victron energy
BLUE POWER

OFF-GRID BACK-UP & ISLAND SYSTEMS

ENERGY. ANYTIME. ANYWHERE.

INDEX

Wood shack with solar cell roof, Germany/Hollandse Hoogte

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

APPLICATION EXAMPLES


GRID CONNECTED HOUSE


HOSPITAL

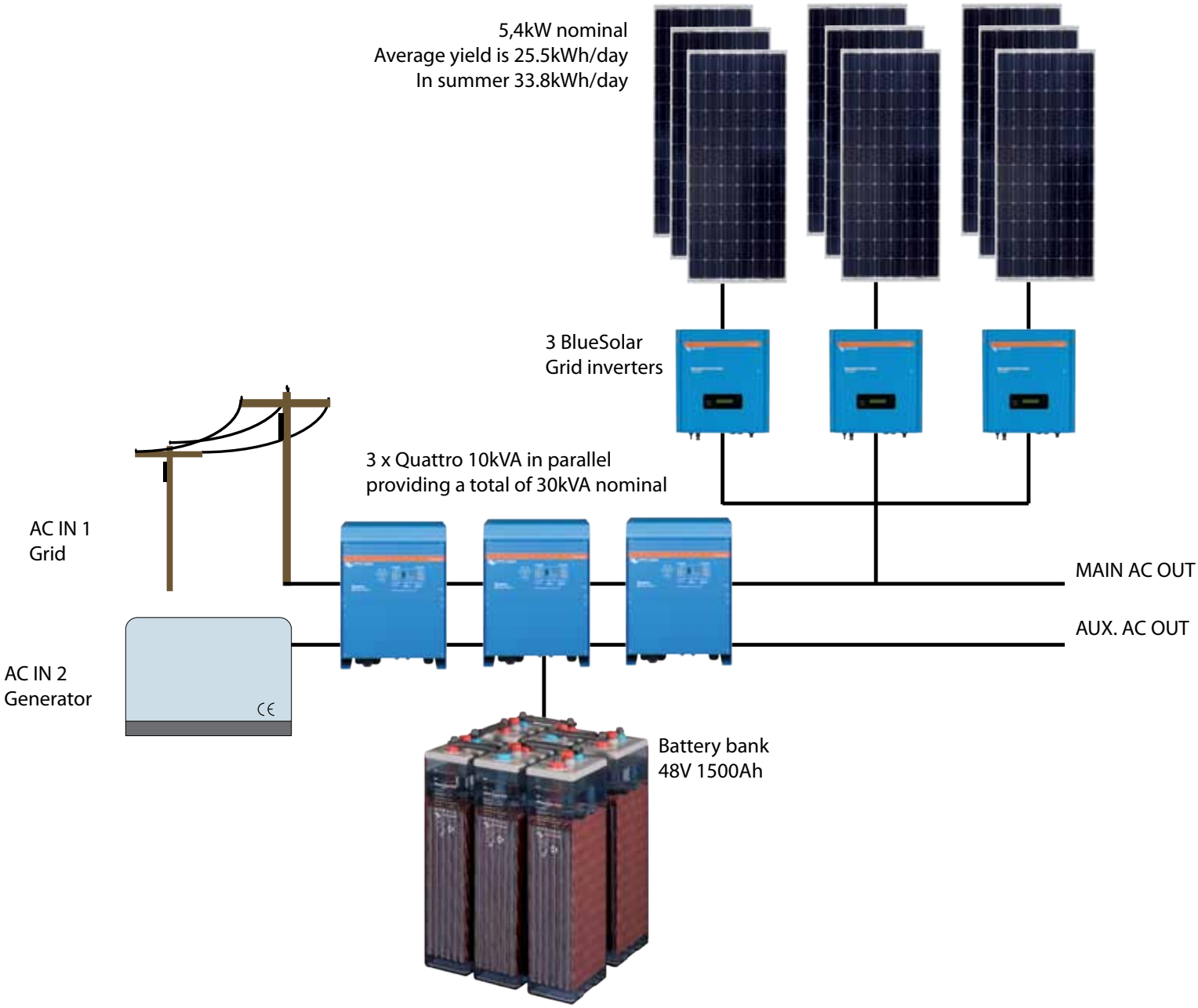

ENERGY HOUSE

GRID CONNECTED HOUSE

Calig, Spain: Grid connected house with Quattro and BlueSolar Grid Inverter

This Spanish grid connected house is using solar panels to support the load. It has a three phase system installed, containing three 10kVA Quattro's. They are in a three-phase configuration together with three 2000W BlueSolar Grid Inverters, one per phase. The battery bank is 48V 1500Ah. During the day the BlueSolar Grid Inverter is supplying the load for the house and charging the battery. If the battery is full, the Quattro shifts the output frequency to signal the Grid Inverter to stop charging. During this time the installation is not connected to the grid. In the evening and when there is no or little sun, the Quattro's are supplying the loads with energy from the batteries. When the battery bank is discharged below 60%, the Quattro's connect to the grid to recharge the batteries and power the loads. There is also a generator installed to take care of grid failures.

GRID CONNECTED HOUSE



Schematic overview of the installation in Calig, Spain.

HOSPITAL

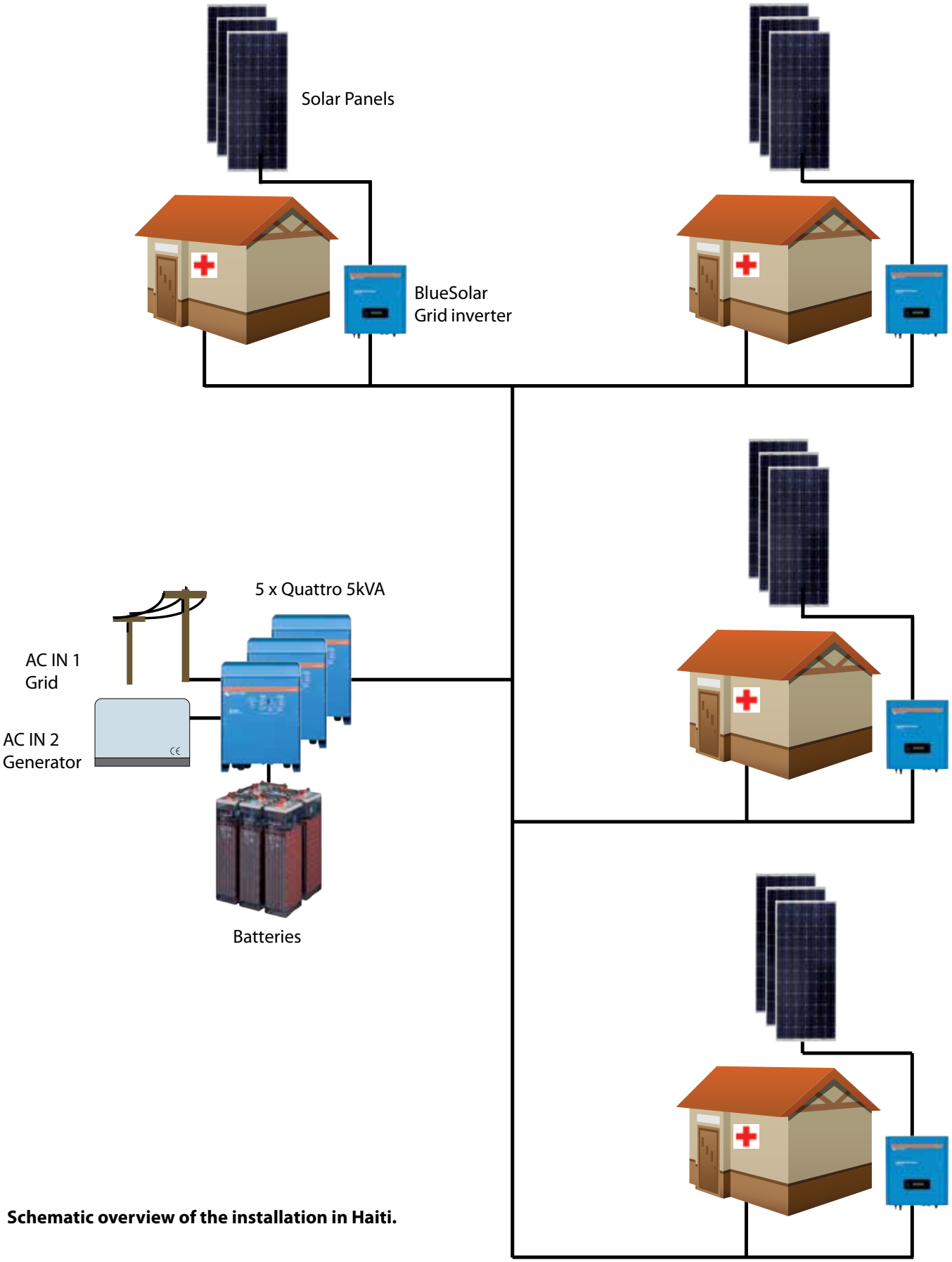
Charity-run hospital in Cap-Hatian, Haiti

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



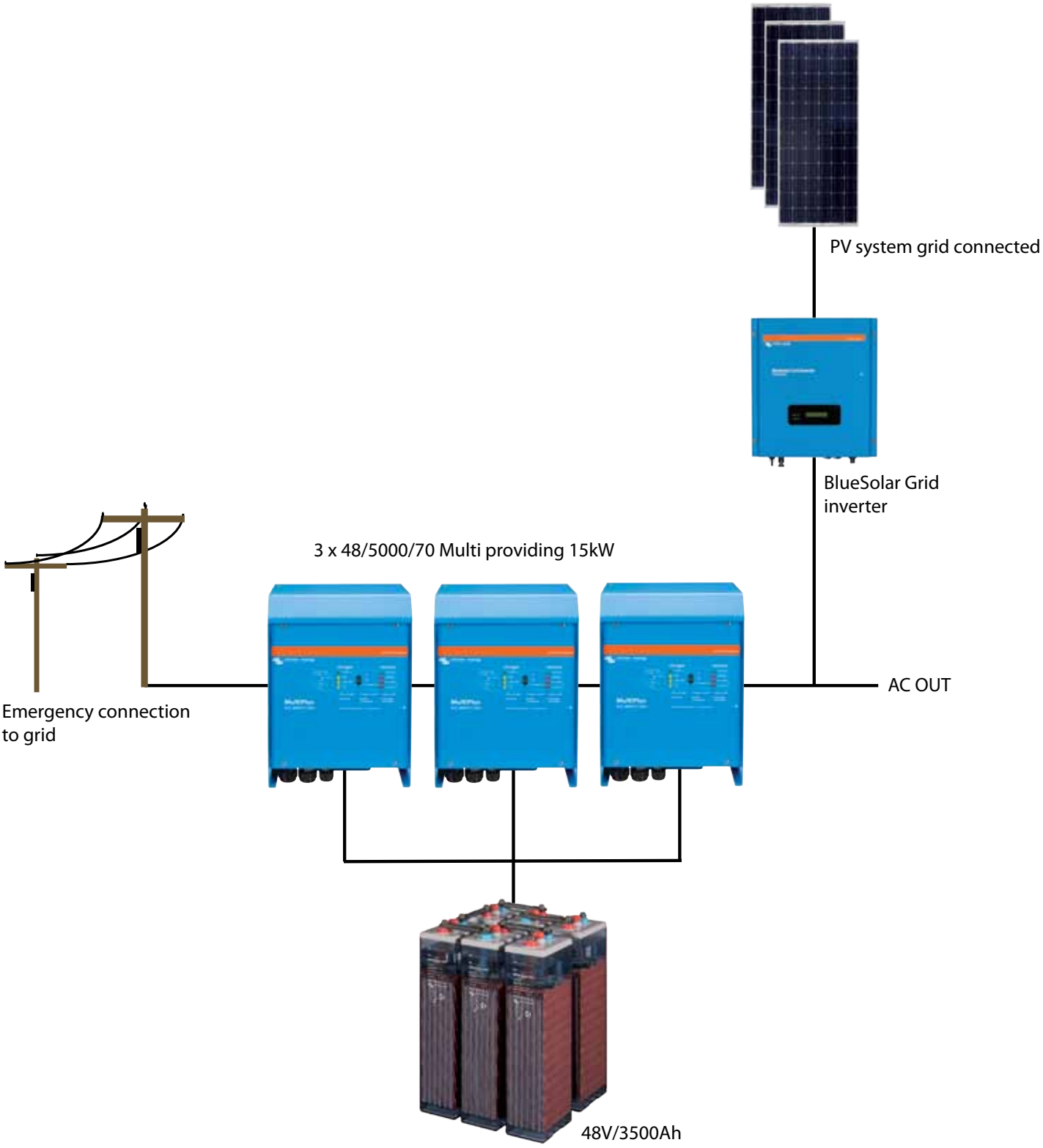
Schematic overview of the installation in Haiti.

ENERGY HOUSE

Energy house 'de Mirre', The Netherlands

Through 28 solar panels, mounted on the roof of the energy house, electricity is generated. This generated electricity is stored in 48 batteries so that electricity is present at all times. At night and in the winter months there is little or no sun to generate energy, the stored energy from the batteries will be used. When the batteries are fully charged, the house can be provided with the necessary energy for one month. The batteries have a storage capacity of 300 kWh and the installation produces 4200 kWh per year.

