



# Phocos CIS-N

Bedienungsanleitung

User Manual

Manual de Instrucciones

Guide de l'utilisateur

Manual do Usuário

用户说明书



CID: 181818510

## Introduction

Please read the instructions carefully and thoroughly before using the product. It comes with a number of outstanding features such as:

- Negative grounding
- Dimming function
- Case protection: IP68 (1.5 m water depth, 72 hours)
- Widely programmable using optional accessories
- External temperature sensor for temperature compensation of charge 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

### Regulatory Information

This product is CE compliant.

This product is manufactured in an ISO9001 certified facility.



RoHS



E497008

Photovoltaic Charge Controller

E490503  
Hazardous Location  
Class 1, Div. 2  
Groups A-D, T4



This equipment is suitable for use in Class I, Division 2 groups A, B, C, D or non-hazardous locations only.

The hazardous location temperature code is T4.

UL listed to UL1741 and CSA C22.2 No. 107.1-16.

UL listed to ANSI/ISA 12.12.01-2015 and C22.2 No. 213-15.

### Battery Type

Suitable for use with lead acid (GEL, AGM, flooded) batteries.

Nominal voltage: 12 or 24 V

## IMPORTANT SAFETY INSTRUCTIONS



### SAVE THESE INSTRUCTIONS

This manual contains important instructions for models CIS-N-05-2.1, CIS-N-10-2.1, CIS-N-20-2.1 that shall be followed during installation and maintenance of the charge controller.

**CAUTION** – A battery can present a risk of electrical shock, burn from high short-circuit current, fire or explosion from vented gasses. Observe proper precautions.

**WARNING** - EXPLOSION HAZARD - Do not disconnect while circuit is live or unless area is free of ignitable concentrations.

Please do not disassemble or attempt to repair Phocos products. Phocos charge controllers do not contain user serviceable parts.

The controller warms up during normal operation.

### Overcurrent Protection for Battery

Install a fast acting fuse with a minimum of 1000A interrupt rating as close as possible to the battery terminal. Select a device rated for 1.5 times the nominal current rating of the controller (see table). An overcurrent protection device must be purchased separately.

**CAUTION** – Maximum overcurrent protection device rating:

CIS-N type	CIS-N-05	CIS-N-10	CIS-N-20
Fuse	7.5 ADC	15 ADC	30 ADC

### Maintenance and Installation

When installing or working on the PV system, please disconnect the PV (solar) modules from the charge controller first to prevent damage to the charge controller!

Please verify that all cable/wire connections are tightly fastened to the connectors/connecting posts in order to avoid bad or loose connections that could result in excessive heating.

Install a fuse or breaker near the battery before installing or adjusting the controller!

Make sure the cables are always connected to the correct terminal.

Ensure adequate ventilation for batteries which produce flammable hydrogen gas.

The controller does not need any maintenance or service. Remove dust with a dry tissue.

**WARNING:** This unit is not provided with a GFDI device. This charge controller must be used with an external GFDI device if required by Article 690 of the National Electric Code for the installation location.

### High voltage risks

Operation of this device may produce a high voltage which could cause severe injury or death if improper installation or operation of the device occurs.

PV modules can generate high DC voltages!

An electrical shock can be lethal. In general, any electric shock can be dangerous to your health.

### Mounting of the Unit

Since the charge controller must be able to sense the battery temperature, it must be mounted in the same compartment with the battery, as close as possible to the battery. Phocos recommends not to use more than 1m wire length between battery and charge controller.

If the controller is mounted in a location far from the battery and cannot accurately sense battery temperature, overcharging or undercharging will occur. This can cause permanent damage to the battery.

- Mount vertically on non-flammable surface with minimum 2 cm distance below and above unit.
- If heat dissipation is limited by the surrounding compartment or high ambient temperatures, unit will limit charge current to reduce temperature.

- The charge controller is not intended to be installed within the wiring compartment of a PV module.
- Intended for indoor use only or installation in a suitable enclosure. Use in a dry environment. Controller wires are not UV resistant.
- Strain relief is recommended for the wires to avoid loose connections at the terminals.

