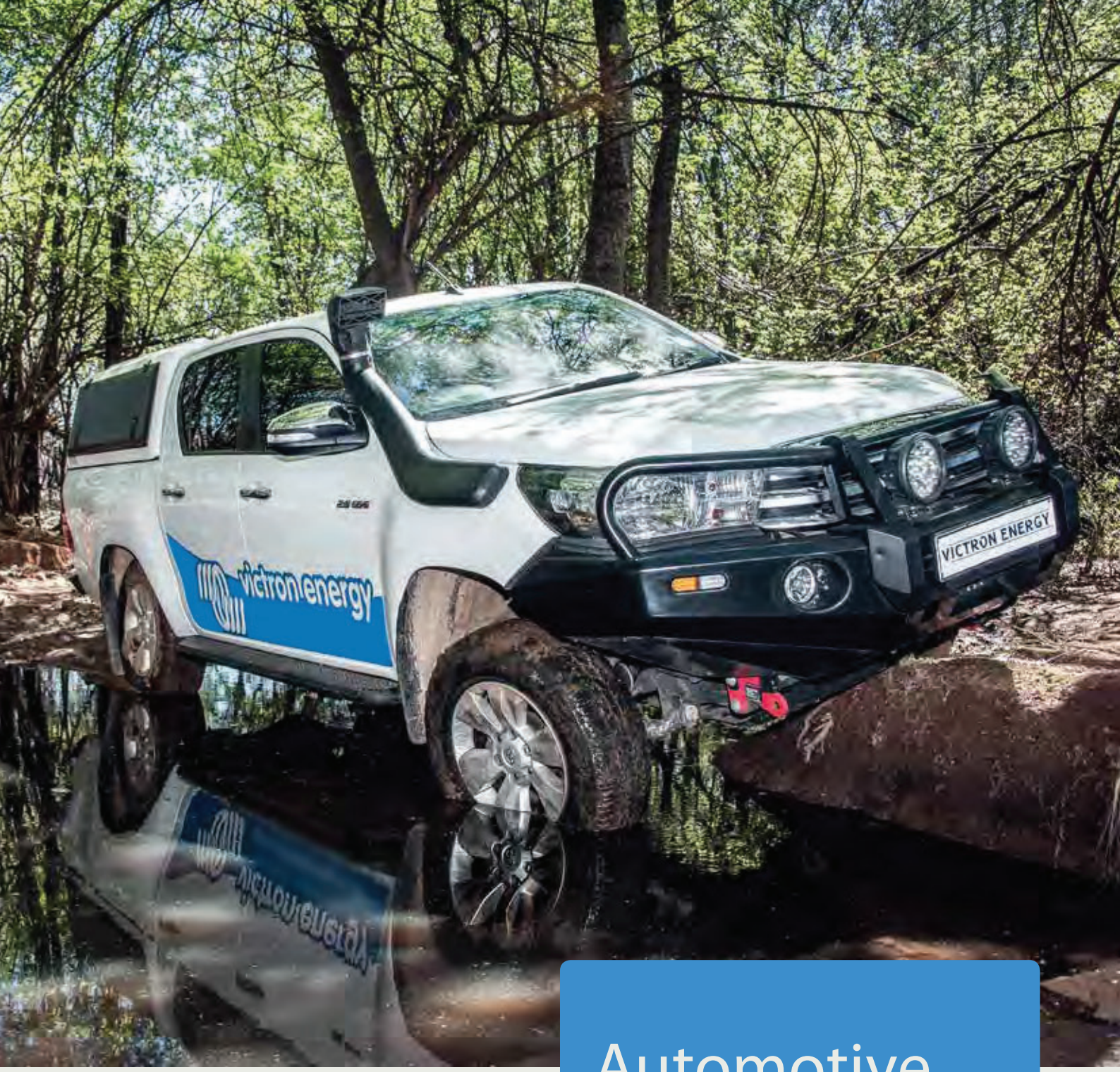


Automotive

victron energy
BLUE POWER

INDEX

Automotive

The automotive market comprises a broad range of applications requiring a reliable power supply. In vehicles such as fire engines, ambulances and police cars a human life may depend on an autonomous system. So it is vital that all systems function flawlessly. Victron Energy offers you such an answer. We are proud to offer you our modern translation for freedom and independence. Energy. Anytime. Anywhere.

Autonomous systems

Our products are being used in all vehicles requiring an extra power supply, for example ambulances, firetrucks, police cars, motorhomes, service vehicles, luxurious horse trailers, military vehicles and broadcasting vehicles.

Motorhomes

Ambulances

Coffee cart

On adventure with a motorhome

For those who are looking for real adventure during their vacation, proper equipment and good transport are the basic needs.
The Australian company 'SLR Caravans & Motorhomes' builds four wheel drive motor homes, expedition vehicles and caravans, especially made to withstand harsh Australian conditions.

Adventurer

The most advanced vehicle for extreme conditions is the Adventurer 4x4 motorhome/expedition from SLR. This vehicle is the gateway to spectacular and usually inaccessible destinations all over the globe. Thanks to the purpose designed and engineered body, the Adventurer is capable of tackling tough terrain such as the desert, rivers, mountains and sandy roads.

Victron Energy equipment

An almost indispensable option for the off-road vehicles is the Victron Phoenix MultiPlus: a powerful true sine wave inverter. In the event of generator power being disconnected, the inverter within the Multi is automatically activated and takes over the supply to the connected loads. So even in the middle of nowhere the off-road vehicles are assured of a reliable power supply.

The inverter converts 12 Volt power to 240 Volt power, which can be used for appliances such as the air conditioner, microwave, washing machine, refrigeration compressor, etc. The higher Watt units provide even more 'start up power', which is generally required by these appliances.

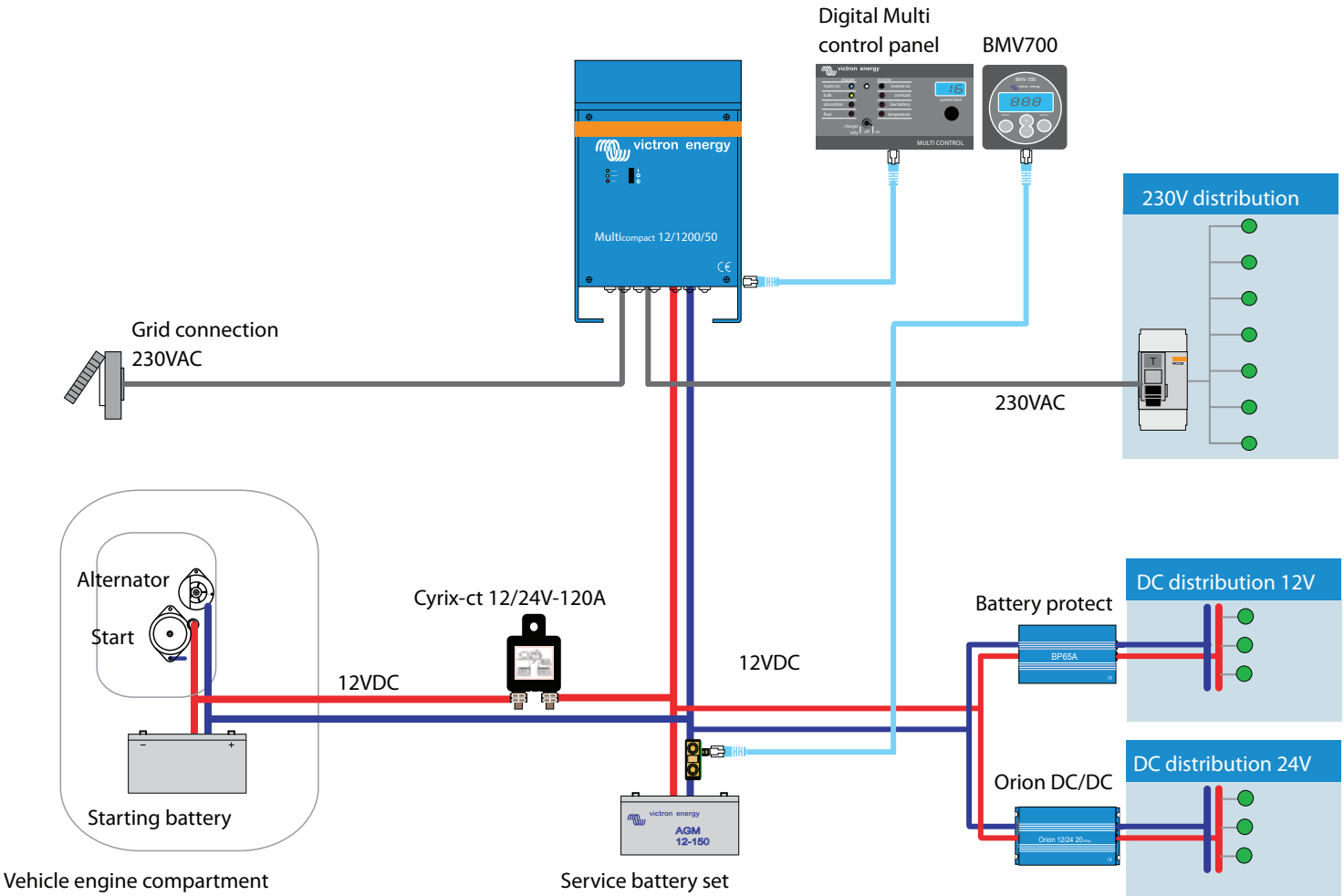
Ambulances

The company Petit Picot has installed MultiPlus 12/1600/70 in ambulances in the Parisian region. The MultiPlus provides a pure sinusoidal 230 volt alternating current power supply for the different medical devices (incubators, monitors, defibrillators, etc.) on board. These important medical devices need to be operational at all times. The MultiPlus UPS function provides the ambulances a 230Vac permanent power supply.

So an ambulance can function whether it is connected to the mains when idle or in autonomous mode when driving.
With the MultiPlus on board it has been possible to simplify wiring, compared with a separately installed inverter and charger, with the consequent cost saving in the installation.

Global market leader in ambulances

Victron Energy is global market leader in power supply equipment for ambulances. Our products are considered to be very reliable and extremely suitable for rescue vehicles such as ambulances.



Schematic overview of the installation in the ambulances in Paris.

Coffee cart Espressi

Coffee cart

Dutch-based company Espressi, which rents out various types of mobile espresso machines, has developed a coffee cart that is powered exclusively by electricity. The coffee cart can be driven and operated on electricity and used in any location, thanks to its on board equipment. The electric coffee cart can be used for a diversity of events: weddings, openings, business functions, exhibitions, festivals and conferences.

Victron equipment

To ensure that the coffee cart can be operated without any need whatsoever for mains electricity, the vehicle is equipped with the following:

- 1 x Quattro 48V 10kVA
- 1 x Battery Monitor BMV-700
- 48V 1000A OPzV batteries

Devices

The following devices are powered by the electricity stored in the batteries:

- Coffee machine
- Refrigeration system
- Sun screen
- Coffee grinder
- Lighting
- The vehicle's drive system

The coffee cart has a special switch to operate the electrical devices and the vehicle's drive system separately and so avoid using too much electricity at the same time.

Consumption

When the batteries are fully charged, the coffee cart can make coffee for up to 5 hours. That equates to around 1000 cups of coffee. When all devices are running simultaneously the total power consumption is 8kW.

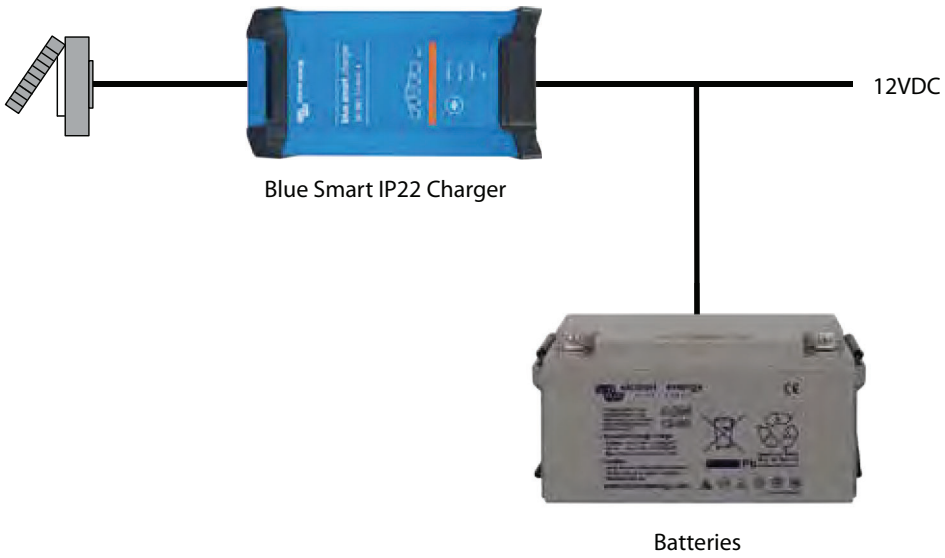
When the coffee machine is not being used, the coffee cart has a range of 300 kilometres.

The Battery Monitor checks on how full the batteries are so that the coffee cart is always able to get back home.


ESPRESSI

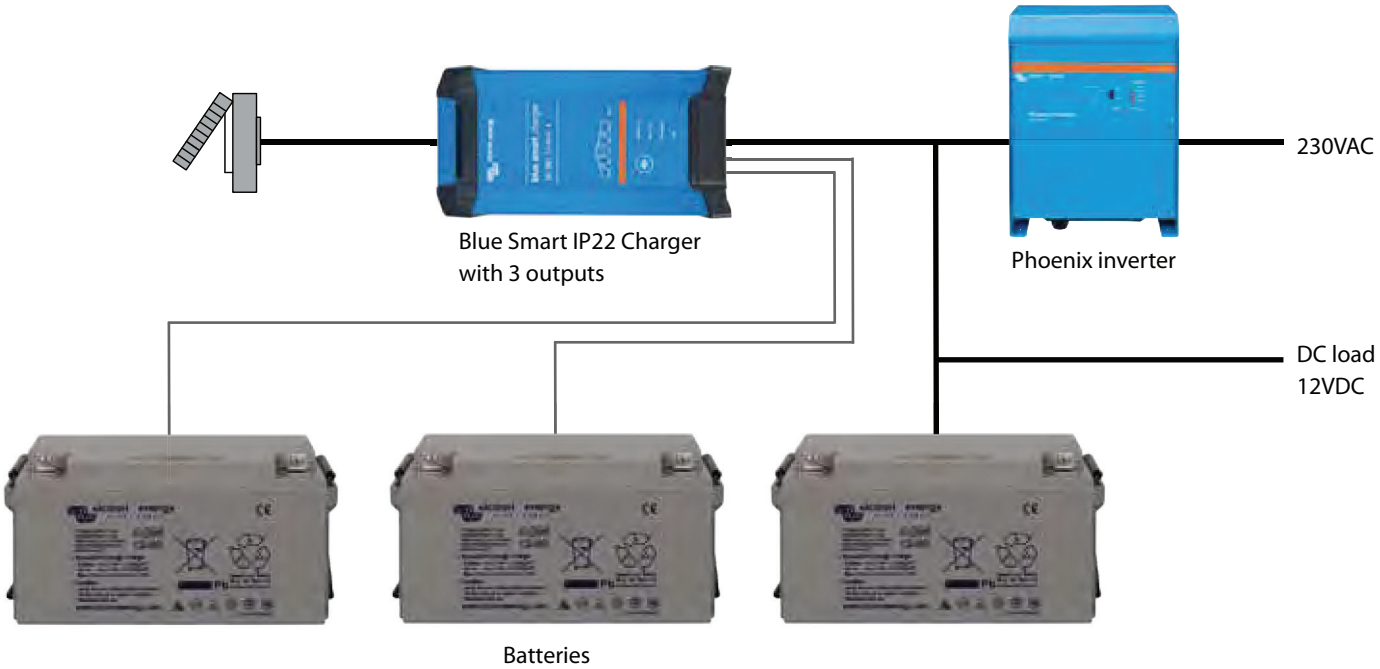
1. Simple system with only DC consumers

The battery charger charges the battery and functions as a power supply for the consumers.



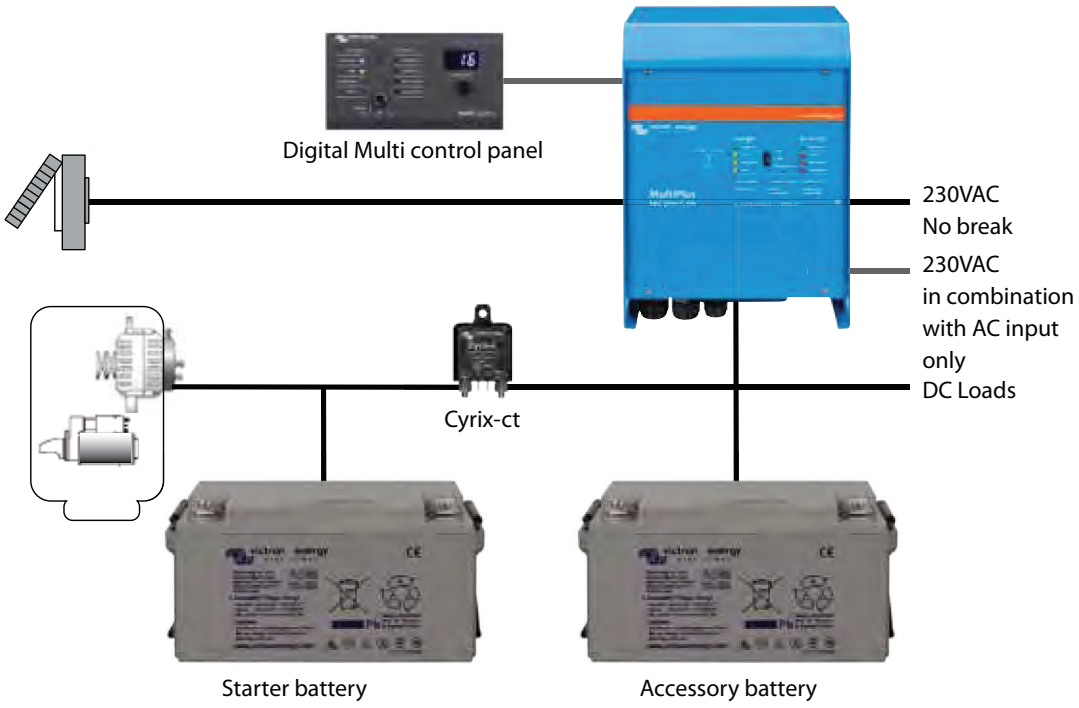
2. Charger system with inverter

This system contains a charger with three isolated outputs in order to charge three isolated battery banks.
The inverter in this system provides 230VAC loads.



3. Multi system

The Multiplus combines the charger and inverter functionality. This will result in easy installation and features like Power-Control and PowerAssist.



MultiPlus vs Quattro

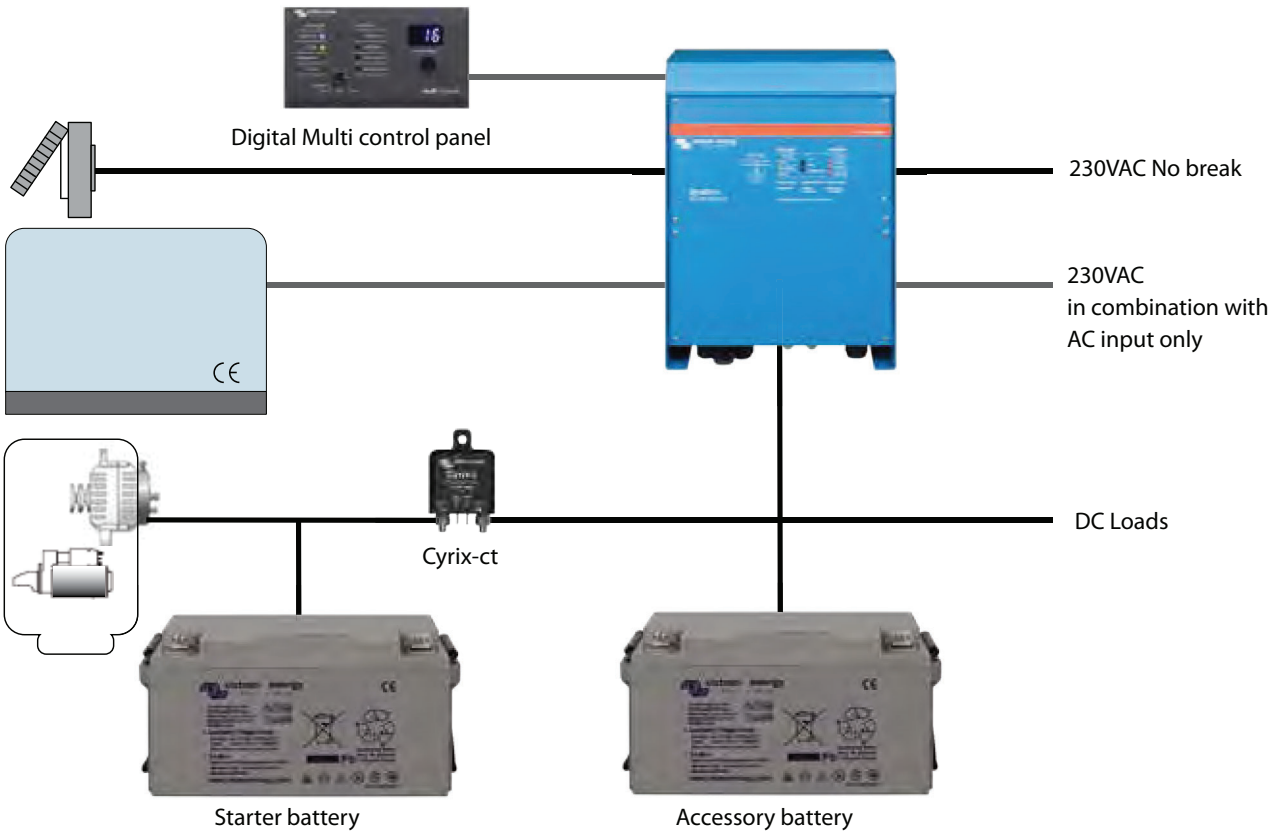
The MultiPlus and Quattro products play a central role in both AC and DC systems. They are both powerful battery chargers and inverters in one box.

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.

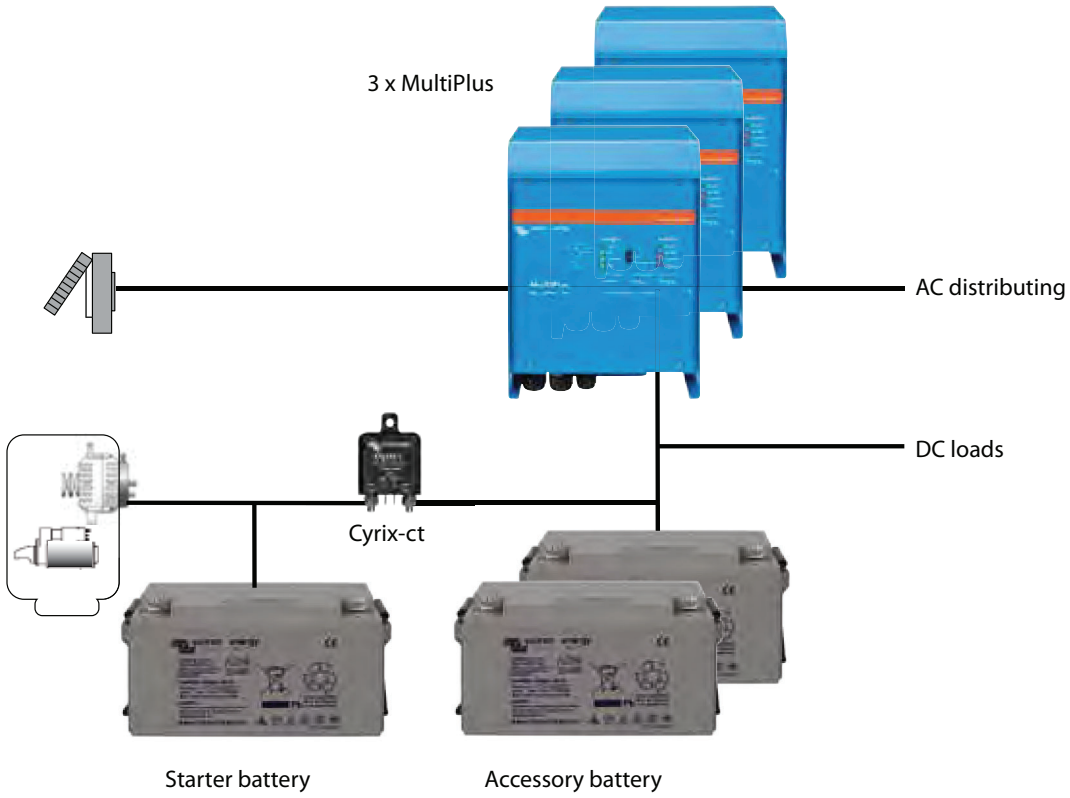
4. Quattro system

The Quattro has the same functions as the MultiPlus, but with an extra additon: a transfer system which automatically selects the available input.



5. Parallel system

Our inverters, Multis and Quattros can be paralleled to meet higher power requirements. A simple setting with our VEConfigure configuration software is sufficient.

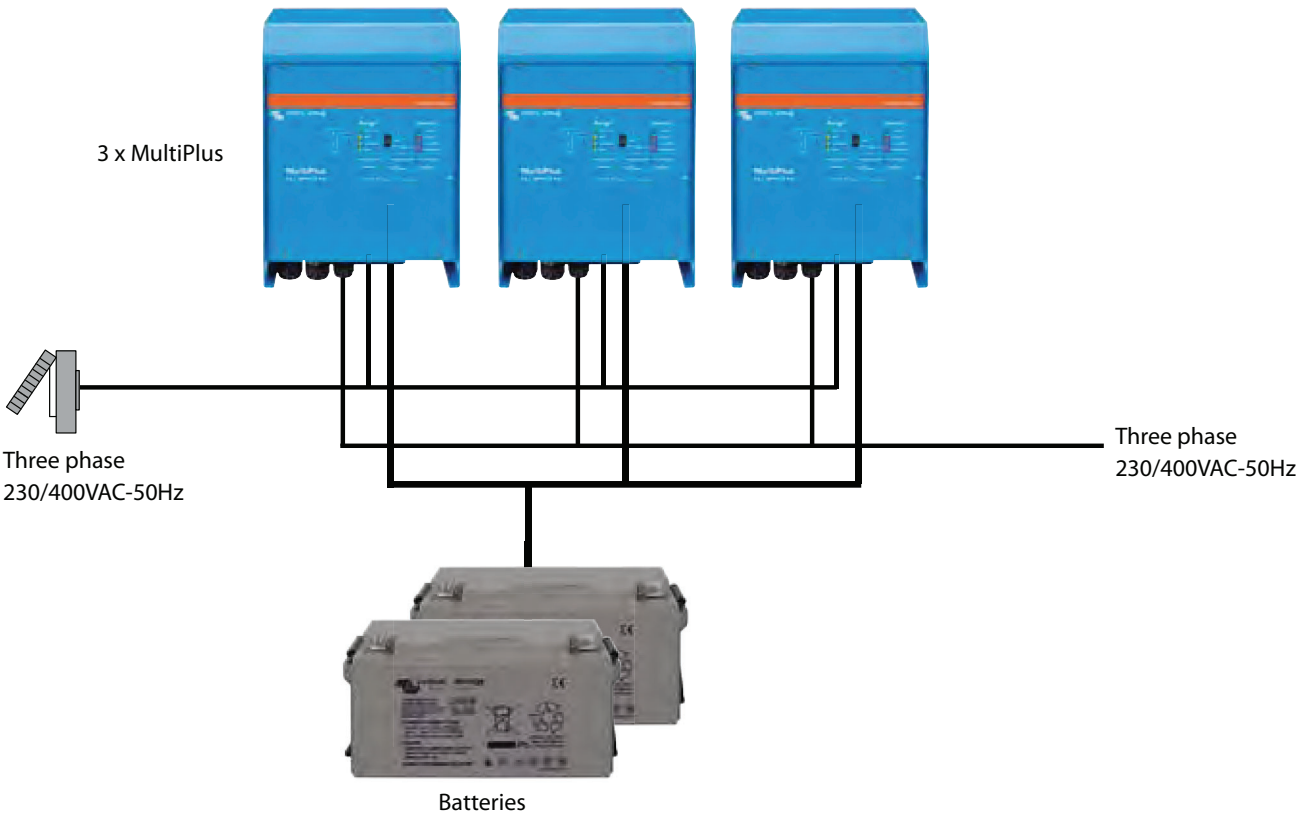


Easy to configure

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

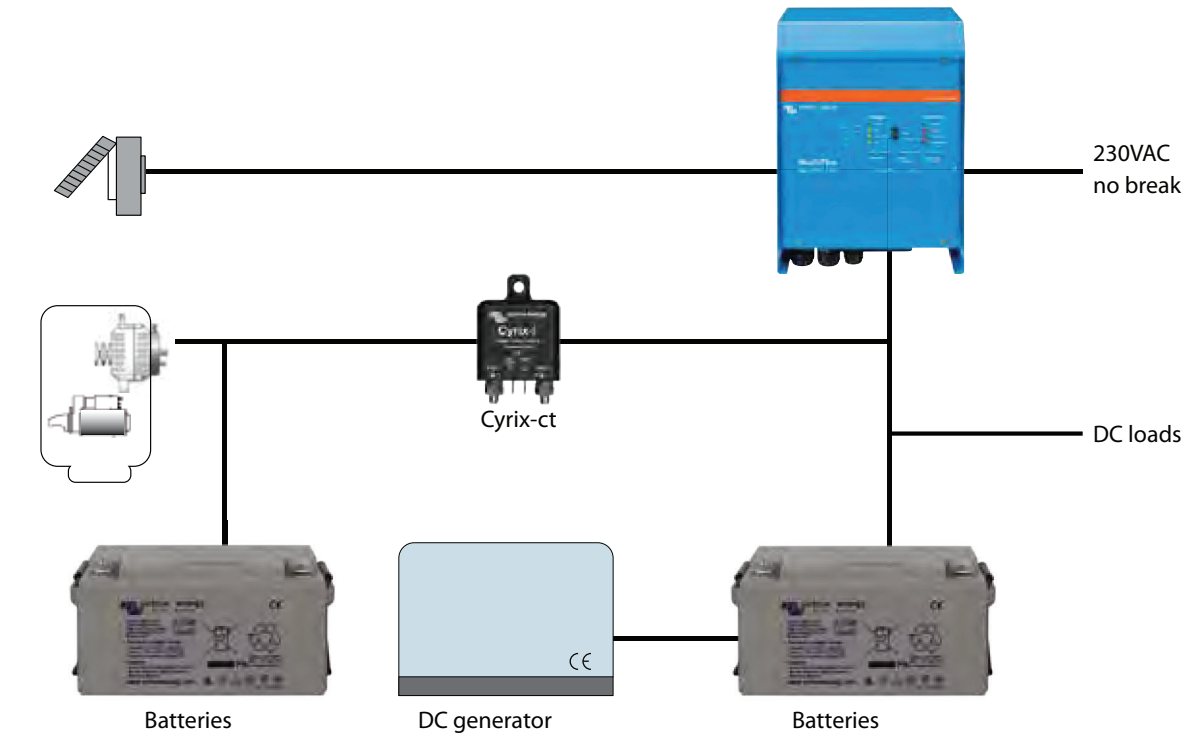
6. Three-phase system

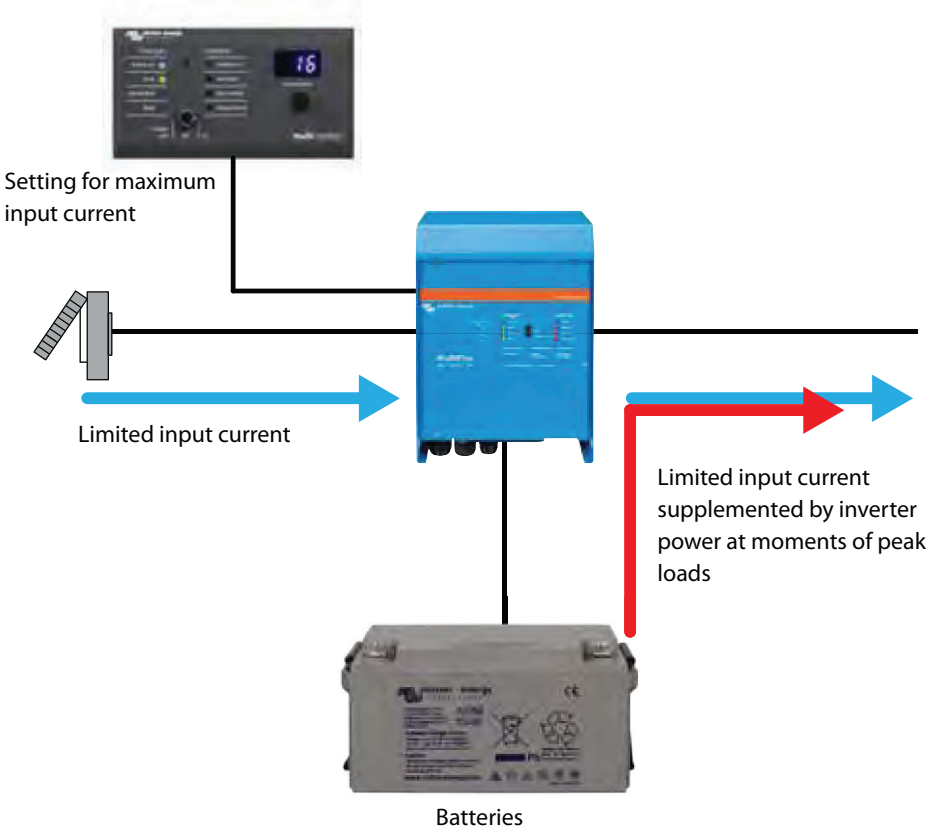
Similar to connecting units in parallel they can also be connected in split-phase and three-phase configurations.