ENERGY HOUSE

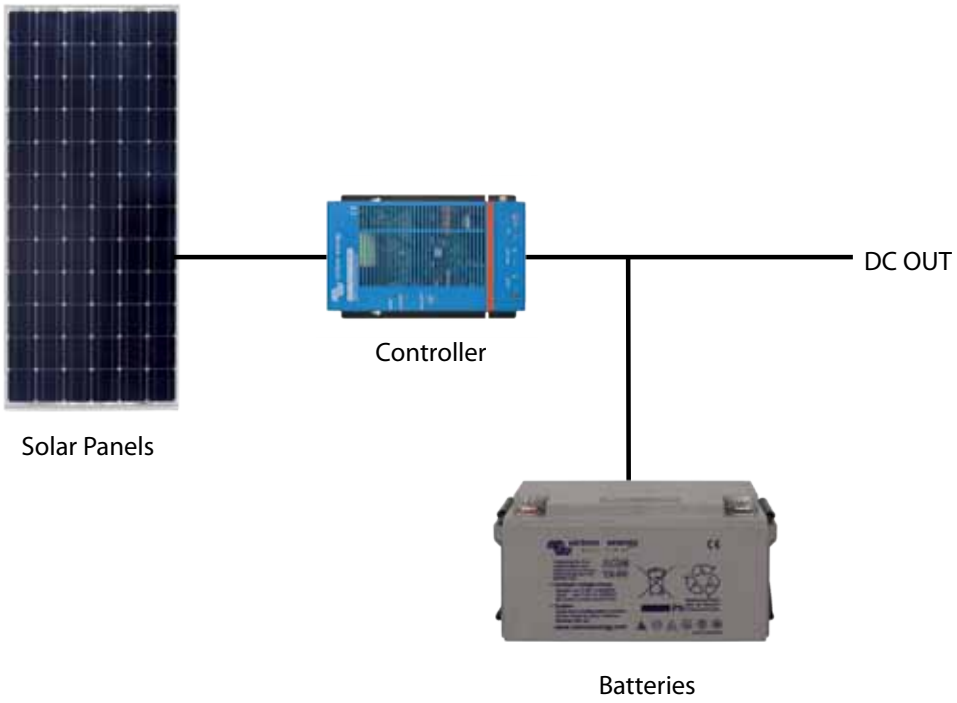


Schematic overview of the installation in energy house 'de Mirre'.

DC SYSTEMS

DC Systems

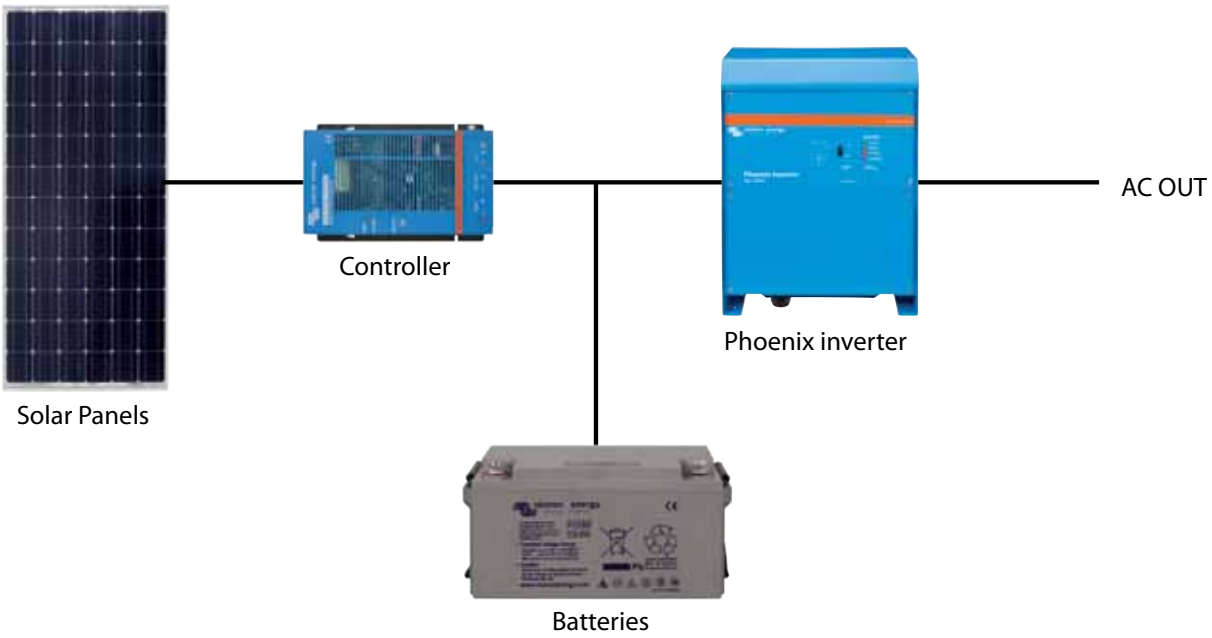
In DC systems solar energy is converted into regulated DC. Consequently the regulated DC is fed to the batteries and consumers. An inverter powers any AC consumers that are connected to the DC system. Unlike in DC systems, solar power is directly converted into AC in AC systems.



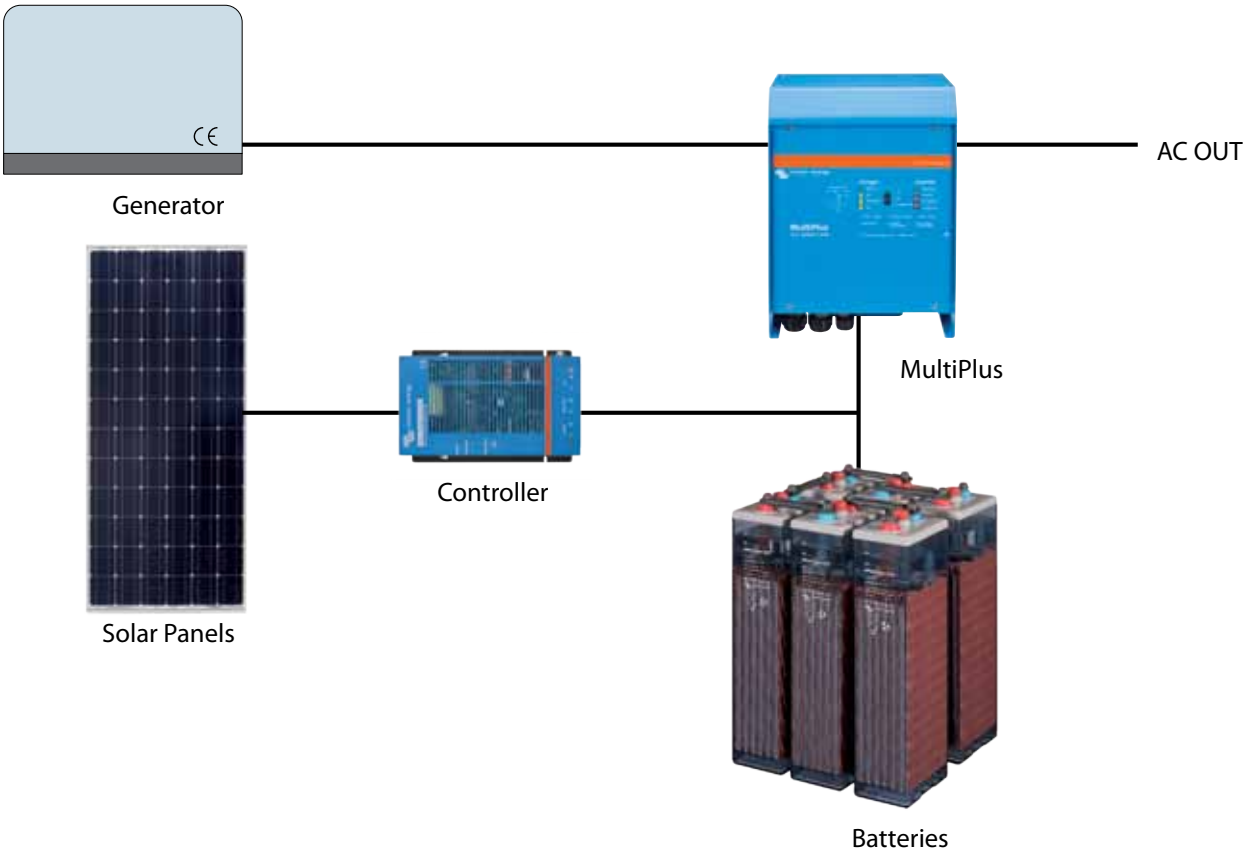
1. DC consumers

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



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.

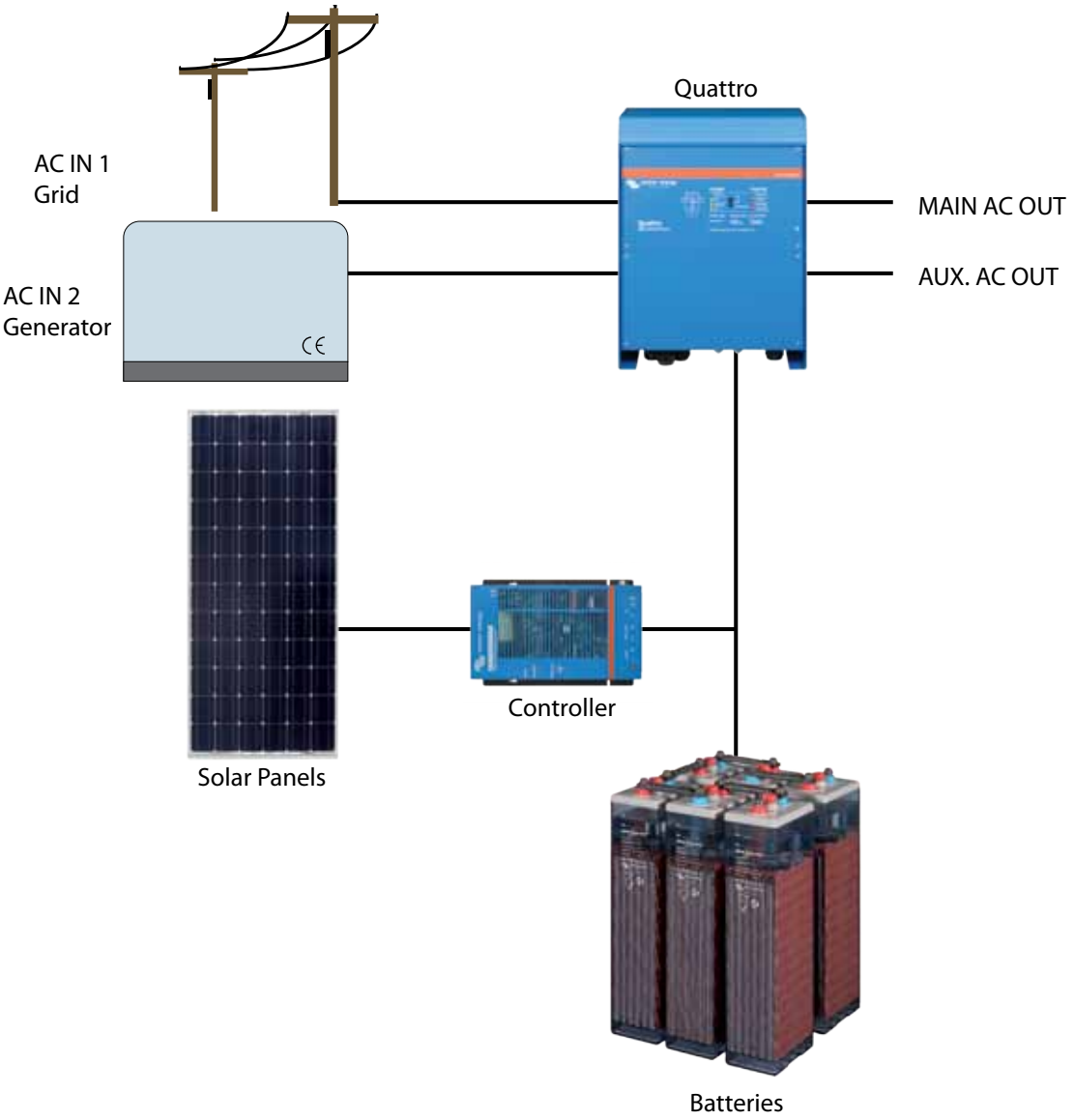


3. Not enough sun – hybrid power
If the sun isn't providing you with enough energy, a generator is added to the system. In this case a Multiplus inverter/charger is used instead of an inverter. The generator is connected directly to the MultiPlus. The MultiPlus automatically regulates the starting and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

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.

