



phocos CXNsolid 50 Solar Charge Controller User Manual

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phocos CXNsolid 50 Solar Charge Controller



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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 CXN solid 50 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:

- Multifunction LC display shows system status
- User friendly configuration interface with keys
- LED indication displays the battery state-of-charge
- Flexible load disconnect algorithms
- Temperature-compensated four-stage PWM series charging regulation
- Automatic 12/24/48 V detection
- External temperature sensor
- Remote output terminal for the Phocos inverter series
- Optional USB interface MXI and CX Link software
- Aluminum housing (IP20)
- Data logger (2 years)



IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for CXN solid 50 controller that shall be followed during installation and maintenance of the charge controller.

RISK OF FIRE, PLEASE MOUNT THE BATTERY TEMPERATURE SENSOR ON THE BATTERY!

Battery types: Lead acid (GEL, AGM, flooded)

Nominal voltage rating of the battery: 12, 24 or 48 V

Battery fuse: Only use fast acting fuses with a minimum current interrupting capacity of 1000A for 12V and 24V systems or minimum 2000A for 48V systems.

Recommendations protection fuses::

1. 12V .. 48V Systems, Fuse Strips 80V DC, DIN 43560/1
→ Use same rating as nominal current of controller
2. 12V .. 48V Systems, FK3 80V (max 30A)
→ Use 1.5 times the rating of the nominal current of charge controller
3. 12V .. 24V Systems, FK3 32V
→ Use 1.5 times the rating of the nominal current of charge controller
4. 12V .. 24V Systems, ATO Fuse 32V
→ Use 1.5 times nominal current of controller as fuse rating.
5. 12 .. 24V Systems, TOE58V Blade fuse
→ Use 1.5 times the rating of the nominal current of charge controller
6. 12 .. 24V Systems, MEGA fuse
→ Use 1.5 times the rating of the nominal current of charge controller

Alternatively, circuit breakers with similar properties can be used.

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 a PV system, please disconnect the PV (solar) modules from the charge controller first, to prevent any damages to the charge controller! Only then continue with further work required on the PV system. Please make sure that all cable/wire connections are tightly fastened to the connectors/connecting posts in order to avoid any bad or loose connections that could result in excessive heating.

Please install a fuse or breaker near to the battery before installing or adjusting the controller! Please install and operate the controller in a dry non flammable environment!

High voltage risks

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!

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

Major 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 contain automatic adaption to the ambient temperature.
- The charge controller adjusts itself automatically to 12 V, 24 V or 48 V system voltage.
- The controller provides some control interfaces for Phocos inverter, battery sense and external temperature sensor.

Additionally, it has a serial interface which can be used with an optional interface adapter (MXI) for data logging functions.

- The charge controller offers a number of safety and display functions

Connecting and Grounding

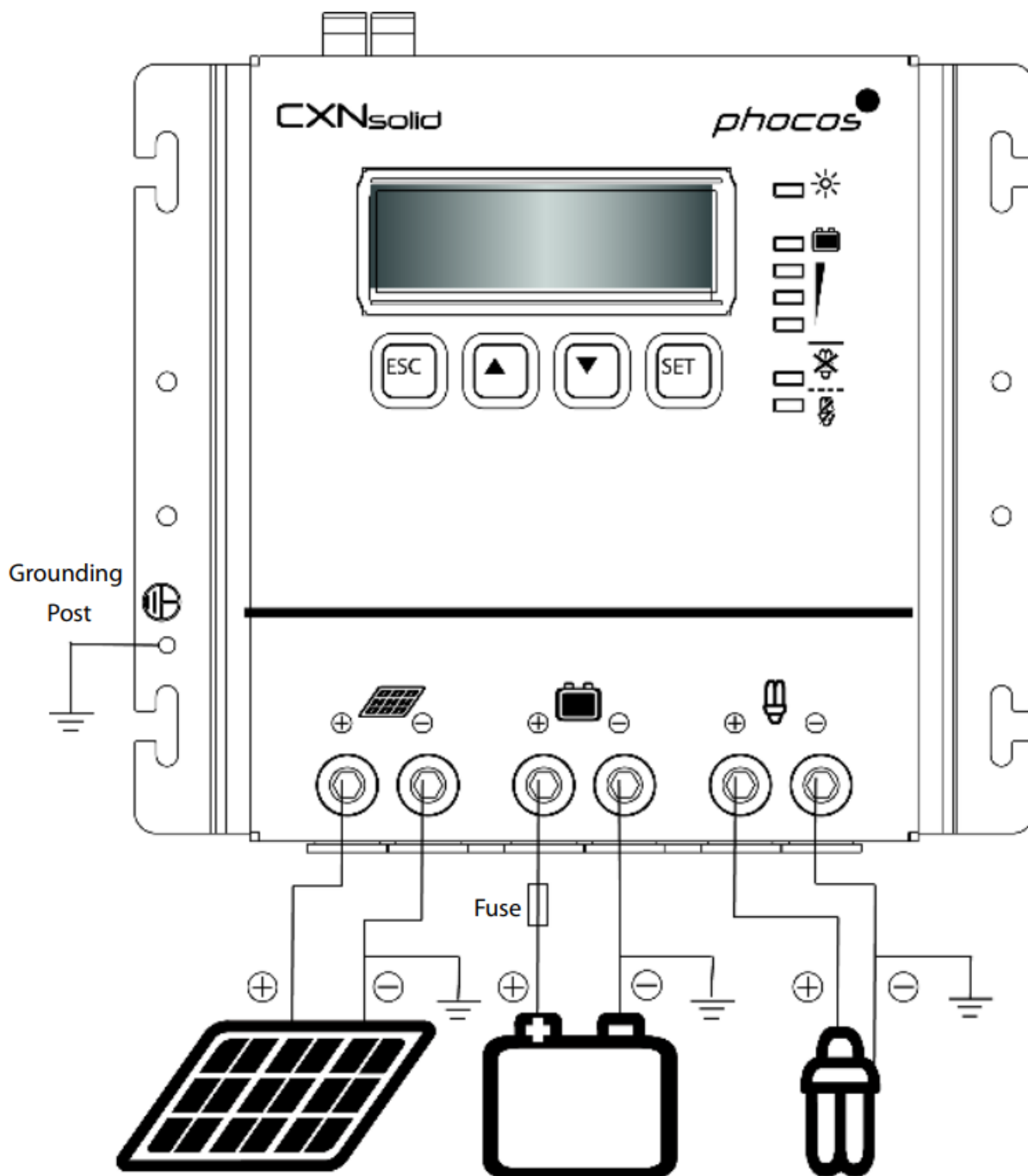
The controller is intended for indoor use only. Protect it from direct sun and place it in a dry environment. Never install it in humid rooms (like bathrooms). The controller warms up during operation, and should therefore be installed on a non flammable surface only! Connect the controller by following the steps described below to avoid avoid any installation faults

