

Profile

Phocos is one of the largest suppliers of off-grid power supply system components in the world. Headquartered in Ulm, Germany, Phocos develops, designs and manufactures products to suit the needs of all stake-holders in the global solar power market.

Technology

Phocos is strongly committed to developing and producing products that meet our strict specifications in terms of quality, innovation and technology. Our highly-skilled Research and Development team works in close collaboration with the University of Applied Science of Ulm and distinguished institutes in Germany to produce components which greatly enhance the life-span of the battery and improve the efficiency of the solar power system.

Reliability & Cost

Key issues in the off-grid rural electrification market are reliability and cost. The rugged and advanced technology used in Phocos charge controllers and products ensures greater reliability, improves the overall efficiency of the system and lowers the costs of energy storage.

Specialty in Off-grid Application

We offer a cutting edge range of components for off-grid power supply systems including a comprehensive range of solar charge controllers, system management units, DC fluorescent lamps and refrigerators, micro-hydro turbines and fuel-cell hybrid systems. Our products are versatile and suitable for a wide range of applications such as industrial power supplies, telecommunications, traffic control, lighting and for leisure purposes such as boating and sailing.

Flexibility

Our ability to respond to our customer's specific needs enables us to offer highly sophisticated and customised solutions for use in larger industrial systems or in low cost stand-alone systems for large rural electrification projects.

Worldwide Network

Our extensive distribution network ensures that our products are accessible all over the world, while our team of highly experienced engineers in Germany and through our subsidiaries provide the necessary technical back-up and support.

Phocos has operations in Germany, China, India, Bolivia, Bangladesh, Australia, Brazil, Kenya, Mongolia, Romania, Singapore, South Africa, Tunisia and the USA.

More information is available online at www.phocos.com

Products Application Range

Phocos products can meet your requirements for solar stand alone systems.

Recreational System



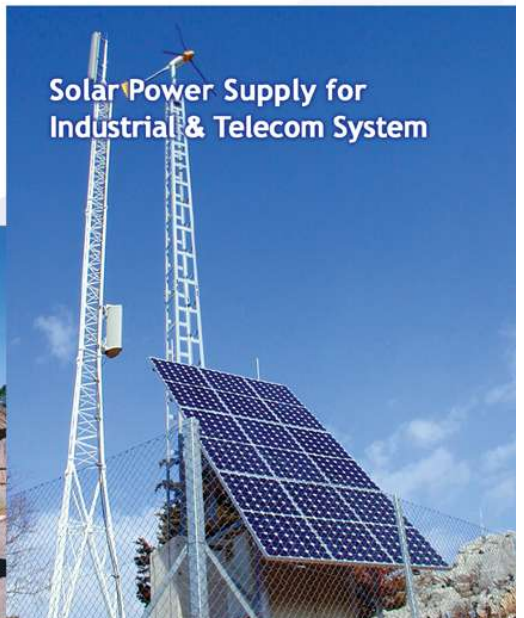
Solar Power Lighting System



Rural Electrification System



Solar Power Supply for Industrial & Telecom System





DC Lighting

phocos

Compact Fluorescent Lamp - CFL

Technical Data	CL1203W/C	CL1205W/C	CL1207W/C	CL1209W/C	CL1211W/C	CL1215W/C	CL1230W/C	CL2407W/C*	CL2415W/C
Voltage range	11-15V	11-15V	11-15V	11-15V	11-15V	11-15V	11-15V	20-30V	20-30V
Nominal power	3W	5W	7W	9W	11W	15W	30W	7W	15W
Nominal current(at 12.5V)	240mA	400mA	560mA	720mA	900mA	1200mA	2400mA	280mA	600mA
Average light intensity	100lm(W) 100lm(C)	250lm(W) 250lm(C)	350lm(W) 350lm(C)	520lm(W) 520lm(C)	670lm(W) 630lm(C)	950lm(W) 925lm(C)	1500lm(W) 1500lm(C)	350lm(W) 350lm(C)	900lm(W) 900lm(C)
Average luminous efficiency	35lm/W(W) 35lm/W(C)	50lm/W(W) 50lm/W(C)	54lm/W(W) 54lm/W(C)	58lm/W(W) 58lm/W(C)	63lm/W(W) 61lm/W(C)	67lm/W(W) 65lm/W(C)	58lm/W(W) 58lm/W(C)	50lm/W(W) 50lm/W(C)	65lm/W(W) 65lm/W(C)
Life span	-8,000hrs at 25°C ambient temperature								
Switching cycles	>500,000(IEC 925); >50,000(DIN EN 50316-3)								
Ambient temperature range	-10 ~ +50°C			-10 ~ +40°C			-10 ~ +35°C	-10 ~ +50°C	-10 ~ +50°C
Equivalent brightness (Incandescent Lamp)									

Compact Fluorescent Lamp - Detachable Tube

Technical Data	CL1205W/C D	CL1207W/C D	CL1211W/C D	CL1215W/C D
Voltage range	11-15V	11-15V	11-15V	11-15V
Nominal power	5W	7W	11W	15W
Nominal current (at 12.5V)	400mA	560mA	900mA	1200mA
Average light intensity	240lm(W) 240lm(C)	360lm(W) 350lm(C)	650lm(W) 620lm(C)	900lm(W) 900lm(C)
Average luminous efficiency	48lm/W(W) 48lm/W(C)	54lm/W(W) 53lm/W(C)	62lm/W(W) 62lm/W(C)	65lm/W(W) 65lm/W(C)
Life span	-8,000hrs for the tube; 30,000hrs for the ballast			
Switching cycles	>500,000(IEC 925); >50,000(DIN EN 50316-3)			
Ambient temperature range	-10 ~ +50°C		-10 ~ +40°C	
Equivalent brightness (Incandescent lamp)				

LED Lamp

Technical Data	SL1210CF	SL1210CS	SLLR12CF*
Nominal voltage	12V	12V	12/24V
Voltage range	11-15V	11-15V	10-30V
Nominal power	0.5-1.0W	0.5-1.0W	1.2W
Nominal current	40-80mA	40-80mA	100/50mA
Light intensity	30-50lm	25-35lm	50lm
Radiation angles	90°	15°	120°
Color	White		
Switching cycles	Infinite number		
Equivalent brightness (Candle)			

Long Life Compact Fluorescent Lamp

Technical Data	LL 1202W/C	LL 1204W/C
Voltage range	10.5-15V	10.5-15V
Nominal power	2W	4W
Nominal current (at 12V)	170mA	330mA
Light intensity	40lm	100lm
Life span	>25,000 hours	
Switching cycles	>50,000	
Equivalent brightness (Incandescent lamp)		

* Available in 2008.