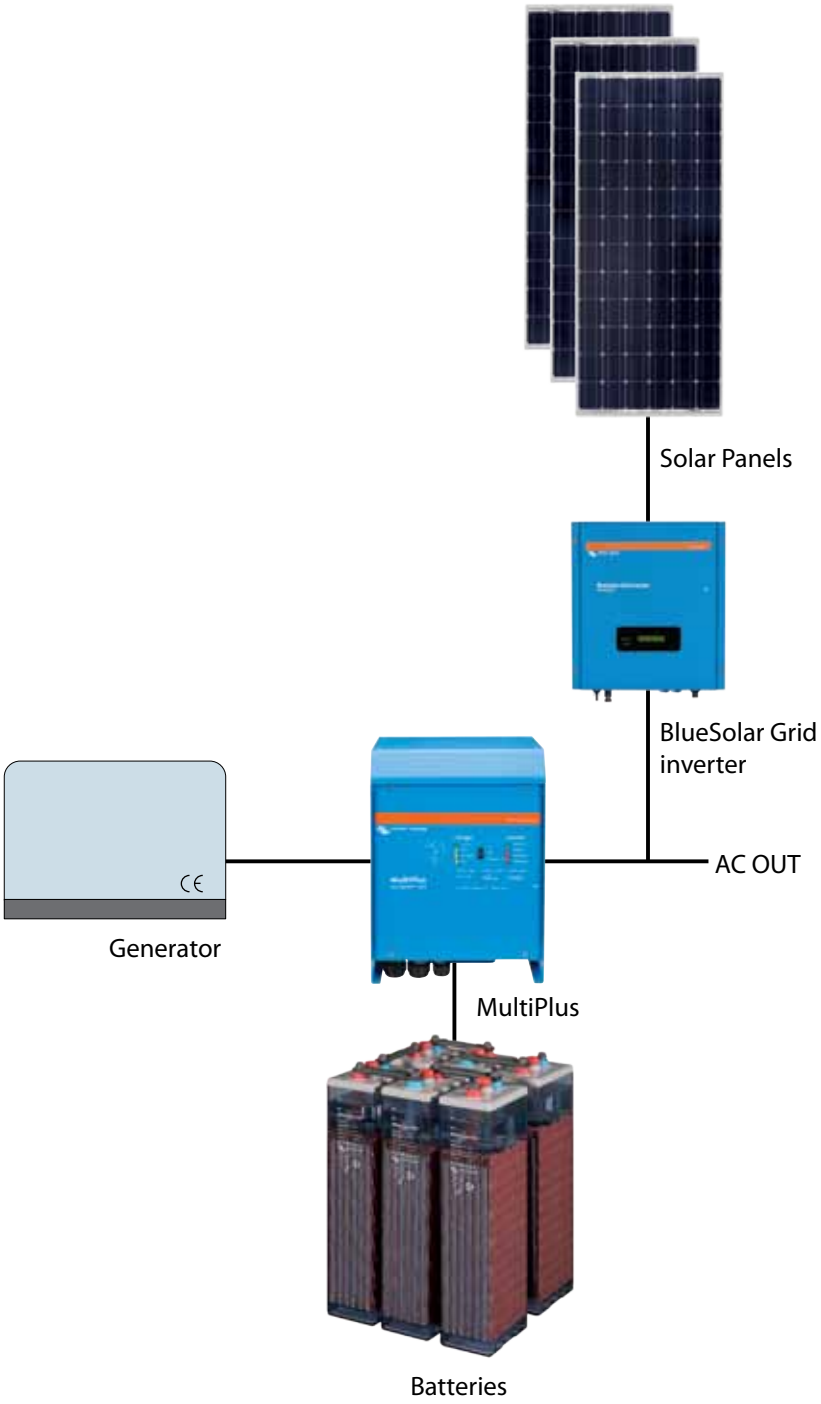
Note: this feature is available in both the MultiPlus and the Quattro.



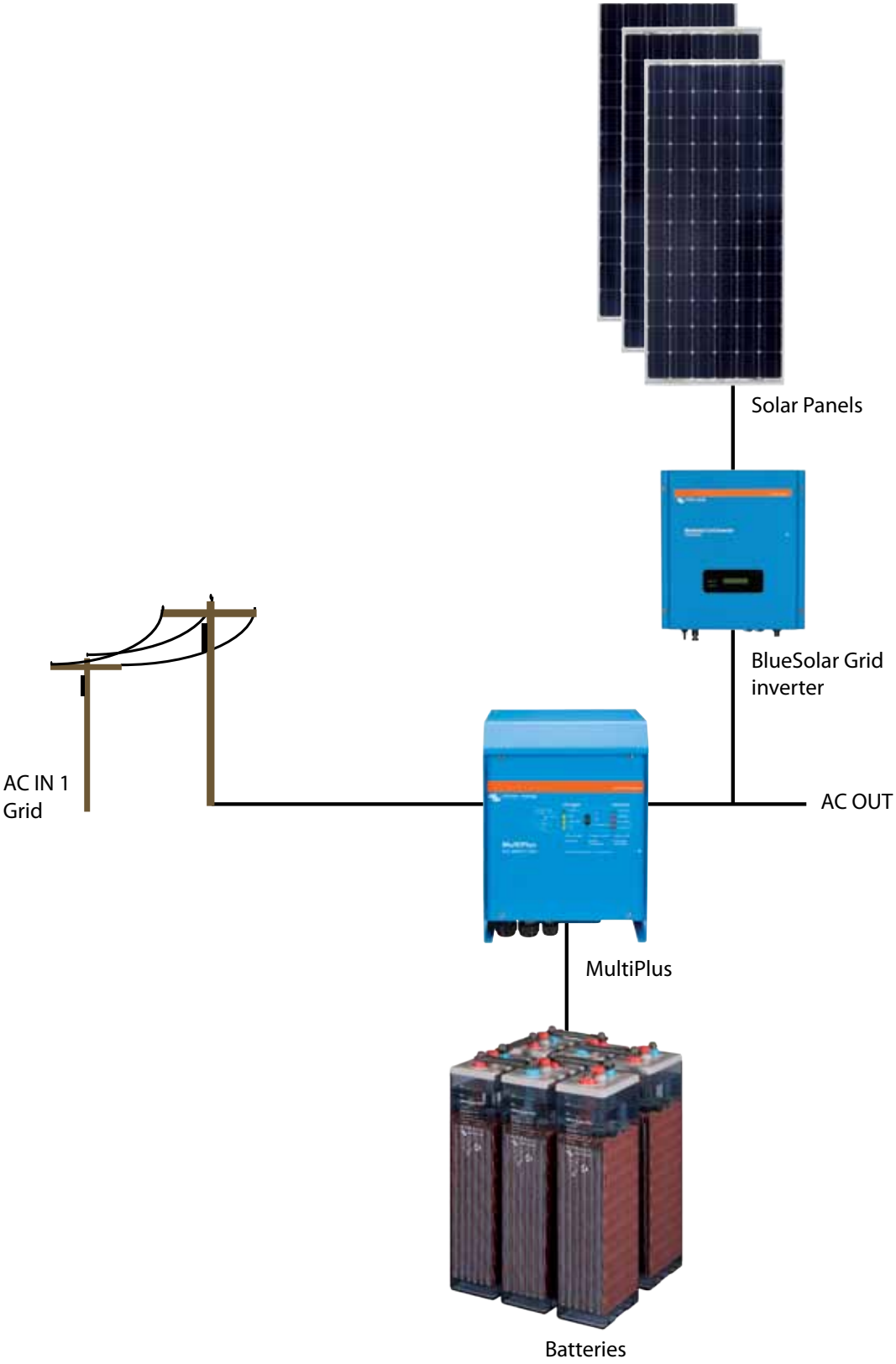
4. Back-up system
Solar energy can also be combined with a grid connection. But a grid that suffers from power failures in combination with an insufficient solar supply requires support of a generator. Instead of a MultiPlus, we recommend the Quattro, which is a MultiPlus with built-in transfer switch 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 BlueSolar 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 Blue Solar 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.

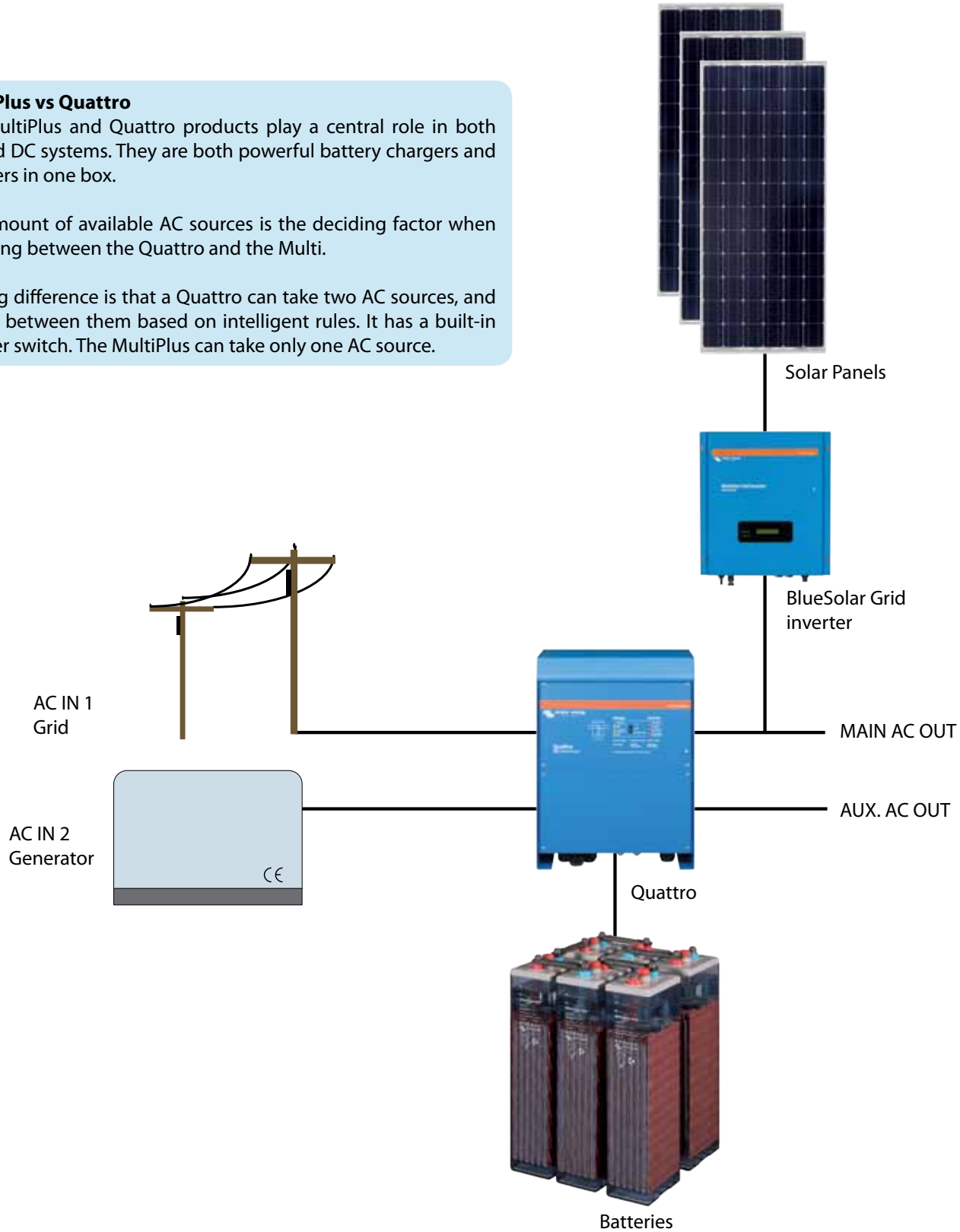


2. Solar and grid
In this back-up system, AC from the grid can supplement the energy supply coming from the solar panels. And vice versa, the energy from the solar panels can cover any grid failure that may occur.

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.

