



# OFF-GRID BACK-UP & ISLAND SYSTEMS

ENERGY. ANYTIME. ANYWHERE.



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## INTRODUCTION

### Off-grid

The presence of a functional electricity grid is not always as obvious as it would seem to be. An insufficient infrastructure is often the cause for an unreliable grid. Things become even more difficult when there is no grid at all. And yet you are in need of a reliable electricity supply. A local and properly functioning system is the only answer at this point. Victron Energy offers you such an answer. We are proud to offer you our modern translation for freedom and independence. Energy, Anytime, Anywhere.

### Hybrid systems

If the sun is your only available source of energy, the choice is simple. You will choose a solar system in order to meet your demand for energy. If there are more sources available, these could support your solar system. Because the fact is, that the sun isn't always able to entirely cover your energy demand. A solar system is often supported by a generator set or a wind generator. These energy sources can make certain that the solar deficit is covered. Designing combinations such as these, which include several energy sources, is what Victron Energy does best.

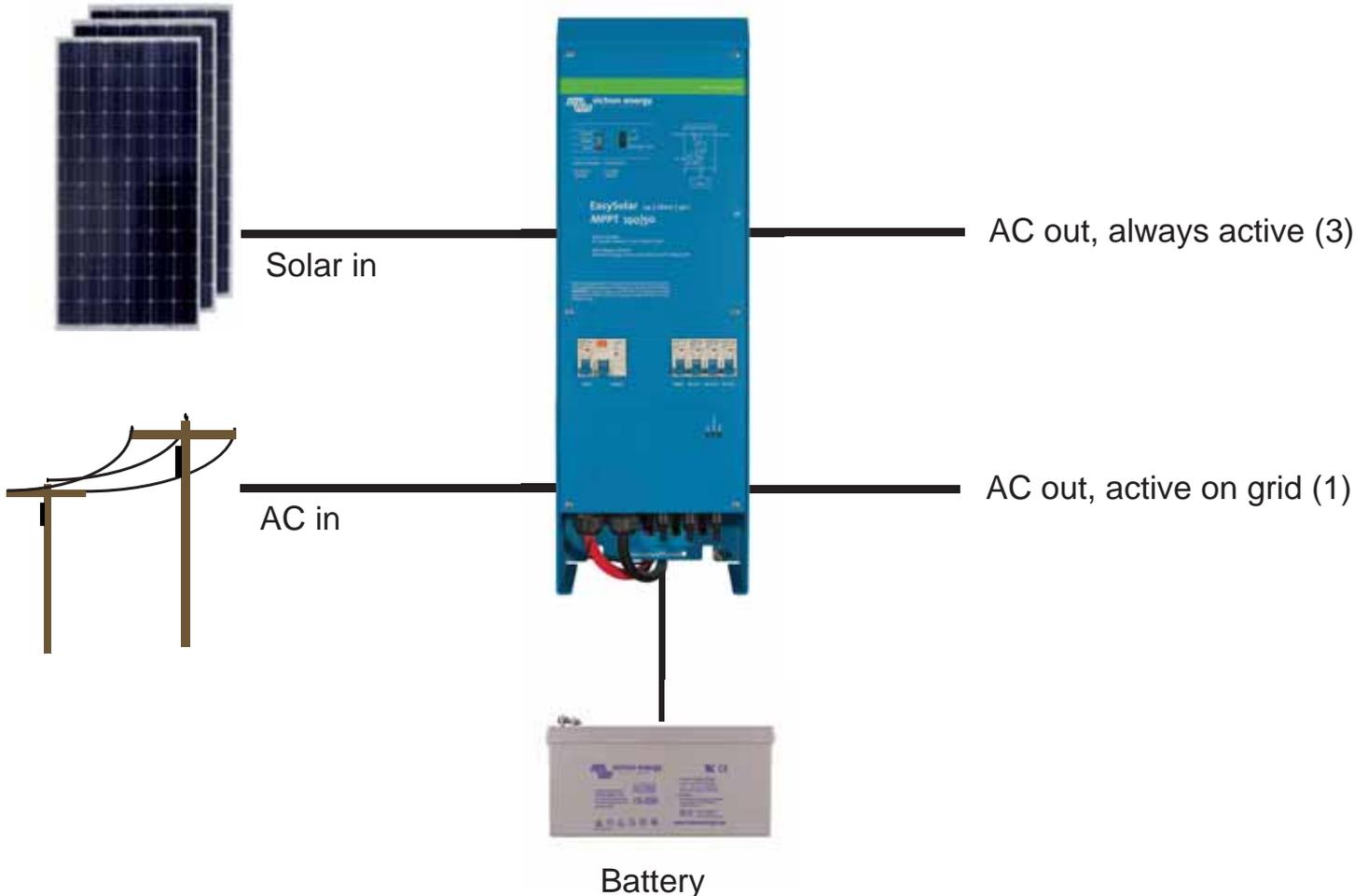


## APPLICATION EXAMPLES

Our products are being used in all off-grid and grid-connected systems, for example autonomous buildings, oil platforms and private houses.



## EASYSOLAR 12V AND 24V: THE ALL-IN-ONE SOLAR POWER SOLUTION



### EasySolar: The all-in-one solar power solution

EasySolar takes power solutions one stage further; by combining an Ultra-fast BlueSolar charge controller (MPPT), an inverter/charger and AC distribution all in one enclosure. With an extensive reduction in wiring, EasySolar provides ease of use combined with a maximum return on investment. When using the 24V model, it is possible to use up to 1400 Watt of solar power and with 1600VA continuous inverter power, even peaks of 3000 Watt can be handled without any problems.

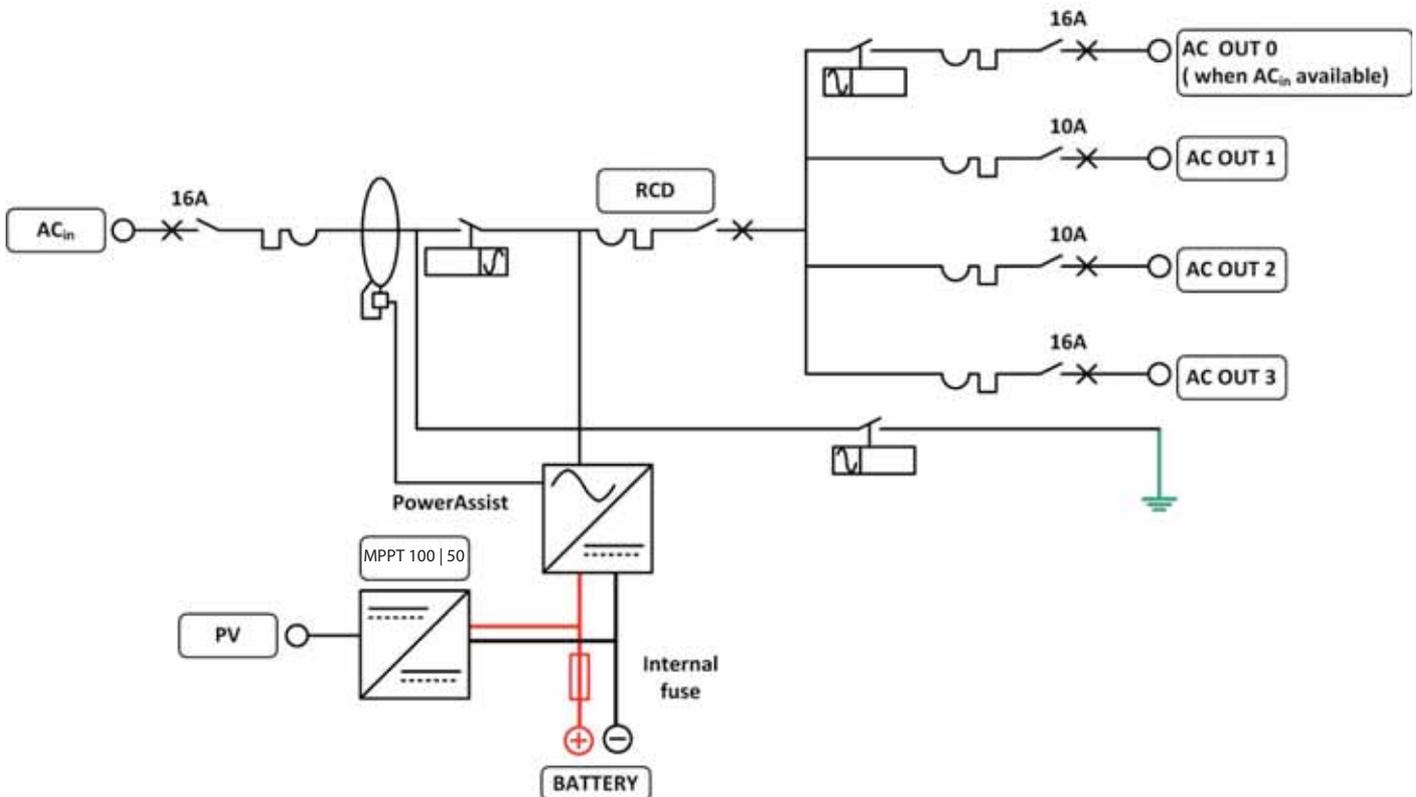
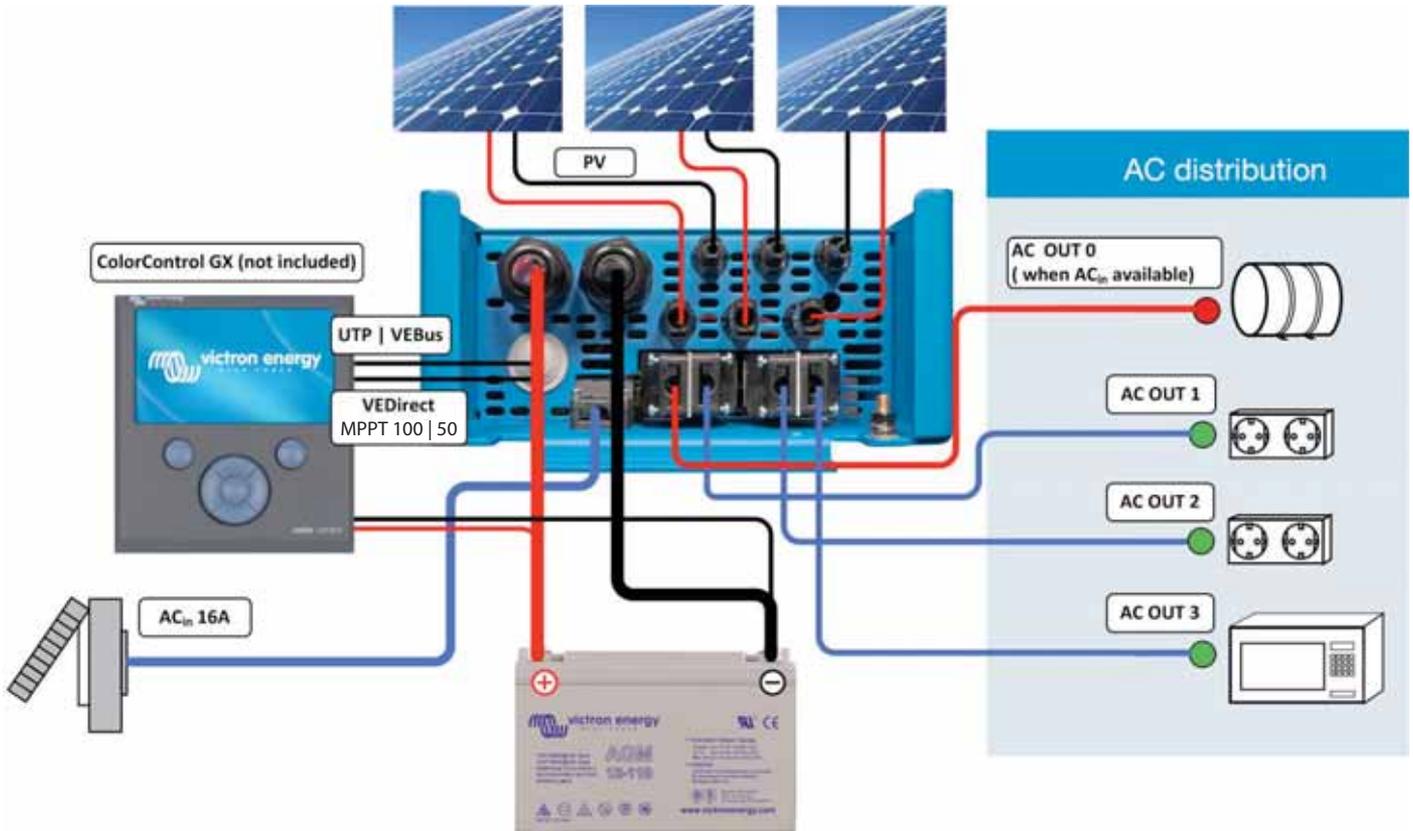
### The solar charge controller: BlueSolar MPPT 100/50

Up to three strings of PV panels can be connected with three sets of MC4 (PV-ST01) PV connectors. Efficient energy distribution is guaranteed.

### Inverter/charger providing 1600 VA continuous inverter power

The MPPT charge controller and the inverter/charger share the DC battery cables so no additional wiring is needed. The batteries can be charged with solar power (BlueSolar MPPT) and/or with AC power (inverter/charger) from the utility grid or a genset. Consumers are always assured of energy, even when the sun isn't providing sufficient energy for electrical appliances.

# EASYSOLAR 12V AND 24V: THE ALL-IN-ONE SOLAR POWER SOLUTION



## OFF-GRID LIGHTHOUSE



**Off-grid lighthouse in Saldanha, South Africa**

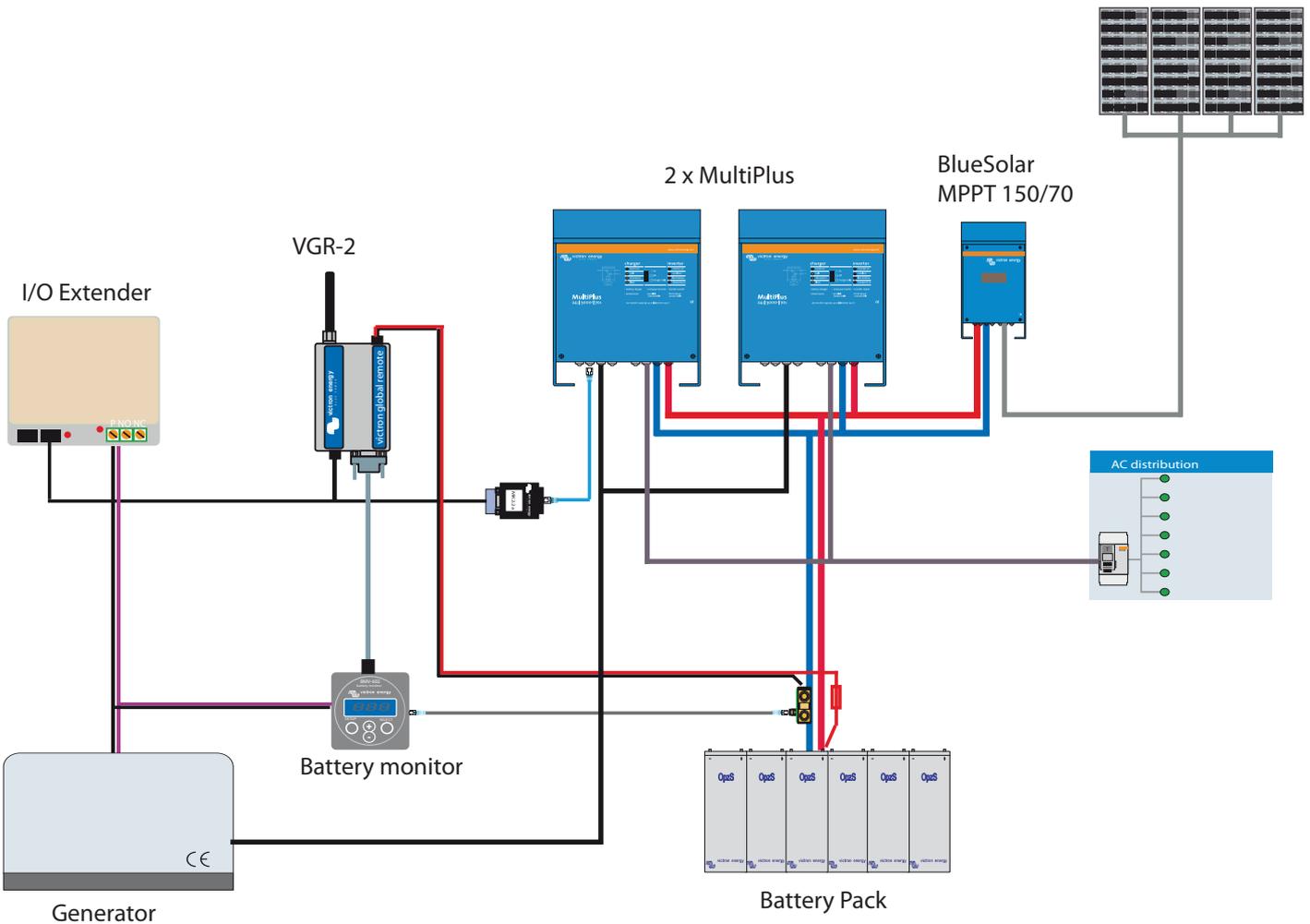
Several Off-grid lighthouses on the South African coastline used to be powered with three old 12kW generators. The old generators were replaced by a new Solar system, which is a clean and silent alternative to generator power. The generated energy is used to power all the loads at the lighthouses: radio communication, lights and special radar equipment to detect radar signals from ships nearby.

The new Solar system consists of:

- 2 x 48/3000/35 MultiPlus in parallel
- 1500Ah C10 OPzS 2V batteries
- 16 x 230 Wp Solar Panels
- BlueSolar Charge Controller MPPT 150/70
- 10kW generator for back-up
- Precision Battery Monitor BMV-602S to monitor the main battery bank and generator battery. The BMV-602S automatically starts and stops the generator based on state of charge of the battery bank.
- A Victron Global Remote with an I/O Extender for Remote Monitoring and also a Remote Generator start function.



# OFF-GRID LIGHTHOUSE



System schematic of the installation in the lighthouse.



## HOSPITAL



**Charity-run hospital in Cap-Haitian, Haiti**

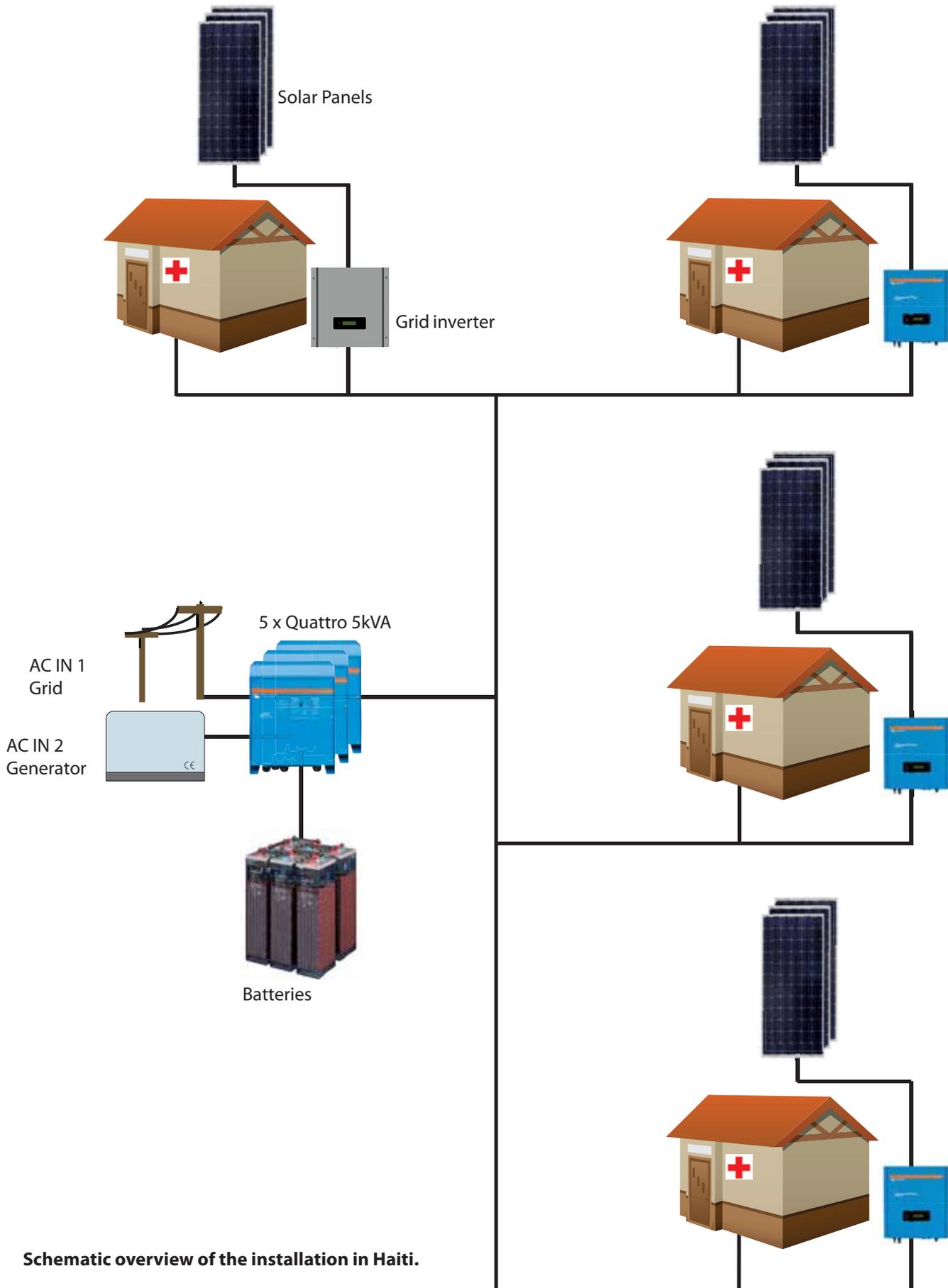
After the devastating earthquake in Haiti, people are still rebuilding and recovering. At a charity-run hospital in Cap-Haitian, Haiti, a comprehensive hybrid power system is installed to power a complete hospital. At the heart of this system there are five Victron 24/5000/120 Quattro's connected in parallel. Only a small grid connection is available, with a capacity of hundred Ampères. When the required power is higher, the Quattro's will supplement the grid with energy from the batteries. This is a unique Victron feature called PowerAssist, that synchronizes the output of the inverters with the grid. Effectively adding power to the grid. When the load reduces, the spare power is used to recharge the battery bank.

On top of being too small, the grid connection is also unreliable. On a loss of grid power, the Quattro's seamlessly pick up the power demand, so the Hospital can count on a reliable power supply. They'll also automatically start the 40kVA generator when the power outage is not restored quick enough.

All six buildings of the hospital have their roof filled with solar panels, eighty pieces of 180W panels in total. These panels are connected to the outputs of the Quattro's via grid inverters, powering the loads. All excess solar power is used to charge the batteries.



# HOSPITAL



Schematic overview of the installation in Haiti.

## GRID-TO-GO UNIT



**UK: 'Grid-to-go' unit powers outdoor events.**

Outdoor events usually require a lot of power for all the needed equipment. When there is no access to mains electricity at an outdoor event, a generator would be an obvious choice to generate power. But generators are noisy and produce a lot of air pollution. A company from the UK offers a green solution: the 'Grid-to-go' unit.

**Grid-to-go**

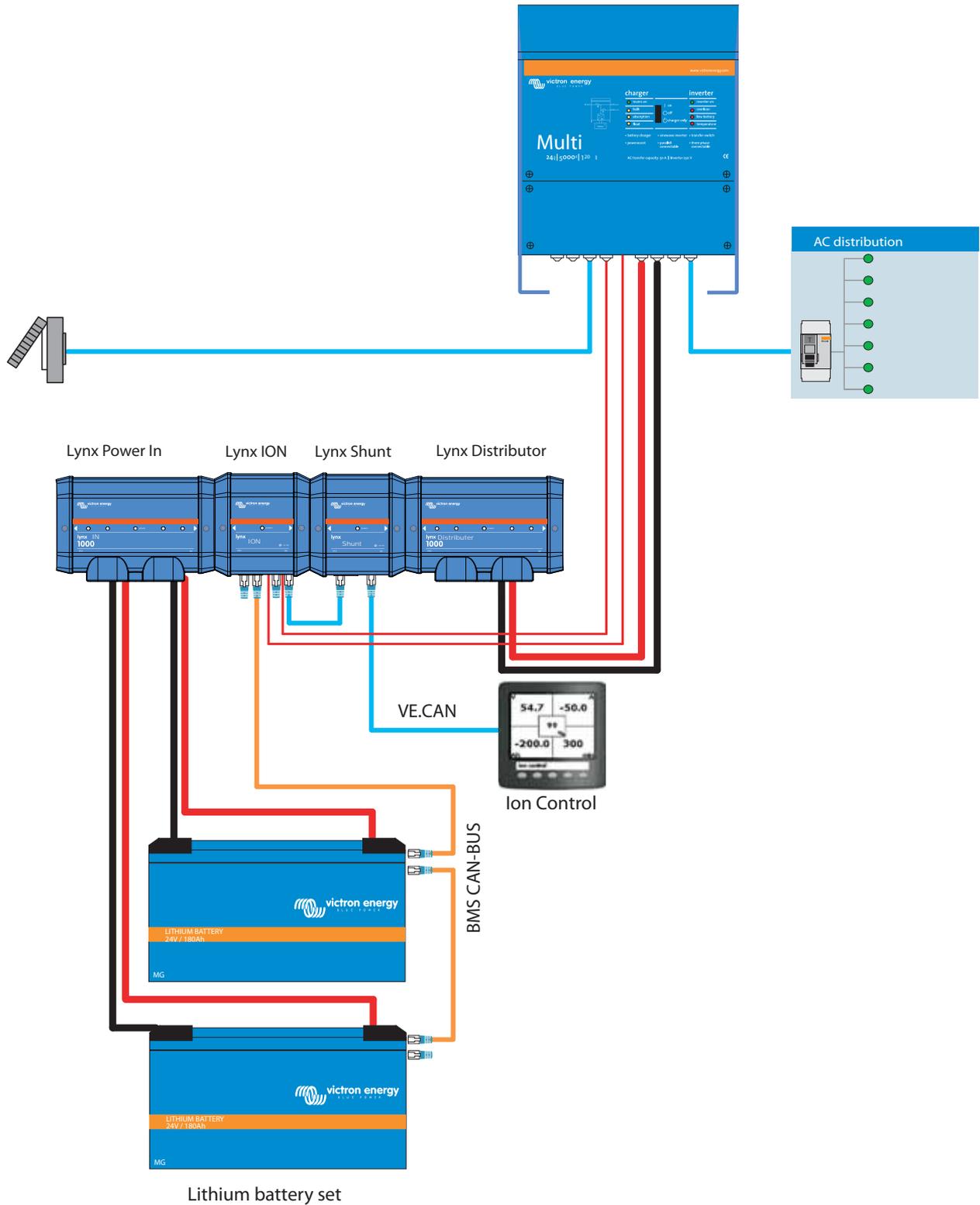
The Grid-to-go unit is a clean and silent alternative to generator power. It uses energy stored in Lithium-ion batteries and it can also incorporate renewable forms of energy (solar and wind) to top up the batteries. There are two versions of the Grid-to-go unit: one with an integrated generator and fuel tank and one 'mini' version, without a generator. Both can be supplied with Solar panels.

**Victron Energy equipment**

The Grid-to-go unit is fully equipped with Victron Energy: 24V 180Ah Lithium-ion batteries, 2 or 3 Quattro 48V 8kVA units that can supply single or three phase, Lynx boxes and several other products from Victron Energy.



# GRID-TO-GO UNIT

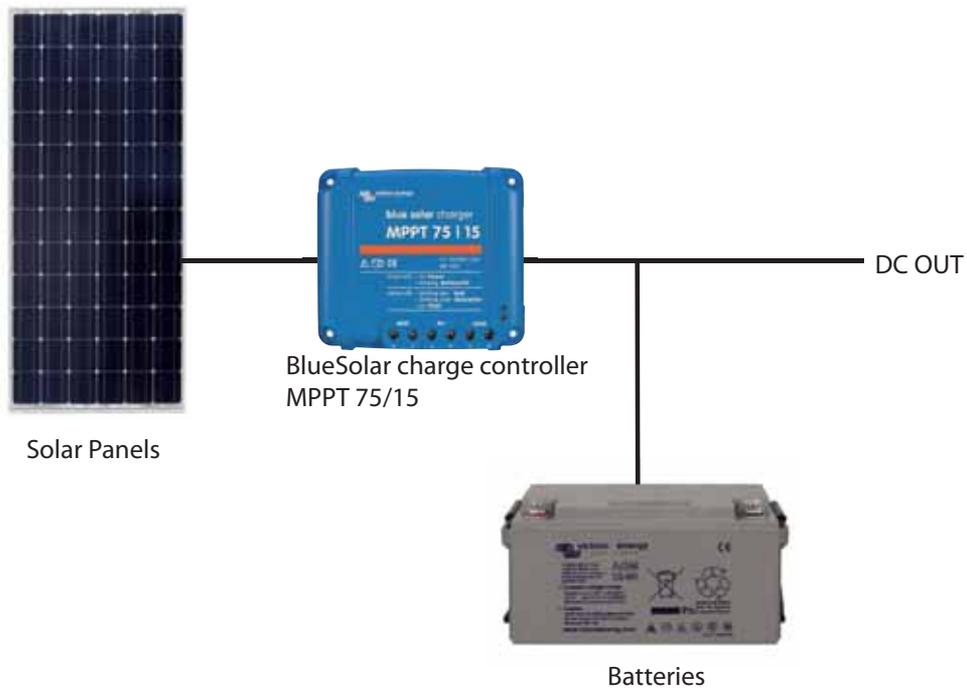


Schematic overview of the 'Grid-to-go' unit.

## DC SYSTEMS

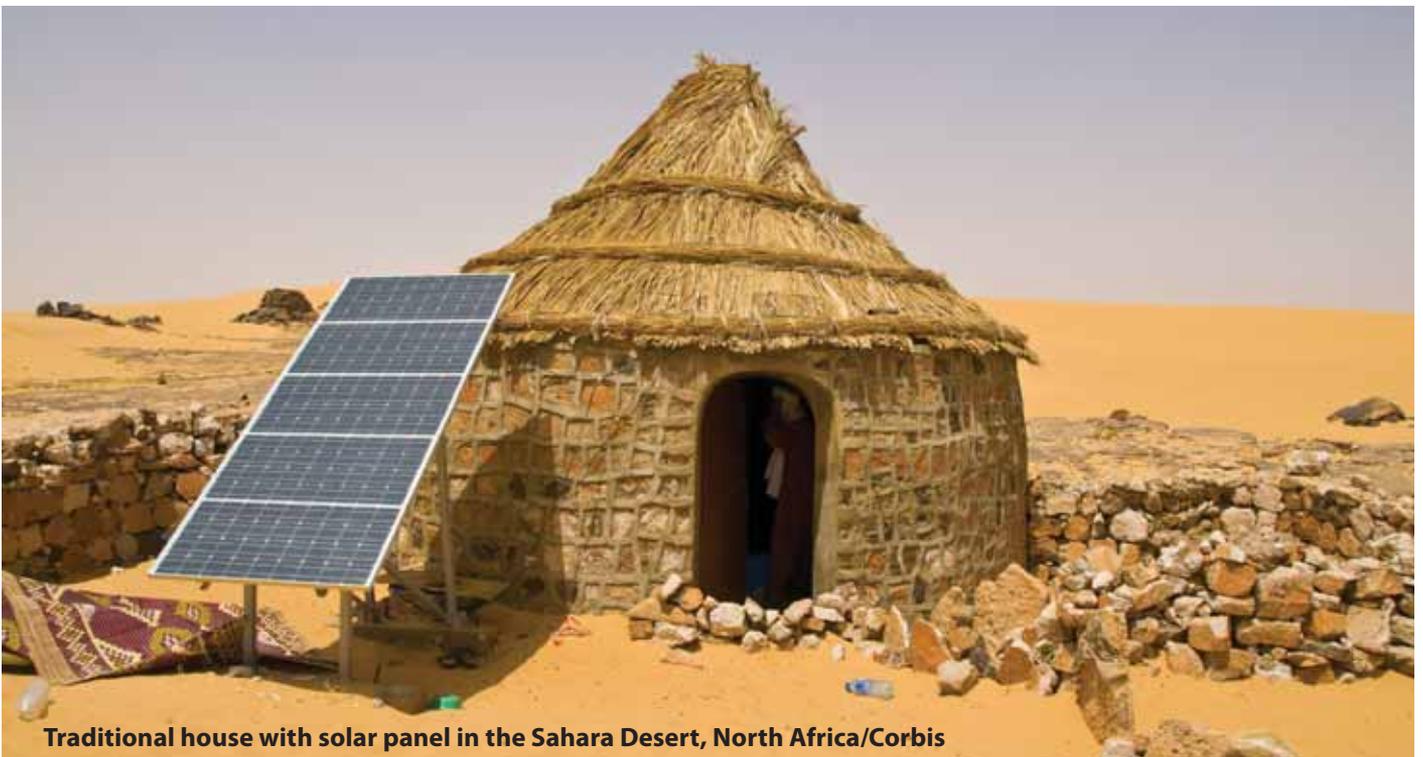
### DC Systems

In DC systems solar energy is converted into regulated DC. Consequently the regulated DC is fed to the batteries and consumers. An inverter powers any AC consumers that are connected to the DC system. Unlike in AC systems, solar power is directly converted into AC in AC systems.



