



phocos CXNup Solar Charge Controller User Manual

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Dear Customer,

Congratulations on buying your Phocos product! Please read the instructions carefully and thoroughly before using the product. Your new CXNup 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:

User friendly LCD showing extensive system information

Four-stage PWM charging algorithm with integrated temperature compensation for lead battery and two stage charge algorithm for LiFePO4 battery

Full electronic protection

Programmable nightlight function

USB charging port

Datalogger information which can also be exported

Load status indication

Touch keys ensuring long lasting operation

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This manual contains important instructions for CXNup controller that shall be followed during installation, operation and maintenance of the charge controller.

RISK OF FIRE: ATTACH THE TEMPERATURE SENSOR TO THE BATTERY.

b Lead acid (GEL, AGM, flooded), LiFePO4

Nominal voltage rating of the battery: 12 or 24 V

Battery fuse: Use a fast acting fuse with an interruption rating capacity of 1000 A on the battery side. We

recommend to use a fast acting melting fuse (e. g. car type fuses) as close as possible to the battery terminal. The maximum current rating should be 1.5 times of the nominal current of the charge controller. Respect the maximum current rating of the BMS when using LiFePO4 batteries.

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.

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 tightly fastened to the connectors/ binding posts in order to avoid any bad or loose connections that could result in excessive heating.

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

Please install and operate the controller in a dry environment.

High voltage risks

Operation of this device may produce high voltages which can cause severe injuries or death in case of improper installation or operation of the device.

PV modules can generate high DC voltages!

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 which comprise automatic adaptation to the battery temperature.

The charge controller adjusts itself automatically to 12 V or 24 V system voltage.

The controller provides a user friendly LCD, programmable parameters, and various safety 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 warms up during operation, and should therefore be installed on a non flammable 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: CXNup 10 : 4 mm² ; CXNup 20 : 6 mm², CXNup 40 : 10 mm²

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

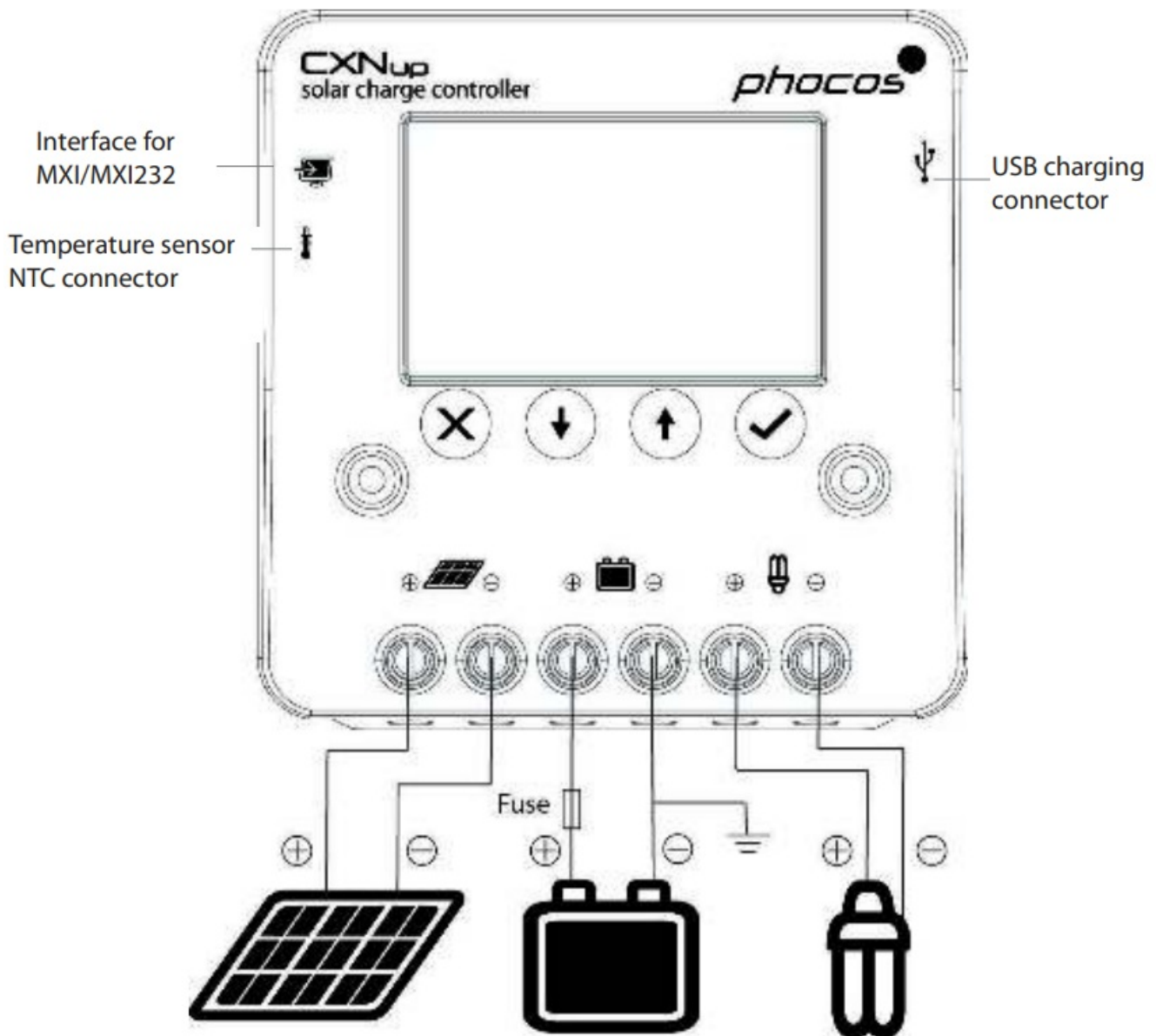
Be aware that all negative connections of the CXNup controller are common and therefore have the same

