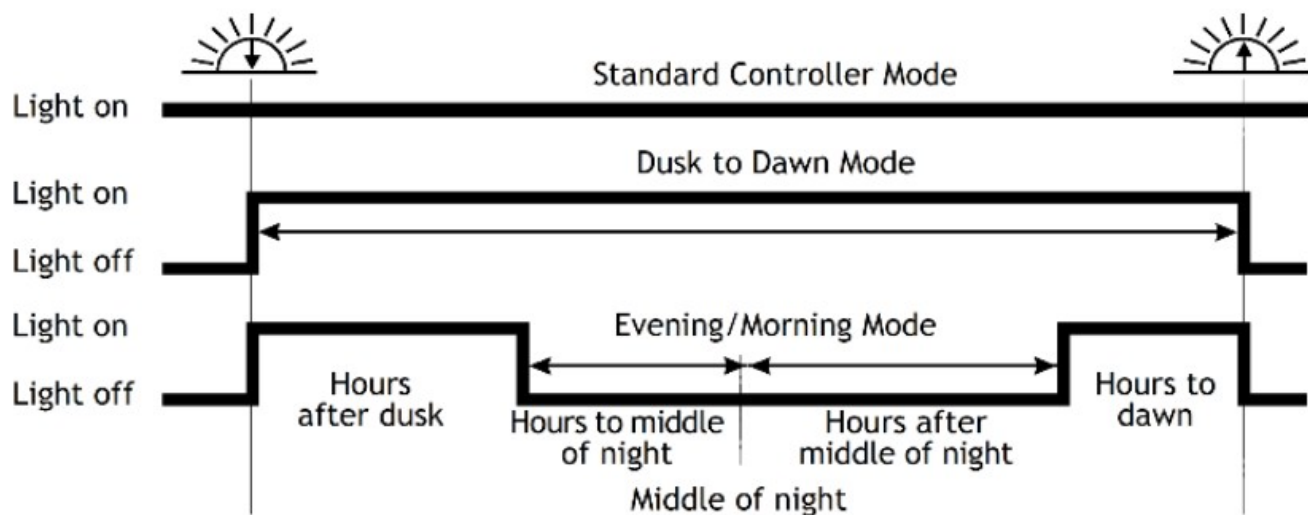
"Middle of night" is automatically detected as the midpoint between dusk and dawn; no setting of a clock is required. It may take several days until the controller has "learned" the middle of the night precisely. "Middle of night" may be different from 12:00 midnight depending on your location/longitude. The controller recognizes day and night based on the solar array open circuit voltage. The day/night threshold can be modified according to your local light conditions and the type of solar array used.

Dimming Function

- Output voltage 0 V to 10 V relative to battery minus pole (adjust step 1 V, 3% tolerance)
- Impedance 1,000 Ohm
- Load hours (load 1 on CIS-CU case printing) and Dimming hours (load 2 on CIS-CU case printing) work together to effect the dimming function:

	No dimming	Dimming is on	Load off
Load hours	on	on	off
Dimming hours	on	off	N/A
Dimming output voltage	10 V	Voltage proportional to adjusted dimming value	0 V

- Corresponding relationship of 'Output voltage' and 'Dimming value'

Output voltage	0 V	1 V	2 V	3 V	4 V	5 V	6 V	7 V	8 V	9 V	10 V
Dimming value*	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

* : +/- 3% tolerance

Testing Function

Pushing the test button on the CIS-CU (Control Unit) will switch on load terminal for 1 minute. Should pressing the button cause a load disconnect event (LVD/SOC, overcurrent) then the load will be switched off immediately.

Safety Features

	PV terminal	Battery terminal	Load terminal
Reverse polarity	Protected (1)	Protected	Protected (2)
Short circuit (3)	Protected	Protected (4)	Switches off immediately
Overcurrent	Limited	—	Switches off with a delay (5)
Reverse current	Protected (6)	—	—
Overvoltage	Max. 100 V (7)	Max. 100 V	Switches off above 15.5/31.0 V
Undervoltage			Switches off
Over temperature	Reduces the charging cur ent if over temperature occurs and switches off the load if the temperature reaches a high level.		