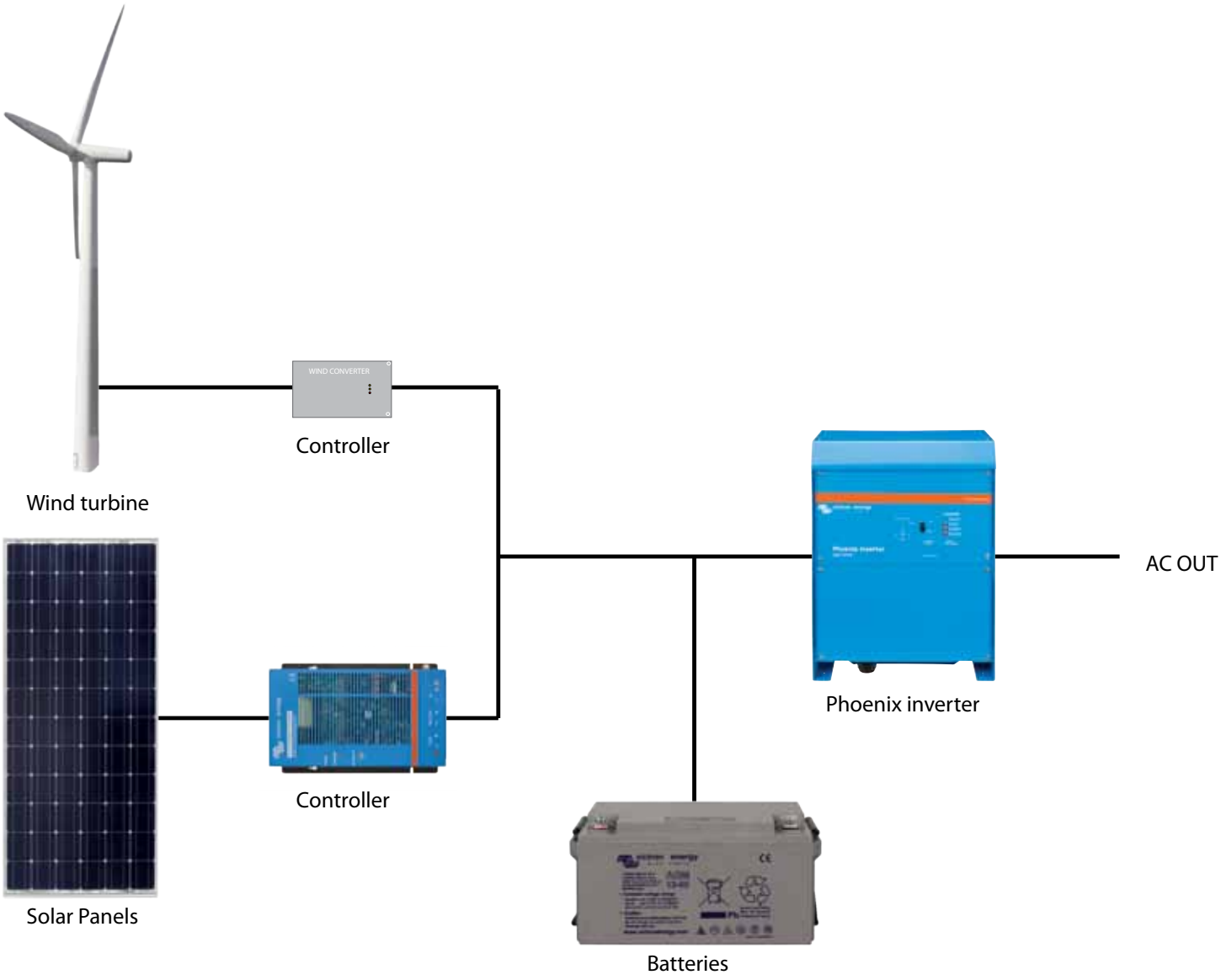
The amount of available AC sources is the deciding factor when choosing between the Quattro and the Multi.

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.

Victron Global Remote 2
Monitoring from a large distance is possible with the Victron Global Remote 2. The Global Remote 2 is a modem which sends text messages to mobile phones. These messages contain information about the status of a system as well as warnings and alarms. The Global Remote 2 also logs various types of data coming from Victron Battery Monitors, Multi's, Quattro's and Inverters. Consequently this data is sent to a website via a GPRS-connection. This enables you to access the read-outs remotely, where en whenever you like.

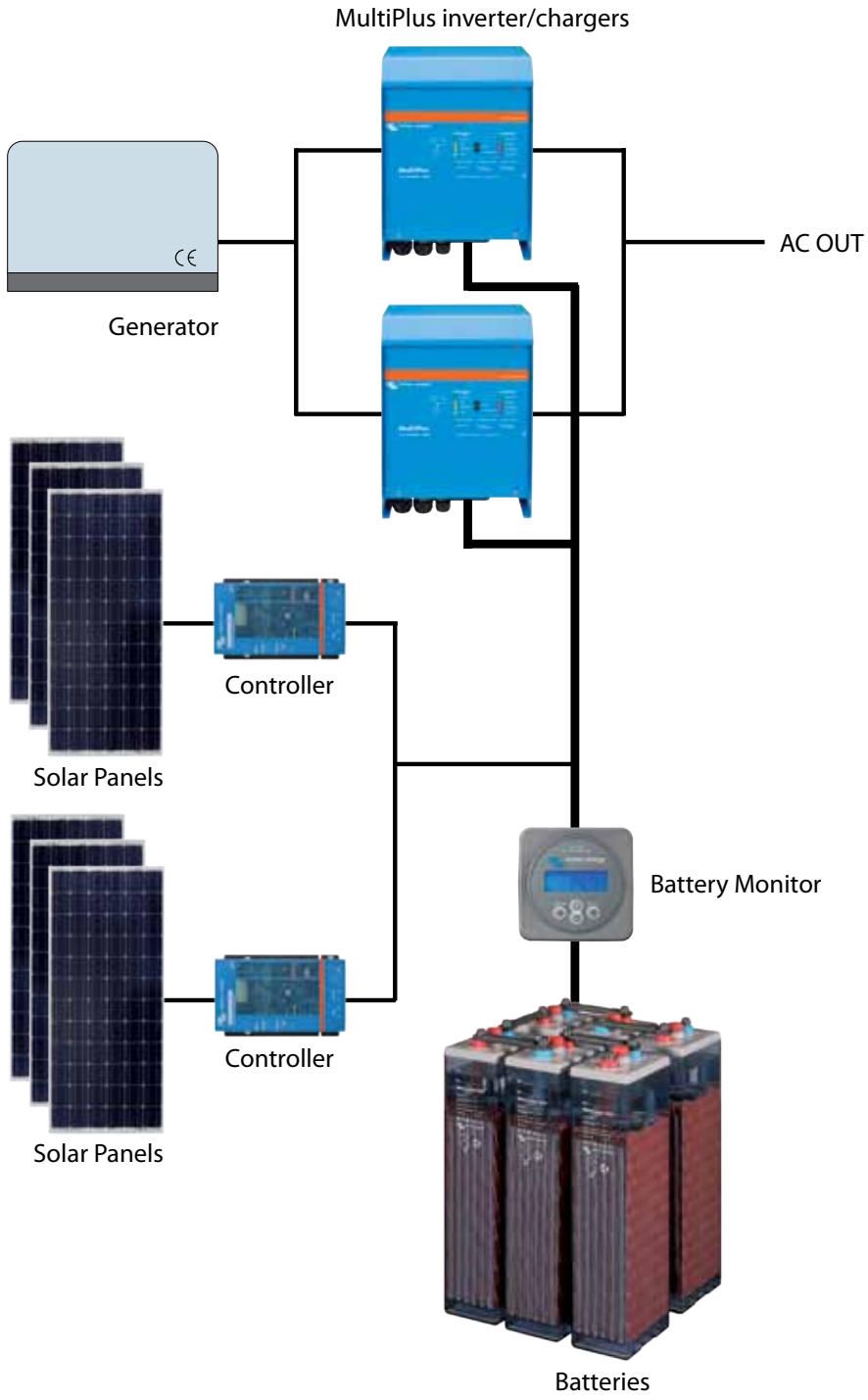
Ethernet Remote
The Ethernet Remote is similar to the Global Remote. The difference is that the Ethernet Remote has a LAN-connection. A special cable can be used to connect the Ethernet Remote directly to an existing internet connection.

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.

Blue Power Panel
It can be difficult to maintain a clear overview of your system as it grows larger. This is however not the case with a Blue Power Panel. Thanks to its clear display and intuitive control it enables you to easily monitor and control all devices connected to VE.Net and VE.Bus. Examples are Multi's, Quattro's and the VE.Net Battery Controller, which keeps track of the status of your battery bank.

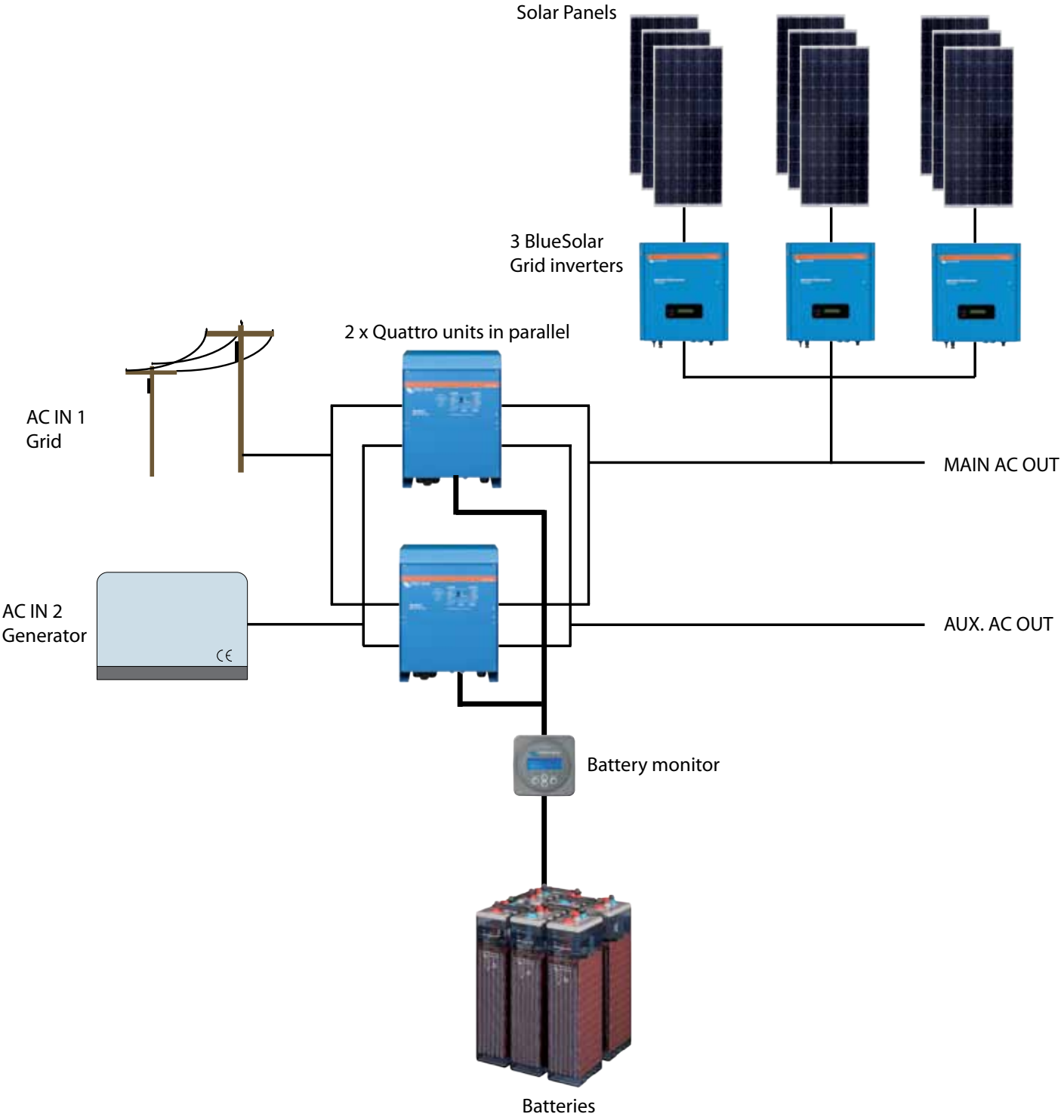
MORE POWER

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 systemsis 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.



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

TECHNICAL INFORMATION

Phillippines/Hollandse Hoogte

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

Phoenix Inverter 12/750

Phoenix Inverter 12/800 with Schuko socket

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 miliseconds) so that computers and other electronic equipment will continue to operate without disruption.

LED diagnosis

Please see manual for a description.

Remote on/off switch

Connector for remote on off switch available on all models.

Remote control panel (750VA model only)

Connects to the inverter with a RJ12 UTP cable (length 3 meter, included).

DIP switch for 50/60Hz selection (750VA model only)

DIP switches for Power Saving Mode (750VA model only)

When operating in Power Saving Mode, the no-load current is reduced to 1/3 of nominal. In this mode the inverter is switched off in case of no load or very low load, and switches on every two seconds for a short period. I f the output current exceeds a set level. The inverter will continue to operate. If not, the inverter will shut down again. The on/off level can be set from 15W to 85W with DIP switches.

Available with three 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 INVERTERS 180VA - 1200VA 120V AND 230V

Phoenix Inverter 12 Volt / 24 Volt / 48 Volt	12/180 24/180	12/350 24/350 48/350	12/750 24/750 48/750	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. AC power at 25 °C (VA) (3)	180	350	750	800	1200
Cont. power at 25 °C / 40 °C (W)	175 / 150	300 / 250	700 / 650	700 / 650	1000 / 900
Peak power (W)	350	700	1400	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	91 / 93 / 94	92 / 94 / 94
Zero-load power (W)	2,6 / 3,8	3,1 / 5,0 / 6,0	14 / 14 / 13	6 / 6 / 6	8 / 9 / 8
Zero-load power in search mode	n. a.	n. a.	3 / 4 / 5	2	2,3
Protection (2)	a - e				
Operating temperature range	-40 to +50°C (fan assisted cooling)				
Humidity (non condensing)	max 95%				
ENCLOSURE					
Material & Colour	aluminium (blue Ral 5012)				
Battery-connection	1)	1)	Screw terminals	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	2,7 / 5,4	6,5 / 14.3	8,5 / 18.7
Dimensions (hxwxd in mm) (hxwxd in inches)	72x132x200 2.8x5.2x7.9	72x155x237 2.8x6.1x9.3	72x180x295 2.8x7.1x11.6	108x165x305 4.2x6.4x11.9	108x165x305 4.2x6.4x11.9
ACCESSORIES					
Remote control panel	n. a.	n. a.	Optional	n. a.	n. a.
Remote on-off switch	Two pole connector		RJ12 plug	Two pole connector	
Automatic transfer switch	Filax				
STANDARDS					
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 (750VA models only)

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

Remote Control Panel
(750VA models only)
RJ12 UTP cable to connect to the inverter is included (length: 3 meter).