electrical potential. If any grounding is required, always do this on the negative wire.

When connecting inductive loads (motors, relays, etc.), a freewheel diode must be connected in parallel to the loads in the reverse biased direction.

Due to their high inrush currents, large inverters should always be connected directly to the battery

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: 15 A for CXNup 10 , 30 A for CXNup 20 and 50 A for CXNup 40.



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 start-up, 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 mode is then added. If you intend to use a LiFePO4 battery, you also can adjust the charging characteristics (see “Settings”).

In case of any doubts consult your local dealer.

Recommendations for Use

The controller warms up during normal operation.

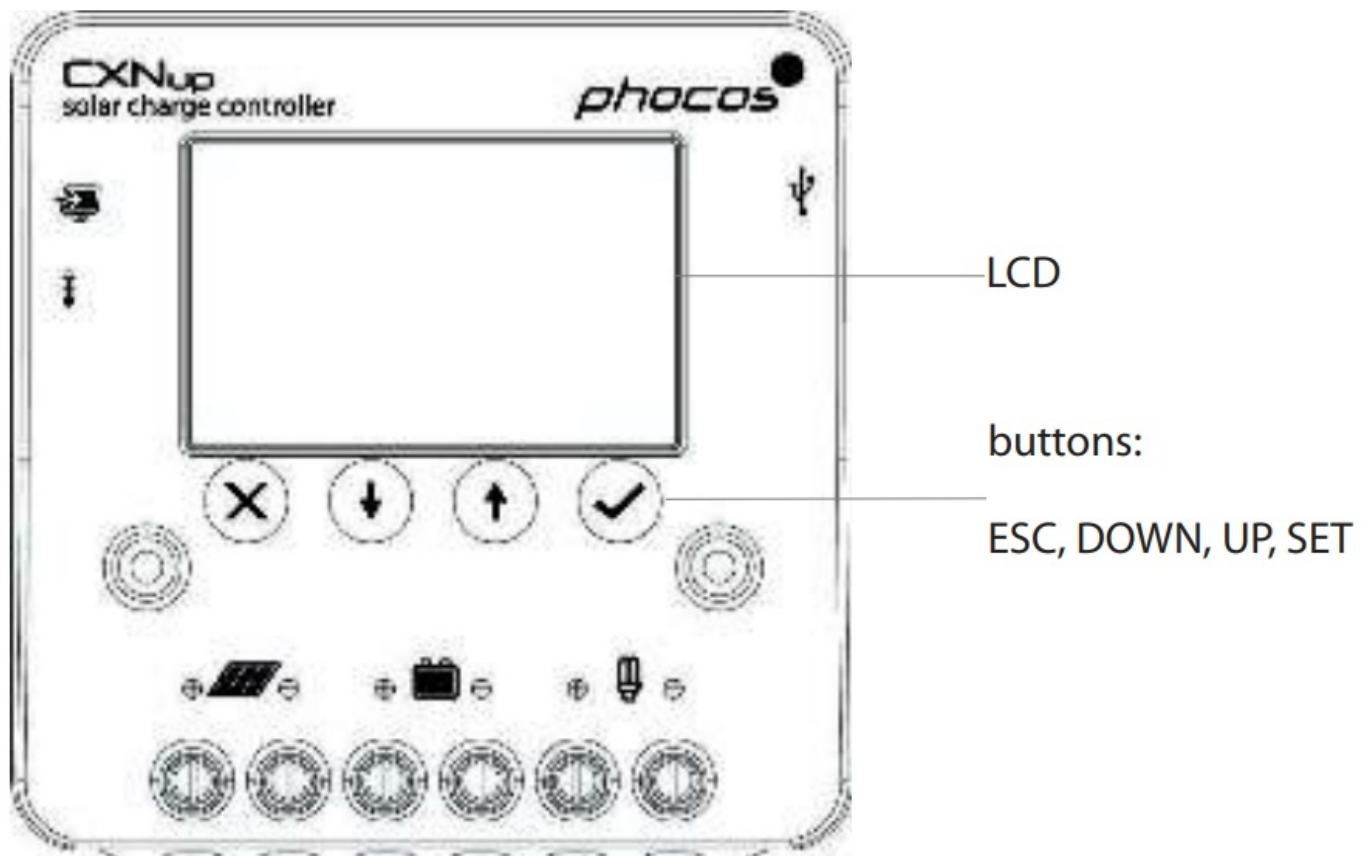
The controller does not need any maintenance or service. Remove dust with a dry tissue.