1. Panels are short circuited by diodes. So there is a limited time the controller can be subjected to these conditions. A Battery connected to the panel terminals in reverse polarity will instantly cause a damage to the controller.
2. Controller can protect itself, but any connected loads might be damaged.
3. Short circuit: >3x 20x nominal current.
4. Battery must be protected by a fuse, or it might be permanently damaged in case of short circuit.
5. >103% nominal current: disconnect with 2 min. delay >124% nominal current: disconnect with 40s delay
6. MPPT switches off when detecting reverse current.
7. At voltages above 95 V the MPPT will stop charging.

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

Low Voltage Disconnect Function (LVD)

- State of charge controlled (SOC): Disconnects at 11.00/22.00 V to 11.70/23.40 V(SOC1), 11.12/22.24 V to 11.76/23.52 V(SOC2), 11.25/22.50 V to 11.83/23.63 V(SOC3), 11.38/22.72 V to 11.89/23.78 V(SOC4), 11.51/23.02 V to 11.96/23.92 V(SOC5), 11.64/23.28 V to 12.02/24.04 V(SOC6).
- Voltage controlled (LVD): Disconnects at a fixed voltage between 11.0/22.0 V and 11.9/23.8 V (voltage steps 0.1/0.2 V).

    Note: Battery voltage must be below adjusted setting for longer than 2 minutes before LVD occurs.

    Note: Voltage levels before/after the slash are valid for 12 V and 24 V systems respectively (valid for the charge controllers presented in this manual).

LFP Lithium Battery Wake-up Function

This charge controller is equipped with an LFP (LiFePO4) lithium battery wake-up feature. If lithium batteries are used with this controller, they must have an integrated battery management system (BMS). The BMS typically provides numerous safety features. When necessary, the BMS will shut-down the battery, electrically removing the battery from this charge controller. When PV power is available, this CIS controller will attempt to "wake-up" the BMS when it detects a disconnected battery by providing it with a current of approximately 100 mA, signalling that power is available for charging. If the BMS wakes up successfully, the battery will provide voltage to the controller

to resume normal operation and allow charging. If wake-up is not successful, the controller will continually attempt to wake the battery up again in increasingly longer intervals.

Ensure that no loads are directly connected to the battery for two reasons. First, this will interfere with the wake-up function and will likely prevent the BMS from re-activating the battery. Second, if a load is directly connected to the battery, it is likely the reason the BMS has had to intervene in the first place to prevent critical discharge. Therefore, ensure all loads are connected to the load output of the controller or, if their current is too high (in the case of inverters for example), connect these to the LFP battery only via a normally-open power relay or solid-state relay. The relay coil / control side should then be powered by the controller load output. Note: The connection of a relay to the output of a charge controller requires a free-wheeling diode in parallel to the load output. Please pay attention to the polarity – the freewheeling diode must be connected in reverse polarity. This way the CIS can control the load and avoid BMS intervention. Even if the BMS must disconnect the battery, the wakeup feature can then wake the battery as necessary when PV power is available, without human intervention.

Factory Settings

	Factory setting
Load mode	Standard controller (nightlight off)
Low voltage disconnect	SOC4
Battery type	Gel
Nightlight level	8.0/16.0 V (1)
Load 1 evening hours	0 h
Load 1 morning hours	0 h
Dimming evening hours	0 h
Dimming morning hours	0 h
Dimming value	50%