* E27 / Edison is available.

* Light temperature: warm color(W) / cool color(C).



CF Lamp With Housing



TFT-LCD TV/Monitor



FR165/225 DC Refrigerator/Freezer



DC Lighting & Appliance

phocos

CF Lamp With Housing

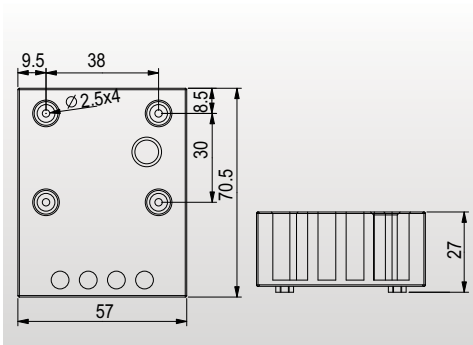
Technical Data	CF1209W/C	CF1211W/C
Voltage range	11-15V	11-14.5V
Nominal power	9W@12.5V	11W@12.5V
Nominal current (at 12.5V)	560mA	900mA
Light intensity	Up to 450lm(W) Up to 450lm(C)	Up to 550lm(W) Up to 550lm(C)
Average luminous efficiency	50lm/W(W) 50lm/W(C)	50lm/W(W) 50lm/W(C)
Life span	>8,000hrs at 25 °C ambient temperature and 12.5V	
Switching cycles	>500,000(IEC 925); >50,000(DIN EN 50316-3)	
Ambient temperature range	-10 ~ +50 °C	
Equivalent brightness (Incandescent lamp)		

TFT-LCD TV/Monitor

Technical Data	TV07
Nominal voltage	12V
Average power consumption	5W
Standby power consumption	0.36W
Display component	16:9, 7" TFT, 480*234 pix
Color system	PAL/NTSC/SECAM (Auto switch)
Compatible signals	CATV, VHF-L, VHF-H, UHF
Dimension	205*147*40mm
Net weight	700g
Ambient temperature range	0~+40°C

FR165, FR225 Refrigerator / Freezer

Technical Data	FR165R/F	FR225R/F
Net capacity	165 liters	225 liters
Voltage	12/24V DC	12/24V DC
System	Brushless, thermostatically-controlled Danfoss compressor/Environmentally friendly refrigerant (R-134a)/ Patented low-frost system	
Power consumption (typical/max)	40/80W	40/80W
Min. energy required at 21°C ambient temperature (Refrigerator/Freezer)	96/300Wh/d	120/480Wh/d
Min. energy required at 32°C ambient temperature (Refrigerator/Freezer)	168/444Wh/d	204/540Wh/d
Interior temperature range (Refrigerator/Freezer)	5~2°C/-12~-18°C	5~2°C/-12~-18°C
Shipping dim. (WxHxD)	1020x760x940mm	1270x760x940mm
Weight	51kg	59kg

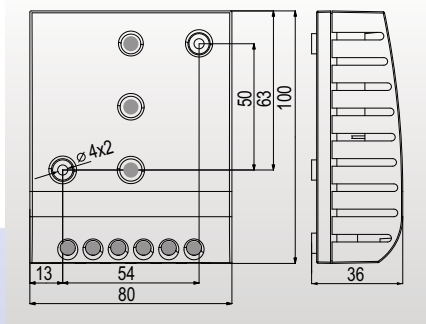


CM Solar Charge Controller

The CM charge controller is designed specifically for use in small solar systems where the load disconnect feature is not required. The CM is ideally suited for applications on yachts and in caravans.

- **Highly efficient battery charging capabilities**
PWM shunt battery regulation with integrated temperature compensation.
- **Extremely reliable**
Solid state circuit, anti-melting fuse, PCB conformal coating for protection against harsh environment.

Technical Data	CM04
Nominal voltage	12V
Max. solar panel current	4A
Ambient temperature range	-40° C to +50° C
Max. wire size	16mm ² (AWG#6)
Self consumption	4mA
Weight	110g

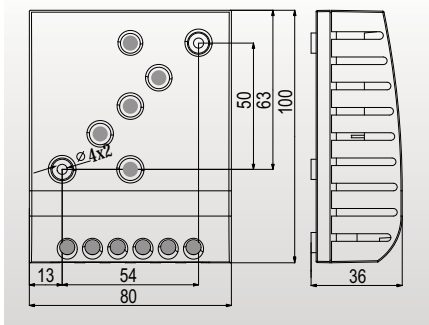


CA Solar Charge Controller

Phocos CA controller is a perfect solution for cost-sensitive PV systems (particularly those used for rural electrification and leisure applications)

- **Advanced electronic design**
Temperature compensated two-stage PWM-series charging method. PCB conformal coating for humidity protection.
- **Complete electronic protection**
Anti-melting fuse. Fully protected against reverse polarity, short circuit, overcurrent, overload and reverse current.
- **Easy to connect**
Large and rugged terminal block with anti-corrosive screws. Compact casing similar to that of the popular CML series.