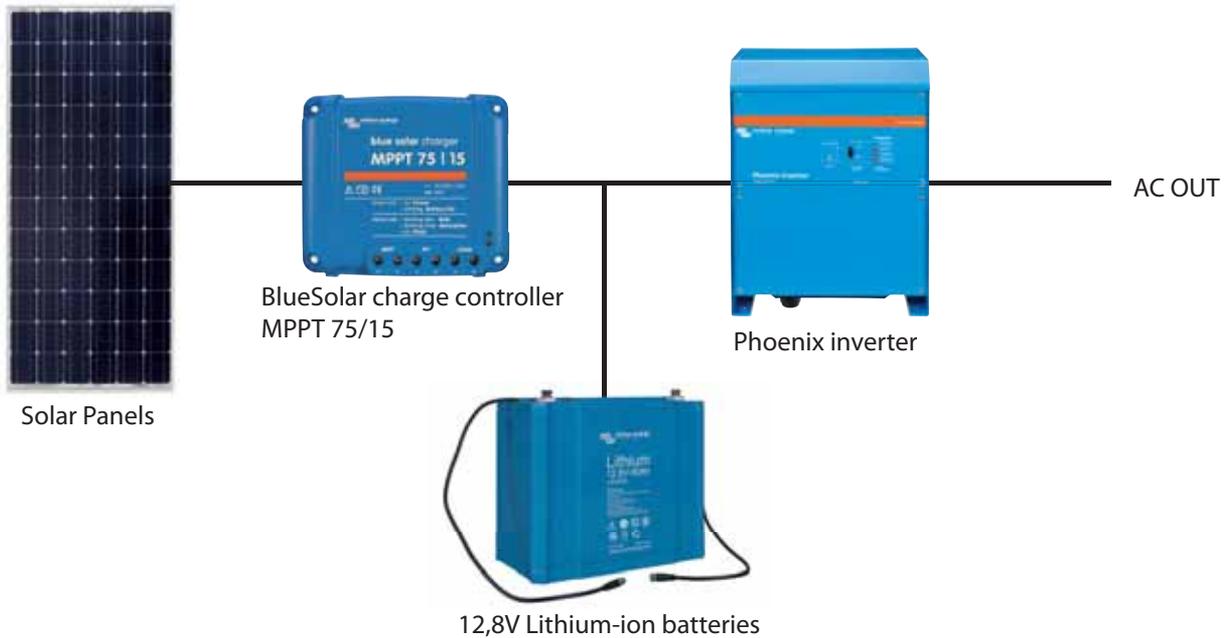
### 1. DC consumers

A solar panel feeds the consumers practically directly. The only item in between the panel and the power consumer is a charge controller. This Blue Solar Charge Controller controls the voltages for the consumers and the batteries.



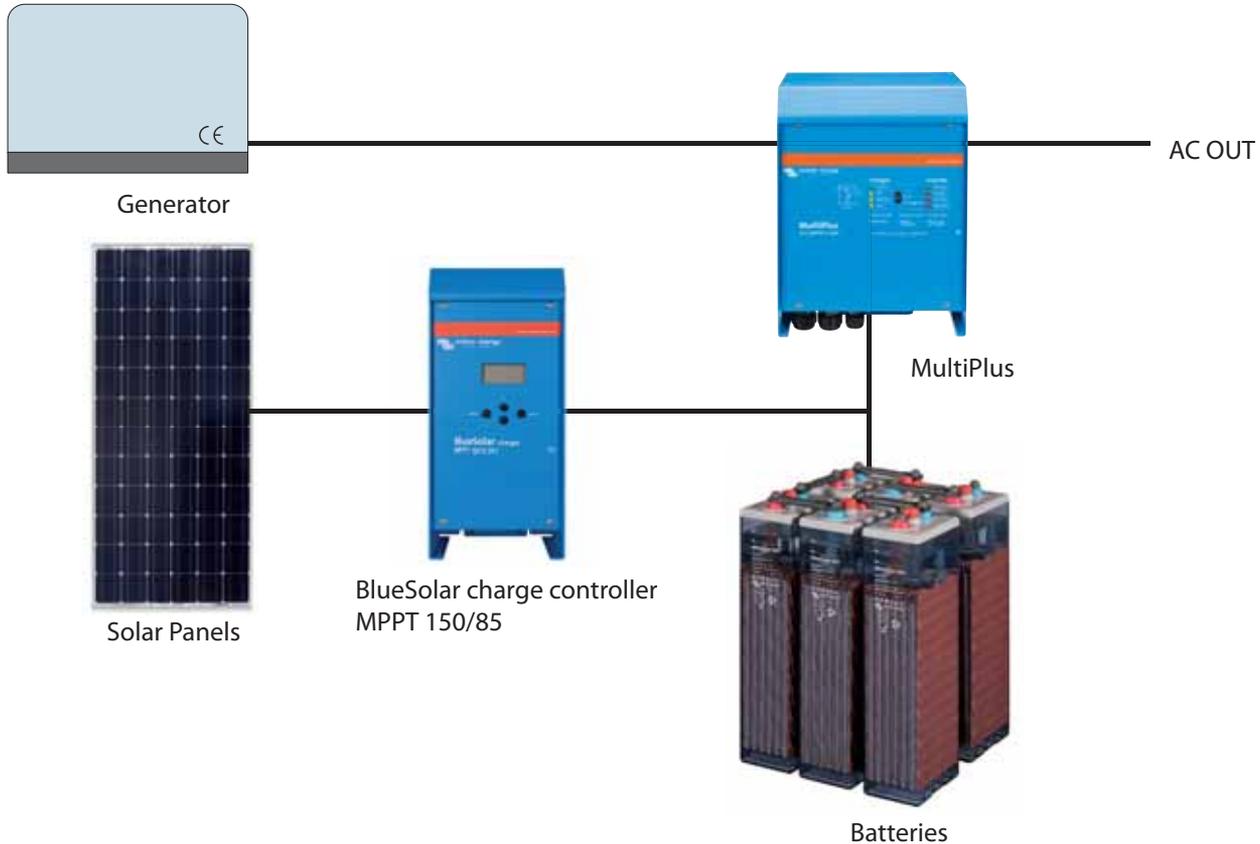
Traditional house with solar panel in the Sahara Desert, North Africa/Corbis

## DC SYSTEMS



### 2. AC consumers

This is a DC system with a 230 Volt output for AC consumers. In above example a Victron Phoenix inverter is added to provide the AC output.



### 3. Not enough sun – hybrid power

If the sun isn't providing you with enough energy, a generator is added to the system. In this case a Multiplus inverter/charger is used instead of an inverter. The generator is connected directly to the MultiPlus. The MultiPlus automatically regulates the starting and stopping of the generator, while maximizing the use of solar power and securing a long battery life.

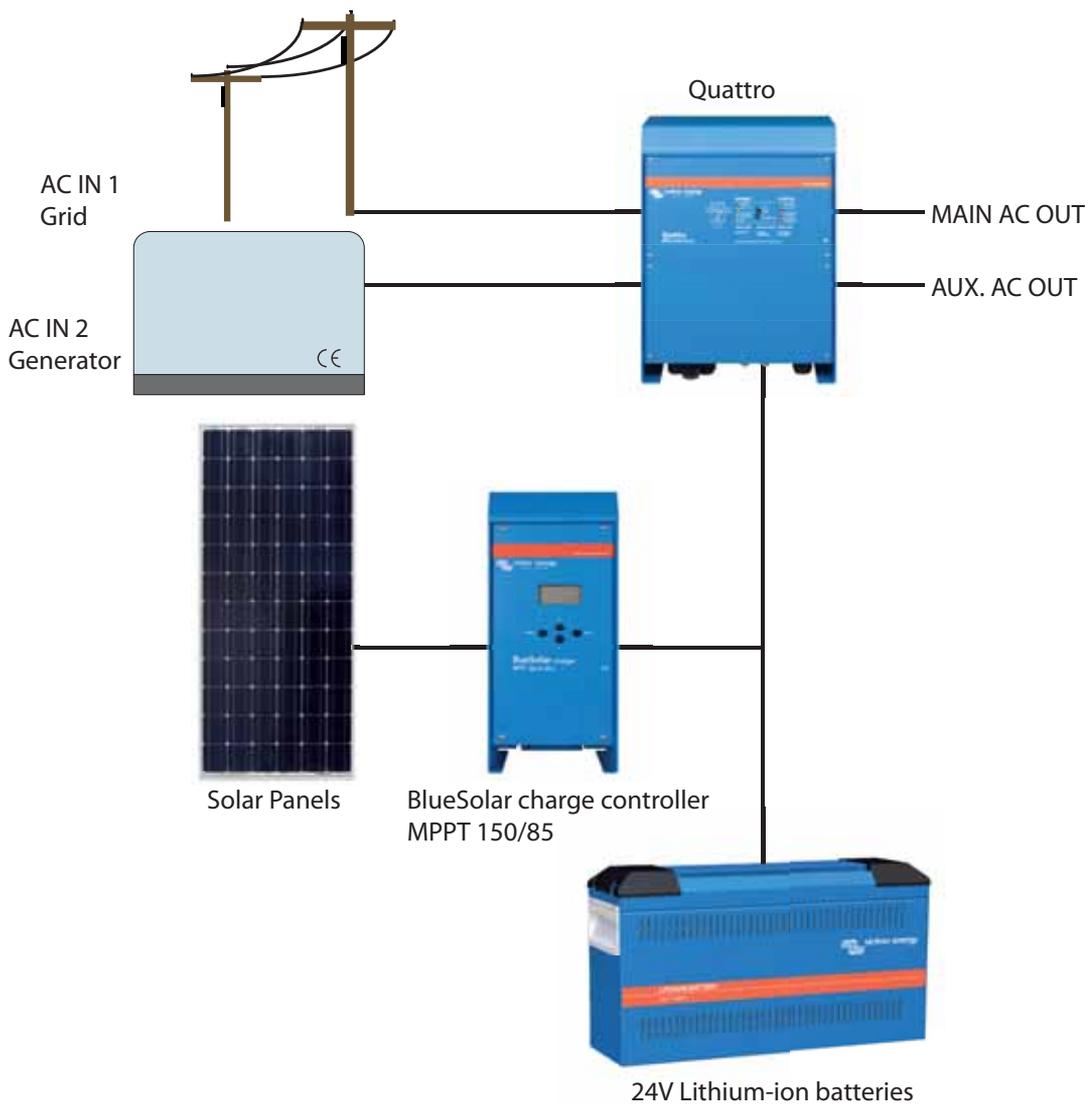
## DC SYSTEMS

### PowerAssist – boosting the capacity of grid or generator power

This unique Victron feature allows the MultiPlus to supplement the capacity of the grid or generator power. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient grid or generator power is immediately compensated with power from the battery. When the load reduces, the spare power is used to recharge the battery bank.

It is therefore no longer necessary to size a generator on the maximum peak load. Use the most efficient size generator instead.

Note: this feature is available in both the MultiPlus and the Quattro.



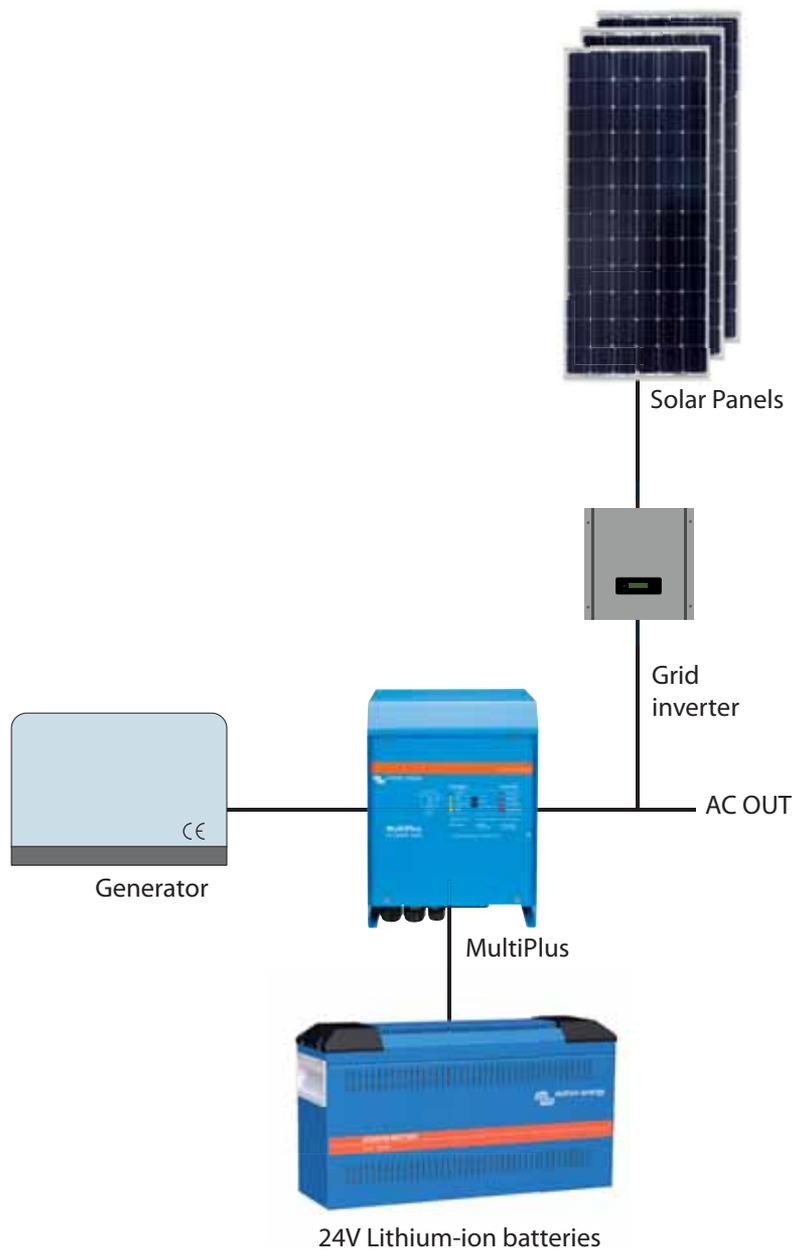
### 4. Back-up system

Solar energy can also be combined with a grid connection. But a grid that suffers from power failures in combination with an insufficient solar supply requires support of a generator. Instead of a MultiPlus, we recommend the Quattro, which is a MultiPlus with built-in transfer switch to connect both the grid and a generator. This entirely automates the switching process between the grid and the generator.

# AC SYSTEMS

## AC Systems

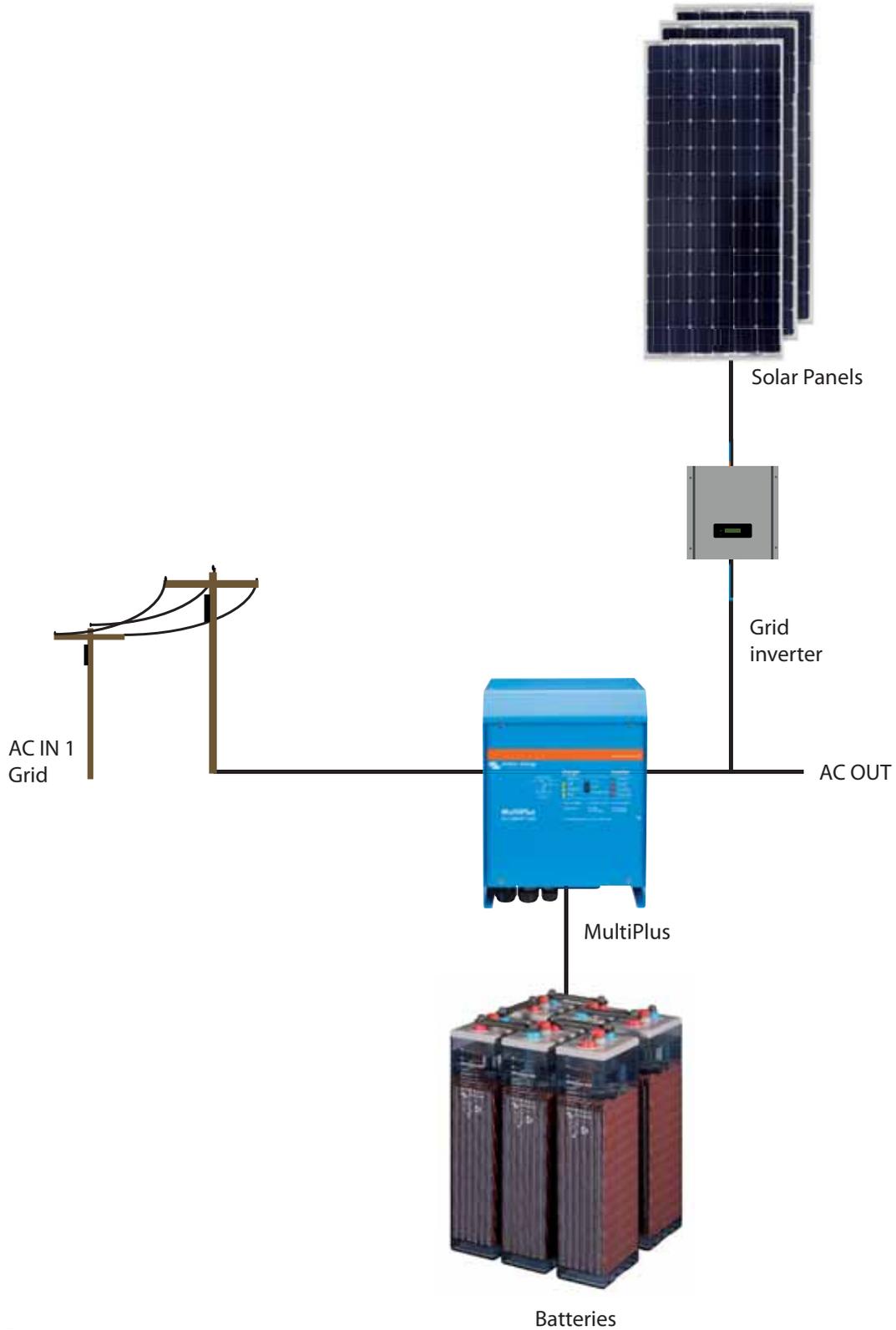
For larger solar systems that generally supply to AC consumers, it is more efficient to immediately invert the solar power into AC. Therefore we call these systems "AC systems". AC systems have a higher energy efficiency in comparison to DC systems. The Grid Inverter directly converts the solar energy into AC. This inverter requires 'grid', which is provided for by a MultiPlus or Quattro. All excess solar power which isn't used by the AC consumers is used to charge the batteries.



### 1. Island system with generator

As soon as energy is collected by the solar panels it is inverted to AC by the Grid Inverter. The generator supplies its alternating current directly to the MultiPlus inverter/charger. The MultiPlus will automatically start and stop the generator, while maximizing the use of solar power.

## AC SYSTEMS



### 2. Solar and grid

In this back-up system, AC from the grid can supplement the energy supply coming from the solar panels. And vice versa, the energy from the solar panels can cover any grid failure that may occur.

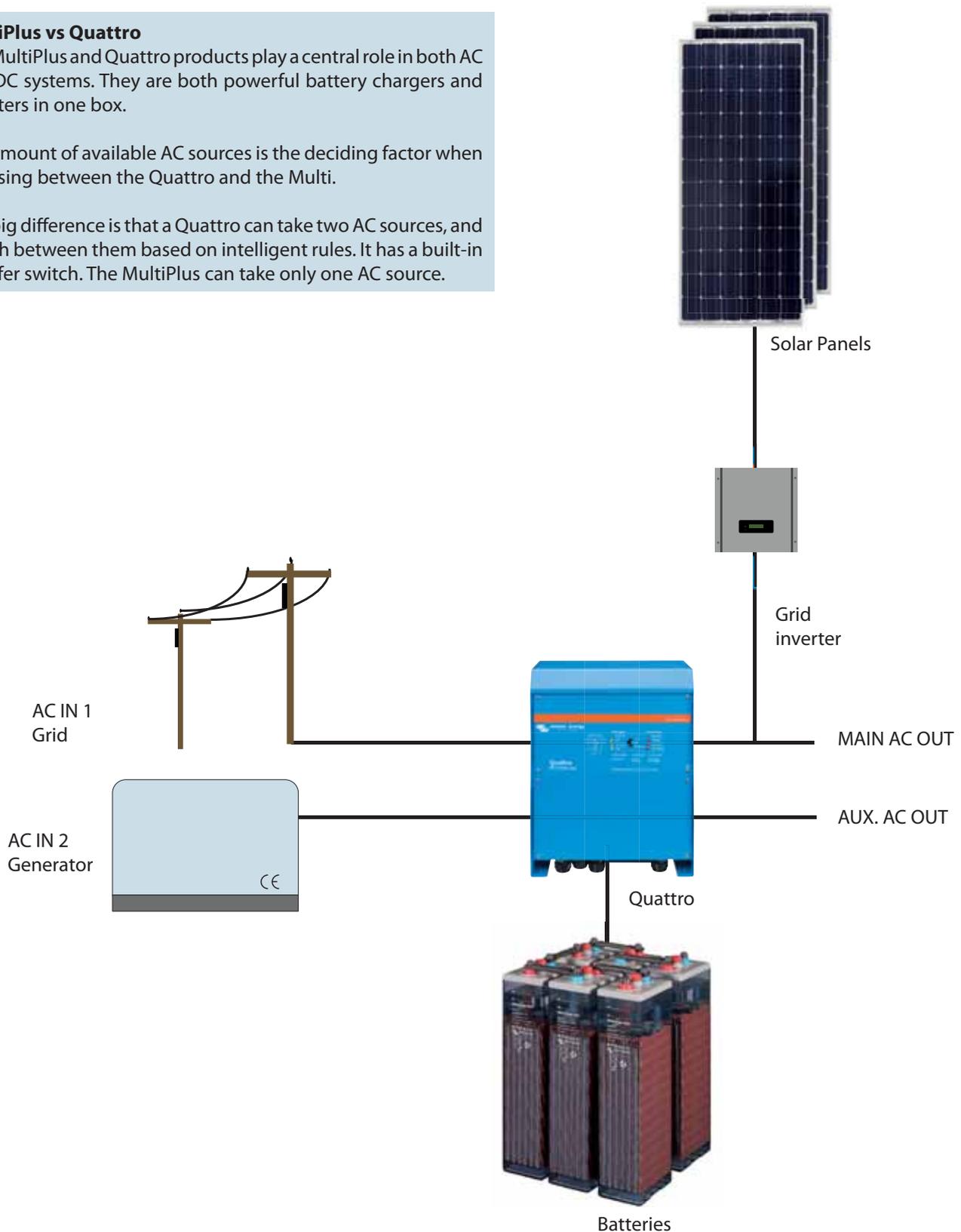
## AC SYSTEMS

### MultiPlus vs Quattro

The MultiPlus and Quattro products play a central role in both AC and DC systems. They are both powerful battery chargers and inverters in one box.

The amount of available AC sources is the deciding factor when choosing between the Quattro and the Multi.

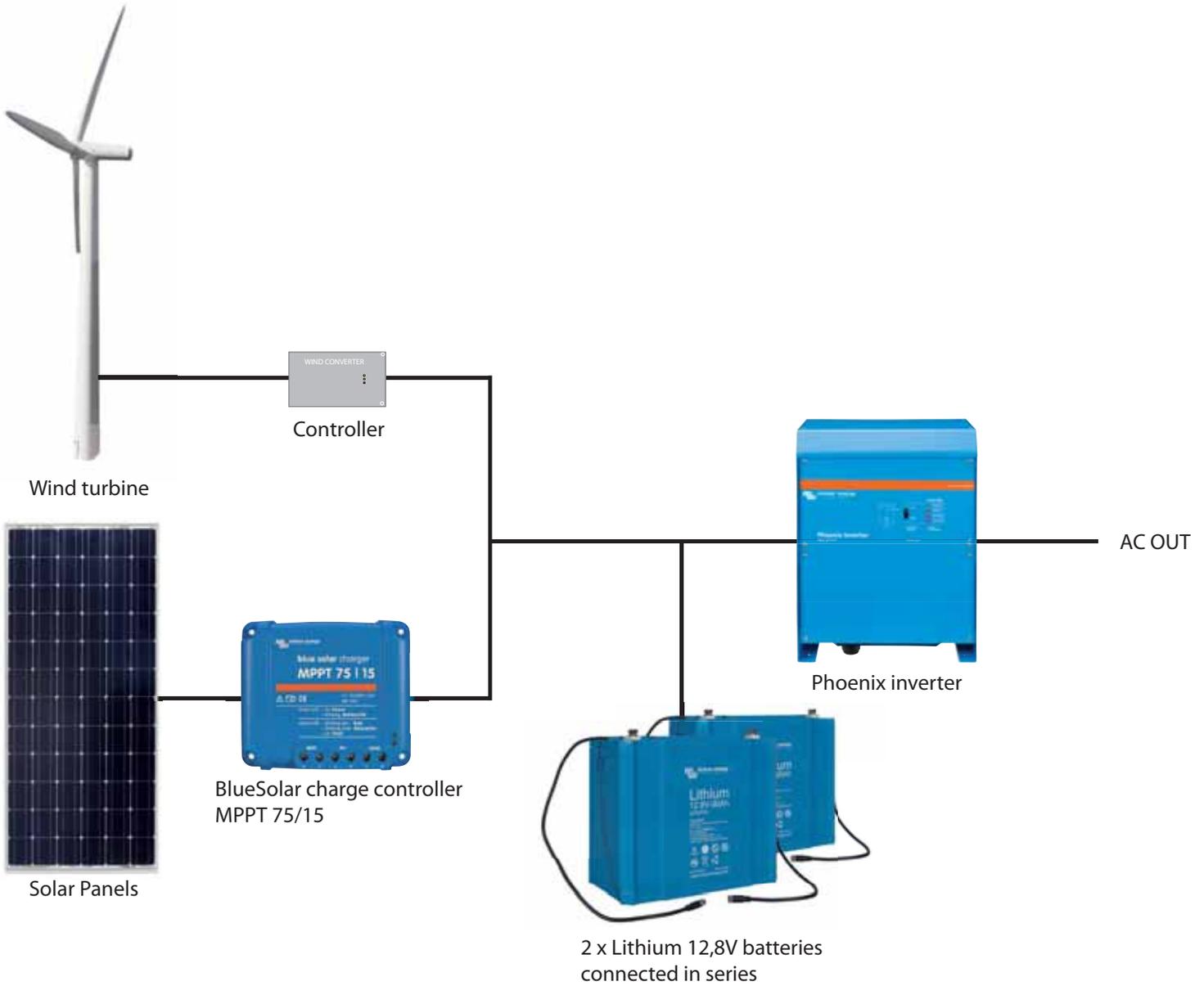
The big difference is that a Quattro can take two AC sources, and switch between them based on intelligent rules. It has a built-in transfer switch. The MultiPlus can take only one AC source.



### 3. Solar, generator and grid

An extensive back-up system such as the one illustrated here guarantees a non-stop supply of energy. If for example a grid failure occurs, the batteries are empty and at the same time there is a limited amount of solar energy available, the Quattro inverter/charger will start the generator. As soon as the generator is not needed anymore, it will be stopped automatically.

## ADDING MORE RENEWABLE ENERGY SOURCES



**Example showing how to add other renewable energy sources via the DC.**

# ACCESSORIES

Our systems are comprised of various components. Some of which are specifically designed for specific markets. Other Victron components are applicable for a wide range of applications. You are able to find the specifications and other detailed information about these components in the 'Technical Information' section.



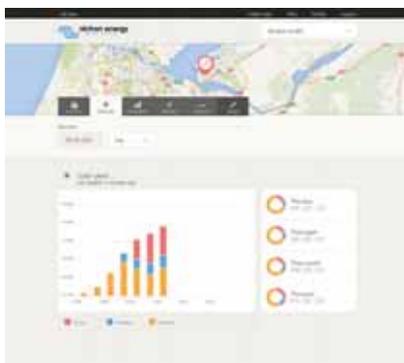
### Battery Monitor

Key tasks of the Victron Battery Monitor are measuring charge and discharge currents as well as calculating the state-of-charge and time-to-go of a battery. An alarm is sent when certain limits are exceeded (such as an excessive discharge). It is also possible for the battery monitor to exchange data with the Victron Global Remote. This includes sending alarms.



### Color Control GX

The Color Control GX provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, Multi's, Quattro's, MPPT 150/70, BMV-600 series, BMV-700 series, Skylla-i, Lynx Ion and even more.



### VRM Online Portal

Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal.

To get an impression of the VRM Online Portal, visit <https://vrm.victronenergy.com>, and use the 'Take a look inside' button. The portal is free of charge.

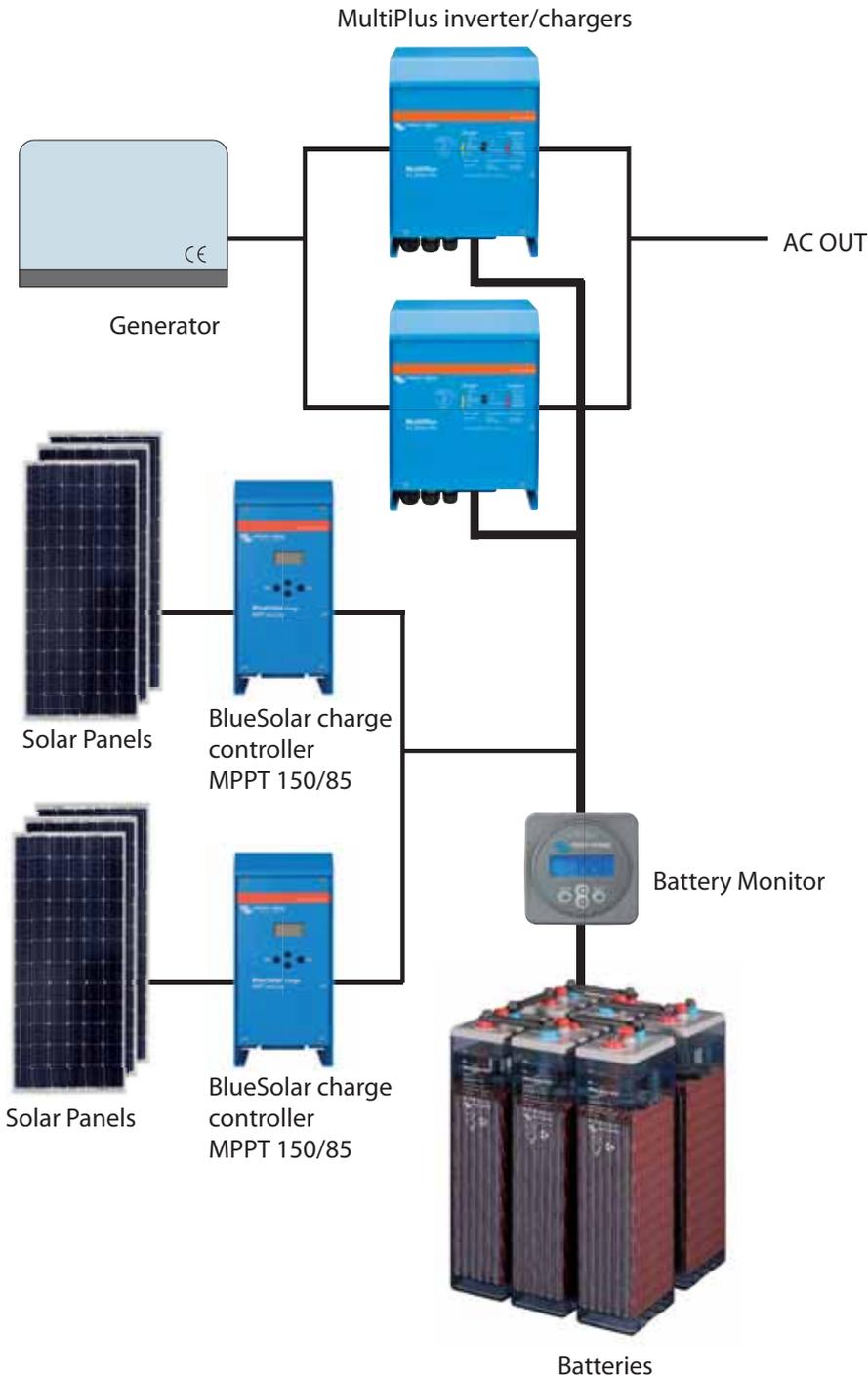


### Digital Multi Control Panel

With this panel you are able to remotely monitor and control Multiplus and Quattro systems. A simple turn of the button can limit the power supply of for example a generator and/or shore-side current. The setting range is up to 200A.