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

Follow the reverse procedure when deinstalling!

- To avoid any voltage on the wires, first connect the wire to the controller, then to the battery and to the photovoltaic modules. Considering the load, first connect the wire to the load, then to the controller.
- Recommended minimum cable size: 10 mm²;
- Make sure the wire length between battery and controller is as short as possible.
- Be aware that the negative terminals of CXNsolid 50 controller are internally interconnected and therefore have the same electrical potential. If any grounding is required, always do this on the negative wires.
- Grounding the case is recommended, a groundig post is available on the charge controller case

REMARK: Mind the recommendations of your battery manufacturer. We strongly recommend connecting a fuse directly to the battery pole to protect any short circuit on the battery wiring. Please refer to the chapter **IMPORTANT SAFETY INSTRUCTIONS**.



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.

A battery can only be fully charged if not too much energy is drawn from the system while during charging. Keep that in mind, especially if you have installed additional loads.

Starting up the controller

Self Test

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

System Voltage

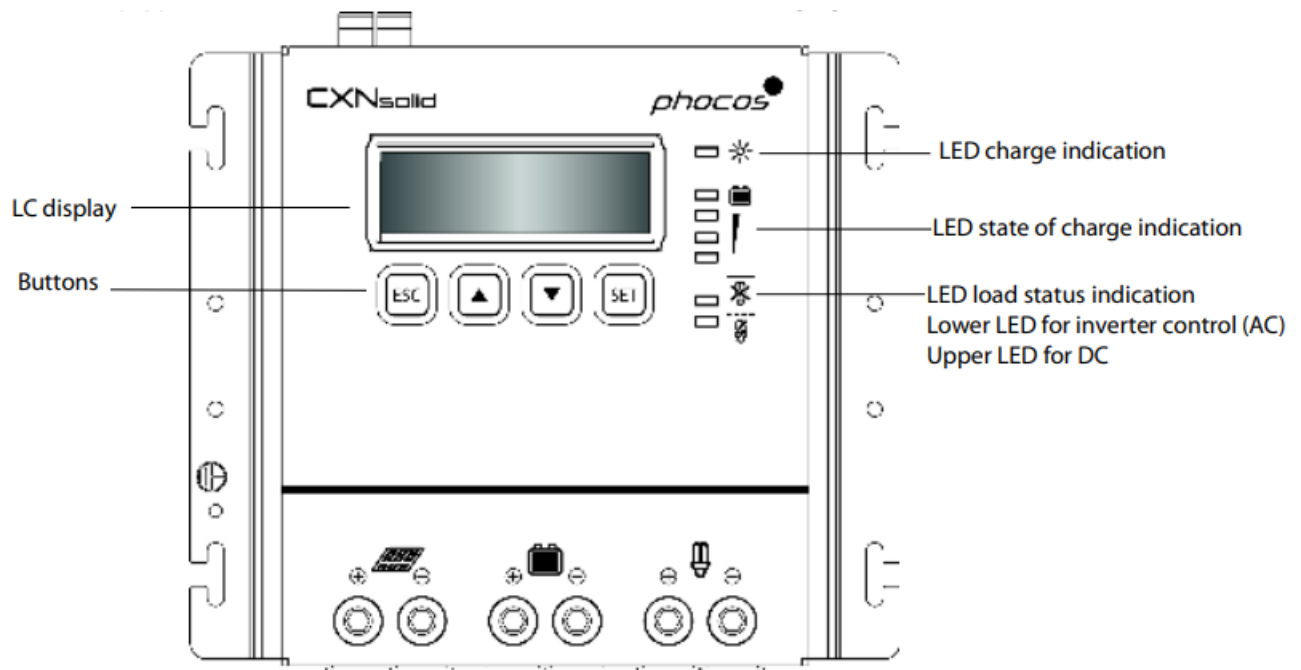
The controller adjusts itself automatically to 12 V, 24 V or 48 V system voltage. As soon as the voltage at the time of start-up falls below 18 V, the controller considers it a 12 V system, if between 18 V and 36 V, the controller implies a 24 V system, in exceeds of 36 V, the controller implies a 48 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 will be displayed.