Technical Data	CA06	CA08	CA10	CA14
Nominal voltage	12V	12V	12V	12V
Max. solar panel current	5A	8A	10A	14A
Max. load current	6A	8A	10A	14A
Overcharge protection	Constant voltage PWM series regulation: boost charge, float charge			
Overdischarge protection	Controlled by fixed battery voltage (11.5V)			
Ambient temperature range	-40° C to +50° C			
Max. wire size	16mm ² (AWG#6)			
Self consumption	4mA			
Weight	180g			

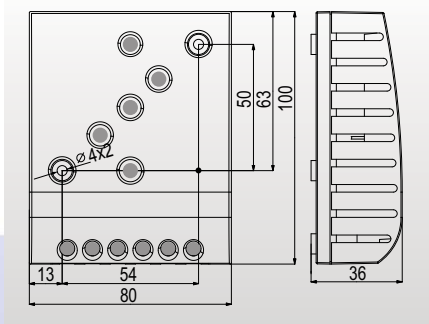


CML Solar Charge Controller

Phocos CML series is one of the world's best-selling small solar charge controller. Over 250,000 CML controllers are currently in use in numerous projects around the world.

- **High-efficiency charging process**
Temperature compensation, three stage PWM series charging method. Sealed or vented batteries may be used.
- **Improved system indicators**
Five LEDs indicate the PV, battery, load status and malfunctions. Acoustic signal alerts user to potential system malfunctioning.
- **Complete electronic protection**
Fully protected against reverse polarity, short circuit, overcurrent, overvoltage and reverse current flow at any of the controller terminals.

Technical Data	CML05/08/10/15/20
Nominal voltage	12/24V, automatic detection
Max. solar panel current	5A/8A/10A/15A/20A
Max. load current	5A/8A/10A/15A/20A
Overcharge protection	Constant voltage PWM series regulation: boost charge, float charge, optional equalization charge.
Overdischarge protection selectable LVD modes	11.4-11.9/22.8-23.8V controlled by state of charge(SOC) 11.0/22.0V controlled by fixed battery voltage
Ambient temperature range	-40°C to +50°C
Max. wire size	16mm ² (AWG#6)
Self consumption	4mA
Weight	180g

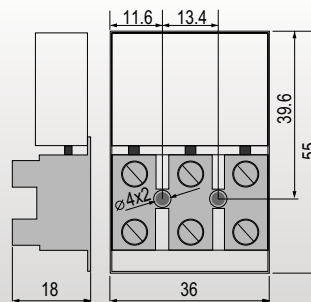


CMLNL Solar Charge Controller

Phocos CMLNL controller is a solar lighting controller for street lighting, parking lots and bus-shelters.

- **Proven reliability**
CMLNL has the same electronic circuit and mechanical design as famous CML controller.
- **Greater adaptability**
Day/night threshold (light on/off point) can be detected automatically and adjusted according to prevailing on-site conditions and solar module array type.
- **Fully integrated programmable timer**
Adjustable for shorter periods of up to 12 hours, or from dusk to dawn for all-night applications.

Technical Data	CML05/08/10/15/20NL
Nominal voltage	12/24V, automatic detection
Max. solar panel current	5A/8A/10A/15A/20A
Max. load current	5A/8A/10A/15A/20A
Overcharge protection	Constant voltage PWM series regulation: boost charge, float charge, optional equalization charge.
Overdischarge protection selectable LVD modes	11.4-11.9/22.8-23.8V controlled by state of charge(SOC) 11.0/22.0V controlled by fixed battery voltage
Ambient temperature range	-40°C to +50°C
Max. wire size	16mm ² (AWG#6)
Self consumption	4mA
Weight	180g
Button function	*Long push to program all nightlight function settings *Short push in the day to verify the correct installation of the system



PR Solar Charge Controller

Phocos PR series of charge controllers is a two-stage charge controller designed to charge lead acid batteries. Fully sealed within a robust casing, the PR is able to withstand continued exposure to sea air.

- **Ideal for marine application**

Totally sealed construction for outdoor use, brass screws and epoxy resins potted circuit.

- **Heat resistant design**

Able to withstand temperatures of up to 70°C .

Technical Data	PR1210	PR1210L	PR2410	PR2410L
Nominal voltage	12V	12V	24V	24V
Max. solar panel current	10A	10A	10A	10A
Battery type	Vented	Sealed	Vented	Sealed
Ambient temperature range	-20°C to +70°C			
Max. wire size	14.5mm ²			
Self consumption	4mA			
Weight	50g			

* The PR has no load connection and blocking diode.

DIN Rail Mounting

A DIN rail mounting plate (CX-DR2) is available as an accessory. This allows the controller to be mounted on a standard 35mm DIN rail. Screws are supplied with the mounting plate.

- **CX, CXN Installation**



- **CML, CMLNL, CA, BCM, DCL, DCS Installation**



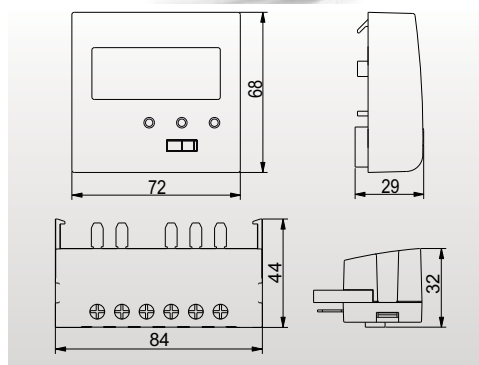
IP Protection

Higher IP protection can be achieved by using different IP cases.

CMM Remote Display

Phocos CMM remote display is designed to measure and display current values of the PV system.

