phocos CIS-N-MPPT-LED 85/15 Solar Charge Controller with LED Driver User Manual

**LED 85/15 Solar Charge Controller with LED Driver
User Manual**

Contents

CIS-N-MPPT-LED 85/15 Solar Charge Controller with LED Driver

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:

- High efficiency (up to 98%)
- Three functions in one: charge controller + timer + LED driver
- Power output maximization and system costs reduction
- SMD assembly, greater reliability
- IP68 protection
- High current-rated MOSFETs
- High-performance microcontroller
- Nightlight function
- Auto-saving function: two voltage disconnect levels
- Programmable via CIS-CU IR remote control unit
- Datalogger via MXI-IR and CISCO software
- Compatible with 60-cell PV modules
- Input for motion sensor
- Programmable for Lithium batteries with a BMS using CIS-CU or remote control CISCOM in expert mode

⚠️General Safety Information
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. Photo charge controllers do not contain user-serviceable parts.
Please observe all instructions with regard 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.

Choosing a Battery
The CIS-N-MPPT-LED is suitable for use with lead acid batteries (gel, AGM, flooded) as well as 12V and 24V Lithium batteries that are supplied with a Battery Management system (BMS). Use the CIS-CU or CISCOM in expert mode to adjust charge settings. If using lithium-ion (LFP, Li-NMC) , it must be supplied with a BMS. Lithium batteries have maximum allowed charge currents. These maximums typically decrease in cold temperatures. CIS-

N-MPPT-LED does not limit current for these restrictions. The system design of the solar array must account for this. Follow all battery manufacturer safety instructions.

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 damage to the charge controller!

Verify all cable/wire connections are done properly and are 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.

Install a fuse or breaker near the battery before installing or adjusting the controller! When connecting inductive loads (motors, relays, etc.) a freewheel diode must be connected in parallel to the loads in the reverse-biased direction.

High voltage risks
Never touch any electrical conductors to avoid electrical shock.

Never work on life (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.

MPPT	Maximum Power Point	High Efficiency	Up to 98% power conversion effici
IR Interface	Infrared interface		Electronic fuse
Deep Discharge	Deep discharge protection	Electronic Fuse	Fit for flooded and gel/AGM batter
NTC	External temperature	12 V 24 V DC	12/24 V, automatic recognition

Connecting and Grounding

- The controller warms up during operation, and should therefore be installed on a nonflammable surface only.
- 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 load, to the battery or to the panel.
- Minimum recommended wire size: 4 mm²
- Make sure the wire length between the battery and the controller is as short as possible
- Be aware that all negative wires of CIS-N-MPPT-LED 85/15 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.
- Maximum cable length from the charge controller to LEDs: < 3 m

	Function	**Wire size (cross-section)**	**Color**
1	Positive wire LED output	AWG 20 (0.5 mm^2)	Red
2	Negative wire LED output	AWG 20 (0.5 mm^2)	Blue
3	Negative battery terminal	AWG 13 (2.5 mm^2)	Black
4	Positive battery terminal	AWG 13 (2.5 mm^2)	Red
5	Negative panel terminal	AWG 13 (2.5 mm^2)	Black
6	Positive panel terminal	AWG 13 (2.5 mm^2)	Yellow
7	Input for PIR motion sensor	AWG 24 (0.25 mm^2)	Black

LED indications & warning functions

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

LED Driver Description

- Output voltage up to 69 V

  Nominal output current: 350~3500 mA
- Two timers inside to control LED brightness

Output base level
The CIS-N-MPPT-LED 85/15 base output current can be adjusted via the MXI-IR interface and CISCO software. The CIS-N-MPPT-LED 85/15 base output current is adjustable between 350 mA and 3500 mA.

Nightlight Function
The CIS-N-MPPT-LED 85/15 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.
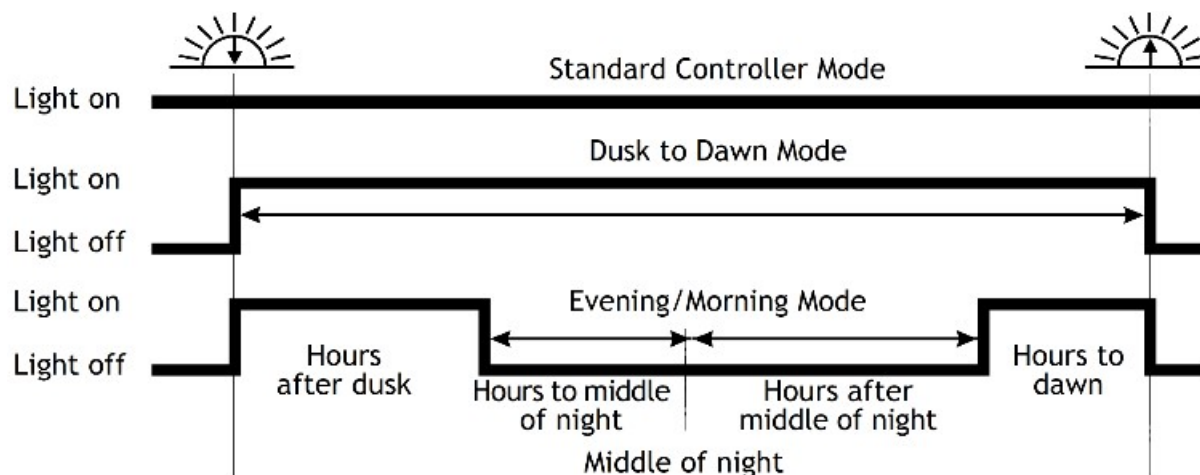
"Middle of the night" is automatically detected as the midpoint between dusk and dawn; no setting of a clock is required. It may take several days until the controller has "learned" the middle of the night precisely. "Middle of the night" may be different from 12:00 midnight depending on your location/longitude. The controller recognizes day and night based on the solar array's 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