7. MultiPlus system with DC generator

In this configuration the batteries are being charged directly with the DC generator, the alternator or AC power.





PowerAssist – boosting the capacity of AC or generator power

This unique Victron feature allows the MultiPlus to supplement the capacity of the mains or generator power. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient mains 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.

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

Battery Monitor

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

Color Control GX

The Color Control GX provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT 150/70, BMV-600 series, BMV-700 series, Skylla-i, Lynx Ion and even more.
The Color Control GX is now also equipped with a generator start/stop function using the internal relay.
Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal.

VRM Online Portal

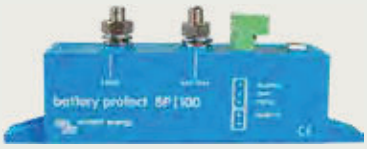
Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal. The portal is free of charge.

Digital Multi Control Panel GX

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.

Filax 2: the ultra fast transfer switch

The Filax has been designed to switch sensitive loads, such as computers or modern entertainment equipment from one AC source to another. The priority source typically is the mains, a generator or shore power. The alternate source typically is an inverter.



BatteryProtect
Models 12/24V: 65A, 100A & 220A
Model 48V: 100A

The BatteryProtect disconnects the battery from non-essential loads before it is completely discharged (which would damage the battery) or before it has insufficient power left to crank the engine.

Shore power cable

Waterproof Shore Power Cable and Inlet IP56
Moulded Plug and Connector
Power indication LED
Protection Cap
Stainless Steel Inlet

Tools

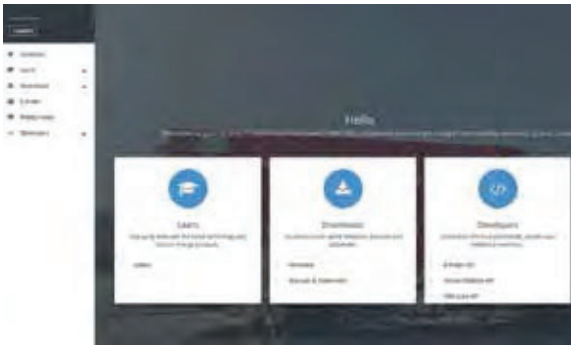
We have a couple of tools available that make it easy for Victron distributors, installers and customers to work with Victron Energy products. Whether you want to configure and read out your Victron products with VictronConnect using your smartphone, tablet or computer or you want to show your VRM site to friends and family, it is all possible with these Victron tools.

VRM Online Portal: Remotely monitor Victron equipment

Victron Remote Management (VRM) is provided by Victron Energy to remotely monitor electrical equipment all over the world.
Once you have a VRM account you will be able to view live feed from your installation, such as generated solar energy, state of charge of your batteries and the consumption.

VictronConnect

VictronConnect lets you get live status info and configure Victron products with built-in bluetooth support, such as the SmartSolar and the Blue Smart IP65 Charger, or using a VE.Direct Bluetooth Smart dongle or VE.Direct USB interface. Firmware updates are included inside VictronConnect.
VictronConnect is available for both Windows PCs, Max OS X, iOS and Android phones as well as tablets.



Victron Professional

Victron Professional is a new online portal, available to both distributors as well as other professionals and end users that work with Victron equipment.
With Victron Professional you can get insight into training sessions, videos, firmware files, APIs and the latest news. If you already use E-Order you can login with those credentials.

VRM World: View shared VRM sites around the world

Ever wanted to show your clients, friends, colleagues how much solar energy your installation is generating or indeed any other data that you can see on your VRM site? Well now you can – using VRM World.
You need a VRM account to be able to view shared VRM sites. In your VRM portal it is possible to publicly share on VRM World.

Campervan, the home of Pine van den Berg during her travels in Europe.

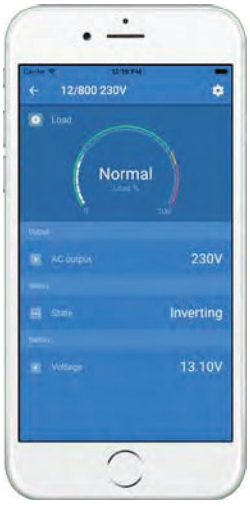
TECHNICAL INFORMATION

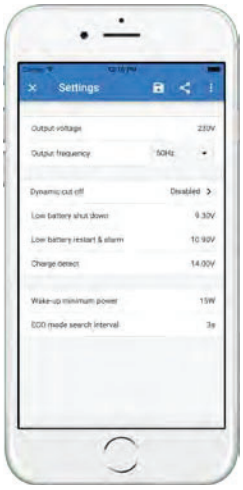
Phoenix inverters 250VA - 1200VA VE.Direct
Phoenix inverters 1200VA - 5000VA 230V
MultiPlus inverter/charger 500VA - 1200VA
MultiPlus-II inverter/charger
MultiPlus inverter/charger 800VA - 5kVA 230V
MultiPlus inverter/charger 2kVA and 3kVA 120V
Quattro inverter/charger 3kVA - 15kVA 230V
Quattro inverter/charger 3kVA - 10kVA 120V
Blue Smart IP22 charger
Blue Smart IP67 charger
Blue Smart IP65 Charger
Phoenix Smart charger
Centaur charger 12/24V
Phoenix battery charger 12/24V
Skylla-i battery charger 24V
Skylla TG charger 24/48V 230V
Skylla charger 24V universal input and GL approval
Orion-Tr DC-DC converters isolated: 100 / 250 / 400 Watt
Orion-Tr DC-DC converters, low power
Orion DC-DC converters
Orion IP67 24/12 DC-DC converter
Color Control GX
Venus GX
Buck-Boost DC-DC converter
BatteryProtect 65A/100A/220A
Cyrix-ct 12/24V 120A and 230A
Cyrix-ct 400A 12/24V and 24/48V
BMV-700 series: precision battery monitoring
BMV-712 Smart: Bluetooth inside
Argo diode battery isolators
Argo FET battery isolators
Battery Balancer
GEL and AGM batteries
12,8 Volt Lithium Iron Phosphate Batteries Smart
Lithium-Ion HE Battery and Lynx Ion BMS
Telecom batteries
BlueSolar and SmartSolar charge controllers - overview
MultiPlus principle

Phoenix inverters 250VA - 1200VA VE.Direct

Phoenix 12/375 VE.Direct

Phoenix 12/375 VE.Direct





VE.Direct communication port

The VE.Direct port can be connected to:

- A computer (VE.Direct to USB interface cable needed)
- Apple and Android smartphones, tablets, MacBook's and other devices (VE.Direct Bluetooth Smart dongle needed)

Fully configurable:

- Low battery voltage alarm trip and reset levels
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage 210 - 245V
- Frequency 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level

Monitoring:

- In- and output voltage, % load and alarms

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value (min load: 15W). Once in standby the inverter will switch on for a short period (adjustable, default: every 2,5 seconds). If the load exceeds a preset level, the inverter will remain on.

Remote on/off

A remote on/off switch can be connected to a two pole connector, or between battery plus and the left hand contact of the two pole connector.

LED diagnosis

Please see manual for a description.

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

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

Available with different output sockets

Schuko

UK

AU/NZ

IEC-320
(male plug included)

Nema 5-15R

DC connection with screw terminals

No special tools needed for installation

Phoenix Inverter 12 Volt / 24 Volt / 48 Volt	12/250 24/250 48/250	12/375 24/375 48/375	12/500 24/500 48/500	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. power at 25°C (1)	250VA	375VA	500VA	800VA	1200VA
Cont. power at 25°C / 40°C	200 / 175W	300 / 260W	400 / 350W	650 / 560W	1000 / 850W
Peak power	400W	700W	900W	1500W	2200W
Output AC voltage / frequency (adjustable)	230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0,1%				
Input voltage range	9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V				
DC low shut down (adjustable)	9,3 / 18,6 / 37,2V				
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off				
DC low restart and alarm (adjustable)	10,9 / 21,8 / 43,6V				
Battery charged detect (adjustable)	14,0 / 28,0 / 56,0V				
Max. efficiency	87 / 88 / 88%	89 / 89 / 90%	90 / 90 / 91%	90 / 90 / 91%	91 / 91 / 92%
Zero-load power	4,2 / 5,2 / 7,9W	5,6 / 6,1 / 8,5W	6 / 6,5 / 9W	6,5 / 7 / 9,5W	7 / 8 / 10W
Default zero-load power in ECO mode (default retry interval: 2,5 s, adjustable)	0,8 / 1,3 / 2,5W	0,9 / 1,4 / 2,6W	1 / 1,5 / 3,0	1 / 1,5 / 3,0	1 / 1,5 / 3,0
ECO mode stop and start power setting	Adjustable				
Protection (2)	a - f				
Operating temperature range	-40 to +65°C (fan assisted cooling) Derate 1,25% per °C above 40°C				
Humidity (non-condensing)	max 95%				
ENCLOSURE					
Material & Colour	Steel chassis and plastic cover (blue Ral 5012)				
Battery-connection	Screw terminals				
Maximum cable cross-section	10 mm² / AWG8	10 mm² / AWG8	10 mm² / AWG8	25/10/10mm² / AWG4/8/8	35/25/25 mm² / AWG 2/4/4
Standard AC outlets	230V: Schuko (CEE 7/4), IEC-320 (male plug included) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema 5-15R				
Protection category	IP 21				
Weight	2,4kg / 5,3lbs	3,0kg / 6,6lbs	3,9kg / 8.5lbs	5,5kg / 12lbs	7,4kg / 16,3lbs
Dimensions (hxwxd, mm) (hxwxd, inch)	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 172 x 275 3,4 x 6,8 x 10,8	105 x 216 x 305 4.1 x 8.5 x 12.1 (12V model: 105 x 230 x 325)	117 x 232 x 327 4.6 x 9.1 x 12.9 (12V model: 117 x 232 x 362)
ACCESSORIES					
Remote on-off	Yes				
Automatic transfer switch	Filax				
STANDARDS					
Safety	EN-IEC 60335-1 / EN-IEC 62109-1				
EMC	EN 55014-1 / EN 55014-2 / IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3				
Automotive Directive	ECE R10-4				

1) Nonlinear load, crest factor 3:1
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) DC ripple too high

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

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

VE.Direct Bluetooth Smart dongle
(must be ordered separately)

Phoenix inverters 1200VA - 5000VA 230V

Phoenix Inverter
24/5000

SinusMax - Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with 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 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).

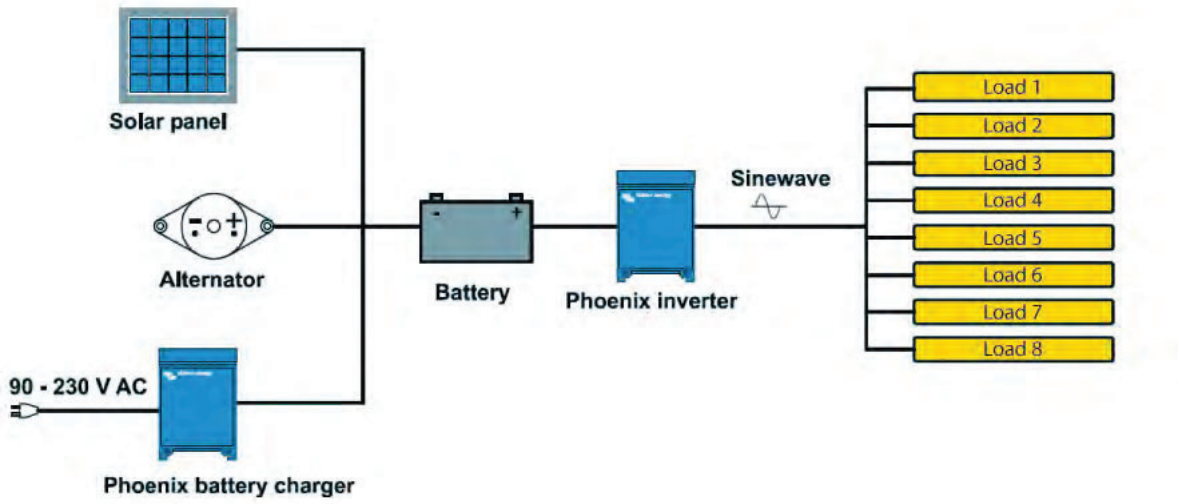
Computer interface

All models have a RS-485 port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VEConfigure software, which can be downloaded free of charge from our website, all parameters of the inverters can be customized. 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 computerized 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'

Phoenix Inverter Compact
24/1600



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°C (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25°C (W)	1000	1300	1600	2400	4000
Cont. output power at 40°C (W)	900	1200	1450	2200	3700
Cont. output power at 65°C (W)	600	800	1000	1700	3000
Peak power (W)	2400	3000	4000	6000	10000
Max. efficiency 12/ 24 /48 V (%)	92 / 94 / 94	92 / 94 / 94	92 / 92	93 / 94 / 95	94 / 95
Zero load power 12 / 24 / 48 V (W)	8 / 10 / 12	8 / 10 / 12	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8 / 10	5 / 8 / 10	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3 / 4	2 / 3 / 4	3 / 4	8 / 10 / 12	10 / 15
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 +65°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 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 60 Hz and to 240 V
2) Non-linear load, crest factor 3:1
3) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 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:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA 2000 marine electronics network. See the NMEA 2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 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 500VA - 1200VA

Proven reliability
The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverter is short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

PowerControl - Dealing with limited generator, shore side or grid power (800VA/1200VA)
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 (800VA/1200VA)
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.

High start-up power
Needed to start high inrush loads such as power converters for LED lamps, halogen lamps or electric tools.

Search Mode
When Search Mode is 'on', the power consumption of the inverter in no-load operation is decreased by approx. 70%. In this mode the Multi, when operating in inverter mode, is switched off in case of no load or very low load, and switches on every two seconds for a short period. If the output current exceeds a set level, the inverter will continue to operate. If not, the inverter will shut down again.

Programmable relay
By default, the programmable relay is set as an alarm relay, i.e. the relay will de-energise in the event of an alarm or a pre-alarm (inverter almost too hot, ripple on the input almost too high, battery voltage almost too low).

Remote on / off / charger on
Three pole connector.

12 Volt 24 Volt 48 Volt	MultiPlus 12/500/20 MultiPlus 24/500/10 MultiPlus 48/500/6	MultiPlus 12/800/35 MultiPlus 24/800/16 MultiPlus 48/800/9	MultiPlus 12/1200/50 MultiPlus 24/1200/25 MultiPlus 48/1200/13
PowerControl / PowerAssist	No	Yes	
Three Phase and parallel operation	No	Yes	
Transfer switch	16A		
INVERTER			
Input voltage range	9,5 – 17V	19 – 33V	38– 66V
Output	Output voltage: 230VAC ± 2%	Frequency: 50Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	500VA	800VA	1200VA
Cont. output power at 25°C	430W	700W	1000W
Cont. output power at 40°C	400W	650W	900W
Cont. output power at 65°C	300W	400W	600W
Peak power	900W	1600W	2400W
Maximum efficiency	90 / 91 / 92%	92 / 93 / 94%	93 / 94/95%
Zero-load power	6 / 6 / 7W	7 / 7 / 8W	10 / 9 / 10W
Zero-load power in search mode	2 / 2 / 3W	2 / 2 / 3W	3 / 3 /3W
CHARGER			
AC Input	Input voltage range: 187-265 VAC	Input frequency: 45 – 65 Hz	
Charge voltage 'absorption'	14,4 / 28,8 / 57,6V		
Charge voltage 'float'	13,8 / 27,6 / 55,2V		
Storage mode	13,2 / 26,4 /52,8V		
Charge current house battery (4)	20 / 10 / 6A	35 / 16 / 9A	50 / 25 / 13A
Charge current starter battery	1A (12V and 24V models only)		
Battery temperature sensor	Yes		
GENERAL			
Programmable relay (5)	Yes		
Protection (2)	a – g		
Common Characteristics	Operating temp. range: -40 to +65°C (fan assisted cooling) Humidity (non-condensing): max 95%		
ENCLOSURE			
Common Characteristics	Material & Colour: Steel/ABS (blue RAL 5012)	Protection category: IP 21	
Battery-connection	16 / 10 / 10 mm²	25 / 16 / 10 mm²	35 / 25 / 10 mm²
230V AC-connection	G-ST18i connector		
Weight	4,4 kg	6,4 kg	8,2 kg
Dimensions (h x w x d)	311 x 182 x 100 mm	360 x 240 x 100 mm	406 x 250 x 100 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN 62109-1		
Emission / Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	ECE R10-4		

1) Can be adjusted to 60Hz and to 240V
2) Protection
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 230VAC on inverter output
g. Input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) At 25°C ambient
5) Programmable relay which can be set for:
general alarm, DC under voltage or generator start/stop signal function
AC rating: 230V/4A
DC rating: 4A up to 35VDC, 1A up to 60VDC


POLITIE
POLITIE

MultiPlus-II inverter/charger

A MultiPlus, plus ESS (Energy Storage System) functionality

The MultiPlus-II combines the functions of the MultiPlus and the MultiGrid.
It has all the features of the MultiPlus, plus an external current sensor option which extends the PowerControl and PowerAssist function to 50A resp 100A
It also has all the features of the MultiGrid with built-in anti-islanding and an increasingly long list of country approvals.

PowerControl and PowerAssist - Boosting the capacity of grid or generator power

A maximum generator or grid current can be set. The Multi will then take account of other AC loads and use whatever is extra for battery charging, thus preventing the generator or grid from being overloaded (PowerControl function).
PowerAssist takes the principle of PowerControl to a further dimension. Where peak power is so often required only for a limited period, the Multi will compensate insufficient generator, shore or grid power with power from the battery. When the load reduces, the spare power is used to recharge the battery.

ESS: Energy Storage Systems

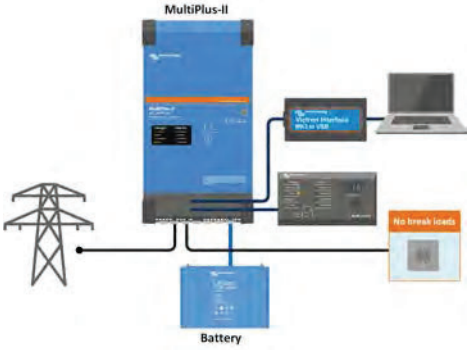
The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems.
Several system configurations are possible, for more detailed information see the ESS Design and configuration manual.

On-site monitoring and control

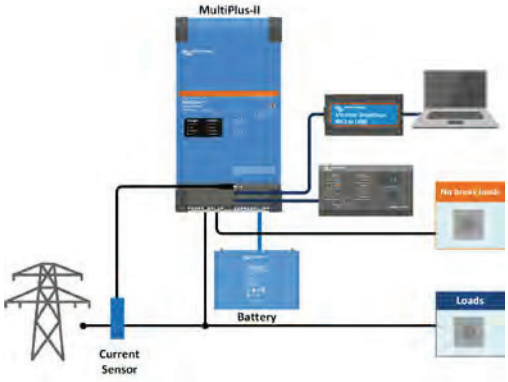
Several options are available: Battery Monitor, Digital Multi Control Panel, Color Control Panel, Bluetooth (Venus GX or Color Control panel needed), laptop or computer.

Remote configuring and monitoring

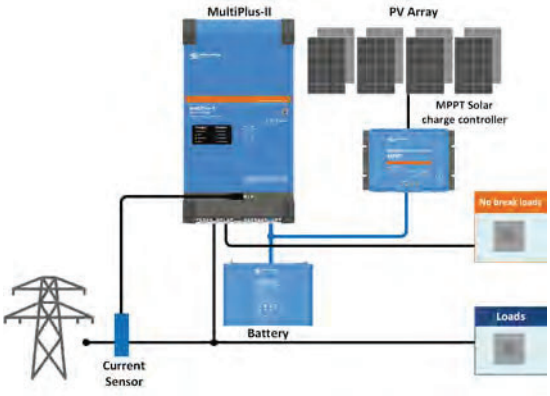
Install a Venus GX or a Color Control Panel to connect to the internet.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.
When connected to the Ethernet, systems can be accessed remotely and settings can be changed.



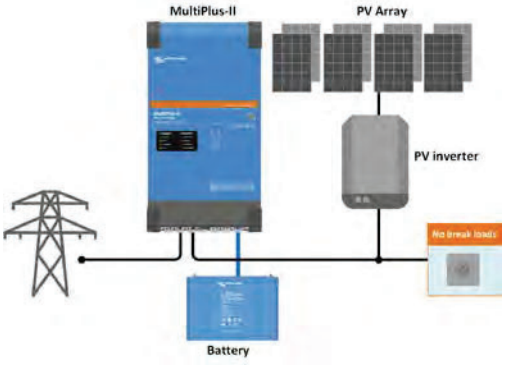
Standard mobile or off-grid application
Loads that should shut down when AC input power is not available can be connected to a second output (not shown). These loads will be taken into account by the PowerControl and PowerAssist function in order to limit AC input current to a safe value.



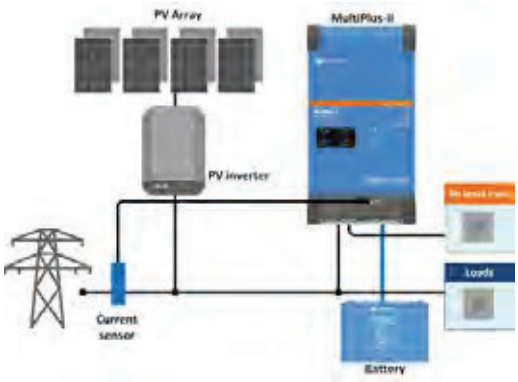
Standard mobile or off-grid application with external current sensor
Maximum current sensing range: 50A resp 100A



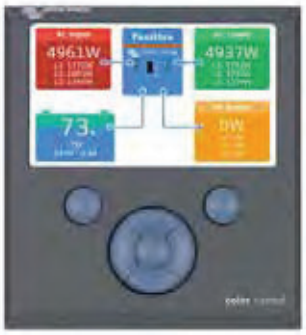
Grid parallel topology with MPPT solar charge controller
Certain critical loads only are protected against a power outage.
The MultiPlus-II will use data from an external AC current sensor or power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid. In case of a power outage, the MultiPlus-II will continue to supply the critical loads



Grid in-line topology with PV inverter
PV power is directly converted to AC.
The MultiPlus-II will use excess PV power to charge the batteries or to feed power back into the grid, and will discharge the battery or use power from the grid to supplement a shortage of PV power. In case of a power outage, the MultiPlus-II will disconnect the grid and continue to supply the loads.



Grid parallel topology with PV inverter
In this topology the PV inverter will shut down in case of a power outage.
The MultiPlus-II will use data from the external AC current sensor or power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid.



Color Control Panel (CCGX)
Provides intuitive system control and monitoring
Besides system monitoring and control the CCGX enables access to our free remote monitoring website: the VRM Online Portal

VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet.
Available for both iOS and Android.

VRM Portal
Our free remote monitoring website (VRM) will display all your system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail.

MultiPlus-II	48/3000/35-32	48/5000/70-50
PowerControl & PowerAssist	Yes	
Transfer switch	32 A	50 A
Maximum AC input current	32 A	50 A
INVERTER		
DC Input voltage range	38 – 66 V	
Output	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	3000 VA	5000VA
Cont. output power at 25°C	2400 W	4000W
Cont. output power at 40°C	2200 W	3700W
Cont. output power at 65°C	1700 W	3000W
Maximum apparent feed-in power	2500VA	4000VA
Peak power	5500 W	9000W
Maximum efficiency	95 %	96%
Zero load power	11 W	18W
Zero load power in AES mode	7 W	12W
Zero load power in Search mode	2 W	2W
CHARGER		
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz	
Charge voltage 'absorption'	57,6 V	
Charge voltage 'float'	55,2 V	
Storage mode	52,8 V	
Maximum battery charge current (4)	35 A	70A
Battery temperature and voltage sensor	VE.Bus Smart dongle (optional)	
GENERAL		
Auxiliary output	Yes (32 A)	
External AC current sensor (optional)	50 A	100 A
Programmable relay (5)	Yes	
Protection (2)	a - g	
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration	
General purpose com. port	Yes, 2x	
Remote on-off	Yes	
Operating temperature range	-40 to +65°C (fan assisted cooling)	
Humidity (non-condensing)	max 95%	
ENCLOSURE		
Material & Colour	steel, blue RAL 5012	
Protection category	IP22	
Battery-connection	Two M6 bolts	
230 V AC-connection	Screw terminals 13 mm² (6 AWG)	
Weight	18 kg	29 kg
Dimensions (hxwxd)	499 x 268 x 141 mm	560 x 320 x 141 mm
STANDARDS		
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2	
Emission, Immunity	EN 55014-1, EN 55014-2 EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3	
Uninterruptible power supply	IEC 62040-1, AS 620401.1	
Anti-islanding	VDE-AR-N 4105, TOR-D4, AS/NZS 4777.2, NRS 097-2-1, UTE C15-712-1, C10/11, RD 1699-RD 413, G59/3-2, G83/2	

1) Can be adjusted to 60 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) 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) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. AC rating: 230V / 4A, DC rating: 4A up to 35VDC and 1A up to 60VDC

Current sensor 100A:50mA
To implement PowerControl and PowerAssist and to optimize self-consumption with external current sensing.
Maximum current: 50A resp. 100A
Length of connection cable: 1 m.
(must be ordered separately)

Digital Multi Control Panel
A convenient and low-cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

MultiPlus inverter/charger 800VA - 5kVA 230V

Lithium Ion battery compatible

MultiPlus 24/3000/70

MultiPlus Compact 12/2000/80

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 3 kVA and more).

Virtually unlimited power thanks to parallel operation

Up to 6 Multis 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 10 A per 5 kVA Multi at 230 VAC). 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.

Solar energy: AC power available even during a grid failure

The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring

- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control

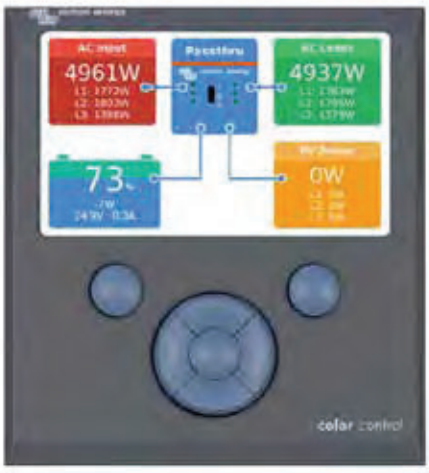
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power Panel, Color Control Panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control

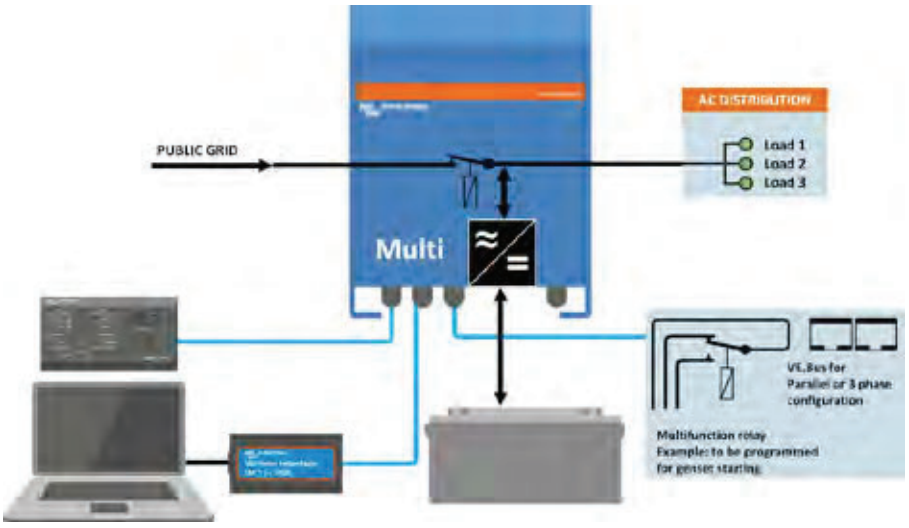
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring

When connected to the Ethernet, systems with a Color Control panel can be accessed remotely and settings can be changed.



Color Control Panel, showing a PV application



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	100
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	2400	4000
Cont. output power at 40°C (W)	650	900	1200	1400	2200	3700
Cont. output power at 65°C (W)	400	600	800	1000	1700	3000
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	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
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 (12 V and 24 V models only)					
Battery temperature sensor	yes					
GENERAL						
Auxiliary output (5)	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
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	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	Yes					
Common Characteristics	Operating temp. range: -40 to +65°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)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375x214x110			520x255x125	362x258x218	444x328x240
STANDARDS						
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, IEC 62109-1					
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3					
Road vehicles	12V and 24V models: ECE R10-4					
Anti-islanding	See our website					

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 under voltage or genset start/stop function
AC rating: 230 V/4A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist 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:

Color Control GX
Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network.
See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 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

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

Multifunctional, 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 Multis 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 45 kW / 54 kVA three phase inverter and 1260 A charger can be built.

Split phase options

Two units can be stacked to provide 120-0-120 V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30 kW / 36 kVA of split phase power.
Alternatively, a split phase AC source can be obtained by connecting our autotransformer to a 'European' inverter programmed to supply 240 V / 60 Hz.

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 20 A per 3 kVA MultiPlus at 120 VAC). 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.

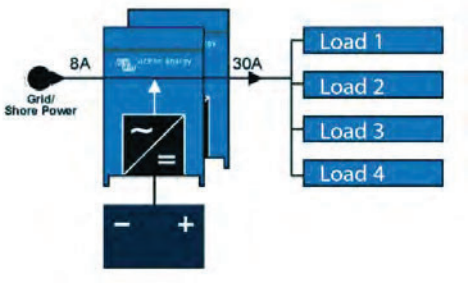
Four stage adaptive charger and dual bank battery charging

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.

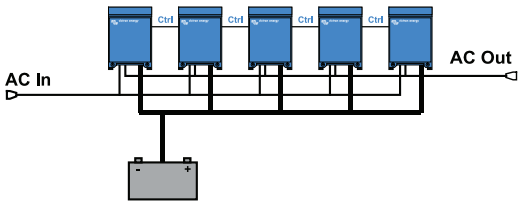
System configuring has never been easier

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	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 25°C / 77°F (VA) (3)		2000	3000
Cont. output power at 25°C / 77°F (W)		1600	2400
Cont. output power at 40°C / 104°F (W)		1450	2200
Cont. output power at 65°C / 150°F (W)		1100	1700
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero load power (W)		9 / 11	20 / 20
Zero load power in AES mode (W)		7 / 8	15 / 15
Zero load power in Search mode (W)		3 / 4	8 / 10
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: -40 - +65°C / -40 to 150°F (fan assisted cooling)	Humidity (non-condensing): max 95%
ENCLOSURE			
Common Characteristics		Material & Colour: aluminium (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 (13 mm²)	Screw-terminal 6 AWG (13mm²)
Weight		13 kg 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		EN 55014-1, 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 under voltage or genset start/stop function
AC rating: 230 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
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 PowerControl and PowerAssist 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:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 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 - 15kVA 230V

Lithium Ion battery compatible

Quattro
48/5000/70-100/100

Quattro
48/15000/200-100/100

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps 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 to a 'European' inverter programmed to supply 240V / 60Hz.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.

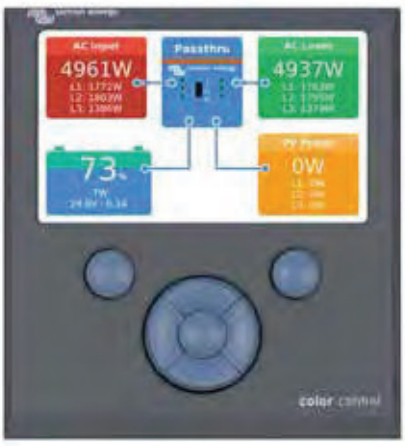
Solar energy: AC power available even during a grid failure
The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

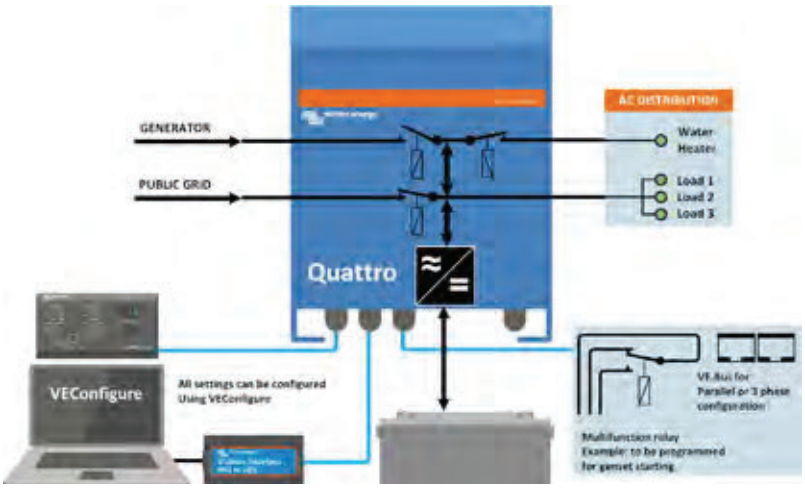
On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power panel, Color Control panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control panel can be accessed and settings can be changed.