- For Phocos CA, CML and CMLNL
- Multifunctional LC display
Measure and display panel current, load current and battery voltage by 3 digit LC Display
- Easy to select
3-position switch to select which value to be displayed
- Prepared for DIN rail and wall mounting

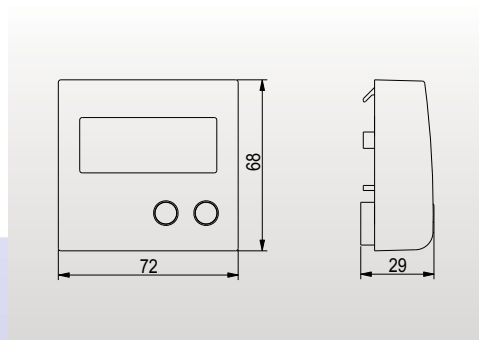


Technical Data	CMM
Voltage range	0 to 35Volt
Current range	0 to 25Amp
Operating temperature range	-25 to +50 °C
Length of connecting wire	2m
Weight	194gr (with connecting wire)

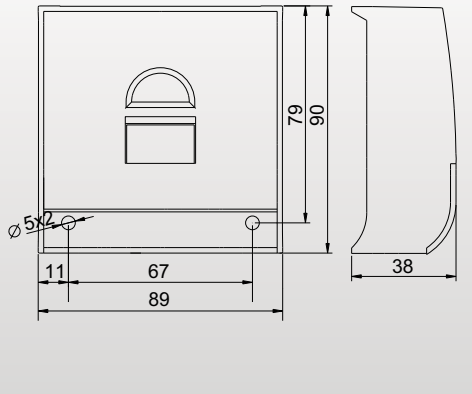
CXM Remote Display

Phocos CXM can be used in combination with Phocos CXN series charge controllers and display current values and historical data.

- For Phocos CXN
- Multifunctional LC display
Display PV/load current, battery voltage, SOC% and daily PV/load Ah. Seven days of datalogger values are also accessible.
- Easy to select
Two push buttons to cycle through displayed data.
- Prepared for DIN rail and wall mounting



Technical Data	CXM
Voltage range	Display voltage range of your CXN
Current range	Display current range of your CXN
Operating temperature range	-25 to +50 °C
Length of connecting wire	2m
Weight	94gr (with connecting wire)



CXN Solar Charge Controller

Phocos CXN series is a **negative grounding**, sophisticated solar charge controller which offers exceptional features at an extremely competitive price.

- Innovative fuzzy logic algorithm**
 Significantly reduces the danger of battery sulfation.
- High reliability design**
 Superior design ensures high degree of reliability through PCB conformal coating and anti-corrosive screws and terminals. Full electronic protection against short circuits, overload, overcurrent, reverse flow, wrong polarity and over-temperature.
- Multifunctional LCD display**
 The SOC bar indicates the exact state of charge (available energy) as a percentage through the battery gauge symbol. Any decrease in the SOC to sub-optimal levels is signalled by an electronic beep. Also has load status symbol and manual load switch.
- Negative Grounding**
- Various optional system accessories**

Technical Data	CXN10	CXN20	CXN40
Nominal voltage	12/24V, automatic detection		
Max. solar panel current	10A	20A	40A
Max. load current	10A	20A	40A
Overcharge protection	Constant voltage PWM series regulation: boost charge, float charge and optional equalization charge.		
Overdischarge protection selectable LVD modes	High or low fixed voltage setting; high or low SOC (state of charge); adaptive low voltage disconnect (fuzzy logic algorithm)		
Ambient temperature range	-25°C to +50°C		
Max. wire size	16mm ² (AWG#6)		
Self consumption	4mA		
Weight	168g	168g	179g

Low voltage disconnect function:

The CXN controller has 5 different modes to protect the battery from deep discharging:

Mode 1: Disconnect at 11.4V (at nominal load current) to 11.9V (at no load current). Normal operation mode for good battery protection.

Mode 2: Disconnect at 11.0V (at nominal load current) to 11.75V (at no load current). Mode with lower disconnection point. Battery is cycled deeper, which can shorten battery lifetime.

Mode 3: Disconnect at 11.0 to 12.2V depending on load current and previous charging cycles. This adaptive mode leads to a longer battery lifetime because it allows recovery of the battery by full recharge, thus maximizing battery life.

Mode 4: Disconnect at 11.5V fixed setting. Appropriate if bypass loads draw current directly from battery.

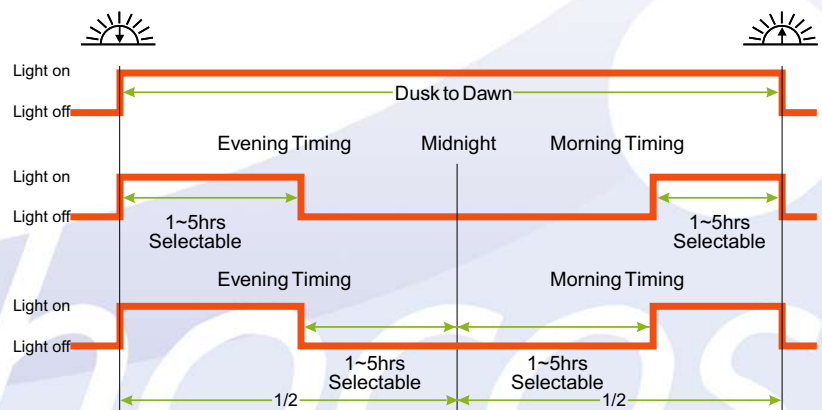
Mode 5: Disconnect at 11.0V fixed setting. Appropriate if bypass loads draw current directly from battery. Mode with lower disconnection point. Battery is cycled deeper, which can shorten battery lifetime.

Flexible nightlight function:

Automatically detects day/night.

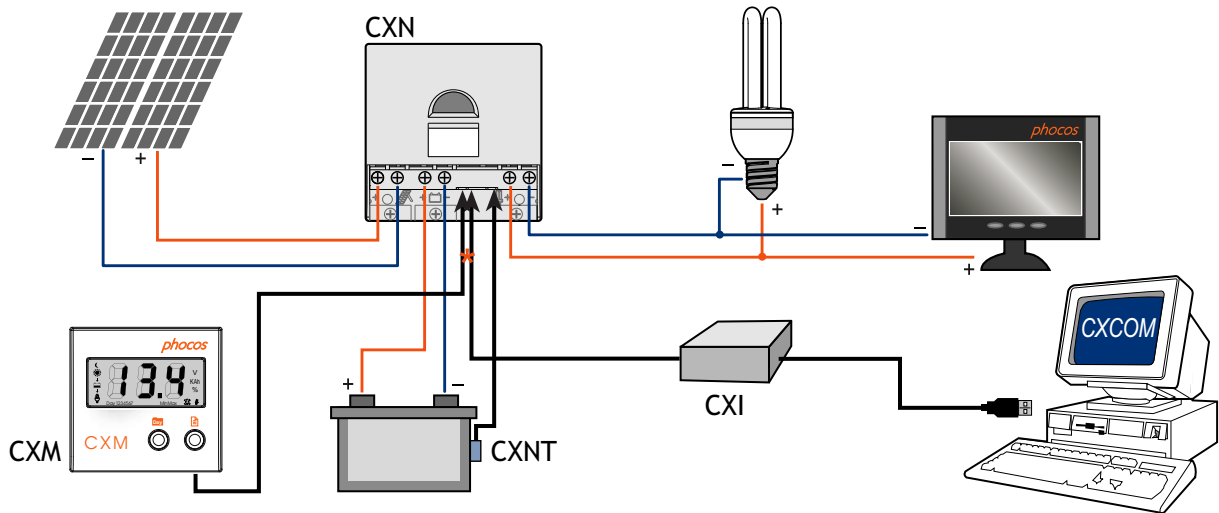
Programmable day/night threshold (light on/off point).