# MORE POWER

The AC and DC systems which are shown in this brochure are examples of the various possibilities that Victron Energy offers. As illustrated they vary from very simple to very extensive solutions. Our products can be put in parallel, or in three-phase configurations, if the necessary power is too high for a single unit.

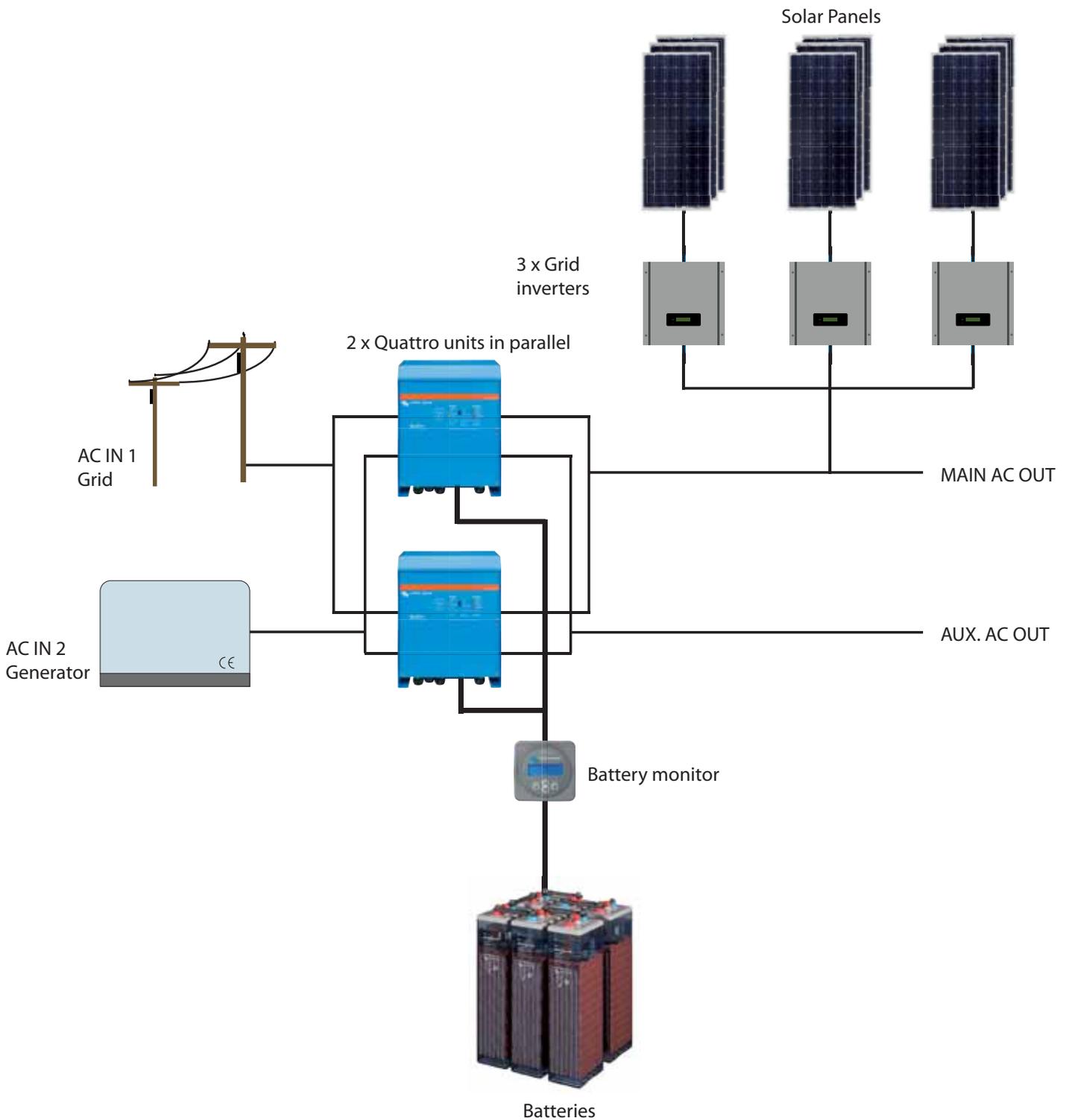


**Easy to configure**  
Configuring parallel and three phase systems is easy. Our VEConfigure software tool allows the installer to put components together, without any hardware changes or dipswitches. Just using standard products.

**1. DC system**

The illustration above shows a DC system with three charge controllers, two MultiPlus inverter/chargers configured in parallel and one generator.

# MORE POWER



## 2. AC system

The illustration above shows an AC system with three grid inverters and two Quattro's in parallel.

Note - for our newest datasheets please refer to our website:  
[www.victronenergy.com](http://www.victronenergy.com)

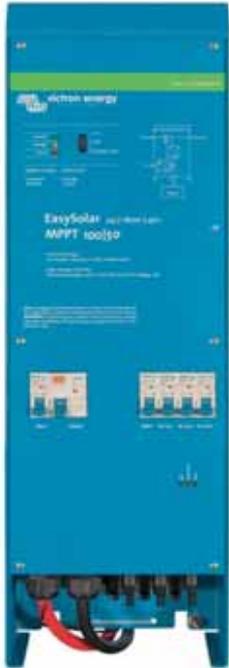


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# EASYSOLAR 12V AND 24V: THE ALL-IN-ONE SOLAR POWER SOLUTION



### All-in-one solar power solution

The EasySolar combines a MPPT solar charge controller, an inverter/charger and AC distribution in one enclosure.

The product is easy to install, with a minimum of wiring.

### The solar charge controller: Blue Solar MPPT 100/50

Up to three strings of PV panels can be connected with three sets of MC4 (PV-ST01) PV connectors.

### The inverter/charger: MultiPlus Compact 12/1600/70 or 24/1600/40

The MPPT charge controller and the MultiPlus Compact inverter/charger share the DC battery cables (included). The batteries can be charged with solar power (BlueSolar MPPT) and/or with AC power (inverter/charger) from the utility grid or a genset.

### AC distribution

The AC distribution consists of a RCD (30mA/16A) and four AC outputs protected by two 10A and two 16A circuit breakers.

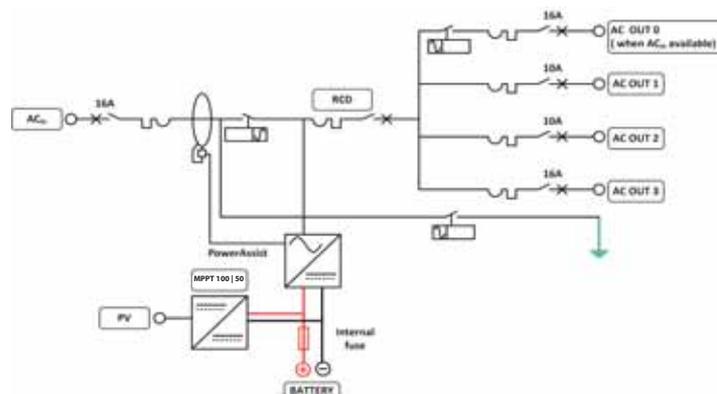
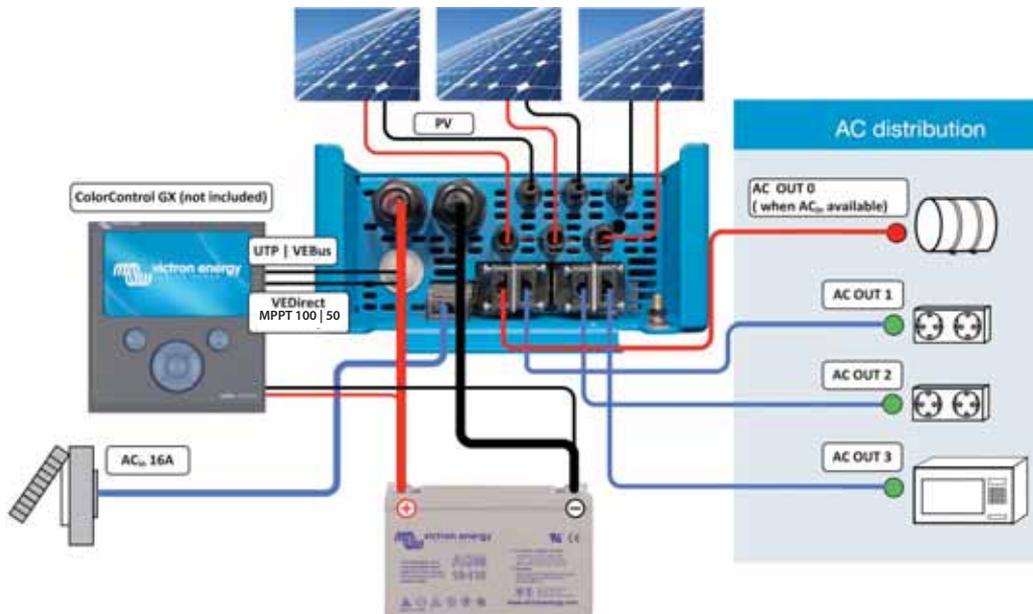
One 16A output is controlled by the AC input: it will switch on only when AC is available.

### PowerAssist

Unique PowerAssist technology protects the utility or generator supply from being overloaded by adding extra inverter power when needed.

### Unique solar application software

Several software programs (Assistants) are available to configure the system for various grid interactive or stand-alone applications. Please see <http://www.victronenergy.nl/support-and-downloads/software/>



# EASYSOLAR 12V AND 24V: THE ALL-IN-ONE SOLAR POWER SOLUTION

EasySolar	EasySolar 12/1600/70	EasySolar 24/1600/40
<b>Inverter/charger</b>		
Transfer switch	16 A	
<b>INVERTER</b>		
Input voltage range	9,5 – 17 V	19 – 33 V
“Heavy duty” output AC 0	16 A	
Output AC1, 2, 3	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)	
Cont. output power at 25 °C (3)	1600 VA / 1300 W	
Cont. output power at 40 °C	1200 W	
Peak power	3000 W	
Maximum efficiency	92%	94%
Zero-load power	8 W	10 W
Zero load power in search mode	2 W	3 W
<b>CHARGER</b>		
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz    Power factor: 1	
Charge voltage 'absorption'	14,4 / 28,8 V	
Charge voltage 'float'	13,8 / 27,6 V	
Storage mode	13,2 / 26,4 V	
Charge current house battery (4)	70 A	40 A
Charge current starter battery (A)	4	
Battery temperature sensor	yes	
Programmable relay (5)	yes	
Protection (2)	a - g	
<b>Solar Charge Controller</b>		
Maximum output current	50 A	
Maximum PV power, 6a,b)	700 W	1400 W
Maximum PV open circuit voltage	100 V	100 V
Maximum efficiency	98 %	
Self-consumption	10 mA	
Charge voltage 'absorption', default setting	14,4 V	28,8 V
Charge voltage 'float', default setting	13,8 V	27,6 V
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Protection	a - g	
<b>COMMON CHARACTERISTICS</b>		
Operating temp. range	-20 to +50°C (fan assisted cooling)	
Humidity (non condensing):	max 95%	
<b>ENCLOSURE</b>		
Material & Colour	aluminium (blue RAL 5012)	
Protection category	IP 21	
Battery-connection	Battery cables of 1.5 meter	
PV connection	Three sets of MC4 (PV-ST01) PV connectors.	
230 V AC-connection	G-ST18i connector	
Weight	15 kg	
Dimensions (hxwx d)	745 x 214 x 110 mm	
<b>STANDARDS</b>		
Safety	EN 60335-1, EN 60335-2-29, EN 62109	
Emission / Immunity	EN55014-1, EN 55014-2, EN 61000-3-3	
Automotive Directive	2004/104/EC	
1) Can be adjusted to 60Hz and to 240V 2) Protection a. Output short circuit b. Overload c. Battery voltage too high d. Battery voltage too low e. Temperature too high f. 230VAC on inverter output g. Input voltage ripple too high	3) Non linear load, crest factor 3:1 4) At 25 °C ambient 5) Programmable relay which can be set for general alarm, DC undervoltage or genset start signal function 6a) If more PV power is connected, the controller will limit input power to 700W resp. 1400W 6b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V	

# PHOENIX INVERTERS 180VA - 1200VA 120V AND 230V



Phoenix Inverter  
12/180

### SinusMax – Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with optimized efficiency but without compromise in performance. Employing hybrid HF technology, the result is a top quality product with compact dimensions, light in weight and capable of supplying power, problem-free, to any load.

### Extra start-up power

A unique feature of the SinusMax technology is very high start-up power. Conventional high frequency technology does not offer such extreme performance. Phoenix inverters, however, are well suited to power up difficult loads such as computers and low power electric tools.

### To transfer the load to another AC source: the automatic transfer switch

For our lower power models we recommend the use of our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption.



Phoenix Inverter  
12/800 with Schuko socket

### LED diagnosis

Please see manual for a description.

### Remote on/off switch

Connector for remote on/off switch available on all models.

### DIP switch for 50/60Hz selection (48/350 model only)

### Available with different output sockets

Please see pictures below.



Phoenix Inverter 12/350  
with IEC-320 sockets



Phoenix Inverter 12/180  
with Schuko socket



Phoenix Inverter 12/180  
with Nema 5-15R sockets



Phoenix Inverter 12/800  
with IEC-320 socket



Phoenix Inverter 12/800  
with Schuko socket



Phoenix Inverter 12/800  
with BS 1363 socket



Phoenix Inverter 12/800  
with AN/NZS 3112 socket



Phoenix Inverter 12/800  
with Nema 5-15R socket

# PHOENIX INVERTERS 180VA - 1200VA 120V AND 230V

Phoenix Inverter	12 Volt 24 Volt 48 Volt	12/180 24/180	12/350 24/350 48/350	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. AC power at 25 °C (VA) (3)		180	350	800	1200
Cont. power at 25 °C / 40 °C (W)		175 / 150	300 / 250	700 / 650	1000 / 900
Peak power (W)		350	700	1600	2400
Output AC voltage / frequency (4)		110VAC or 230VAC +/- 3% 50Hz or 60Hz +/- 0,1%			
Input voltage range (V DC)		10,5 - 15,5 / 21,0 - 31,0 / 42,0 - 62,0		9,2 - 17,3 / 18,4 - 34,0 / 36,8 - 68,0	
Low battery alarm (V DC)		11,0 / 22 / 44		10,9 / 21,8 / 43,6	
Low battery shut down (V DC)		10,5 / 21 / 42		9,2 / 18,4 / 36,8	
Low battery auto recovery (V DC)		12,5 / 25 / 50		12,5 / 25 / 50	
Max. efficiency (%)		87 / 88	89 / 89 / 90	91 / 93 / 94	92 / 94 / 94
Zero-load power (W)		2,6 / 3,8	3,1 / 5,0 / 6,0	6 / 5 / 4	6 / 5 / 6
Zero-load power in search mode		n. a.	n. a.	2	2
Protection (2)		a - e			
Operating temperature range		-40 to +50°C (fan assisted cooling)			
Humidity (non condensing)		max 95%			
<b>ENCLOSURE</b>					
Material & Colour		aluminium (blue Ral 5012)			
Battery-connection		1)	1)	1)	1)
Standard AC outlets		230V: IEC-320 (IEC-320 plug included), CEE 7/4 (Schuko) 120V: Nema 5-15R			
Other outlets (at request)		BS 1363 (United Kingdom) AN/NZS 3112 (Australia, New Zealand)			
Protection category		IP 20			
Weight (kg / lbs)		2,7 / 5,4	3,5 / 7,7	6,5 / 14,3	8,5 / 18,7
Dimensions (hxxwd in mm) (hxxwd in inches)		72x132x200 2.8x5.2x7.9	72x155x237 2.8x6.1x9.3	108x165x305 4.2x6.4x11.9	108x165x305 4.2x6.4x11.9
<b>ACCESSORIES</b>					
Remote on-off switch		Two pole connector			
Automatic transfer switch		Filax			
<b>STANDARDS</b>					
Safety		EN 60335-1			
Emission Immunity		EN55014-1 / EN 55014-2 / EN 61000-6-2 / EN 61000-6-3			
1) Battery cables of 1.5 meter (12/180 with cigarette plug) 2) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low e) temperature too high		3) Non linear load, crest factor 3:1 4) Frequency can be set by DIP switch (48/350 model only)			



### Battery Alarm

An excessively high or low battery voltage is indicated by an audible and visual alarm, and a relay for remote signalling.



### BMV Battery Monitor

The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

## PHOENIX INVERTERS 1200VA - 5000VA 230V



**Phoenix Inverter  
24/5000**

### SinusMax - Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with optimised efficiency but without compromise in performance. Employing hybrid HF technology, the result is a top quality product with compact dimensions, light in weight and capable of supplying power, problem-free, to any load.

### Extra start-up power

A unique feature of the SinusMax technology is very high start-up power. Conventional high frequency technology does not offer such extreme performance. Phoenix inverters, however, are well suited to power up difficult loads such as refrigeration compressors, electric motors and similar appliances.

### Virtually unlimited power thanks to parallel and 3-phase operation capability

Up to 6 units inverters can operate in parallel to achieve higher power output. Six 24/5000 units, for example, will provide 24kW / 30kVA output power. Operation in 3-phase configuration is also possible.

### To transfer the load to another AC source: the automatic transfer switch

If an automatic transfer switch is required we recommend using the MultiPlus inverter/charger instead. The switch is included in these products and the charger function of the MultiPlus can be disabled. Computers and other electronic equipment will continue to operate without disruption because the MultiPlus features a very short switchover time (less than 20 milliseconds).

### Computer interface

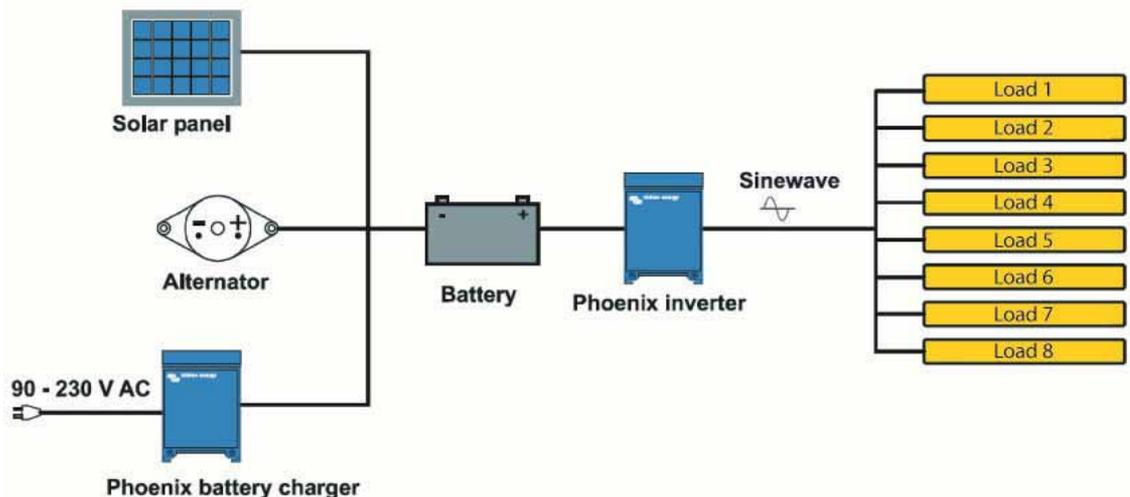
All models have a RS-485 port. All you need to connect to your PC is our MK2 interface (see under accessories). This interface takes care of galvanic isolation between the inverter and the computer, and converts from RS-485 to RS-232. A RS-232 to USB conversion cable is also available. Together with our VEConfigure software, which can be downloaded free of charge from our website, all parameters of the inverters can be customised. This includes output voltage and frequency, over and under voltage settings and programming the relay. This relay can for example be used to signal several alarm conditions, or to start a generator. The inverters can also be connected to VENet, the new power control network of Victron Energy, or to other computerised monitoring and control systems.

### New applications of high power inverters

The possibilities of paralleled high power inverters are truly amazing. For ideas, examples and battery capacity calculations please refer to our book "Energy Unlimited" (available free of charge from Victron Energy and downloadable from [www.victronenergy.com](http://www.victronenergy.com)).



**Phoenix Inverter Compact  
24/1600**



# PHOENIX INVERTERS 1200VA - 5000VA 230V

Phoenix Inverter	C12/1200 C24/1200	C12/1600 C24/1600	C12/2000 C24/2000	12/3000 24/3000 48/3000	24/5000 48/5000
Parallel and 3-phase operation	Yes				
<b>INVERTER</b>					
Input voltage range (V DC)	9,5 – 17V 19 – 33V 38 – 66V				
Output	Output voltage: 230 VAC ±2% Frequency: 50 Hz ± 0,1% (1)				
Cont. output power at 25 °C (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25 °C (W)	1000	1300	1600	2500	4500
Cont. output power at 40 °C (W)	900	1200	1450	2200	4000
Peak power (W)	2400	3000	4000	6000	10000
Max. efficiency 12/ 24 /48 V (%)	92 / 94	92 / 94	92 / 92	93 / 94 / 95	94 / 95
Zero-load power 12 / 24 / 48 V (W)	8 / 10	8 / 10	9 / 11	15 / 15 / 16	25 / 25
Zero-load power in AES mode (W)	5 / 8	5 / 8	7 / 9	10 / 10 / 12	20 / 20
Zero-load power in Search mode (W)	2 / 3	2 / 3	3 / 4	4 / 5 / 5	5 / 6
<b>GENERAL</b>					
Programmable relay (3)	Yes				
Protection (4)	a - g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration				
Remote on-off	Yes				
Common Characteristics	Operating temperature range: -40 to +50 °C (fan assisted cooling) Humidity (non condensing): max 95%				
<b>ENCLOSURE</b>					
Common Characteristics	Material & Colour: aluminum (blue RAL 5012) Protection category: IP 21				
Battery-connection	battery cables of 1.5 meter included	M8 bolts	2+2 M8 bolts		
230 V AC-connection	G-ST18i plug	Spring-clamp	Screw terminals		
Weight (kg)	10	12	18	30	
Dimensions (hxwhd in mm)	375x214x110	520x255x125	362x258x218	444x328x240	
<b>STANDARDS</b>					
Safety	EN 60335-1				
Emission Immunity	EN 55014-1 / EN 55014-2				
1) Can be adjusted to 60Hz and to 240V 2) Non linear load, crest factor 3:1 3) Programmable relay that can a.o. be set for general alarm, DC undervoltage or genset start/stop function. AC rating: 230V/4A DC rating: 4a up to 35VDC, 1A up to 60VDC	4) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low e) temperature too high f) 230 V AC on inverter output g) input voltage ripple too high				



### Phoenix Inverter Control

This panel can also be used on a MultiPlus inverter/charger when an automatic transfer switch but no charger function is desired. The brightness of the LEDs is automatically reduced during night time.



### Computer controlled operation and monitoring

Several interfaces are available:

- **MK2.2 VE.Bus to RS232 converter**  
Connects to the RS232 port of a computer (see 'A guide to VEConfigure')
- **MK2-USB VE.Bus to USB converter**  
Connects to a USB port (see 'A guide to VEConfigure')
- **VE.Net to VE.Bus converter**  
Interface to VE.Net (see VE.Net documentation)
- **VE.Bus to NMEA 2000 converter**
- **Victron Global Remote**  
The Global Remote is a modem which sends alarms, warnings and system status reports to cellular phones via text messages (SMS). It can also log data from Victron Battery Monitors, Multi's, Quattro's and Inverters to a website through a GPRS connection. Access to this website is free of charge.
- **Victron Ethernet Remote**  
To connect to Ethernet.



### BMV Battery Monitor

The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge / discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

Several models available (see battery monitor documentation).

# MULTIPLUS INVERTER/CHARGER 800VA- 5KVA 230V

## Lithium Ion battery compatible



**MultiPlus**  
24/3000/70

### Multi-functional, with intelligent power management

The MultiPlus is a powerful true sine wave inverter, a sophisticated battery charger that features adaptive charge technology, and a high-speed AC transfer switch in a single compact enclosure. Next to these primary functions, the MultiPlus has several advanced features, as outlined below.

### Two AC Outputs

The main output has no-break functionality. The MultiPlus takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption. The second output is live only when AC is available on one of the inputs of the MultiPlus. Loads that should not discharge the battery, like a water heater for example, can be connected to this output (second output available on models rated at 3kVA and more).

### Virtually unlimited power thanks to parallel operation

Up to 6 Multi's can operate in parallel to achieve higher power output. Six 24/5000/120 units, for example, will provide 25 kW / 30 kVA output power with 720 Amps charging capacity.

### Three phase capability

In addition to parallel connection, three units of the same model can be configured for three-phase output. But that's not all: up to 6 sets of three units can be parallel connected for a huge 75 kW / 90 kVA inverter and more than 2000 Amps charging capacity.

### PowerControl - Dealing with limited generator, shore side or grid power

The MultiPlus is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (nearly 10A per 5kVA Multi at 230VAC). With the Multi Control Panel a maximum generator or shore current can be set. The MultiPlus will then take account of other AC loads and use whatever is extra for charging, thus preventing the generator or shore supply from being overloaded.

### PowerAssist - Boosting the capacity of shore or generator power

This feature takes the principle of PowerControl to a further dimension. It allows the MultiPlus to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

### Four stage adaptive charger and dual bank battery charging

The main output provides a powerful charge to the battery system by means of advanced 'adaptive charge' software. The software fine-tunes the three stage automatic process to suit the condition of the battery, and adds a fourth stage for long periods of float charging. The adaptive charge process is described in more detail on the Phoenix Charger datasheet and on our website, under Technical Information. In addition to this, the MultiPlus will charge a second battery using an independent trickle charge output intended for a main engine or generator starter battery (trickle charge output available on 12V and 24V models only).

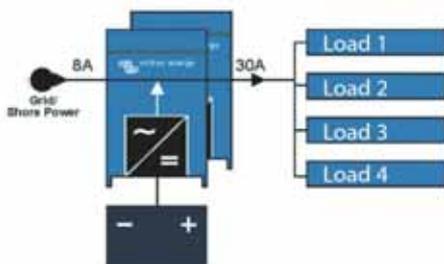
### System configuring has never been easier

After installation, the MultiPlus is ready to go. If settings have to be changed, this can be done in a matter of minutes with a new DIP switch setting procedure. Even parallel and 3-phase operation can be programmed with DIP switches: no computer needed! Alternatively, VE.Net can be used instead of the DIP switches. And sophisticated software (VE.Bus Quick Configure and VE.Bus System Configurator) is available to configure several new, advanced, features.

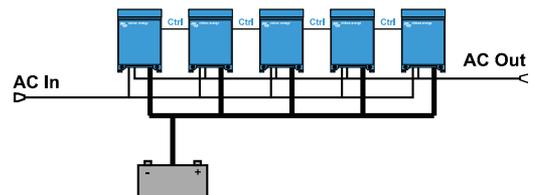


**MultiPlus Compact**  
12/2000/80

### PowerAssist with 2x MultiPlus in parallel



### Five parallel units: output power 25 kVA



# MULTIPLUS INVERTER/CHARGER 800VA - 5kVA 230V

MultiPlus	12 Volt 24 Volt 48 Volt	C 12/800/35 C 24/ 800/16	C 12/1200/50 C 24/1200/25	C 12/1600/70 C 24/1600/40	C 12/2000/80 C 24/2000/50	12/3000/120 24/3000/70 48/3000/35	24/5000/120 48/5000/70
<b>PowerControl</b>		<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>PowerAssist</b>		<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>Transfer switch (A)</b>		<b>16</b>	<b>16</b>	<b>16</b>	<b>30</b>	<b>16 or 50</b>	<b>100</b>
<b>Parallel and 3-phase operation</b>		<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>
<b>INVERTER</b>							
Input voltage range (V DC)		9,5 – 17 V		19 – 33 V	38 – 66 V		
Output		Output voltage: 230 VAC ± 2%			Frequency: 50 Hz ± 0,1% (1)		
Cont. output power at 25 °C (VA) (3)		800	1200	1600	2000	3000	5000
Cont. output power at 25 °C (W)		700	1000	1300	1600	2500	4500
Cont. output power at 40 °C (W)		650	900	1200	1450	2200	4000
Peak power (W)		1600	2400	3000	4000	6000	10.000
Maximum efficiency (%)		92 / 94	93 / 94	93 / 94	93 / 94	93 / 94 / 95	94 / 95
Zero-load power (W)		8 / 10	8 / 10	8 / 10	9 / 11	15 / 15 / 16	25 / 25
Zero load power in AES mode (W)		5 / 8	5 / 8	5 / 8	7 / 9	10 / 10 / 12	20 / 20
Zero load power in Search mode (W)		2 / 3	2 / 3	2 / 3	3 / 4	4 / 5 / 5	5 / 6
<b>CHARGER</b>							
AC Input		Input voltage range: 187-265 VAC		Input frequency: 45 – 65 Hz		Power factor: 1	
Charge voltage 'absorption' (V DC)		14,4 / 28,8 / 57,6					
Charge voltage 'float' (V DC)		13,8 / 27,6 / 55,2					
Storage mode (V DC)		13,2 / 26,4 / 52,8					
Charge current house battery (A) (4)		35 / 16	50 / 25	70 / 40	80 / 50	120 / 70 / 35	120 / 70
Charge current starter battery (A)		4 (12V and 24V models only)					
Battery temperature sensor		yes					
<b>GENERAL</b>							
Auxiliary output (5)		n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (25A)
Programmable relay (6)		Yes					
Protection (2)		a - g					
VE.Bus communication port		For parallel and three phase operation, remote monitoring and system integration					
General purpose com. port (7)		n. a.	n. a.	n. a.	n. a.	Yes (8)	Yes
Remote on-off		Yes					
Common Characteristics		Operating temp. range: -40 to +50°C (fan assisted cooling) Humidity (non condensing): max 95%					
<b>ENCLOSURE</b>							
Common Characteristics		Material & Colour: aluminium (blue RAL 5012)			Protection category: IP 21		
Battery-connection		battery cables of 1.5 meter			M8 bolts	Four M8 bolts (2 plus and 2 minus connections)	
230 V AC-connection		G-ST18i connector			Spring-clamp	Screw terminals 13 mm <sup>2</sup> (6 AWG)	
Weight (kg)		10	10	10	12	18	30
Dimensions (hxxwxd in mm)		375x214x110			520x255x125	362x258x218	444x328x240
<b>STANDARDS</b>							
Safety		EN 60335-1, EN 60335-2-29					
Emission, Immunity		EN55014-1, EN 55014-2, EN 61000-3-3					
Automotive Directive		2004/104/EC					
1) Can be adjusted to 60 HZ; 120 V 60 Hz on request		3) Non linear load, crest factor 3:1					
2) Protection key:		4) At 25 °C ambient					
a) output short circuit		5) Switches off when no external AC source available					
b) overload		6) Programmable relay that can a. o. be set for general alarm,					
c) battery voltage too high		DC undervoltage or genset start/stop function					
d) battery voltage too low		AC rating: 230V/4A					
e) temperature too high		DC rating: 4A up to 35VDC, 1A up to 60VDC					
f) 230 VAC on inverter output		7) A. o. to communicate with a Lithium Ion battery BMS					
g) input voltage ripple too high		8) Models with 16A transfer switch only (see Quattro for 50A transfer switch)					



### Digital Multi Control

A convenient and low cost solution for remote monitoring, with a rotary knob to set Power Control and Power Assist levels.



### Blue Power Panel

Connects to a Multi or Quattro and all VE.Net devices, in particular the VE.Net Battery Controller. Graphic display of currents and voltages.