Color Control panel, showing a PV application



Quattro	12/3000/120-50/50 24/3000/70-50/50	12/5000/220-100/100 24/5000/120-100/100 48/5000/70-100/100	24/8000/200-100/100 48/8000/110-100/100	48/10000/140-100/100	48/15000/200-100/100
PowerControl / PowerAssist	Yes				
Integrated Transfer switch	Yes				
AC inputs (2x)	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1				
Maximum feed through current (A)	2x 50	2x100	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	15000
Cont. output power at 25°C (W)	2400	4000	6500	8000	12000
Cont. output power at 40°C (W)	2200	3700	5500	6500	10000
Cont. output power at 65°C (W)	1700	3000	3600	4500	7000
Peak power (W)	6000	10000	16000	20000	25000
Maximum efficiency (%)	93 / 94	94 / 94 / 95	94 / 96	96	96
Zero load power (W)	20 / 20	30 / 30 / 35	45 / 50	55	80
Zero load power in AES mode (W)	15 / 15	20 / 25 / 30	30 / 30	35	50
Zero load power in Search mode (W)	8 / 10	10 / 10 / 15	10 / 20	20	30
CHARGER					
Charge voltage 'absorption' (V DC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6	57,6
Charge voltage 'float' (V DC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
Storage mode (V DC)	13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8	52,8
Charge current house battery (A) (4)	120 / 70	220 / 120 / 70	200 / 110	140	200
Charge current starter battery (A)	4 (12V and 24V models only)				
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output (A) (5)	25	50	50	50	50
Programmable relay (6)	3x	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	2x	2x	2x	2x	2x
Remote on-off	Yes				
Common Characteristics	Operating temp.: -40 to +65˚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	Bolts M6
Weight (kg)	19	34 / 30 / 30	45 / 41	51	72
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	572 x 488 x 344
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1				
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Road vehicles	12V and 24V models: ECE R10-4				
Anti-islanding	See our website				

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

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

Computer controlled operation and monitoring
Several interfaces are available:

Color Control GX
Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Quattro inverter/charger 3kVA - 10kVA 120V

Quattro
48/5000/70-100/100

Two AC inputs with integrated transfer switch

The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps charging capacity.

Three phase capability

Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.
Loss of mains detection software is available.

System configuring

- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control

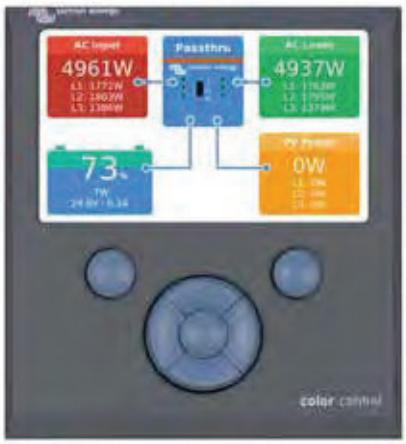
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power panel, Color Control panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control

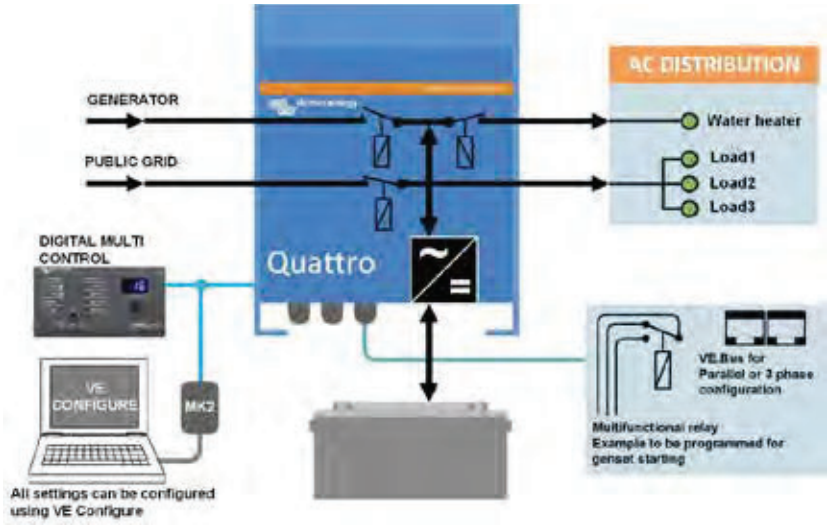
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring

When connected to the Ethernet, systems with a Color Control panel can be accessed and settings can be changed.



Color Control panel, showing a PV application



Quattro	48/3000/35-50/50 120V	12/5000/220-100/100 120V 24/5000/120-100/100 120V 48/5000/70-100/100 120V	48/10000/140-100/100 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	2x 50 A	2x 100 A	2x 100 A
INVERTER			
Input voltage range	9,5 – 17 V 19 – 33V 38 – 66 V		
Output (1)	Output voltage: 120 VAC ± 2% Frequency: 60 Hz ± 0,1%		
Cont. output power at 25°C (3)	3000 VA	5000 VA	10000 VA
Cont. output power at 25°C	2400 W	4000 W	8000 W
Cont. output power at 40°C	2200 W	3700 W	6500 W
Cont. output power at 65°C	1700 W	3000 W	4500 W
Peak power	6000 W	10000 W	20000 W
Maximum efficiency	94 %	94 / 94 / 95 %	96 %
Zero load power	25 W	30 / 30 / 35 W	55 W
Zero load power in AES mode	20 W	20 / 25 / 30 W	35 W
Zero load power in Search mode	12 W	10 / 10 / 15 W	20 W
CHARGER			
Charge voltage 'absorption' (V DC)	57,6 V	14,4 / 28,8 / 57,6 V	57,6 V
Charge voltage 'float' (V DC)	55,2 V	13,8 / 27,6 / 55,2 V	55,2 V
Storage mode (V DC)	52,8 V	13,2 / 26,4 / 52,8 V	52,8 V
Charge current house battery (A) (4)	35 A	200 / 120 / 70 A	140 A
Charge current starter battery (A)	4 A (12V and 24V models only)		
Battery temperature sensor	Yes		
GENERAL			
Auxiliary output (5)	32 A	50 A	50 A
Programmable relay (6)	3x		
Protection (2)	a-g		
VE.Bus communication port	For parallel, split phase and three phase operation, remote monitoring and system integration		
General purpose com. port	2x		
Remote on-off	Yes		
Common Characteristics	Operating temp.: -40 to +65°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
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch 362 x 258 x 218 mm	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 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch 572 x 488 x 344 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1		
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	12V and 24V models: ECE R10-5		
Anti-islanding	See our website		

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

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

Computer controlled operation and monitoring
Several interfaces are available:

Color Control GX
Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Blue Smart IP22 charger

Blue Smart IP22
12/30 (3)

Bluetooth Smart

The Blue Smart IP22 Charger is the wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.

High efficiency

With up to 94% efficiency, these chargers generate up to four times less heat when compared to the industry standard. And once the battery is fully charged, power consumption reduces to 0,5 Watt, some five to ten times better than the industry standard.

Adaptive 6-stage charge algorithm: test - bulk – absorption - recondition – float – storage

The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The adaptive feature will automatically optimize the charging process relative to the way the battery is being used.

Storage Mode: less maintenance and aging when the battery is not in use

The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2V/cell (13,2V for a 12V battery) to minimize gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulfation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries

$LiFePO_4$ batteries are charged with a simple bulk – absorption – float algorithm.

NIGHT and LOW setting

When in NIGHT or LOW mode, the output current is reduced to max. 50% of the nominal output and the charger will be totally noiseless. The NIGHT mode automatically ends after 8 hours. The LOW mode can be ended manually.

Protected against overheating

Output current will reduce as temperature increases up to 50°C, but the Blue Smart Charger will not fail.

Eleven LEDs for status indication

Charge algorithm: TEST / BULK / ABSORPTION / RECONDITION / FLOAT / STORAGE / READY.
MODE button to set: NORMAL (14,4V) / HIGH (14,7V) / RECONDITION / LI-ION.

Blue Smart IP22 Charger	12V, 1 output 15 / 20 / 30A	12V, 3 outputs 15 / 20 / 30A	24V, 1 output 8 / 12 / 16A	24V, 3 outputs 16A
Input voltage range	180 – 265 VAC		180 – 265 VAC	
Charge current, normal mode	15 / 20 / 30 A		8/12/16 A	
Charge current, NIGHT or LOW	7,5 / 10 / 15 A		4 / 6 / 8 A	
Efficiency	93%		94%	
No load power consumption	0.5 W		0.5 W	
Frequency	45 – 65 Hz		45 – 65 Hz	
Number of outputs	1	3	1	3
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V		Normal: 28,8V High: 29,4V Li-ion: 28,4V	
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V		Normal: 27,6V High: 27,6V Li-ion: 27,0V	
Charge voltage 'storage'	Normal: 13,2V High: 13,2V Li-ion: 13,5V		Normal: 26,4V High: 26,4V Li-ion: 27,0V	
Charge algorithm	6-stage adaptive			
Can be used as power supply	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to +50°C			
Humidity (non-condensing)	Max 98%			
ENCLOSURE				
Material & Colour	Aluminium (blue RAL 5012)			
Battery connection	Screw terminals 13 mm^2 / AWG6			
230 V AC connection	Cable of 1,5 meter with CEE 7/7 plug, BS 1363 plug (UK) or AS/NZS 3112 plug (AU/NZ)			
Protection category	IP22			
Weight	1,3 kg			
Dimensions (h x w x d)	235 x 108 x 65 mm			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
Automotive	E4-10R		E4-10R	

Blue Smart IP67 Charger 12/25

Bluetooth Smart enabled
The Blue Smart IP67 Charger is the wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.
With Bluetooth, the functionality of the IP67 charger is enhanced and is similar to that of our IP22 and IP65 chargers.

Completely encapsulated: waterproof, shockproof and ignition protected
Water, oil or dirt will not damage the Blue Smart IP67 Charger. The casing is made of cast aluminium and the electronics are moulded in resin.

The highest efficiency ever!
Setting a new industry standard: with 92% efficiency or better, these chargers waste three to four times less heat. And once the battery is fully charged, power consumption reduces to less than a Watt, some five to ten times better than the industry standard.

Adaptive 5-stage charge algorithm: bulk – absorption – recondition – float – storage
The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The 'adaptive' feature will automatically optimise the charging process relative to the way the battery is being used.

Storage Mode: Less maintenance and aging when the battery is not in use
The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries
$LiFePO_4$ batteries are charged with a simple bulk – absorption – float algorithm.

Protected against overheating
Can be used in a hot environment such as a machine room. Output current will reduce as temperature increases up to 60°C, but the charger will not fail.

Two LEDs for status indication
Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off)
Green LED: power on

Blue Smart IP67 Charger	12/7	12/13	12/17	12/25	24/5	24/8	24/12
Input voltage range and frequency	180-265 VAC 45-65 Hz						
Efficiency	93%	93%	95%	95%	94%	96%	96%
No load power consumption	0.5W						
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V				Normal: 28,8V High: 29,4V Li-ion: 28,4V		
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V				Normal: 27,6V High: 27,6V Li-ion: 27,0V		
Charge voltage 'storage'	Normal: 13,2V High: 13,2V Li-ion: 13,5V				Normal: 26,4V High: 26,4V Li-ion: 27,0V		
Charge current, normal mode	7A	13A	17A	25A	5A	8A	12A
Charge current, LOW	2A	4A	6A	10A	2A	3A	4A
Charge algorithm	5-stage adaptive						
Can be used as power supply	yes						
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature						
Operating temp. range	-20 to +60°C (full rated output up to 40°C) Derate 3% per °C above 40°C						
Humidity	Up to 100%						
Start interrupt option (Si)	Short circuit proof, current limit 0,5 A Output voltage: max one volt lower than main output						
ENCLOSURE							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	Black and red cable of 1,5 meter						
230 V AC-connection	Cable of 1,5 meter with CEE 7/7 plug						
Protection category	IP67						
Weight (kg)	1,8	1,8	2,4	2,4	1,8	2,4	2,4
Dimensions (h x w x d in mm)	85 x 211 x 60	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65
STANDARDS							
Safety	EN 60335-1, EN 60335-2-29						
Emission Immunity	EN 55014-1, EN 61000-6-3, EN 61000-3-2						
Automotive Directive	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3						

Blue Smart IP 65 Charger

Blue Smart IP65 Charger	12 V 4/5/7/10/15 A	24 V 5/8 A
Input voltage range	180 - 265 VAC	
Efficiency	94%	95%
Standby power consumption	0,5 W	
Charge voltage 'absorption'	Normal: 14,4 V High: 14,7 V Li-ion: 14,2 V	Normal: 28,8 V High: 29,4 V Li-ion: 28,4 V
Charge voltage 'float'	Normal: 13,8 V High: 13,8 V Li-ion: 13,5 V	Normal: 27,6 V High: 27,6 V Li-ion: 27,0 V
Charge voltage 'storage'	Normal: 13,2 V High: 13,2 V Li-ion: 13,5 V	Normal: 26,4 V High: 26,4 V Li-ion: 27,0 V
Charge current	4 / 5 / 7 / 10 / 15 A	5 / 8 A
Low current mode	2 / 2 / 2 / 3 / 4 A	2 / 3 A
Temperature compensation (lead-acid batteries only)	16 mV/ºC	32 mV/ºC
Can be used as power supply	Yes	
Back current drain	0,7 Ah/month (1 mA)	
Protection	Reverse polarity Output short circuit Over temperature	
Operating temp. range	-30 to +50°C (full rated output up to 30°C) (cables retain flexibility at low temperature)	
Humidity (non-condensing)	Max 95%	
ENCLOSURE		
Battery-connection	Black and red cable of 1,5 meter	
230 V AC-connection	Cable of 1,5 meter with CEE 7/7, BS 1363 plug (UK) or AS/NZS 3112 plug	
Protection category	IP65 (splash and dust proof)	
Weight	0,9 kg	0,9 kg
Dimensions (h x w x d)	IP65s 12V 4/5A : 45 x 81 x 182 mm IP65 12V 7A 24V 5A : 47 x 95 x 190 mm IP65 12V 10/15A 24V 8A : 60 x 105 x 190 mm	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2	
Immunity	EN 55014-2,EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	

victron energy
BLUE POWER

Included

Clamps

M8 eyelets

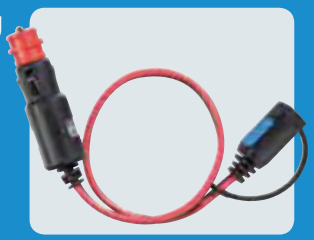
Optional

Fused clamps

Fused M6 or M8 eyelets

Extension cable, 2 m

Autoplug



Battery indicator panel

Battery indicator eyelet M8

Blue Smart Charger

IP65

The professional's choice

Bluetooth SMART

5 Year WARRANTY

- Water, dust and chemical resistant
- Seven step smart charge algorithm
- Recovery of fully discharged 'dead' batteries
- Automatic power supply function
- Severe cold performance: down to -30°C
- Several other battery life enhancing features
- Low power mode to charge smaller batteries
- ***Li-ion*** battery mode
- Setup and configure, readout of voltage and current by ***Bluetooth Smart***

victron energy
BLUE POWER

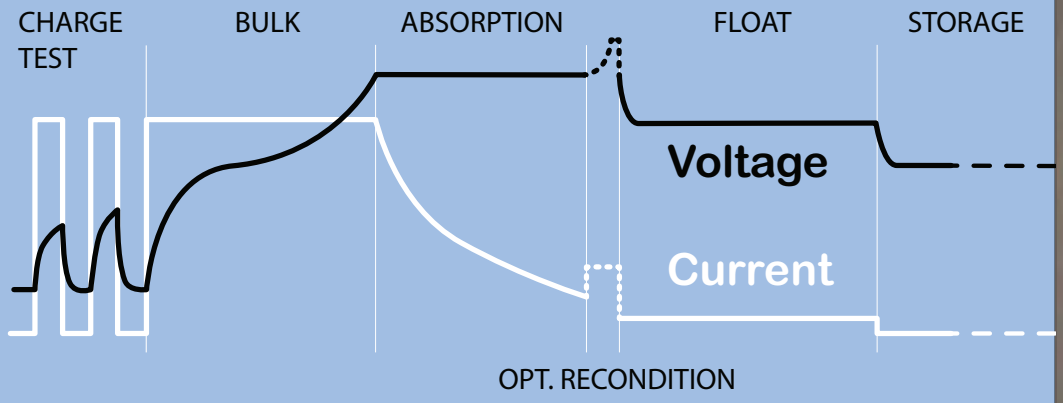
IP65 - Charger **Guide**

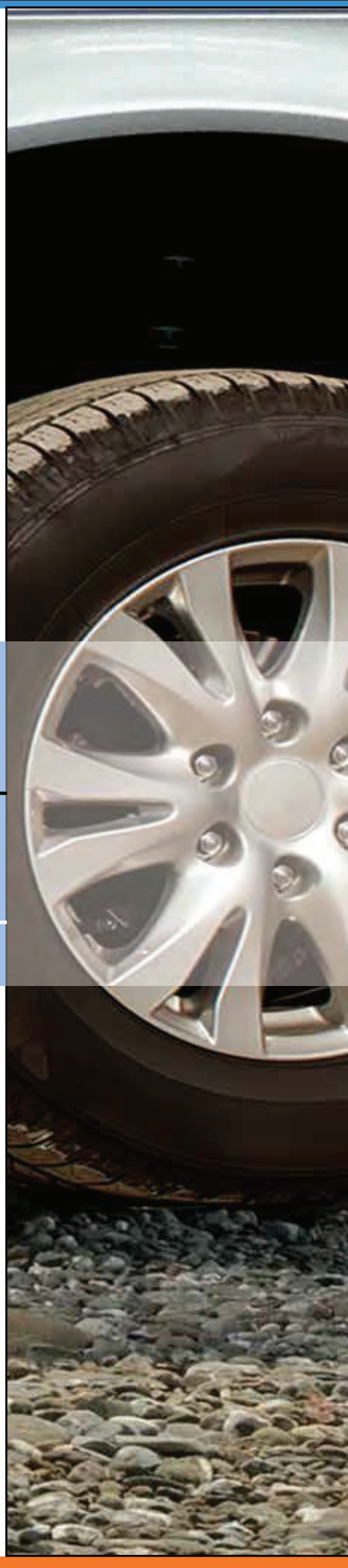
Blue Smart IP65 Charger

	12V				24V	
Battery size Ah	4 & 5 A 20 - 50 Ah	7 A 20 - 70 Ah	10 A 30 - 100 Ah	15 A 50 - 150 Ah	5 A 20 - 50 Ah	8 A 30 - 80 Ah
Your IP65 Charger »	12/4&5	12/7	12/10	12/15	24/5	24/8
	●	●	●	●		
	●	●	●	●		
CLASSIC	●	●	●	●		
MODERN	●	●	●	●		
	●	●	●	●	●	●
					●	●
	●	●	●	●	●	●

● **Recommended**
This is the best charger for this type of battery. The battery will be charged in the most efficient way.

● **OK**
This charger can be used for this battery. It is possible that it takes longer to charge the battery than using a recommended charger.





Reconditioning

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

Recovery function for fully discharged batteries

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

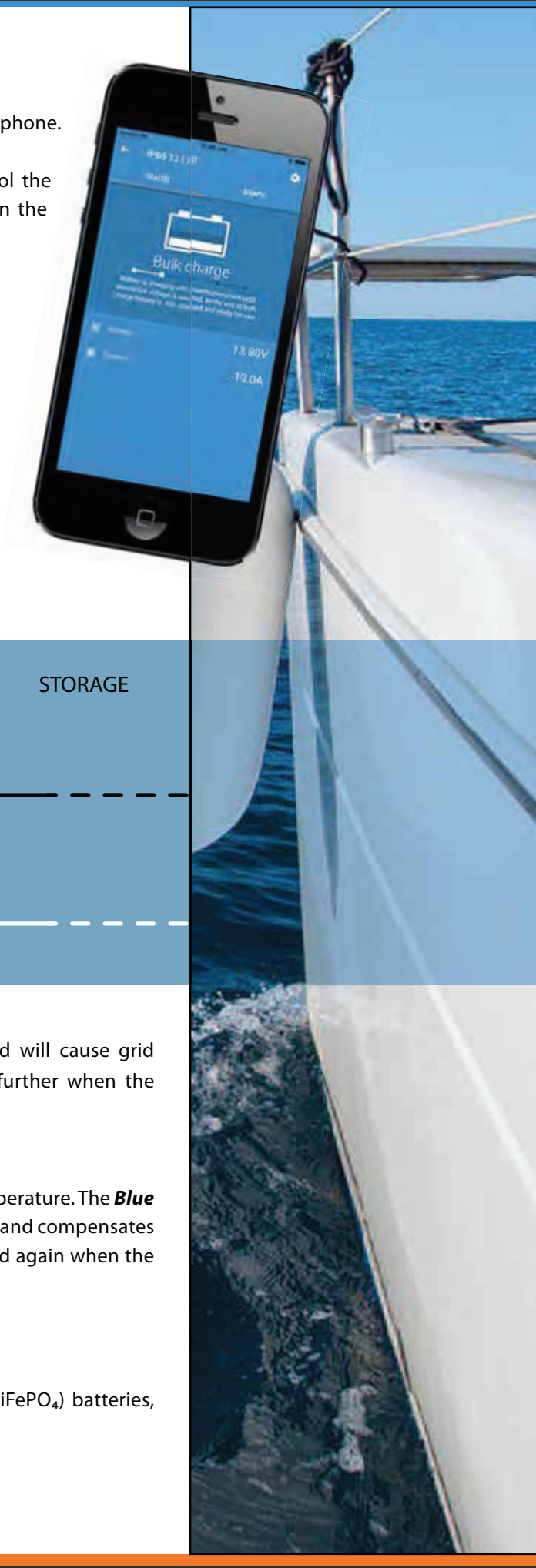
Ultra high efficiency "green" battery charger

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

The VictronConnect app

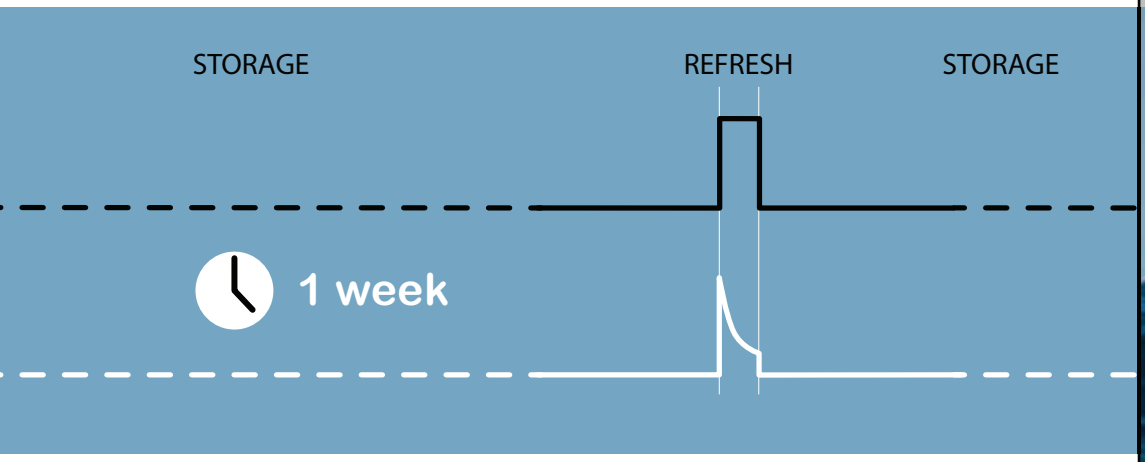
Setup, readout and configure your ***Blue Smart IP65 Charger*** via your smartphone.

You can display the status of your charger and battery and even control the functions of your charger using the VictronConnect app. On your screen the readout of voltage and current is default available.



Durable, safe and silent

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



Storage mode: less corrosion of the positive plates

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

Temperature compensated charging

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

Li-ion battery mode

The ***Blue Smart Charger*** uses a specific charging algorithm for Li-ion ($LiFePO_4$) batteries, with automatic Li-ion under voltage protection reset.

Phoenix Smart charger

Phoenix Smart 12/50(1+1)

Phoenix Smart 12/50(3)

Bluetooth Smart enabled
Any Bluetooth enabled smart phone, tablet or other device can be used to monitor, to change settings and to update the charger when new software features become available.

Phoenix Smart (1+1): two outputs to charge 2 battery banks
The second output, limited to approximately 3A and with a slightly lower output voltage, is intended to top up a starter battery.

Phoenix Smart (3): three full current outputs to charge 3 battery banks
All outputs can supply the full rated output current.

Automatic voltage compensation
The charger compensates for voltage drop over the DC cabling by slightly increasing output voltage when the DC current increases. Please see the manual for details.

Adaptive 5-stage charge algorithm: bulk – absorption – recondition – float – storage
The Phoenix Smart Charger features our well-known 'adaptive' battery management system that can be preset to suit different types of batteries. The 'adaptive' feature will automatically optimise the charge process relative to the way the battery is being used.

The right amount of charge: variable absorption time
When only shallow discharges occur (a yacht connected to shore power for example) the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery will be fully charged.

Preventing damage due to excessive gassing: the BatterySafe mode (see fig. 2)
If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the charger will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached (see the charge curve between 14,4 V and 15,0 V in fig. 2).

Less maintenance and aging when the battery is not in use: the Storage mode (see fig. 1 & 2)
The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries
Charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-ion BMS to the remote on-off port.
Alternatively full control of voltage and current can be achieved with Bluetooth.

Fully programmable charge algorithm
The charge algorithm can be programmed with help of Bluetooth or the VE.Direct interface.
Three preprogrammed algorithms can be selected with the mode button (see specifications).

Remote on-off
Remote on-off can be implemented with a switch, a relay or with an open collector optocoupler signal. See manual for details.

VE.Direct interface
For a wired data connection to a Color Control panel, PC or other devices.
Please see the VictronConnect app under Downloads / Software on our website.

Programmable relay
Can be programmed using the VE.Direct interface or a Bluetooth enabled device to trip on an alarm or other events.

Learn more about batteries and battery charging
For more information about adaptive charging please look under Downloads / White papers on our website.

Phoenix Smart Charger	12V, 2 outputs 12/30(1+1) 12/50(1+1)	12V, 3 outputs 12/30(3) 12/50(3)	24V, 2 outputs 24/16(1+1) 24/25(1+1)	24V, 3 outputs 24/16(3) 24/25(3)
Input voltage	230 VAC (range: 200 – 250 V)			
DC input voltage range	250 – 375 VDC			
Frequency	45-65 Hz			
Power factor	0,7			
Back current drain	< 4 mA			
No load power consumption	1 W			
Efficiency	12/30: 95% 12/50: 93%	12/30: 95% 12/50: 93%	94%	94%
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V		Normal: 28,8V High: 29,4V Li-ion: 28,4V	
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V		Normal: 27,6V High: 27,6V Li-ion: 27,0V	
Storage mode	Normal: 13,2V High: 13,2V Li-ion: 13,5V		Normal: 26,4V High: 26,4V Li-ion: 27,0V	
Fully programmable	Yes, with Bluetooth and/or VE.Direct			
Charge current house battery	30 / 50 A	30 / 50 A	16 / 25 A	16 / 25 A
Charge current starter battery	3 A (1+1 output models only)			
Charge algorithm	5 stage adaptive			
Protection	Battery reverse polarity (fuse, not user accessible) / Output short circuit / Over temperature			
Can be used as power supply	Yes, output voltage can be set with Bluetooth and/or VE.Direct			
Voltage and temperature sense	Smart Battery Sense (optional)			
Operating temp. range	-20 to 60°C (0 - 140°F) Rated output current up to 40°C, derate linearly to 20% at 60°C			
Humidity (non-condensing)	max 95%			
Relay (programmable)	DC rating: 5A up to 28VDC			
Parallel operation	Yes (parallel redundant ready, via Bluetooth)			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	Screw terminals 16 mm² (AWG6)			
AC-connection	IEC 320 C14 inlet with retainer clip (AC cord with country specific plug must be ordered separately)			
Protection category	IP43 (electronic components), IP22 (connection area)			
Weight kg (lbs)	3,5 kg			
Dimensions (hxwxd)	180 x 249 x 100 mm (7.1 x 9.8 x 4.0 inch)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
Automotive Directive	E5-10R			
Vibration	IEC68-2-6:10-150Hz/1.0G			

Retainer clip
(included)

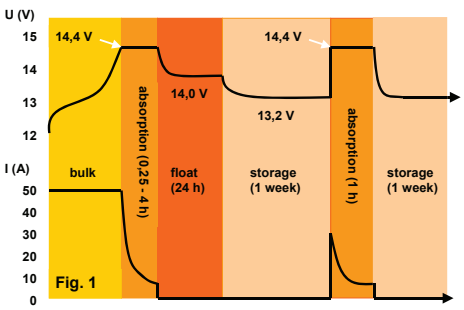
AC cord
(must be ordered separately)

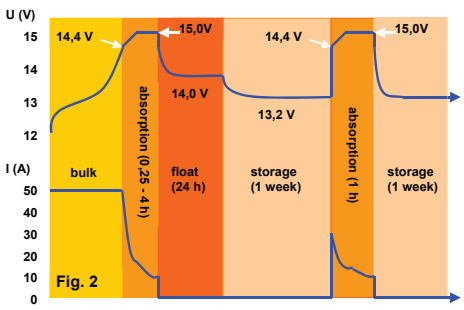
Plug options:
Europe: CEE 7/7
UK: BS 1363
Australia/New Zealand: AS/NZS 3112

Smart Battery Sense
(must be ordered separately)

For voltage and temperature compensation

Charge curves: up to the gassing voltage (fig.1), and exceeding the gassing voltage (fig.2)





Centaur charger 12/24V

Centaur
Battery Charger 24 30

Quality without compromise

Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

Universal 90-265V AC input voltage range and also suitable for DC supply (AC-DC and DC-DC operation)

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 also accept a 90-400 V DC supply.

Three outputs that each can supply the full output current

Three isolated outputs to simultaneously charge 3 battery banks
Each output is capable to supply the full rated current.

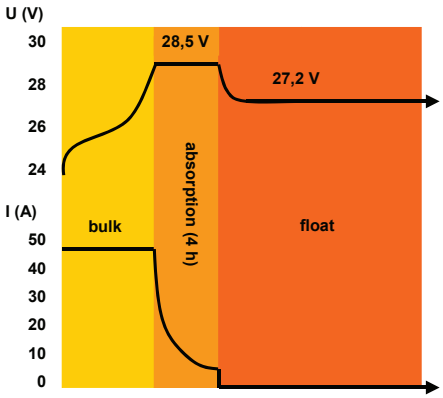
Three-stage charging, with temperature compensation

The Centaur charges at bulk rate until the output has reduced to 70% of the rated Amps, at which a 4 hour timer begins. After the timed period the charger switches to float rate.
An internal temperature sensor is used to compensate the charge voltage with – 2 mV/ºC (– 1 mV/ºF) per cell.
A DIP switch is available to select the optimum charge/float voltages for Flooded Lead-acid, Gel or AGM batteries.

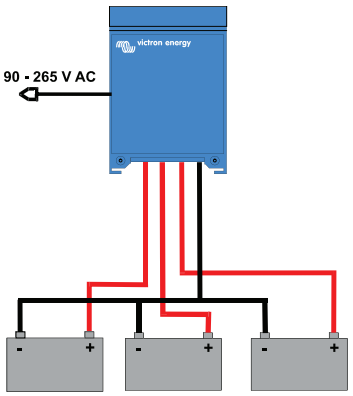
Learn more about batteries and battery charging

To learn more about batteries and charging batteries (including the pro's and cons of multi-bank charging and intelligent charging), please refer to our book 'Electricity on Board'.

Charge curve



Application example



Centaur Charger	12/20	12/30 24/16	12/40	12/50	12/60 24/30	12/80 24/40	12/100 24/60
Input voltage (V AC)	90 – 265						
Input voltage (V DC)	90 – 400						
Input frequency (Hz)	45 – 65						
Power factor	1						
Charge voltage 'absorption' (V DC)	14,3 / 28,5 (1)						
Charge voltage 'float' (V DC)	13,5 / 27,0 (1)						
Output banks	3						
Charge current (A) (2)	20	30 / 16	40	50	60 / 30	80 / 40	100 / 60
Total output ammeter	Yes						
Charge characteristic	IUoU (Three stage charging)						
Recommended battery capacity (Ah)	80 - 200	120 - 300 45 - 150	160 - 400	200 - 500	240 - 600 120 - 300	320 - 800 160 - 400	400 - 1000 240 - 600
Temperature sensor	Internal, - 2mV / °C (- 1mV / °F) per cell						
Forced cooling	Yes, temperature and current controlled fan						
Protection	Output short circuit, over temperature						
Operating temp. range	- 20 to 60°C (0 - 140°F)						
Ignition protected	Yes						
Humidity (non condensing)	max 95%						
ENCLOSURE							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	M6 studs	M6 studs	M8 studs	M8 studs	M8 studs	M8 studs	M8 studs
AC-connection	screw-clamp 4 mm² (AWG 6)						
Protection category	IP 20						
Weight kg (lbs)	3,8 (8.4)	3,8 (8.4)	5 (11)	5 (11)	5 (11)	12 (26)	12 (26)
Dimensions hxwxd in mm (hxwxd in inches)	355x215x110 (14.0x8.5x4.3)	355x215x110 (14.0x8.5x4.3)	426x239x135 (16.8x9.4x5.3)	426x239x135 (16.8x9.4x5.3)	426x239x135 (16.8x9.4x5.3)	505x255x130 (19.9x10.0x5.2)	505x255x130 (19.9x10.0x5.2)
STANDARDS							
Safety	EN 60335-1, EN 60335-2-29, UL 1236						
Emission Immunity	EN 55014-1, EN 61000-3-2						
Automotive Directive	EN 55014-2, EN 61000-3-3						

1) Standard setting. Optimum charge/float voltages for Flooded Lead-acid, Gel-Cell or AGM batteries selectable by DIP switch.
2) Up to 40°C (100°F) ambient. Output will reduce to approximately 80% of nominal at 50°C (120°F) and 60% of nominal at 60°C (140°F).

BMV-700 Battery Monitor

The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Battery Alarm

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

Installation made easy

1. Fasten the separate mounting plate (A) to the wall where you want to place the battery charger, and simply hook up the Centaur.
2. Secure the bottom of the backside (B) to the wall.

Phoenix battery charger 12/24V

Phoenix Charger
12 V 30 A

Phoenix Charger
24 V 25 A

Adaptive 4-stage charge characteristic: bulk – absorption – float – storage

The Phoenix Charger features a microprocessor controlled 'adaptive' battery management system that can be preset to suit different types of batteries. The 'adaptive' feature will automatically optimise the process relative to the way the battery is being used.

The right amount of charge: variable absorption time

When only shallow discharges occur (a yacht connected to shore power for example) the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.