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 should adjust the controller in the menu setting. If first used, please set the battery type and capacity. In case of any doubts please consult your dealer.

Display Functions

The controller is equipped with 2×16 characters LCD, 7 LEDs and an acoustic warning signal.

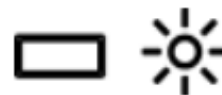


In normal operation, the controller shows the state of charge of the battery and the charge from the solar panels. Any change of the state of charge (SOC) to a lower status also is acoustically signalled.

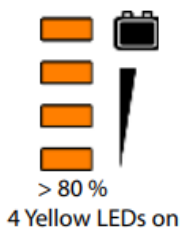
Charge display



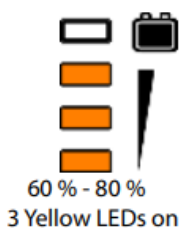
Solar array delivers energy
Green LED on



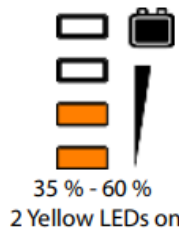
Solar array does not deliver energy
Green LED off



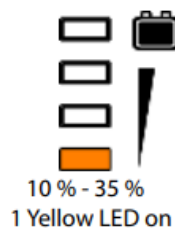
> 80 %
4 Yellow LEDs on



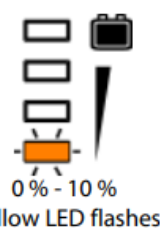
60 % - 80 %
3 Yellow LEDs on



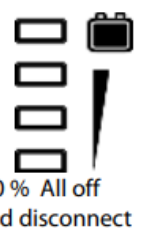
35 % - 60 %
2 Yellow LEDs on



10 % - 35 %
1 Yellow LED on



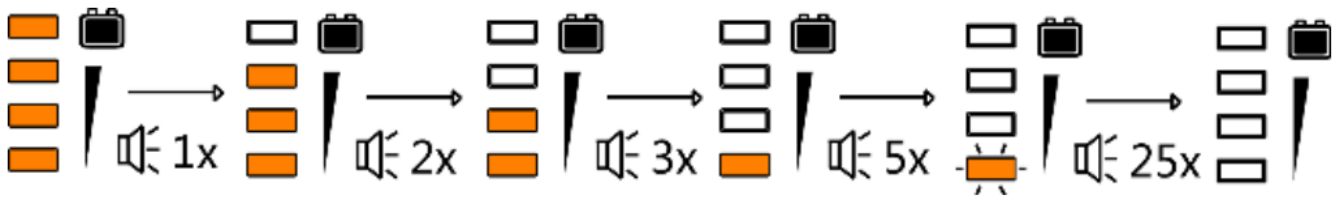
0 % - 10 %
1 Yellow LED flashes



0 % All off
Load disconnect

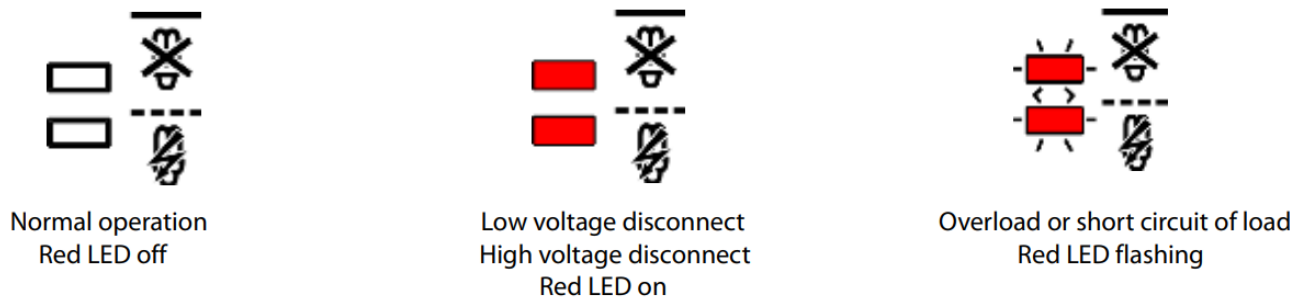
Acoustic signals

A change in the state of charge (SOC) to a lower status is indicated by an acoustic signal. You can switch the acoustic signal off by manual settings.