(1) PV panel open circuit voltage: Day level = Night level + 1.5/3.0 V

Nightlight level

The controller recognizes "day" and "night" based on the solar PV array open circuit voltage. The daylight threshold can be modified according to the requirements of the local conditions and the solar PV array used.
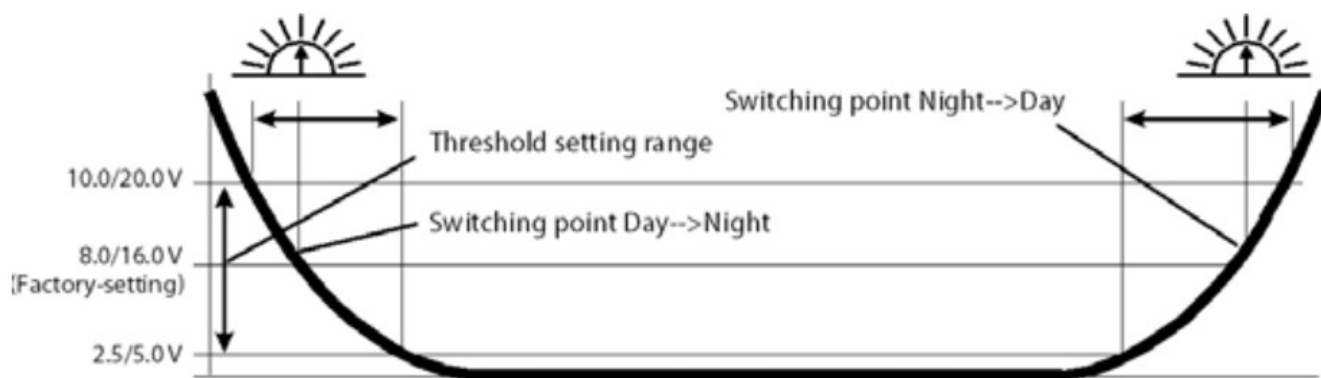
Open circuit voltage curve of solar array

To find the exact values, we recommend measuring the PV solar array "open circuit voltage" at twilight and when the controller is expected to switch the loads "on" or "off". This value (the closest setting available) can then be set

according to the description presented in the programming section.

Technical Data

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

Technical Data	CIS-N-MPPT 100/30
System voltage	12/24 V auto recognition
Max. charge current	30 A*
Max. load current	30 A*
Max. usable PV power	450 W (12 V system), 900 W (24 V system)
Max. PV array power	600 Wp (12 V system), 1200 Wp (24 V system)
Power conversion efficiency	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 charge	14.8/29.6 V (25 °C), 2 h, activation: battery voltage < 12.1 /24.2 V (at least every 30 days)
Overvoltage protection	15.5/31.0 V
Deep-discharge protection	11.0-12.0/22.0-24.0 V by SOC 11.0-11.9/22.0-23.8 V by voltage (adjustable step 0.1/0.2 V)
Reconnect level	12.8/25.6 V
Undervoltage protection	10.5/21.0 V
Min. operating	9 V
Max. PV voltage	95 V
Min. PV voltage	17/34 V
Max. battery voltage	100 V
Temperature compensation (charge voltage)	-25 mV/K @ 12 V / -50 mV/K @ 24 V
Idle self-consumption	12 – 16 mA
Grounding	Common negative
Ambient temperature	–40 to +60 °C
Max. altitude	4,000 m above sea level
Battery type	Lead acid (GEL, AGM, flooded) lithium (LFP)

Adjustment range: Evening hours Morning hours Night detection Day detection	0 – 15 h 0 – 14 h 2.5 – 10.0 V / 5.0 – 20.0 V (adjust step 0.5/1.0 V) 4.0 – 11.5 V / 8.0 – 23.0 V (adjust step 0.5/1.0 V)
Wire length	20 cm
Wire cross section	3.3 mm² (AWG 12)
Dimensions (W x H x D)	128 x 150 x 42 mm
Weight	1300 g
Type of protection	IP68 (1.5 m, 72 h)

Dimming output	CIS-N-MPPT 100/30
Dimming value	0 – 100 % output power (adjust step 10 %)
Dimming output voltage	0 V to 10 V relative to battery minus
Impedance	1000 Ohm
Wire cross section	0.5 mm²(AWG 20)

** : At 45°C CIS-N-MPPT, 100/30 can only have full current on panel or load, not simultaneously. Above that, PV panel power is reduced (derating).

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.

CE   **ISO9001**
RoHs

Documents / Resources

	[**phocos CIS-N-MPPT 100 MPPT Solar Charge Controller**](#) [pdf] User Manual CIS-N-MPPT 100, MPPT Solar Charge Controller, CIS-N-MPPT 100 MPPT Solar Charge Controller, Solar Charge Controller, Charge Controller, Controller
	[**phocos CIS-N-MPPT 100 MPPT Solar Charge Controller**](#) [pdf] User Manual CIS-N-MPPT 100, MPPT Solar Charge Controller, CIS-N-MPPT 100 MPPT Solar Charge Controller, Solar Charge Controller, Charge Controller, Controller

References

- [**Solar Power Charge Controllers, Inverters, and More | Phocos**](#)

[**Manuals+**](#),