Preventing damage due to excessive gassing: the BatterySafe mode (see fig. 2 below)

If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the Phoenix Charger will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached (see the charge curve between 14,4 V and 15,0 V in fig. 2 below).

Less maintenance and aging when the battery is not in use: the Storage mode (see fig. 1 & 2 below)

The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for 12 V battery) to minimize gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

To increase battery life: temperature compensation

Every Phoenix 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 and/or when important fluctuations of battery temperature are expected.

Battery voltage sense

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

Universal 90-265 V AC input voltage range and also suitable for DC supply (AC-DC and DC-DC operation)

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

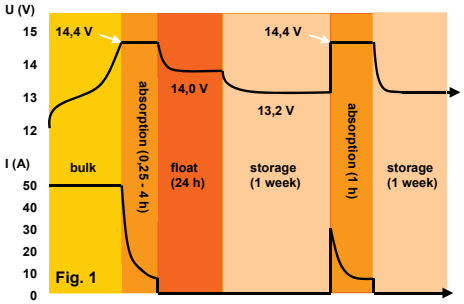
Computer interface

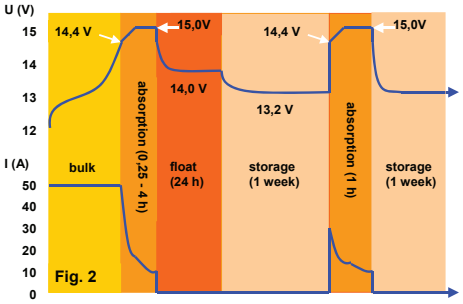
Every Phoenix Charger is ready to communicate with a computer through its RS-485 data port. Together with our VEConfigure software, which can be downloaded free of charge from our website and the data link MK2-USB (see accessories), all parameters of the chargers can be customised.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'. For more information about adaptive charging please look under Technical Information on our website.

Charge curves: up to the gassing voltage (fig.1), and exceeding the gassing voltage (fig.2)





Phoenix Charger	12/30	12/50	24/16	24/25
Input voltage range (V AC)	90-265			
Input voltage range (V DC)	90-400			
Frequency (Hz)	45-65			
Power factor	1			
Charge voltage 'absorption' (V DC)	14,4	14,4	28,8	28,8
Charge voltage 'float' (V DC)	13,8	13,8	27,6	27,6
Storage mode (V DC)	13,2	13,2	26,4	26,4
Charge current house batt. (A) (2)	30	50	16	25
Charge current starter batt. (A)	4	4	4	4
Charge characteristic	4 stage adaptive			
Battery capacity (Ah)	100-400	200-800	100-200	100-400
Temperature sensor	√	√	√	√
Can be used as power supply	√	√	√	√
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	M6 studs			
AC-connection	screw-clamp 4 mm² (AWG 11)			
Protection category	IP 21			
Weight kg (lbs)	3,8 (8)			
Dimensions (hxwxd in mm and inches)	350x200x108 mm (13.8x7.9x4.3 inch)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission Immunity	EN 55014-1, EN 61000-3-2,			
Automotive Directive	EN 55014-2, EN 61000-3-3			
Vibration	IEC68-2-6:10-150Hz/1.0G			

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

Battery Alarm
An excessively high or low battery voltage is indicated by an audible and visual alarm, and potential free contacts.

Phoenix Charger Control
The PCC panel provides remote control and monitoring of the charge process with LED indication of the charger status. In addition, the remote panel also offers output current adjustment that can be used to limit the output current and thus the power drawn from the AC supply. This is particularly useful when operating the charger from limited shore power or small gensets. The panel can also be used to change the battery charging parameters.
The brightness of the LEDs is automatically reduced during night time. Connection to the charger is with a standard UTP–cable.

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Skylla-i battery charger 24V

Li-Ion ready

Skylla-i 24/100 (3)

Skylla-i 24/100 (1+1)

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

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

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

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

Rugged

Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

Flexible

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

Important features:

Synchronised parallel operation

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

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

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

Preventing damage due to excessive gassing: the BatterySafe mode

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

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

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

To increase battery life: temperature compensation

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

Battery voltage sense

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

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

The chargers also accept a DC supply.

Use as a power supply

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

Li-Ion (LiFePO4) ready

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

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'.

Skylla-i	24/80 (1+1)	24/80 (3)	24/100 (1+1)	24/100 (3)
Input voltage (VAC)	230V			
Input voltage range (VAC)	185-265V			
Input voltage range (VDC)	180-350V			
Maximum AC input current @ 180 VAC	16A		20A	
Frequency (Hz)	45-65Hz			
Power factor	0,98			
Charge voltage 'absorption' (VDC) (1)	28,8V			
Charge voltage 'float' (VDC)	27,6V			
Charge voltage 'storage' (VDC)	26,4V			
Charge current (A) (2)	80A	3 x 80A (max total output: 80A)	100A	3 x 100A (max total output: 100A)
Charge current starter batt. (A)	4A	n. a.	4	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity (Ah)	400-800Ah		500-1000Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
CAN bus communication port (VE.Can)	Two RJ45 connectors, NMEA2000 protocol, galvanically isolated			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST AC rating: 240VAC/4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Forced cooling	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	M8 bolts			
230 VAC-connection	screw-clamp 10mm² (AWG 7)			
Protection category	IP 21			
Weight kg (lbs)	7kg (16 lbs)			
Dimensions hxwxd in mm (hxwxd in inches)	405 x 250 x 150 (16.0 x 9.9 x 5.9)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			

1) Output voltage range 20-36V. Can be set with rotary switch or potentiometers.

2) Up to 40°C (100°F) ambient. Output will reduce to 80% at 50°C, and to 60% at 60°C.

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current.
The software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery.
The BMV-700 selectively displays battery voltage, battery current, consumed Ah or time to go.

Skylla-i Control

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

Skylla TG charger 24/48V 230V

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 (24V models only)

The TG Chargers feature 2 isolated outputs. The second output, limited to approximately 4A 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.

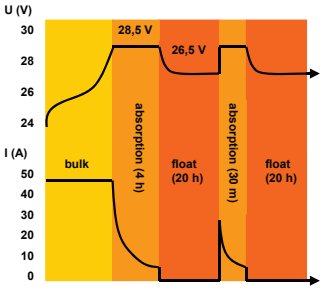
Battery voltage sense

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.

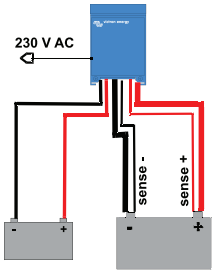
Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'.

Charge curve



Application example

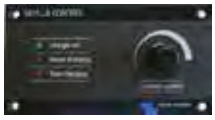


Skylla	24/30 TG 24/50 TG	24/50 TG 3 phase	24/80 TG	24/100 TG	24/100 TG 3 phase	48/25 TG	48/50 TG
Input voltage (V AC)	230	3 x 400	230	230	3 x 400	230	230
Input voltage range (V AC)	185-264	320-450	185-264	185-264	320-450	185-264	185-264
Input voltage range (V DC)	180-400	n. a.	180-400	180-400	n. a.	180-400	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	-40 to +50°C (-40 - 122°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

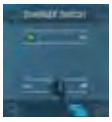
BMV-700 Battery Monitor

The BMV-700 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-700 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 charger 24V universal input and GL approval

Skylla Charger
24 V 50 A

Universal 90-265 V 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 90-400 V 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 185-265 V 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

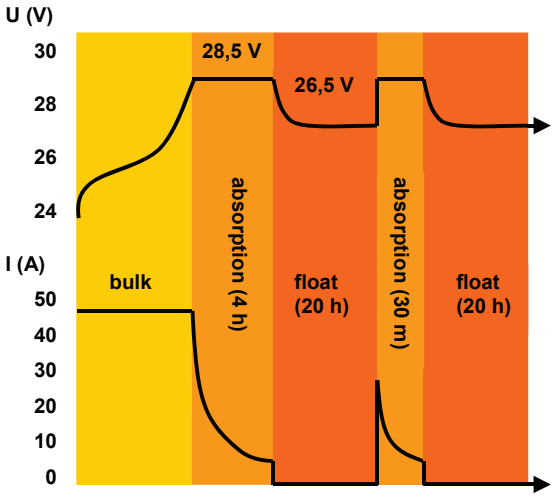
Other Skylla Chargers

- Standard 185-265 V 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'.

Charge curve



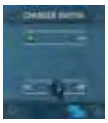
Skylla-TG	24/30 90-265 VAC	24/50 90-265 VAC	24/100-G 90-265 VAC
Input voltage (V AC)	230	230	230
Input voltage range (V AC)	90-265	90-265	90-265
Input voltage range (V DC)	90-400	90-400	90-400
Frequency (Hz)	45-65 Hz or DC		
Power factor	1		
Charge voltage 'absorption' (V DC)	28,5	28,5	28,5
Charge voltage 'float' (V DC)	26,5	26,5	26,5
Charge current house batt. (A) (2)	30 (limited to 22 A at 110V AC)	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	-40 to +%0°C (-40 - 122°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 mm^2 (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-700 Battery Monitor
The BMV-700 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-700 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.

Orion-Tr DC-DC converters isolated: 100 / 250 / 400 Watt

Orion-Tr 24/12-20 (240W)

Orion-Tr 24/12-20 (240W)

Remote on-off
The remote on-off eliminates the need for a high current switch in the input wiring. The remote on-off can be operated with a low power switch or by for example the engine run/stop switch (see manual).

Adjustable output voltage: can also be used as a battery charger
For example to charge a 12 Volt starter or accessory battery in an otherwise 24V system.

All models are short circuit proof and can be paralleled to increase output current
An unlimited number of units can be connected in parallel.

High temperature protected
The output current will reduce at high ambient temperature.

IP43 protection
When installed with the screw terminals oriented downwards.

Screw terminals
No special tools needed for installation.

Input fuse (not replaceable)
On 12V and 24V input models only.

Isolated converters 110 – 120W	Orion-Tr 12/12-9 (110W)	Orion-Tr 12/24-5 (120W)	Orion-Tr 24/12-9 (110W)	Orion-Tr 24/24-5 (120W)	Orion-Tr 24/48-2,5 (120W)	Orion-Tr 48/12-9 (110W)	Orion-Tr 48/24-5 (120W)	Orion-Tr 48/48-2,5 (120W)
Input voltage range	8-17V	8-17V	16-35V	16-35V	16-35V	32-70V	32-70V	32-70V
Under voltage shut down	7V	7V	14V	14V	14V	28V	28V	28V
Under voltage restart	7,5V	7,5V	15V	15V	15V	30V	30V	30V
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
Output voltage tolerance	+/- 0,2V							
Output noise	2mV rms							
Cont. output current at nominal output voltage and 25°C	9A	5A	9A	5A	2,5A	9A	5A	2,5A
Maximum output current (10 s) at nominal output voltage	12,5A	6,3A	12,5A	6,3A	3,0A	12,5A	6,3A	3,0A
Short circuit output current	32A	23A	39A	30A	19A	27A	25A	17A
Cont. output power at 25°C	110W	120W	110W	120W	120W	110W	120W	120W
Cont. output power at 40°C	85W	110W	85W	115W	115W	85W	100W	85W
Efficiency	87%	88%	85%	87%	88%	87%	86%	89%
Off load current	< 50mA	< 80mA	< 40mA	< 60 mA	< 120mA	< 50mA	< 60mA	< 80mA
Galvanic isolation	200V dc between input, output and case							
Operating temperature range	-20 to +55°C (derate 3% per °C above 40°C)							
Humidity	Max. 95% non-condensing							
DC connection	Screw terminals							
Maximum cable cross-section	6 mm² AWG10							
Weight	0,42 kg (1 lb)							
Dimensions hxwxd	100 x 113 x 47 mm (4.0 x 4.5 x 1.9 inch)							
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5							

Isolated converters 220 - 280 Watt	Orion-Tr 12/12-18 (220W)	Orion-Tr 12/24-10 (240W)	Orion-Tr 24/12-20 (240W)	Orion-Tr 24/24-12 (280W)	Orion-Tr 24/48-6 (280W)	Orion-Tr 48/12-20 (240W)	Orion-Tr 48/24-12 (280W)	Orion-Tr 48/48-6 (280W)
Input voltage range	8-17V	8-17V	16-35V	16-35V	16-35V	32-70V	32-70V	32-70V
Under voltage shut down	7V	7V	14V	14V	14V	28V	28V	28V
Under voltage restart	7,5V	7,5V	15V	15V	15V	30V	30V	30V
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
Output voltage tolerance	+/- 0,2V							
Output noise	2mV rms							
Cont. output current at nominal output voltage and 40°C	18A	10A	20A	12A	6A	20A	12A	6A
Maximum output current (10 s) at nominal output voltage	25A	15A	25A	15A	8A	25A	15A	8A
Short circuit output current	40A	25A	50A	30A	25A	50A	30A	25A
Cont. output power at 25°C	280W	280W	300W	320W	320W	280W	320W	320W
Cont. output power at 40°C	220W	240W	240W	280W	280W	240W	280W	280W
Efficiency	87%	88%	88%	89%	89%	87%	89%	89%
Off load current	< 80mA	< 100mA	< 100mA	< 80mA	< 120 mA	< 80mA	< 80mA	< 80mA
Galvanic isolation	200V dc between input, output and case							
Operating temperature range	-20 to +55°C (derate 3% per °C above 40°C)							
Humidity	Max. 95% non-condensing							
DC connection	Screw terminals							
Maximum cable cross-section	16 mm² AWG6							
Weight	1,3 kg (3 lb)							
Dimensions hxwxd	130 x 186 x 70 mm (5.1 x 7.3 x 2.8 inch)							
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5							

Isolated converters 360 - 400 Watt	Orion-Tr 12/12-30 (360W)	Orion-Tr 12/24-15 (360W)	Orion-Tr 24/12-30 (360W)	Orion-Tr 24/24-17 (400W)	Orion-Tr 24/48-8,5 (400W)	Orion-Tr 48/12-30 (360W)	Orion-Tr 48/24-16 (380W)	Orion-Tr 48/48-8 (380W)
Input voltage range	10-17V	10-17V	20-35V	20-35V	20-35V	40-70V	40-70V	40-70V
Under voltage shut down	7V	7V	14V	14V	14V	28V	28V	28V
Under voltage restart	7,5V	7,5V	15V	15V	15V	30V	30V	30V
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
Output voltage tolerance	+/- 0,2V							
Output noise	2mV rms							
Cont. output current at nominal output voltage and 40°C	30A	15A	30A	17A	8,5A	30A	16A	8A
Maximum output current (10 s) at nominal output voltage minus 20%	40A	25A	45A	25A	15A	40A	25A	15A
Short circuit output current	60A	40A	60A	40A	25A	60A	40A	25A
Cont. output power at 25°C	430W	430W	430W	480W	480W	430W	430W	430W
Cont. output power at 40°C	360W	360W	360W	400W	400W	360W	380W	380W
Efficiency	87%	88%	88%	89%	89%	87%	89%	89%
Off load current	< 80mA	< 100mA	< 100mA	< 80mA	< 120 mA	< 80mA	< 80mA	< 80mA
Galvanic isolation	200V dc between input, output and case							
Operating temperature range	-20 to +55°C (derate 3% per °C above 40°C)							
Humidity	Max. 95% non-condensing							
DC connection	Screw terminals							
Maximum cable cross-section	16 mm² (AWG6)							
Weight	12V input and/or 12V output models: 1,8 kg (3 lb) Other models: 1,6 kg (3.5 lb)							
Dimensions hxwxd	12V input and/or 12V output models: 130 x 186 x 80 mm (5.1 x 7.3 x 3.2 inch) Other models: 130 x 186 x 70 mm (5.1 x 7.3 x 2.8 inch)							
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5							

Orion-Tr DC-DC converters, low power

High efficiency
Using synchronous rectification, full load efficiency exceeds 95%.

IP43 protection
When installed with the screw terminals oriented downwards.

Screw terminals
No special tools needed for installation.

Orion-Tr 24/12-5 (60W)

Orion-Tr 24/12-10 (120W)

Non isolated converters	Orion-Tr 24/12-5	Orion-Tr 24/12-10	Orion-Tr 24/12-15	Orion-Tr 24/12-20
Input voltage range	18-35V	18-35V	18-35V	18-35V
Output voltage	12.7V	12.5V	12.5V	12.5V
Efficiency	95%	97%	97%	97%
Continuous output current	5A	10A	15A	20A
Max. Output current	7A	12A	20A	25A
Galvanic isolation	no	no	no	no
Off load current	< 20mA	< 45mA	< 35mA	< 35mA
Operating temperature range (derate 3% per °C above 40°C)	-20 to +55°C			
DC connection	Screw terminals			
Maximum cable cross-section	3,3 mm² AWG12	6 mm² AWG10	6 mm² AWG10	6 mm² AWG10
Weight kg (lbs)	0,09 (0.20)	0,2 (0.44)	0,25 (0.55)	0,25 (0.55)
Dimensions hxwxd in mm (hxwxd in inches)	53x51x27 (2.1x2x1.1)	73x94x37 (2.9x3.7x1.5)	73x94x45 (2.9x3.7x1.8)	73x94x45 (2.9x3.7x1.8)
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-4			

Orion 24/12-25

Orion 24/12-40

Remote on-off connector
The remote on-off eliminates the need for a high current switch in the input wiring. The remote on-off can be operated with a low power switch or by the engine run/stop switch (see manual).

All models with adjustable output can also be used as a battery charger
For example to charge a 12 Volt starter or accessory battery in an otherwise 24V system.

All models with adjustable output can be paralleled to increase output current
Up to five units can be connected in parallel.

The Orion 12/27,6-12: a 24V battery charger (see page 2)
To charge a 24V battery from a 12V system.
The output voltage of this model can be adjusted with a potentiometer

A super wide input range buck-boost regulator: the Orion 7-35/12-3 (see page 2)
The Orion 7-35/12-3 is an isolated converter with a very wide input range, suitable for both 12V and 24V systems, and a fixed 12,6V output.

Easy to install
Delivery includes four Insulated Fastons Female Crimp 6.3mm (eight Fastons in case of the Orion 24/12-40).

Low power models: please see Orion-Tr series

Orion 24/12-70

Orion 24/12-70 with binding posts

Non isolated converters	Orion 24/12-25	Orion 24/12-40	Orion 24/12-70	Orion 12/24-8	Orion 12/24-10	Orion 12/24-20
Input voltage range (V)	18-35	18-35	18-35	9-18	9-18	9-18
Under voltage shutdown (V)	14	14	14	8	8	8
Under voltage restart (V)	18	18	18	10	10	10
Output voltage adjustable with potentiometer	yes	no	yes	no	yes	yes
Output voltage (V)	Adjustable 10–15V F set 13,2V	13,2	Adjustable 10–15V F set 13,2V	24	Adjustable 20-30V F set 26,4V	Adjustable 20-30V F set 26,4V
Efficiency (%)	96	95	92	95	95	93
Suitable to buffer-charge a battery	yes	no	yes	no	yes	yes
Can be connected in parallel	yes	no	yes	no	yes	yes
Continuous output current (A)	25	40	70	8	10	20
Max. Output current (A)	35	55	85	20	20	30
Fan assisted cooling (temp. controlled)	no	yes	yes	no	no	yes
Galvanic isolation	no	no	no	no	no	no
Off load current	< 15mA	< 20mA	< 20mA	< 10mA	< 15mA	< 30mA
Remote on-off	yes	yes	yes	no	no	yes
Operating temperature range (derate 3% per °C above 40°C)	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C
DC connection	Faston tabs 6.3 mm	Double Faston tabs 6.3 mm	M6 bolts	Faston tabs 6.3 mm	Faston tabs 6.3 mm	M6 bolts
Weight kg (lbs)	0,7 (1.55)	0,85 (1.9)	0,9 (2.0)	0,4 (0.8)	0,4 (0.9)	0,9 (2.0)
Dimensions hxwxd in mm (hxwxd in inches)	65x88x160 (2.6x3.5x6.3)	65x88x185 (2.6x3.5x7.3)	65x88x195 (2.6x3.5x7.7)	45x90x115 (1.8x3.5x4.5)	45x90x125 (1.8x3.5x4,5)	65x88x195 (2.6x3.5x7.7)
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-4					

Orion IP67 24/12 DC-DC converter

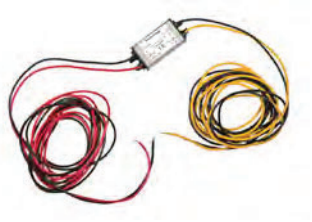
Orion IP67 24/12-10
Orion IP67 24/12-20

Completely encapsulated: waterproof, shockproof and ignition protected
Water, oil or dirt will not damage the Orion IP67 DC-DC Converter. The casing is made of cast aluminium and the electronics are moulded in resin.

Extra-long input and output cables
Thanks to the cables of 1.8 meters in length, intermediate cable interconnections to increase length even more will in most cases not be needed. This is an important reliability increasing feature in an area were IP67 protection grade is needed.

Wide input voltage range
With 15 to 40 Volts input range, a stable output is ensured during surges or sags due to other equipment connected to same battery.

Protected against overheating
It can be used in a hot environment such as a machine room.



Orion IP67 24/12-5
with 1,8 m cables

Orion IP67	24/12-5	24/12-10	24/12-20
Input voltage range	15-40VDC		
Under voltage shutdown	13V		
Under voltage restart	14V		
No load current at 24V	1mA	20mA	50mA
DC output voltage	12V +/- 3%	12V +/- 3%	12V +/- 3%
Maximum continuous output current	5A	10A	20A
Efficiency	93%	93%	95%
Ripple & Noise	75mV pp		
Operating temperature range (derate 3% per °C above 40°C)	-20 to +70°C (full rated output up to 40°C)		
Overload protection	Hiccup mode, recovers automatically after fault condition is removed		
Short circuit proof	Yes		
Protection against reverse polarity connection	With external fuse or circuit breaker (not included)		
ENCLOSURE			
Material & Colour	Aluminium (blue RAL 5012)		
Protection category	IP67		
DC connection	Two input and two output cables, length 1,8m		
Cable cross section, input	0,8mm² (18 AWG)	1,5mm² (15 AWG)	2,6mm² (13 AWG)
Cable cross section, output	0,8mm² (18 AWG)	1,5mm² (15 AWG)	2,6mm² (13 AWG)
Weight (kg)	50 g	300 g	300 g
Dimensions (h x w x d in mm)	25 x 43 x 20	74 x 74 x 32	74 x 74 x 32
STANDARDS			
Safety	EN 60950		
Emission	EN 61000-6-3, EN 55014-1		
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2		
Automotive Directive	ECE R10-4		
Vibration	IEC 68-2-6: 10-150 Hz / 1.0 G		

Dutch firetruck equipped with Victron Energy.

Color Control GX

Color Control GX

The Color Control (CCGX) provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VRM Online Portal

Besides monitoring and controlling products locally on the CCGX itself, all readings are also forwarded to our free remote monitoring website: the VRM Online Portal.

Remote Console on VRM

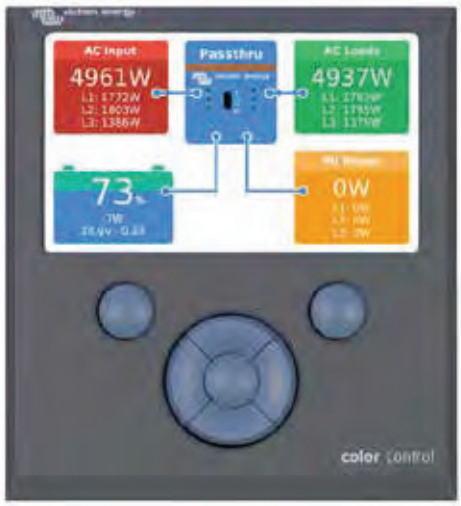
Monitor, control and configure the CCGX remotely, over the internet. Just like standing in front of the device, everything can also be done remotely. The same functionality is also available on the local network, Remote Console on LAN.

Automatic genset start/stop

A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System

The CCGX is the Energy Manager in an ESS system. More information in the ESS manual:



Data logging

When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the CCGX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port. When multiple BlueSolar MPPTs with VE.Can are used in parallel, the all information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the CCGX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the CCGX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. Location and speed will be visible on the display, and the data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

Internet connection

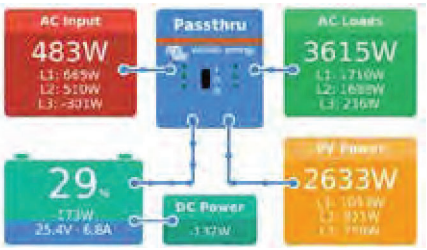
The CCGX can be connected to internet with an Ethernet cable and via Wi-Fi. To connect via Wi-Fi, a Wi-Fi USB accessory is required. The CCGX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Other highlights

- The CCGX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the CCGX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

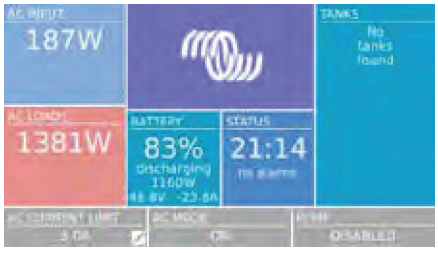
Color Control GX			
Power supply voltage range	9 – 70V DC		
Current draw	12V DC	24V DC	48V DC
Display off	140mA	80mA	40mA
Display at minimum intensity	160mA	90mA	45mA
Display at maximum intensity	245mA	125mA	65mA
Potential free contact	3A / 30V DC / 250V AC (Normally open)		
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Color Control GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	130 x 120 x 28mm		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	E4-10R-053535		

Overview - Multi with PV Inverter on output

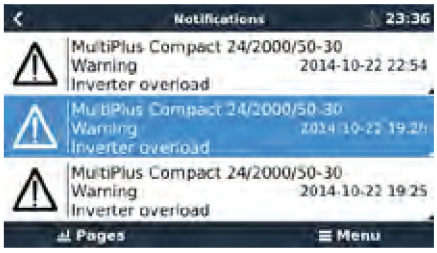


Main menu

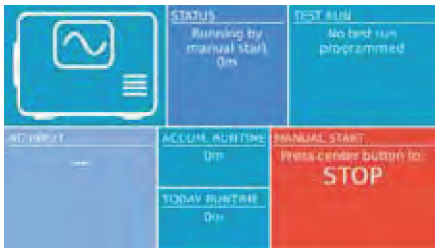
Mobile & boat overview



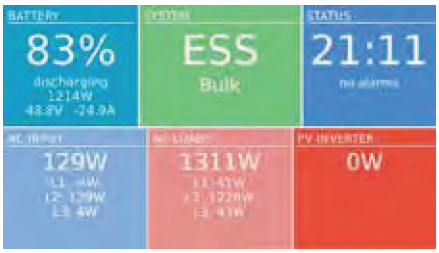
Alarm notifications



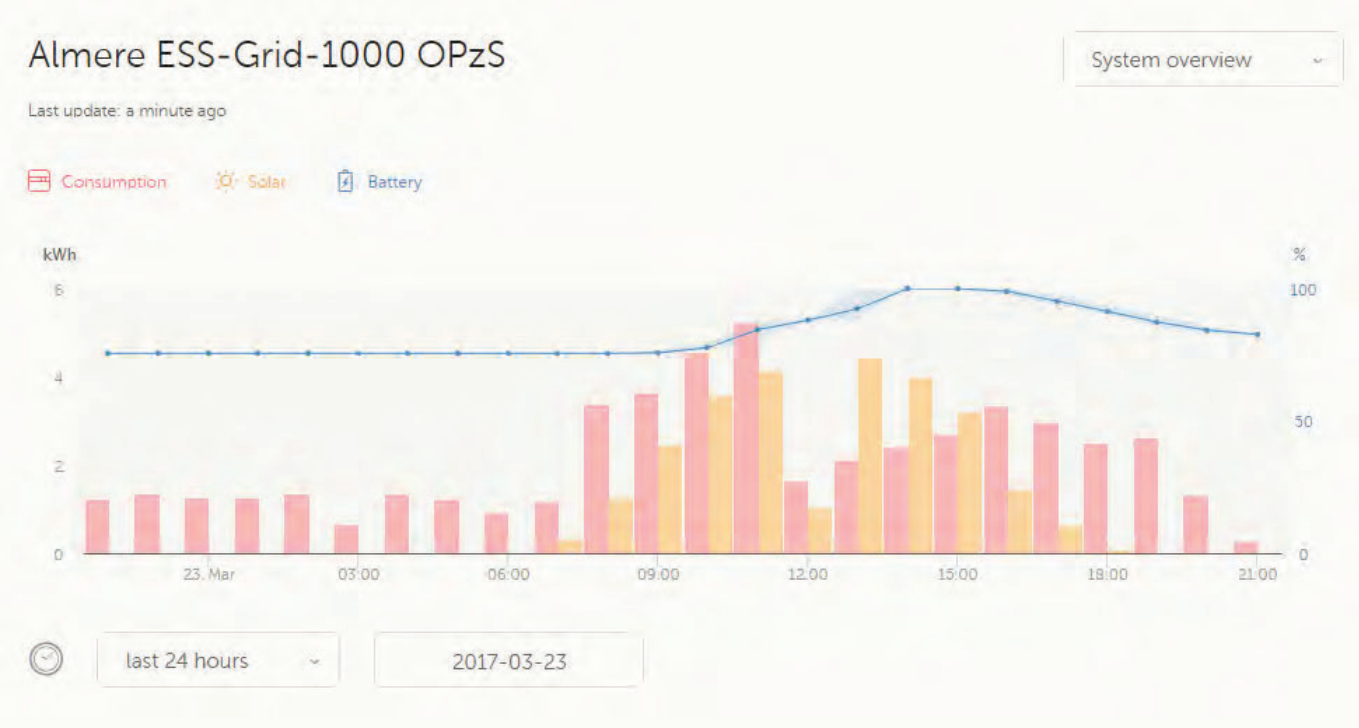
Genset control page



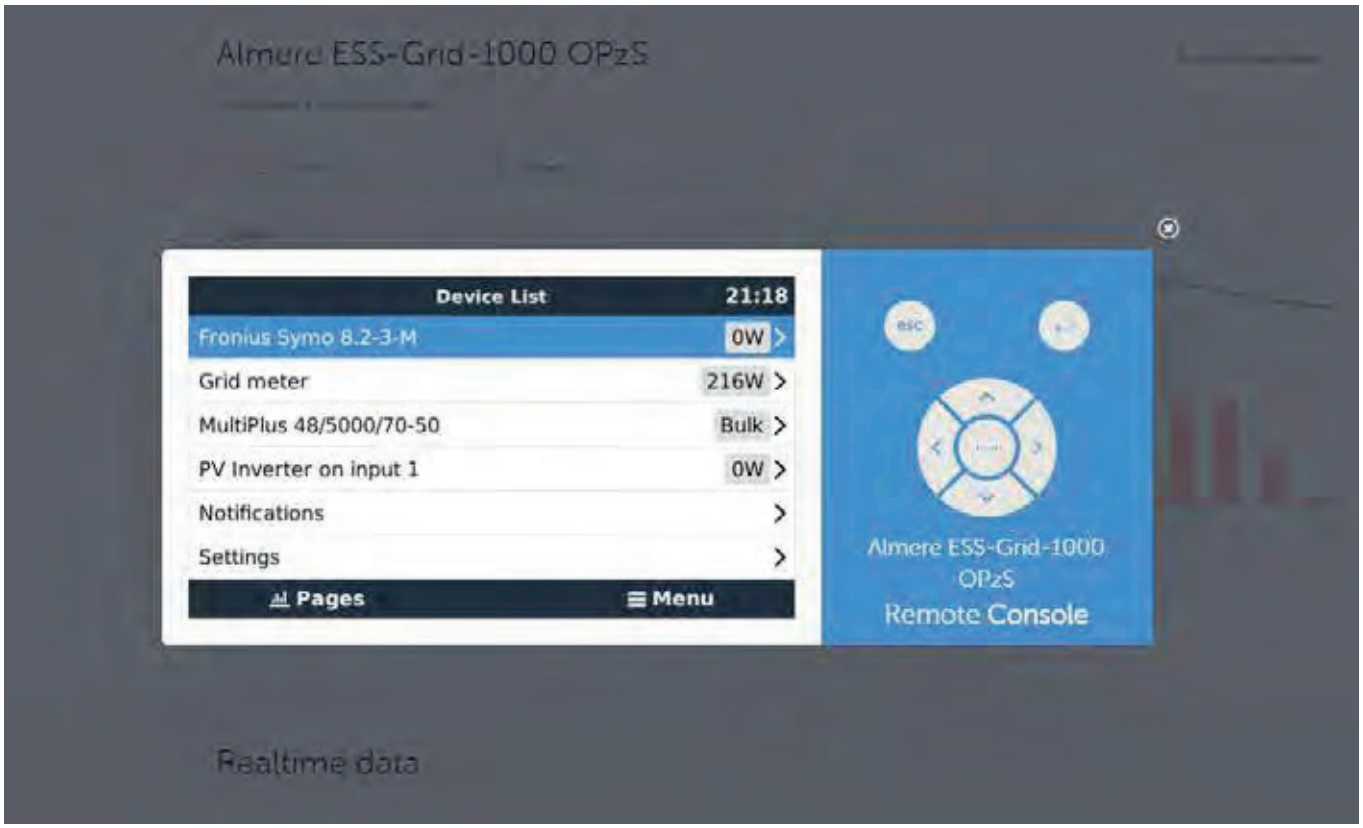
Tiles overview

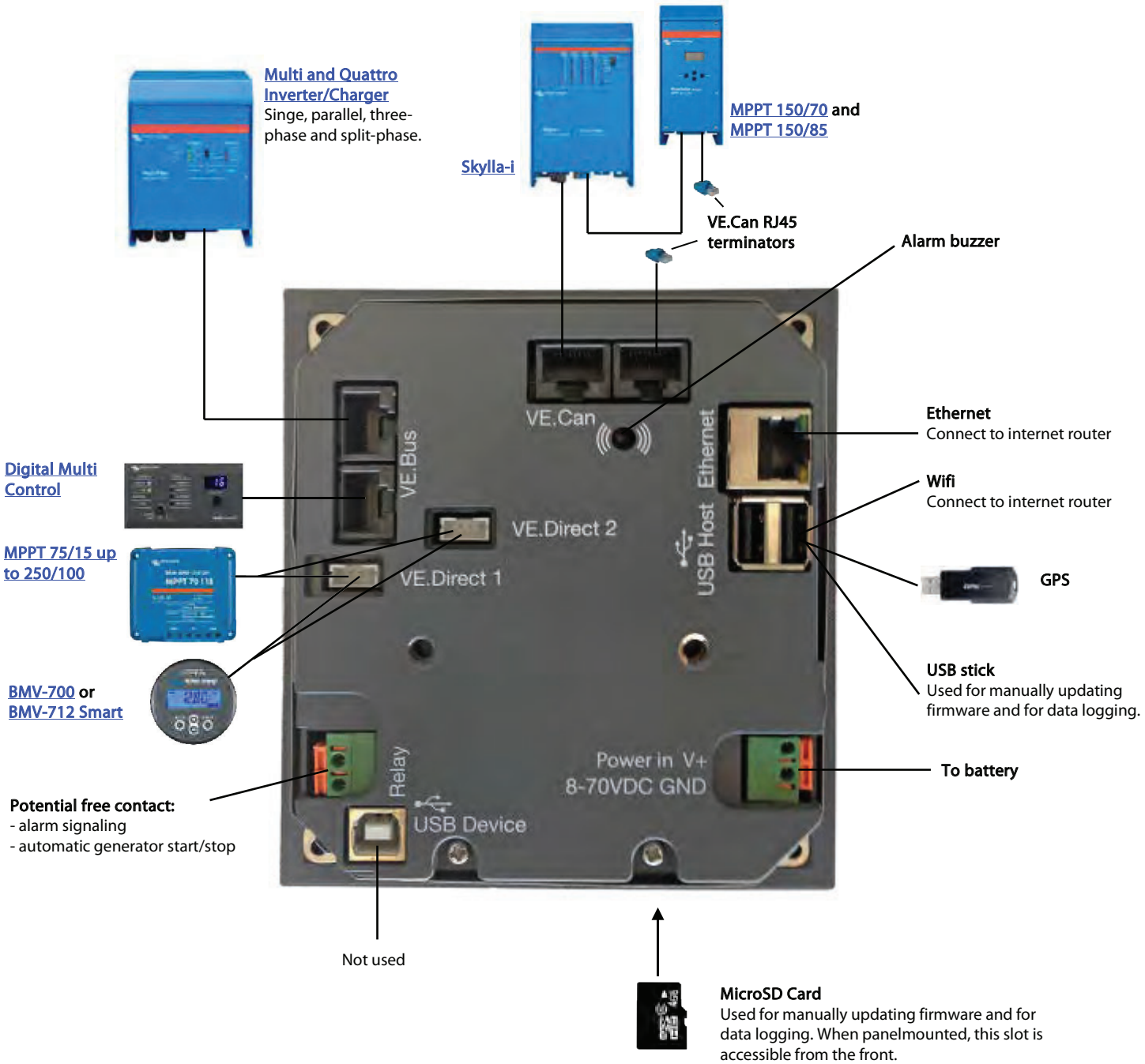


VRM Portal - Dashboard



VRM Portal – Remote Console




Multi and Quattro Inverter/Charger
Singe, parallel, three-phase and split-phase.
Skylla-i
MPPT 150/70 and MPPT 150/85
VE.Can RJ45 terminators
Alarm buzzer
VE.Can
VE.Bus
VE.Direct 2
VE.Direct 1
Ethernet
USB Host
Ethernet
Connect to internet router
Wifi
Connect to internet router
GPS
USB stick
Used for manually updating firmware and for data logging.
Digital Multi Control
MPPT 75/15 up to 250/100
BMV-700 or BMV-712 Smart
Relay
Power in V+
8-70VDC GND
To battery
Potential free contact:
- alarm signaling
- automatic generator start/stop
USB Device
Not used
MicroSD Card
Used for manually updating firmware and for data logging. When panelmounted, this slot is accessible from the front.