## Connecting and Grounding

**WARNING:** When the photovoltaic (solar) array is exposed to light, it supplies a DC voltage to this equipment.

Recommended minimum wire size: CIS-N-05: 2.5mm<sup>2</sup> (AWG 14) ; CIS-N-10: 6.0mm<sup>2</sup> (AWG 10); CIS-N-20: 10mm<sup>2</sup> (AWG 8)

Use minimum 75°C stranded copper wire.

Make sure the wire length between battery and controller is as short as possible.

CIS-N is designed for use in negative ground systems. If any grounding is required, always do this on the negative wires.

The photovoltaic maximum current as defined in the National Electrical Code, clause 690.8 must not exceed the rated charge current of the controller.

The photovoltaic maximum voltage as defined in the National Electrical Code, clause 690.7 cannot exceed 30VDC (12V system) and 50VDC (24V system).

Wiring methods in accordance with the National Electrical Code, ANSI/NFPA 70 are to be used. Wiring methods used shall be in accordance with the Canadian Electrical Code, Part I.

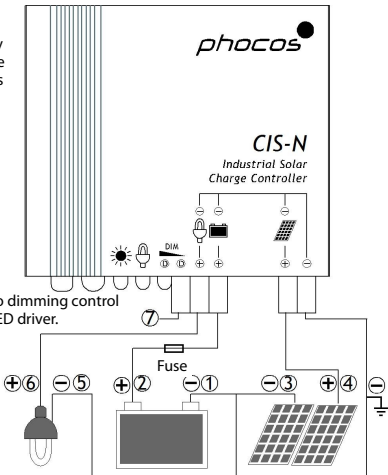
	<b>Function</b>	<b>Cable marker</b>	<b>Wire size (cross section)</b>	<b>Color</b>
①	Negative battery wire	COMMON -	AWG 13 (2.5 mm <sup>2</sup> )	black
②	Positive battery wire	BATTERY +	AWG 13 (2.5 mm <sup>2</sup> )	red
③	Negative panel wire	COMMON -	AWG 13 (2.5 mm <sup>2</sup> )	black
④	Positive panel wire	SOLAR +	AWG 13 (2.5 mm <sup>2</sup> )	yellow
⑤	Negative load wire	COMMON -	AWG 13 (2.5 mm <sup>2</sup> )	black
⑥	Positive load wire	LOAD +	AWG 13 (2.5 mm <sup>2</sup> )	orange
⑦	Dimming signal wire	---	AWG 19 (0.6 mm <sup>2</sup> )	black

Connect wires in order indicated 1 2 3 4 5 6 to avoid installation faults.

To avoid any voltage on the wires, first connect the wire to the controller, then to the battery, panel or load.

Install a fuse on the battery positive wire as close to the battery positive terminal as possible.

Connect dimming wire to dimming control terminal of an external LED driver.





## Operational Description

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CIS-N is a series PWM (Pulse Width Modulation) solar charge controller. It uses fast switching to connect and disconnect the solar panel to the battery. This switching regulates the battery voltage and charge current.

CIS-N protects PV panels from reverse current flow from the battery at night.

CIS-N will attempt to charge the battery up to a target voltage. Target voltage and duration are determined by the charge state (Main, Boost, Equalize, or Float). Either Main, Boost or Equalize will be completed first. Float will occur for the remainder of the day. If solar energy is insufficient, or if too much load energy is drawn from the battery during charging, the battery cannot be fully charged.

CIS-N adjusts the target charge voltage based on ambient temperature to optimize battery charging. Charge voltage is increased in cold temperatures. Charge voltage is decreased in hot temperatures.

CIS-N provides a power output to supply DC loads with electricity. The voltage of this load output is the battery voltage. Energy for the loads and for the controller's self-consumption are drawn from the battery.

To protect the battery from becoming deeply discharged, CIS-N will disconnect the load output when battery voltage drops to a low SOC (state of charge). This is known as Low Voltage Disconnect (LVD). When the battery is charged above the reconnect level, load power will turn on. This protects the battery from sulfation and improves battery life.

To protect connected loads, CIS-N will disconnect the load immediately if the battery voltage rises too high or too low. Disconnect will occur at the overvoltage level or undervoltage level.




CIS-N has over temperature protection. If the internal temperature rises higher than about 75°C (e.g. at high charge currents and high ambient temperatures) the charge current will be decreased to reduce internal heating. If the internal temperature of the controller is too high, it will also switch off the load current.