Lighting timing modes include dusk to dawn and ON/OFF/ON.



CXN Solar Charge Controller

There are various optional accessories for CXN solar charge controller



Software and precise datalogger system for automatic data recording and fault analysis in stand-alone systems

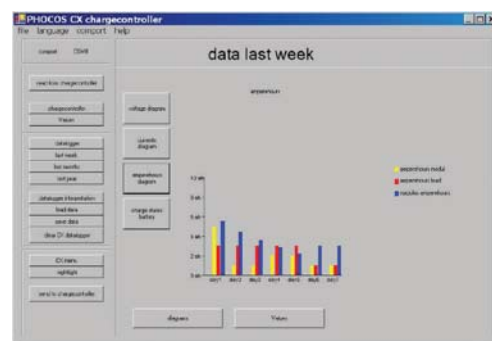
Through the CXI USB interface and the CXCOS software, users can now gain immediate and easy access to the CXN solar controller directly from their computer.

CXI: USB Interface for CXN/CX Series Controllers

- The CXN charge controller is connected to the computer via a USB plug
- The CXI is a device which allows the CXN series solar controllers to communicate with a computer
- The CXI converts signals from the charge controller into a format which is easily read and interpreted by the computer

CXCOS: Application Software

- Allows the CXN controller to communicate with computer
- Displays the current state and historical data of the system
- Information can be saved in an Excel or Text file format
- Displays and allows modification of the controller settings, including battery type, buzzer, programming button, low voltage disconnect function, nightlight function, etc.



The system performance analysis provides insights for problem solving.

CXM: Remote Display

- Display panel current, load current and battery voltage, Ah, SOC, etc.
- Clear, readable 3-digit LC display and symbols

CXNT: External Temperature Sensor

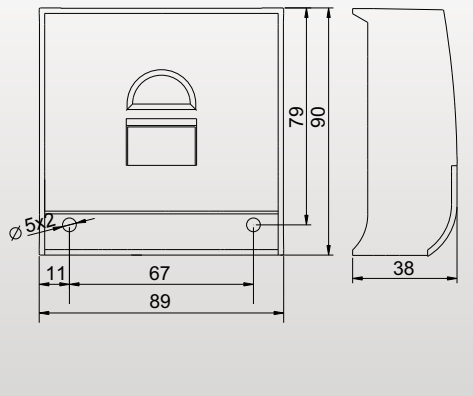
CXNT measures battery temperature. CXN can adjust charging voltage accordingly.



CX Solar Charge Controller

Phocos CX series is a sophisticated solar charge controller which offers exceptional features at an extremely competitive price.

- Innovative fuzzy logic algorithm**
 Significantly reduces the danger of battery sulfation.
- High reliability design**
 Superior design ensures high degree of reliability through PCB conformal coating and anti-corrosive screws and terminals. Full electronic protection against short circuits, overload, overcurrent, reverse flow, wrong polarity and over-temperature.
- Multifunctional LCD display**
 The SOC bar indicates the exact state of charge (available energy) as a percentage through the battery gauge symbol. Any decrease in the SOC to sub-optimal levels is signalled by an electronic beep. Also has load status symbol and manual load switch.
- Basic datalogging function**
 Software and basic datalogger system for automatic data recording and fault analysis in stand-alone systems. Through the CXI USB interface and the CXCOM software, users can now gain immediate and easy access to the CX solar controller directly from their computer.



Technical Data	CX10	CX20	CX40
Nominal voltage	12/24V, automatic detection		
Max. solar panel current	10A	20A	40A
Max. load current	10A	20A	40A
Overcharge protection	Constant voltage PWM series regulation: boost charge, float charge and optional equalization charge.		
Overdischarge protection selectable LVD modes	High or low fixed voltage setting; high or low SOC (state of charge); adaptive low voltage disconnect (fuzzy logic algorithm)		
Ambient temperature range	-25 °C to +50 °C		
Max. wire size	16mm ² (AWG#6)		
Self consumption	4mA		
Weight	200g		

Low voltage disconnect function:

The CX controller has 5 different modes to protect the battery from deep discharging:

Mode 1: Disconnect at 11.4V (at nominal load current) to 11.9V (at no load current). Normal operation mode for good battery protection.

Mode 2: Disconnect at 11.0V (at nominal load current) to 11.75V (at no load current). Mode with lower disconnection point. Battery is cycled deeper, which can shorten battery lifetime.

Mode 3: Disconnect at 11.0 to 12.2V depending on load current and previous charging cycles. This adaptive mode leads to a longer battery lifetime because it allows recovery of the battery by full recharge, thus maximizing battery life.

Mode 4: Disconnect at 11.5V fixed setting. Appropriate if bypass loads draw current directly from battery.