Venus GX

Venus GX

Venus GX with connectors

Venus GX front angle

Venus GX

The Venus GX provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VRM Online Portal

All readings are forwarded to our free remote monitoring website: the VRM Online Portal.

Remote Console on VRM

The way to access the device for setting up, as well as monitoring, is via Remote Console. Either via VRM, via the built-in WiFi Access Point, or on the local LAN/WiFi network.

Automatic genset start/stop

A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System

The Venus GX is the Energy Manager in an ESS system. More information in the ESS manual:

Data logging

When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the Venus GX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- EasySolar 1600VA
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port. When multiple BlueSolar MPPTs with VE.Can are used in parallel, the all information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the Venus GX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the Venus GX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Ion BMS
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. The data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

Internet connection

The Venus GX can be connected to internet with an Ethernet cable and via Wi-Fi. The Venus GX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Tank level inputs

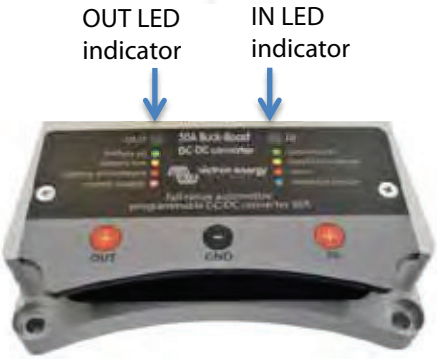
The tank level inputs are resistive: connect them to a resistive tank sender. Such tank senders are not supplied by Victron. The tank level ports can each be configured to work with either European tank senders (0 - 180 Ohm), or US (240 - 30 Ohm).

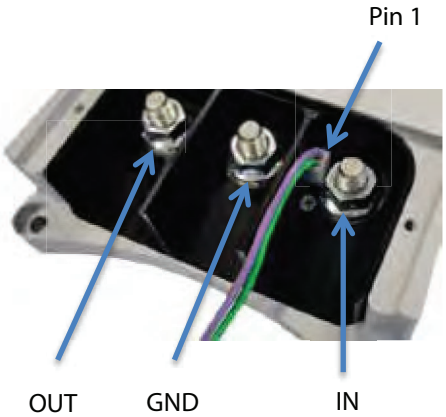
Other highlights

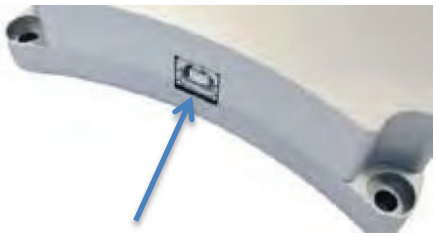
- The Venus GX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the Venus GX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

Venus GX			
Power supply voltage range	8 – 70V DC		
Current Draw	210 mA @ 12V	110 mA @ 24V	60 mA @ 48V
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
CAN	2nd CAN interface – non isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
WiFi Access Point	Use to connect to Remote Console		
WiFi Client	Connect the Venux GX to an existing WiFi network		
	IO		
Potential free contact	NO/COM/NC – 6 A 250 VAC/30 VDC		
Tank level inputs	3 x Configurable for European (0 - 180 Ohm) or US (240 - 30 Ohm)		
Temperature level inputs	2 x Requires ASS000001000.		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Venus GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	45 x 143 x 96		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	In progress		

Buck-Boost DC-DC converter







DC-DC Converter for charging a 12V or 24V service battery in vehicles with a smart alternator (regenerative braking, Euro 5 and Euro 6 engines)

The Buck-Boost DC-DC Converter is a DC-DC Converter for charging a 12V or 24V service battery in vehicles with a smart alternator. The converter will charge the auxiliary battery with a pre-set charge voltage, eliminating high voltages (e.g. Mercedes: 15,4V) and low voltages.

'Engine running' detection system

Deep discharge of the vehicle's starting battery is avoided by a built-in 'engine running' detection system.
Instead of this detection system, the converter can also be activated by means of a programmable input (D+, CAN bus or (+)15 connection).

Fully programmable

The converter can be fully programmed by means of a simple and user-friendly PC application. (USB type A male to USB type B male cable needed)

One product for 12V, 24V and 12/24V systems

The converter can be programmed to charge a 12V or a 24V auxiliary battery from either a 12V or a 24V alternator and starter battery.

Charge current and input current limiter

The output current is determined by the following factors:

- The maximum charge current setting.
- The maximum input current setting.
- The maximum operating temperature limit of the converter.

Input status indication (LED)

Green: converter on.
Yellow: input voltage below threshold, converter off.
Red: over temperature, converter off.
Blue, quick flash: engine running, converter will start after preset delay.
Blue, slow flash: the converter is OFF and activation is blocked due to low input voltage.

Output status indication (LED)

Green: converter off, battery voltage normal.
Yellow: converter off, battery voltage low.
Red: converter off, battery discharged or not connected.
Purple: converter on.

Buck-Boost DC-DC Converter	25A	50A
Input voltage range	7-35V	
Under voltage threshold	10V	
Output voltage range	2-30V	
Maximum charge current	12V : 25A 24V : 15A	12V : 50A 24V : 25A
Power consumption		
Converter off, LEDs off (power save mode)	7 mA	
On/off input (pin 1, purple wire)		
'On' threshold voltage	> 2V	
Maximum input voltage	60V	
Output pin 1 and pin 2		
Output voltage if activated	V_{pinout} = Vin	
Maximum current (per pin)	I_{pinout} = 1A	
GENERAL		
Operating temperature range	-25 +80°C	
Ambient temperature	Max current: up to 40°C	
Weight	1kg	1,1kg
Dimensions	165 x 120 x 30mm	213 x 120 x 30mm

BatteryProtect BP-65

BatteryProtect BP-100

BatteryProtect BP-220

Connector with preassembled DC minus cable (included)

The BatteryProtect disconnects the battery from non essential loads before it is completely discharged (which would damage the battery) or before it has insufficient power left to crank the engine.

12/24V auto ranging

The BatteryProtect automatically detects system voltage

Programming made easy

The BatteryProtect can be set to engage / disengage at several different voltages.
The seven segment display will indicate which setting has been chosen.

A special setting for Li-ion batteries

In this mode the BatteryProtect can be controlled by the VE.Bus BMS.
Note: the BatteryProtect can also be used as a charge interrupter in between a battery charger and a Li-ion battery. See connection diagram in the manual.

Ultra low current consumption

This is important in case of Li-ion batteries, especially after low voltage shutdown.
Please see our Li-ion battery datasheet and the VE.Bus BMS manual for more information.

Over voltage protection

To prevent damage to sensitive loads due to over voltage, the load is disconnected whenever the DC voltage exceeds 16V respectively 32V.

Ignition proof

No relays but MOSFET switches, and therefore no sparks.

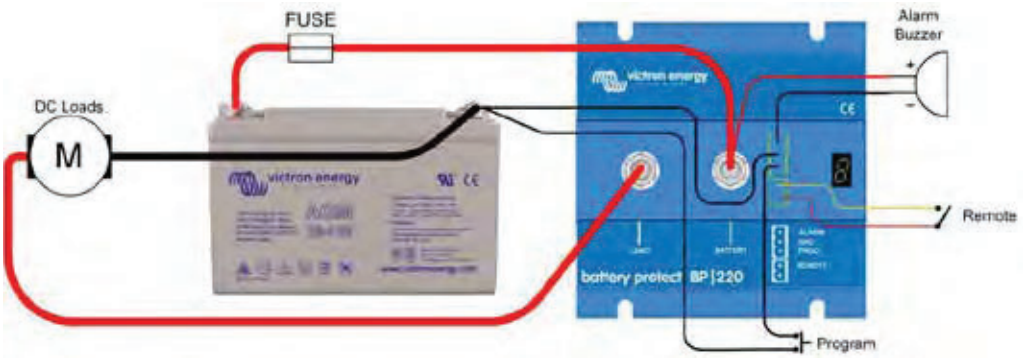
Delayed alarm output

The alarm output is activated if the battery voltage drops below the preset disconnect level during more than 12 seconds. Starting the engine will therefore not activate the alarm. The alarm output is a short circuit proof open collector output to the negative (minus) rail, max. current 50 mA. The alarm output is typically used to activate a buzzer, LED or relay.

Delayed load disconnect and delayed reconnect

The load will be disconnected 90 seconds after the alarm has been activated. If the battery voltage increases again to the connect threshold within this time period (after the engine has been started for example), the load will not be disconnected.
The load will be reconnected 30 seconds after the battery voltage has increased to more than the preset reconnect voltage.

BatteryProtect	BP-65	BP-100	BP-220
Maximum continuous load current	65A	100A	220A
Peak current (during 30 seconds)	250A	600A	600A
Operating voltage range	6 –35V		
Current consumption	When on: 1,5 mA When off or low voltage shutdown : 0,6 mA		
Alarm output delay	12 seconds		
Maximum load on alarm output	50 mA (short circuit proof)		
Load disconnect delay	90 seconds (immediate if triggered by the VE.Bus BMS)		
Load reconnect delay	30 seconds		
Default thresholds	Disengage: 10,5V or 21V Engage: 12V or 24V		
Operating temperature range	Full load: -40°C to +40°C (up to 60% of nominal load at 50°C)		
Connection	M6	M8	M8
Weight	0,2 kg 0.5 lbs	0,5 kg 0.6 lbs	0,8 kg 1.8 lbs
Dimensions (hxwxd)	40 x 48 x 106 mm 1.6 x 1.9 x 4.2 inch	59 x 42 x 115 mm 2.4 x 1.7 x 4.6 inch	62 x 123 x 120 mm 2.5 x 4.9 x 4.8 inch



Cyrix-ct 12/24V 120A and 230A

Cyrix-ct 12/24-120

Cyrix-ct 12/24-230

Control cable for
Cyrix-ct 12/24-230
Length: 1 m

Intelligent battery monitoring to prevent unwanted switching

Some battery combiners (also called voltage controlled relay, or split charge relay) will disconnect a battery in case of a short but high amperage load. A battery combiner also may fail to connect a large but discharged battery bank because the DC voltage immediately drops below the disengage value once the batteries are connected.
The software of the Cyrix-ct 12/24 does more than simply connect and disconnect based on battery voltage and with a fixed time delay. The Cyrix-ct 12/24 looks at the general trend (voltage increasing or decreasing) and reverses a previous action only if the trend has reversed during a certain period of time. The time delay depends on the voltage deviation from the trend.
(for Battery Combiners with multiple engage/disengage profiles, please see the Cyrix-i 400)

Long bolts to allow connection of more than one power cable

Cyrix 12/24-120: 13 mm (M6) Cyrix 12/24-230: 16 mm (M8)

Protection against overheating (due to a long duration overload e.g.)

The Cyrix will disengage in case of excessive contact temperature, and reengage again after it has cooled down.

LED status indication (Cyrix 12/24 230 only)

LED on: engaged LED 10 s flash: disengaged
LED 2 s flash: connecting LED 2 s blink: disconnecting
LED 0,25 s blink: alarm (over temperature; voltage > 16 V; both batteries < 10 V; one battery < 2 V)
(multiply by two for 24 V)

12/24 V auto ranging

The Cyrix-ct 12/24 automatically detects system voltage.

No voltage loss

Cyrix battery combiners are an excellent replacement for diode isolators. The main feature is that there is virtually no voltage loss so that the output voltage of alternators or battery chargers does not need to be increased.

Prioritising the starter battery

In a typical setup the alternator is directly connected to the starter battery. The accessory battery, and possibly also a bow thruster and other batteries are each connected to the starter battery with Cyrix battery combiners. When a Cyrix senses that the starter battery has reached the connect voltage it will engage, to allow for parallel charging of the other batteries.

Bidirectional voltage sensing and power supply from both batteries

The Cyrix senses the voltage of both connected batteries. It will therefore also engage if for example the accessory battery is being charged by a battery charger.
The Cyrix-ct 12/24 has a dual power supply. It will therefore also close if the voltage on one battery is too low to operate the Cyrix.
In order to prevent unexpected operation during installation or when one battery has been disconnected, the Cyrix-ct 12/24 will not close if the voltage on one of the two battery connections is lower than 2 V (12 V battery) or 4 V (24 V battery).

Parallel connection in case of emergency (Start Assist)

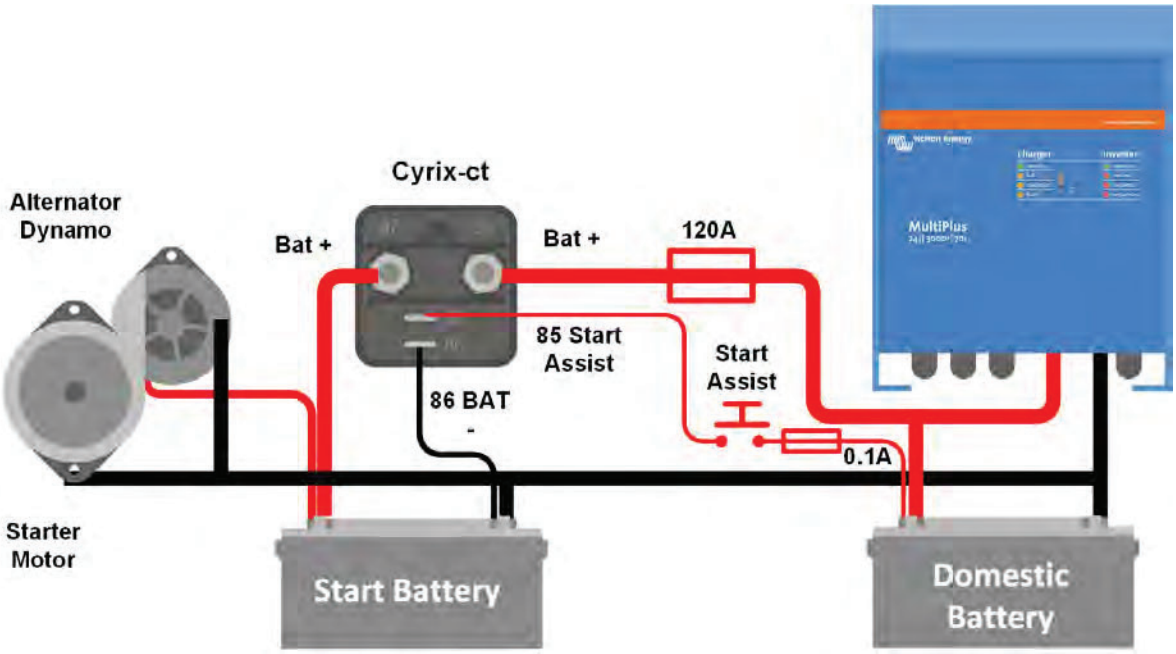
The Cyrix can also be engaged with a push button (Cyrix remains engaged during 30 seconds) or a switch to connect batteries in parallel manually.
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Cyrix Battery Combiner	Cyrix-ct 12/24-120	Cyrix-ct 12/24-230
LED status indication	No	Yes
Continuous current	120 A	230 A
Cranking rating (5 seconds)	180 A	500 A
Connect voltage	From 13 V to 13,8 V and 26 to 27,6 V with intelligent trend detection	
Disconnect voltage	From 11 V to 12,8 V and 22 to 25,7 V with intelligent trend detection	
Current consumption when open	<4 mA	
Current consumption when closed	12 V : 220 mA 24 V : 120 mA	12 V : 320 mA 24 V : 180 mA
Start Assist	Yes (Cyrix remains engaged during 30 seconds)	
Control cable included (length 1 m)	No	Yes
Protection category	IP54	
Weight kg (lbs)	0,11 (0.24)	0,27 (0.6)
Dimensions h x w x d in mm (h x w x d in inches)	46 x 46 x 80 (1.8 x 1.8 x 3.2)	65 x 100 x 50 (2.6 x 4.0 x 2.0)

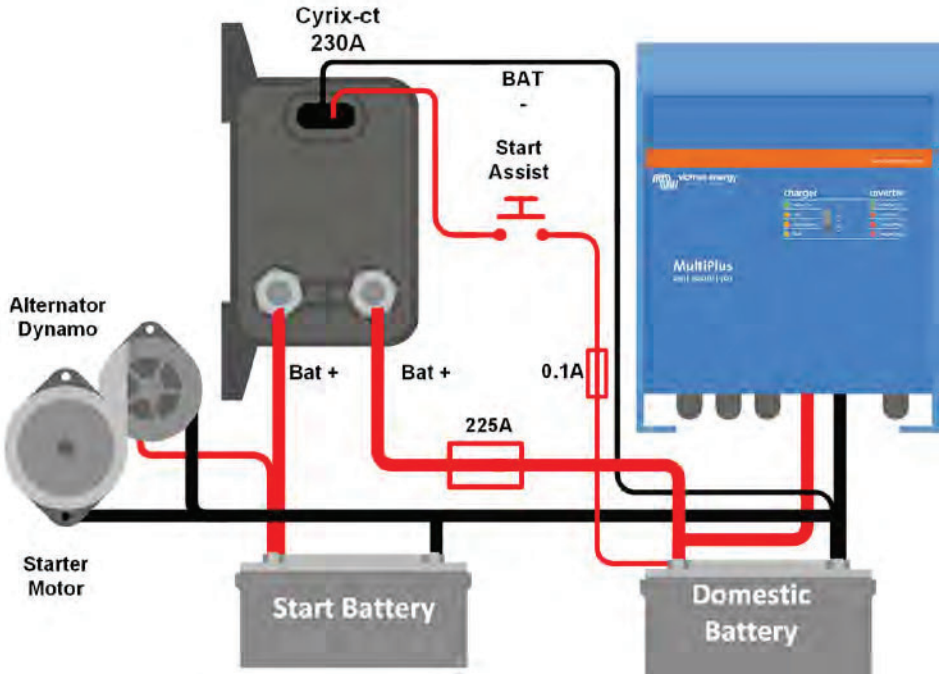
Connect (V)	Delay
V < 13 V	Remains open
13,0 V < V < 13,2 V	10 min
13,2 V < V < 13,4 V	5 min
13,4 V < V < 13,6 V	1 min
13,6 V < V < 13,8 V	4 sec

Disconnect (V)	Delay
V < 11 V	0 sec
11,0 V < V < 12,0 V	1 sec
12,0 V < V < 12,2 V	10 sec
12,2 V < V < 12,4 V	30 sec
12,4 V < V < 12,8 V	3 min
> 12,8 V	remains closed
> 16 V	over voltage disconnect

Approximate connect and disconnect delay
(multiply by two for a 24 V system)



Cyrix-ct 12/24-120: connection diagram



Cyrix-ct 12/24-230: connection diagram

Cyrix-ct 400A 12/24V and 24/48V

Cyrix-i 24/48 V 400 A

New: intelligent battery monitoring to prevent unwanted switching

Some battery combiners will disconnect a battery in case of a short but high amperage load. A battery combiner also may fail to connect a large but discharged battery bank because the DC voltage immediately drops below the disengage value once the batteries are connected.
The software of the Cyrix-i does more than simply connect and disconnect based on battery voltage and with a fixed time delay. The Cyrix-i looks at the general trend (voltage increasing or decreasing) and reverses a previous action only if the trend has reversed during a certain period of time. The time delay depends on the voltage deviation from the trend.

In addition, four switch timing profiles can be chosen (see back page).

12/24 V and 24/48 V auto ranging

The Cyrix-i automatically detects system voltage.

No voltage loss

Cyrix battery combiners are an excellent replacement for diode isolators. The main feature is that there is virtually no voltage loss so that the output voltage of alternators or battery chargers does not need to be increased.

Prioritizing the starter battery

In a typical setup the alternator is directly connected to the starter battery. The accessory battery, and possibly also a bow thruster and other batteries are each connected to the starter battery with Cyrix battery combiners. When a Cyrix senses that the starter battery has reached the connect voltage it will engage, to allow for parallel charging of the other batteries.

Bidirectional voltage sensing and power supply from both batteries

The Cyrix senses the voltage of both connected batteries. It will therefore also engage if for example the accessory battery is being charged by a battery charger.
The Cyrix-i has a dual power supply. It will therefore also close if the voltage on one battery is too low to operate the Cyrix.
In order to prevent unexpected operation during installation or when one battery has been disconnected, the Cyrix-i will not close if the voltage on one of the two battery connections is lower than 2 V (12 V battery), or 4 V (24 V battery) or 8 V (48 V battery).

Parallel connection in case of emergency

The Cyrix can also be engaged with a push button (Cyrix remains engaged during 30 s) or a switch to connect batteries in parallel manually.
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Model	Cyrix-i 12/24-400 Cyrix-i 24/48-400
Continuous current	400A
Peak current	2000A during 1 second
Input voltage 12/24 V model Input voltage 24/48 V model	8-36 VDC 16-72 VDC
Connect/disconnect profiles	See table
Over voltage disconnect	16 V / 32 / 64 V
Current consumption when open	4 mA
Emergency start	Yes, 30 s
Micro switch for remote monitoring	Yes
Status indication	Bicolour LED
Weight kg (lbs)	0,9 (2.0)
Dimensions h x w x d in mm (h x w x d in inches)	78 x 102 x 110 (3.1 x 4.0 x 4.4)

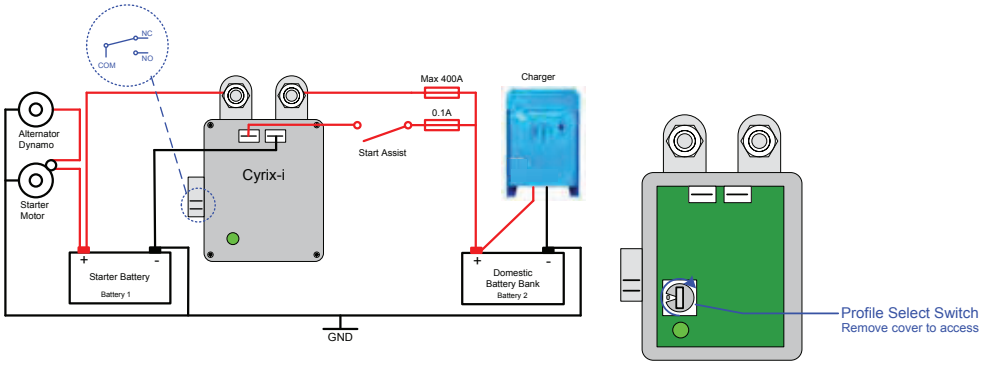
Profile 0			
Connect (V)*		Disconnect (V)*	
Less than 13 V	Remains open	More than 12,8 V	Remains closed
	Closes after		Opens after
13 V	10 min	12,8 V	10 min
13,2 V	5 min	12,4 V	5 min
13,4 V	3 min	12,2 V	1 min
13,6 V	1 min	12 V	4 sec
13,8 V	4 sec	Less than 11 V	Immediate

Profile 1			
Connect (V)*		Disconnect (V)*	
Less than 13,25 V	Remains open	More than 12,75 V	Remains closed
More than 13,25 V	Closes after 30 sec	From 10,5 V to 12,75 V	Opens after 2 min
		Less than 10,5 V	Immediate

Profile 2			
Connect (V)*		Disconnect (V)*	
Less than 13,2 V	Remains open	More than 12,8 V	Remains closed
More than 13,2 V	Closes after 6 sec	From 10,5 V to 12,8 V	Opens after 30 sec
		Less than 10,5 V	Immediate

Profile 3			
Connect (V)*		Disconnect (V)*	
Less than 13,25 V	Remains open	More than 13,5 V	Remains closed
	Closes after		Opens after
13 V	10 min	12,8 V	30 min
13,2 V	5 min	12,4 V	12 min
13,4 V	3 min	12,2 V	2 min
13,6 V	1 min	12 V	1 min
13,8 V	4 sec	Less than 10,5 V	Immediate

NOTES
1) After connecting 3 times, the minimum time to reconnect is 1 minute (to prevent 'rattling')
2) The Cyrix will not connect if the voltage on one of the battery connections is less than 2 V*. (to prevent unexpected switching during installation)
3) The Cyrix will always connect if the **start assist** is activated, as long as the voltage on one of the battery connections is sufficient to operate the Cyrix (approximately 10 V*)
* Multiply voltage x2 for 24 V systems and x4 for 48 V systems



BMV-700 series: precision battery monitoring

BMV-700

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

BMV-702 Black

BMV-700H

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

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

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

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

Bluetooth Smart

Use the Bluetooth Smart dongle to monitor your batteries on Apple or Android smartphones, tablets, macbooks and other devices.

Easy to install

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

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

Easy to program (with your smartphone!)

A quick install menu and a detailed setup menu with scrolling texts assist the user when going through the various settings.

Alternatively, choose the fast and easy solution: download the smartphone app (Bluetooth Smart dongle needed)

Midpoint voltage monitoring (BMV-702 only)

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

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

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

Standard features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events**,** which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 95V
- High current measurement resolution: 10 mA (0,01A)
- Low current consumption: 2,9Ah per month (4mA) @12V and 2,2Ah per month (3mA) @ 24V

BMV-702 additional features

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

BMV-700HS: 60 to 385 VDC voltage range

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

Other battery monitoring options

- VE.Net Battery Controller
- Lynx Shunt VE.Net
- Lynx Shunt VE.Can

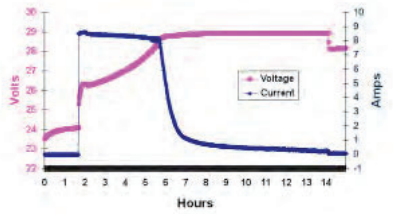
More about midpoint voltage

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our **Battery Balancer** (BMS012201000) to maximize service life of series-connected batteries.

Battery Monitor	BMV-700	BMV-702 BMV-702 BLACK	BMV-700HS
Supply voltage range	6,5 - 95 VDC	6,5 - 95 VDC	60 – 385 VDC
Current draw, back light off	< 4mA	< 4mA	< 4mA
Input voltage range, auxiliary battery	n. a.	6,5 - 95 VDC	n. a.
Battery capacity (Ah)	1 - 9999 Ah		
Operating temperature range	-40 +50°C (-40 - 120°F)		
Measures voltage of second battery, or temperature, or midpoint	No	Yes	No
Temperature measurement range	-20 +50°C		n. a.
VE.Direct communication port	Yes	Yes	Yes
Relay	60V / 1A normally open (function can be inverted)		
RESOLUTION & ACCURACY (with a 500 A shunt)			
Current	± 0,01A		
Voltage	± 0,01V		
Amp hours	± 0,1 Ah		
State of charge (0 – 100%)	± 0,1%		
Time to go	± 1 min		
Temperature (0 - 50°C or 30 - 120°F)	n. a.	± 1°C/°F	n. a.
Accuracy of current measurement	± 0,4%		
Accuracy of voltage measurement	± 0,3%		
INSTALLATION & DIMENSIONS			
Installation	Flush mount		
Front	63mm diameter		
Front bezel	69 x 69mm (2.7 x 2.7 inch)		
Body diameter	52mm (2.0 inch)		
Body depth	31mm (1.2 inch)		
STANDARDS			
Safety	EN 60335-1		
Emission / Immunity	EN 55014-1 / EN 55014-2		
Automotive	ECE R10-4 / EN 50498		
ACCESSORIES			
Shunt (included)	500A / 50mV		
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection		
Temperature sensor	Optional (ASS000100000)		

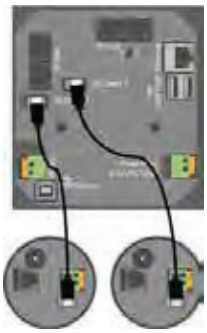
1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

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

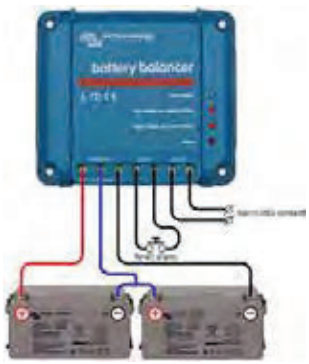


The PC application software **BMV-Reader** will show all current readings on a computer, including history data. It can also log the data to a CSV formatted file. It is available for free, and can be downloaded from our website at the Support and downloads section. Connect the BMV to the computer with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

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.



A maximum of four BMVs can be connected directly to the Color Control.
Even more BMVs can be connected to a USB Hub for central monitoring.



Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

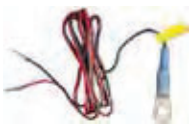
A 48V battery bank can be balanced with three Battery Balancers.

With the **VE.Direct to Bluetooth Smart dongle** real time data and alarms can be displayed on Apple and Android smartphones, tablets, macbooks and other devices.

Also use your smartphone to adjust settings!

(the VE.Direct to Bluetooth Smart dongle must be ordered separately)

See the VictronConnect BMV app Discovery Sheet for more screenshots



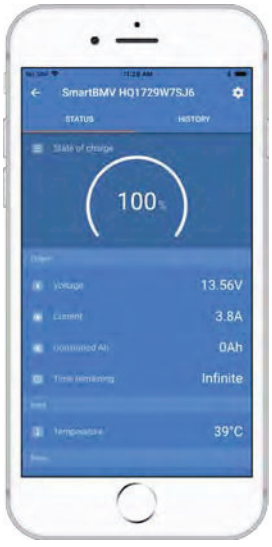
Temperature sensor

BMV-712 Smart: Bluetooth inside

BMV-712 Smart

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb



See the VictronConnect BMV app Discovery Sheet for more screenshots

Bluetooth inside

With Bluetooth built-in, the BMV Smart is ready for the Internet of Things (IoT) era. With Bluetooth being implemented in most other Victron Energy products, wireless communication between products will simplify system installation and enhance performance.

Download the Victron Bluetooth app

Use a smartphone or other Bluetooth enabled device to

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Easy to install

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

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

Midpoint voltage monitoring

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our **Battery Balancer** (BMS012201000) to maximize service life of series-connected lead-acid batteries.

Very low current draw from the battery

Current consumption: 0,7Ah per month (1mA) @12V and 0,6Ah per month (0,8mA) @ 24V
Especially Li-ion batteries have virtually no capacity left when discharged until low voltage shutdown. After shutdown due to low cell voltage, the capacity reserve of a Li-ion battery is approximately 1Ah per 100Ah battery capacity. The battery will be damaged if the remaining capacity reserve is drawn from the battery. A residual current of 10mA for example may damage a 200Ah battery if the system is left in discharged state during more than 8 days.