CIS-N has a dimming output that provides a signal between 0 .. 10VDC to control the brightness of an LED fixture when used with a compatible LED driver.

Charge, load, and dimming settings are widely programmable. Settings can be adjusted using CIS-CU, an infrared remote control designed for the CIS product family. Settings can also be adjusted using MXI-IR infrared to USB computer cable and CISCOM PC software.

## Display and Warning Functions

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LED	Status	Function
Green 	On	Controller connected to battery, night detected
	Flash	Controller connected to battery, day detected
	Off	No battery connected
Red 	On	Load 1 low/high voltage disconnect (LVD/HVD)
	Flash	Load 1 over current
	Off	Load 1 OK
Red DIM 	On	Dimming because of low/high voltage disconnect
	Off	Time control dimming
All LEDs	Green->Red-> Green	Programming

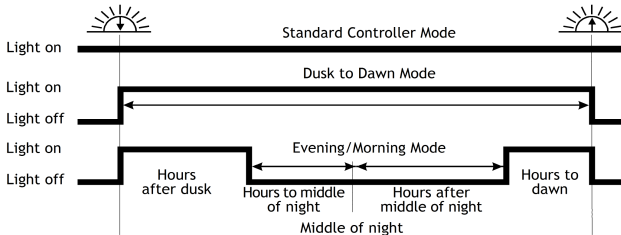
## Night Light Function

The CIS-N controller comes with a sophisticated night-light function. It controls the load output at night and is widely programmable with optional accessories CIS-CU or MXI-IR and CISCOM software.

There are 3 modes available:

- **Standard Controller:** Load is on all the time.
- **Dusk to Dawn:** Load turns on at dusk and off at dawn.
- **Evening/Morning:** Load turns on at dusk and off at dawn with an off period in between.

Load disconnect events will override the load programming.



"Middle of night" is detected automatically 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.

The controller intelligently recognizes day and night based on solar array open circuit voltage. This day/night threshold can be modified according to local light conditions and the solar array used.

### Dimming Function

The CIS-N dimming wire must be connected to an LED driver with a dimming control interface for dimming to be implemented. CIS-N dimming settings are programmable using accessories CIS-CU remote or MXI-IR with CISCOM PC software. Dimming can be initiated by time or low voltage settings.

- Output voltage 0 to 10 VDC relative to battery negative
- Adjustable steps of 1 V
- Impedance: 5000 Ohm

Load hours are programmed with "Light ON" or "Nightlight (Load 1)" settings in CISCOM or Load 1 settings on CIS-CU. Dimming hours are programmed with "Dimming" or "Nightlight (Load 2)" settings in CISCOM or Load 2/Dim settings on CIS-CU.

Dimming will be off when:

- Load hours are on AND dimming hours are off AND dimming is not triggered for low voltage
- Load hours are on AND dimming hours are on AND dimming percentage is 100%
- Dimming hours are off AND dimming is not triggered for low voltage Dimming will be on when:
- Load hours are on AND dimming hours are on AND dimming percentage is between 10% to 90%
- Dimming percentage is between 10% to 90% AND dimming is triggered for low voltage

Relationship of 'Output voltage' and 'Dimming value'

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

## Testing Function

Pushing the test button on the CIS-CU (Control Unit) will switch on the load output for 1 minute. If pressing the button causes a load disconnect event (LVD, over current), the load will be switched off immediately.

## Safety Features

	PV terminal	Battery terminal	Load terminal
Reverse polarity	Protected (1)	Protected (1)	Protected (2)
Short circuit (3)	Protected (8)	Protected (4)	Switches off immediately (8)
Over current	N/A	N/A	Switches off with delay (5)
Reverse current	Protected (6)	N/A	N/A
Over voltage	Max. 55 V (7)	Max. 40 V	Switches off above 15.5/31.0 V
Under voltage	N/A	N/A	Switches off
Over temp.	Reduces the charging current by PWM if over temperature occurs and switches off the load if the temperature reaches a high level.		

(1) Upanel – Ubattery is limited to 60 V. The controller should not remain in this condition for a long time.

(2) Controller can protect itself, but loads might be damaged.

(3) Short circuit: >3x – 20x nominal current.

(4) Battery must be protected by a fuse or it can be permanently damaged by a short circuit.

(5) >200% nominal current: disconnect with 3s delay,  
>150% nominal current: disconnect with 10s delay,  
>110% nominal current: disconnect with 120s delay.