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

Phoenix Inverter Compact 24/1600

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

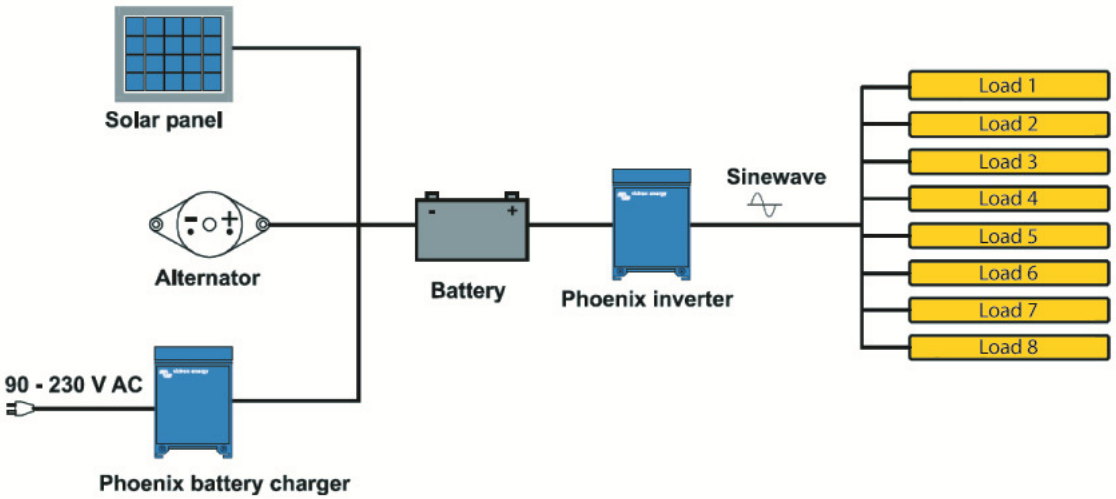
If an automatic transfer switch is required we recommend using the MultiPlus inverter/charger instead. The switch is included in these products and the charger function of the MultiPlus can be disabled. Computers and other electronic equipment will continue to operate without disruption because the MultiPlus 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).



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				
INVERTER					
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 ºC (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25 ºC (W)	1000	1300	1600	2500	4500
Cont. output power at 40 ºC (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
GENERAL					
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 ºC (fan assisted cooling) Humidity (non condensing): max 95%				
ENCLOSURE					
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
STANDARDS					
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

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 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.

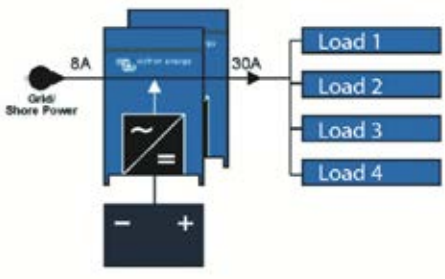
Four stage adaptive charger and dual bank battery charging

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).

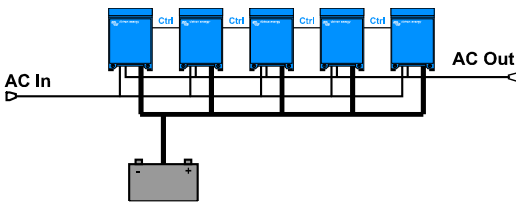
System configuring has never been easier

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.

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
PowerControl	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
PowerAssist	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Transfer switch (A)	**16**	**16**	**16**	**30**	**16 or 50**	**50**
Parallel and 3-phase operation	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
INVERTER						
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
CHARGER						
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					
GENERAL						
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%					
ENCLOSURE						
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 mm² (6 AWG)	
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375x214x110			520x255x125	362x258x218	444x328x240
STANDARDS						
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
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) 230 VAC on inverter output
   g) input voltage ripple too high
3) Non linear load, crest factor 3:1
4) At 25 °C ambient
5) Switches off when no external AC source available
6) 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
7) A. o. to communicate with a Lithium Ion battery BMS
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

Quattro
48/5000/70-100/100

Quattro
24/3000/70-50/30

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

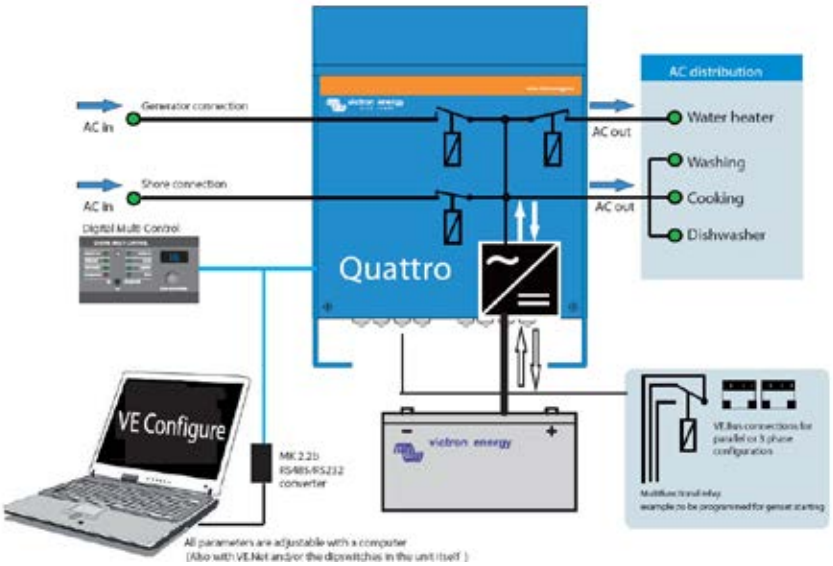
This feature takes the principle of PowerControl to a further dimension allowing the Quattro to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the Quattro will make sure that insufficient shore or generator power is immediately compensated 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 INVERTER/CHARGER 3KVA - 10KVA 230V

Quattro	12/3000/120 24/3000/70	12/5000/220 24/5000/120 48/5000/70	24/8000/200 48/8000/110	48/10000/140
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
INVERTER				
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	96	96
Zero-load power (W)	15 / 15	25 / 25 / 25	35	35
Zero load power in AES mode (W)	10 / 10	20 / 20 / 20	30	30
Zero load power in Search mode (W)	4 / 5	5 / 5 / 6	10	10
CHARGER				
Charge voltage 'absorption' (V DC)	14,4 / 28,8	14,4 / 28,8 / 57,6	57,6	57,6
Charge voltage 'float' (V DC)	13,8 / 27,6	13,8 / 27,6 / 55,2	55,2	55,2
Storage mode (V DC)	13,2 / 26,4	13,2 / 26,4 / 52,8	52,8	52,8
Charge current house battery (A) (4)	120 / 70	200 / 120 / 70	110	140
Charge current starter battery (A)	4 (12V and 24V models only)			
Battery temperature sensor	Yes			
GENERAL				
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%			
ENCLOSURE				
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 mm² (6 AWG)	Bolts M6	Bolts M6	Bolts M6
Weight (kg)	19	34 / 30 / 30	45/41	45
Dimensions (hxwxd 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
STANDARDS				
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
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

3) Non linear load, crest factor 3:1
4) At 25 °C ambient
5) Switches off when no external AC source available
6) 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
7) A. o. to communicate with a Lithium Ion battery BMS

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

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).

MULTIPLUS INVERTER/CHARGER 2KVA AND 3KVA 120V

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 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) 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.

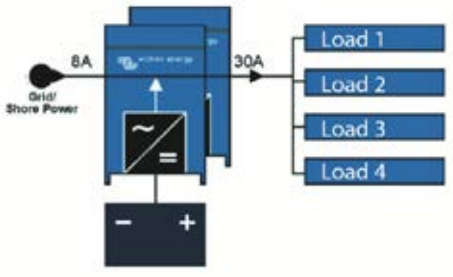
Four stage adaptive charger and dual bank battery charging

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.

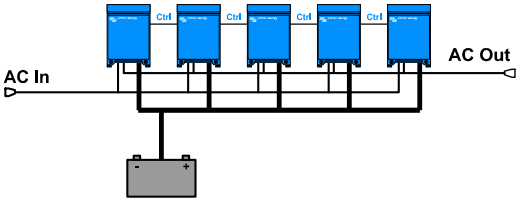
System configuring has never been easier

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
PowerControl		**Yes**	
PowerAssist		**Yes**	
Transfer switch (A)		**50**	
Parallel and 3-phase operation		**Yes**	
INVERTER			
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
CHARGER			
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	
GENERAL			
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%	
ENCLOSURE			
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 (13mm²)	Screw-terminal 6 AWG (13mm²)
Weight		13kg 25 lbs	19kg 40 lbs
Dimensions (hxwxd in mm and inches)		520x255x125 mm 20.5x10.0x5.0 inch	362x258x218 mm 14.3x10.2x8.6 inch
STANDARDS			
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
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

3) Non linear load, crest factor 3:1
4) At 75 °F ambient
5) Switches off when no external AC source available
6) 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
7) A. o. to communicate with a Lithium Ion battery BMS

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

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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.

QUATTRO INVERTER/CHARGER 3KVA - 5KVA 120V

Lithium Ion battery compatible

Quattro
24/5000/120-100/100

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) 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

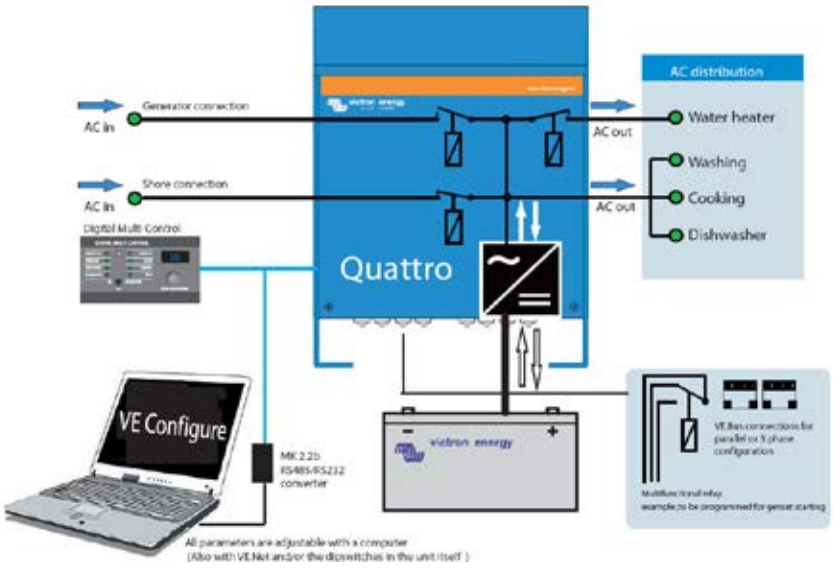
This feature takes the principle of PowerControl to a further dimension allowing the Quattro to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the Quattro will make sure that insufficient shore or generator power is immediately compensated 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 INVERTER/CHAGER 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
INVERTER				
Input voltage range (V DC)	19 – 33	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
CHARGER				
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			
GENERAL				
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%			
ENCLOSURE				
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 mm² (6 AWG)	M6 bolts
Weight (kg)	75 lb 34 kg	66 lb 30 kg	42 lb 19 kg	66 lb 30 kg
Dimensions (hxwxd)	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
STANDARDS				
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
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 120 VAC on inverter output
g) input voltage ripple too high

3) Non linear load, crest factor 3:1
4) At 25 °C ambient5) Switches off when no external AC source available
5) Switches off when no external AC source available
6) Programmable relay that can be set for general alarm, DC undervoltage or genset start/stop function
AC rating: 120V/4A
DC rating: 4A up to 35VDC, 1A up to 60VDC
7) A. o. to communicate with a Lithium Ion battery BMS

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.

Solarvillage Tinginaput, India/Hollandse Hoogte

SKYLLA CHARGER 24/48V

Skylla TG 24 50

Skylla TG 24 50 3 phase

Skylla TG 24 100

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

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.

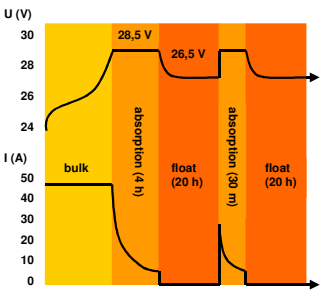
Battery voltage sense

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.

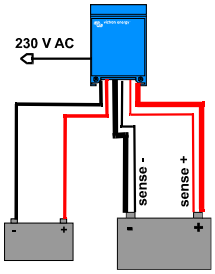
Learn more about batteries and battery charging

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).