Bi-stable alarm relay

Prevents increased current draw in case of an alarm.

Other features

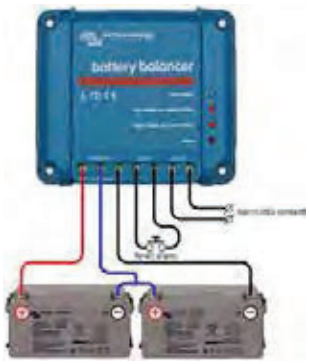
- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events, which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 70V
- High current measurement resolution: 10 mA (0,01A)
- Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings

Battery Monitor	BMV-712 Smart
Supply voltage range	6,5 - 70 VDC
Current draw, back light off	< 1mA
Input voltage range, auxiliary battery	6,5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50°C (-40 - 120°F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50°C
VE.Direct communication port	Yes
Bistable relay	60V / 1A normally open (function can be inverted)
RESOLUTION & ACCURACY (with a 500 A shunt)	
Current	± 0,01A
Voltage	± 0,01V
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)	± 1°C/°F
Accuracy of current measurement	± 0,4%
Accuracy of voltage measurement	± 0,3%
INSTALLATION & DIMENSIONS	
Installation	Flush mount
Front	63mm diameter
Front bezel	69 x 69mm (2.7 x 2.7 inch)
Body diameter	52mm (2.0 inch)
Body depth	31mm (1.2 inch)
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN 55014-1 / EN 55014-2
Automotive	ECE R10-4 / EN 50498
ACCESSORIES	
Shunt (included)	500A / 50mV
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection
Temperature sensor	Optional (ASS000100000)

1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 712 to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to the Color Control or to a computer.

Temperature sensor

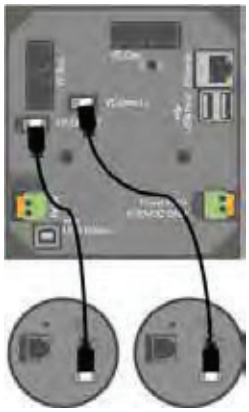


Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three Battery Balancers.

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.



A maximum of four BMVs can be connected directly to the Color Control.
Even more BMVs can be connected to a USB Hub for central monitoring.

Venus GX
The Venus GX provides intuitive control and monitoring. It has the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

Argo diode battery isolators

Argo Diode Isolator 120-2AC

Argo Diode Isolator 140-3AC

Diode battery isolators allow simultaneous charging of two or more batteries from one alternator, without connecting the batteries together. Discharging the accessory battery for example will not result in also discharging the starter battery.

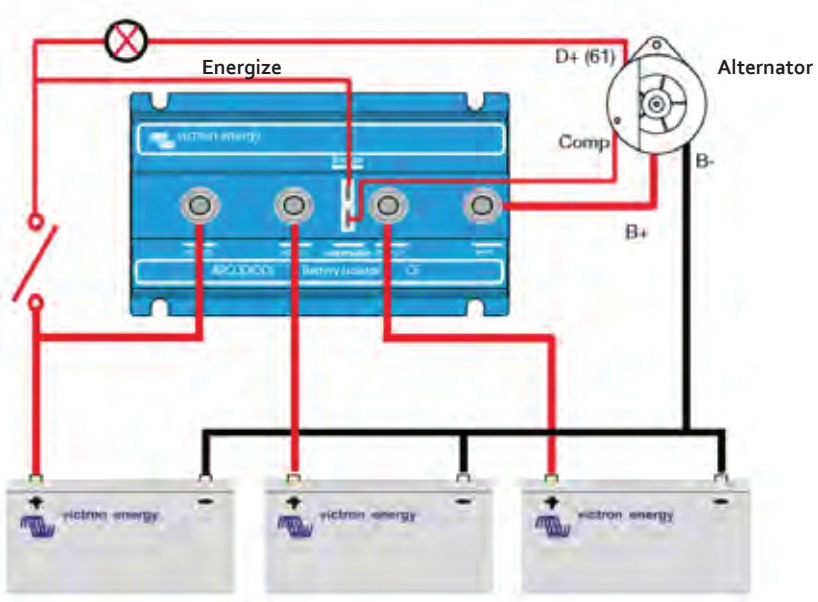
The Argo Battery Isolators feature a low voltage drop thanks to the use of Schottky diodes: at low current the voltage drop is approximately 0,3 V and at the rated output approximately 0,45 V.
All models are fitted with a compensation diode that can be used to slightly increase the output voltage of the alternator. This compensates for the voltage drop over the diodes in the isolator.

Please see our book 'Energy Unlimited' or ask for specialist advice when installing a diode isolator. Simply inserting the isolator in the cabling between the alternator and the batteries will slightly reduce charge voltage. The result can be that batteries are not charged to the full 100% and age prematurely.

Alternator energize input

Some alternators need DC voltage on the B+ output to start charging. Obviously, DC will be present when the alternator is directly connected to a battery. Inserting a Diode or FET splitter will however prevent any return voltage/current from the batteries to the B+, and the alternator will not start.
The new 'AC' diode isolators feature a special current limited energize input that will power the B+ when the engine run/stop switch is closed.

Argo Diode Battery Isolator	80-2SC	80-2AC	100-3AC	120-2AC	140-3AC	160-2AC	180-3AC
Maximum charge current (A)	80	80	100	120	140	160	180
Maximum alternator current (A)	80	80	100	120	140	160	180
Number of batteries	2	2	3	2	3	2	3
Alternator Energize Input	no	yes	yes	yes	yes	yes	yes
Connection	M6 Studs	M6 Studs	M6 Studs	M8 Studs	M8 Studs	M8 Studs	M8 Studs
Compensation diode and Energize connection	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston
Weight kg (lbs)	0,5 (1.3)	0,6 (1.3)	0,8 (1.8)	0,8 (1.8)	1,1 (2.5)	1,1 (2.5)	1,5 (3.3)
Dimensions h x w x d in mm (h x w x d in inches)	60 x 120 x 75 (2.4 x 4.7 x 3.0)	60 x 120 x 90 (2.4 x 4.7 x 3.9)	60 x 120 x 115 (2.4 x 4.7 x 4.5)	60 x 120 x 115 (2.4 x 4.7 x 4.5)	60 x 120 x 150 (2.4 x 4.7 x 5.9)	60 x 120 x 150 (2.4 x 4.7 x 5.9)	60 x 120 x 200 (2.4 x 4.7 x 7.9)



Argo FET 100-3
3bat 100A

Similarly to Diode Battery Isolators, FET Isolators allow simultaneous charging of two or more batteries from one alternator (or a single output battery charger), without connecting the batteries together. Discharging the accessory battery for example will not result in also discharging the starter battery.

In contrast with Diode Battery Isolators, FET Isolators have virtually no voltage loss. Voltage drop is less than 0,02 Volt at low current and averages 0,1 Volt at higher currents.

When using Argo FET Battery Isolators, there is no need to also increase the output voltage of the alternator. However, care should be taken to keep cable lengths short and of sufficient cross section.

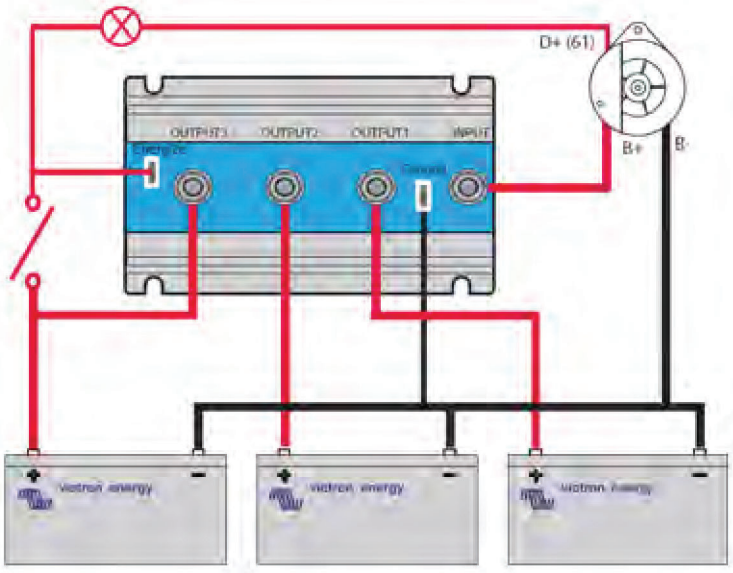
Example:
When a current of 100 A flows through a cable of 50 mm^2 cross section (AWG 0) and 10 m length (30 ft), the voltage drop over the cable will be 0,26 Volt. Similarly a current of 50 A through a cable of 10 mm^2 cross section (AWG 7) and 5 m length (15 ft) will result in a voltage drop of 0,35 Volt!

Alternator energize input

Some alternators need DC voltage on the B+ output to start charging. Obviously, DC will be present when the alternator is directly connected to a battery. Inserting a Diode or FET splitter will however prevent any return voltage/current from the batteries to the B+, and the alternator will not start.
The new Argo FET Isolators have a special current limited energize input that will power the B+ when the engine run/stop switch is closed.

Argo FET 100-3
3bat 100A

Argo FET Battery Isolator	Argo FET 100-2	Argo FET 100-3	Argo FET 200-2	Argo FET 200-3
Maximum charge current (A)	100	100	200	200
Maximum alternator current (A)	100	100	200	200
Number of batteries	2	3	2	3
Connection	M8 bolts	M8 bolts	M8 bolts	M8 bolts
Weight kg (lbs)	1,4 (3.1)	1,4 (3.1)	1,4 (3.1)	1,4 (3.1)
Dimensions: h x w x d in mm (h x w x d in inches)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)



Battery Balancer

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

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

The Solution: battery balancing

The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27,3V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 0,7A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

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

LED indicators

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

Alarm relay

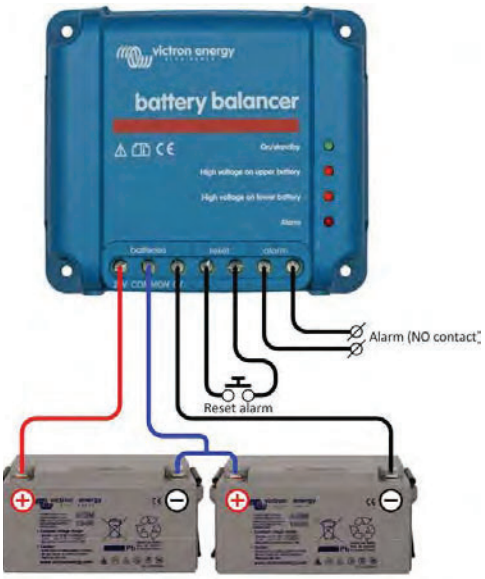
Normally open. The alarm relay closes when the red LED switches on and opens when the red LED switches off.

Alarm reset

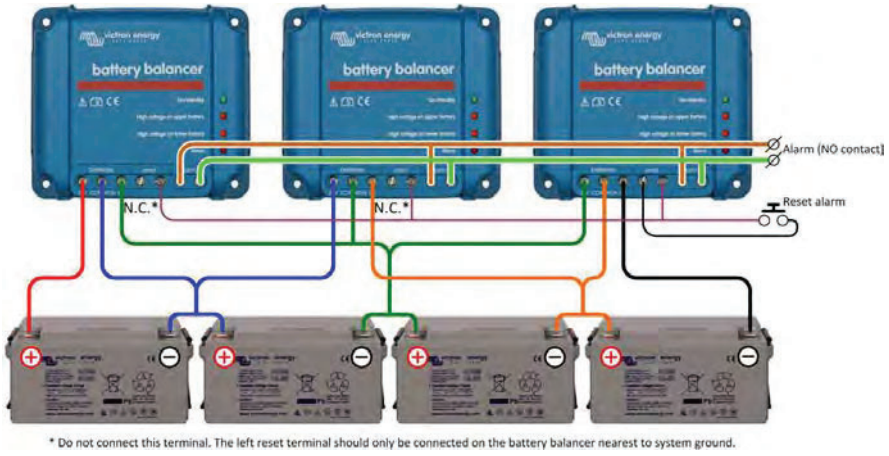
Two terminals are available to connect a push button. Interconnecting the two terminals resets the relay.
The reset condition will remain active until the alarm is over. Thereafter the relay will close again when a new alarm occurs.

Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

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

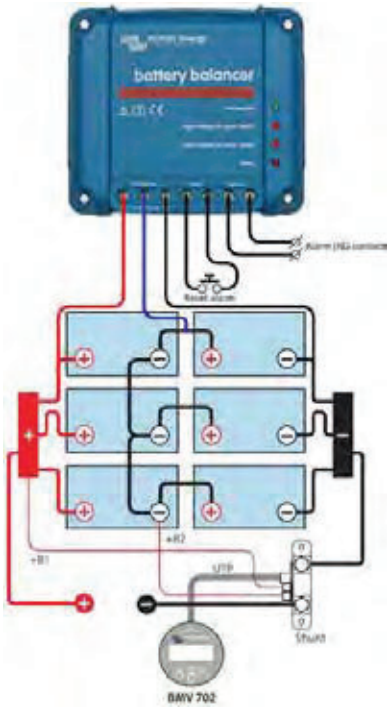


Battery Balancer connected to two series connected 12V batteries (24V system)



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

Victron Battery Balancer	
Input voltage range	Up to 18V per battery, 36V total
Turn on level	27,3V +/- 1%
Turn off level	26,6V +/- 1%
Current draw when off	0,7 mA
Midpoint deviation to start balancing	50 mV
Maximum balancing current	0,7A (when deviation > 100 mV)
Alarm trigger level	200 mV
Alarm reset level	140 mV
Alarm relay	60V / 1A normally open
Alarm relay reset	Two terminals to connect a push button
Over temperature protection	yes
Operating temperature	-30 t0 +50°C
Humidity (non-condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm² / AWG10
Protection category	IP22
Weight	0,4 kg
Dimensions (h x w x d)	100 x 113 x 47 mm
STANDARDS	
Safety	EN 60950
Emission	EN 61000-6-3, EN 55014-1
Immunity	EN 61000-6-2, EN 61000-6-1, EN 55014-2
Automotive Directive	EN 50498



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

Installation

1) The Battery Balancer(s) must be installed on a well-ventilated vertical surface close to the batteries (but, due to possible corrosive gasses, not above the batteries!)
2) **In case of series-parallel connection, the midpoint interconnecting cables must be sized to at least carry the current that arises when one battery becomes open-circuited.**
   - In case of 2 parallel strings: cross section 50% of the series interconnecting cables.
   - In case of 3 parallel strings: cross section 33% of the series interconnecting cables, etc.
3) If required: first wire the alarm contact and the alarm reset.
4) Use at least 0,75 mm² to wire the negative, positive and midpoint connections (in this order).
5) The balancer is operational.
   When the voltage over a string of two batteries is less than 26,6V the balancer switches to standby and all LEDs will be off.
   When the voltage over a string of two batteries increases to more than 27,3V (during charging) the green LED will turn on, indicating that the balancer is on.
   When on, a voltage deviation of more than 50 mV will start the balancing process and at 100 mV one of the two orange LEDs will turn on. A deviation of more than 200 mV will trigger the alarm relay.

What to do in case of an alarm during charging

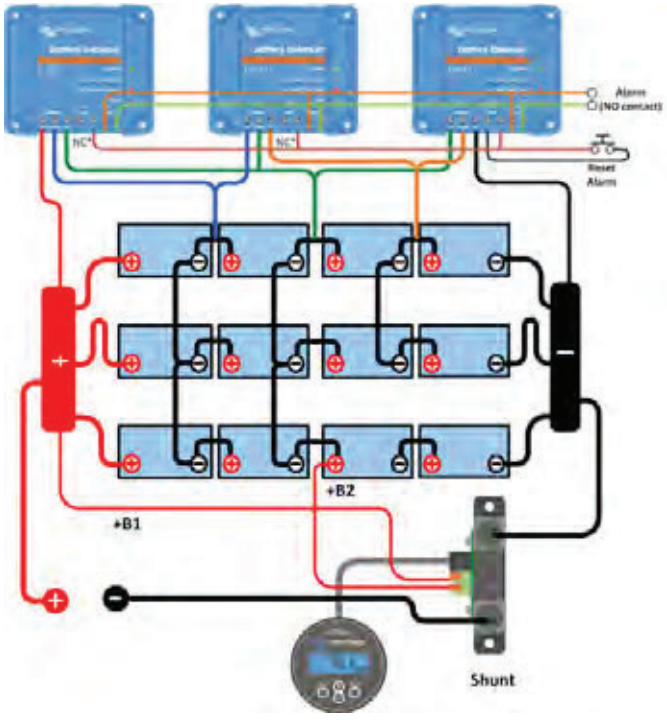
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially and allow the batteries to equalize over time.

If the problem persists after several charge-discharge cycles:

a) In case of series-parallel connection disconnect the midpoint parallel connection wiring and measure the individual midpoint voltages during absorption charge to isolate batteries or cells which need additional charging, or:
b) Charge and then test all batteries or cells individually or:
c) Connect two or more battery balancers in parallel (on average one balancer will take care of up to three parallel 200 Ah strings).

In case of an older battery bank which has performed well in the past, the problem may be due to:

d) Systematic undercharge: more frequent charging needed (VRLA batteries), or equalization charge needed (flooded deep cycle flat plate or OPzS batteries). Better and regular charging will solve the problem.
e) One or more faulty cells: replace all batteries.



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

AGM Battery
12V 90Ah

GEL OPzV 2V cell

1. VRLA technology

VRLA stands for Valve Regulated Lead Acid, which means that 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 high currents 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 by 10°C.
Victron VRLA batteries can therefore be stored for 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.
Nevertheless repeatedly deep and prolonged discharge has a very negative effect 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.

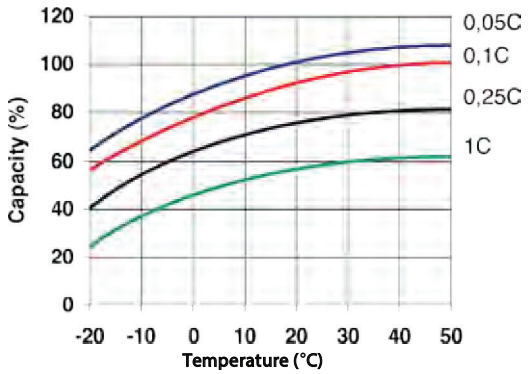


Fig. 1: Effect of temperature on capacity

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.

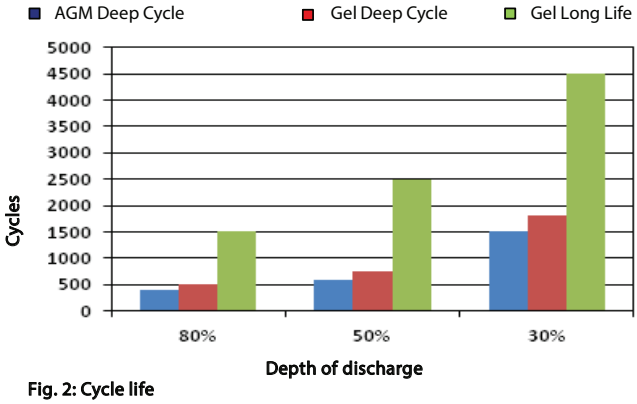


Fig. 2: Cycle life

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.

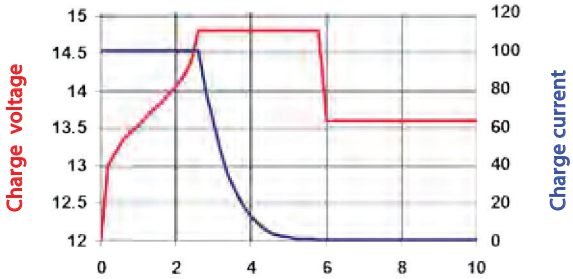


Fig. 3: Three step charge curve

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.

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

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

Victron developed the adaptive charge curve. The 4-step adaptive 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 pre-set 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).

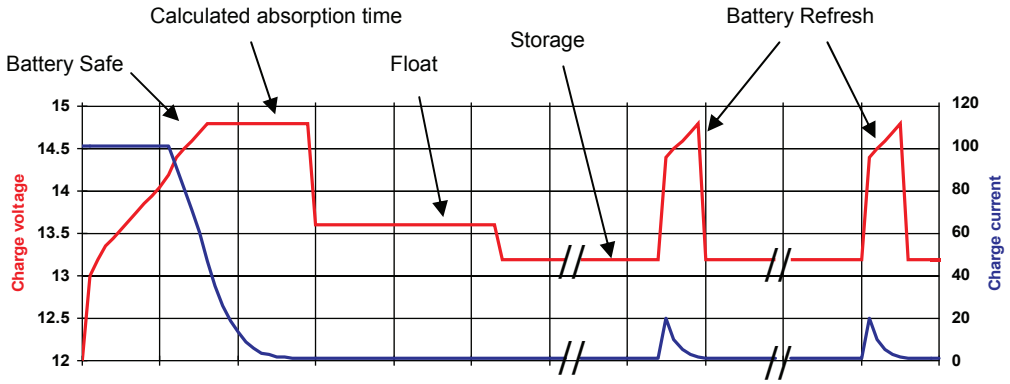


Fig. 4: Four-step adaptive charge curve

13. Optimum charge voltage of Victron VRLA batteries

The recommended charge voltage settings for a 12V 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 12V battery).
The centre point for temperature compensation is 25°C / 70°F.

15. Charge current

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

	Float Service (V)	Cycle service Normal (V)	Cycle service Fastest recharge (V)
Victron AGM 'Deep Cycle'			
Absorption		14,2 - 14,6	14,6 - 14,9
Float	13,5 - 13,8	13,5 - 13,8	13,5 - 13,8
Storage	13,2 - 13,5	13,2 - 13,5	13,2 - 13,5
Victron Gel 'Deep Cycle'			
Absorption		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'			
Absorption		14,0 - 14,2	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	

Table 3: Recommended charge voltage

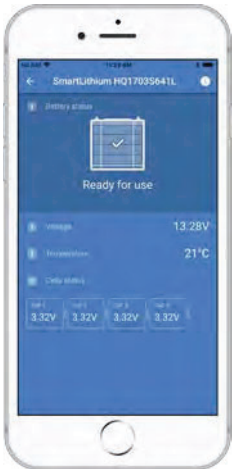
12 Volt Deep Cycle AGM							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate AGM Terminals: copper
BAT406225084	**240**	6	320x176x247	31	700	270	Rated capacity: 20 hr. discharge at 25°C Float design life: 7-10 years at 20°C Cycle design life: 400 cycles at 80% discharge 600 cycles at 50% discharge 1500 cycles at 30% discharge
BAT212070084	**8**	12	151x65x101	2,5			
BAT212120084	**14**	12	151x98x101	4,1			
BAT212200084	**22**	12	181x77x167	5,8			
BAT412350084	**38**	12	197x165x170	12,5			
BAT412550084	**60**	12	229x138x227	20	280	80	
BAT412600084	**66**	12	258x166x235	24	300	90	
BAT412800084	**90**	12	350x167x183	27	400	130	
BAT412101084	**110**	12	330x171x220	32	500	170	
BAT412121084	**130**	12	410x176x227	38	550	200	
BAT412151084	**165**	12	485x172x240	47	600	220	
BAT412201084	**220**	12	522x238x240	65	650	250	
BAT412124081	**240**	12	522 x 240 x 224	67	650	250	

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
BAT412550104	**60**	12	229x138x227	20	250	70	Rated capacity: 20 hr. discharge at 25°C Float design life: 12 years at 20°C Cycle design life: 500 cycles at 80% discharge 750 cycles at 50% discharge 1800 cycles at 30% discharge
BAT412600100	**66**	12	258x166x235	24	270	80	
BAT412800104	**90**	12	350x167x183	26	360	120	
BAT412101104	**110**	12	330x171x220	33	450	150	
BAT412121104	**130**	12	410x176x227	38	500	180	
BAT412151104	**165**	12	485x172x240	48	550	200	
BAT412201104	**220**	12	522x238x240	66	600	220	
BAT412126101	**265**	12	520x268x223	75	650	250	

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

Other capacities and terminal types: at request

12,8V 300Ah LiFePO4 Battery



Li-ion app

Why lithium-iron-phosphate?

Lithium-iron-phosphate (LiFePO4 or LFP) is the safest of the mainstream li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 12,8V LFP battery therefore consists of 4 cells connected in series; and a 25,6V battery consists of 8 cells connected in series.

Rugged

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

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

A LFP battery does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of LFP compared to lead-acid.
Other advantages are the wide operating temperature range, excellent cycling performance, low internal resistance and high efficiency (see below).

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

Efficient

In several applications (especially off-grid solar and/or wind), energy efficiency can be of crucial importance.
The round trip energy efficiency (discharge from 100% to 0% and back to 100% charged) of the average lead-acid battery is 80%.
The round trip energy efficiency of a LFP battery is 92%.
The charge process of lead-acid batteries becomes particularly inefficient when the 80% state of charge has been reached, resulting in efficiencies of 50% or even less in solar systems where several days of reserve energy is required (battery operating in 70% to 100% charged state).
In contrast, a LFP battery will still achieve 90% efficiency under shallow discharge conditions.

Size and weight

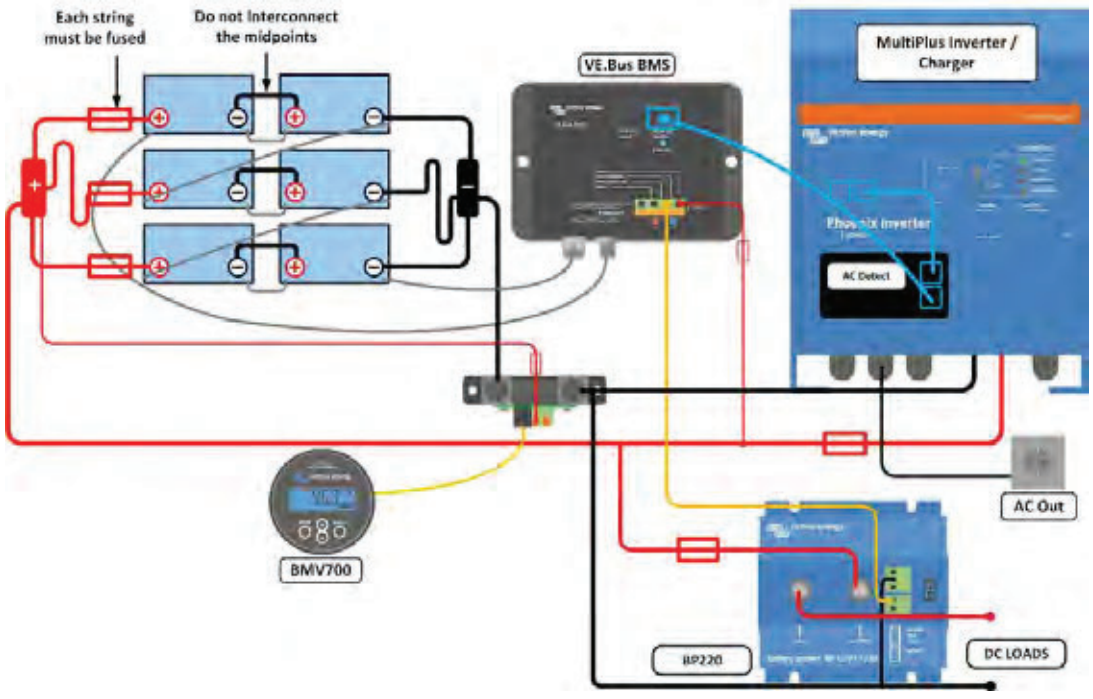
Saves up to 70% in space
Saves up to 70% in weight

Expensive?

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

Bluetooth

With Bluetooth cell voltages, temperature and alarm status can be monitored.
Very useful to localize a (potential) problem, such as cell imbalance.



Our LFP batteries have integrated cell balancing and cell monitoring. Up to 5 batteries can be paralleled and up to four batteries can be series connected, so that a 48V battery bank of up to 1500Ah can be assembled. The cell balancing/monitoring cables can be daisy-chained and must be connected to a Battery Management System (BMS).

Battery Management System (BMS)

The BMS will:

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

See the BMS datasheets for more features

Battery specification

VOLTAGE AND CAPACITY	LFP-Smart 12,8/60	LFP-Smart 12,8/90	LFP-Smart 12,8/100-a	LFP-Smart 12,8/150	LFP-Smart 12,8/160	LFP-Smart 12,8/200	LFP-Smart 12,8/300	LFP-Smart 25,6/200
Nominal voltage	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	25,6V
Nominal capacity @ 25°C*	60Ah	90Ah	100Ah	150Ah	160Ah	200Ah	300Ah	200Ah
Nominal capacity @ 0°C*	48Ah	72Ah	80Ah	125Ah	130Ah	160Ah	240Ah	160Ah
Nominal capacity @ -20°C*	30Ah	45Ah	50Ah	75Ah	80Ah	100Ah	150Ah	100Ah
Nominal energy @ 25°C*	768Wh	1152Wh	1280Wh	1920Wh	2048Wh	2560Wh	3840Wh	5120Wh
*Discharge current ≤1C								
CYCLE LIFE (capacity ≥ 80% of nominal)								
80% DoD	2500 cycles							
70% DoD	3000 cycles							
50% DoD	5000 cycles							
DISCHARGE								
Maximum continuous discharge current	120A	180A	200A	300A	320A	400A	600A	400A
Recommended continuous discharge current	≤60A	≤90A	≤100A	≤150A	≤160A	≤200A	≤300A	≤200A
End of discharge voltage	11V	11V	11V	11V	11V	11V	11V	22V
OPERATING CONDITIONS								
Operating temperature	Discharge: -20°C to +50°C Charge: +5°C to +50°C							
Storage temperature	-45°C to +70°C							
Humidity (non-condensing)	Max. 95%							
Protection class	IP 22							
CHARGE								
Charge voltage	Between 14V/28V and 14,4V/28,8V (14,2V/28,4V recommended)							
Float voltage	13,5V/27V							
Maximum charge current	120A	180A	200A	300A	320A	400A	600A	400A
Recommended charge current	≤30A	≤45A	≤50A	≤75A	≤80A	≤100A	≤150A	≤100A
OTHER								
Max storage time @ 25°C*	1 year							
BMS connection	Male + female cable with M8 circular connector, length 50cm							
Power connection (threaded inserts)	M8	M8	M8	M8	M10	M10	M10	M8
Dimensions (hxwxd) mm	240x285x132	249x285x168	197x321x152	237x321x152	320x338x233	297x425x274	347x425x274	317x631x208
Weight	12kg	16kg	15kg	20kg	33kg	42kg	51kg	56Kg
*When fully charged								

Lithium-Ion HE Battery and Lynx Ion BMS

24V/100Ah HE battery

24V/200Ah HE battery

Lynx-ion BMS 1000A

Ultra-high energy density
185Wh/kg thanks to Lithium Nickel Manganese Cobalt Oxide (NMC) technology

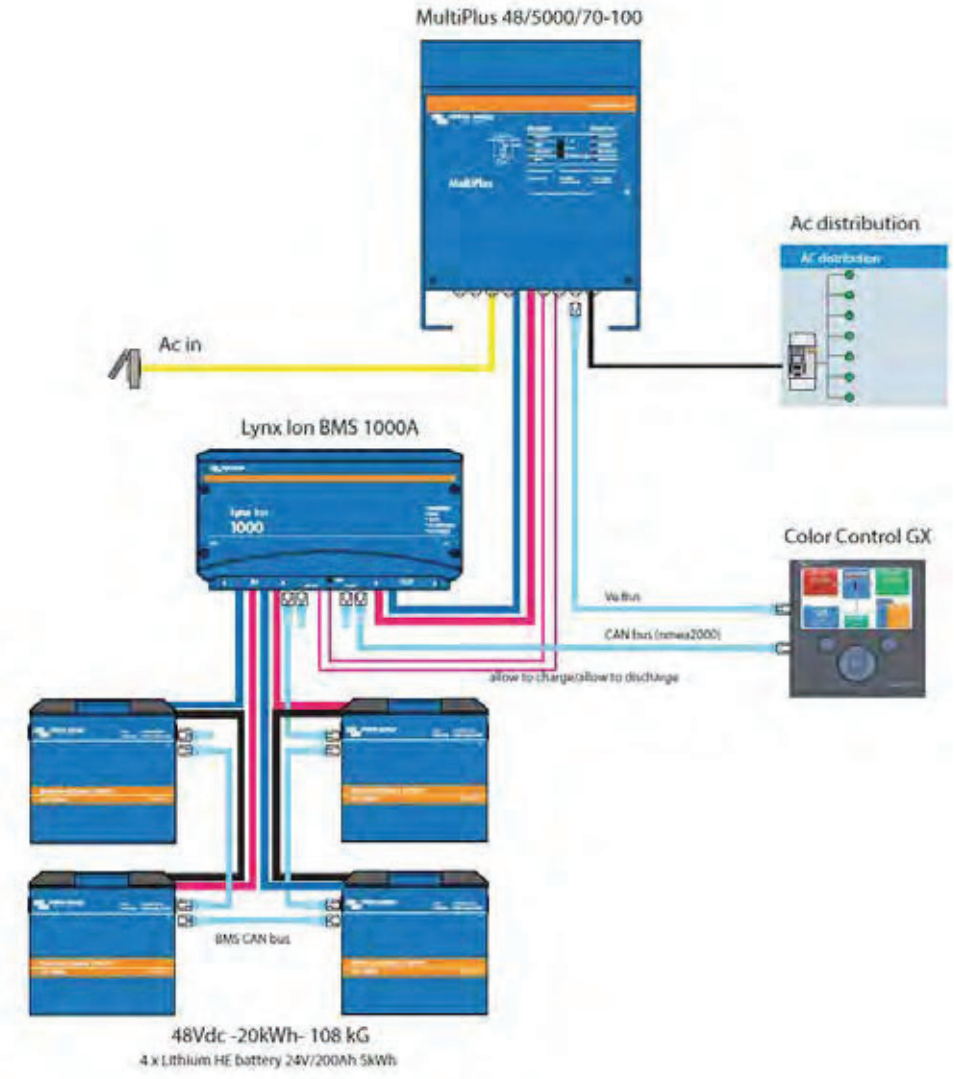
Fan cooled
For high charge and discharge currents (up to 2C for short periods)

Parallel and series connection
Up to 64 batteries can be parallel connected.
For 48V systems two batteries can be connected in series, and up to 32 strings of two batteries can be parallel connected.