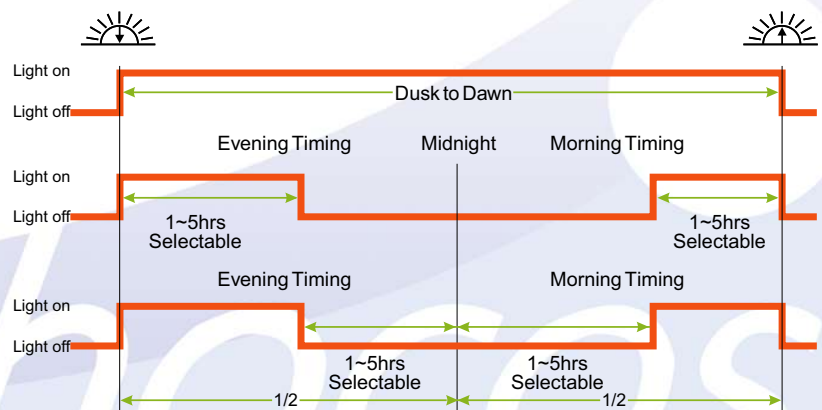
Mode 5: Disconnect at 11.0V fixed setting. Appropriate if bypass loads draw current directly from battery. Mode with lower disconnection point. Battery is cycled deeper, which can shorten battery lifetime.

Flexible nightlight function:

Automatically detects day/night.

Programmable day/night threshold (light on/off point).

Lighting timing modes include dusk to dawn and ON/OFF/ON.





MPPT Maximum Power Point Tracker

Innovative Maximum Power Point Tracking technology increases system efficiency and reduces system cost.

- Maximum power point tracking technology**

With innovative maximum power point tracking technology, Phocos' MPP tracker ensures maximum performance from your solar array at all times and in any weather conditions. The MPPT can yield energy gain of 10%-25% from your PV system. MPPT includes a sweep-function which runs through the whole solar panel voltage range once every 2h to find the point of the absolute maximum power output.

- Use solar panels for grid-feed-in systems**

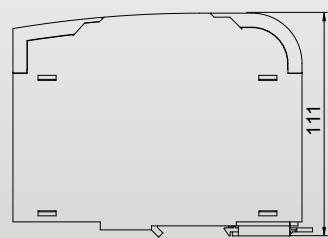
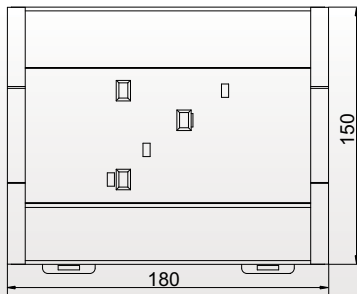
The possibility to use less expensive grid-feed-in solar panels with up to 95V open circuit voltage for 12V or 24V stand-alone-systems will significantly reduce cost of the total system.

- 3 stage I-U curve charge regulation**

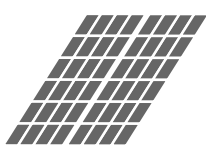
The temperature-compensated three-stage I-U curve charge regulation algorithm significantly extends the life span of your battery.

- Parallel Operation of Multiple MPPTs***

Up to 16 MPPTs can be operated in parallel enabling you to increase your system capacity substantially. Parallel operation is accomplished by designating one controller as the "Master Controller". Charge regulation for each controller in multiple MPPT systems is controlled by the Master Controller via data bus.

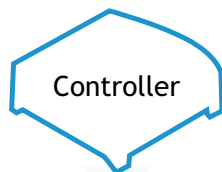


Technical Data	MPPT100/20
Nominal voltage	12/24V, automatic recognition
Max. solar input voltage Voc	95V
Max. battery charge current	20A
Power conversion efficiency	up to 97%
Standby power consumption	<30mW@12V system voltage(<2mA) <80mW@24V system voltage(<3mA)
Temperature compensation	-4mV/cell*K
Max. wire size	32mm ² (AWG#2)
Ambient temperature range	-25°C to +50°C
Weight	1581g



Panel Data

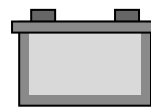
$V_o=21.5V$
 $I_{SC}=4.9A$
 $V_{MPP}=17V$
 $I_{MPP}=4.4A$
 $P_{MPP}=75Wp$



Working Point

Panel	Controller
$V_{BAT}=12V$	$P_{Charge}=54W$
$I_{Charge}=4.5A$	$V_{BAT}=12V$

$V_{BAT}=17V$	$P_{Charge}=72W$
$I_{Charge}=4.4A$	$V_{BAT}=12V$



Battery

$I_{Charge}=4.5A$

$I_{Charge}=6A$

The comparison between MPPT and traditional controller shows that the energy output of the panel is up to 30% higher with the use of MPPT. This leads to an average increase of about 15%.

* Future funtion



PL Solar Charge Controller

Phocos PL series charge controller gives you the freedom to operate your solar electric system the way you want to.

- **Informative**

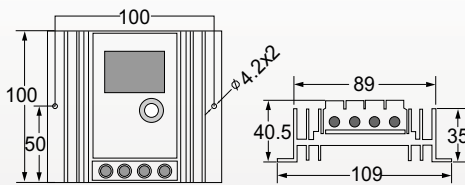
Display shows battery voltage, charge current, ampere hours in and out of battery, load being drawn from the battery and charge cycle status.

- **Intelligent**

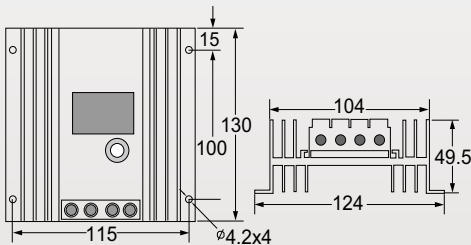
Data stores for the last 30 days.

- **Well Connected**

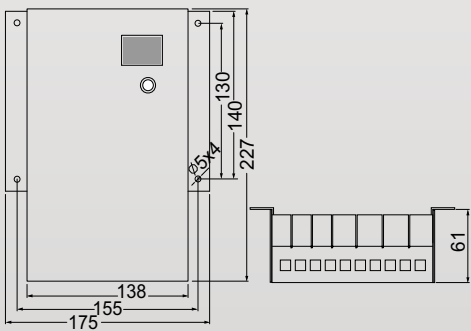
With the optional PLI interface and PLCOM software, the user can access the regulator from a computer. Data can be read or settings adjusted remotely.