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 has an LCD and an acoustic warning signal.



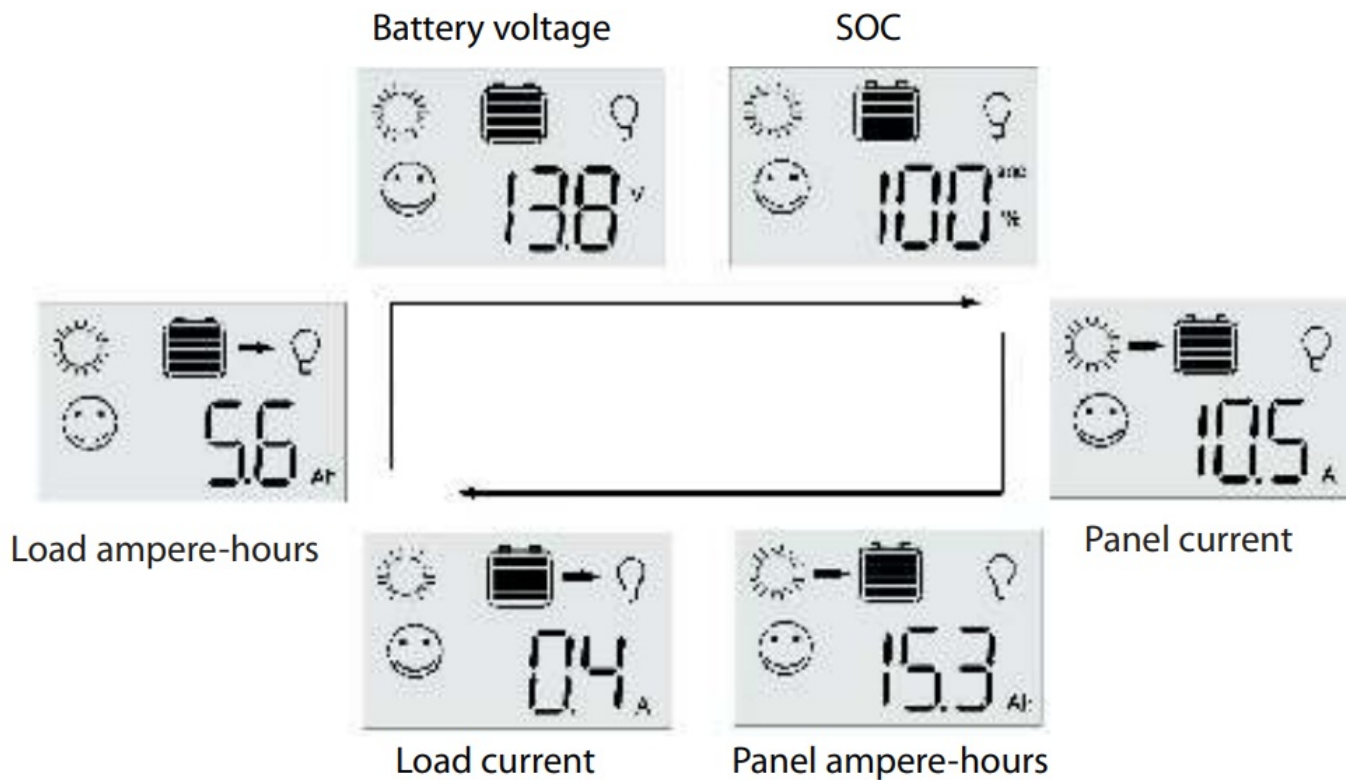
In normal operation, the controller shows the state of charge of the battery and the solar panel activity. Any change of the state of charge (SOC) to a lower status is additionally signaled acoustically.

Symbol display

Symbol	Status and function	Symbol	Status and function
	System OK		Load OK
	System not OK (Error or empty)		Load current flowing
	On: Day and charging		LVD
	Flash with PWM due to OTP		
	Night		Load over current

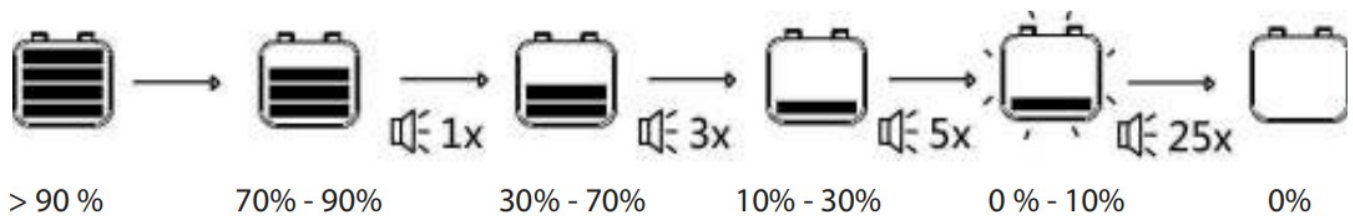
Current Value

The LCD will scroll the current values below after power up. “SET” () button can stop scrolling, pressing “DOWN” or “UP” button proceeds with scrolling the values.