(6) Reverse current through solar panel is blocked by a serial MOSFET. This function is tested and activated approx. once in 1 min +/-5s.

(7) The solar panel voltage should not exceed this limit for a long time as voltage protection is done by a varistor.

(8) Limited electronic protection; must be additionally protected by an external fast acting fuse against short circuit to prevent damage from charge controller; nominal fuse rating shall be 1.5 times the maximum charge current.

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

### Low Voltage Disconnect Function (LVD)

There are 2 modes of LVD. State of Charge (SOC) controlled LVD takes into account battery voltage and load current. Voltage controlled LVD takes into account battery voltage only.

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

State of charge (SOC) controlled disconnect options:

- 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): Disconnect at a fixed voltage between 11.0/22.0 V and 11.9/23.8 V (Steps of 0.1/0.2 V).



Battery voltage must be below setting for longer than 2 minutes and up to 30 minutes for LVD to take effect.

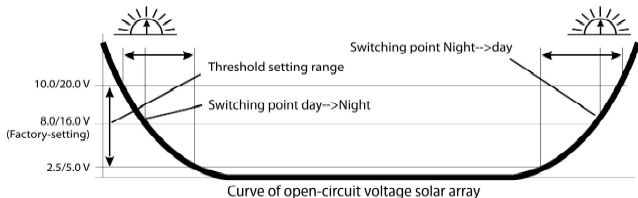
## Factory Settings

You can configure CIS-N charge controllers via the Control Unit (CIS-CU) or MXI-IR computer cable and CISCOM software. See CIS-CU or CISCOM manuals for details.

	<b>Factory setting</b>
Load mode	Standard controller (night light off)
Low voltage disconnect	SOC4
Battery type	Gel
Night detection 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 %

## Night Detection 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 correct values, we recommend measuring the PV solar array open circuit voltage at the time when twilight has reached the level when the controller should switch the loads "on" or "off". This value (or the closest available) can then be set according to the description in the programming section.

Day Detection level = Night level + 1.5/3.0 V

## Technical Data

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

Voltage and current specifications are direct current (DC) type.

Technical Data	CIS-N-05	CIS-N-10	CIS-N-20
System nominal voltage	12/24 V, auto recognition		
Max. charge current	5 A**	10 A**	20 A**
Max. load current	5 A**	10 A**	20 A**
Range of Battery Voltage for Operation	9.0 to 15.5 V / 18.0 to 31.0 V		
Float charge	13.8/27.6 V (25 °C)		
Main charge	14.4 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 every 30 days)		
Charging Voltage Range	9.0 to 15.0 V / 18.0 to 30.0 V		
Deep Discharge Protection Cut-off voltage	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
Overvoltage protection	15.5/31.0 V
Undervoltage protection	10.5/21.0 V
Maximum solar voltage	30/50 V
Temperature compensation (Charge voltage)	-24/48 mV/K
Load output voltage range	11.0 to 15.5/22.0 to 31.0 Vdc ***
Max. self-consumption	5 – 10 mA
Grounding	Negative grounding
Ambient temperature range	-40 to +60 °C**
Max. altitude	4,000 m above sea level
Battery type	lead acid (GEL, AGM, flooded)
Load adjustment range:	
Evening hours	0 – 15 h
Morning hours	0 – 14 h
Night detection	2.5 – 10.0 V / 5.0 – 20.0 V (adjust step 0.5/1.0 V)
Day detection	Night detect level plus 1.5/3.0 V
Wire length	20 cm
Dimensions (WXHxD)	82 x 63 x 20 mm
Weight	150 g
Wire cross section	AWG 13 (2.5 mm <sup>2</sup> )

Environmental protection	IP68 (1.5 m, 72 h)
Warranty	5 years

Dimming output	CIS-N-05	CIS-N-10	CIS-N-20
Dimming value	0 – 100 % output power (adjust step 10 %)		
Dimming output voltage	0 V to 10 V relative to battery minus		
Impedance	5000 Ohm		

\*\* : At an ambient temperature above 50°C with all currents applied, the charge controller will automatically reduce the charge current to limit the internal temperature.

\*\*\* : Depends on selected settings. Load voltage matches battery voltage when load is on.

## 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.

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Specifications are subject to change without notice.

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