Load status display

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



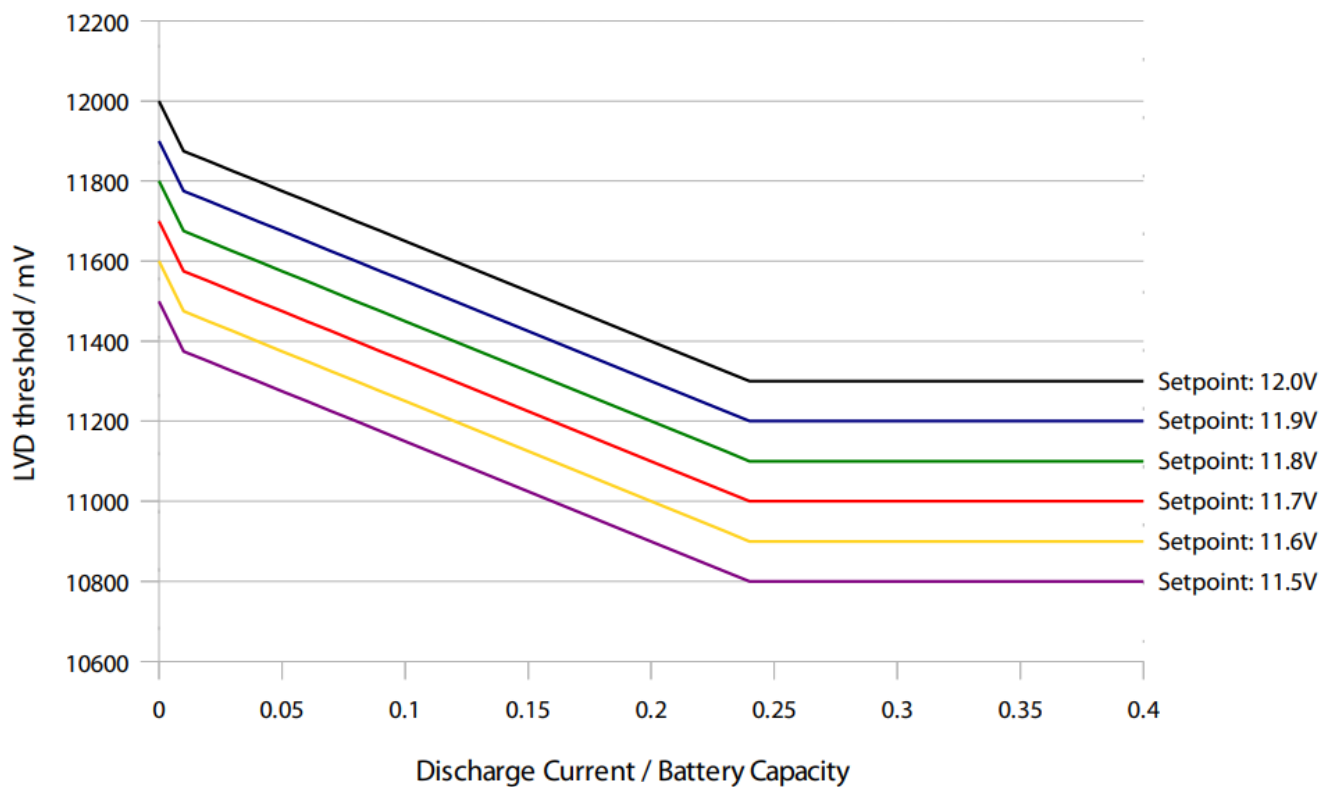
LC Display

The CXNsolid features a LC display with 2 rows, each with one 16 characters. Four buttons can adjust the menu settings: UP, DOWN, SET, ESC. As soon as the controller is supplied with power from the battery, it starts a self test routine over a few seconds, then the display changes to normal operation. The LC display will show the following cycle order: PV data, load data, date/time data and battery data. Stop cycle with SET key and start cycle with arrow keys. You also can get the date about ampere hours through 'Data' menu. 'Total in' is number of panel ampere hours and 'Total out' is load ampere hours.

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 11.5/23.0/46.0 V and 12.0/24.0/48.0 V. The disconnect voltage depends on the voltage, discharge current and battery capacity. At nominal discharge current (0,1 C/h) : 11.15/22.3/44.6 V to 11.65/23.3/46.6 V Battery capacity : 10Ah-5000Ah