Galvanically isolated CAN-Bus communication
Protocol: VE.Can/NMEA2000

Lynx-ion BMS: 400A or 1000A
The Lynx-ion BMS reduces wiring and installation time to a minimum: it combines four fused battery connections, four fused DC load connections, a safety contactor and a current shunt with a BMS in one compact enclosure.

Monitoring: The Color Control GX or Venus GX
Monitors the complete system.
Is the gateway for remote monitoring on the VRM online portal.
Adds an amazing amount of useful functionality to system (such as a very sophisticated generator start-stop program
See the Color Control GX and Venus GX datasheet for more information.



Lithium HE battery	24V / 100Ah	24V / 200Ah
Technology	Lithium-Ion NMC	Lithium-Ion NMC
Cell configuration	7S32P	7S64P
Nominal voltage	25,2 V	25,2 V
Nominal capacity	100 Ah	200 Ah
Nominal energy	2,5 kWh	5,0 kWh
Cycle Life @80% DoD (0,3C)	2000	2000
Energy/weight ratio (incl. BMS and enclosure)	159 Wh/kg	175 Wh/kg
Weight (incl. BMS and enclosure)	15,7 kg	28,6 kg
Discharge		
Discharge cut-off voltage	21 V	21 V
Recommended discharge current	30 A (0.3 C)	60 A (0.3 C)
Maximum discharge current (10 minutes)	150 A (1.5 C)	300 A (1.5 C)
Fuses	150 A, fuse inside	300 A, fuse inside
Charge		
Absorption voltage (1 hour)	28,4 V	28,4 V
Float voltage	27,5 V	27,5 V
Maximum charge current	100 A (1 C)	200 A (1 C)
Recommended charge current	30 A (0.3 C)	60 A (0.3 C)
Configuration		
Series configuration	Yes, up to 2	
Parallel configuration	Yes, up to 96	
Temperature		
Operating temp. charge	0~45°C	
Operating temp. discharge	-20~55°C	
Storage temp.	-20~45°C	
Mechanical		
Power connections	M8 stud, Max. 15 Nm	M8 stud, Max. 15 Nm
Protection class	IP20	IP20
Cooling	Air, active (1x fan inside)	Air, active (2x fan inside)
Dimensions (l x w x h)	362 x 193 x 214 mm	362 x 193 x 355 mm
Safety		
Battery Management System (BMS)	Integrated slave BMS	
Balancing	Passive	
Compatible BMS master controller	Lynx Ion BMS	
Communication with Lynx Ion BMS	CAN bus	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

Lynx Ion BMS intended for both 100 Ah & 200Ah batteries	400A	1000A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	96 (48 V: 48 strings of two batteries	
Supply voltage range	18 to 58 VDC	
Power consumption, standby mode	73 mW @ 26,2V and 138 mW @ 52,4V	
Power consumption, active mode	8,7 W	
Main safety contactor	400A	1000A
Communication port	VE.CAN (NMEA2000, RJ45 connection, galvanically isolated)	
IO		
Auxiliary output	13,5 V / 1 A, short circuit protected	
Allow-to-charge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-discharge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-charge (relay output)	1 A @ 60 VDC, potential free	
Allow-to-discharge (relay output)	1 A @ 60 VDC, potential free	
Programmable contact (relay output)	1 A @ 60 VDC, potential free	
External status signal	13,5 V / 140 mA	
Enclosure		
Material	ABS	
Weight	4,6 kg	5,7 kg
Dimensions (lxwxh)	225 x 426 x 117 mm	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

Telecom batteries

Telecom Battery
Battery AGM 12V 200Ah

Telecom Battery
Battery AGM 12V 200Ah

Designed for telecom applications; excellent 'floor space savers' for marine and vehicle applications

The deep cycle AGM telecom series has been designed for use in telecom systems. With front access terminals and small footprint, the batteries are ideal for racked systems. Similarly, these batteries can help solve limited floor space and access problems on board boats and vehicles.

AGM technology

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action.

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 by 10°C.

Low internal resistance

Accepts very high charge and discharge rates.

High cyclic life capability

More than 500 cycles at 50% depth of discharge.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'.

12V AGM Telecom battery	115Ah	165Ah	200Ah
Capacity 1 / 3 / 5 / 10 / 20 hours (% of nominal)	60 / 75 / 82 / 91 / 100 (@ 70°F/25°C, end of discharge 10,5V)		
Capacity 10 / 20 / 30 / 40 minutes (% of nominal)	33 / 44 / 53 / 57 (@ 70°F/25°C, end of discharge 9,6V)		
Nominal capacity (77°F/25°C, 10,5V)	115Ah	165Ah	200Ah
Cold Cranking Amps @ 0°F/-18°C	1000	1500	1800
DIN cold start current (A) @ 0°F/-18°C	600	900	1000
Short Circuit Current (A)	3500	5000	6000
Reserve Capacity (minutes)	200	320	400
Shelf life @ 70°F/20°C	1 year		
Absorption voltage (V) @ 70°F/20°C	14,4 – 14,7		
Float voltage (V) @ 70°F/20°C	13,6 – 13,8		
Storage voltage (V) @ 70°F/20°C	13,2		
Float design life @ 70°F/20°C	12 years		
Cycle design life @ 80% discharge	500		
Cycle design life @ 50% discharge	750		
Cycle design life @ 30% discharge	1800		
Dimensions (lxwxh, mm)	395 x 110 x 293mm	548 x 105 x 316mm	546 x 125 x 323mm
Dimensions (lxwxh, inches)	15.37 x 4.33 x 11.53	21.57 x 4.13 x 12.44	21.49 x 4.92 x 12.71
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	60kg/132lbs

BlueSolar and SmartSolar charge controllers - overview

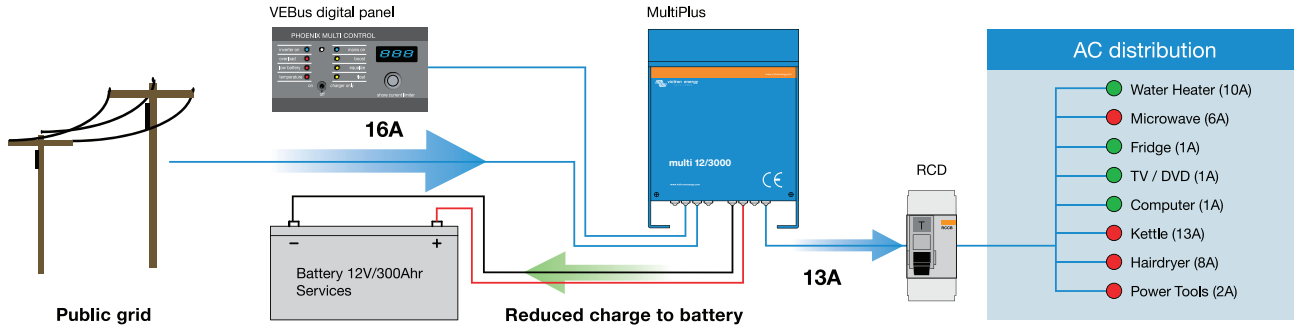
BlueSolar Charge Controller	Load output	Fan	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	Yes	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	Yes	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	Yes	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/30	No	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	M
100/50	No	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	M
150/35	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	M
150/45-Tr	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/45-MC4	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-Tr	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70 CAN-bus	No	Yes	12/24/36/48	Integrated display	n.a.	VE.Can	Yes	Yes	n.a.
150/85 CAN-bus	No	Yes	12/24/36/48	Integrated display	n.a.	VE.Can	Yes	Yes	n.a.
SmartSolar Charge Controller	Load output	Fan	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/20_48V	Yes, 100mA	No	48	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	No	12/24	MPPT control	Built-in	VE.Direct	No	No	M
100/50	No	No	12/24	MPPT control	Built-in	VE.Direct	No	No	M
150/35	No	No	12/24/36/48	MPPT control	Built-in	VE.Direct	No	No	M
150/45-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/45-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/85-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/85-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/60-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/60-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/85-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/85-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/100-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/100-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL

Inverter/charger system with intelligent shore and generator power management

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

PowerControl ©

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

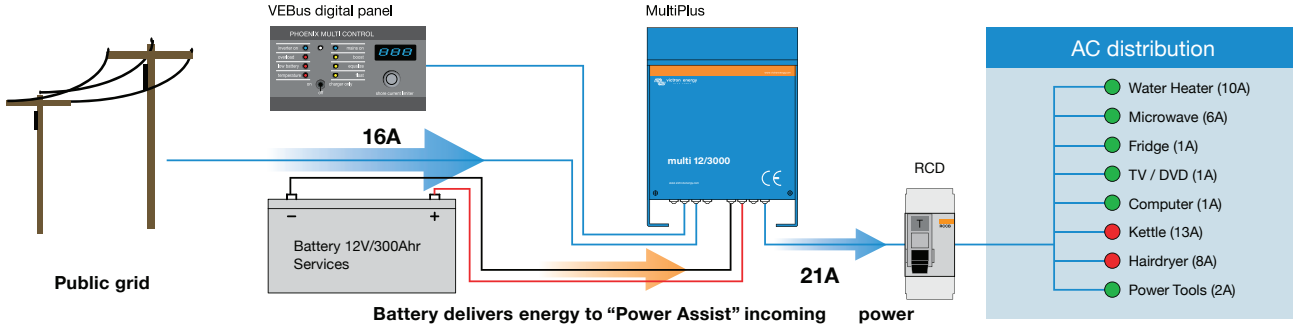


PowerAssist: Boosting the power available from mains or generator, an innovative feature of Multiplus. The feature that most distinguishes the MultiPlus from other inverter/chargers is PowerAssist. This feature takes the principle of PowerControl to a further dimension by allowing a MultiPlus to supplement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

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

PowerAssist ©

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



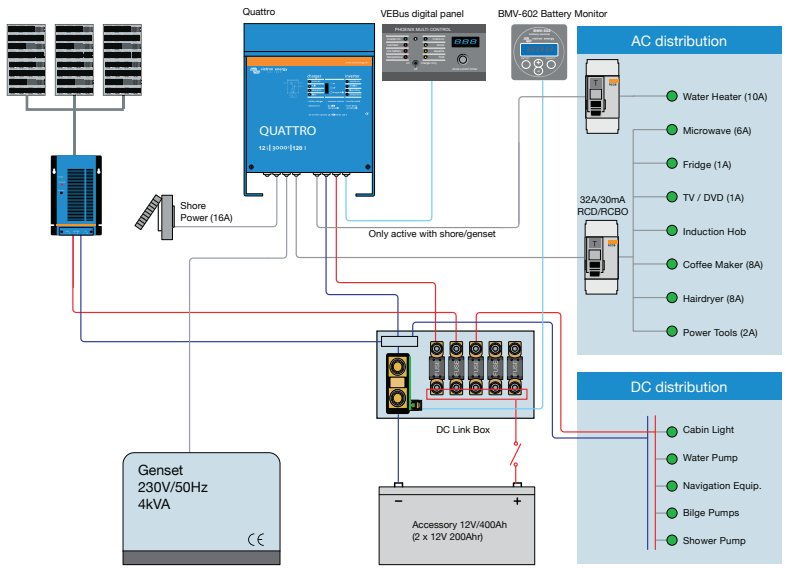
Comfort system

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

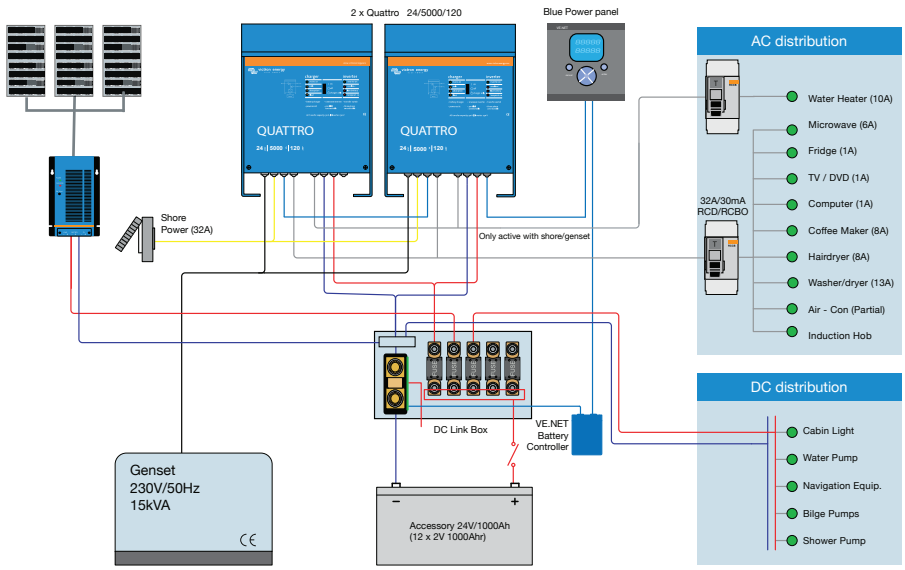
Comfort Plus system

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

Comfort system - 7 kVa (30a) capacity



Comfort plus system - 25 kVa capacity



About Victron Energy

With over 44 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 44 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.

Luxury camper from Vennegoor Installatie B.V.


DAF

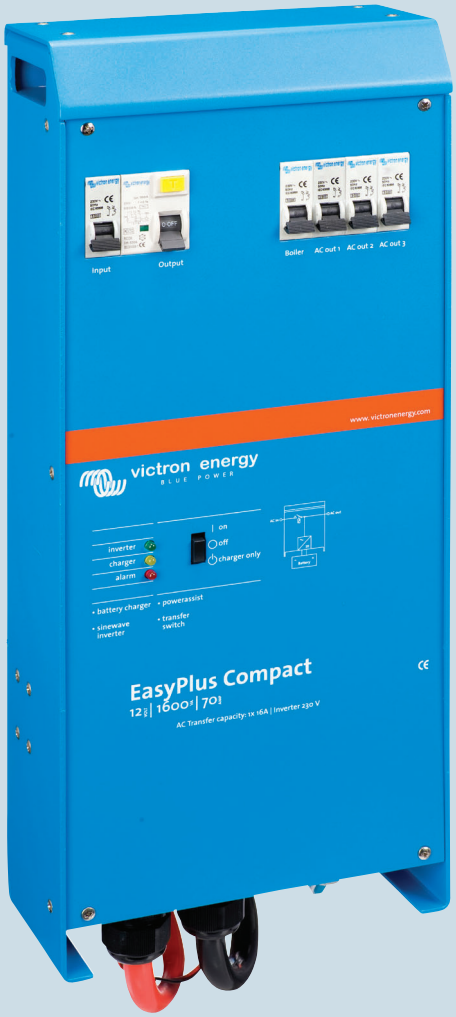
victron energy
BLUE POWER

victron energy
BLUE POWER

EASYPLUS

ENERGY. ANYTIME. ANYWHERE.

EasyPlus



Multi-functional power solution
The EasyPlus is a multifunctional energy system consisting of a powerful sine wave inverter, a sophisticated battery charger, a high speed AC transfer switch and AC distribution in a single light weight and compact enclosure. The system has been designed for those who want to enjoy the comfort and freedom of a complete energy system without spending time on the installation of separate components and difficult technical procedures

Optimum comfort and safety
The EasyPlus guarantees uninterrupted power supply, whenever and wherever you are. Where shore or generator power is limited, the unique PowerAssist® technology makes it possible to boost the total capacity by adding extra energy from the batteries. Optimum safety is guaranteed with the integrated RCD (Residual Current Device) protecting against earth leakage.

5 step installation: quick and easy
The EasyPlus gets its name from the simplicity of installation and use. The system can be installed within five simple steps making significant savings in time as well as space. The EasyPlus provides plugs and sockets for all AC connections and is supplied with the battery cables already fitted so you can save hours in installation time.

Step 1. Select a suitable place for the EasyPlus (as close as possible to the batteries) and install the wall mounting bracket. Attach the EasyPlus to the bracket and secure it with the screws provided.

Step 2. Connect the shore/generator input power and the outgoing circuits (including dedicated water heater feed) to the EasyPlus.

Step 3. Connect the control panel (optional) with the UTP patch lead.

Step 4. Connect the battery cables and temperature sensor to the batteries (also supplied as standard).

Step 5. Switch on the RCD, the AC distribution and the inverter/charger and the system is ready to use.

How does it work?

The EasyPlus is connected to the batteries and to the shore power or generator. The maximum available generator or shore current is set using the dial on the control panel. The power consumers are divided into two groups. The first group consists of the 'regular', low or short term power users such as sockets or kitchen equipment. This group can be fed from both shore/generator and battery power via the inverter. The second group is the 'heavy user' circuit. This can be a water heater or the air-conditioning. In order to protect the batteries from excessive discharge, this group is shore/generator-only and cannot be supplied when the inverter is functioning. Unique PowerAssist® technology protects the shore or generator from being overloaded by adding extra inverter power when needed.

Technical information

12 Volt 1600 VA sine wave inverter (3000 Watt peak power).

70 A charger incl. 4 A trickle charge for start battery.

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

4 Stage adaptive charge technology for quick and accurate battery charging.

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

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

RCD (30 mA/16 A) on AC output.

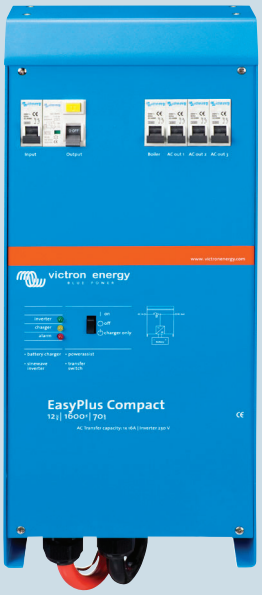
No-break system: uninterrupted switching between shore/generator and inverter.

Battery cables included.

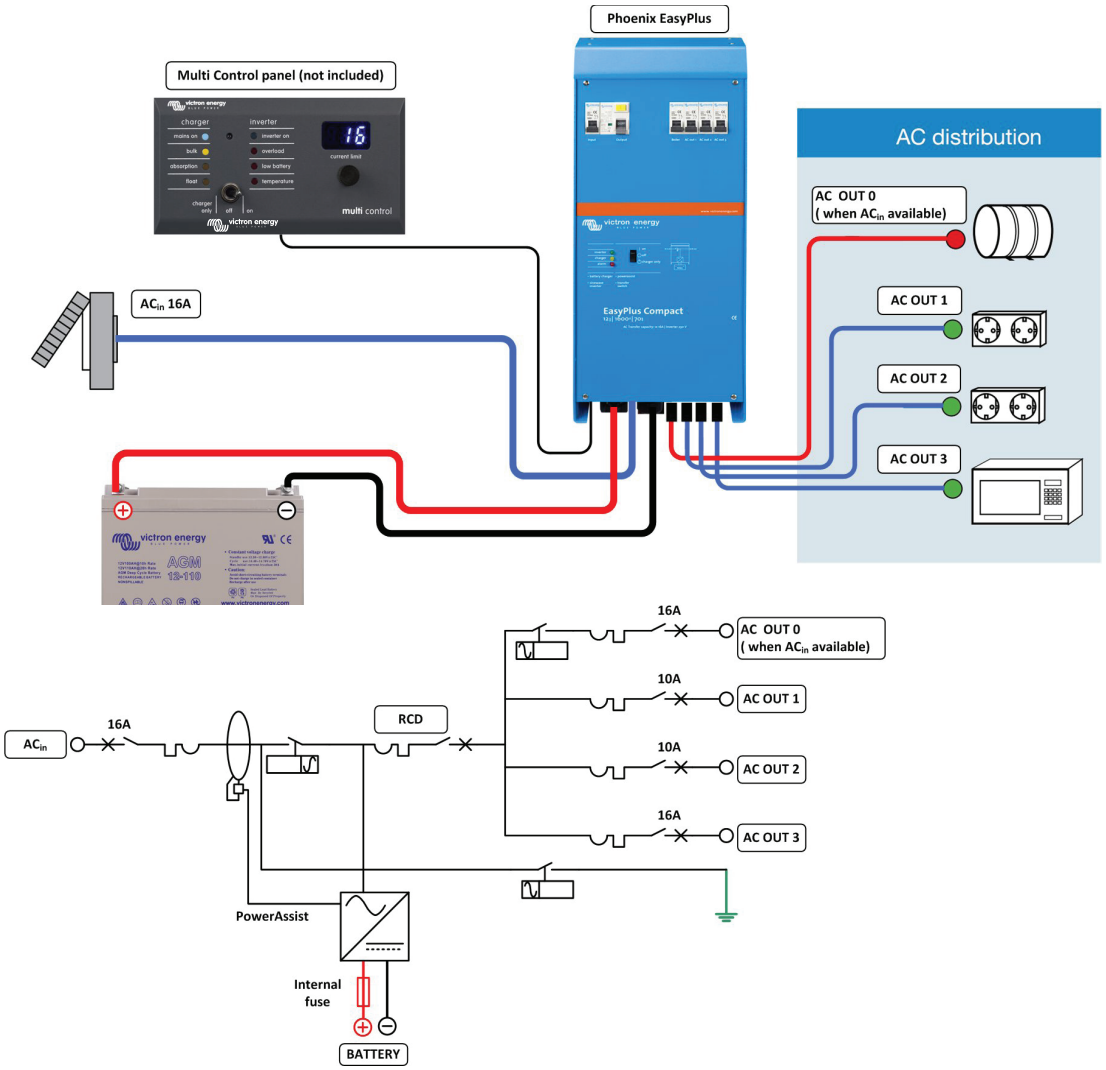
24 Month worldwide warranty.

Dimensions

Height : 510 mm
Width : 214 mm
Depth : 110 mm
Weight : 11,7 Kg



Typical installation and wiring diagram



Self-consumption & energy storage

victron energy
BLUE POWER

Energy. Anytime. Anywhere.

INDEX

Introduction

Self-consumption or grid independence

The primary goal of a self-consumption system is to optimise the use of solar and/or wind power. The major obstacle in such a system is that power generation times do not match with the actual times of power use. This results in a system being forced to import energy from the grid and export it when there is a surplus.

In an optimised self-consumption system, surplus energy is stored locally for local on demand use. Such energy storage is becoming an increasingly attractive proposition, especially with feed-in tariffs decreasing and grid supplies becoming less stable and more expensive.

Self-consumption versus off-grid systems

There are some major considerations which should be taken into account when comparing an off-grid system with a self-consumption system.

An off-grid system is a system that is not (or mostly not) connected to grid power and is used to supply the total energy needs of the complete energy system. Therefore it is sized to cope in a worst case scenario. This worst case scenario can occur when there is simultaneous usage of high loads which then requires a high power inverter for occasional use.

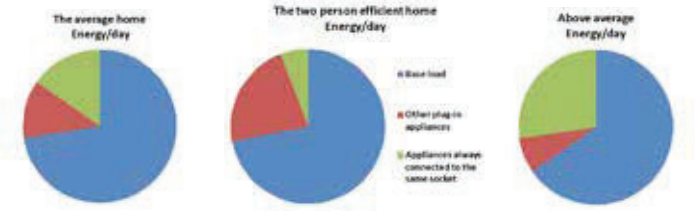
The other worst case scenario is the lack of ability to generate energy in periods of overcast weather and/or wind outages. This results in substantial battery storage to overcome this, which, like the large inverter power situation mentioned above, is only used on occasion.

In general it can therefore be stated that an off-grid system is oversized in both inverter power and storage capacity in order to deal with such situations.

For a self-consumption system this is different, as there is always a grid present. With Grid assist functionality the grid can be used seamlessly, whenever there is a high peak load, meaning the inverter can be sized according to the base load.

The baseload is the part of the total energy-need which generally comes from low powered equipment and these loads continue to draw energy almost constantly over the 24 hours of a day.

Examples of this are heating pumps, chargers and the standby power of household equipment. In order to optimise PV usage and limit the import of energy this base-load is the most efficient part to target.



Avoiding the import of the total energy need is possible but this would require a higher investment in the inverter, as it must then be able to cover for high loads. Most high loads are however peak loads and active over a limited period of time. So even though this requires a high energy supply, the time period is limited and the energy value within this peak-load period is quite low - so the investment in a larger inverter is often not justified.

When considering battery capacity, a self-consumption system is able to work with a smaller battery capacity. The energy stored in such a system is limited to the surplus PV power as part of the generated PV power is directly used by the loads. In this case PV power is sized according to the base load and any surplus energy is used overnight.

Why choose Victron Energy for your Energy Storage system

A wide range of inverter/charger sizes and configurations

Our inverter/charger models range from a small 500VA unit all the way up to a 15kVA unit. Multiple units can be connected in parallel and/or 3-phase configuration. Thus it is possible to create systems ranging in power size from a small single phase system up to an impressive 180kVA 3-phase system.

Reinout Vader showing first inverter

Unrivalled experience with battery storage systems

Victron Energy was founded in 1973, back then we started with providing inverters and chargers for the marine industry. This quickly expanded to the land based and automotive market. We therefore have an unrivalled length of experience with battery storage systems.

DC-Coupled PV or AC-Coupled PV. Or even a combination of both

We can work with DC-Coupled PV: MPPT solar chargers. We have a broad range of efficient MPPT solar chargers. Starting from the MPPT 75V/15A (290 W charger) up to the 250V/100A (5.7kW solar charger).
We can also work with AC-Coupled PV etc. We are compatible with many brands of PV Inverters; with a strong collaboration with Fronius PV Inverters.
We can even combine AC and DC coupled PV in one system.

Excellent remote monitoring and diagnostics tools

Our remote monitoring website (VRM) can display all your systems data in a comprehensive graphical format. System settings can be changed via the portal. Alarms can be received by e-mail.

UPS no-break output, operate without any disruption

Our inverter/charger takes over supplying power to the connected loads in the event of a grid or generator failure. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without any disruption.

Wide range of compatible battery technologies

We sell our own brand of lead acid and lithium batteries. Also, our programmable inverter/chargers work with a wide range of battery technologies, see the logos below.

Battery technologies we work with:

victron energy
BLUE POWER

AQUION ENERGY

RESU

freedom

GARAMANTA

LG Chem

BMZ
THE INNOVATION GROUP

redflow
advanced energy storage

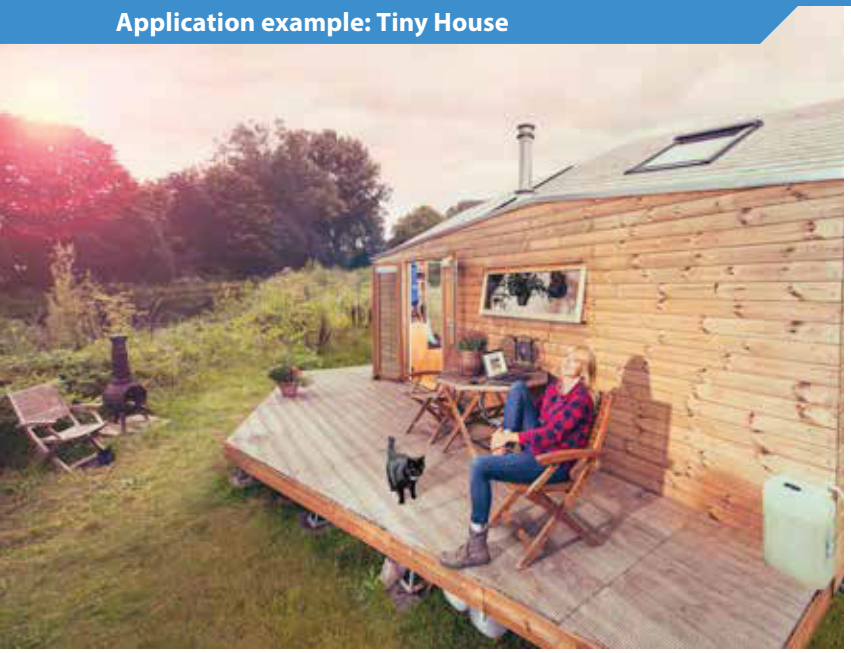
Leclanché
Energy Storage Solutions

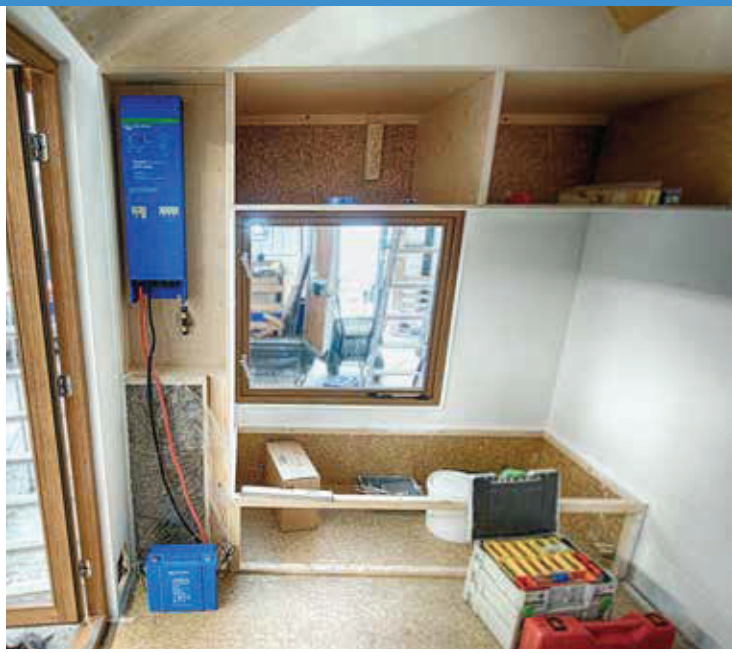
www.axitecsolar.com
AXITEC
high quality german solar brand

BYD

And many more!

Application example: Tiny House





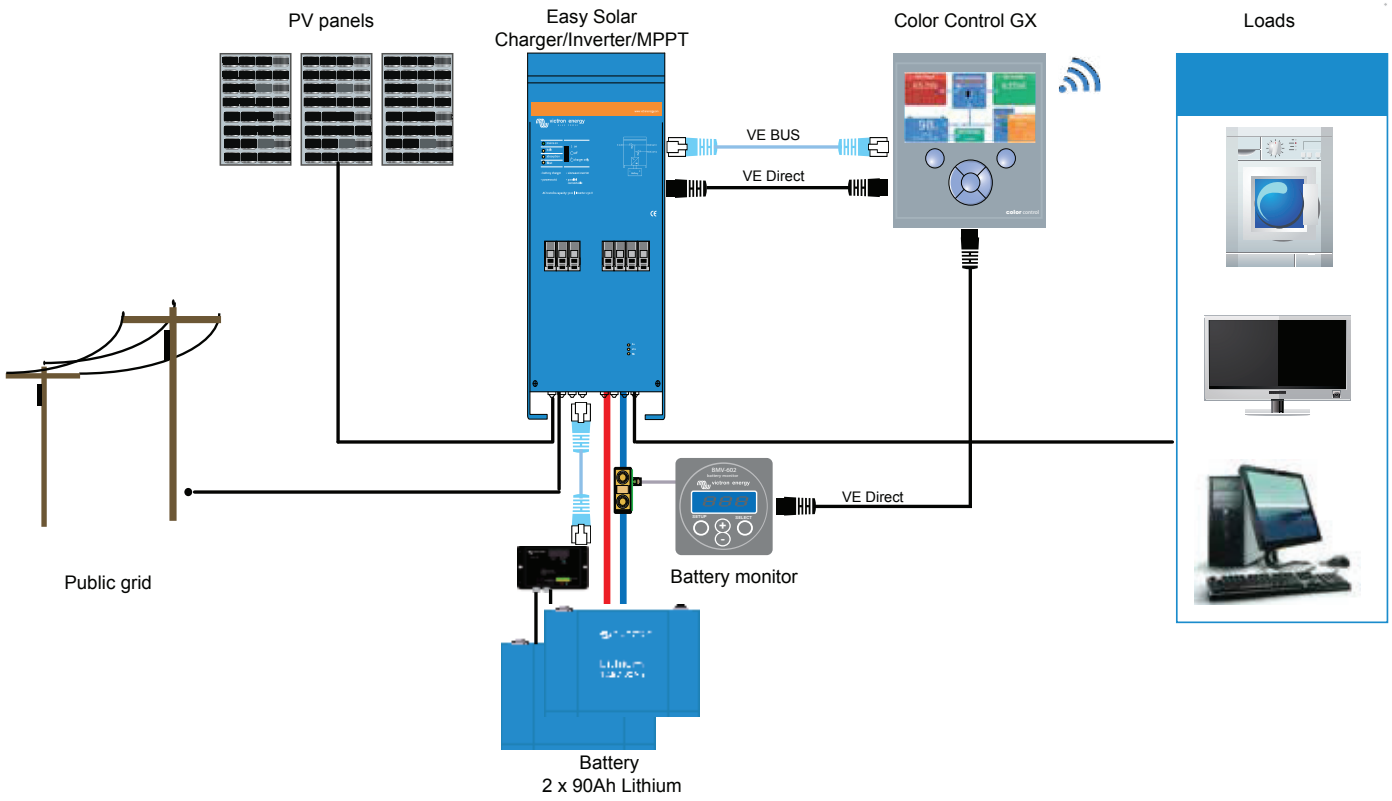
Tiny House

This is an application example of a Tiny House. Tiny Houses are very small homes that enable simple living in a smaller, more efficient space. They are usually made of wood, being creatively designed to maximise the utility of a small living space. The principal reasons for living in a Tiny House are to live sustainably in a financially and environmentally conscious way, whilst at the same time enjoying the resulting freedom.
The Tiny House in the photograph belongs to Marjolein Jonker. She lives in The Netherlands and has built her own Tiny House, together with a team of specialists.