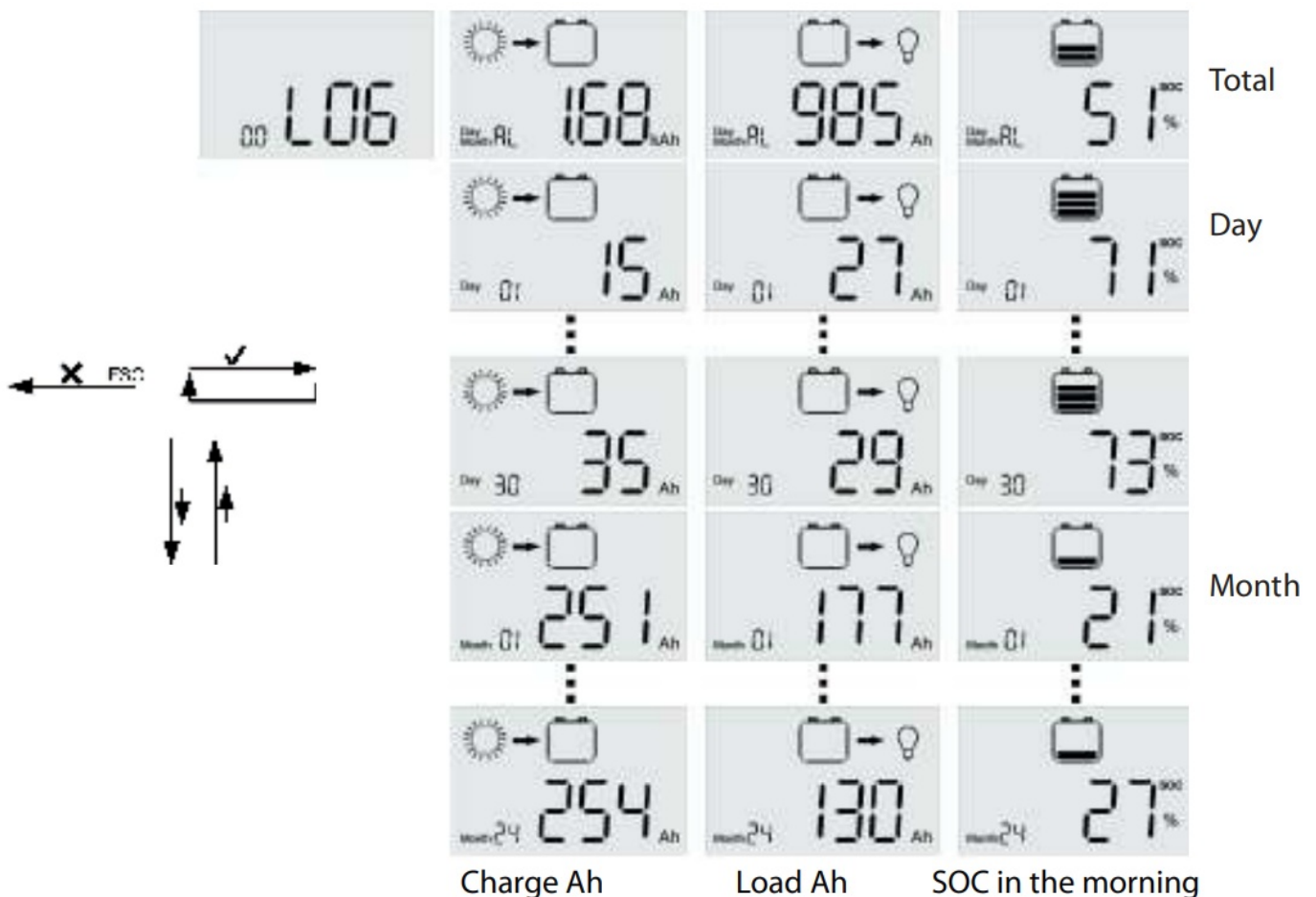
Charge state and acoustic signals

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

History Data



The CXNup controller has a 2 years datalogger. Push the “ESC” (X) button when the LCD is scrolling the current values and the controller will enter the menu. Select “LOG” with the arrow keys and press “SET” () to enter the datalogger menu. You can get the charge Ah, load Ah and SOC in the morning, as daily data for a month, monthly data for two years and total data.