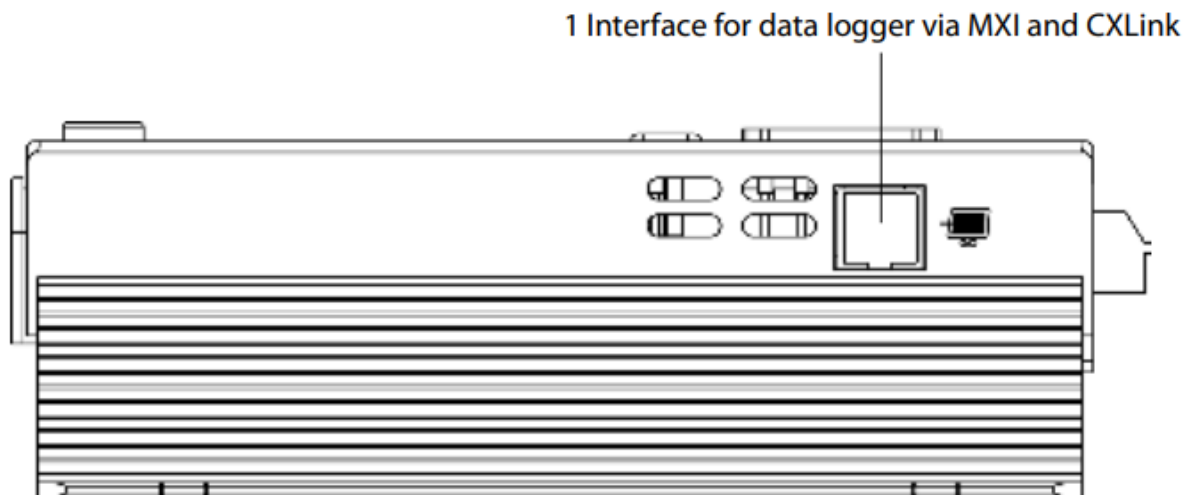


Mode 2 voltage: Load disconnect level can be set between 11.0/22.0/44.0 V and 11.5/23.0/46.0 V. Appropriate if bypass loads draw current directly from battery. This mode allows a lower disconnection point. Battery is cycled deeper, and can shorten battery lifetime.

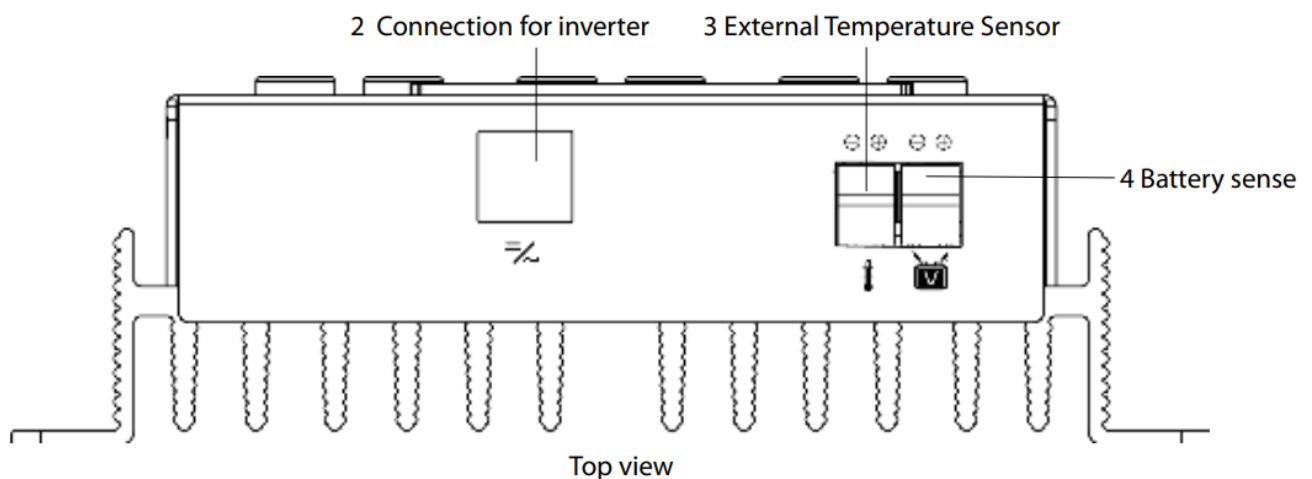
Optional Functions

1. Interface and data logger (MXI and CXLink)

The controller comes with one serial interface which can be connected to a PC with an optional interface adapter MXI (see interface adapter manual for details) and software CXLink. The CXNsolid 50 controller features a built-in data logger. The data logger registers up to 2 year performance data of your PV system, including max. and min. battery voltage, battery state of charge, max. charging current and max. load current, 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 and CXLink application software, the CXNsolid 50 data logger can be accessed by a computer. Performance data can be read and displayed with the aid of CXLink.