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%						
ENCLOSURE							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	M8 studs						
230 V AC-connection	screw-clamp 2,5 mm² (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 hxwxd in mm (hxwxd 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)
STANDARDS							
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
   c. Battery voltage too high
   d. Temperature too high
2) Up to 40°C (100°F) ambient

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

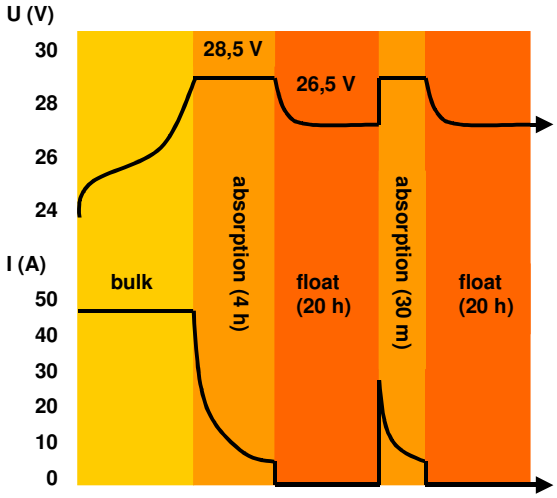
Other Skylla chargers

- 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).

Charge curve



SKYLLA TG CHARGER 24V 90-265V GL APPROVED

Skylla-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%		
ENCLOSURE			
Material & Colour	aluminium (blue RAL 5012)		
Battery-connection	M8 studs		
230 V AC-connection	screw-clamp 2,5 mm² (AWG 6)		
Protection category	IP 21		
Weight kg (lbs)	5,5 (12.1)	5,5 (12.1)	10 (22)
Dimensions hxwxd in mm (hxwxd in inches)	365x250x147 (14.4x9.9x5.8)	365x250x147 (14.4x9.9x5.8)	365x250x257 (14.4x9.9x10.1)
STANDARDS			
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-600 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.

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.

VICTRON GLOBAL REMOTE 2 AND VICTRON ETHERNET REMOTE

Victron Global Remote 2

Victron Ethernet Remote

Victron Global Remote 2: A GSM/GPRS modem

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. The usage of this website is free of charge.

Victron Ethernet Remote: A GSM/GPRS modem with Ethernet connection

The Ethernet Remote has the same functions as the Global Remote. An extra function of the Ethernet Remote is that it can connect with LAN, due to a special cable. In this way, the Ethernet Remote can be connected to the internet without a SIM-card.

Simple and easy to use

The idea is simple: you can use it to get SMS alarms from a Multi, a Battery System, or both. When monitoring the usage of batteries, it can be extremely helpful to receive under and overvoltage alarms; whenever they occur. For this purpose, the Global Remote is perfect. A prepaid SIM-card (for example) in combination with the Global Remote is adequate for remotely monitoring your system.

Connections Global Remote

The Global Remote has two serial connections. The can be used to connect to a VE.Bus Multi/Quattro/Inverter unit or system. This connection needs a MK2 which is supplied with the VGR. The other connection is to connect a BMV-600S or BMV-602S Battery Monitor. To connect it to a BMV you will also need the connection kit accessory which needs to be purchased separately. The Global Remote also has a connection for an optional accessory, the VGR IO Extender.

Connections Ethernet Remote

The Ethernet Remote has one serial connection. This can be used to connect to a VE.Bus Multi/Quattro/Inverter unit or system, or a BMV Battery Monitor. To connect it to a BMV you will also need the connection kit accessory which needs to be purchased separately.

Advanced usage: Monitoring historic data

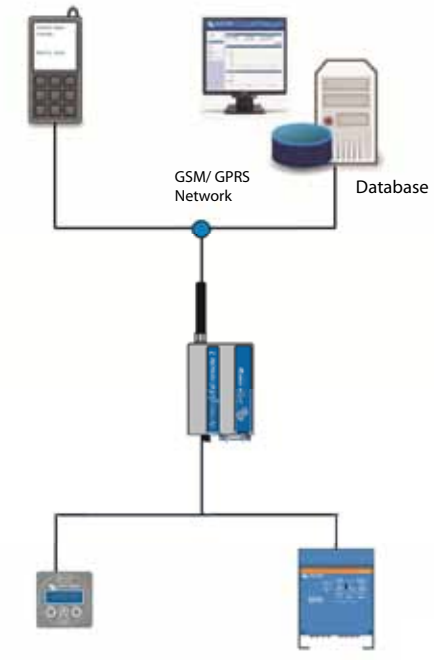
Taking it one step further, an internet browser and -connection is all you need to view all of the data online. You can simply create an account on the website and add your modem(s). Subsequently you can configure the GPRS connection, which will enable you to monitor the historic data of several basic properties such as system voltages, power levels and status information. All of this data is graphed. These graphs are available in daily, weekly and monthly timeframes.

Victron Remote Management

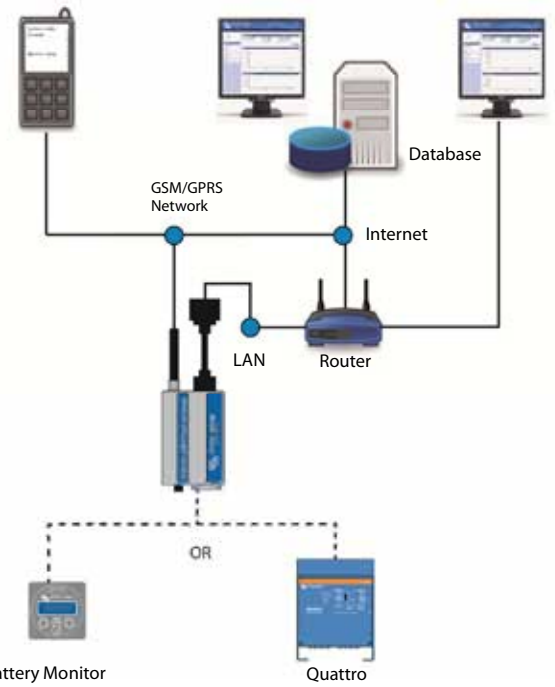
Victron Remote Management is the name of the system which consists of the VGR and the monitoring website. To get a preview: please go to https://vrm.victronenergy.com, and login with below details.

Username: demo@victronenergy.com
Password: vrmdemo

Victron Global Remote



Victron Ethernet Remote



VICTRON GLOBAL REMOTE 2 AND VICTRON ETHERNET REMOTE

	Victron Global Remote 2	Victron Ethernet Remote
Serial connection (Mk2.2a – included)	Connect VE.Bus Multi/Quattro/Inverter unit/system	
Serial connection (BMV-602 Datalink – not included)	Connect BMV-602 Battery Monitor	
	GENERAL	
Power supply voltage range	5.5 to 32VDC	
Current draw (max.)	0.48A at 5.5VDC	
Current draw (connected to GSM network)	90mA at 12VDC and 50mA at 24 VDC	
Operating temperature range	-30° to 75° C. / -22° to 167° F.	
	ENCLOSURE	
Dimensions VGR Modem (hxwxd)	73 x 54.5 x 25.5 mm / 2.9 x 2.1 x 1 inch	
Weight VGR Modem	89 grams / 3.1 ounces	
Body	Aluminium	
Installation	Two aluminum mounting bridles	
	GSM / GPRS	
GPRS data usage	Depends on usage	
Antenna connection	50 Ohm SMA	
	INCLUDED ACCESSORIES	
GSM antenna	Included	Included
Ethernet attachment	n.a.	Included
Battery cable	With inline fuse	Included
Y-cable for serial and IO Extender connection	Included	Included
Male DB15 to female DB9 cable	Included	Included
MK2 interface	Included	Included
	OPTIONAL ACCESSORIES (NOT INCLUDED, TO BE ORDERED SEPARATELY)	
Global Remote to BMV-60xS conn. kit	Compatible	Compatible
VGR IO Extender	Compatible	Not compatible
Global Remote Antenna	Compatible	Compatible

BMV-600S and 602S
The BMV-600S and 602S are our newest high precision battery monitors. The essential function of a battery monitor is to calculate ampere-hours consumed as well as the state of charge of a battery. Ampere-hours consumed are calculated by integrating the current flowing in or out of the battery.

Global Remote to BMV-60xS conn. kit
Cable kit required to connect the BMV-60xS and the Victron Global Remote. BMV 60xS Data Link included.

MultiPlus Inverter/Charger
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.

Phoenix Inverter
Pure sinwave output, high peak power and high efficiency. Combined high frequency and line frequency technologies ensure the best of both worlds.

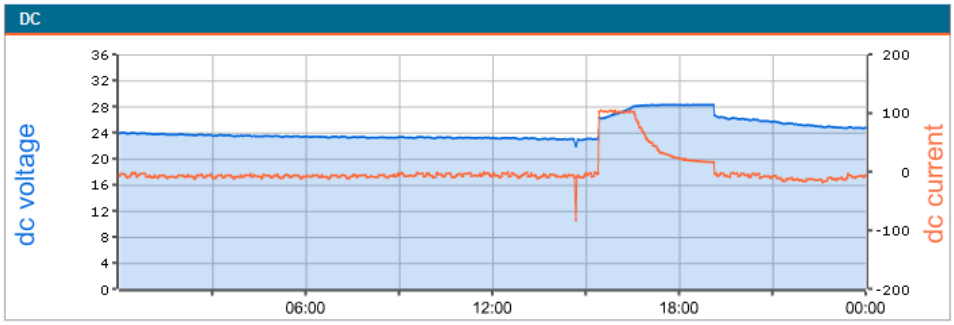
Quattro Inverter/Charger
The Quattro can be connected to two independent AC sources, for example shore-side power and a generator, or two generators. The Quattro will automatically connect to the active source.

Global Remote Antenna
The Global Remote Antenna is an optional accessory to improve the reception of the Victron Global Remote. The Global Remote Antenna replaces the standard antenna that is included with the Global Remote. The antenna is an outdoor 4dBi Gain antenna for stationary usage. A standard 5m low loss coax cable and wall-mount is included.

Specifications:

Frequency:	900 (2dBi) / 1800 & 1900-1990 and 1990-2200 and 2400Mhz
Vertically polarized	
Antenna length:	24cm
Antenna diameter:	1,8cm
Impedance:	50 Ω
Connector:	SMA-M connector

Example of graph available on https://vrm.victronenergy.com



Note that it is not possible to combine the Global Remote or Ethernet Remote with one of the following products in a VE.Bus system:

- VE.Net to VE.Bus Converter
- Blue Power Panel 2
- Blue Power Panel GX
- VE.Bus to NMEA2000 interface

Combining with the Digital Multi Control, VE.Bus Multi Control or Phoenix Inverter Control is possible.

PRECISION BATTERY MONITORING

BMV 600S

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

BMV 602S Black

VE.Net Battery Controller

Precision monitoring

The essential function of a battery monitor is to calculate ampere-hours consumed and the state of charge of a battery. Ampere-hours consumed is calculated by integrating the current flowing in or out of the battery. In case of a constant current, this integration is equivalent to current multiplied by time. A discharge current of 10A during 2 hours, for example, amounts to 20Ah consumed. All our battery monitors are based on a powerful microprocessor, programmed with the algorithms needed for precision monitoring.

Standard information and alarms

- Battery voltage (V).
- Battery charge/discharge current (A).
- Ampere-hours consumed (Ah).
- State of charge (%).
- Time to go at the current rate of discharge.
- Visual and audible alarm: over- and under voltage, and/or battery discharged.
- Programmable alarm or generator start relay.

BMV 600S: low cost ultra high resolution monitor

- Highest resolution: 10mA (0,01A) with 500A shunt.
- Can be used with 50, 60 or 100mV shunts, current rating from 100A to 1000A
- Lowest current consumption: 4mA @12V and 3mA @ 24V.
- Easiest to wire: the BMV 600S comes with shunt, 10 meter RJ 12 UTP cable and 2 meter battery cable with fuse; no other components needed.
- Easiest to install: separate front bezel for square or round appearance; ring for rear mounting and screws for front mounting.
- Broadest voltage range: 9.5 – 95 VDC without prescaler needed.
- Communication port (Isolated RS232 interface is needed to connect to a computer)

BMV 602S: two batteries

In addition to all the features of the BMV600S, the BMV602S can measure the voltage of a second battery. A version with a black front bezel (BMV 602S Black) is also available.

BMV 600HS: 70 to 350VDC voltage range

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

Optional Isolated RS232 communication interface and software

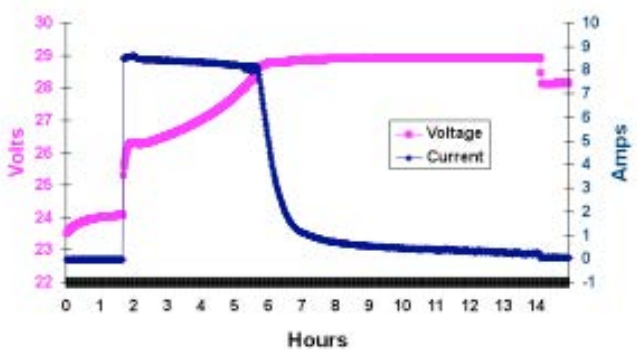
(for all BMV models) Displays all information on a computer and loads charge/discharge data in an Excel file for graphical display.

VE.Net Battery Controller: any number of batteries

- One VE.Net panel or Blue Power panel will connect to any number of battery controllers.
- Comes with 500A/50mV shunt and can be programmed for 50, 60 or 100mV shunts, current rating from 100A to 10.000A.
- With use, abuse and data memory.
- Temperature sensor and connection kit included.