### Computer controlled operation and monitoring

Several interfaces are available:

- **MK2.2 VE.Bus to RS232 converter**  
Connects to the RS232 port of a computer (see 'A guide to VEConfigure')
- **MK2-USB VE.Bus to USB converter**  
Connects to a USB port (see 'A guide to VEConfigure')
- **VE.Net to VE.Bus converter**  
Interface to VE.Net (see VE.Net documentation)
- **VE.Bus to NMEA 2000 converter**
- **Victron Global Remote**  
The Global Remote is a modem which sends alarms, warnings and system status reports to cellular phones via text messages (SMS). It can also log data from Victron Battery Monitors, Multi's, Quattro's and Inverters to a website through a GPRS connection. Access to this website is free of charge.
- **Victron Ethernet Remote**  
To connect to Ethernet.



### BMV Battery Monitor

The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery. Several models available (see battery monitor documentation).

# QUATTRO INVERTER/CHARGER 3KVA - 10KVA 230V

## Lithium Ion battery compatible

### Two AC inputs with integrated transfer switch

The Quattro can be connected to two independent AC sources, for example shore-side power and a generator, or two generators. The Quattro will automatically connect to the active source.

### Two AC Outputs

The main output has no-break functionality. The Quattro takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption. The second output is live only when AC is available on one of the inputs of the Quattro. Loads that should not discharge the battery, like a water heater for example, can be connected to this output.

### Virtually unlimited power thanks to parallel operation

Up to 10 Quattro units can operate in parallel. Ten units 48/10000/140, for example, will provide 90kW / 100kVA output power and 1400 Amps charging capacity.

### Three phase capability

Three units can be configured for three-phase output. But that's not all: up to 10 sets of three units can be parallel connected to provide 270kW / 300kVA inverter power and more than 4000A charging capacity.

### PowerControl – Dealing with limited generator, shore-side or grid power

The Quattro is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (16A per 5kVA Quattro at 230VAC). A current limit can be set on each AC input. The Quattro will then take account of other AC loads and use whatever is spare for charging, thus preventing the generator or shore supply from being overloaded.

### PowerAssist – Boosting shore or generator power

This feature takes the principle of PowerControl to a further dimension allowing the Quattro to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the Quattro will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

### Solar energy: AC power available even during a grid failure

The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.

### System configuring has never been easier

After installation, the Quattro is ready to go.

If settings have to be changed, this can be done in a matter of minutes with a new DIP switch setting procedure. Even parallel and 3-phase operation can be programmed with DIP switches: no computer needed! Alternatively, VE.Net can be used instead of the DIP switches.

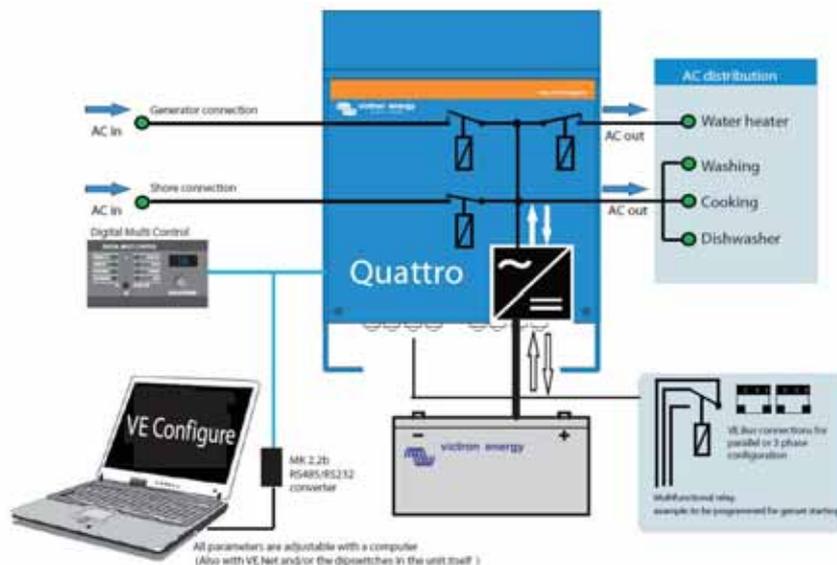
And sophisticated software (VE.Bus Quick Configure and VE.Bus System Configurator) is available to configure several new, advanced, features.



**Quattro**  
48/5000/70-100/100



**Quattro**  
24/3000/70-50/30



# QUATTRO INVERTER/CHARGER 3KVA - 10KVA 230V

Quattro	12/3000/120-50/30 24/3000/70-50/30	12/5000/220-100/100 24/5000/120-100/100 48/5000/70-100/100	24/8000/200-100/100 48/8000/110-100/100	48/10000/140-100/100
PowerControl / PowerAssist	Yes			
Integrated Transfer switch	Yes			
AC inputs (2x)	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1			
Maximum feed through current (A)	50 / 30	2x100	2x100	2x100
<b>INVERTER</b>				
Input voltage range (V DC)	9,5 – 17V 19 – 33V 38 – 66V			
Output (1)	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1%			
Cont. output power at 25 °C (VA) (3)	3000	5000	8000	10000
Cont. output power at 25 °C (W)	2500	4500	7000	9000
Cont. output power at 40 °C (W)	2200	4000	6300	8000
Peak power (W)	6000	10000	16000	20000
Maximum efficiency (%)	93 / 94	94 / 94 / 95	94 / 96	96
Zero-load power (W)	15 / 15	25 / 25 / 25	30 / 35	35
Zero load power in AES mode (W)	10 / 10	20 / 20 / 20	25 / 30	30
Zero load power in Search mode (W)	4 / 5	5 / 5 / 6	8 / 10	10
<b>CHARGER</b>				
Charge voltage 'absorption' (V DC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6
Charge voltage 'float' (V DC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2
Storage mode (V DC)	13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8
Charge current house battery (A) (4)	120 / 70	220 / 120 / 70	200 / 110	140
Charge current starter battery (A)	4 (12V and 24V models only)			
Battery temperature sensor	Yes			
<b>GENERAL</b>				
Auxiliary output (A) (5)	25	50	50	50
Programmable relay (6)	1x	3x	3x	3x
Protection (2)	a-g			
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration			
General purpose com. port (7)	1x	2x	2x	2x
Remote on-off	Yes			
Common Characteristics	Operating temp.: -40 to +50 °C Humidity (non condensing): max. 95%			
<b>ENCLOSURE</b>				
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP 21			
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)			
230 V AC-connection	Screw terminals 13 mm <sup>2</sup> (6 AWG)	Bolts M6	Bolts M6	Bolts M6
Weight (kg)	19	34 / 30 / 30	45/41	45
Dimensions (hwxwd in mm)	362 x 258 x 218	470 x 350 x 280 444 x 328 x 240 444 x 328 x 240	470 x 350 x 280	470 x 350 x 280
<b>STANDARDS</b>				
Safety	EN 60335-1, EN 60335-2-29			
Emission, Immunity	EN55014-1, EN 55014-2, EN 61000-3-3, EN 61000-6-3, EN 61000-6-2, EN 61000-6-1			
1) Can be adjusted to 60 HZ; 120 V 60 Hz on request	3) Non linear load, crest factor 3:1			
2) Protection key:	4) At 25 °C ambient			
a) output short circuit	5) Switches off when no external AC source available			
b) overload	6) Programmable relay that can a. o. be set for general alarm, DC undervoltage or genset start/stop function			
c) battery voltage too high	AC rating: 230V/4A			
d) battery voltage too low	DC rating: 4A up to 35VDC, 1A up to 60VDC			
e) temperature too high	7) A. o. to communicate with a Lithium Ion battery BMS			
f) 230 VAC on inverter output				
g) input voltage ripple too high				



### Digital Multi Control Panel

A convenient and low cost solution for remote monitoring, with a rotary knob to set Power Control and Power Assist levels.



### Blue Power Panel

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Several interfaces are available:

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The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery. Several models available (see battery monitor documentation).

# MULTIPLUS INVERTER/CHARGER 2KVA AND 3KVA 120V

## Lithium Ion battery compatible



**MultiPlus**  
24/3000/70



**MultiPlus Compact**  
12/2000/80

### Multi-functional, with intelligent power management

The MultiPlus is a powerful true sine wave inverter, a sophisticated battery charger that features adaptive charge technology, and a high-speed AC transfer switch in a single compact enclosure. Next to these primary functions, the MultiPlus has several advanced features, as outlined below.

### Two AC Outputs

The main output has no-break functionality. The MultiPlus takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption.

The second output is live only when AC is available on the input of the MultiPlus. Loads that should not discharge the battery, like a water heater for example, can be connected to this output (second output available on models rated at 3kVA and more).

### Virtually unlimited power thanks to parallel operation

Up to six Multi's can operate in parallel to achieve higher power output. Six 24/3000/70 units, for example, provide 15kW / 18kVA output power with 420 Amps of charging capacity.

### Three phase capability

In addition to parallel connection, three units can be configured for three-phase output. But that's not all: with three strings of six parallel units a 45kW / 54kVA three phase inverter and 1260A charger can be built.

### Split phase options

Two units can be stacked to provide 120-0-120V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30kW / 36kVA of split phase power.

Alternatively, a split phase AC source can be obtained by connecting our autotransformer (see data sheet on [www.victronenergy.com](http://www.victronenergy.com)) to a 'European' inverter programmed to supply 240V / 60Hz.

### PowerControl - Dealing with limited generator, shore side or grid power

The MultiPlus is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (nearly 20A per 3kVA MultiPlus at 120VAC). With the Multi Control Panel a maximum generator or shore current can be set. The MultiPlus will then take account of other AC loads and use whatever is extra for charging, thus preventing the generator or shore supply from being overloaded.

### PowerAssist - Boosting the capacity of shore or generator power

This feature takes the principle of PowerControl to a further dimension. It allows the MultiPlus to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

### Four stage adaptive charger and dual bank battery charging

The main output provides a powerful charge to the battery system by means of advanced 'adaptive charge' software. The software fine-tunes the three stage automatic process to suit the condition of the battery, and adds a fourth stage for long periods of float charging. The adaptive charge process is described in more detail on the Phoenix Charger datasheet and on our website, under Technical Information. In addition to this, the MultiPlus will charge a second battery using an independent trickle charge output intended for a main engine or generator starter battery.

### System configuring has never been easier

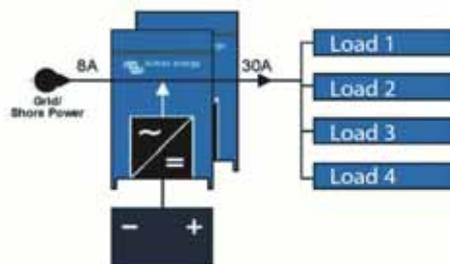
After installation, the MultiPlus is ready to go.

If settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure. Even parallel and 3-phase operation can be programmed with DIP switches: no computer needed!

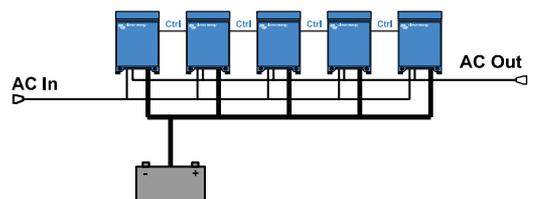
Alternatively, VE.Net can be used instead of the DIP switches.

And sophisticated software (VE.Bus Quick Configure and VE.Bus System Configurator) is available to configure several new, advanced, features.

### PowerAssist with 2x MultiPlus in parallel



### Five parallel units: output power 12,5 kW



# MULTIPLUS INVERTER/CHARGER 2KVA AND 3KVA 120V

MultiPlus	12 Volt 24 Volt	12/2000/80 24/2000/50	12/3000/120 24/3000/70
<b>PowerControl</b>			<b>Yes</b>
<b>PowerAssist</b>			<b>Yes</b>
<b>Transfer switch (A)</b>			<b>50</b>
<b>Parallel and 3-phase operation</b>			<b>Yes</b>
<b>INVERTER</b>			
Input voltage range (V DC)		9,5 – 17 V	19 – 33 V
Output		Output voltage: 120 VAC ± 2%	Frequency: 60 Hz ± 0,1% (1)
Cont. output power at 75 °F (VA) (3)		2000	3000
Cont. output power at 75 °F (W)		1600	2500
Cont. output power at 100 °F (W)		1450	2200
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero-load power (W)		9 / 11	15 / 15
Zero load power in AES mode (W)		7 / 8	10 / 10
Zero load power in Search mode (W)		3 / 4	4 / 5
<b>CHARGER</b>			
AC Input		Input voltage range: 95-140 VAC	Input frequency: 45 – 65 Hz Power factor: 1
Charge voltage 'absorption' (V DC)			14,4 / 28,8
Charge voltage 'float' (V DC)			13,8 / 27,6
Storage mode (V DC)			13,2 / 26,4
Charge current house battery (A) (4)		80 / 50	120 / 70
Charge current starter battery (A)			4
Battery temperature sensor			yes
<b>GENERAL</b>			
Auxiliary output (5)		n. a.	Yes (32A)
Programmable relay (6)		Yes (1x)	Yes (3x)
Protection (2)			a - g
VE.Bus communication port		For parallel and three phase operation, remote monitoring and system integration	
General purpose com. port (7)		n. a.	Yes (2x)
Remote on-off			Yes
Common Characteristics		Operating temp. range: 0 - 120°F (fan assisted cooling)	Humidity (non condensing): max 95%
<b>ENCLOSURE</b>			
Common Characteristics		Material & Colour: aluminum (blue RAL 5012)	Protection category: IP 21
Battery-connection		M8 bolts	M8 bolts (2 plus and 2 minus connections)
120 V AC-connection		Screw-terminal 6 AWG (13mm <sup>2</sup> )	Screw-terminal 6 AWG (13mm <sup>2</sup> )
Weight		13kg 25 lbs	19kg 40 lbs
Dimensions (hwxwd in mm and inches)		520x255x125 mm 20.5x10.0x5.0 inch	362x258x218 mm 14.3x10.2x8.6 inch
<b>STANDARDS</b>			
Safety		EN 60335-1, EN 60335-2-29	
Emission Immunity		EN55014-1, EN 55014-2, EN 61000-3-3	
1) Can be adjusted to 60 Hz; 120 V 60 Hz on request		3) Non linear load, crest factor 3:1	
2) Protection key:		4) At 75 °F ambient	
a) output short circuit		5) Switches off when no external AC source available	
b) overload		6) Programmable relay that can a. o. be set for general alarm,	
c) battery voltage too high		DC undervoltage or genset start/stop function	
d) battery voltage too low		AC rating: 230V/4A	
e) temperature too high		DC rating: 4A up to 35VDC, 1A up to 60VDC	
f) 230 VAC on inverter output		7) A. o. to communicate with a Lithium Ion battery BMS	
g) input voltage ripple too high			



### Digital Multi Control

A convenient and low cost solution for remote monitoring, with a rotary knob to set Power Control and Power Assist levels.



### Blue Power Panel

Connects to a Multi or Quattro and all VE.Net devices, in particular the VE.Net Battery Controller. Graphic display of currents and voltages.



### Computer controlled operation and monitoring

Several interfaces are available:

- **MK2.2 VE.Bus to RS232 converter**  
Connects to the RS232 port of a computer (see 'A guide to VEConfigure')
- **MK2-USB VE.Bus to USB converter**  
Connects to a USB port (see 'A guide to VEConfigure')
- **VE.Net to VE.Bus converter**  
Interface to VE.Net (see VE.Net documentation)
- **VE.Bus to NMEA 2000 converter**
- **Victron Global Remote**  
The Global Remote is a modem which sends alarms, warnings and system status reports to cellular phones via text messages (SMS). It can also log data from Victron Battery Monitors, Multi's, Quattro's and Inverters to a website through a GPRS connection. Access to this website is free of charge.
- **Victron Ethernet Remote**  
To connect to Ethernet.



### BMV Battery Monitor

The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

# QUATTRO INVERTER/CHARGER 3KVA - 5KVA 120V

## Lithium Ion battery compatible

### Two AC inputs with integrated transfer switch

The Quattro can be connected to two independent AC sources, for example shore-side power and a generator, or two generators. The Quattro will automatically connect to the active source.

### Two AC Outputs

The main output has no-break functionality. The Quattro takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption.

The second output is live only when AC is available on one of the inputs of the Quattro. Loads that should not discharge the battery, like a water heater for example, can be connected to this output.

### Virtually unlimited power thanks to parallel operation

Up to 10 Quattro units can operate in parallel. Ten units 48/5000/70, for example, will provide 45kW / 50kVA output power and 700 Amps charging capacity.

### Three phase capability

Three units can be configured for three-phase output. But that's not all: up to 10 sets of three units can be parallel connected to provide 135kW / 150kVA inverter power and more than 2000A charging capacity.

### Split phase options

Two units can be stacked to provide 120-0-120V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30kW / 36kVA of split phase power.

Alternatively, a split phase AC source can be obtained by connecting our autotransformer (see data sheet on [www.victronenergy.com](http://www.victronenergy.com)) to a 'European' inverter programmed to supply 240V / 60Hz.

### PowerControl – Dealing with limited generator, shore-side or grid power

The Quattro is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (Up to 40A per 5kVA Quattro at 120VAC). A current limit can be set on each AC input. The Quattro will then take account of other AC loads and use whatever is spare for charging, thus preventing the generator or shore supply from being overloaded.

### PowerAssist – Boosting shore or generator power

This feature takes the principle of PowerControl to a further dimension allowing the Quattro to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the Quattro will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

### Solar energy: AC power available even during a grid failure

The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.

### System configuring has never been easier

After installation, the Quattro is ready to go.

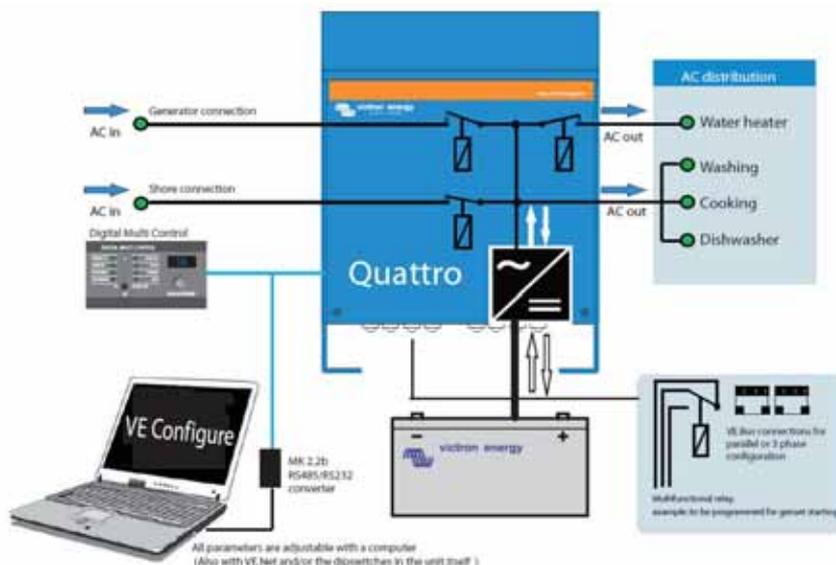
If settings have to be changed, this can be done in a matter of minutes with a new DIP switch setting procedure. Even parallel and 3-phase operation can be programmed with DIP switches: no computer needed!

Alternatively, VE.Net can be used instead of the DIP switches.

And sophisticated software (VE.Bus Quick Configure and VE.Bus System Configurator) is available to configure several new, advanced, features.



**Quattro**  
**24/5000/120-100/100**



# QUATTRO INVERTER/CHARGER 3KVA - 5KVA 120V

Quattro	12/5000/200-100/100 120V	24/5000/120-100/100 120V	48/3000/35-50/50 120V	48/5000/70-100/100 120V
PowerControl / PowerAssist	Yes			
Integrated Transfer switch	Yes			
AC inputs (2x)	Input voltage range: 90-140 VAC Input frequency: 45 – 65 Hz Power factor: 1			
Maximum feed through current (A)	2x100	2x100	2x50	2x100
<b>INVERTER</b>				
Input voltage range (V DC)	9,5 - 17	19 - 33	37,2 – 64,4	37,2 – 64,4
Output (1)	Output voltage: 120 VAC ± 2%		Frequency: 60 Hz ± 0,1%	
Cont. output power at 25 °C (VA) (3)	5000	5000	3000	5000
Cont. output power at 25 °C (W)	4500	4500	2500	4500
Cont. output power at 40 °C (W)	4000	4000	2200	4000
Peak power (W)	10000	10000	6000	10000
Maximum efficiency (%)	94	94	94	95
Zero-load power (W)	25	25	15	25
Zero load power in AES mode (W)	20	20	10	20
Zero load power in Search mode (W)	5	5	5	6
<b>CHARGER</b>				
Charge voltage 'absorption' (V DC)	14,4	28,8	57,6	57,6
Charge voltage 'float' (V DC)	13,8	27,6	55,2	55,2
Storage mode (V DC)	13,2	26,4	52,8	52,8
Charge current house battery (A) (4)	200	120	35	70
Charge current starter battery (A)	4	4	n. a.	n. a.
Battery temperature sensor	Yes			
<b>GENERAL</b>				
Auxiliary output (A) (5)	50	50	32	50
Programmable relay (6)	3x	3x	3x	3x
Protection (2)	a-g			
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration			
General purpose com. port (7)	Yes, 2x			
Remote on-off	Yes			
Common Characteristics	Operating temp.: -20 to +50 °C (0 - 120°F) Humidity (non condensing): max. 95%			
<b>ENCLOSURE</b>				
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP 21			
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)			
230 V AC-connection	M6 bolts	M6 bolts	Screw terminals 13 mm <sup>2</sup> (6 AWG)	M6 bolts
Weight (kg)	75 lb 34 kg	66 lb 30 kg	42 lb 19 kg	66 lb 30 kg
Dimensions (hwxwd)	18,5 x 14,0 x 11,2 inch 470 x 350 x 280 mm	17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	14.3x10.2x8.6 inch 362x258x218 mm	17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm
<b>STANDARDS</b>				
Safety	EN 60335-1, EN 60335-2-29			
Emission, Immunity	EN55014-1, EN 55014-2, EN 61000-3-3			
1) Can be adjusted to 50 Hz	3) Non linear load, crest factor 3:1			
2) Protection key:	4) At 25 °C ambient 5) Switches off when no external AC source available			
a) output short circuit	5) Switches off when no external AC source available			
b) overload	6) Programmable relay that can be set for general alarm, DC undervoltage or genset start/stop function			
c) battery voltage too high	AC rating: 120V/4A			
d) battery voltage too low	DC rating: 4A up to 35VDC, 1A up to 60VDC			
e) temperature too high	7) A. o. to communicate with a Lithium Ion battery BMS			
f) 120 VAC on inverter output				
g) input voltage ripple too high				



### Digital Multi Control

A convenient and low cost solution for remote monitoring, with a rotary knob to set Power Control and Power Assist levels.



### Blue Power Panel

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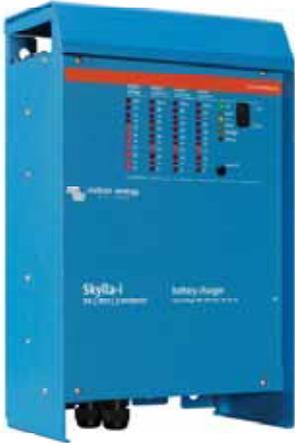


### BMV Battery Monitor

The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

## SKYLLA-I BATTERY CHARGER 24V

### Li-Ion ready



**Skylla-i 24/100 (3)**



**Skylla-i 24/100 (1+1)**

#### **Skylla-i (1+1): two outputs to charge 2 battery banks**

The Skylla-i (1+1) features 2 isolated outputs. The second output, limited to approximately 4 A and with a slightly lower output voltage, is intended to top up a starter battery.

#### **Skylla-i (3): three full current outputs to charge 3 battery banks**

The Skylla-i (3) features 3 isolated outputs. All outputs can supply the full rated output current.

#### **Rugged**

Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.

Circuit boards are protected with an acrylic coating for maximum corrosion resistance.

Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

#### **Flexible**

Next to a CAN bus (NMEA2000) interface, a rotary switch, DIP switches and potentiometers are available to adapt the charge algorithm to a particular battery and its conditions of use.

Please refer to the manual for a complete overview of the possibilities

#### **Important features:**

##### **Synchronised parallel operation**

Several chargers can be synchronised with the CAN bus interface. This is achieved by simply interconnecting the chargers with RJ45 UTP cables. Please see the manual for details.

##### **The right amount of charge for a lead-acid battery: variable absorption time**

When only shallow discharges occur the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.

##### **Preventing damage due to excessive gassing: the BatterySafe mode**

If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the Skylla-i will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached

##### **Less maintenance and aging when the battery is not in use: the Storage mode**

The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (26,4 V for 24 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'refresh' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

##### **To increase battery life: temperature compensation**

Every Skylla-i comes with a battery temperature sensor. When connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed lead-acid batteries and/or when important fluctuations of battery temperature are expected.

##### **Battery voltage sense**

In order to compensate for voltage loss due to cable resistance, the Skylla-i is provided with a voltage sense facility so that the battery always receives the correct charge voltage.

##### **Suitable for AC and DC supply (AC-DC and DC-DC operation)**

The chargers also accept a DC supply.

##### **Use as a power supply**

As a result of the perfectly stabilized output voltage, the Skylla-i can be used as a power supply if batteries or large buffer capacitors are not available.

##### **Li-Ion (LiFePO4) ready**

Simple charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-Ion BMS to the remote control port of the charger. Alternatively complete control of voltage and current can be achieved by connecting to the galvanically isolated CAN bus port.

##### **Learn more about batteries and battery charging**

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from [www.victronenergy.com](http://www.victronenergy.com)).

# SKYLLA-I BATTERY CHARGER 24V

Skylla-i	24/80 (1+1)	24/80 (3)	24/100 (1+1)	24/100 (3)
Input voltage (VAC)	230 V			
Input voltage range (VAC)	185-265 V			
Input voltage range (VDC)	180-350 V			
Maximum AC input current @ 180 VAC	16 A		20 A	
Frequency (Hz)	45-65 Hz			
Power factor	0,98			
Charge voltage 'absorption' (VDC) (1)	28,8 V			
Charge voltage 'float' (VDC)	27,6 V			
Charge voltage 'storage' (VDC)	26,4 V			
Charge current (A) (2)	80 A	3 x 80 A (max total output: 80A)	100 A	3 x 100 A (max total output: 100A)
Charge current starter batt. (A)	4 A	n. a.	4	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity (Ah)	400-800 Ah		500-1000 Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
CAN bus communication port (VE.Can)	Two RJ45 connectors, NMEA2000 protocol, galvanically isolated			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST	AC rating: 240VAC/4A	DC rating: 4A up to 35VDC, 1A up to 60VDC	
Forced cooling	Yes			
Protection	Battery reverse polarity (fuse)	Output short circuit	Over temperature	
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non condensing)	max 95%			
<b>ENCLOSURE</b>				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	M8 bolts			
230 VAC-connection	screw-clamp 10mm <sup>2</sup> (AWG 7)			
Protection category	IP 21			
Weight kg (lbs)	7 kg (16 lbs)			
Dimensions hwxwd in mm (hwxwd in inches)	405 x 250 x 150 mm (16.0 x 9.9 x 5.9 inch)			
<b>STANDARDS</b>				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
1) Output voltage range 20-36V. Can be set with rotary switch or potentiometers.		2) Up to 40°C (100°F) ambient. Output will reduce to 80% at 50°C, and to 60% at 60°C.		



### BMV 600S Battery Monitor

The BMV 600S Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. The software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV 600S selectively displays battery voltage, battery current, consumed Ah or time to go.



### Skylla-i Control

The Skylla-i Control panel provides remote control and monitoring of the charge process with LED status indication. In addition, the remote panel also offers input current adjustment that can be used to limit the input current and thus the power drawn from the AC supply. This is particularly useful when operating the charger from limited shore power or small gensets. The panel can also be used to change several battery charging parameters. Several control panels can be connected to one charger or to a set of synchronised and parallel connected chargers.

## SKYLLA CHARGER 24/48V



**Skylla TG 24 50**

### Perfect chargers for any type of battery

Charge voltage can be precisely adjusted to suit any sealed or unsealed battery system. In particular, sealed maintenance free batteries must be charged correctly in order to ensure a long service life. Overvoltage will result in excessive gassing and venting of a sealed battery. The battery will dry out and fail.

### Suitable for AC and DC supply (AC-DC and DC-DC operation)

Except for the 3 phase input models, the chargers also accept a DC supply.

### Controlled charging

Every TG charger has a microprocessor, which accurately controls the charging in three steps. The charging process takes place in accordance with the IUoUo characteristic and charges more rapidly than other processes.

### Use of TG chargers as a power supply

As a result of the perfectly stabilized output voltage, a TG charger can be used as a power supply if batteries or large buffer capacitors are not available.

### Two outputs to charge 2 battery banks (24V models only)

The TG chargers feature 2 isolated outputs. The second output, limited to approximately 4 A and with a slightly lower output voltage, is intended to top up a starter battery.

### To increase battery life: temperature compensation

Every Skylla TG charger comes with a battery temperature sensor. When connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed batteries which otherwise might be overcharged and dry out due to venting.

### Battery voltage sense

In order to compensate for voltage loss due to cable resistance, TG chargers are provided with a voltage sense facility so that the battery always receives the correct charge voltage.

### Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from [www.victronenergy.com](http://www.victronenergy.com)).

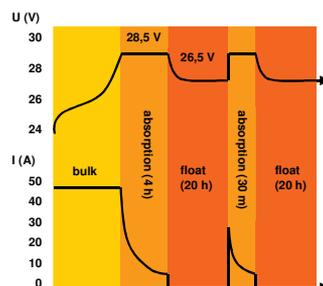


**Skylla TG 24 50 3 phase**

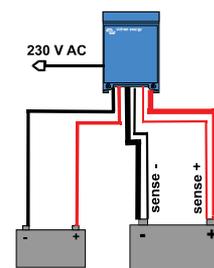


**Skylla TG 24 100**

**Charge curve**



**Application example**



# SKYLLA CHARGER 24/48V

Skylla	24/30 TG 24/50 TG	24/50 TG 3 phase	24/80 TG	24/100 TG	24/100 TG 3 phase	48/25 TG	48/50 TG
Input voltage (V AC)	230	3 x 400	230	230	3 x 400	230	230
Input voltage range (V AC)	185-264	320-450	185-264	185-264	320-450	185-264	185-264
Input voltage range (V DC)	180-400	n. a.	180-400	180-400	n. a.	180-400	180-400
Frequency (Hz)	45-65						
Power factor	1						
Charge voltage 'absorption' (V DC)	28,5	28,5	28,5	28,5	28,5	57	57
Charge voltage 'float' (V DC)	26,5	26,5	26,5	26,5	26,5	53	53
Charge current house batt. (A) (2)	30 / 50	50	80	100	100	25	50
Charge current starter batt. (A)	4	4	4	4	4	n. a.	n. a.
Charge characteristic	IUoUo (three step)						
Battery capacity (Ah)	150-500	250-500	400-800	500-1000	500-1000	125-250	250-500
Temperature sensor	√						
Can be used as power supply	√						
Remote alarm	Potential free contacts 60V / 1A (1x NO and 1x NC)						
Forced cooling	√						
Protection (1)	a,b,c,d						
Operating temp. range	-20 to 60°C (0 - 140°F)						
Humidity (non condensing)	max 95%						
<b>ENCLOSURE</b>							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	M8 studs						
230 V AC-connection	screw-clamp 2,5 mm <sup>2</sup> (AWG 6)						
Protection category	IP 21						
Weight kg (lbs)	5,5 (12.1)	13 (28)	10 (22)	10 (22)	23 (48)	5,5 (12.1)	10 (12.1)
Dimensions hxxxd in mm (hxxxd in inches)	365x250x147 (14.4x9.9x5.8)	365x250x257 (14.4x9.9x10.1)	365x250x257 (14.4x9.9x10.1)	365x250x257 (14.4x9.9x10.1)	515x260x265 (20x10.2x10.4)	365x250x147 (14.4x9.9x5.8)	365x250x257 (14.4x9.9x10.1)
<b>STANDARDS</b>							
Safety	EN 60335-1, EN 60335-2-29						
Emission	EN 55014-1, EN 61000-3-2						
Immunity	EN 55014-2, EN 61000-3-3						
1) Protection a. Output short circuit b. Battery reverse polarity detection 2) Up to 40°C (100°F) ambient c. Battery voltage too high d. Temperature too high							



### BMV 600S Battery Monitor

The BMV 600S Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV 600S selectively displays battery voltage, current, consumed Ah or time to go.



### Skylla Control

The Skylla Control allows you to alter the charge current and see the system status. Altering the charge current is useful if the shore power fuse is limited: the AC current drawn by the battery charger can be controlled by limiting the maximum output current, thereby preventing the shore power fuse from blowing.