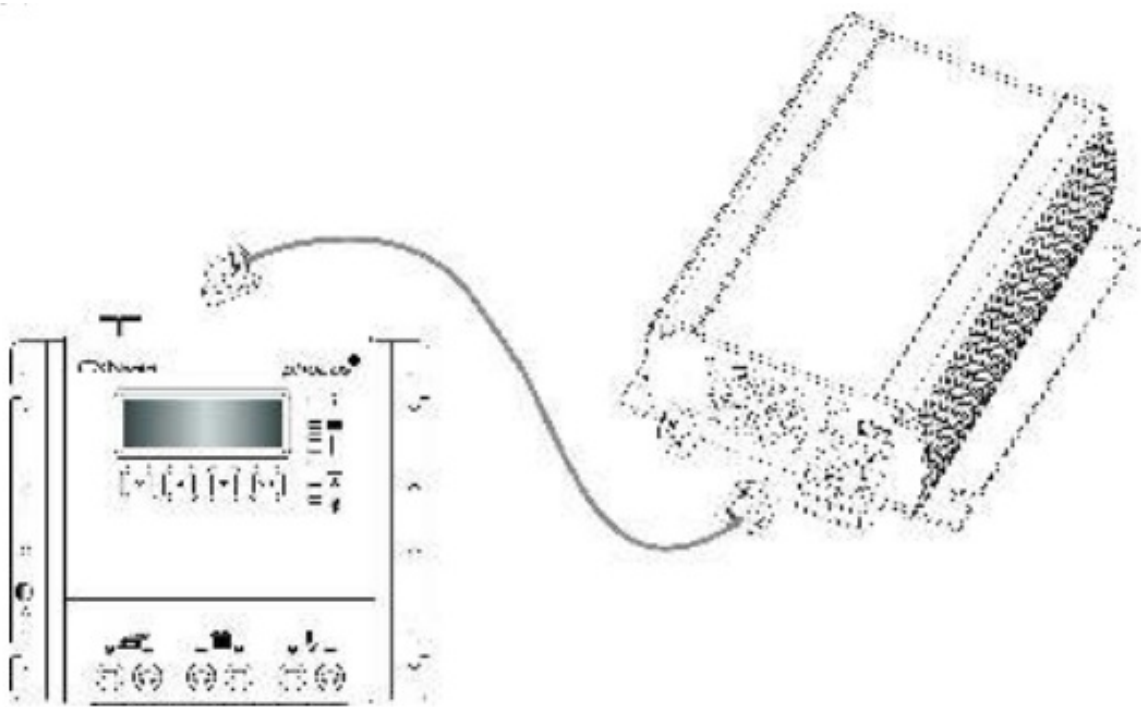
Right side view



Top view

2. Remote connection interface for inverter

A modular 6p4c connector is available to control any inverter of the Phocos SI series, SI 350, SI 700 or SI 1500 by the LVD function of the charge controller. You can choose the inverter type by menu setting. The inverter is not being switched off when load overcurrent occurs. The CXNsolid 50 interface for remote control of inverters is compatible with Modbus or phone 1:1 jumper cables. Connect the inverter directly to the battery. In this case the SOC function will not be available, because the CXNsolid 50 can not measure the current drawn by the inverter.



3. External Temperature Sensor

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

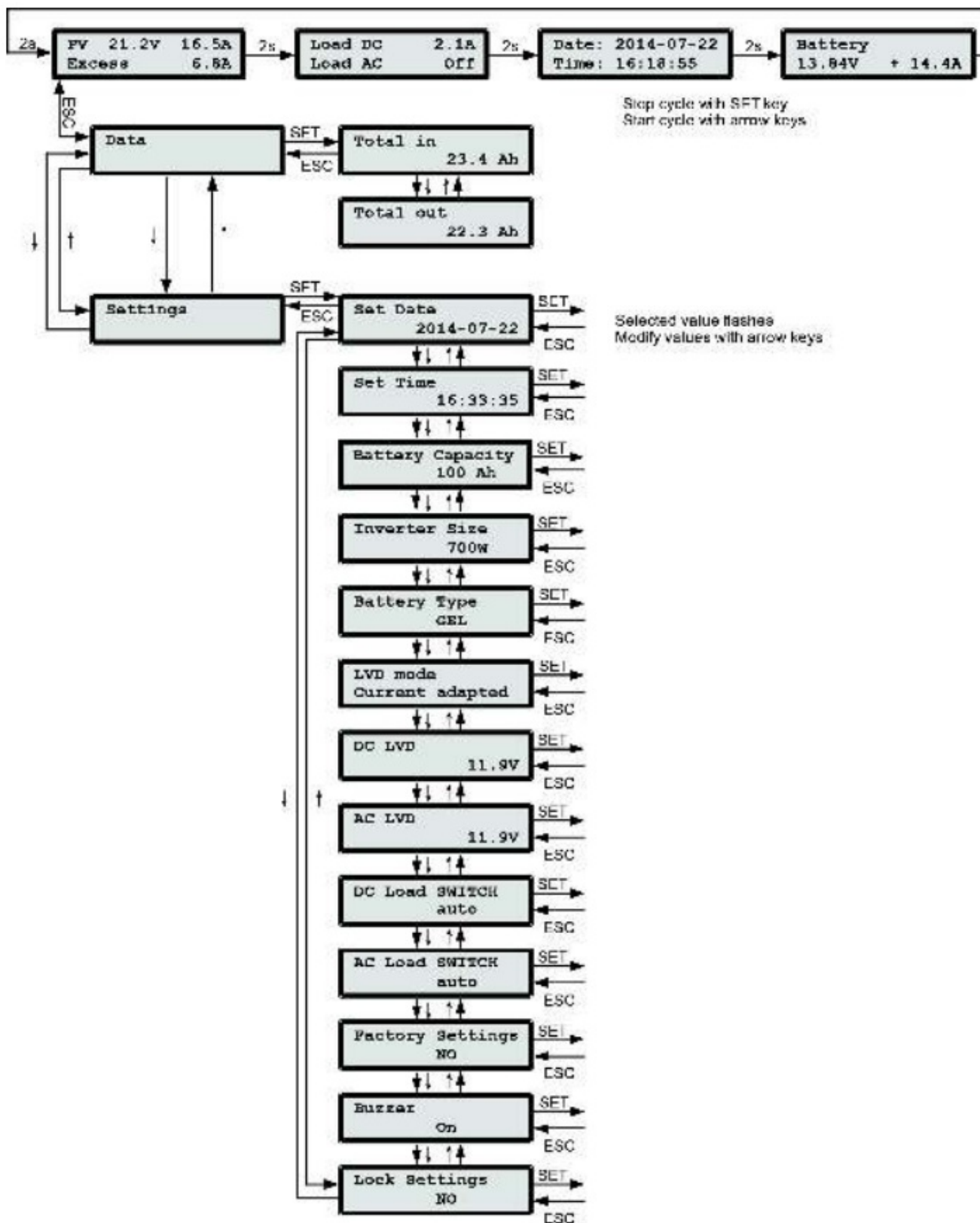
4. Battery sense

The battery sense wires need to be connected directly to the battery terminals to get an accurate battery voltage. These wires have to be protected by small capacity fuses e.g. glass fuse 200-500 mA.