High voltage VE.Net Battery Controller: 70 to 350VDC

No prescaler needed. Note: RJ45 connectors are galvanically isolated from Controller and shunt.



Example of a battery charge curve recorded with a BMV 602 and VEBat software

PRECISION BATTERY MONITORING

Battery monitor	BMV 600S	BMV 602S & BMV 602S BLACK	BMV 600HS	VE. Net Battery Controller	VE. Net High Voltage Battery Controller
Power supply voltage range	9.5 - 90 VDC	9.5 - 90 VDC	70 – 350 VDC	7 - 75 VDC	70 - 350 VDC[1]
Current draw, back light off	< 4 mA	< 4 mA	< 4 mA	< 5 mA	< 4 mA
Input voltage range (VDC)	9.5 - 95 VDC	9.5 - 95 VDC	70 – 350 VDC	0 - 75 VDC	0 – 350 VDC
Battery capacity (Ah)	20 – 9.999 Ah			20 - 60.000 Ah	
Operating temperature range	-20 +50°C (0 - 120°F)				
Measures voltage of second battery	No	Yes	Yes	Yes	
Communication port	Yes	Yes	Yes	Yes (VE.Net)	
Potential free contacts	60V/1A (N/O)				
RESOLUTION (with a 500 A shunt)					
Current	± 0,01 A			± 0,1 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 (± 1°F)	
Accuracy of current measurement	± 0,3 %				
Accuracy of voltage measurement	± 0,4 %				
INSTALLATION & DIMENSIONS					
Installation	Flush mount			DIN rail	
Front	63 mm diameter			22 X 75 mm (0.9 x 2.9 inch)	
Front bezel	69 x 69 mm (2.7 x 2.7 inch)			n. a.	
Body diameter	52mm (2.0 inch)			n. a.	
Body depth	31mm (1.2 inch)			105 mm (4,1 inch)	
ACCESSORIES					
Shunt (included)	500 A / 50 mV[2]			500 A / 50 mV[3]	
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection			Supplied with 1 m cables	
Temperature sensor	n. a.			Supplied with 3 m cable	
Computer interface	optional			n.a.	
	1) 7 – 75 VDC needed for VE.Net network power supply 2) HV version with shunt in plastic enclosure 3) HV version with shunt + Controller in plastic enclosure				

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, Quattro's and Inverters to a website through a GPRS connection. Access to this website is free of charge.

Victron Global Remote to BMV 60xS Connection Kit
Cable kit required to connect the BMV and the Victon Global Remote. BMV Data Link included.

Blue Power panel
The VE.Net Blue Power Panel is the panel that connects to the VE.Net Battery Controller. The panel can show the information of multiple batteries on one display for simple and efficient monitoring of your battery systems. For our other VE.Net products please refer to our VE.Net datasheet.

1000A/50mV shunt
For ease of use with BMV series: quick connect pcb of standard 500A/50mV shunt can be mounted on this shunt.

2000A/50mV shunt
For ease of use with BMV series: quick connect pcb of standard 500A/50mV shunt can be mounted on this shunt.

Solar panels, US/Hollandse Hoogte

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 (1)				
				Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-circuit Current
				P_{MPP}	V_{MPP}	I_{MPP}	Voc	Isc
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
SPM50-12	760 x 540 x 35	755 x 535	5.5	50	18	2.78	22.2	3.16
SPM80-12	1110 x 540 x 35	1105 x 535	8.2	80	18	4.58	22.25	4.98
SPM100-12	963 x 805 x 35	958 x 800	10.5	100	18	5.56	22.4	6.53
SPM130-12	1220 x 808 x 35	1214 x 802	13	130	18	7.23	21.6	7.94
SPM180-24	1580 x 808 x 35	1574 x 802	14.5	180	36	5.01	44.9	5.50
SPM280-24	1956 x 992 x 50	1950 x 986	20	280	36	7.89	44.25	8.76

Module	SPM30-12	SPM50-12	SPM80-12	SPM100-12	SPM130-12	SPM180-24	SPM280-24
Nominal Power (±3% tolerance)	30W	50W	80W	100W	130W	180W	280W
Cell type	Monocrystalline						
Number of cells in series	36					72	
Maximum system voltage (V)	1000V						
Temperature coefficient of P_{MPP} (%)	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C	-0.48/°C
Temperature coefficient of Voc (%)	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C	-0.34/°C
Temperature coefficient of Isc (%)	+0.037/°C	+0.037/°C	+0.037/°C	+0.037/°C	+0.05/°C	+0.037/°C	+0.037/°C
Temperature Range	-40°C to +80°C						
Surface Maximum Load Capacity	200kg/m²						
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	No connector	MC4	MC4	MC4	MC4	MC4	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/m², 25ºC, 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 (1)				
				Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-circuit Current
				P_{MPP}	V_{MPP}	I_{MPP}	Voc	Isc
Module	mm	mm	Kg	W	V	A	V	A
SPP30-12	735x350x25	730x345	3.5	30	18	1.66	21.6	1.83
SPP50-12	610x670x35	605x665	5	50	18	2.85	22.19	3.09
SPP80-12	950x670x35	945x665	8.2	80	18	4.58	22.25	4.98
SPP100-12	1150x670x35	1145x665	11.8	100	18	5.72	22.36	6.12
SPP130-12	1480x680x35	1474x674	12.5	130	18	7.43	22.4	8.02
SPP280-24	1956x992x50	1950x986	24	280	36	7.89	44.25	8.76

Module	SPP30-12	SPP50-12	SPP80-12	SPP100-12	SPP130-12	SPP280-24
Nominal Power (±3% tolerance)	30W	50W	80W	100W	130W	280W
Cell type	Polycrystalline					
Number of cells in series	36					72
Maximum system voltage (V)	1000V					
Temperature coefficient of PMPP (%)	-0.47/°C	-0.47/°C	-0.47/°C	-0.47/°C	-0.47/°C	-0.47/°C
Temperature coefficient of Voc (%)	-0.35/°C	-0.35/°C	-0.34/°C	-0.34/°C	-0.35/°C	-0.35/°C
Temperature coefficient of Isc (%)	+0.05/°C	+0.05/°C	+0.045/°C	+0.045/°C	+0.05/°C	+0.045/°C
Temperature Range	-40°C to +80°C					
Surface Maximum Load Capacity	200kg/m²					
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	No connector	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/m², 25ºC, AM (Air Mass) 1.5

BLUESOLAR CHARGE CONTROLLERS

BlueSolar 12/24-10

BlueSolar 12/24-PWM **Three models: 5A, 10A or 20A at 12V or 24V ***

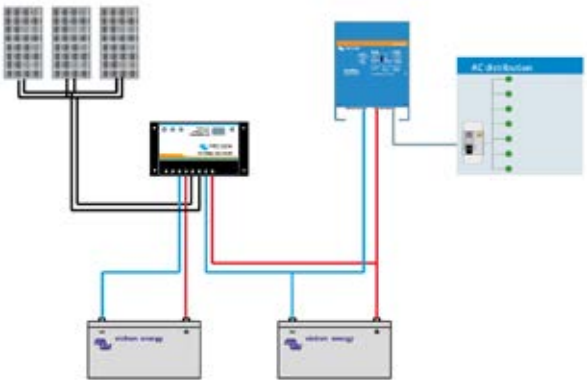
- Low cost PWM controller.
- Internal temperature sensor.
- Three stage battery charging (bulk, absorption, float).
- Protected against over current.
- Protected against short circuit.
- Protected against reverse polarity connection of the solar panels and/or battery.
- With low voltage load disconnect 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 DUO 12/24-20

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

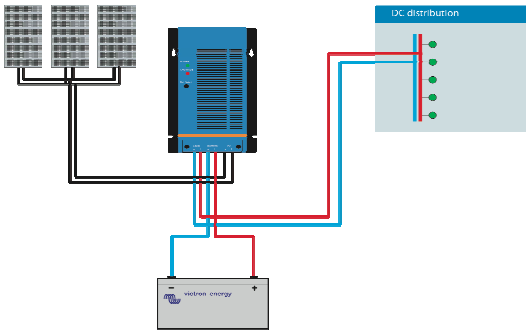


Starter battery Service battery

BlueSolar MPPT 12/24-40 **40A at 12V or 24V ***

- Maximum Power Point Tracking (MPPT) controller. Increases charge current by up to 30% compared to a PWM controller.
- Charge voltage settings for eight battery types, plus two equalize settings.
- Remote temperature sensor.
- 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.

BlueSolar MPPT 12/24-40

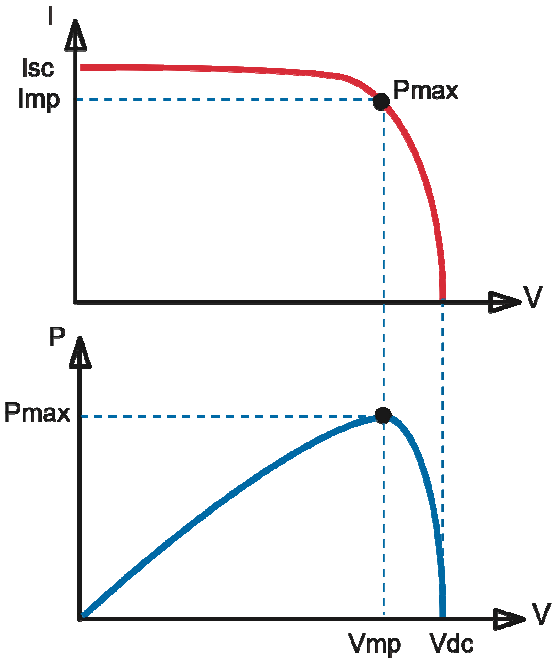


* For 12V use 36 cells solar panels
For 24V use 72 cells solar panels

BLUESOLAR CHARGE CONTROLLERS

BlueSolar	BlueSolar 12/24-5 BlueSolar 12/24-10 BlueSolar 12/24-20		BlueSolar DUO 12/24-20		BlueSolar MPPT 12/24-40	
	12V	24V	12V	24V	12V	24V
Battery Voltage	12/24V Auto Select (2)		12/24V Auto Select (2)		12/24V Auto Select (2)	
Rated charge current	5/10/20A		20A		40A	
MPPT Tracking	No		No		Yes	
Second battery output	No		Yes		No	
Automatic load disconnect	Yes (maximum load 10/10/20A)		n. a.		Yes (maximum load 15A)	
Maximum solar voltage	28/55V (2)		28/55V (2)		28/55V (2)	
Self-consumption	6mA		4mA		10mA	
Default settings						
Absorption charge (1)	14.4V	28.8V	14.4V	28.8V	14.4V	28.8V
Float charge (1)	13.7V	27.4V	13.7V	27.4V	13.7V	27.4V
Equalization charge	n. a.		n. a.		15.0V	30.0V
Over charge disconnect	n. a.		n. a.		14.8V	29.6V
Over charge recovery	n. a.		n. a.		13.6V	27.2V
Low voltage load disconnect	11.1V	22.2V	n. a.		10.8V	21.6V
Low voltage load reconnect	12,6V	25.2V	n. a.		12.3V	24.6V
Enclosure & Environmental						
Battery temperature sensor	Yes Internal sensor		Yes Internal sensor		Yes Remote 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)		0-40°C (full load) 40-60°C (derating)	
Cooling	Natural Convection		Natural Convection		Natural Convection	
Humidity (non condensing)	Max. 95%		Max. 95%		Max. 95%	
Protection class	IP20		IP20		IP20	
Terminal size	6mm² / AWG10		6mm² / AWG10		8mm² / AWG8	
Weight	160/160/180gr		180gr		1400gr	
Dimension (h x w x d)	70x133x34 mm 70x133x34 mm 76x153x37 mm		76x153x37 mm		202x66x140 mm	
Mounting	Vertical wall mount Indoor only		Vertical wall mount Indoor only		Vertical wall mount Indoor only	
Standards						
Safety	EN60335-1					
EMC	EN61000-6-1, EN61000-6-3					

1) BlueSolar 12/24-20, DUO 12/24-20 and BlueSolar MPPT 12/24-40: Other settings possible (see manual)
2) For 12V use 36 cell Solar panels
For 24V use 72 cell Solar panels



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 x V reaches its peak.

Lower curve:
Output power P = I x 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}.