PL20



PL40



PL60

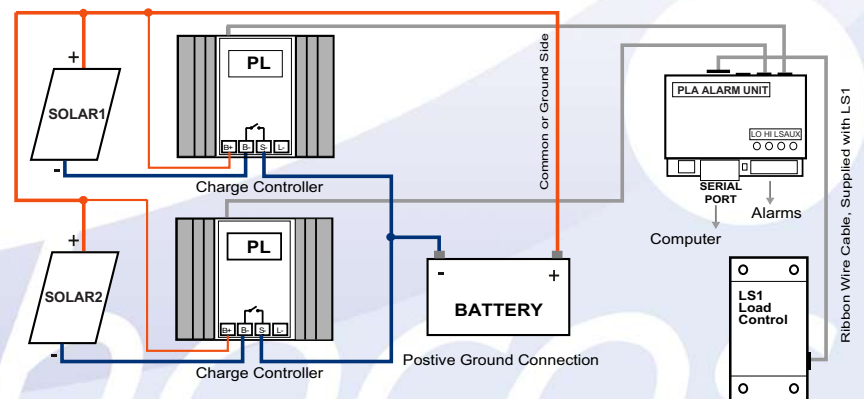
Technical Data	PL20	PL40	PL60
Nominal voltage	12, 24, 32, 36, 48V		
Max. solar panel current	20A	40A	60A
Max. load current	20A	7A	30A
Regulation set points	4 pre-set programs or user adjust		
Weight	320g	515g	1100g
Ambient temperature range	-20°C to +55°C		
Max. wire size	30mm ²		

Accessories

PLA: Multi-PL control unit

The PLA allows up to 3 PL series charge controllers to work together. The PLA provides a common communication interface, four alarms or control channel outputs, and control over a separate load control unit called an LS1(50A).

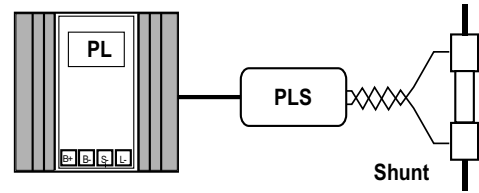
The PLA makes the retrieval of system performance data easier by providing a PC compatible method of collecting all relevant information on the system.



PL Solar Charge Controller

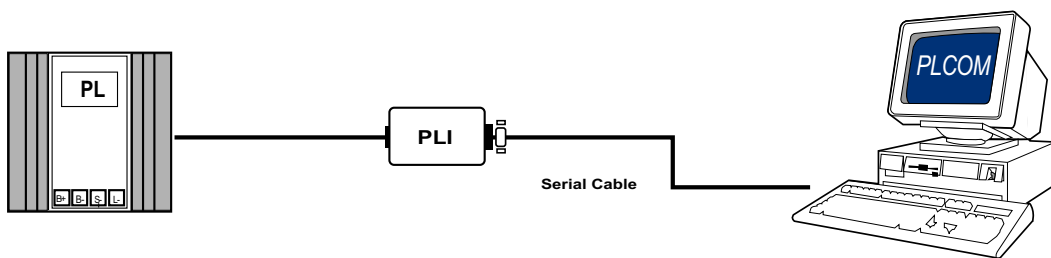
PLS Shunt Adaptor

The PLS shunt adaptor is designed for use with PL series solar charge controllers. It allows the controller to measure charge or load currents which do not go through the controller. This allows inverter or generator currents to be included in the controller's display. The PLS shunt adaptor measures the voltage across a current shunt and converts that measurement into digital form. This data is then sent to the PL controller. Two shunts can be used.



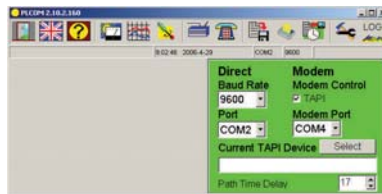
PLI Computer Interface: RS232 Interface for PL series controllers

The PLI is a device which allows the PL series solar controllers to communicate with a computer. It converts the signals from the PL into a form which a computer can recognize. It also converts signals from the computer to suit the PL controller.



PLCOM Software

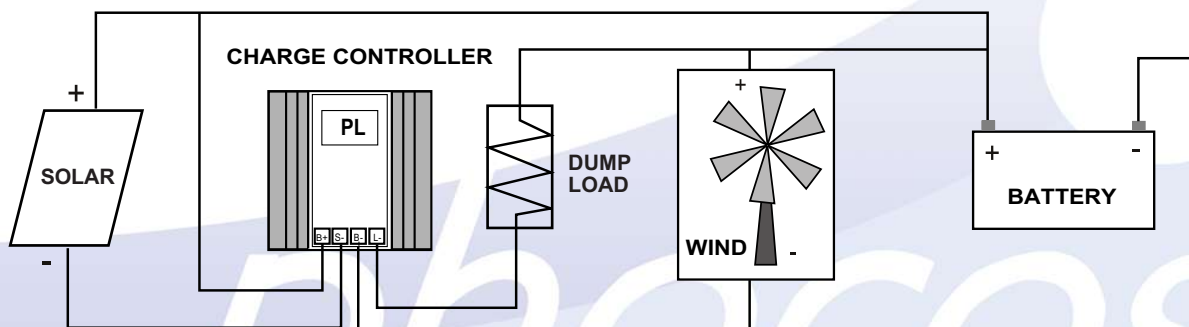
PLCOM is a Windows-based program which enables communication with the PL controller and helps in system performance analysis.



Hybrid Power System

Although the PL is primarily a device to control the charging of batteries from the solar panel, it can also be used with other energy sources such as wind, microhydro and fuel driven generators.

The PL supports series and shunt control. Shunt control is appropriate for wind generators or microhydro system which requires a constant dump load. In a hybrid system, the solar component can be controlled by the SOL-input and the other energy sources by the shunt control which is done through the LOAD or "G" terminals.



BCM DC Battery Charger



Phocos BCM is an innovative charger for AA-size rechargeable NiMH and NiCd batteries.