Menu settings

The CXN solid has an LC display with 2 rows, each with 16 characters. Four buttons can adjust the menu settings: UP, DOWN, SET, ESC. The system status is continuously cycling on the display. Push the 'ESC' button to get into the 'Data' menu and navigate with the arrow buttons (up and down) to the 'Setting' menu. By pressing the 'SET' button you get into the final menu settings. The selected value flashes with the 'SET' button. You can modify the values with the arrow buttons (up and down) and escape with the ESC button. The following menu settings are presented by the LC display of the controller:

1. Set Date: set real time clock date
2. Set Time: set real time clock time
3. Battery Capacity: Set Battery Capacity
4. Inverter Size: set inverter size connected to controller with remote terminal
5. Battery Type: set battery type as 'GEL' or 'LIQUID'
6. LVD mode: set LVD mode as 'SOC' or 'Voltage'
7. DC LVD: set DC disconnect voltage
8. AC LVD: set AC disconnect voltage
9. DC Load SWITCH: set DC load switch mode as 'auto' or 'Off'



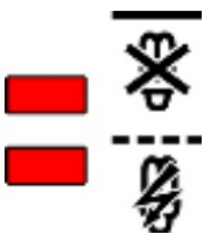
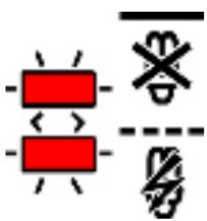
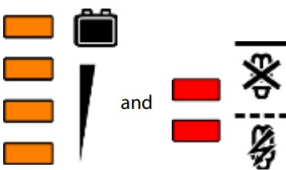
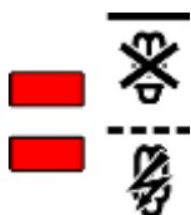
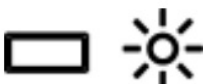
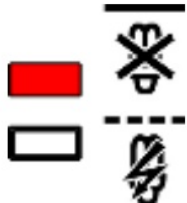
1. AC Load SWITCH: set AC load switch mode as 'auto' or 'Off'
2. Factory Setting: set controller back to factory setting
3. Buzzer: set buzzer as 'On' or 'Off'
4. Lock Setting: lock the controller settings

	PV terminals	Battery terminals	Load terminals
Reverse polarity	Full protection in 12 and 24 V systems. Limited protection in 48 V (1)	Full protection in 12 and 24 V systems. Limited protection in 48 V (1). Acoustic warning.	Protected (2)
Short circuit	Limited	Protected (3)	Protected (3)
Overcurrent	—	—	Switches off with a delay (4)
Reverse current	Protected	—	—
Overvoltage	Max. 100 V	Max. 100 V	Switches off above 15.5 / 31.0 / 62.0 V
Under voltage	—	—	Switches off
Overtemperature	Reduces the charging current if overtemperature occurs and switches off the load if the temperature reaches high level.		

1. Only panel or battery may be connected.
2. Controller can protect itself, but any connected loads might be damaged.
3. Battery and wires must be protected by a fuse, or they might be permanently damaged in case of short circuit.
Fire hazard!
4. >150% nominal current: disconnects with 120s delay
>200% nominal current: disconnects with 10s delay

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

Error Description

Error	Display	Reason	Remedy
Loads are not supplied with energy		Battery is low (Red LED on)	Load will reconnect as soon as battery is recharged.
		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 with energy		Battery voltage too high (>15.5 / 31.0 / 62.0 V)	Check if other sources overcharge the battery. If not, controller is damaged.
Battery gets empty after a short time		Battery cables or battery fuse damaged, battery shows high resistance	Check battery cables, fuses and battery.
		Battery has low capacity (Red LED on)	Replace battery
Battery is not being charged during the day		Solar array faulty or reversed polarity (Green LED off)	Remove faulty connection / reversed polarity
Battery wrong polarity		Battery is connected with reversed polarity (Red LED on)	Remove reversed polarity