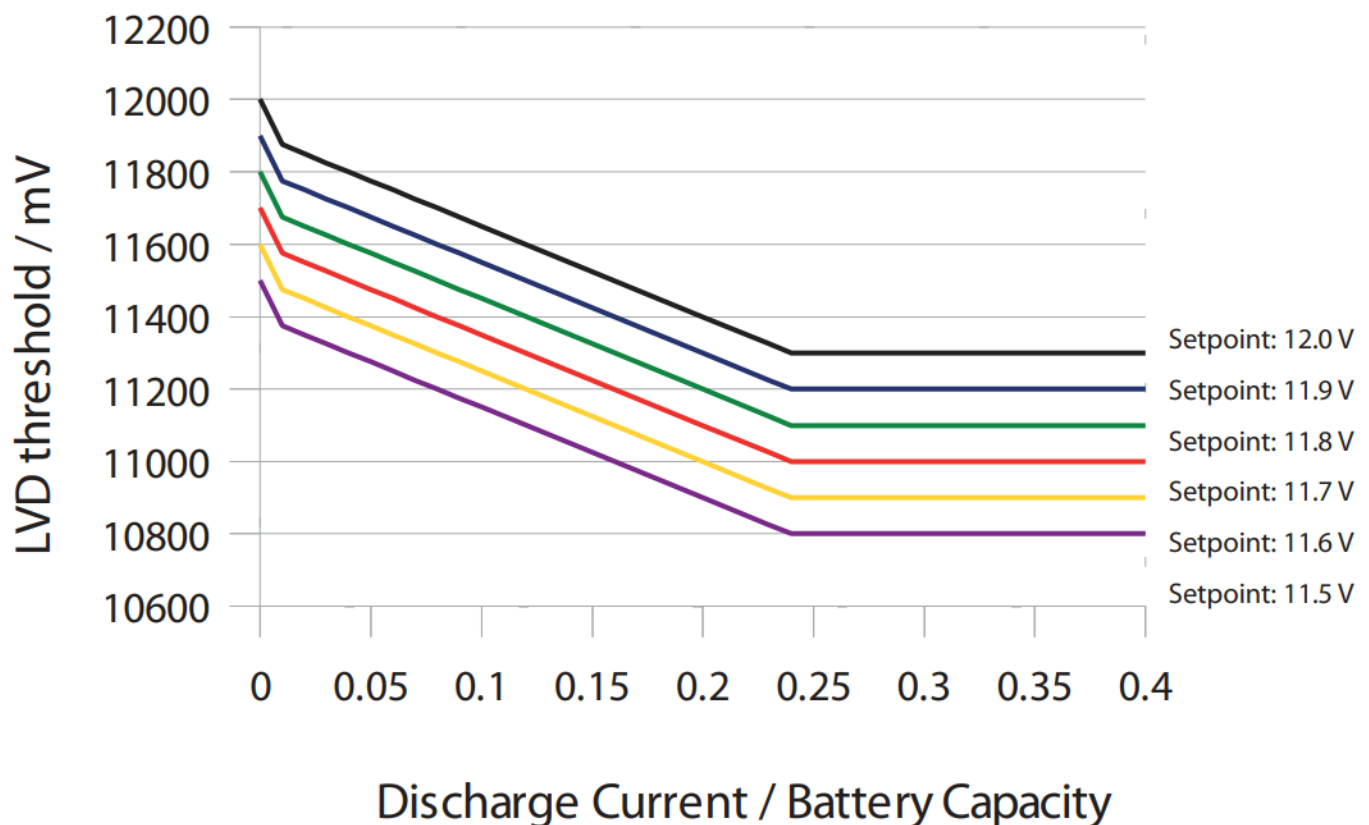
Low Voltage Disconnect Function

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

Mode 1 LVD Current Adapted (SOC): Load disconnect level at no discharge current can be set between 11.5/23.0 V and 12.0/24.0 V. The disconnect voltage depends on the voltage, discharge current and battery capacity. At nominal discharge current (0.1 C/h): 11.15/22.3 V to 11.65/ 23.3 V.

Battery capacity : 10 Ah – 5000 Ah

Mode 1 LVD Current Adapted (SOC) is the standard setting.