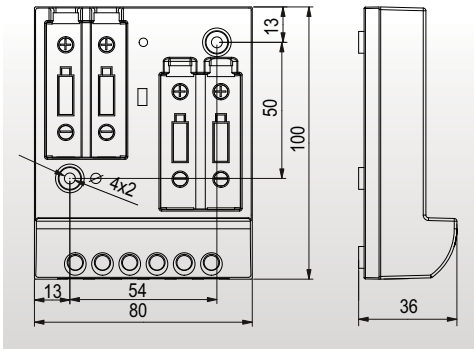
- **Accurate battery charging:**

Special voltage and current limitation features ensure a smooth charging process for AA-size rechargeable batteries.

- **Excess Energy Management**

The BCM enables the efficient use of excess energy in the PV system.

* The 4 AA-size rechargeable batteries in the picture are not included.



Technical Data	BCM
Input voltage range	10.5-15V
Normal output voltage	4 x 1.5V
Max. charging current	< 60 mA
Battery capacity	500mAh-2500mAh
Ambient temperature range	-40 °C to +50 °C
Max. wire size	16mm ² (AWG#6)
Weight	140g

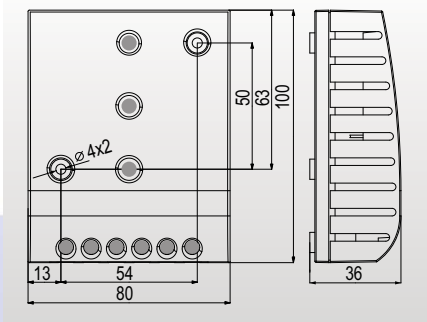


DCS DC Voltage Converter

Phocos DCS adjusts the voltage to below 12V for certain DC appliances such as radios, cassette players, etc.

DCL DC Voltage Converter with excess energy management

- Phocos DCL possesses all DCS functions.
- Phocos DCL is designed to charge the second battery in your solar system using the excess energy from the solar module.



Technical Data	DCS and DCL
Nominal voltage	12V
Output voltage @ output current	1.5V@250mA / 3V@300mA / 4.5V@400mA / 6V@450mA / 9V @ 650 mA / 12V @ 1000 mA / 13.6V @ 2000 mA
Additional DCL data	Second battery float voltage: 13.4V Max. charge current: 2A @ 13.4V
Ambient temperature range	-40 °C to +50 °C
Weight	170g / 180g

Feature		Model		CM	CA	CML	CX	CXN	PL
Main Feature	System Voltage	12V	12V	12/24V	12/24V	12/24V	12/24V	12/24V	12/24/32/36/48V
	Rated Solar Current	4A	5, 8A	5, 8, 10, 15, 20A	10, 20, 40A	10, 20, 40A	10, 20, 40A	10, 20, 40A	20, 40, 60A
	Rated Load Current	None	6, 8A	5, 8, 10, 15, 20A	10, 20, 40A	10, 20, 40A	10, 20, 40A	10, 20, 40A	20, 7, 30A
Overcharge Protection	Charging Regulation	Shunt	Series	Series	Series	Series	Series	Series	Series or Series & Shunt
	PWM Battery Charging	✓	✓	✓	✓	✓	✓	✓	PWM or "On-Off"
	Temperature Compensation	✓	✓	✓	✓	✓	✓	✓	Pre-set or user adjust
	Equalization Charging	—	—	✓	✓	✓	✓	✓	Pre-set or user adjust
	Boost Charging	✓	✓	✓	✓	✓	✓	✓	Pre-set or user adjust
Over Discharge Protection	Vented or Sealed Battery	✓	✓	✓	✓	By Jumper	By Menu	By Menu	Pre-set or user adjust
	Control Mode	—	Voltage	Voltage or SOC	Voltage or SOC	Voltage or SOC	Voltage or SOC	Voltage or SOC	Voltage, pre-set or user adjust
Communication Capability	Battery Sulfation Protection (Adaptive Low Voltage Disconnect)	—	—	—	—	—	✓	✓	—
	Display (Battery and Load Status)	1LED	3LEDs	5LEDs	Graphic LCD	Graphic LCD	Graphic LCD	Graphic LCD	Digital LCD
	Acoustic Warning	—	—	✓	✓	✓	✓	✓	—
Safety Protection	Manual Load Disconnect	—	—	—	—	—	✓	✓	—
	Data Logging with Optional Computer Interface	—	—	—	—	—	USB	USB	RS232C
	Reverse Polarity Protection	✓ (No load)	✓	✓	✓	✓	✓	✓	✓
	Short Circuit Protection	Electronic fuse	Electronic fuse	Electronic fuse	Electronic fuse	Electronic fuse	Electronic fuse	Electronic fuse	Electronic fuse
	Over Temperature Protection	—	—	—	✓	✓	✓	✓	✓
	Over Voltage Protection	✓ (No load)	✓	✓	✓	✓	✓	✓	✓
	Overcurrent Protection	—	Load only	Load only	PV and load	PV and load	PV and load	PV and load	PV and load
Other Features	Reverse Current Protection	✓	✓	✓	✓	✓	✓	✓	✓
	Night Light Function	—	—	—	✓	✓	✓	✓	✓
	External Temperature Sensor	—	—	—	✓	✓	✓	✓	✓
	PCB Conformal Coating	✓	✓	✓	✓	✓	✓	✓	✓
	Ambient Temperature Range	-40 to 50 °C	-40 to 50 °C	-40 to 50 °C	-25 to 50 °C	-25 to 50 °C	-25 to 50 °C	-25 to 50 °C	-20 to 55 °C
Max. Wire Size	16mm ²	16mm ²	16mm ²	16mm ²	16mm ²	16mm ²	16mm ²	30mm ²	
IP Protection	IP22	IP22	IP22	IP22	IP22	IP22	IP22	IP22	
Negative Grounding	—	—	—	—	—	—	—	—	—
Certificate	CE	CE, World Bank	CE, World Bank	CE	CE	CE	CE	CE	



RoHS | CE



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