### Charger Switch

A remote on-off switch



### Battery Alarm

An excessively high or low battery voltage is indicated by an audible and visual alarm.

## SKYLLA TG CHARGER 24V 90-265V GL APPROVED



**Skylla Charger**  
24V 50A

### Universal 90-265V AC input voltage range and also suitable for DC supply

All models will operate without any adjustment needed over a 90 to 265 Volt input voltage range, whether 50 Hz or 60 Hz.

The chargers will also accept a 90-400V DC supply.

### Germanischer Lloyd approval

The Chargers have been approved by Germanischer Lloyd (GL) to environmental category C, EMC 1.

Category C applies to equipment protected from the weather.

EMC 1 applies to conducted and radiated emission limits for equipment installed on the bridge of a ship.

The approval to GL C, EMC1 implies that the Chargers also complies to IEC 60945-2002, category "protected" and "equipment installed on the bridge of a ship".

The GL certification applies to 185-265V AC supply.

### Other features

- Microprocessor control
- Can be used as power supply
- Battery temperature sensor for temperature compensated charging
- Battery voltage sensing to compensate for voltage loss due to cable resistance

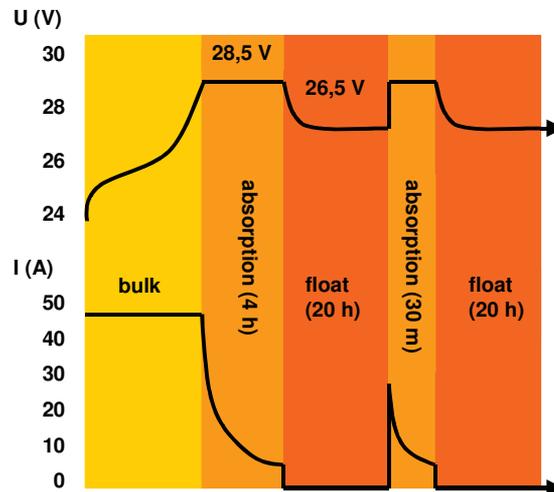
### Other Skylla chargers

- Standard 185-265V AC models with additional output to charge a starter battery
- GMDSS models, with all required monitoring and alarm functions.

### Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from [www.victronenergy.com](http://www.victronenergy.com)).

**Charge curve**



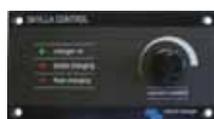
# SKYLLA TG CHARGER 24V 90-265V GL APPROVED

Skylia-TG	24/30 90-265 VAC	24/50 90-265 VAC	24/100-G 90-265 VAC
Input voltage (V AC)	230	230	230
Input voltage range (V AC)	90-265	90-265	90-265
Input voltage range (V DC)	90-400	90-400	90-400
Frequency (Hz)	45-65 Hz or DC		
Power factor	1		
Charge voltage 'absorption' (V DC)	28,5	28,5	28,5
Charge voltage 'float' (V DC)	26,5	26,5	26,5
Charge current house batt. (A) (2)	30	50	100
Charge current starter batt. (A)	4	4	4
Charge characteristic	IUoUo (three step)		
Battery capacity (Ah)	150-300	250-500	500-1000
Temperature sensor	√		
Can be used as power supply	√		
Remote alarm	Potential free contacts 60V / 1A (1x NO and 1x NC)		
Forced cooling	√		
Protection (1)	a,b,c,d		
Operating temp. range	-20 to 60°C (0 - 140°F)		
Humidity (non condensing)	max 95%		
<b>ENCLOSURE</b>			
Material & Colour	aluminium (blue RAL 5012)		
Battery-connection	M8 studs		
230 V AC-connection	screw-clamp 2,5 mm <sup>2</sup> (AWG 6)		
Protection category	IP 21		
Weight kg (lbs)	5,5 (12.1)	5,5 (12.1)	10 (22)
Dimensions hxxwx d in mm (hxxwx d in inches)	365x250x147 (14.4x9.9x5.8)	365x250x147 (14.4x9.9x5.8)	365x250x257 (14.4x9.9x10.1)
<b>STANDARDS</b>			
Vibration	0,7g (IEC 60945)		
Safety	EN 60335-1, EN 60335-2-29, IEC 60945		
Emission	EN 55014-1, EN 61000-3-2, IEC 60945		
Immunity	EN 55014-2, EN 61000-3-3, IEC 60945		
Germanischer Lloyd	Certificate 54 758 – 08HH		
1) Protection key: a) Output short circuit b) Battery reverse polarity detection	c) Battery voltage too high d) Temperature too high		2) Up to 40°C (100°F) ambient



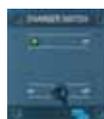
### BMV-600S Battery Monitor

The BMV – 600 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV – 600 selectively displays battery voltage, current, consumed Ah or time to go.



### Skylia Control

The Skylia Control allows you to alter the charge current and see the system status. Altering the charge current is useful if the shore power fuse is limited: the AC current drawn by the battery charger can be controlled by limiting the maximum output current, thereby preventing the shore power fuse from blowing.



### Charger Switch

A remote on-off switch



### Battery Alarm

An excessively high or low battery voltage is indicated by an audible and visual alarm.

## COLOR CONTROL GX



### Color Control GX

The Color Control provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, Multi's, Quattro's, MPPT 150/70, BMV-600, BMV-700, Skylla-I, Lynx Ion and even more.

### VRM Online Portal

Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal. To get an impression of the VRM Online Portal, visit <https://vrm.victronenergy.com/>, and try our demo. See also the kWh dashboard screenshot further down in this datasheet.

### Future functionality

The Color Control has endless possibilities. To implement all our ideas and wishes will take years. There are therefore many features that are not yet available. Functions marked with 'Future function' will become available later on, as a firmware update. Firmware updates are free of charge, as with all Victron products. Updating the product is easy: the Color Control GX will update itself automatically, as long as it is connected to the internet. Manual updates can be done with a USB stick and microSD cards.

### Supported products

- Multi's, including split-phase and three phase systems. Monitoring and control (on/off and current limiter). Changing Multi settings is not yet available.
- Quattro's, including split-phase and three phase systems. Same limitations as Multi's, and some Quattro specific features, such as seeing which input is currently active, are not yet available.
- BlueSolar MPPT 150/70. Current solar output is visible on the overview screen, and all parameters are logged to the VRM online portal. Note that the VRM App has a nice overview showing data of the BlueSolar MPPT 150/70 as well. When multiple BlueSolar MPPT 150/70's are used in parallel, the Color Control will show all information as one. See also our blog-post about [synchronizing multiple MPPT 150/70 solar chargers](#).
- BMV-600 family can be connected to the VE.Direct ports on the Color Control GX. Use the VE.Direct to BMV60xS cable for that. [See our pricelist](#).
- BMV-700 family can be connected directly to the VE.Direct ports on the Color Control GX. Use the VE.Direct Cable for this. [See our pricelist](#).
- BlueSolar MPPT Solar Chargers with a VE.Direct port (70/15, 75/15, 100/15, 75/50) can also be connected to the VE.Direct ports on the Color Control GX. Connecting multiple at the same time is possible. They will all appear as a separate Solar Charger in the device list.
- A USB GPS can be connected to the USB port. Location and speed will be visible on the display, and the data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position. Implementation of more advanced racking features on the VRM Portal is expected in 2014-Q1.
- Lynx Ion BMS
- Lynx Shunt VE.Can



Note that there are more options for products which use the VE.Direct ports, such as BMV's and small MPPT's. They can also be connected through USB, useful when more than two products need to be connected. Use an off-the-shelf USB-hub, and the VE.Direct to USB interface, ASS030530000.

### Other highlights

- When connected to the internet, the Color Control GX will update itself automatically as if there is a new software version available. It checks for an update every night at 02:00 UTC.
- Multiple languages: English, Chinese, German, Italian, Spanish, French, Swedish and Dutch.

### Notes for existing VGR2 and VER users

- Opposite to the Victron Global Remote 2 (VGR2) and Victron Ethernet Remote (VER), the Color Control GX stores all data locally during network interruptions. As soon as the connection to the VRM Online Portal is restored, it will automatically send all backlogged data to the portal. Data can then be analyzed on <https://vrm.victronenergy.com>. This local storage feature can be useful for diagnostics and problem solving as well: leave it for a couple of days in an installation where there are problems, then take it back to the office and connect it to the internet.
- Remote VEConfigure is not yet supported by the Color Control GX. This functionality is expected in 2014 Q1, and it will include support for changing Assistants and their settings, which is not possible with the VGR2 and VER.
- The local website, as present on the VER, is not yet supported.
- The Color Control GX has no internal GPRS modem: you cannot insert a sim-card into the Color Control GX. Support for VGR and VER connected through USB is coming in 2014-Q1. And we are looking for a lower cost alternative as well. Note that you can always use an off-the-shelf GPRS or 3G router. See FAQ for data consumption.



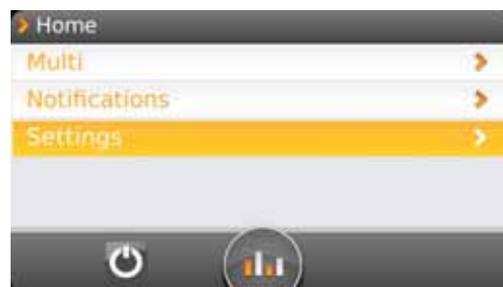
# COLOR CONTROL GX

Color Control GX			
Power supply voltage range	9 – 70V DC		
<b>Current draw</b>	12V DC	24V DC	48V DC
Switched off	0mA	0mA	0mA
Display off	140mA	tbm	tbm
Display at minimum intensity	160mA	tbm	tbm
Display at maximum intensity	245mA	tbm	tbm
Potential free contact	3A / 30V DC / 250V AC (Normally open)		
Data communication			
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
Other			
Outer dimensions (h x w x d)			
Operating temperature range	-20 to +50°C		

Overview - Multi with PV Inverter on output (Hub-2)



Main menu



Overview - Multi



Alarm notifications



Overview - Multi with MPPT 150/70



## COLOR CONTROL GX

VRM Dashboard – Live feed

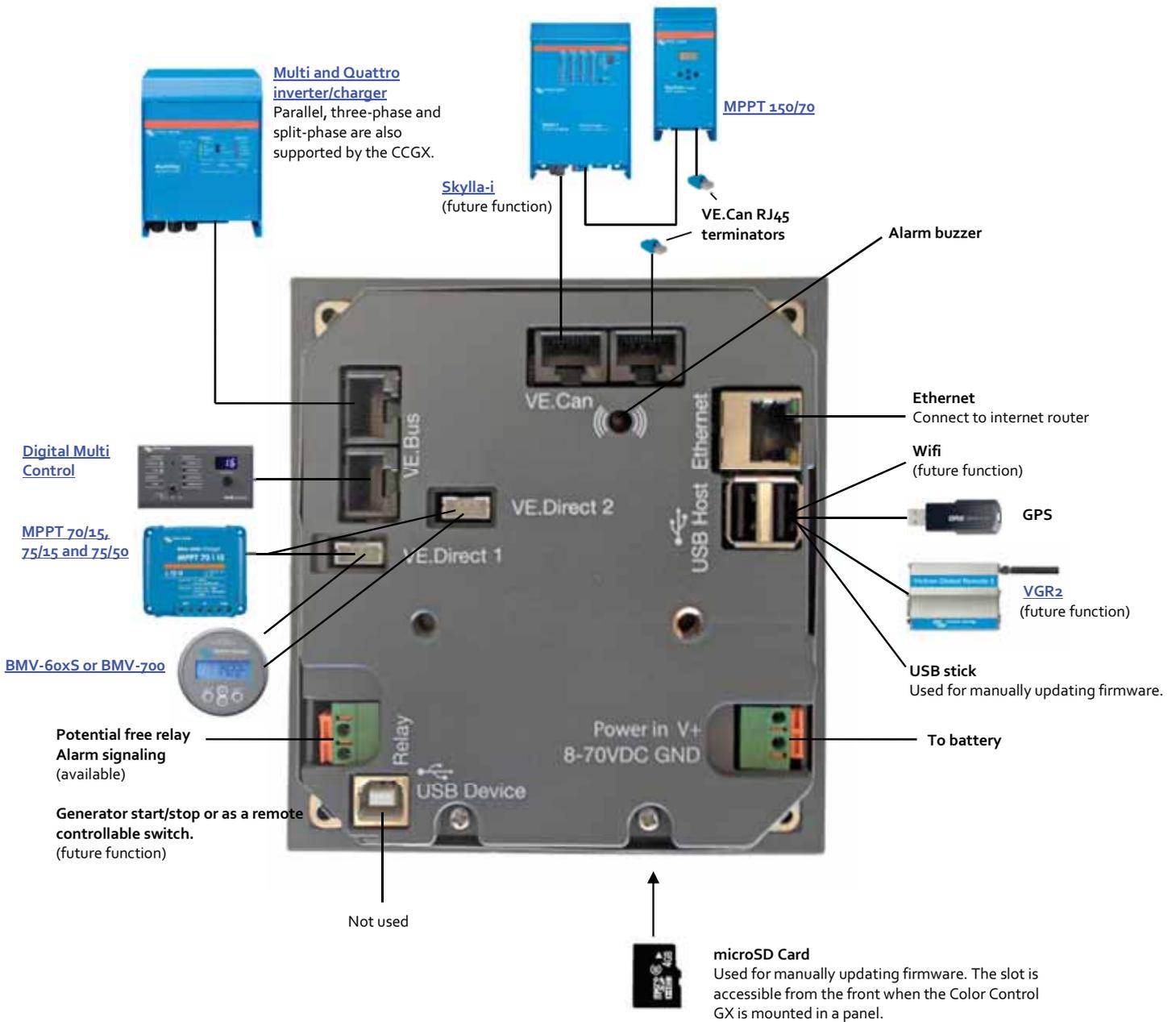


VRM Dashboard – Distribution of Solar Yield



# COLOR CONTROL GX

Color Control GX schematic diagram



Blue Power Charger IP65	12 V 7/10/15 A	24 V 5/8 A
Input voltage range	180-265 VAC	
Efficiency	94%	95%
Standby power consumption	0,5 W	
Charge voltage 'absorption'	Normal: 14,4 V High: 14,6 V Li-ion: 14,2 V	Normal: 28,8 V High: 29,2 V Li-ion: 28,4 V
Charge voltage 'float'	Normal: 13,8 V High: 13,8 V Li-ion: 13,5 V	Normal: 27,6 V High: 27,6 V Li-ion: 27,0 V
Charge voltage 'storage'	Normal: 13,2 V High: 13,2 V Li-ion: 13,5 V	Normal: 26,4 V High: 26,4 V Li-ion: 27,0 V
Charge current	7 / 10 / 15 A	5 / 8 A
Minimum battery capacity	24 / 30 / 45 Ah	16 / 24 Ah
Temperature compensation (lead-acid batteries only)	16 mV/°C	32 mV/°C
Can be used as power supply	Yes	
Back current drain	0,7 Ah/month (1 mA)	
Protection	Reverse polarity    Output short circuit Over temperature	
Operating temp. range	-20 to +50°C (full rated output up to 30°C)	
Humidity (non condensing)	Max 95 %	
<b>ENCLOSURE</b>		
Battery-connection	Black and red cable of 1,5 meter	
230 V AC-connection	Cable of 1,5 meter with CEE 7/7, BS 1363 plug (UK) or AS/NZS 3112 plug	
Protection category	IP65 (splash and dust proof)	
Weight	0,9 kg	0,9 kg
Dimensions (h x w x d)	12/7: 47x95x190mm Other: 60x105x190mm	24/5: 47x95x190mm 24/8: 60x105x190mm
<b>STANDARDS</b>		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	



[www.victronenergy.com](http://www.victronenergy.com)

Customer support: [service@victronenergy.com](mailto:service@victronenergy.com)

# blue power charger

IP65

The professional's choice

5  
YEAR  
WARRANTY



*Energy. Anytime. Anywhere.*

- **The highest efficiency ever!**
- Seven step smart charge algorithm
- Water resistant
- Automatic compensation for high or low temperature
- Fully discharged "dead" battery recovery function
- Several other battery life enhancing features
- Power supply function
- **Li-ion** battery mode

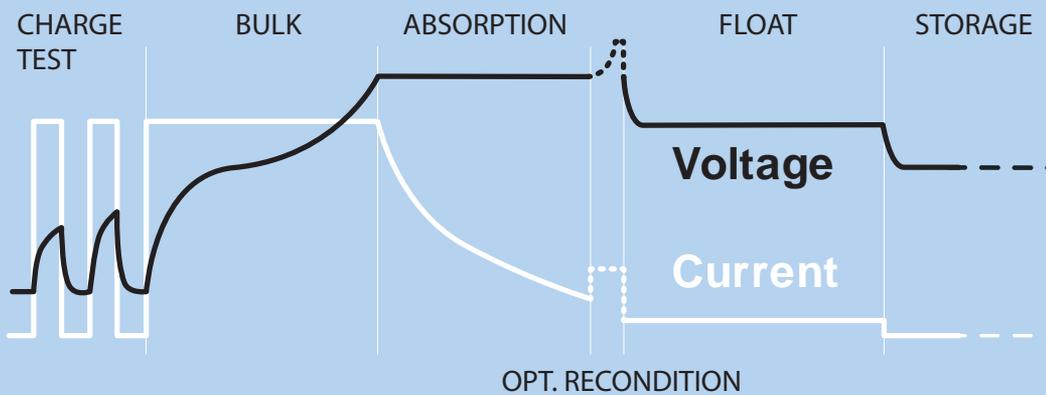


 **victron energy**  
BLUE POWER

Battery size Ah	Model		
	12 / 7 24 / 5	12 / 10 24 / 8	12 / 15
20 - 50	●	●	●
50 - 70	●	●	●
70 - 90	●	●	●
90 - 150	●	●	●

## Quick selection guide

- Recommended
- Ok
- Not recommended

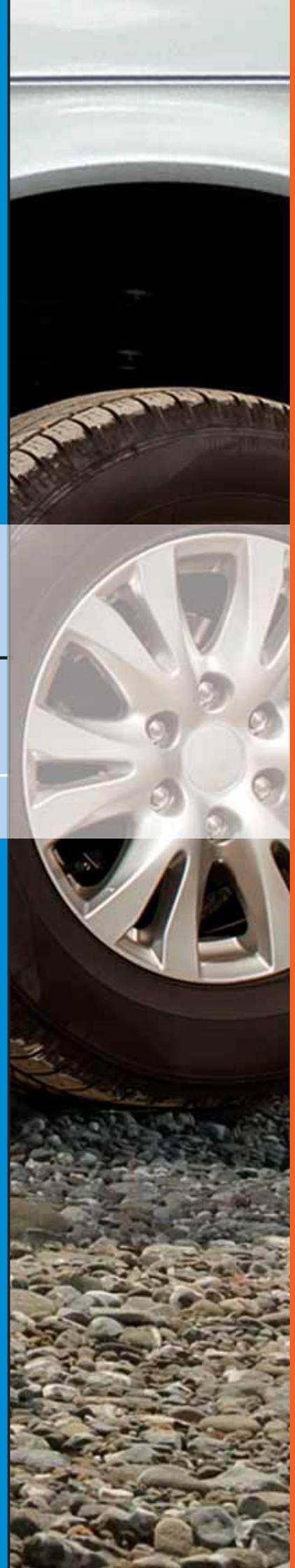


## Reconditioning

A lead-acid battery that has been insufficiently charged or has been left discharged during days or weeks will deteriorate due to sulfation. If caught in time, sulfation can sometimes be partially reversed by charging the battery with low current up to a higher voltage.

## Recovery function for fully discharged batteries

Most reverse polarity protected chargers will not recognize, and therefore not recharge a battery which has been discharged to zero or nearly zero Volts. The **Blue Power Charger** however will attempt to recharge a fully discharged battery with low current and resume normal charging once sufficient voltage has developed across the battery terminals.

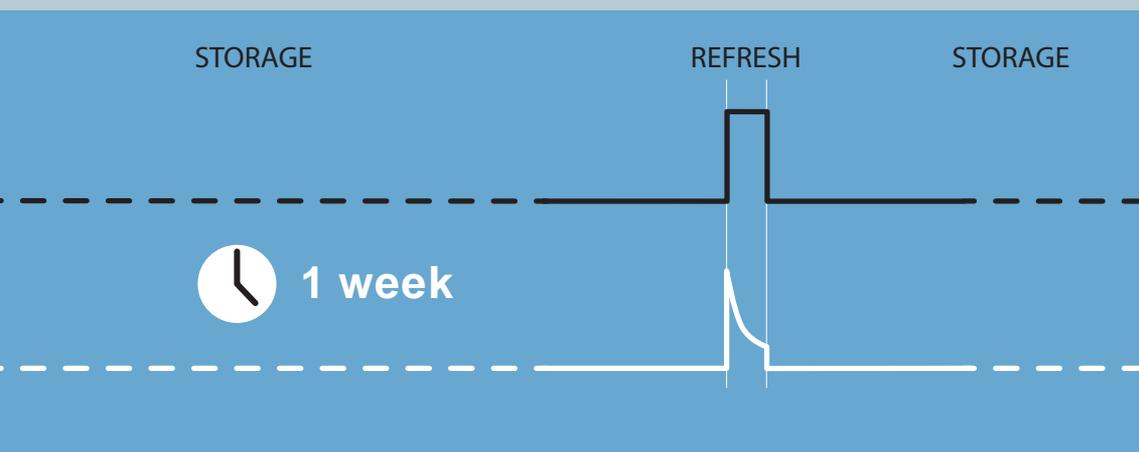


## Ultra high efficiency “green” battery charger

With up to 95% efficiency, these chargers generate up to four times less heat when compared to the industry standard. And once the battery is fully charged, power consumption reduces to 0,5 Watt, some five to ten times better than the industry standard.

## Durable, safe and silent

- Low thermal stress on the electronic components.
- Protection against ingress of dust, water and chemicals.
- Protection against overheating: the output current will reduce as temperature increases up to 60°C, but the charger will not fail.
- The chargers are totally silent: no cooling fan or any other moving parts.



## Storage mode: less corrosion of the positive plates

Even the lower float charge voltage that follows the absorption period will cause grid corrosion. It is therefore essential to reduce the charge voltage even further when the battery remains connected to the charger during more than 48 hours.

## Temperature compensated charging

The optimal charge voltage of a lead-acid battery varies inversely with temperature. **The Blue Power IP65 Charger** measures ambient temperature during the test phase and compensates for temperature during the charge process. The temperature is measured again when the charger is in low current mode during float or storage. Special settings for a cold or hot environment are therefore not needed.

## Li-ion battery mode

The **Blue Power Charger** uses a specific charging algorithm for Li-ion (LiFePO<sub>4</sub>) batteries, with automatic Li-ion under voltage protection reset



## BMV700 PRECISION BATTERY MONITORING



**BMV 700**

### Battery 'fuel gauge', time-to-go indicator, and much more

The remaining battery capacity depends on the ampere-hours consumed, discharge current, temperature and the age of the battery. Complex software algorithms are needed to take all these variables into account.

Next to the basic display options, such as voltage, current and ampere-hours consumed, the BMV-700 series also displays state of charge, time to go, and power consumption in Watts.

The BMV-702 features an additional input which can be programmed to measure the voltage (of a second battery), temperature or midpoint voltage (see below).

### Easy to install

All electrical connections are to the quick connect PCB on the current shunt. The shunt connects to the monitor with a standard RJ12 telephone cable. Included: RJ 12 cable (10 m) and battery cable with fuse (2 m); no other components needed.

Also included are a separate front bezel for a square or round display appearance; a securing ring for the rear mounting and screws for the front mounting.

### Easy to program

A quick install menu and a detailed setup menu with scrolling texts assists the user when going through the various settings. Please consult the manual for details.

### New: midpoint voltage monitoring (BMV-702 only)

This feature which is often used in industry to monitor large and expensive battery banks, is now for the first time made available at a low cost, to monitor any battery bank.

A battery bank consists of a string of series connected cells. The midpoint voltage is the voltage halfway along the string. Ideally, the midpoint voltage would be exactly half of the total voltage. In practice, however, deviations will be seen, dependent on many factors such as a different state of charge for new batteries or cells, different temperatures, internal leakage currents, capacities and much more.

Large or increasing deviation of the midpoint voltage, points to improper battery care or a failed battery or cell. Corrective action following a midpoint voltage alarm can prevent severe damage to an expensive battery. Please consult the BMV manual for more information.

### Standard features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Time to go at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed.
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events, which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 9,5 – 95 V
- High current measurement resolution: 10 mA (0,01A)
- Low current consumption: 2,9 Ah per month (4 mA) @12V and 2,2 Ah per month (3mA) @ 24V

### BMV-702 additional features

Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings.

### BMV 700HS: 60 to 385VDC voltage range

No prescaler needed. Note: suitable for systems with grounded minus only (battery monitor is not isolated from shunt).

### Other battery monitoring options

- VE.Net Battery Controller
- High voltage VE.Net Battery Controller: 70 to 350VDC
- Lynx Shunt VE.Net
- Lynx Shunt VE.Can



**BMV bezel square**



**BMV shunt 500A/50mV**  
With quick connect pcb



**BMV 702 Black**



**BMV 700H**

# BMV700 PRECISION BATTERY MONITORING

Battery monitor	BMV 700	BMV 702 BMV 702 BLACK	BMV 700HS
Supply voltage range	6,5 - 95 VDC	6,5 - 95 VDC	60 - 385 VDC
Current draw, back light off	< 4 mA	< 4 mA	< 4 mA
Input voltage range, auxiliary battery	n.a.	6,5 - 95 VDC	n.a.
Battery capacity (Ah)	20 - 9999 Ah		
Operating temperature range	-20 +50°C (0 - 120°F)		
Measures voltage of second battery, or temperature, or midpoint	No	Yes	No
Temperature measurement range	-20 +50°C		n.a.
VE.Direct communication port	Yes	Yes	Yes
Relay	60V/1A normally open (function can be inverted)		
RESOLUTION & ACCURACY (with a 500 A shunt)			
Current	± 0,01 A		
Voltage	± 0,01 V		
Amp hours	± 0,1 Ah		
State of charge (0 - 100 %)	± 0,1 %		
Time to go	± 1 min		
Temperature (0 - 50°C or 30 - 120°F)	n. a.	± 1 °C/°F	n. a.
Accuracy of current measurement	± 0,4 %		
Accuracy of voltage measurement	± 0,3 %		
INSTALLATION & DIMENSIONS			
Installation	Flush mount		
Front	63 mm diameter		
Front bezel	69 x 69 mm (2.7 x 2.7 inch)		
Body diameter	52mm (2.0 inch)		
Body depth	31mm (1.2 inch)		
STANDARDS			
Safety	EN 60335-1		
Emission / Immunity	EN 55014-1 / EN 55014-2		
Automotive	ECE R10-4 / EN 50498		
ACCESSORIES			
Shunt (included)	500 A / 50 mV		
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection		
Temperature sensor	Optional (ASS000100000)		



### Victron Global Remote

The Global Remote is a modem which sends alarms, warnings and system status reports to cellular phones via text messages (SMS). It can also log data from Victron Battery Monitors, MultiPlus units, Quattros and Inverters to a website through a GPRS connection to the [VRM Portal](#). Access to this website is free of charge. VE.Direct to Global remote Interface cable needed (ASS030534000).



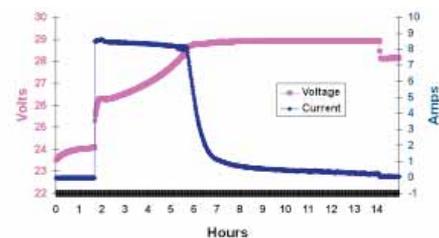
### 1000A/50mV and 2000A/50mV shunt

For ease of use with the BMV series: the quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.



### Interface cables

- VE.Direct cables to connect a BMV 70x to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to the Color Control or to a computer.
- VE.Direct to Global remote interface to connect a BMV 70x to a Global Remote. (ASS030534000)



The PC application software **BMV-Reader** will show all current readings on a computer, including history data. It can also log the data to a CSV formatted file. It is available for free, and can be downloaded from our website at the [Support and downloads section](#). Connect the BMV to the computer with the VE.Direct to USB interface, ASS030530000.



### Color Control

The powerful Linux computer, hidden behind the color display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating to Victron equipment, the Color Control communicates through NMEA2000, Ethernet and USB.

Data can be stored and analyzed on the VRM Portal. iPhone and Android apps are available for monitoring and control.

<https://vrm.victronenergy.com/>



A maximum of four BMVs can be connected directly to the Color Control.

Even more BMVs can be connected to a USB Hub for central monitoring.



# BLUESOLAR MONOCRYSTALLINE PANELS



BlueSolar Monocrystalline 280W

- Low voltage-temperature coefficient enhances high-temperature operation.
- Exceptional low-light performance and high sensitivity to light across the entire solar spectrum.
- 25-year limited warranty on power output and performance.
- 2-year Limited warranty on materials and workmanship.
- Sealed, waterproof, multi-functional junction box gives high level of safety.
- High performance bypass diodes minimize the power drop caused by shade.
- Advanced EVA (Ethylene Vinyl Acetate) encapsulation system with triple-layer back sheet meets the most stringent safety requirements for high-voltage operation.
- A sturdy, anodized aluminum frame allows modules to be easily roof-mounted with a variety of standard mounting systems.
- Highest quality, high-transmission tempered glass provides enhanced stiffness and impact resistance.
- Pre wired quick-connect system with MC4 (PV-ST01) connectors. (Except for the 30W panel)



MC4 connectors

Type	Module Size	Glass size	Weight	Electrical data under STC <sup>(1)</sup>				
				Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-circuit Current
				P <sub>MPP</sub>	V <sub>MPP</sub>	I <sub>MPP</sub>	V <sub>oc</sub>	I <sub>sc</sub>
Module	mm	mm	Kg	W	V	A	V	A
SPM30-12	450 x 540 x 25	445 x 535	2.5	30	18	1.67	22.5	2
SPM51-12	645 x 540 x 35	640 x 535	5.2	50	18	2.78	22.2	3.16
SPM81-12	1005 x 540 x 35	1000 x 535	7	80	18	4.45	22.3	4.96
SPM101-12	1210 x 540 x 35	1205 x 535	8	100	18	5.56	22.4	6.53
SPM131-12	1110 x 808 x 35	1105 x 802	11.5	130	18	7.23	22.4	78.03
SPM190-24	1580 x 808 x 35	1574 x 802	14.5	190	36	5.44	43.2	5.98
SPM300-24	1956 x 992 x 50	1950 x 986	23.5	300	36	8.06	45.5	8.56
Module	SPM30-12	SPM51-12	SPM81-12	SPM101-12	SPM131-12	SPM190-24	SPM300-24	
Nominal Power (±3% tolerance)	30W	50W	80W	100W	130W	190W	300W	
Cell type	Monocrystalline							
Number of cells in series	36						72	
Maximum system voltage (V)	1000V							
Temperature coefficient of P <sub>MPP</sub> (%)	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C
Temperature coefficient of V <sub>oc</sub> (%)	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C
Temperature coefficient of I <sub>sc</sub> (%)	+0.037/°C	+0.037/°C	+0.037/°C	+0.037/°C	+0.05/°C	+0.037/°C	+0.037/°C	+0.037/°C
Temperature Range	-40°C to +85°C							
Surface Maximum Load Capacity	200kg/m <sup>2</sup>							
Allowable Hail Load	23m/s, 7.53g							
Junction Box Type	PV-JH03-2	PV-JH02	PV-JH02	PV-JH02	PV-RH0301	PV-JH03	PV-JH200	
Connector Type	MC4							
Length of Cables	450mm	750mm	900mm	900mm	900mm	900mm	1000mm	
Output tolerance	+/-3%							
Frame	Aluminium							
Product warranty	2 years							
Warranty on electrical performance	10 years 90% + 25 years 80% of power output							
Smallest packaging unit	1 panel							
Quantity per pallet	40 panels	40 panels	20 panels	20 panels	20 panels	20 panels	20 panels	

1) STC (Standard Test Conditions): 1000W/m<sup>2</sup>, 25°C, AM (Air Mass) 1.5

## BLUESOLAR POLYCRISTALLINE PANELS



**BlueSolar Polycrystalline 130W**

- Low voltage-temperature coefficient enhances high-temperature operation.
- Exceptional low-light performance and high sensitivity to light across the entire solar spectrum.
- 25-year limited warranty on power output and performance.
- 2-year Limited warranty on materials and workmanship.
- Sealed, waterproof, multi-functional junction box gives high level of safety.
- High performance bypass diodes minimize the power drop caused by shade.
- Advanced EVA (Ethylene Vinyl Acetate) encapsulation system with triple-layer back sheet meets the most stringent safety requirements for high-voltage operation.
- A sturdy, anodized aluminum frame allows modules to be easily roof-mounted with a variety of standard mounting systems.
- Highest quality, high-transmission tempered glass provides enhanced stiffness and impact resistance.
- Pre wired quick-connect system with MC4 (PV-ST01) connectors.