BLUESOLAR GRID INVERTER

BlueSolar Grid Inverter	1500	2000	2800	4000	5000
GRID OUTPUT (AC)					
Nominal output power	1500W	2000W	2800W	4000W	5000W
Maximum output power	1650W	2200W	3000W	4400W	5500W
Nominal output current	6.52A	8.7A	12A	17.5A	22A
Maximum output current	7.2A	9.5A	13A	19A	24A
Maximum fuse protection	16A	16A	16A	25A	25A
Harmonic distortion of output current	<3% at nominal power <5% at 50% power				
Nominal AC output voltage	220V - 230V - 240V				
Power factor	>0,99% at nominal power				
Operating AC voltage range	190-260V				
Nominal AC frequency	50Hz				
Operating AC frequency range	45.5-54.5Hz				
Internal consumption at night	<0,1W				
Short circuit proof	Yes				
SOLAR INPUT (DC)					
Maximum Input voltage	450V	500V	500V	550V	550V
Input Voltage MPPT range	110-430V	110-480V	110-480V	110-530V	110-530V
Maximum input current	9A	10A	13A	18A	20A
Maximum input power	1750W	2280W	3160W	4500W	5200W
Number of MPPT trackers	1	1	1	1	1
Number of strings	1	1	2	4	4
Start-up power	7W	7W	7W	10W	10W
Ground fault monitoring	RCMU (residual current monitoring unit)				
Reverse polarity protection	Yes, with short circuit diode				
EFFICIENCY					
Maximum efficiency	95.5%	96.4%	96.4%	97.6%	97.8%
European standard efficiency	94.5%	95.4%	95.5%	96.7%	96.9%
GENERAL					
Topology	Transformerless				
Communication port	RS232				
Operating temperature range	-20°C to 60°C (automatic power limit in case of internal over temperature)				
Nominal power temperature range	-20°C to 55°C				
Storage temperature range	-20°C to 70°C				
Maximum operating altitude	2000 m (5% derating at 4000 m)				
Cooling method	Natural convection				
Relative humidity	Max 95%				
ENCLOSURE					
Protection degree	IP54				
DC connectors	MC4 (Multi Contact 4mm)				
Weight (kg)	14.8 kg	14.8 kg	14.8 kg	20.7 kg	20.7 kg
Dimensions (hxwxd, mm))	376x415x125	376x415x125	376x415x125	368x475x195	368x475x195
STANDARDS					
Safety	EN 50178				
EMC, Emission	EN 61000-6-3				
EMC, Immunity	EN 61000-6-2				
EMC, Harmonics and Flicker	EN 61000-3-2, EN 61000-3-3				
Automatic Grid Disconnection	VDE 0126-1-1 (2006)				

OPZS SOLAR BATTERIES

Battery OPzS Solar

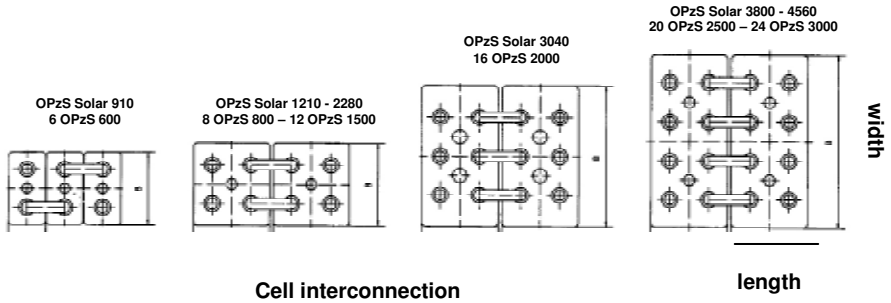
Long life flooded tubular plate batteries
Design life: >20 years at 20ºC, >10 years at 30ºC, >5 years at 40ºC.
Cycling expectancy of up to 1500 cycles at 80% depth of discharge.
Manufactured according to DIN 40736, EN 60896 and IEC 896-1.

Low maintenance
Under normal operating conditions and 20ºC, 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 @ 20ºC).
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).

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 / 20ºC)	910 Ah	1210 Ah	1520 Ah	1830 Ah	2280 Ah	3040 Ah	3800 Ah	4560 Ah
Capacity (10 hr / 20ºC)	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 (@ 68ºF/20ºC, end of discharge 1,8 Volt per cell)							
Capacity 20 / 24 / 48 / 72 hours (% of 120hr capacity)	77 / 80 / 89 / 95 (@ 68ºF/20ºC, end of discharge 1,85 Volt per cell)							
Capacity 100 / 120 / 240 hours (% of 120hr capacity)	99 / 100 / 104 (@ 68ºF/20ºC, end of discharge 1,85 Volt per cell)							
Self-discharge @ 70ºF/20ºC	3% per month							
Absorption voltage (V) @ 70ºF/20ºC	2,35 to 2,50 V/cell (28,2 to 30,0 V for a 24 Volt battery)							
Float voltage (V) @ 70ºF/20ºC	2,23 to 2,30 V/cell (26,8 to 27,6 V for a 24 Volt battery)							
Storage voltage (V) @ 70ºF/20ºC	2,18 to 2,22 V/cell (26,2 to 26,6 V for a 24 Volt battery)							
Float design life @ 70ºF/20ºC	20 years							
Cycle design life @ 80% discharge	1500							
Cycle design life @ 50% discharge	2500							
Cycle design life @ 30% discharge	4000							
Dimensions (lxwxh, mm)	147 x 208 x 666	191 x 210 x 666	233 x 210 x 666	275 x 210 x 666	275 x 210 x 821	397 x 212 x 797	487 x 212 x 797	576 x 212 x 797
Dimensions (lxwxh, inches)	5,8 x 8,2 x 26,3	7,5 x 8,2 x 26,3	9,2 x 8,2 x 26,3	10,8 x 8,2 x 26,3	10,8 x 8,2 x 32,4	15,7 x 8,4 x 31,4	19,2 x 8,4 x 31,4	22,7 x 8,4 x 31,4
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



Cell interconnection

GEL AND AGM BATTERIES

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.

Discharg 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

8. Effect of temperature on capacity

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

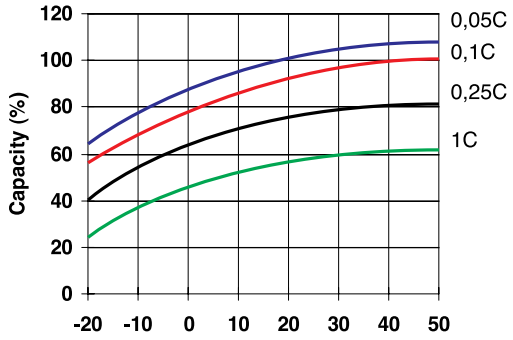


Fig. 1: Effect of temperature on capacity

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.

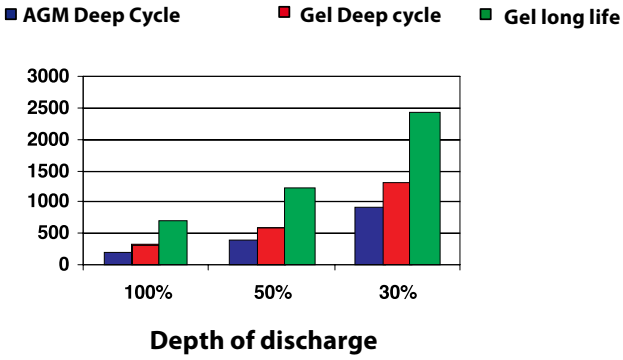


Fig. 2: Cycle life

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.

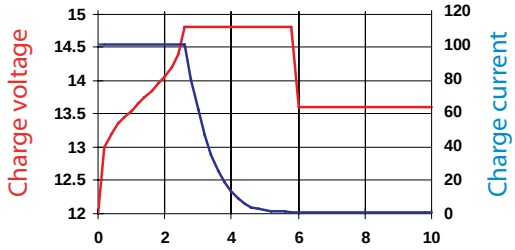


Fig. 3: Three step charge curve

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 trough 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 chare 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).

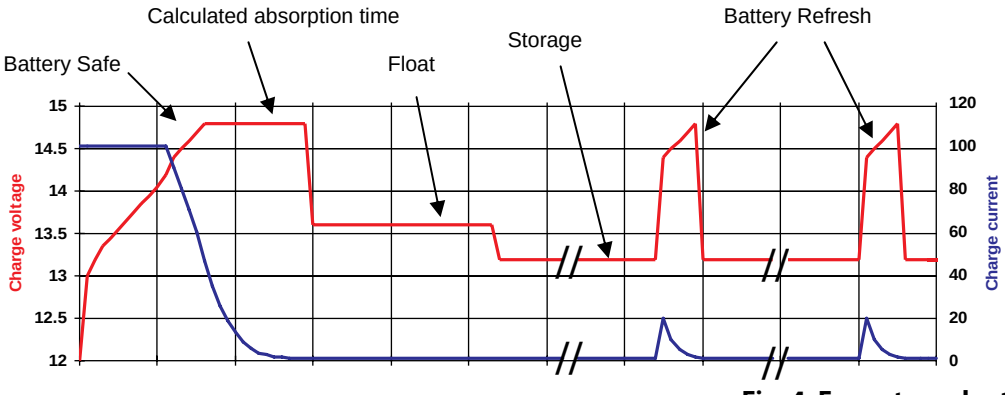


Fig. 4: Four-step adaptive charge curve

13. Optimum charge voltage of Victron VRLA batteries

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

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)
Victron AGM "Deep Cycle"			
Absorbtion		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
Victron Gel "Deep Cycle"			
Absorbtion		14,1 - 14,4	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	
Victron Gel "Long Life"			
Absorbtion		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: 200 cycles at 100% discharge* 400 cycles at 50% discharge 900 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: 300 cycles at 100% discharge * 600 cycles at 50% discharge 1300 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: 600 cycles at 100% discharge * 1200 cycles at 50% discharge 2400 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

* End of discharge voltage: 10,8 V for a 12 V battery

ABOUT VICTRON ENERGY

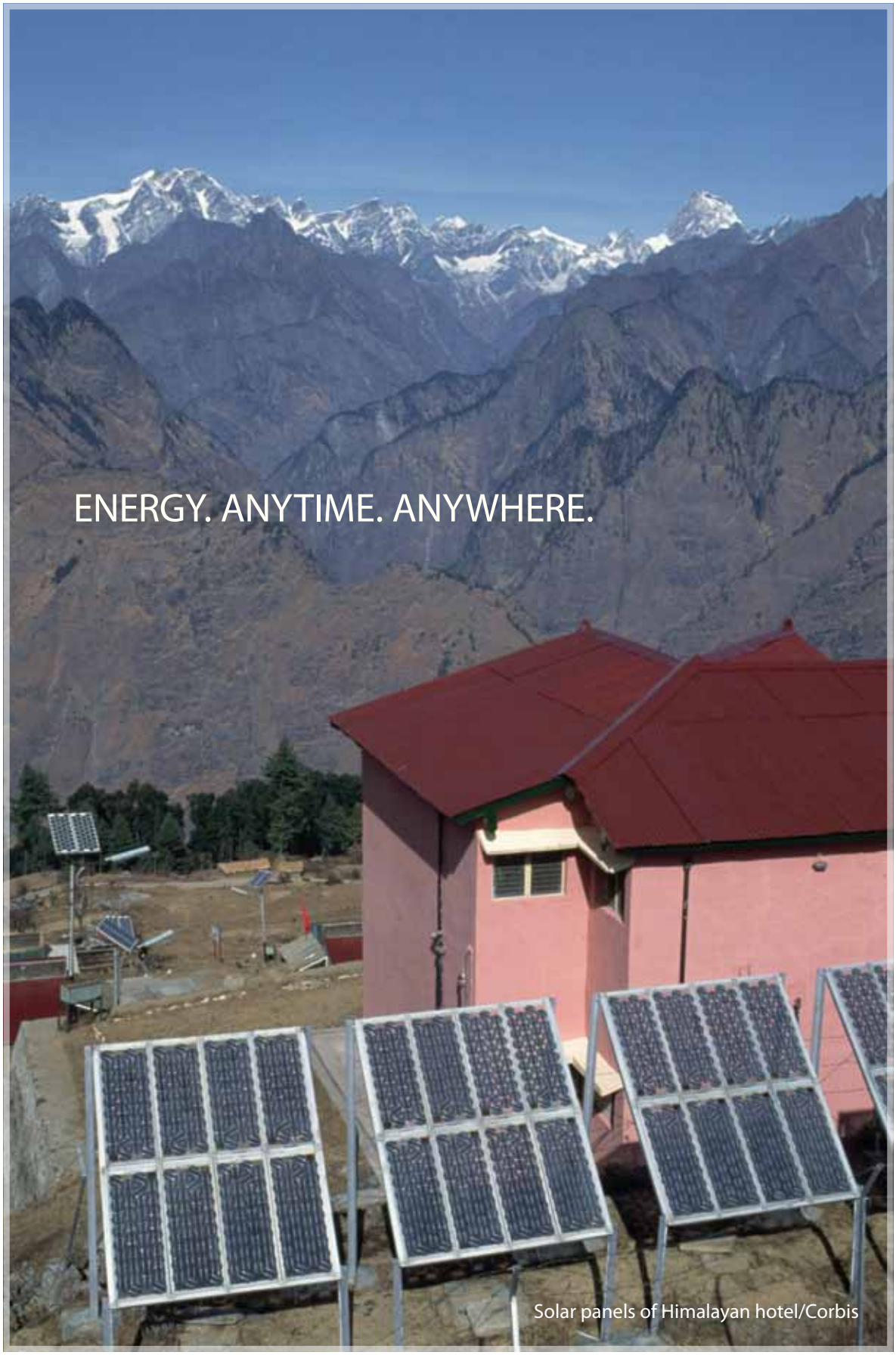
With over 35 years of experience, Victron Energy enjoys an unrivalled reputation for technical innovation, reliability and quality. Victron is a world leader in the supply of self-supporting electrical power. Our products have been designed to meet the most demanding situations faced by a diversity of 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 inverter/chargers, 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 35 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.

Victron Energy solar products



Solar panels of Himalayan hotel/Corbis

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