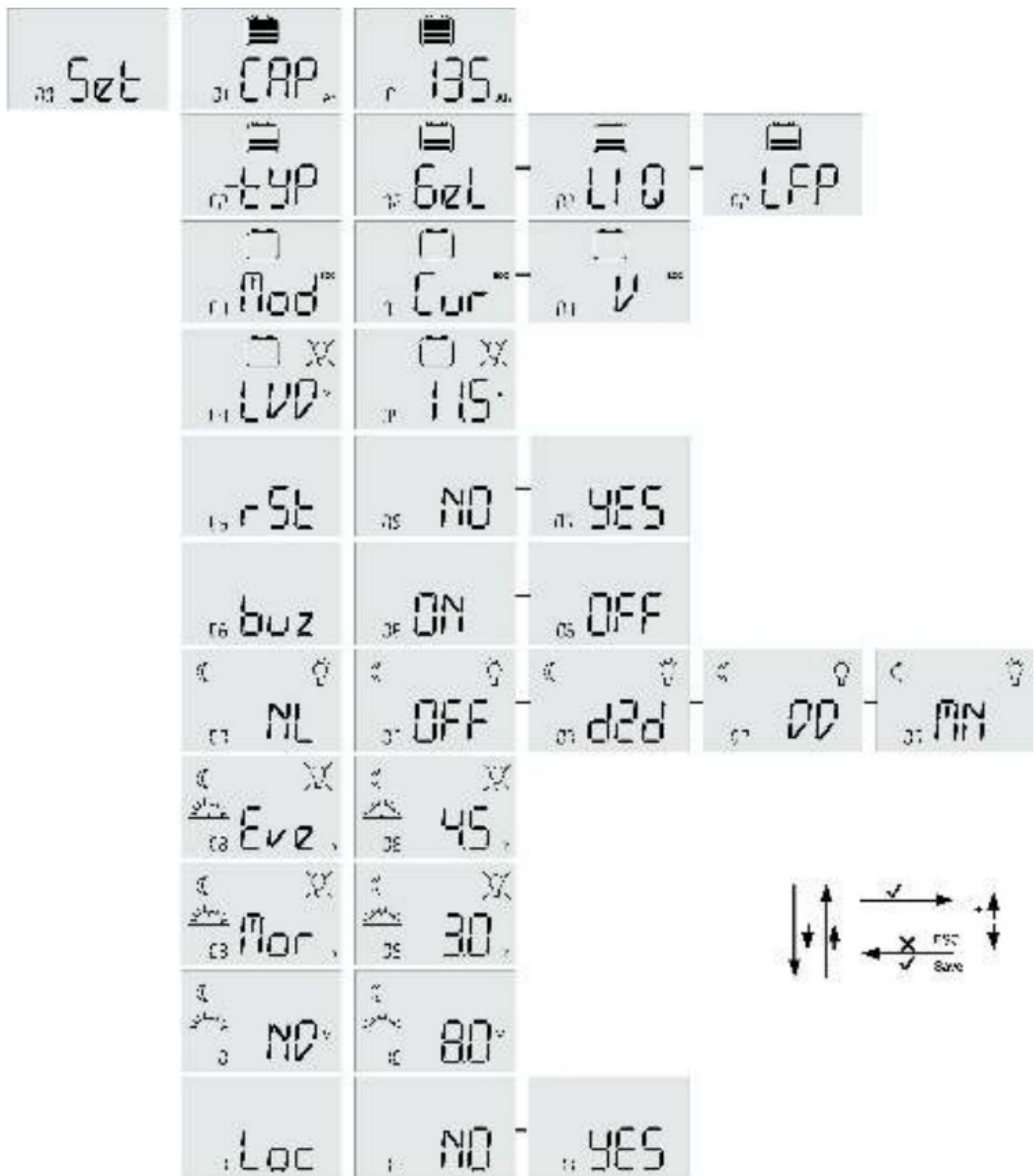
Mode 2 voltage: Load disconnect level can be set between 11.0/22.0 V and 11.5/23.0 V. It is appropriate if bypass loads draw current directly from the battery. This mode allows a lower disconnection point. The battery is cycled deeper, and this can shorten battery lifetime.

Settings

The CXNup has four buttons (ESC = X, DOWN, UP, = SET) to navigate through the menu and adjust the settings. By pushing the SET () button during 5 seconds you can turn the load on or off. To enter the menu, push the ESC (X) button and navigate between the 'LOG' and the 'Set' menu with the arrow buttons (UP and DOWN). To modify settings, enter the menu 'Set' by pressing the SET () button. Navigate to the desired value with the arrow buttons (UP and DOWN). Press the SET () button to modify the value (the selected value flashes). Modify the value with the arrow buttons (UP and DOWN) and save the changes by pressing the SET () button again (The value flashes fast for a second to acknowledge the change) or return to the 'Set' menu without saving the modified value by pressing the ESC (X) button. The following menu settings are presented by the LCD of the controller. Voltage values for 12 V systems. For 24 V systems double voltage values.

1. Battery Capacity 'CAP' menu: Set Battery Capacity 5 ... 5000 Ah (standard: nominal current x 10 h)
2. Battery Type 'typ' menu: set battery type 'GEL' , 'LIQ' and 'LFP' as Gel, Liquid, LiFePO4 battery
3. LVD mode 'Mod' menu: set LVD mode as current adapted (SOC) 'CUR' (Only Battery Type: Gel / Liquid) or 'V' (fixed voltage)
4. LVD menu: LVD: 11.0 V ... 11.5 V (default 11.0 V) / SOC: 11.5 V ... 12.0 V (default 11.9 V) (Only Battery Type: Gel / Liquid)
5. 'rSt' menu: Reset settings to factory default: YES, NO
6. 'buz' menu : Buzzer ON, OFF
7. 'NL' menu: Night Light mode: OFF, D2D, MN (Mid of Night), DD (Dusk and Dawn)
8. 'Eve' menu: Evening hours 0 h ... 20 h (default 0 h) (Only Night Light mode: Mid of Night / Dusk and Dawn)
9. 'Mor' menu: Morning hours 0 h ... 20 h (default 0 h) (Only Night Light mode: Mid of Night / Dusk and Dawn)
10. 'ND' menu: Night detection level 1.5 V ... 10.0 V (default: 8.0 V)

11. 'Loc' menu: Lock settings YES, NO



Safety Features

	PV terminals	Battery terminals	Load terminals
Reverse polarity	Protected	Buzzer warning	Protected (1)
Short-circuit (2)	Protected	Protected (3)	Switches off immediately
Over current	—	—	Switches off with a delay (4)
Reverse current	Protected	—	—
Over voltage	Max. 50 V	Max. 50 V	Switches off above 15.5/31.0 V
Under voltage	—	—	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) The controller can protect itself, but any connected loads might be damaged.