**MC4 connectors**

Type	Module Size	Glass size	Weight	Electrical data under STC <sup>(1)</sup>				
				Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-circuit Current
				P <sub>MPP</sub>	V <sub>MPP</sub>	I <sub>MPP</sub>	V <sub>oc</sub>	I <sub>sc</sub>
Module	mm	mm	Kg	W	V	A	V	A
SPP30-12	735x350x25	730x345	5.2	30	18	1.72	22.5	1.85
SPP51-12	540x670x35	535x665	5.3	50	18	2.85	22.2	3.09
SPP81-12	915x670x35	910x665	8	80	18	4.6	21.6	5.06
SPP101-12	1005x670x35	1000x665	9	100	18	5.75	21.6	6.32
SPP140-12	1480x670x35	1474x664	12.5	140	18	8.05	21.6	8.85
SPP280-24	1956x992x50	1950x986	24	280	36	7.7	44.06	8.26
Module	SPP30-12	SPP51-12	SPP81-12	SPP101-12	SPP140-12	SPP280-24		
Nominal Power (±3% tolerance)	30W	50W	80W	100W	140W	280W		
Cell type	Polycrystalline							
Number of cells in series	36						72	
Maximum system voltage (V)	1000V							
Temperature coefficient of PMPP (%)	-0.47/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.47/°C	
Temperature coefficient of Voc (%)	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.35/°C	-0.34/°C	
Temperature coefficient of Isc (%)	+0.045/°C	+0.037/°C	+0.037/°C	+0.037/°C	+0.037/°C	+0.037/°C	+0.045/°C	
Temperature Range	-40°C to +85°C							
Surface Maximum Load Capacity	200kg/m <sup>2</sup>							
Allowable Hail Load	23m/s, 7.53g							
Junction Box Type	PV-JH03-2	PV-JH02	PV-JH02	PV-JH02	PV-JH02	PV-JH200		
Connector Type	MC4							
Length of Cables	450mm	750mm	900mm			1000mm		
Output tolerance	+/-3%							
Frame	Aluminium							
Product warranty	2 years							
Warranty on electrical performance	10 years 90% + 25 years 80% of power output							
Smallest packaging unit	1 panel							
Quantity per pallet	40 panels	40 panels	20 panels	20 panels	20 panels	20 panels		

1) STC (Standard Test Conditions): 1000W/m<sup>2</sup>, 25°C, AM (Air Mass) 1.5





# BLUESOLAR CHARGE CONTROLLERS - OVERVIEW



### Feature highlights

- Ultra-fast Maximum Power Point Tracking (MPPT)
- Advanced Maximum Power Point Detection in case of partial shading conditions
- Load output on the small models
- BatteryLife: intelligent battery management by load shedding
- Automatic battery voltage recognition
- Flexible charge algorithm
- Over-temperature protection and power de-rating when temperature is high.

### Color Control GX

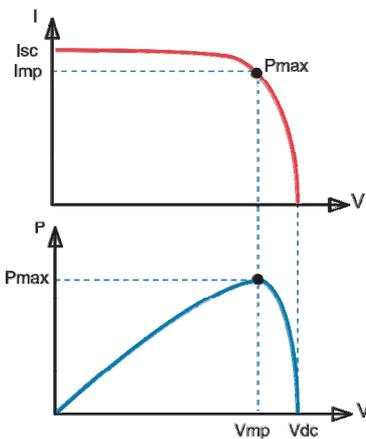
All Victron Energy MPPT Charge Controllers are compatible with the Color Control GX: The Color Control GX provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, Multi's, Quattro's, MPPT 150/70, BMV-600 series, BMV-700 series, Skylla-i, Lynx Ion and even more.

### VRM Online Portal

Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal. To get an impression of the VRM Online Portal, visit <https://vrm.victronenergy.com>, and use the 'Take a look inside' button. The portal is free of charge.

### Related product: EasySolar

Minimal wiring and an all-in-one solution: the EasySolar takes power solutions one stage further, by combining an Ultra-fast BlueSolar charge controller (MPPT), an inverter/charger and AC distribution in one enclosure.



### Maximum Power Point Tracking

#### Upper curve:

Output current (I) of a solar panel as function of output voltage (V).

The maximum power point (MPP) is the point  $P_{max}$  along the curve where the product  $I \times V$  reaches its peak.

#### Lower curve:

Output power  $P = I \times V$  as function of output voltage.

When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than  $V_{mp}$ .

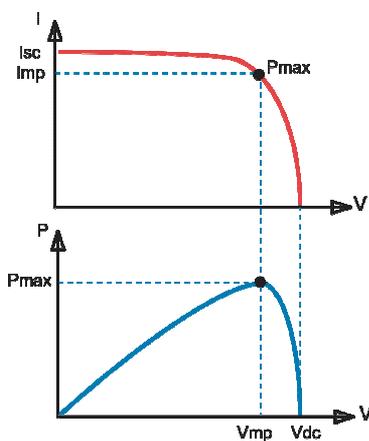
Model	Load output	Fan	Battery voltage	Display	Color Control GX	Com. port
75/15	Yes	No	12/24	No	Compatible	VE.Direct
100/15	Yes	No	12/24	No	Compatible	VE.Direct
100/30	No	No	12/24	No	Compatible	VE.Direct
75/50	No	No	12/24	No	Compatible	VE.Direct
100/50	No	No	12/24	No	Compatible	VE.Direct
150/35	No	No	12/24/36/48	No	Compatible	VE.Direct
150/70	No	No	12/24/36/48	Yes	Compatible	VE.Can
150/85	No	Yes	12/24/36/48	Yes	Compatible	VE.Can



# BLUESOLAR CHARGE CONTROLLER MPPT 75/15 and MPPT 100/15



**Solar charge controller  
MPPT 75/15**



## Maximum Power Point Tracking

### Upper curve:

Output current (I) of a solar panel as function of output voltage (V).  
The maximum power point (MPP) is the point Pmax along the curve where the product  $I \times V$  reaches its peak.

### Lower curve:

Output power  $P = I \times V$  as function of output voltage.  
When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than  $V_{mp}$ .

## Ultra fast Maximum Power Point Tracking (MPPT)

Especially in case of a cloudy sky, when light intensity is changing continuously, an ultra fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

## Load output

Over-discharge of the battery can be prevented by connecting all loads to the load output. The load output will disconnect the load when the battery has been discharged to a preset voltage. Alternatively, an intelligent battery management algorithm can be chosen: see BatteryLife. The load output is short circuit proof.

Some loads (especially inverters) can best be connected directly to the battery, and the inverter remote control connected to the load output. A special interface cable may be needed, please see the manual.

## BatteryLife: intelligent battery management

When a solar charge controller is not able to recharge the battery to its full capacity within one day, the result is often that the battery will be continually be cycled between a "partially charged" state and the "end of discharge" state. This mode of operation (no regular full recharge) will destroy a lead-acid battery within weeks or months.

The BatteryLife algorithm will monitor the state of charge of the battery and, if needed, day by day slightly increase the load disconnect level (i. e. disconnect the load earlier) until the harvested solar energy is sufficient to recharge the battery to nearly the full 100%. From that point onwards the load disconnect level will be modulated so that a nearly 100% recharge is achieved about once every week.

## Resin encapsulated electronics

Protects the electronic components against the environment.

## Automatic battery voltage recognition

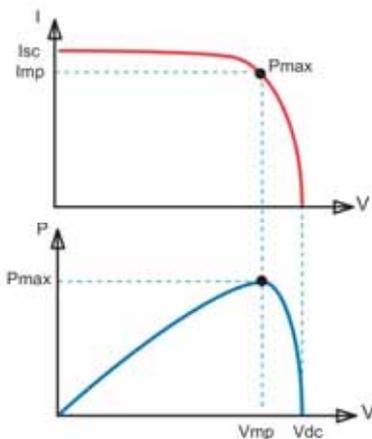
The MPPT 75/15 will automatically adjust to a 12V or a 24V system.

BlueSolar charge controller	MPPT 75/15	MPPT 100/15
Battery voltage	12/24 V Auto Select	
Rated charge current	15 A	
Maximum PV power, 12V 1a,b)	200 W (MPPT range 15 V to 70 V resp. 95 V)	
Maximum PV power, 24V 1a,b)	400 W (MPPT range 30 V to 70 V resp. 95 V)	
Automatic load disconnect	Yes, maximum load 15 A	
Maximum PV open circuit voltage	75 V	100 V
Peak efficiency	98 %	
Self consumption	10 mA	
Charge voltage 'absorption'	14,4 V / 28,8 V	
Charge voltage 'float'	13,8 V / 27,6 V	
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Continuous/peak load current	15A / 50A	
Low voltage load disconnect	11,1 V / 22,2 V or 11,8 V / 23,6 V or BatteryLife algorithm	
Low voltage load reconnect	13,1 V / 26,2 V or 14 V / 28 V or BatteryLife algorithm	
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature	
Operating temperature	-30 to +60°C (full rated output up to 40°C)	
Humidity	100 %, non-condensing	
Data communication port	VE.Direct	
	See the data communication white paper on our website	
<b>ENCLOSURE</b>		
Colour	Blue (RAL 5012)	
Power terminals	6 mm <sup>2</sup> / AWG10	
Protection category	IP65 (electronic components), IP22 (connection area)	
Weight	0,5 kg	
Dimensions (h x w x d)	100 x 113 x 40 mm	
1a) If more PV power is connected, the controller will limit input power to 200W resp. 400W		
1b) PV voltage must exceed $V_{bat} + 5V$ for the controller to start.		
Thereafter minimum PV voltage is $V_{bat} + 1V$		

# BLUESOLAR CHARGE CONTROLLER MPPT 100/30



**Solar charge controller  
MPPT 100/30**



### Maximum Power Point Tracking

#### Upper curve:

Output current (I) of a solar panel as function of output voltage (V). The maximum power point (MPP) is the point Pmax along the curve where the product  $I \times V$  reaches its peak.

#### Lower curve:

Output power  $P = I \times V$  as function of output voltage. When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than Vmp.

### Charge current up to 30 A and PV voltage up to 100 V

The BlueSolar 100/30-MPPT charge controller is able to charge a lower nominal-voltage battery from a higher nominal voltage PV array. The controller will automatically adjust to a 12 or 24V nominal battery voltage.

### Ultra-fast Maximum Power Point Tracking (MPPT)

Especially in case of a cloudy sky, when light intensity is changing continuously, an ultra fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

### Advanced Maximum Power Point Detection in case of partial shading conditions

If partial shading occurs, two or more maximum power points may be present on the power-voltage curve. Conventional MPPT's tend to lock to a local MPP, which may not be the optimum MPP. The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

### Outstanding conversion efficiency

No cooling fan. Maximum efficiency exceeds 98%. Full output current up to 40°C (104°F).

### Flexible charge algorithm

Eight preprogrammed algorithms, selectable with a rotary switch (see manual for details)

### Extensive electronic protection

Over-temperature protection and power derating when temperature is high.  
 PV short circuit and PV reverse polarity protection.  
 PV reverse current protection.

### Internal temperature sensor

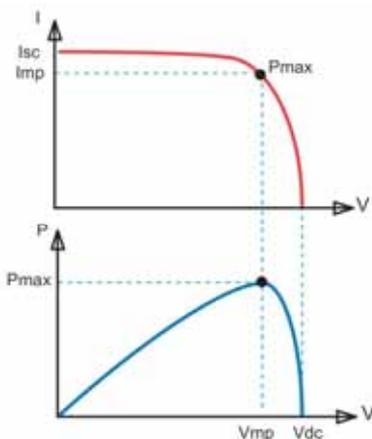
Compensates absorption and float charge voltages for temperature.

BlueSolar charge controller	MPPT 100/30
Battery voltage	12/24 V Auto Select
Maximum output current	30 A
Maximum PV power, 12V 1a,b)	440 W (MPPT range 15 V to 80 V)
Maximum PV power, 24V 1a,b)	880 W (MPPT range 30 V to 80 V)
Maximum PV open circuit voltage	100 V
Maximum efficiency	98 %
Self-consumption	10 mA
Charge voltage 'absorption'	Default setting: 14,4 V / 28,8 V
Charge voltage 'float'	Default setting: 13,8 V / 27,6 V
Charge algorithm	multi-stage adaptive
Temperature compensation	-16 mV / °C resp. -32 mV / °C
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature
Operating temperature	-30 to +60°C (full rated output up to 40°C)
Humidity	95 %, non-condensing
Data communication port	VE.Direct See the data communication white paper on our website
<b>ENCLOSURE</b>	
Colour	Blue (RAL 5012)
Power terminals	13 mm <sup>2</sup> / AWG6
Protection category	IP43 (electronic components), IP22 (connection area)
Weight	1,25 kg
Dimensions (h x w x d)	130 x 186 x 70 mm
1a) If more PV power is connected, the controller will limit input power to 440W resp. 700W 1b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V	

# BLUESOLAR CHARGE CONTROLLERS MPPT 75/50 and MPPT 100/50



**Solar charge controller  
MPPT 75/50**



### Maximum Power Point Tracking

#### Upper curve:

Output current (I) of a solar panel as function of output voltage (V).  
 The maximum power point (MPP) is the point Pmax along the curve where the product  $I \times V$  reaches its peak.

#### Lower curve:

Output power  $P = I \times V$  as function of output voltage.  
 When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than Vmp.

### Charge current up to 50 A and PV voltage up to 75 V, respectively 100 V

The BlueSolar charge controllers will charge a lower nominal-voltage battery with a higher nominal voltage PV array.

The controllers automatically adjust to 12 V or 24 V nominal battery voltage.

### Ultra-fast Maximum Power Point Tracking (MPPT)

Especially in case of a cloudy sky, when light intensity is changing continuously, an ultra fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

### Advanced Maximum Power Point Detection in case of partial shading conditions

If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.

Conventional MPPT's tend to lock to a local MPP, which may not be the optimum MPP.

The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

### Outstanding conversion efficiency

No cooling fan. Maximum efficiency exceeds 98%. Full output current up to 40°C (104°F).

### Flexible charge algorithm

Eight preprogrammed algorithms, selectable with a rotary switch (see manual for details)

### Extensive electronic protection

Over-temperature protection and power derating when temperature is high.

PV short circuit and PV reverse polarity protection.

PV reverse current protection.

### Internal temperature sensor

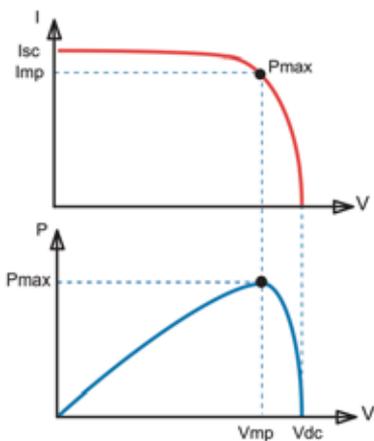
Compensates absorption and float charge voltages for temperature.

BlueSolar charge controller	MPPT 75/50	MPPT 100/50
Battery voltage	12/24 V Auto Select	
Rated charge current	50 A	
Maximum PV power, 12V 1a,b)	700 W (MPPT range 15 V to 70 V resp. 95 V)	
Maximum PV power, 24V 1a,b)	1400 W (MPPT range 30 V to 70 V resp. 95 V)	
Maximum PV open circuit voltage	75 V	100 V
Maximum efficiency	98 %	
Self-consumption	10 mA	
Charge voltage 'absorption'	Default setting: 14,4 V / 28,8 V	
Charge voltage 'float'	Default setting: 13,8 V / 27,6 V	
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Protection	Battery reverse polarity (fuse) PV reverse polarity Output short circuit Over temperature	
Operating temperature	-30 to +60°C (full rated output up to 40°C)	
Humidity	95 %, non-condensing	
Data communication port	VE.Direct See the data communication white paper on our website	
<b>ENCLOSURE</b>		
Colour	Blue (RAL 5012)	
Power terminals	13 mm <sup>2</sup> / AWG6	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	1,25 kg	
Dimensions (h x w x d)	130 x 186 x 70 mm	
1a) If more PV power is connected, the controller will limit input power to 700W resp. 1400W 1b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V		

# BLUESOLAR CHARGE CONTROLLER MPPT 150/35



Solar charge controller  
MPPT 150/35



## Maximum Power Point Tracking

### Upper curve:

Output current (I) of a solar panel as function of output voltage (V).  
The maximum power point (MPP) is the point Pmax along the curve where the product  $I \times V$  reaches its peak.

### Lower curve:

Output power  $P = I \times V$  as function of output voltage.  
When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than  $V_{mp}$ .

## Charge current up to 35 A and PV voltage up to 150 V

The BlueSolar charge controller will charge a lower nominal-voltage battery with a higher nominal voltage PV array.

The controller will automatically adjust to 12 V, 24 V or 48 V nominal battery voltage. (software tool needed to select 36 V)

## Ultra-fast Maximum Power Point Tracking (MPPT)

Especially in case of a cloudy sky, when light intensity is changing continuously, an ultra-fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

## Advanced Maximum Power Point Detection in case of partial shading conditions

If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.

Conventional MPPT's tend to lock to a local MPP, which may not be the optimum MPP.

The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

## Outstanding conversion efficiency

No cooling fan. Maximum efficiency exceeds 98%. Full output current up to 40°C (104°F).

## Flexible charge algorithm

Eight preprogrammed algorithms, selectable with a rotary switch (see manual for details)

## Extensive electronic protection

Over-temperature protection and power derating when temperature is high.

PV short circuit and PV reverse polarity protection.

PV reverse current protection.

## Internal temperature sensor

Compensates absorption and float charge voltages for temperature.

BlueSolar charge controller	MPPT 150/35
Battery voltage	12 / 24 / 48 V Auto Select (software tool needed to select 36 V)
Rated charge current	35 A
Maximum PV power, 12V 1a,b)	12V: 500W / 24V: 1000W / 36V: 1500W / 48V: 2000W
Maximum PV open circuit voltage	150V absolute maximum coldest conditions 145V start-up and operating maximum
Maximum efficiency	98 %
Self-consumption	0,01 mA
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6 V
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2 V
Charge algorithm	multi-stage adaptive
Temperature compensation	-16 mV / °C resp. -32 mV / °C
Protection	Battery reverse polarity (fuse) PV reverse polarity Output short circuit Over temperature
Operating temperature	-30 to +60°C (full rated output up to 40°C)
Humidity	95 % non-condensing
Data communication port	VE.Direct See the data communication white paper on our website
<b>ENCLOSURE</b>	
Colour	Blue (RAL 5012)
Power terminals	13 mm <sup>2</sup> / AWG6
Protection category	IP43 (electronic components), IP22 (connection area)
Weight	1,25 kg
Dimensions (h x w x d)	130 x 186 x 70 mm
1a) If more PV power is connected, the controller will limit input power to 700W resp. 1400W 1b) PV voltage must exceed $V_{bat} + 5V$ for the controller to start. Thereafter minimum PV voltage is $V_{bat} + 1V$	

# BLUESOLAR CHARGE CONTROLLER MPPT 150/70 and MPPT 150/85



**Solar charge controllers  
MPPT 150/70 and 150/85**

### PV voltage up to 150 V

The BlueSolar MPPT 150/70 and 150/85 charge controllers will charge a lower nominal-voltage battery from a higher nominal voltage PV array. The controller will automatically adjust to a 12, 24, 36, or 48 V nominal battery voltage.

### Ultra fast Maximum Power Point Tracking (MPPT)

Especially in case of a clouded sky, when light intensity is changing continuously, an ultra fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

### Advanced Maximum Power Point Detection in case of partial shading conditions

If partial shading occurs, two or more maximum power points may be present on the power-voltage curve. Conventional MPPT's tend to lock to a local MPP, which may not be the optimum MPP. The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

### Outstanding conversion efficiency

Maximum efficiency exceeds 98%. Full output current up to 40°C (104°F).

### Flexible charge algorithm

Several preprogrammed algorithms. One programmable algorithm. Manual or automatic equalisation. Battery temperature sensor. Battery voltage sense option.

### Programmable auxiliary relay

For alarm or generator start purposes

### Extensive electronic protection

Over-temperature protection and power derating when temperature is high. PV short circuit and PV reverse polarity protection. Reverse current protection.

BlueSolar charge controller	MPPT 150/70	MPPT 150/85
Nominal battery voltage	12 / 24 / 36 / 48V Auto Select	
Rated charge current	70A @ 40°C (104°F)	85A @ 40°C (104°F)
Maximum solar array input power 1)	12V: 1000W / 24V: 2000W / 36V: 3000W / 48V: 4000W	12V: 1200W / 24V: 2400W / 36V: 3600W / 48V: 4850W
Maximum PV open circuit voltage	150V absolute maximum coldest conditions 145V start-up and operating maximum	
Minimum PV voltage	Battery voltage plus 7 Volt to start	Battery voltage plus 2 Volt operating
Standby power consumption	12V: 0,55W / 24V: 0,75W / 36V: 0,90W / 48V: 1,00W	
Efficiency at full load	12V: 95% / 24V: 96,5% / 36V: 97% / 48V: 97,5%	
Absorption charge	14.4 / 28.8 / 43.2 / 57.6V	
Float charge	13.7 / 27.4 / 41.1 / 54.8V	
Equalization charge	15.0 / 30.0 / 45 / 60V	
Remote battery temperature sensor	Yes	
Default temperature compensation setting	-2,7mV/°C per 2V battery cell	
Remote on/off	No	Yes
Programmable relay	DPST AC rating: 240VAC/4A	DC rating: 4A up to 35VDC, 1A up to 60VDC
Communication port	VE.Can: two paralleled RJ45 connectors, NMEA2000 protocol	
Parallel operation	Yes, through VE.Can. Max 25 units in parallel	
Operating temperature	-40°C to 60°C with output current derating above 40°C	
Cooling	Natural Convection	Low noise fan assisted
Humidity (non condensing)	Max. 95%	
Terminal size	35mm <sup>2</sup> / AWG2	
Material & color	Aluminium, blue RAL 5012	
Protection class	IP20	
Weight	4,2 kg	
Dimensions (h x w x d)	350 x 160 x 135 mm	
Mounting	Vertical wall mount	Indoor only
Safety	EN60335-1	
EMC	EN61000-6-1, EN61000-6-3	

1) If more solar power is connected, the controller will limit input power to the stated maximum

## PWM CHARGE CONTROLLERS



BlueSolar 12/24-10



BlueSolar DUO 12/24-20



Two remote displays:  
- for BlueSolar 12/24-20  
- for BlueSolar DUO 12/24-20



BlueSolar 12/24 with timer

### BlueSolar 12/24-PWM

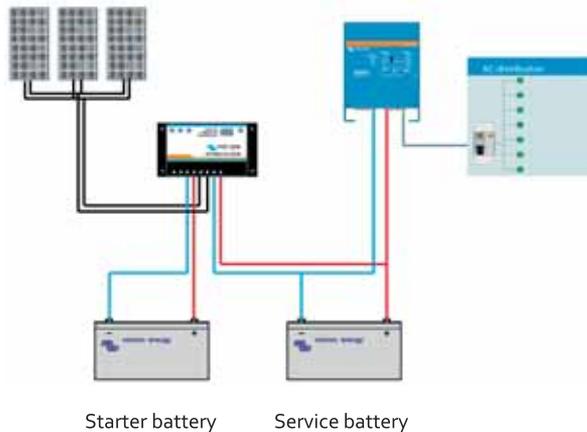
Three models: 5A, 10A or 20A at 12V or 24V

- Low cost PWM controller.
- Internal temperature sensor.
- Three stage battery charging (bulk, absorption, float).
- Protected against over current.
- Protected against short circuit.
- Protected against reverse polarity connection of the solar panels and/or battery.
- With low voltage load disconnect output.
- Optional remote display (20A model only)

### BlueSolar DUO 12/24-20

20A at 12V or 24V

- PWM controller.
- Charges two separate batteries. For example the starter battery and the service battery of a boat or mobile home.
- Programmable charge current ratio (standard setting: equal current to both batteries).
- Charge voltage settings for three battery types (Gel, AGM and Flooded).
- Internal temperature sensor and optional remote temperature sensor.
- Protected against over current.
- Protected against short circuit.
- Protected against reverse polarity connection of the solar panels and/or battery.



### BlueSolar 12/24-10 with timer

10A at 12V or 24V

- PWM solar lighting controller.
- Two timers to enable dusk to dawn operation, or limited time after dusk and limited time before dawn operation.
- Seven segment display to visualize timer settings and analyze fault conditions.
- Battery status indicator with over discharged warning.
- Internal temperature sensor.
- Three stage battery charging (bulk, absorption, float).
- Protected against over current.
- Protected against short circuit.
- Protected against reverse polarity connection of the solar panels and/or battery.
- Low voltage load disconnect override.

## PWM CHARGE CONTROLLERS

BlueSolar	BlueSolar 12/24-5 BlueSolar 12/24-10 BlueSolar 12/24-20		BlueSolar DUO 12/24-20		BlueSolar 12/24 with timer	
	12V	24V	12V	24V	12V	24V
Battery Voltage	12/24V Auto Select (1)		12/24V Auto Select (1)		12/24V Auto Select (1)	
Rated charge current	5/10/20A		20A		10A	
Second battery output	No		Yes		No	
Automatic load disconnect	Yes (maximum load 10/10/20A)		n. a.		Yes (maximum load 10A)	
Maximum solar voltage	28/55V (1)		28/55V (1)		28/55V (1)	
Self-consumption	6mA		4mA		5mA	
<b>Default settings</b>						
Absorption charge (2)	14.4V	28.8V	14.4V	28.8V	14.4V	28.8V
Float charge (2)	13.7V	27.4V	13.7V	27.4V	13.7V	27.4V
Equalization charge (2)	n. a.		n. a.		14.8V	29.6V
Low voltage load disconnect	11.1V	22.2V	n. a.		11.1V	22.2V
Low voltage load reconnect	12,6V	25.2V	n. a.		12,6V	25.2V
<b>Enclosure &amp; Environmental</b>						
Battery temperature sensor	Yes Internal sensor		Yes Internal sensor		Yes Internal sensor	
Temperature compensation	-30mV/°C	-60mV/°C	-30mV/°C	-60mV/°C	-30mV/°C	-60mV/°C
Operating temperature	-35°C to +55°C (full load)		-35°C to +55°C (full load)		-35°C to +55°C (full load)	
Cooling	Natural Convection		Natural Convection		Natural Convection	
Humidity (non condensing)	Max. 95%		Max. 95%		Max. 95%	
Protection class	IP20		IP20		IP30	
Terminal size	6mm <sup>2</sup> / AWG10		6mm <sup>2</sup> / AWG10		6mm <sup>2</sup> / AWG10	
Weight	160/160/180gr		180gr		150gr	
Dimension (h x w x d)	70x133x34 mm 70x133x34 mm 76x153x37 mm		76x153x37 mm		65x140x45 mm	
Mounting	Vertical wall mount Indoor only		Vertical wall mount Indoor only		Vertical wall mount Indoor only	
<b>Standards</b>						
Safety	EN60335-1					
EMC	EN61000-6-1, EN61000-6-3					
1) For 12V use 36 cell Solar panels For 24V use 72 cell Solar panels 2) See manual for alternative charge voltage settings						

# BLUESOLAR PWM - PRO CHARGE CONTROLLERS



BlueSolar PWM-Pro 10 A

### Programmable

The BlueSolar PWM-Pro series is ready for use with its default settings. It also is fully programmable with help of the dedicated BlueSolar Pro Remote Panel (see features below).

### Features

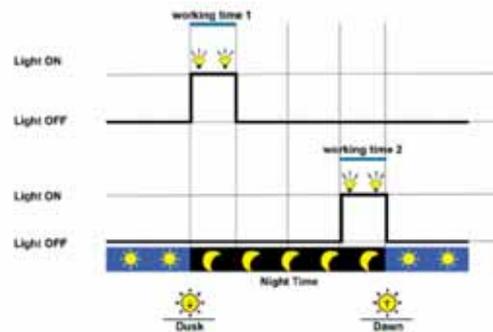
- Lighting control function, fully programmable with the Remote Panel.
- Three stage battery charging (bulk, absorption, float), fully programmable with the Remote Panel.
- Integrated battery monitor function (Remote Panel needed to display state of charge).
- Load output with low voltage disconnect and manual control (default setting).
- Optional external temperature sensor.
- Load output protected against over load and short circuit.
- Protected against reverse polarity connection of the solar panels and/or battery.

### Day/night timing options

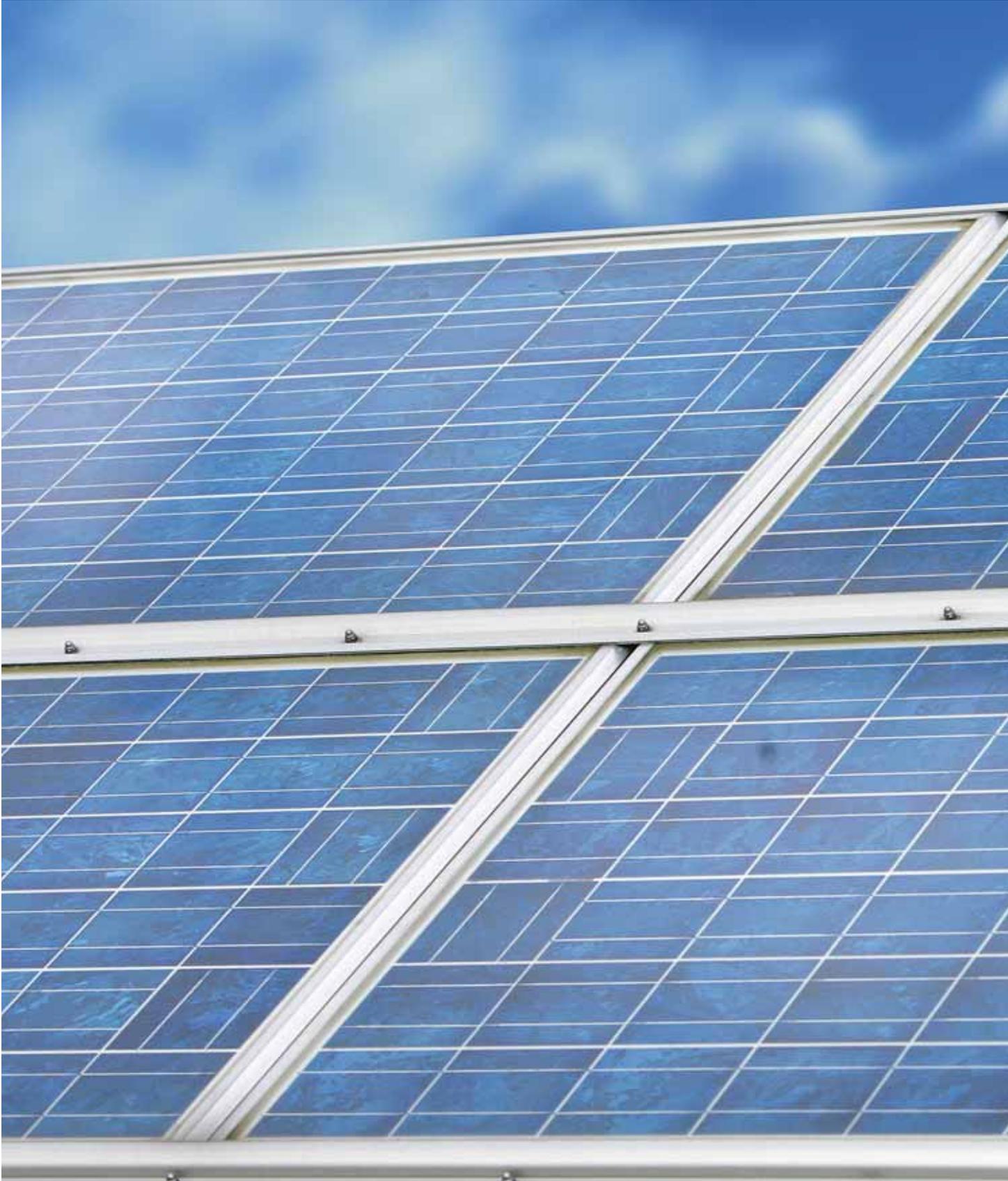
See Remote Panel manual for details



BlueSolar Pro Remote Panel



Blue Solar PWM-Pro	12/24-5	12/24-10	12/24-20	12/24-30
Battery Voltage	12/24V with automatic system voltage detection			
Rated charge current	5 A	10 A	20 A	30 A
Automatic load disconnect	Yes			
Maximum solar voltage	28 V / 55 V (1)			
Self-consumption	< 10 mA			
Load output	Manual control + low voltage disconnect			
Protection	Battery reverse polarity (fuse)	Output short circuit	Over temperature	
Battery temperature sensor	Optional (article SCC940100100)			
Temperature compensation	-30 mV / °C resp. -60 mV / °C (if temperature sensor installed)			
Remote panel	Optional (article SCC900300000)			
Grounding	Common positive			
Operating temp. range	-20 to +50°C			
Humidity (non condensing)	Max 98 %			
DEFAULT SETTINGS				
Absorption charge (2)	14.4 V / 28,8 V			
Float charge (2)	13.8 V / 27,6 V			
Equalization charge (2)	14,6 V / 29,2V			
Low voltage load disconnect	11,1 V / 22,2V			
Low voltage load reconnect	12,6 V / 25,2V			
ENCLOSURE				
Terminal size	4 mm <sup>2</sup>	4 mm <sup>2</sup>	10 mm <sup>2</sup>	10 mm <sup>2</sup>
Protection category	IP30			
Weight	0,13 kg	0,13 kg	0,3 kg	0,5 kg
Dimensions (h x w x d)	138x70x37 mm 5,4x2,7x1,4 inch	138x70x37 mm 5,4x2,7x1,4 inch	160x82x48 mm 6,3x3,2x1,9 inch	200x100x57 mm 7,9x4,0x2,3 inch
STANDARDS				
Safety	IEC 62109-1			
Emission	EN 61000-6-1, EN 61000-6-3, ISO 7637-2			
1) For 12V use 36 cell Solar panels For 24V use 72 cell Solar panels				



# BATTERY BALANCER

**The problem: the service life of an expensive battery bank can be substantially shortened due to state of charge unbalance**

One battery with a slightly higher internal leakage current in a 24 V or 48 V bank of several series/parallel connected batteries will cause under-charge of that battery and parallel connected batteries, and over-charge of the series connected batteries. Moreover, when new cells or batteries are connected in series, they should all have the same initial state of charge. Small differences will be ironed out during absorption or equalize charging, but large differences will result in damage due to excessive gassing (caused by overcharging) of the batteries with the higher initial state of charge and sulphation (caused by undercharging) of the batteries with the lower initial state of charge.