Load hours (load 1 on CIS-CU case printing) and dimming hours (load 2 on CIS-CU case printing) work together to affect the dimming function:

	No dimming	**Dimming is on**	**Load off**
Load hours	on	on	off
Dimming hours	on	off	N/A

The timer and dimming settings can be adjusted using the CIS-CU (Infrared remote control) or MXI-IR (Infrared to USB adapter) and CISCO (PC program)

PIR / DIM override input: (0 – 0.5 V Off, 4 – 30 V On)
Input for a signal from a motion sensor (PIR), to override the dimming and set the light to full brightness in case a person is detected. In this way, one can set a low dimming level to ensure a minimum light level, for sufficient orientation and to save energy. When a motion is detected, the light is switched to 100%. The duration of the activation has o be adjusted on the motion sensor.

Testing Function
Pushing the test button on the CIS-CU (Control Unit) will switch on the 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**	**LED output**
Reverse polarity	Protected (1)	Not Protected (2)	Protected (3)
Short circuit (4)	Protected	Protected (5)	Not Protected
Overcurrent	Limited	—	—
Reverse Current	Protected (6)	—	—
Overvoltage	Max. 85 V (7)	Max. 50 V	Switches off above 15.5/31.0 V
Undervoltage	—	—	Switches off
Over Temperature	Reduces the charging current if over temperature occurs and switches off the load if the temperature reaches a high level.		

1. Panels are short-circuited by diodes. The controller can therefore only be subjected to these conditions for a limited time. A battery connected to the panel terminals in reverse polarity will instantly cause damage to the controller.
2. A battery fuse is necessary to protect the CIS-N-MPPT-LED 85/15 from getting damaged by the reverse polarity connections on the battery terminals.
3. A controller can protect itself, but any connected loads might be damaged.
4. Short circuit: >3x – 20x nominal current.
5. The battery must be protected by a fuse, or it might be permanently damaged in case of a short circuit.
6. MPPT switches off when detecting reverse current.
7. At voltages above 85 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 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 the 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).

Factory Settings

You can configure CIS-N-MPPT-LED 85/15 charge controllers via the Remote Control Unit (CIS-CU). See the CIS-CU manual for details.

	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 %

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. 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.

Open-circuit voltage curve of solar array
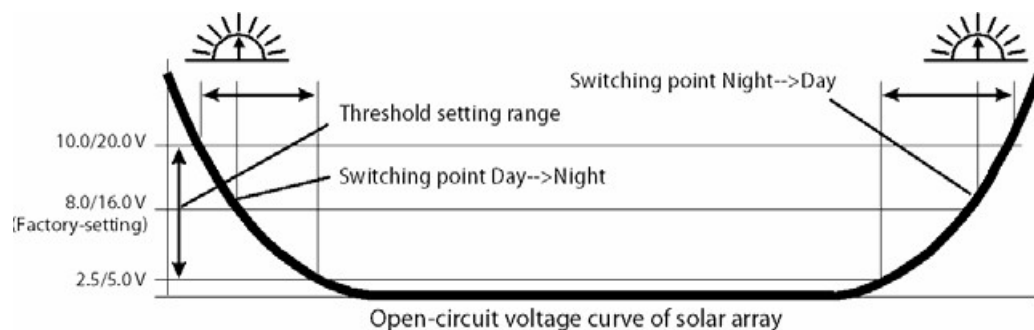
Technical Data

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

Technical Data	CIS-N-MPPT-LED 85/15
System voltage	12/24 V auto recognition
Max. charge current	15 A
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)
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)
Reconnect level	12.8/25.6 V
Overvoltage protection	15.5/31.0 V
Undervoltage protection	10.5/21.0 V
Max. PV panel voltage	50/85 V
Max. usable PV power	225 W @ 12 V, 450 W @ 24 V
Max. PV array power	250 Wp @ 12 V, 500 Wp@ 24 V
Temperature compensation (charge voltage)	-25 mV/K @ 12 V / -50 mV/K @ 24 V
Idle self-consumption	< 10 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 (BMS Required)
Adjustment range: Evening hours Morning hours Night detectionDay 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 / 7.9 in
Wire cross-section	2.5 mm² (AWG 13)
Dimensions (W XH X D)	88.5 x 150 x 41.4 mm / 3.5 x 6 x 1.6 in
Weight	0.78 Kg / 1.72 lbs
Type of protection	IP68 (1.5 m, 72 h)

Dimming output	CIS-N-MPPT-LED 85/15
Output voltage	15 – 69 V (12 V), 30 – 69 V (24 V)
Nominal output current per string	350 – 3500 mA
Max. load power	100 W / 200 W
Dimming level	0-100% (1.7% steps)
Input for PIR motion sensor	4-30 V with respect to battery negative, >= 0.7 mA; limited protection up to 50 V

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.

Specifications are subject to change without notice.

Version: 20201216

Made in China

CE ISO9001 **RoHS**

Documents / Resources

	phocos CIS-N-MPPT-LED 85/15 Solar Charge Controller with LED Driver [pdf] User Manual CIS-N-MPPT-LED 85 15, Solar Charge Controller with LED Driver, CIS-N-MPPT-LED 85 15 Solar Charge Controller with LED Driver, CIS-N-MPPT-LED 85 15 Solar Charge Controller, Solar Charge Controller, Charge Controller, Controller

References

- P **Solar Power Charge Controllers, Inverters, and More | Phocos**