(2) Short-circuit: >4x – 6x nominal current.

(3) The battery must be protected by a fuse, or it might be permanently damaged in case of short-circuit.

(4) >150% nominal current: disconnects within 2 min; >200% nominal current: disconnects within 3s.

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 5 V supply to small appliances like for charging cell phones, compact portable computers, small music players; with up to 1500 mA of current consumption.

Warning: Do not connect the charging device anywhere else! USB negative contact is connected to load negative.

Interface and Datalogger with MXI/MXI232 and PhocosLink

The controller comes with one serial interface which can be connected to a PC with the optional interface adapter MXI/MXI232 (see interface adapter manual for details) and the PhocosLink software.

The CXNup controller features a built-in datalogger. The datalogger registers up to 2 year performance data of your PV system, including charge Ah, load Ah and SOC in the morning etc.

System performance can easily be analyzed with the aid of this history, thus helping the user to get to know the PV system better.




With the MXI/MXI232 and PhocosLink application software, the CXNup datalogger can be accessed by a computer. Performance data can be read and displayed with the aid of PhocosLink.


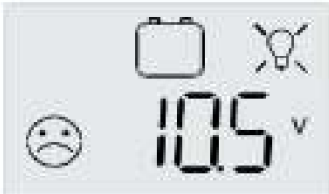

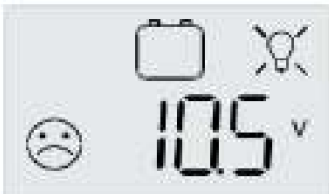
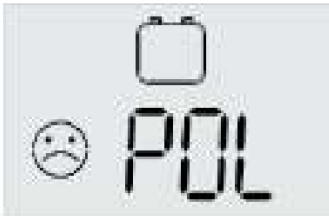
External Temperature Sensor




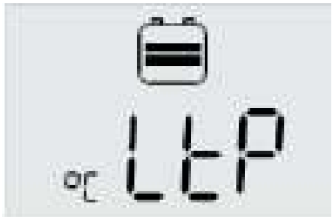
With the temperature sensor (type NTC) the CXNup can measure the battery temperature and adjust the charging voltage accordingly and thus extend the battery lifespan.

Note: The maximum length of all sensor and data communication wires is 10 m. Longer wires will void the CE compliance and product guarantee.

Error Description

Error	Display	Reason	Remedy
Loads are not supplied		Battery is low	Load will reconnect as soon as battery is recharged.
		Overtemperature protection	Switch off all loads. Controller will switch on load automatically after temperature has lowered.
Loads are not supplied		Battery voltage too high (>15.5 / 31.0 V)	Check if other sources overcharge the battery. If not, controller is damaged.
		Battery cables or battery fuse damaged, battery has high resistance	Check battery wires, fuse and battery.

Loads are not supplied		Overcurrent of loads	Switch off all loads. Remove short-circuit. Controller will switch on load automatically after max 1 minute.
Battery is empty after a short time		Battery shows low capacity	Change battery
Battery is not being charged during the day		Solar array faulty or reverse polarity	Remove faulty connection / reverse polarity
Battery reverse polarity		Battery is connected with reverse polarity (Buzzer on)	Remove reverse polarity
Panel reverse polarity		Panel is connected with reverse polarity (Buzzer on)	Remove reverse polarity

°C Err flashing		Temperature sensor not connected.	Connect NTC temperature sensor.
Loads are not supplied.		Battery is in a bad shape.	Replace battery by a new one.
Loads are not supplied and no charging		LiFePO4 high temperature protection	Controller will switch on load automatically after LiFePO4 battery temperature has lowered.
Loads are not supplied and no charging		LiFePO4 low temperature protection	Controller will switch on load automatically after LiFePO4 battery temperature rose.