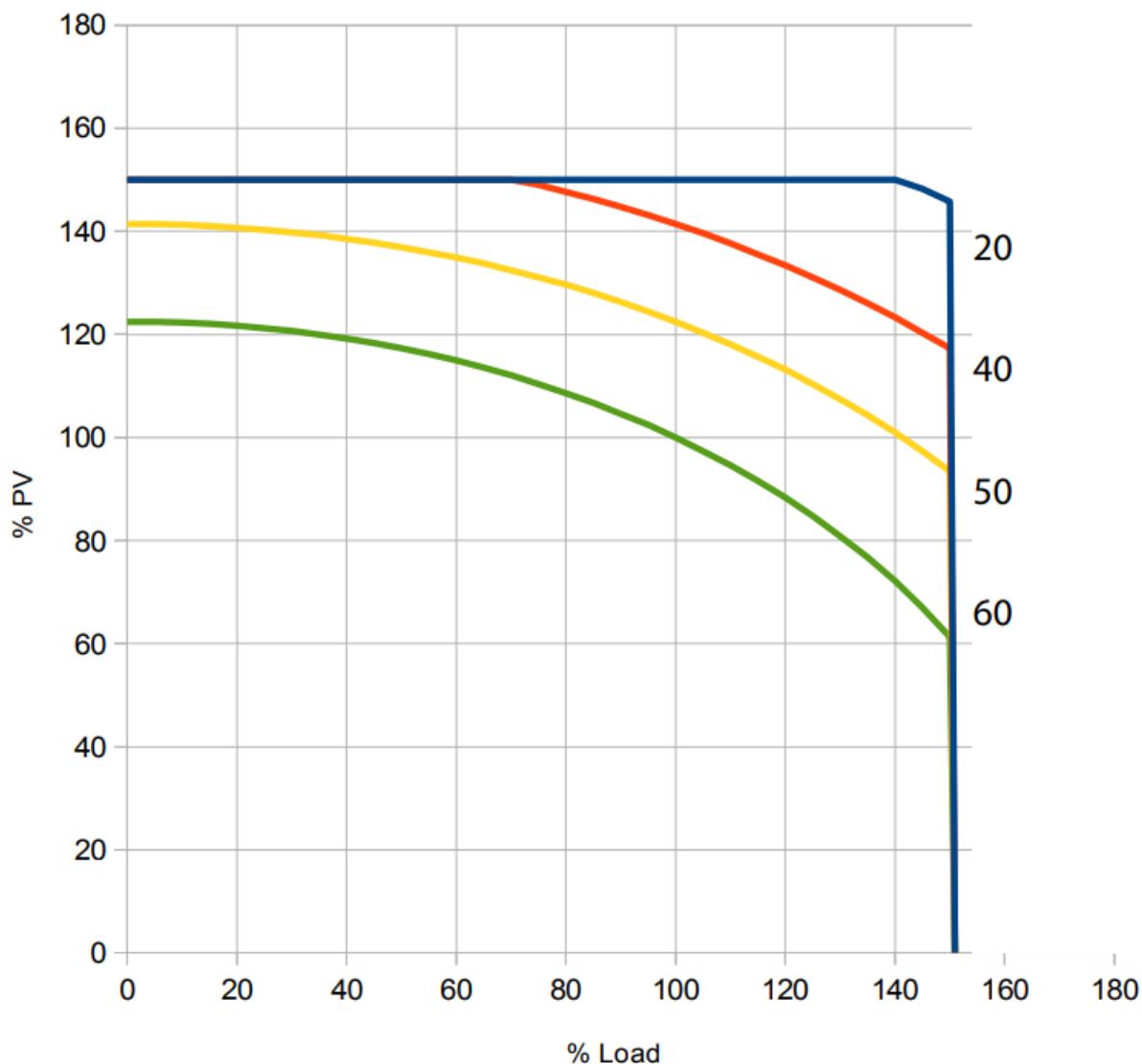
Technical Data

Note: The voltage levels before/after the slash are valid for 12 V, 24 V and 48 V systems respectively.

Technical Data	CXNsolid 50
System voltage	12/24/48V, autorecognition
Nominal charge/load current	50A*(see SOA graph)
Float charge	13.8/27.6/5.2V(25°C)
Main charge	14.4/28.8/57.6V(25°C), 0.5h(daily)
Boost charge	14.4/28.8/57.6V(25°C), 2h Activation : battery voltage <12.3/24.6/49.2V
Equalization charge	14.8/29.6/59.2V(25°C), 2h Activation: battery voltage <12.1/24.2/48.4V (at least one time every 30 days)
Deep discharge protection, Load disconnect voltage	1.50-12.0/23.0 -24.0/46.0 -48.0 V current adapted (SOC) 1.0 -1.5/2.0-23.0/4.0 46.0V independent from current
Reconnect level	12.8/25.6/51.2V
Overvoltage protection	15.5/31.0/62.0V
Under voltage protection	10.5/21.0/42.0V
Max. panel voltage	30V in 12V system, 50V in 24V system, 100V in 48V system
Temperature compensation(charge voltage)	-24mV/K at 12V, -48mV/K at 24V, -96mV/K at 48V
Idle self-consumption	<20mA
Grounding	Negative grounded
Ambient temperature	-20 to +50°C*
Max. altitude	4,000 m above sea level
Battery type	Lead acid(GEL, AGM, flooded)
Data logger	2 years
Wire cross section	Up to 50mm²
Dimensions(W x H x D)	168x162x55 mm
Weight	1,000g
Type of protection	IP20

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

CXNsolid 50 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.

Subject to change without notice. Version: 20150812


Made in one of the following countries:

Germany – China – Bolivia – India

Phocos AG – Germany

www.phocos.com

Documents / Resources

	<p>phocos CXNsolid 50 Solar Charge Controller [pdf] User Manual</p> <p>CXNsolid 50, Solar Charge Controller, CXNsolid 50 Solar Charge Controller, Charge Controller, Controller</p>
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References

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

Manuals+.