**The Solution: battery balancing**

The Battery Balancer equalizes the state of charge of two series connected 12 V batteries, or of several parallel strings of series connected batteries.

When the charge voltage of a 24 V battery system increases to more than 27,3 V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 0,7 A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.  
A 48 V battery bank can be balanced with three Battery Balancers.

**LED indicators**

- Green:** on (battery voltage > 27,3 V)
- Orange:** lower battery leg active (deviation > 0,1 V)
- Orange:** upper battery leg active (deviation > 0,1 V)
- Red:** alarm (deviation > 0,2 V). Remains on until the deviation has reduced to less than 0,14 V, or until system voltage drops to less than 26,6 V.

**Alarm relay**

Normally open. Closes when the red LED switches on, and opens when the red LED switches off.

**Alarm reset**

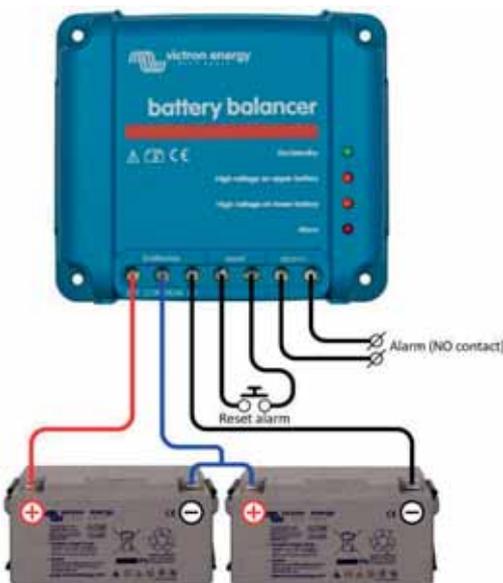
Two terminals are available to connect a push button. Interconnecting the two terminals resets the relay. The reset condition will remain active until the alarm is over. Thereafter the relay will close again when a new alarm occurs.

**Even more insight and control with the midpoint monitoring function of the BMV-702 battery monitor**

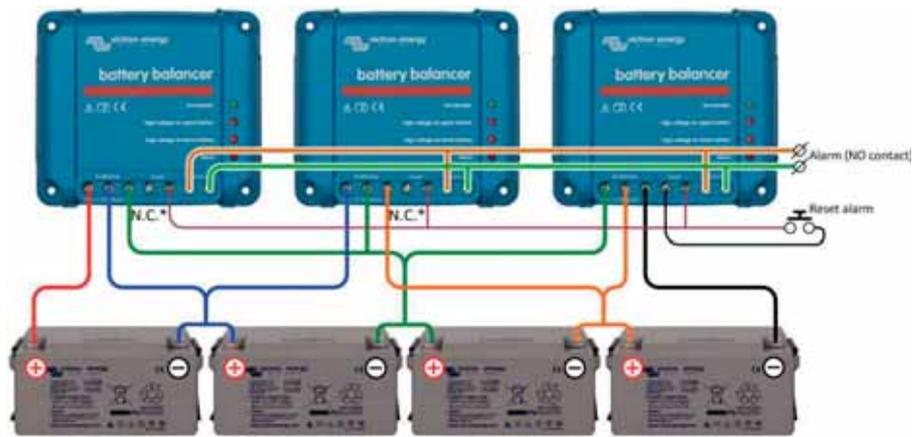
The BMV-702 measures the midpoint of a string of cells or batteries. It displays the deviation from the ideal midpoint in volts or percent. Separate deviation percentages can be set to trigger a visual/audible alarm and to close a potential free relay contact for remote alarm purposes. Please see the manual of the BMV-702 for more information about battery balancing.

**Learn more about batteries and battery charging**

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from [www.victronenergy.com](http://www.victronenergy.com)).



**Battery Balancer connected to two series connected 12 V batteries (24 V system)**

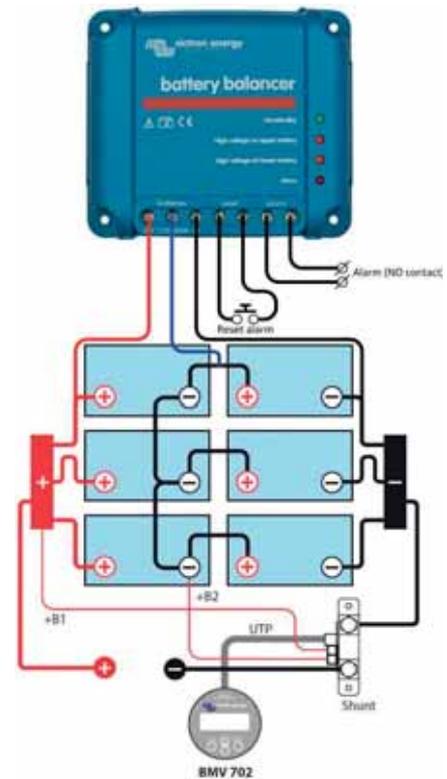


\* Do not connect this terminal. The left reset terminal should only be connected on the battery balancer nearest to system ground.

**Three Battery Balancers connected to four series connected 12 V batteries (48 V system)**

# BATTERY BALANCER

Victron Battery Balancer	
Input voltage range	Up to 18 V per battery, 36 V total
Turn on level	27,3 V +/- 1%
Turn off level	26,6V +/- 1%
Current draw when off	0,7 mA
Midpoint deviation to start balancing	50 mV
Maximum balancing current	0,7 A (when deviation > 100 mV)
Alarm trigger level	200 mV
Alarm reset level	140 mV
Alarm relay	60 V / 1 A normally open
Alarm relay reset	Two terminals to connect a push button
Over temperature protection	yes
Operating temperature	-30 to +50 °C
Humidity (non condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm <sup>2</sup> / AWG10
Protection category	IP22
Weight	0,4 kg
Dimensions (h x w x d)	100 x 113 x 47 mm
STANDARDS	
Safety	EN 60950
Emission	EN 61000-6-3, EN 55014-1
Immunity	EN 61000-6-2, EN61000-6-1, EN 55014-2
Automotive Directive	EN 50498

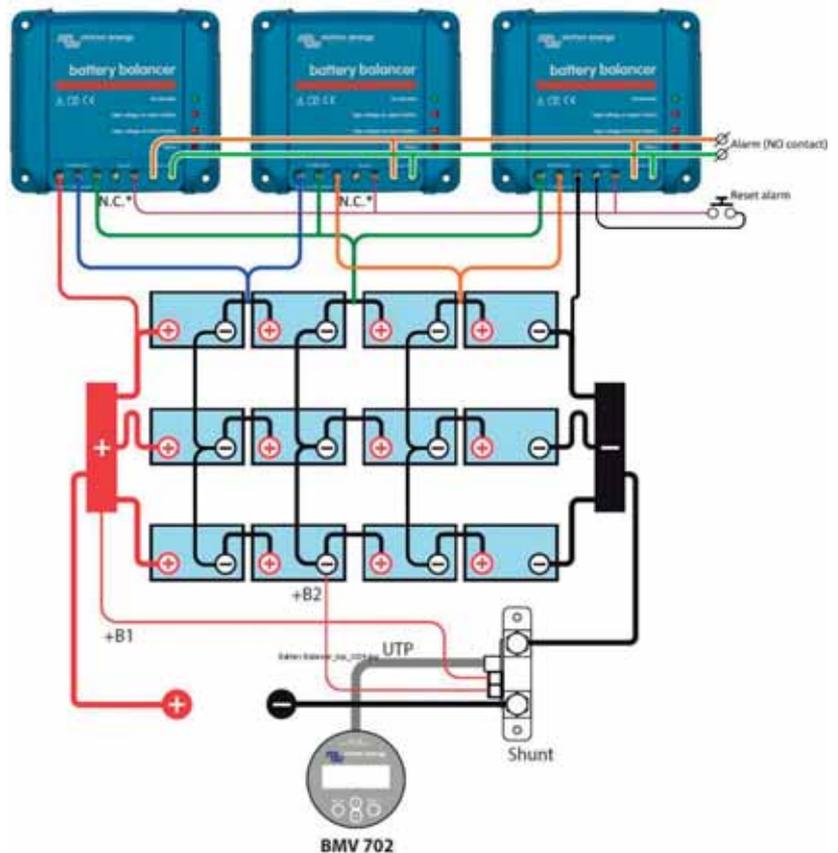


**Battery Balancer connected to six series-parallel connected 12 V batteries (24 V system)**

\* Do not connect this terminal. The left reset terminal should only be connected on the battery balancer nearest to system ground.

## Installation

1. The battery balancer(s) must be installed on a well-ventilated vertical surface close to the battery (but, due to possible corrosive gasses, not above the battery!)
2. If required: first wire the alarm contact and the alarm reset.
3. Use at least 0,75 mm<sup>2</sup> to wire the negative, positive and midpoint connections (in this order).
4. The balancer is operational.  
 When the voltage over a string of two batteries is less than 26,6 V the balancer switches to standby and all LEDs will be off.  
 When the voltage over a string of two batteries increases to more than 27,3 V (during charging) the green LED will turn on, indicating that the balancer is on.  
 When on, a voltage deviation of more than 50 mV will start the balancing process and at 100 mV one of the two orange LEDs will turn on. A deviation of more than 200 mV will trigger the alarm relay.



**Three Battery Balancers connected to 12 series-parallel connected 12 V batteries (48 V system)**



# GEL AND AGM BATTERIES



**AGM battery  
12V 90Ah**



**GEL OPzV 2V cell**

### 1. VRLA technology

VRLA stands for Valve Regulated Lead Acid, which means the batteries are sealed. Gas will escape through the safety valves only in case of overcharging or cell failure.

VRLA batteries are maintenance free for life.

### 2. Sealed (VRLA) AGM batteries

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action. As explained in our book 'Energy Unlimited', AGM batteries are more suitable for short-time delivery of very high currents (engine starting) than gel batteries.

### 3. Sealed (VRLA) Gel batteries

Here the electrolyte is immobilized as gel. Gel batteries in general have a longer service life and better cycle capacity than AGM batteries.

### 4. Low Self-discharge

Because of the use of lead calcium grids and high purity materials, Victron VRLA batteries can be stored during long periods of time without recharge. The rate of self-discharge is less than 2% per month at 20°C. The self discharge doubles for every increase in temperature with 10°C.

Victron VRLA batteries can therefore be stored during up to a year without recharging, if kept under cool conditions.

### 5. Exceptional Deep Discharge Recovery

Victron VRLA batteries have exceptional discharge recovery, even after deep or prolonged discharge.

It should however be stressed that repetitive deep discharge and prolonged discharge have a very negative influence on the service life of all lead acid batteries, Victron batteries are no exception.

### 6. Battery discharging characteristics

The rated capacity of Victron AGM and Gel Deep Cycle batteries refers to 20 hour discharge, in other words: a discharge current of 0,05 C.

The rated capacity of Victron Tubular Plate Long Life batteries refers to 10 hours discharge.

The effective capacity decreases with increasing discharge current (see table 1). Please note that the capacity reduction will be even faster in case of a constant power load, such as an inverter.

Discharge time (constant current)	End Voltage V	AGM 'Deep Cycle' %	Gel 'Deep Cycle' %	Gel 'Long Life' %
20 hours	10,8	100	100	112
10 hours	10,8	92	87	100
5 hours	10,8	85	80	94
3 hours	10,8	78	73	79
1 hour	9,6	65	61	63
30 min.	9,6	55	51	45
15 min.	9,6	42	38	29
10 min.	9,6	38	34	21
5 min.	9,6	27	24	
5 seconds		8 C	7 C	

**Table 1: Effective capacity as a function of discharge time  
(the lowest row gives the maximum allowable 5 seconds discharge current)**

Our AGM deep cycle batteries have excellent high current performance and are therefore recommended for high current applications such as engine starting. Due to their construction, Gel batteries have a lower effective capacity at high discharge currents. On the other hand, Gel batteries have a longer service life, both under float and cycling conditions.

### 7. Effect of temperature on service life

High temperature has a very negative effect on service life. The service life of Victron batteries as a function of temperature is shown in table 2.

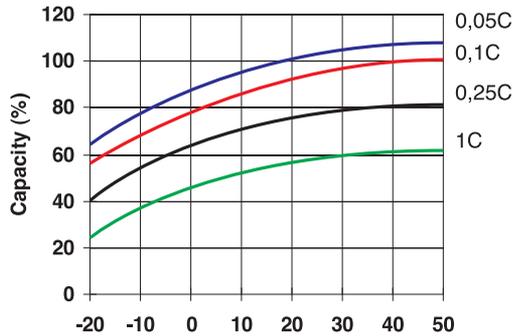
Average Temperature	AGM Deep Cycle  years	Gel Deep Cycle  years	Gel Long Life  years
20°C / 68°F	7 - 10	12	20
30°C / 86°F	4	6	10
40°C / 104°F	2	3	5

**Table 2: Design service life of Victron batteries under float service**

# GEL AND AGM BATTERIES

## 8. Effect of temperature on capacity

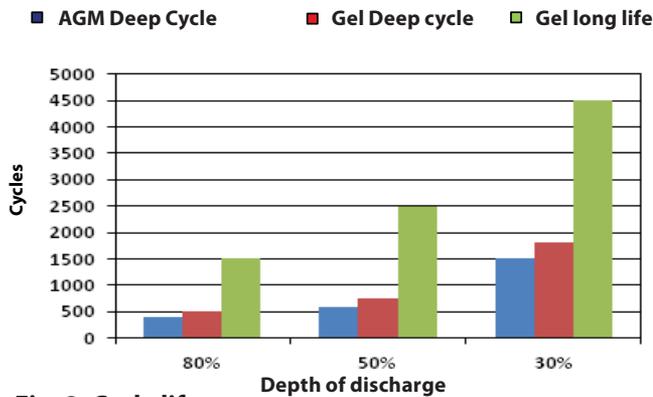
As is shown by the graph below, capacity reduces sharply at low temperatures.



**Fig. 1: Effect of temperature on capacity**

## 9. Cycle life of Victron batteries

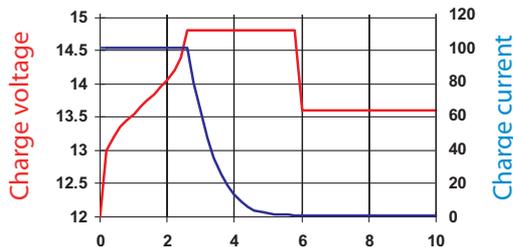
Batteries age due to discharging and recharging. The number of cycles depends on the depth of discharge, as is shown in figure 2.



**Fig. 2: Cycle life**

## 10. Battery charging in case of cycle use: the 3-step charge curve

The most common charge curve used to charge VRLA batteries in case of cyclic use is the 3-step charge curve, whereby a constant current phase (the bulk phase) is followed by two constant voltage phases (absorption and float), see fig. 3.



**Fig. 3: Three step charge curve**

During the absorption phase the charge voltage is kept at a relatively high level in order to fully recharge the battery within reasonable time. The third and last phase is the float phase: the voltage is lowered to standby level, sufficient to compensate for self discharge.

# GEL AND AGM BATTERIES

## Disadvantages of the traditional 3-step charge curve:

- During the bulk phase the current is kept at a constant and often high level, even after the gassing voltage (14,34 V for a 12 V battery) has been exceeded. This can lead to excessive gas pressure in the battery. Some gas will escape through the safety valves, reducing service life.
- Thereafter the absorption voltage is applied during a fixed period of time, irrespective of how deep the battery has been discharged previously. A full absorption period after a shallow discharge will overcharge the battery, again reducing service life. (a. o. due to accelerated corrosion of the positive plates)
- Research has shown that battery life can be increased by decreasing float voltage to an even lower level when the battery is not in use.

## 11. Battery charging: longer battery life with Victron 4-step adaptive charging

Victron developed the adaptive charge curve. The 4-step adaptive charge curve is the result of years of research and testing.

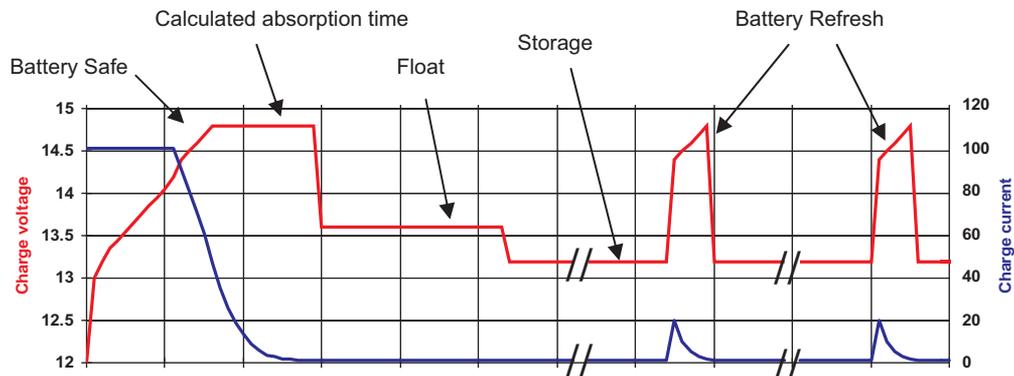
### The Victron four-step adaptive charge curve solves the 3 main problems of the 3 step curve:

- **Battery Safe mode**  
In order to prevent excessive gassing, Victron has invented the 'Battery Safe Mode'. The battery Safe Mode will limit the rate of voltage increase once the gassing voltage has been reached. Research has shown that this will reduce internal gassing to a safe level.
- **Variable absorption time**  
Based on the duration of the bulk stage, the charger calculates how long the absorption time should be in order to fully charge the battery. If the bulk time is short, this means the battery was already charged and the resulting absorption time will also be short, whereas a longer bulk time will also result in a longer absorption time.
- **Storage mode**  
After completion of the absorption period the battery should be fully charged, and the voltage is lowered to the float or standby level. If no discharge occurs during the next 24 hours, the voltage is reduced even further and the battery goes into storage mode. The lower storage voltage reduces corrosion of the positive plates. Once every week the charge voltage is increased to the absorption level for a short period to compensate for self discharge (Battery Refresh mode).

## 12. Battery charging in case of standby use: constant voltage float charging

When a battery is not frequently deeply discharged, a 2-step charge curve can be used. During the first phase the battery is charged with a limited current (the bulk phase). Once a preset voltage has been reached the battery is kept at that voltage (the float phase).

This charge method is used for starter batteries in vehicles, and in uninterruptible power supplies (UPS).



## 13. Optimum charge voltage of Victron VRLA batteries

The recommended charge voltage settings for a 12 V battery are shown in table 3.

**Fig. 4: Four-step adaptive charge curve**

## 14. Effect of temperature on charging voltage

The charge voltage should be reduced with increased temperature. Temperature compensation is required when the temperature of the battery is expected to be less than 10°C / 50°F or more than 30°C / 85°F during long periods of time. The recommended temperature compensation for Victron VRLA batteries is -4 mV / Cell (-24 mV / °C for a 12 V battery). The centre point for temperature compensation is 20°C / 70°F.

## 15. Charge current

The charge current should preferably not exceed 0,2 C (20 A for a 100 Ah battery). The temperature of a battery will increase by more than 10°C if the charge current exceeds 0,2 C. Therefore temperature compensation is required if the charge current exceeds 0,2 C.

## GEL AND AGM BATTERIES

	Float Service (V)	Cycle service Normal (V)	Cycle service Fastest recharge (V)
<b>Victron AGM "Deep Cycle"</b>			
Absorption		14,2 - 14,6	14,6 - 14,9
Float	13,5 - 13,8	13,5 - 13,8	13,5 - 13,8
Storage	13,2 - 13,5	13,2 - 13,5	13,2 - 13,5
<b>Victron Gel "Deep Cycle"</b>			
Absorption		14,1 - 14,4	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	
<b>Victron Gel "Long Life"</b>			
Absorption		14,0 - 14,2	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	

**Table 3: Recommended charge voltage**

12 Volt Deep Cycle AGM							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0 °F	RES CAP @80 °F	Technology: flat plate AGM Terminals: copper
BAT406225080	240	6	320x176x247	31	1500	480	Rated capacity: 20 hr discharge at 25 °C Float design life: 7-10 years at 20 °C Cycle design life: 400 cycles at 80% discharge 600 cycles at 50% discharge 1500 cycles at 30% discharge
BAT212070080	8	12	151x65x101	2,5			
BAT212120080	14	12	151x98x101	4,1			
BAT212200080	22	12	181x77x167	5,8			
BAT412350080	38	12	197x165x170	12,5			
BAT412550080	60	12	229x138x227	20	450	90	
BAT412600080	66	12	258x166x235	24	520	100	
BAT412800080	90	12	350x167x183	27	600	145	
BAT412101080	110	12	330x171x220	32	800	190	
BAT412121080	130	12	410x176x227	38	1000	230	
BAT412151080	165	12	485x172x240	47	1200	320	
BAT412201080	220	12	522x238x240	65	1400	440	

12 Volt Deep Cycle GEL							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0 °F	RES CAP @80 °F	Technology: flat plate GEL Terminals: copper
BAT412550100	60	12	229x138x227	20	300	80	Rated capacity: 20 hr discharge at 25 °C Float design life: 12 years at 20 °C Cycle design life: 500 cycles at 80% discharge 750 cycles at 50% discharge 1800 cycles at 30% discharge
BAT412600100	66	12	258x166x235	24	360	90	
BAT412800100	90	12	350x167x183	26	420	130	
BAT412101100	110	12	330x171x220	33	550	180	
BAT412121100	130	12	410x176x227	38	700	230	
BAT412151100	165	12	485x172x240	48	850	320	
BAT412201100	220	12	522x238x240	66	1100	440	

2 Volt Long Life GEL					General Specification
Article number	Ah	V	l x b x h mm	Weight kg	Technology: tubular plate GEL Terminals: copper
BAT702601260	600	2	145x206x688	49	Rated capacity: 10 hr discharge at 25 °C Float design life: 20 years at 20 °C Cycle design life: 1500 cycles at 80% discharge 2500 cycles at 50% discharge 4500 cycles at 30% discharge
BAT702801260	800	2	210x191x688	65	
BAT702102260	1000	2	210x233x690	80	
BAT702122260	1200	2	210x275x690	93	
BAT702152260	1500	2	210x275x840	115	
BAT702202260	2000	2	215x400x815	155	
BAT702252260	2500	2	215x490x815	200	
BAT702302260	3000	2	215x580x815	235	

**Other capacities and terminal types: at request**

# OPzS SOLAR BATTERIES



**OPzS Solar batteries 910**

### Long life flooded tubular plate batteries

Design life: >20 years at 20°C, >10 years at 30°C, >5 years at 40°C.  
 Cycling expectancy of up to 1500 cycles at 80% depth of discharge.  
 Manufactured according to DIN 40736, EN 60896 and IEC 61427.

### Low maintenance

Under normal operating conditions and 20°C, distilled water has to be added every 2 - 3 years.

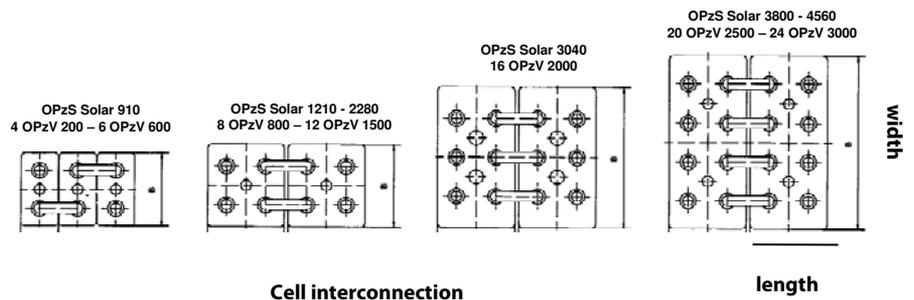
### Dry-charged or ready for use electrolyte filled

The batteries are available filled with electrolyte or dry-charged (for long term stocking, container transport or air transport). Dry charged batteries have to be filled with diluted sulphuric acid (density 1,24kg/l @ 20°C). The electrolyte may be stronger for cold- or weaker for hot climates.

### Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from [www.victronenergy.com](http://www.victronenergy.com)).

OPzS Solar type	OPzS Solar 910	OPzS Solar 1210	OPzS Solar 1520	OPzS Solar 1830	OPzS Solar 2280	OPzS Solar 3040	OPzS Solar 3800	OPzS Solar 4560
Nominal capacity (120 hr / 20°C)	910 Ah	1210 Ah	1520 Ah	1830 Ah	2280 Ah	3040 Ah	3800 Ah	4560 Ah
Capacity (10 hr / 20°C)	640 Ah	853 Ah	1065 Ah	1278 Ah	1613 Ah	2143 Ah	2675 Ah	3208 Ah
Capacity 2 / 5 / 10 hours (% of 10hr capacity)	60 / 85 / 100 (@ 68°F/20°C, end of discharge 1,8 Volt per cell)							
Capacity 20 / 24 / 48 / 72 hours (% of 120hr capacity)	77 / 80 / 89 / 95 (@ 68°F/20°C, end of discharge 1,85 Volt per cell)							
Capacity 100 / 120 / 240 hours (% of 120hr capacity)	99 / 100 / 104 (@ 68°F/20°C, end of discharge 1,85 Volt per cell)							
Self-discharge @ 70°F/20°C	3% per month							
Absorption voltage (V) @ 70°F/20°C	2,35 to 2,50 V/cell (28,2 to 30,0 V for a 24 Volt battery)							
Float voltage (V) @ 70°F/20°C	2,23 to 2,30 V/cell (26,8 to 27,6 V for a 24 Volt battery)							
Storage voltage (V) @ 70°F/20°C	2,18 to 2,22 V/cell (26,2 to 26,6 V for a 24 Volt battery)							
Float design life @ 70°F/20°C	20 years							
Cycle design life @ 80% discharge	1500							
Cycle design life @ 50% discharge	2500							
Cycle design life @ 30% discharge	4000							
Dimensions (lxwxh, mm)	145 x 206 x 711	210 x 191 x 711	210 x 233 x 711	210 x 275 x 711	210 x 275 x 861	212 x 397 x 837	212 x 487 x 837	212 x 576 x 837
Dimensions (lxwxh, inches)	5,7 x 8,1 x 28	8,3 x 7,5 x 28	8,3 x 9,2 x 28	8,3 x 10,8 x 28	8,3 x 10,8 x 33,9	8,4 x 15,6 x 32,9	8,4 x 19,2 x 32,9	8,4 x 22,7 x 32,9
Weight without acid (kg / pounds)	35 / 77	46 / 101	57 / 126	66 / 146	88 / 194	115 / 254	145 / 320	170 / 375
Weight with acid (kg / pounds)	50 / 110	65 / 143	80 / 177	93 / 205	119 / 262	160 / 253	200 / 441	240 / 530



# 12,8 VOLT LITHIUM IRON PHOSPHATE BATTERIES



**12,8V 90Ah LiFePO4 battery**  
**LFP-CB 12,8/90**  
(cell balancing only)



**12,8V 90Ah LiFePO4 battery**  
**LFP-BMS 12,8/90**  
(cell balancing and BMS interface)

## Why lithium-iron phosphate?

Lithium-iron-phosphate (LiFePO<sub>4</sub> or LFP) is the safest of the mainstream li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 12,8V LFP battery therefore consists of 4 cells connected in series; and a 25,6V battery consists of 8 cells connected in series.

### Rugged

A lead-acid battery will fail prematurely due to sulfation if:

- If it operates in deficit mode during long periods of time (i. e. if the battery is rarely, or never at all, fully charged).
- If it is left partially charged or worse, fully discharged (yacht or mobile home during winter time).

A LFP battery does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of LFP compared to lead-acid.

Other advantages are the wide operating temperature range, excellent cycling performance, low internal resistance and high efficiency (see below).

LFP is therefore the chemistry of choice for very demanding applications.

### Efficient

In several applications (especially off-grid solar and/or wind), energy efficiency can be of crucial importance. The round trip energy efficiency (discharge from 100% to 0% and back to 100% charged) of the average lead-acid battery is 80%.

The round trip energy efficiency of a LFP battery is 92%.

The charge process of lead-acid batteries becomes particularly inefficient when the 80% state of charge has been reached, resulting in efficiencies of 50% or even less in solar systems where several days of reserve energy is required (battery operating in 70% to 100% charged state).

In contrast, a LFP battery will still achieve 90% efficiency under shallow discharge conditions.

### Size and weight

Saves up to 70% in space  
Saves up to 70% in weight

### Expensive?

LFP batteries are expensive when compared to lead-acid. But in demanding applications, the high initial cost will be more than compensated by longer service life, superior reliability and excellent efficiency.

### Endless flexibility

LFP batteries are easier to charge than lead-acid batteries. The charge voltage may vary from 14V to 16V (as long as no cell is subjected to more than 4,2V), and they do not need to be fully charged. Therefore several batteries can be connected in parallel and no damage will occur if some batteries are less charged than others.

### With or without Battery Management System (BMS)?

Important facts:

1. A LFP cell will fail if the voltage over the cell falls to less than 2,5V.
2. A LFP cell will fail if the voltage over the cell increases to more than 4,2V.

Lead-acid batteries will eventually also be damaged when discharged too deeply or overcharged, but not immediately. A lead-acid battery will recover from total discharge even after it has been left in discharged state during days or weeks (depending on battery type and brand).

3. The cells of a LFP battery do not auto-balance at the end of the charge cycle.

The cells in a battery are not 100% identical. Therefore, when cycled, some cells will be fully charged or discharged earlier than others. The differences will increase if the cells are not balanced/equalized from time to time.

In a lead-acid battery a small current will continue to flow even after one or more cells are fully charged (the main effect of this current is decomposition of water into hydrogen and oxygen). This current helps to fully charge other cells that are lagging behind, thus equalizing the charge state of all cells.

The current through a LFP cell however, when fully charged, is nearly zero, and lagging cells will therefore not be fully charged. The differences between cells may become some so extreme over time that, even though the overall battery voltage is within limits, some cells will be destroyed due to over- or under-voltage. Cell balancing is therefore highly recommended.

In addition to cell balancing, a BMS will:

- Prevent cell under voltage by timely disconnecting the load.
- Prevent cell overvoltage by reducing charge current or stopping the charge process.
- Shut down the system in case of over temperature.

A BMS is therefore indispensable to prevent damage to large Li-ion battery banks.