Technical Data

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

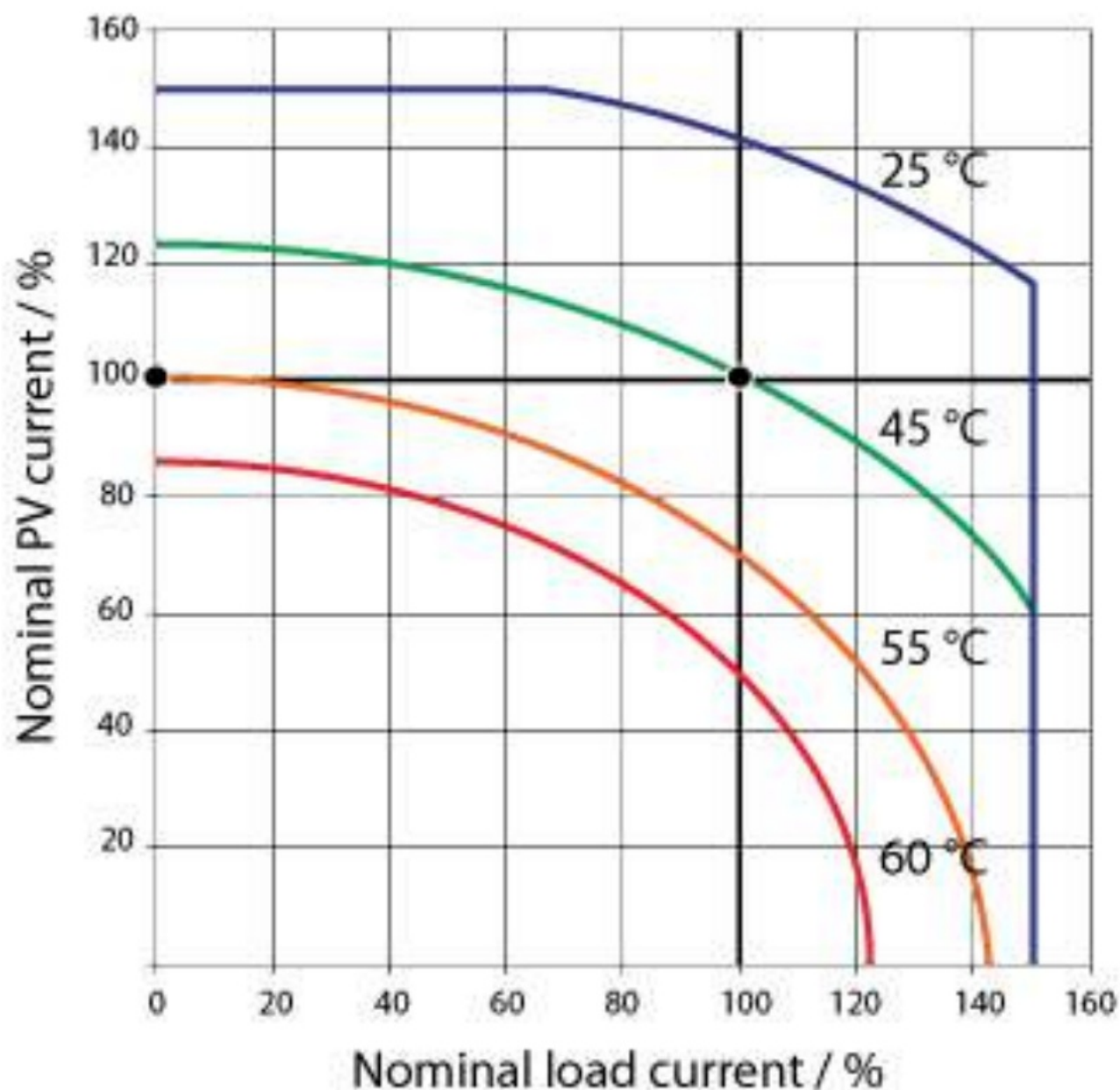
Technical Data	CXNup 10	CXNup 20	CXNup 40
System voltage	12/24 V, auto recognition		

Max. charge current		10 A**	20 A**	40 A**
Max. load current		10 A**	20 A**	40 A**
Charge voltage for lead acid battery	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 once every 30 days)		
Charge voltage for LiFePO4 battery		14.0/28.0 V (Temperature limit: -20 to +60 °C)		
Deep discharge protection, Cut-off voltage		11.5-12.0/23.0-24.0 V by SOC (Only lead acid battery) 11.0-11.5/22.0-23.0 V by voltage		
Reconnect level		12.8/25.6 V for lead acid battery 12.2/24.4 V for LiFePO4 battery		
Overvoltage protection		15.5/31.0 V		
Undervoltage protection		10.5/21.0 V		
Min. operating voltage		9 V		
Max. panel voltage		30 V in 12 V system, 50 V in 24 V system		
Max. battery voltage		50 V		
Temperature compensation (Charge voltage for lead acid)		-25 mV/K at 12 V -50 mV/K at 24 V		
Idle self-consumption		< 6 mA		
Grounding		Common negative pole (for grounding purposes)		

Ambient temperature	-40 to +50 °C	
Max. altitude	4,000 m above sea level	
Battery type	Lead acid (GEL, AGM, flooded), LiFePO4	
Datalogger	2 years	
USB connector	5.0 V; 1500 mA	
External temperature sensor	Yes	
Max. wire size	16 mm ²	
Dimensions (WxHxD)	101 x 103 x 32 mm	
Weight	168 g	179 g
Type of protection	IP 22	

** : Please see graph of SOA (Safe Operating Area)

CXNup Safe Operating Area (SOA)



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.

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Documents / Resources

	<p>phocos CXNup Solar Charge Controller [pdf] User Manual CXNup Solar Charge Controller, CXNup, Solar Charge Controller, CXNup Solar Controller, Solar Controller, Charge Controller</p>
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Manuals+.