# 12,8 VOLT LITHIUM IRON PHOSPHATE BATTERIES

## With cell balancing, but without BMS: 12,8V LFP batteries for light duty applications

In applications where excessive discharge (to less than 11V), overcharge (to more than 15V) or excessive charge current will never occur, 12,8V batteries with cell balancing only may be used.

Please note that these batteries are not suitable for series or parallel connection.

Notes:

1. A Battery Protect module (see [www.victronenergy.com](http://www.victronenergy.com)) may be used to prevent excessive discharge.
2. The current draw of inverters and inverterchargers is often still significant (0,1A or more) after low voltage shutdown. The remaining stand-by current will therefore damage the battery if the inverters or inverterchargers are left connected to the battery after low voltage shutdown during a long period of time.

## With cell balancing and interface to connect to a Victron BMS: 12,8V LFP batteries for heavy duty applications and parallel/series connection

These batteries have integrated Cell Balancing, Temperature and Voltage control (BTv). Up to ten batteries can be paralleled and up to four batteries can be series connected (BTv's are simply daisy-chained) so that a 48V battery bank of up to 2000Ah can be assembled. The daisy-chained BTv's must be connected to a battery management system (BMS).

### Battery Management System (BMS)

The BMS connects to the BTv's and its essential functions are:

1. Disconnect or shut down the load whenever the voltage of a battery cell falls to less than 2,5V.
2. Stop the charging process whenever the voltage of a battery cell increases to more than 4,2V.
3. Shut down the system whenever the temperature of a cell exceeds 50°C.

More features may be included: see the individual BMS datasheets.

Battery specification								
	Cell balancing only				Cell balancing and BMS interface			
VOLTAGE AND CAPACITY	LFP-CB 12,8/60	LFP-CB 12,8/90	LFP-CB 12,8/160	LFP-CB 12,8/200	LFP-BMS 12,8/60	LFP-BMS 12,8/90	LFP-BMS 12,8/160	LFP-BMS 12,8/200
Nominal voltage	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V
Nominal capacity @ 25°C*	60Ah	90Ah	160Ah	200Ah	60Ah	90Ah	160Ah	200Ah
Nominal capacity @ 0°C*	48Ah	72Ah	130Ah	160Ah	48Ah	72Ah	130Ah	160Ah
Nominal capacity @ -20°C*	30Ah	45Ah	80Ah	100Ah	30Ah	45Ah	80Ah	100Ah
Nominal energy @ 25°C*	768Wh	1152Wh	2048Wh	2560Wh	768Wh	1152Wh	2048Wh	2560Wh
*Discharge current ≤1C								
CYCLE LIFE								
80% DoD	2000 cycles							
70% DoD	3000 cycles							
50% DoD	5000 cycles							
DISCHARGE								
Maximum continuous discharge current	180A	270A	400A	500A	180A	270A	400A	500A
Recommended continuous discharge current	≤60A	≤90A	≤160A	≤200A	≤60A	≤90A	≤160A	≤200A
Maximum 10 s pulse current	600A	900A	1200A	1500A	600A	900A	1200A	1500A
End of discharge voltage	11V	11V	11V	11V	11V	11V	11V	11V
OPERATING CONDITIONS								
Operating temperature	-20°C to +50°C (do not charge when battery temperature < 0°C)							
Storage temperature	-45°C to +70°C							
Humidity (non condensing)	Max. 95%							
Protection class	IP 54							
CHARGE								
Charge voltage	Between 14V and 15V (<14,5V recommended)							
Float voltage	13,6V							
Maximum charge current	60A	90A	160A	200A	180A	270A	400A	500A
Recommended charge current	≤20A	≤25A	≤40A	≤50A	≤30A	≤45A	≤80A	≤100A
OTHER								
Max storage time @ 25 °C*	1 year							
Dimensions (hxxwxd) mm	235x293x139	249x293x168	320x338x233	295x425x274	235x293x139	249x293x168	320x338x233	295x425x274
Weight	12kg	16kg	33kg	42kg	12kg	16kg	33kg	42kg
*When fully charged								

## 24V 180AH LITHIUM-ION BATTERY AND LYNX-ION



24V 180Ah Lithium-ion battery

### The advantages of a Lithium-ion battery over conventional lead-acid batteries

- High energy density: more energy with less weight;
- High charge currents (shortens the charge period);
- High discharge currents (enabling for example electrical cooking on a small battery bank);
- Long battery life (up to six times the battery life of a conventional battery);
- High efficiency between charging and discharging (very little energy loss due to heat development);
- Higher continuous power available.

### Why Lithium-iron phosphate?

Lithium-iron-phosphate (LiFePO<sub>4</sub> or LFP) is the safest of the mainstream Li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 25,6V LFP battery consists of 8 cells connected in series.

### The advantages of the Victron Lynx Lithium-ion battery system

The modular system used adds below advantages:

- The Victron Lithium-ion battery system is easy to install due to its modularity. No complicated wiring diagrams are required.
- Detailed information is available on the waterproof Ion Control display.
- The 350A relay in the Lynx Ion provides maximum safety: in case the chargers or loads do not listen to the commands from the Lynx Ion, the main safety relay will open to prevent permanent damage to the batteries.
- For typical marine installations there is an extra smaller output, so you can still power the bilge pump and disconnect all other house loads by opening the 350A relay.



Lynx Ion

### Complete system

A complete system consists of:

- One or more **24V 180Ah Lithium-Ion batteries**.
- (optional) The **Lynx Power In**, a modular dc bus bar.
- The **Lynx Ion** is the battery management system (BMS) that controls the batteries. A 350 Ampère safety contactor is inside the Lynx Ion.
- The **Lynx Shunt VE.Can**, a battery monitor including the main fuse. Note that the fuse needs to be purchased separately.
- (optional) The **Lynx Distributor**, a DC distribution system with fuses.
- (optional) The **Ion Control**, a digital control panel.



Ion control: Main screen

### 24V 180Ah Lithium-Ion Batteries

The base of the Victron Lithium-ion battery system is formed by individual 24V/180Ah Lithium-ion batteries. They have a built-in Cell Management System (BMS) which protects the battery on a cell level. It monitors individual cell voltage and system temperature, and actively balances the individual cells. All measured parameters are sent to the Lynx Ion which monitors the system as a whole.

### Lynx Ion

The Lynx Ion is the BMS. It contains the 350A safety contactor, and controls the cell-balancing, charging and discharging of the system. The Lynx Ion will protect the battery pack from both overcharging and depletion. When an overcharge is imminent, it will signal the charging devices to decrease or stop charging. This is done with the VE.Can bus (NMEA2000) compatible, and also via the two available open/close contacts. Same when the battery is nearing empty, and there is no charging capability available. It will signal big loads to switch off.

For both over charging and depletion there is a last safety resort, the built-in 350A contactor. In case signaling etcetera does not stop the imminent overcharge or depletion, it will open the contactor.

### NMEA2000 Canbus

Communication with the outside world is done via the VE.Can protocol.

### Ion Control

See the separate **Ion Control** datasheet for more information on the display.



Ion control: History screen



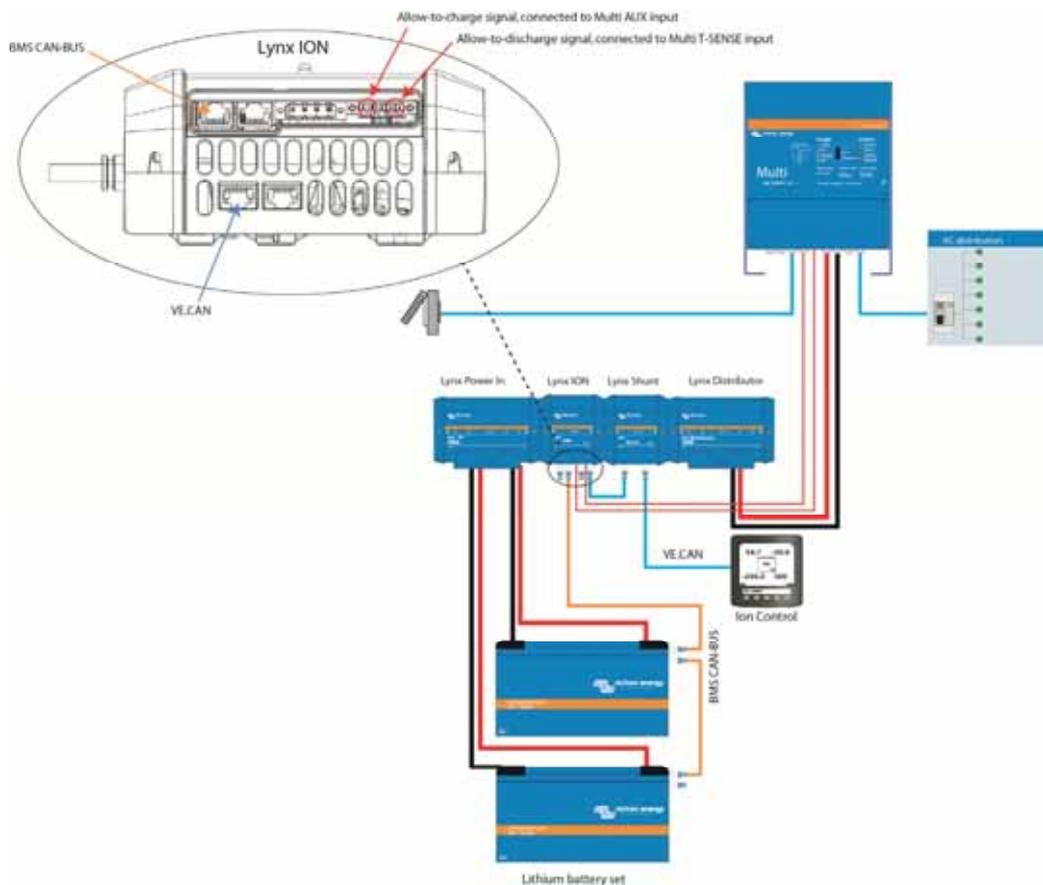
Ion control: Lynx Ion Status

# 24V 180AH LITHIUM-ION BATTERY AND LYNX-ION

Lithium-ion 24V 180Ah 4.75kWh battery	
Technology	Lithium iron phosphate (LiFePo4)
Nominal voltage	26,4 V
Nominal capacity	180 Ah
Nominal power	4,75 kWh
Weight	55 kg
Power/Weight ratio	86 Wh/kg
Dimensions (LxWxH)	625 x 195 x 355 mm
Charge cut-off voltage at 0.05C	28,8 V
Discharge cut-off voltage	20 V
Recommended charge/discharge current	54 A (0,3C)
Maximum charge current (1C)	180 A
Maximum discharge current (1.5C)	270 A
Pulse discharge current (10s)	1000 A
Cycle Life @80% DOD (0.3C)	2000
Series configuration	Yes, up to 2 (more in series on request)
Parallel configuration	Yes, easy up to 4 (more parallel on request)
Operating temp. charge	0~45 °C
Operating temp. discharge	-20~55 °C
Storage temp.	-20~45 °C

Lynx Ion	
Maximum number batteries in series	2
Maximum number batteries in parallel	8
<b>Enclosure</b>	
Weight	1,4 kg
Dimensions (LxWxH)	190 x 180 x 80 mm
<b>IO</b>	
Safety contactor	350 A
Bilge pump contactor maximum current	10 A
External relay contactor maximum current	10 A
Charged-signal contact	1A @ 60VDC
Discharged-signal contact	1A @ 60VDC
<b>Standards</b>	
Emission	EN 50081-1
Immunity	EN 50082-1

**Block diagram Lithium-ion battery system**



## VE.BUS BMS

### Protects each individual cell of a Victron lithium iron phosphate (LiFePO<sub>4</sub> or LFP) battery

Each individual cell of a LiFePO<sub>4</sub> battery must be protected against over voltage, under voltage and over temperature.

Victron LiFePO<sub>4</sub> batteries have integrated Balancing, Temperature and Voltage control (acronym: BTV) and connect to the VE.Bus BMS with two M8 circular connector cord sets.

The BTV's of several batteries can be daisy chained. Please see our LiFePO<sub>4</sub> battery documentation for details.

The BMS will:

- shut down or disconnect loads in case of imminent cell under voltage,
- reduce charge current in case of imminent cell overvoltage or over temperature (VE.Bus products only, see below), and
- shut down or disconnect battery chargers in case of imminent cell overvoltage or over temperature.



VE.Bus BMS

### Protects 12 V, 24 V and 48 V systems

Operating voltage range of the BMS: 9 to 70 V DC.

### Communicates with all VE.Bus products

The VE.Bus BMS connects to a MultiPlus, Quattro or Phoenix inverter with a standard RJ45 UTP cable.

Other products, without VE.Bus can be controlled as shown below:

### Load Disconnect

The Load Disconnect output is normally high and becomes free floating in case of imminent cell under voltage. Maximum current: 2 A.

The Load Disconnect output can be used to control

- the remote on/off of a load, and/or
- the remote on/off of an electronic load switch (Battery Protect) and/or
- a Cyrix-Li-load relay.

### Charge Disconnect

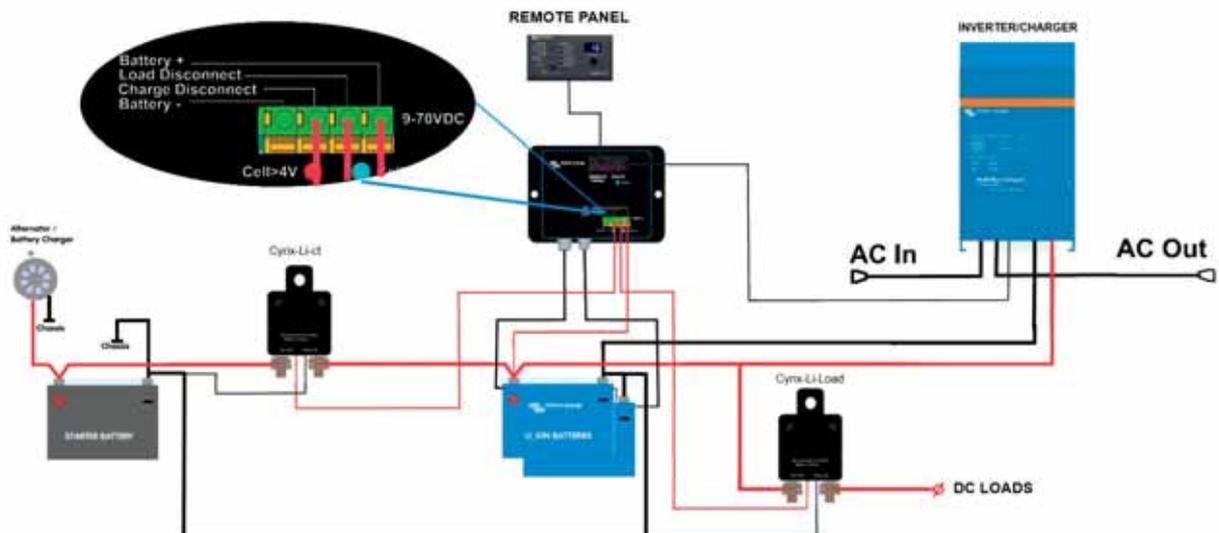
The Charge Disconnect output is normally high and becomes free floating in case of imminent cell over voltage or over temperature. Maximum current: 10 mA.

The Charge Disconnect output can be used to control

- the remote on/off of a charger and/or
- a Cyrix-Li-Charge relay and/or
- a Cyrix-Li-ct Battery Combiner.

### LED indicators

- **Enabled (blue):** VE.Bus products are enabled.
- **Cell>4V or temperature (red):** charge disconnect output low because of imminent cell over voltage or over temperature.
- **Cell>2,8V (blue):** load disconnect output high.

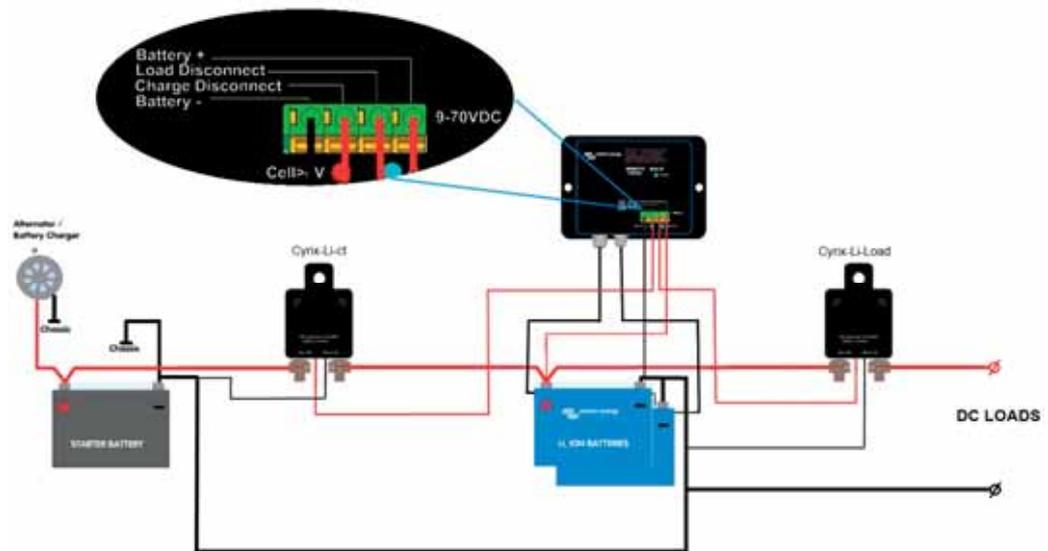


Application example for a vehicle or boat.

A Cyrix Li-ion Battery Combiner is used to connect to the starter battery and alternator. The UTP cable to the inverter/charger also provides the minus connection to the BMS.

# VE.BUS BMS

VE.Bus BMS	
Input voltage range	9 – 70 VDC
Current draw, normal operation	10 mA (excluding Load Disconnect current)
Current draw, low cell voltage	2 mA
Load Disconnect output	Normally high Source current limit: 2 A Sink current: 0 A (output free floating)
Charge Disconnect output	Normally high Source current limit: 10 mA Sink current: 0 A (output free floating)
<b>GENERAL</b>	
VE.Bus communication port	Two RJ45 sockets to connect to all VE.Bus products
Operating temperature	-20 to +50°C    0 - 120°F
Humidity	Max. 95% (non condensing)
Protection grade	IP20
<b>ENCLOSURE</b>	
Material and color	ABS, matt black
Weight	0,1 kg
Dimensions (hxxwxd)	105 x 78 x 32 mm
<b>STANDARDS</b>	
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN61000-6-1, EN 55014-2 EN 50498



Application example for a vehicle or boat, without inverter/charger.



### Three Cyrix Combiners especially designed for use with the VE.Bus BMS:

#### Cyrix-Li-load

The Cyrix-Li-Load will prevent frequent switching when a low cell voltage is followed by a higher voltage after loads have been switched off.

#### Cyrix-Li-ct

A battery combiner with a Li-ion adapted engage/disengage profile and a control terminal to connect to the Charge Disconnect of the BMS.

#### Cyrix-Li-Charge

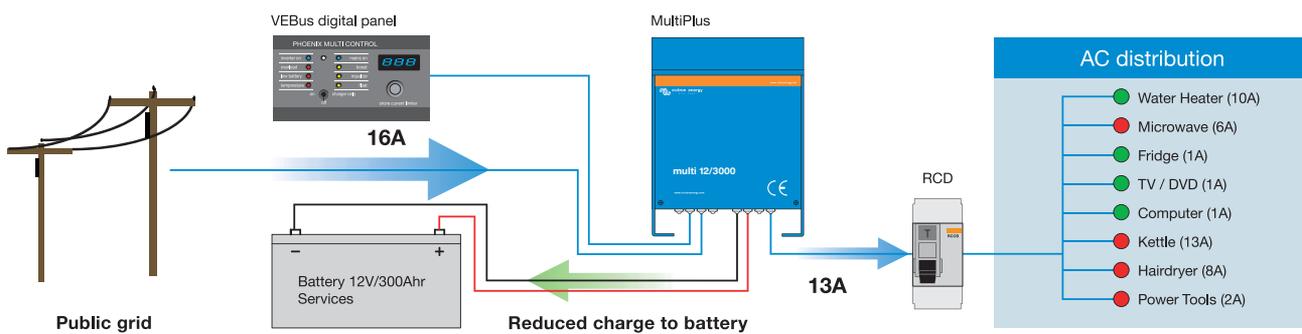
A unidirectional combiner to insert in between a battery charger and the LFP battery. It will engage only when charge voltage from a battery charger is present on its charge-side terminal. A control terminal connects to the Charge Disconnect of the BMS.

**INVERTER/CHARGER SYSTEM WITH INTELLIGENT SHORE AND GENERATOR POWER MANAGEMENT**

**PowerControl:** Dealing with limited generator or grid power. All models in the MultiPlus range feature powerful battery chargers. When the largest model is working hard it can draw almost 10A from a 230V supply. Using the remote panel it is possible to 'dial-in' the maximum current that is available from mains or generator. The MultiPlus will then automatically regulate the charger taking account of other system AC loads and ensuring the charger only uses what is spare. This way it is possible to avoid tripping the mains power or overloading the generator.

**POWER CONTROL ©**

**Battery charger reduces its output, if required, to avoid overload of supply when system consumption is high.**

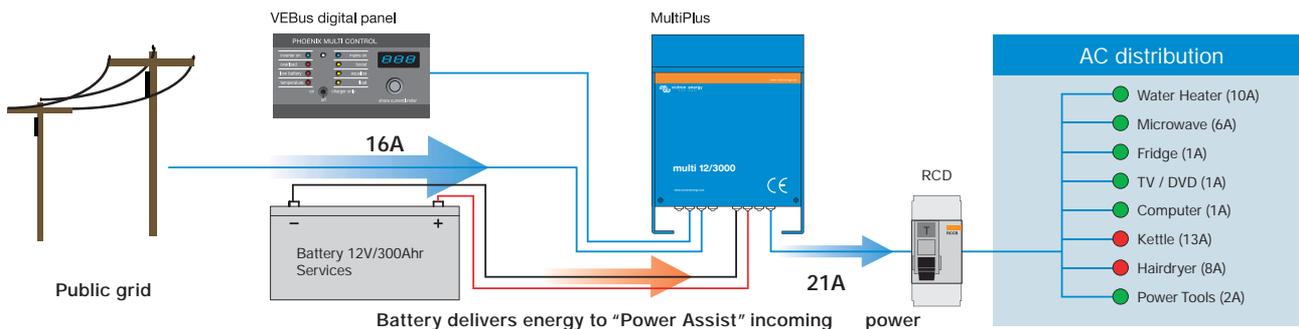


**PowerAssist:** Boosting the power available from mains or generator, an innovative feature of MultiPlus. The feature that most distinguishes the MultiPlus from other inverter / chargers is PowerAssist. This feature takes the principle of PowerControl to a further dimension by allowing a MultiPlus to supplement the power available from mains or generator to 'assist' during periods of high demand. Peak power demand is almost always sustained only for short periods, either a few minutes (in the case of items like cooking appliances) or just a few seconds (in the case of the burst of energy needed to start an air-conditioning or refrigeration compressor).

With the capacity of the generator or mains power set on the remote panel, the MultiPlus detects when the load is becoming too much for the supply and will instantly provide the extra power required. When the demand has reduced, the unit returns to charging the battery. This feature is equally effective in large and small systems helping to reduce the required generator capacity or to achieve greater things with limited mains power. There is even a special feature to enable the MultiPlus/Quattro to work perfectly with portable generators.

**POWER ASSIST ©**

**Inverter boosts incoming power, if required, to avoid overload of supply when system consumption exceeds supply.**



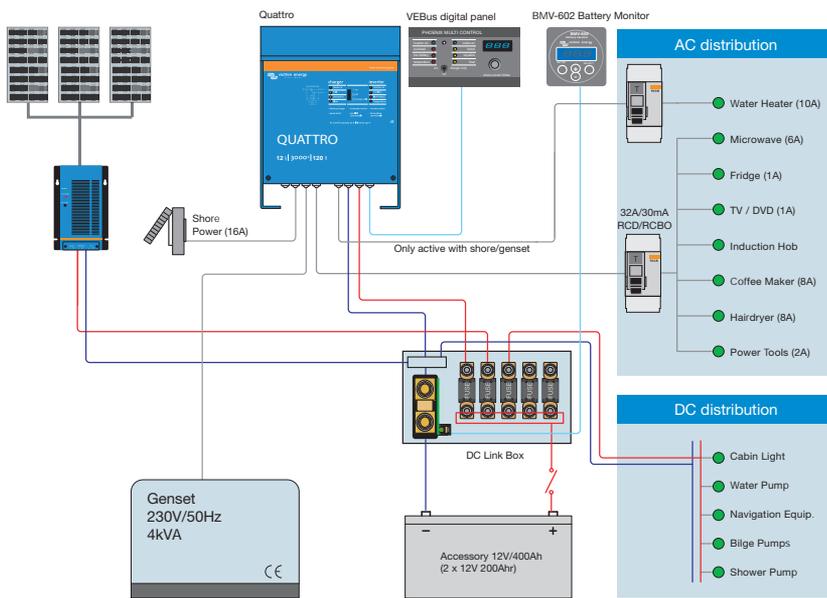
## COMFORT SYSTEM

## COMFORT PLUS SYSTEM

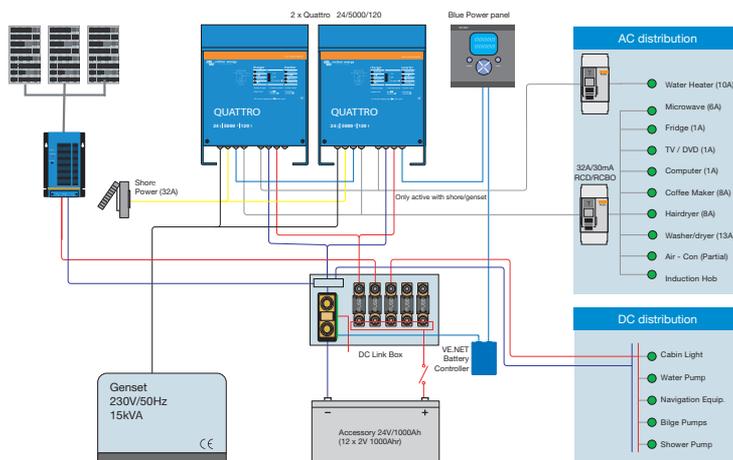
Appliance	System
Lighting	Quattro 12/3000/120
Communication & navigation	BMV602-S battery monitor
Water heater	2x12V/200AH and 1X80AH batteries
Microwave oven	Digital control remote panel
2 ring introduction hob	Alternator 12/150
Coffee machine/Kettle	DC Link Box
TV/DVD	Isolation transformer
Laptop	Cyrix battery separator
Smal chargers (mobile phone, electric shaver)	
Refrigerator and freezer	Solarpanel and MPTT Solar charger

Appliance	System
Lighting	2 xQuattro 24/5000/120
Communication & navigation	VE-NET Battery controller
Water heater	4x12V/200AH and 1X80AH batteries
Electric gallery with 4 ring induction hob, microwave/combi oven, refrigerator, freezer, washer/dryer.	Blue Power panel
Coffee machine and kettle	Alternator 12/150
TV/DVD	DC Link box
Multimedia PC	Isolation transformers
Small chargers (mobile, phone, shaver etc)	
Modest air-conditioning	Solarpanel and MPTT Solar charger

### COMFORT SYSTEM - 7 KVA (30A) CAPACITY



### COMFORT PLUS SYSTEM - 25 KVA CAPACITY



## ABOUT VICTRON ENERGY

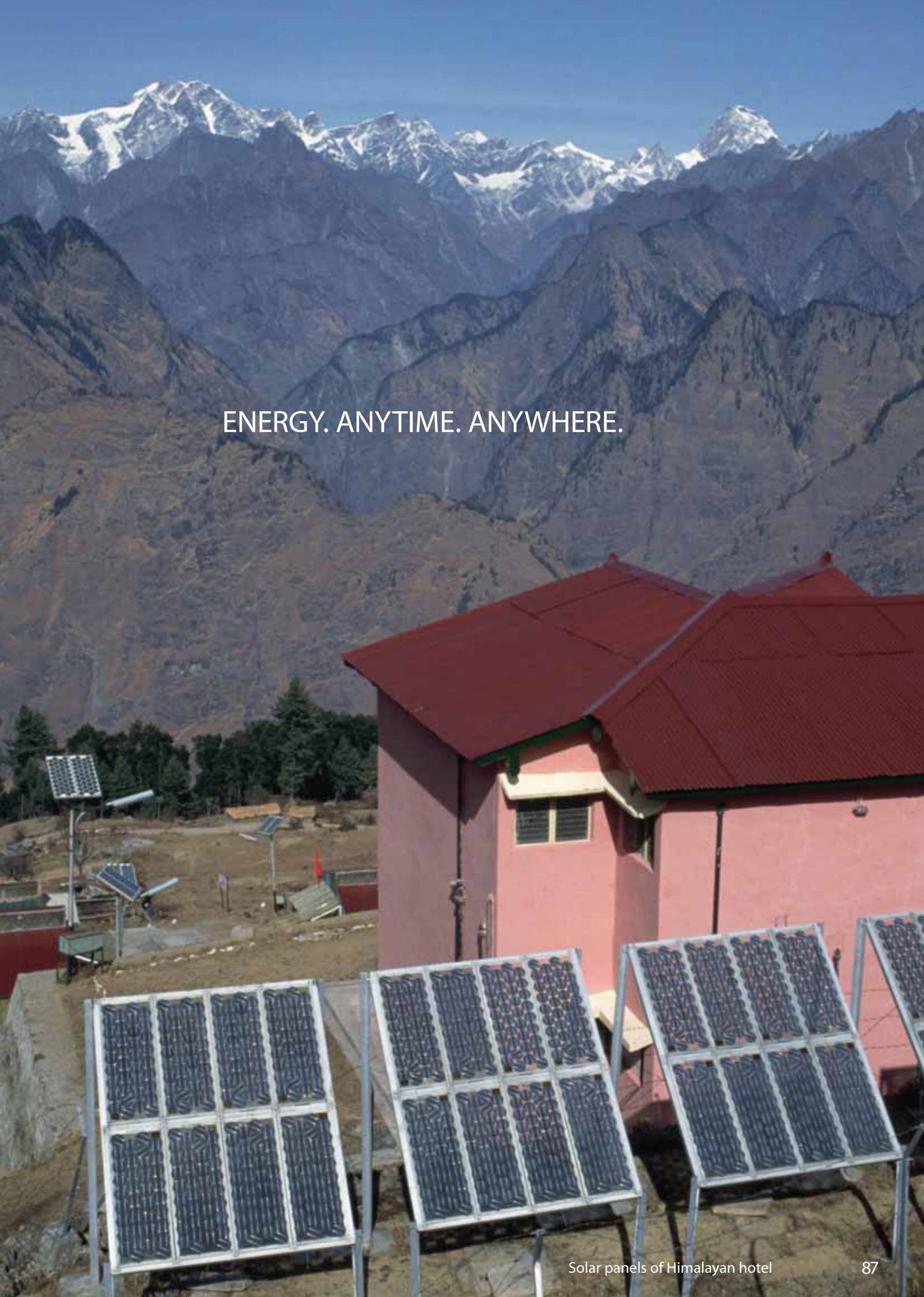
With over 39 years of experience, Victron Energy enjoys an unrivalled reputation for technical innovation, reliability and quality. Victron is a world leader in the supply of self-supporting electrical power. Our products have been designed to meet the most demanding situations faced by a diversity of craft, recreational and commercial alike. Victron's ability to meet the demand for customized off-grid systems is unprecedented. Our product range includes sine wave inverters and inverterchargers, battery chargers, DC/DC converters, transfer switches, gel and AGM batteries, alternators, battery monitors, solar charge regulators, solar panels, complete network solutions and many other innovative solutions.

### World-wide service and support

Having served the off-grid, industrial and vehicle markets as well as both the commercial and leisure marine sectors for over 39 years, Victron has an established network of dealers and distributors covering the whole world. Our customer base is such that providing prompt and competent local service is essential.

This is reflected in the capabilities of our support network. Our flexible approach to service support and our commitment to quick turnaround for repairs is marketleading. There are countless examples of Victron products that have provided for decades of reliable service in the most demanding applications. This level of reliability combined with the highest level of technical know-how results in Victron Energy power systems that offer the very best value available.



A photograph of a Himalayan hotel with solar panels in the foreground and snow-capped mountains in the background. The hotel has a red roof and pink walls. The solar panels are mounted on metal frames and are tilted towards the sun. The background shows a range of rugged, snow-capped mountains under a clear blue sky.

ENERGY. ANYTIME. ANYWHERE.



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