Victron equipment

The Tiny house of Marjolein is equipped with:

- EasySolar
- 2 x 90A Lithium-ion batteries
- BMV-700 Battery Monitor
- Color Control GX



Smartflower POP+

This is an application example of the Smartflower. The Smartflower POP+ can not only turn the sun's energy into electricity very efficiently; it can store it in sufficient quantities too.

Enjoy the energy of the sun. Around the clock, almost independently of the grid

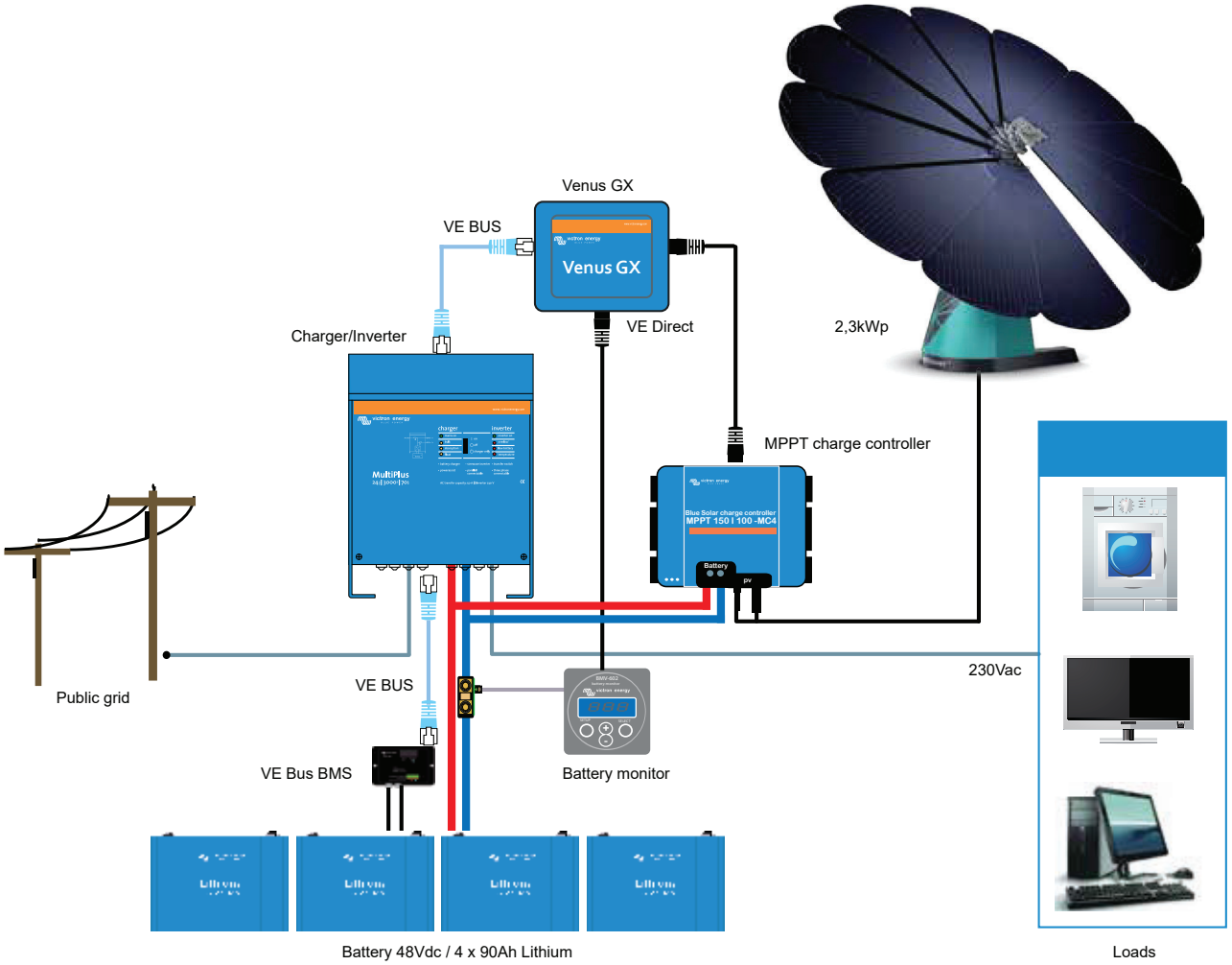
Completely integrated in an innovative all-in-one solar system that works on a plug-and-play principle like any normal household appliance. The intelligent tracking function of the PV modules ensures that the system makes the most efficient use of the sun's energy at all times of the day and year, while the battery is continuously recharged. So you can even enjoy cloudy days with a bright smile on your face.

Monitoring – access to the most important system data

With your personal access to the Monitoring System you can keep an eye on your current production, storage and consumption figures at all times. The system also allows you to make a number of different custom settings.

Victron inside & out

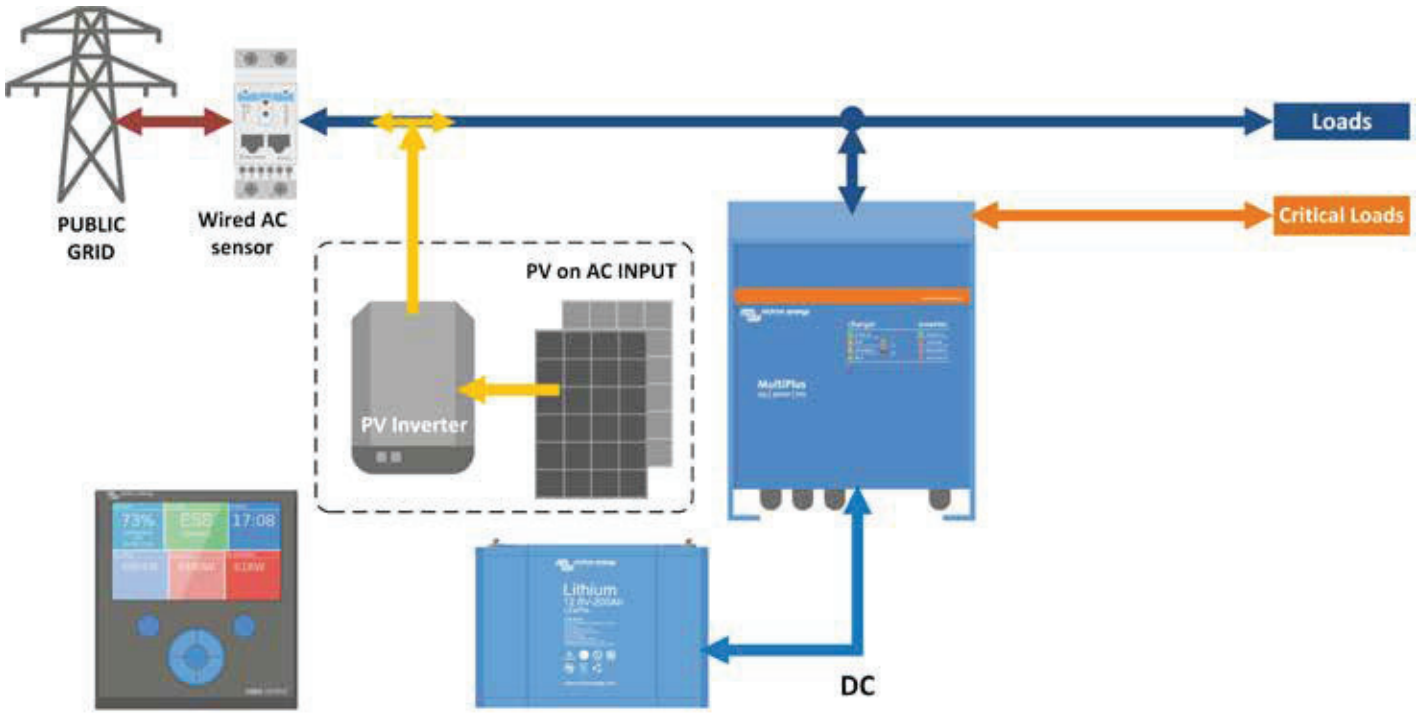
The Smartflower Pop+ uses a Victron Energy inverter, solar charge controller and Lithium batteries, plus this standalone unit connects to Victron Energy's VRM web portal for system monitoring.



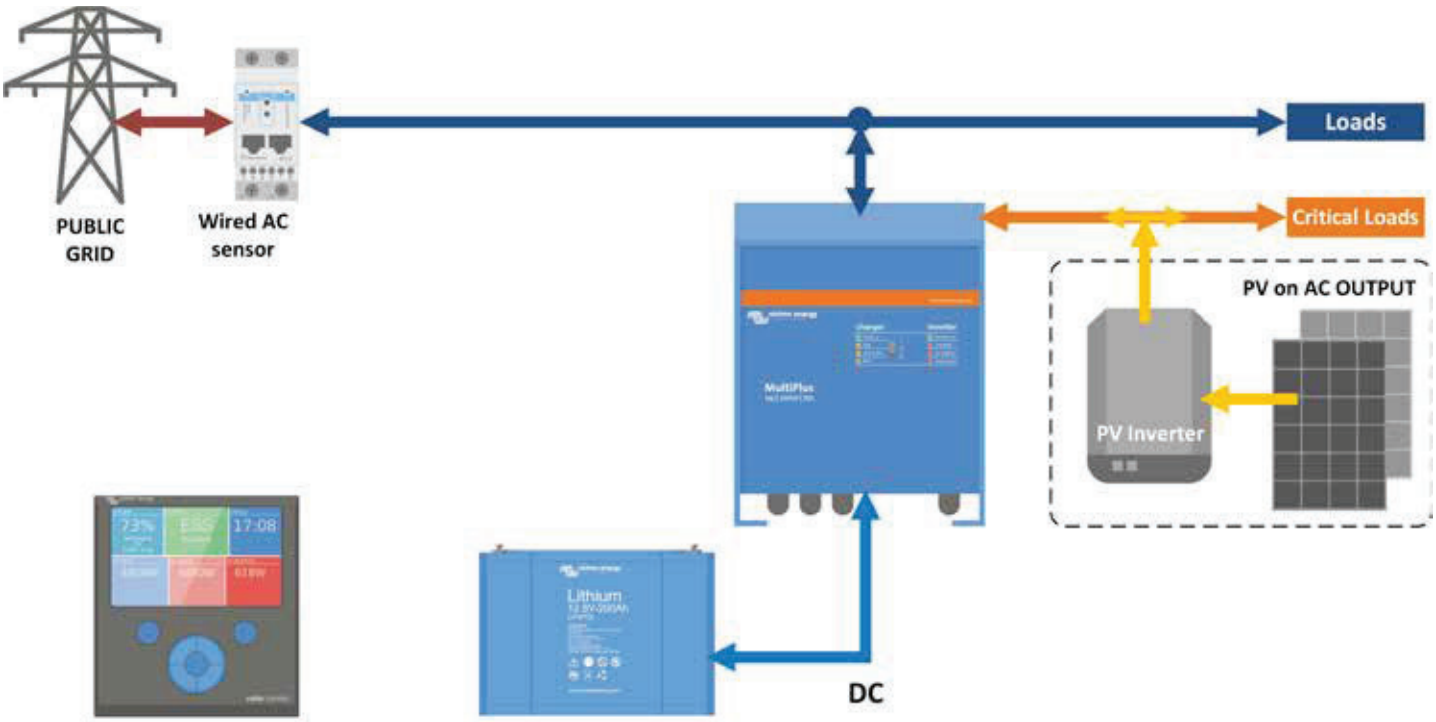
There is a solution for every situation, from simple to more complex solutions. We have different options available: PV in parallel, AC-Coupled PV, DC-Coupled PV or a combination of all these options.

Option 1: PV in parallel

Most practical solution to add battery storage to an existing grid connected PV system.

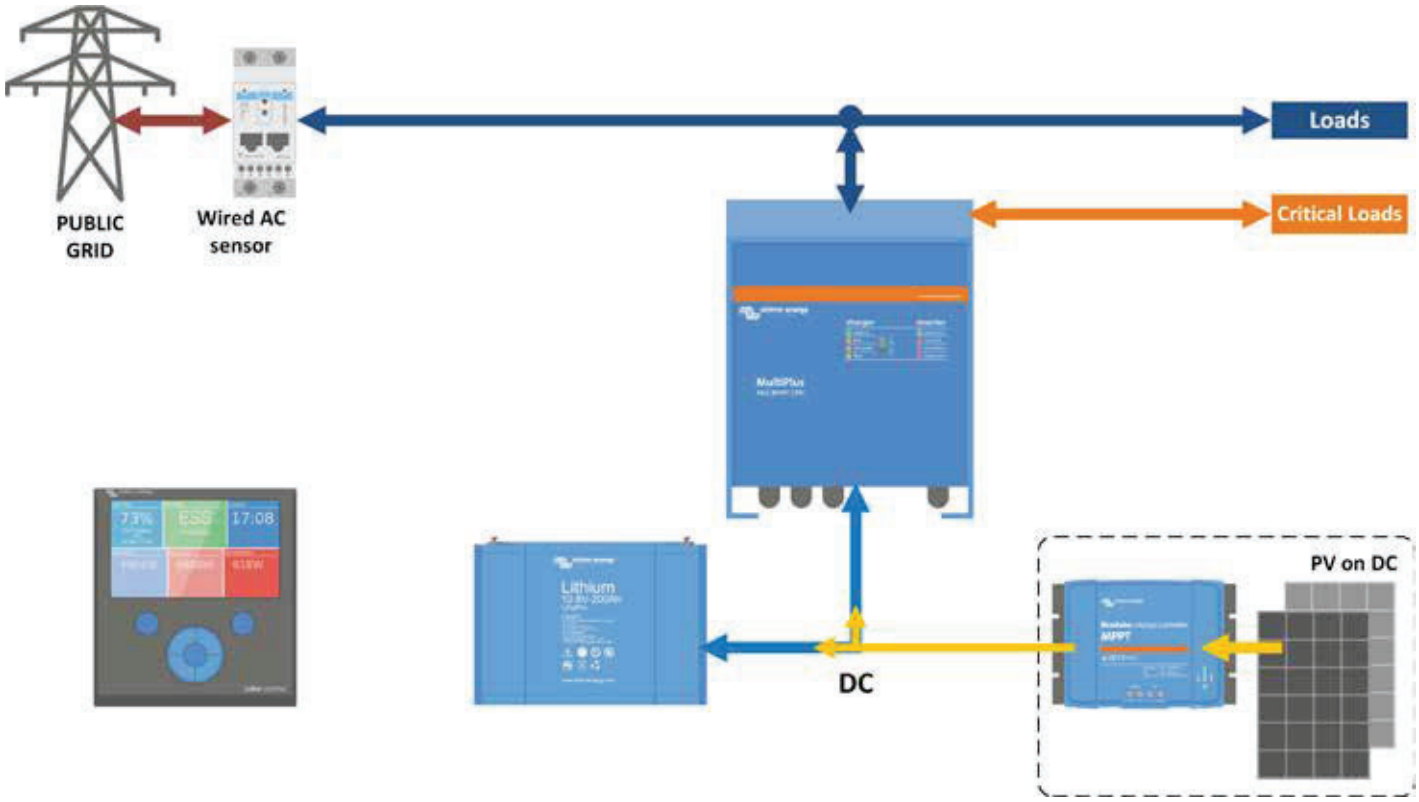


Option 2: AC-Coupled PV

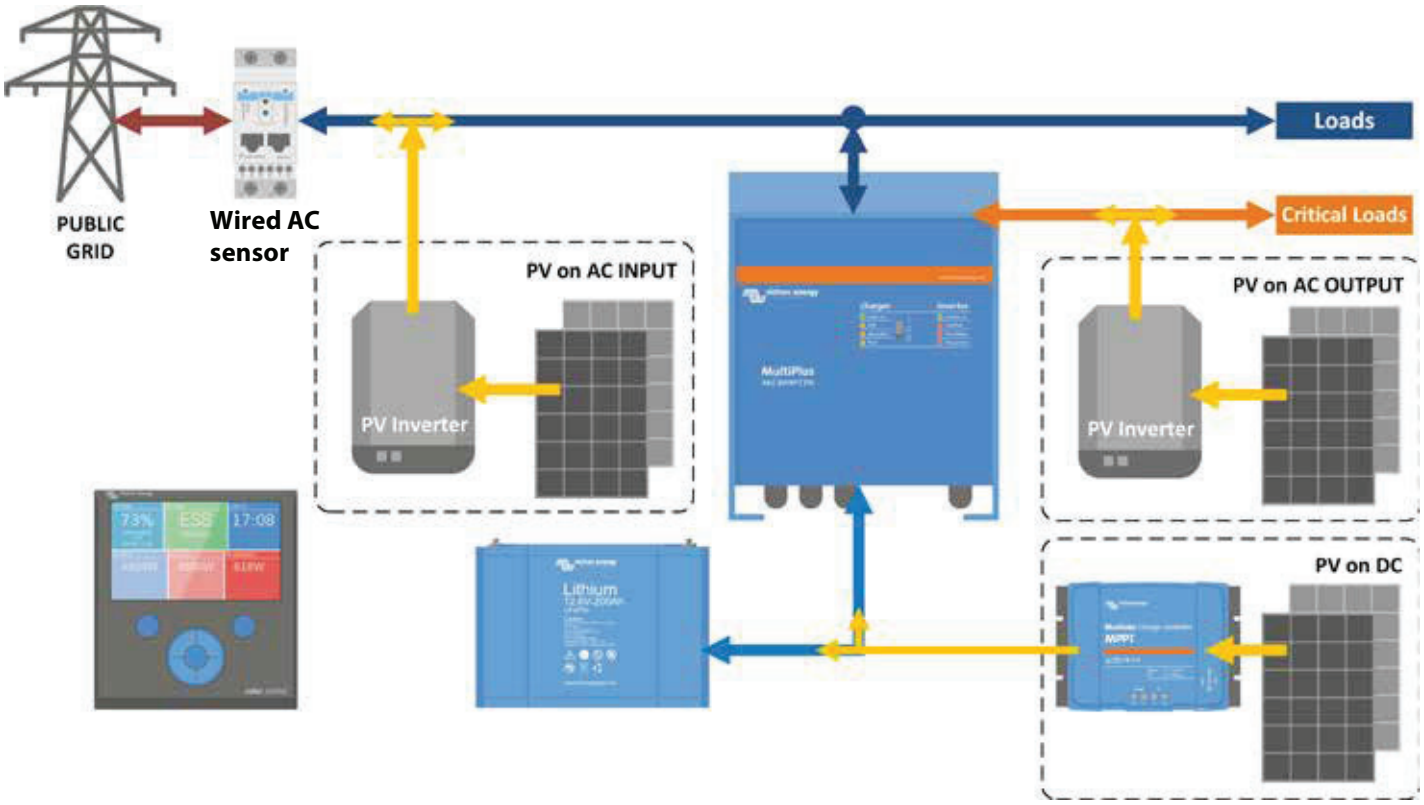


Option 3: DC-Coupled PV

The size of the PV array and the PV inverter is not limited by the maximum nominal power of the inverter/charger.



All options combined



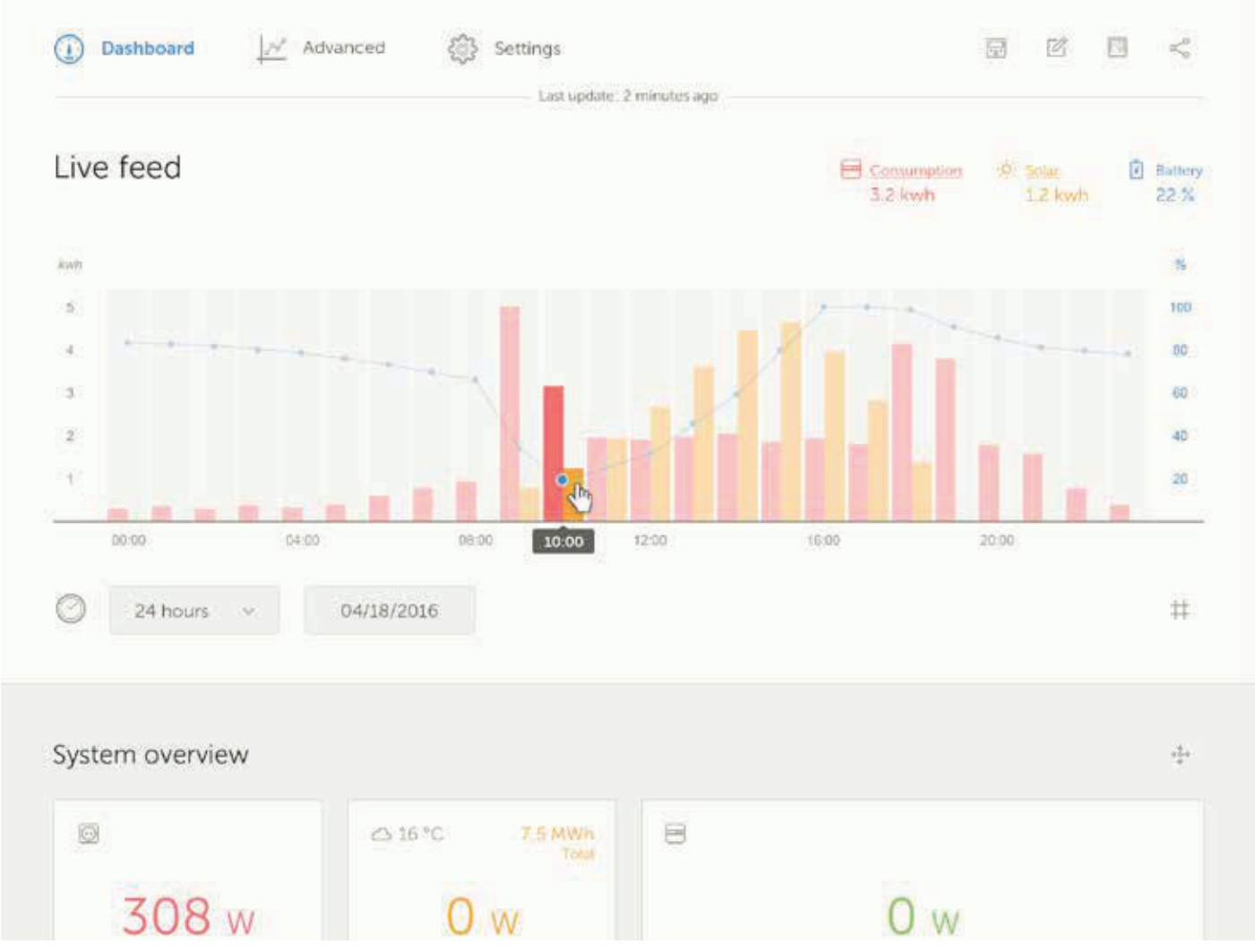
The major considerations for installing a self-consumption system are often financially and/or morally driven. For both, the goal is to minimise the import of grid energy and to optimise the consumption of self-generated power.

Modern inverter and battery monitoring technology helps to achieve this, by detecting how much energy to store and how and when to best use it. Besides this there is another important factor to consider.

This factor is the energy behaviour of the end-user themselves. This can differ between households and it is heavily dependent on circumstances, which can change from day to day. This makes coding the software, to precisely achieve optimal use of energy, quite a challenge.

If for example the washing machine is required on a particular day, the ideal day would be a sunny one just after the battery is (almost) full. Having said that direct power usage is preferable, which saves having to export energy to the grid or use battery power momentarily.

In order to be able to make these kinds of energy use decisions, monitoring is crucial to fine tune and optimise energy use based on ever changing circumstances. This makes monitoring systems an essential feature for every self-consumption system. Tests have shown that users of self-consumption systems with monitoring score a much higher level of self-consumption than those systems which lack it.



VRM: Live feed overview

Color Control GX

Venus GX

Victron Energy self-consumption systems can offer the best of both worlds

By using a Color Control GX, with its easy to use display, a clear system overview will show all the details needed to make crucial decisions as to which loads to use or to delay. Behind the overview screens other advanced information can be found - enough to satisfy even the most data-hungry users.

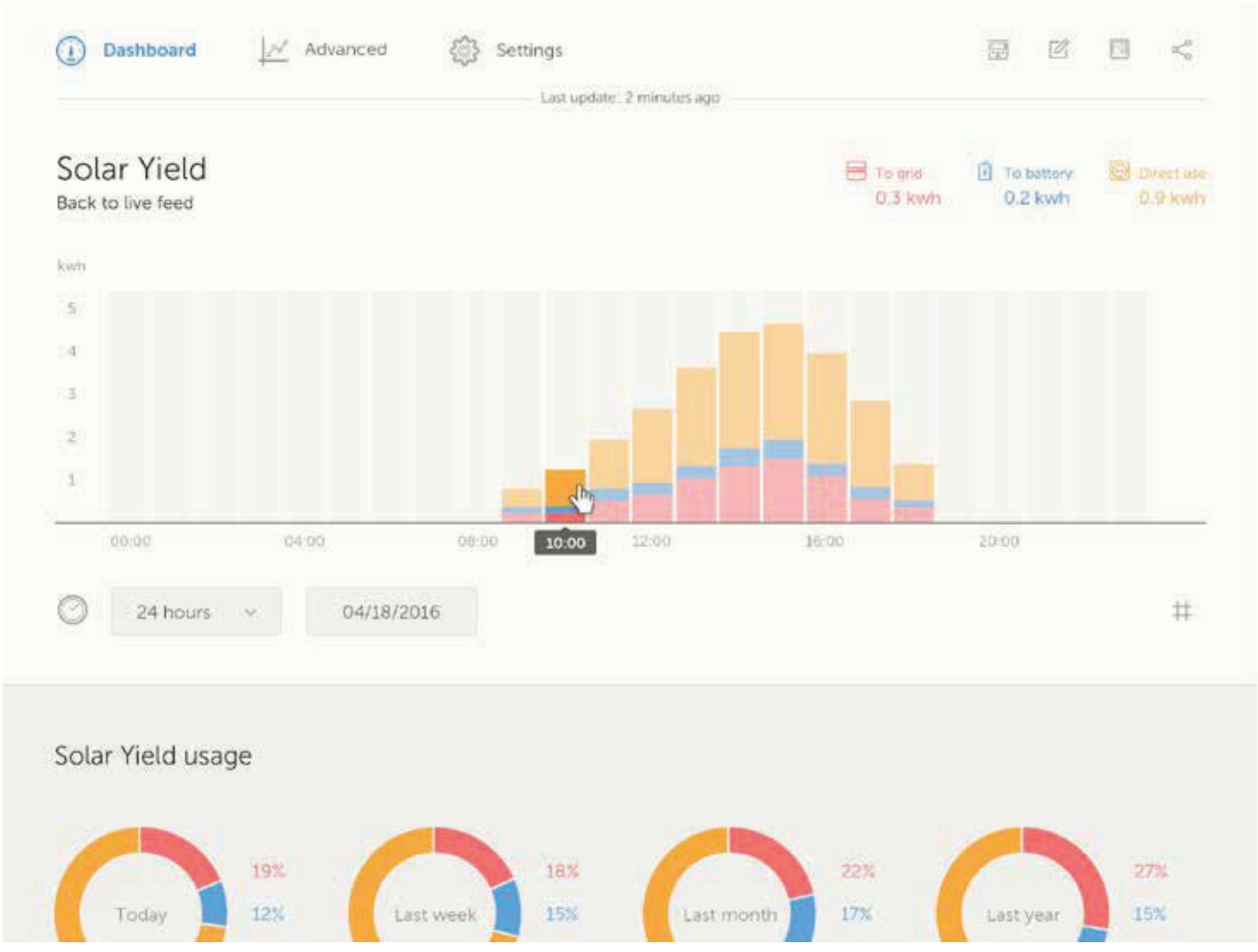
Venus GX

The Venus GX provides the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

VRM Online Portal

All this data is automatically sent to our free remote monitoring website: the VRM Online Portal, which allows even more options. It provides data analysis via the free VRM app which can be used on virtually every smartphone, so even when away from the Color Control GX the system can be easily monitored. Also the webserver is able to provide an advanced system overview, such as calculations of total solar yield, power generation and graphs - for all the equipment connected to the system.

VRM app



VRM: Solar Yield overview

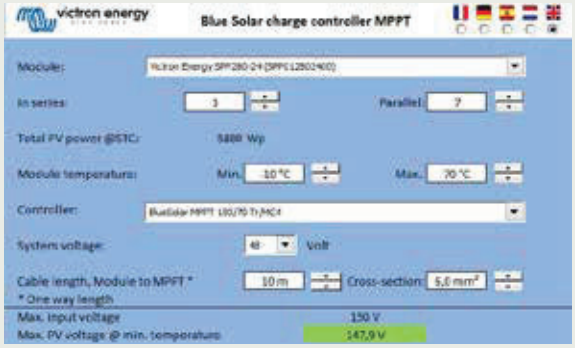
There are a lot of tools available that make it easy to work with Victron Energy products, for both Victron installers as Victron distributors. Whether you would like to configure and read out your Victron products with VictronConnect using your smartphone, tablet or computer or you want to show or share your VRM site.

Instruction videos on Victron youtube channel

On our youtube channel you can watch Victron Energy instruction videos.

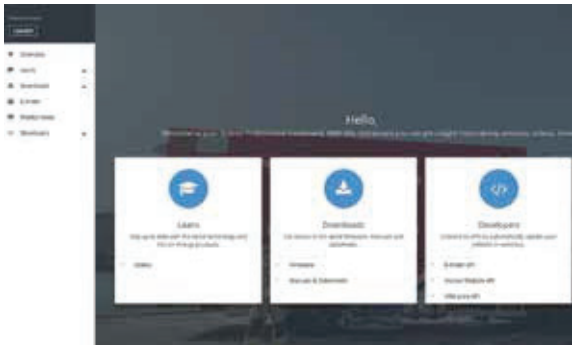
ESS Webinar

There is a webinar about ESS available on our youtube channel, in the languages English, Spanish, German and French.



MPPT Calculator Excel sheet

With the MPPT Calculator Excel sheet you can match solar modules to MPPT charge controllers.



Victron Professional

With Victron Professional you can get insight into training sessions, videos, firmware files, APIs and the latest news. If you already use E-Order you can login with those credentials.

VRM World: View shared VRM sites around the world

Ever wanted to show your clients, friends, colleagues how much solar energy your installation is generating or indeed any other data that you can see on your VRM site? Well now you can – using VRM World.
You need a VRM account to be able to view shared VRM sites. In your VRM portal it is possible to publicly share on VRM World.

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

Battery Monitor

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

Color Control GX

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

Venus GX

The Venus GX provides the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

MPPT Control

The MPPT Control lets you see the status as well as setup all BlueSolar and SmartSolar MPPT Charge Controllers that have a VE.Direct communications port. The new MPPT Control is mounted in the familiar BMV-700 series housing, maintaining a consistent and professional look to your panels and systems monitoring equipment.

Anti-islanding made easy: the anti-islanding box

The anti-islanding box is a complete pre-wired and easy to install anti-islanding device consisting of a Ziehl anti-islanding relay (model UFR1001E or model SPI1021), the required circuit breakers and a 63A contactor.

Energy Meter

The ET112 (for single phase max. 100A) and the ET340 (for three phase max. 65A) Energy Meters are typically used in an Energy Storage System. To measure the power and energy of the whole application at the distribution box. Or to measure the output of a PV Inverter, to display the data on the Color Control GX and the VRM Portal.

AC Current sensor - single phase - max 40A

The AC Current sensor is a simple external current sensor used to measure AC Current, Power (VA) and calculate energy of a PV Inverter connected to the AC input or output of a Multi or Quattro. These values can then be displayed and sent to the VRM-website by the Color Control. The two measurement wires can be connected to the AUX and/or temperature sense input of a Multi or Quattro.

Zigbee to USB converter & Zigbee to RS485

Zigbee to USB converter, DRF2618A, DTK
Zigbee to RS485 converter, DRF2619A, TDK

Ziehl Voltage and frequency relay UFR1001E

The UFR1001E monitors voltage and frequency in plants for own generation of electricity. It fulfills the requirements of VDE-AR-N 4105 bdew-directive, G59/3, G83/2 and ÖVE/ÖNORM E 8001-4-712:2009 for generators connected to the public grid.

For more information, we refer you to the datasheet and certificates below which are available to download and look for the UFR1001E under the Mains monitoring group.

Ziehl Voltage and Frequency Relay SPI1021

Voltage- and Frequency-Relay with integrated Vector-Shift-Relay Grid- and Plant Protection.

For more information, we refer you to the datasheet and certificates below which are available to download.

TECHNICAL INFORMATION

EasySolar 12V and 24V, 1600VA
EasySolar 3kVA & 5kVA with Color Control panel
MultiGrid 3000 VA
MultiPlus-II 3000VA & 5000VA
ECOmulti
Phoenix inverters Smart 1600VA & 2000VA
Phoenix inverters 1200VA - 5000VA 230V
MultiPlus inverter/charger 800VA - 5kVA 230V
Quattro inverter/charger 3kVA - 15kVA 230V
MultiPlus inverter/charger 2kVA and 3kVA 120V
Quattro inverter/charger 3kVA - 10kVA 120V
Color Control GX
Venus GX
BMV-712 Smart: Bluetooth inside
BlueSolar and SmartSolar MPPT Charge Controllers - Overview
SmartSolar charge controller MPPT 75/10, 75/15, 100/15 & 100/20
SmartSolar charge controller MPPT 100/30 & 100/50
SmartSolar charge controller MPPT 150/35
SmartSolar charge controller MPPT 150/45 & MPPT 150/100
SmartSolar charge controller MPPT 250/60, 250/70, 250/85 & 250/100
24V 180Ah Lithium-ion battery and Lynx-ion
Lithium-Ion HE Battery and Lynx Ion BMS

EasySolar 12V and 24V, 1600VA

All-in-one solar power solution

The EasySolar combines a MPPT solar charge controller, an inverter/charger and AC distribution in one enclosure.
The product is easy to install, with a minimum of wiring.

The solar charge controller: Blue Solar MPPT 100/50

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

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

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

AC distribution

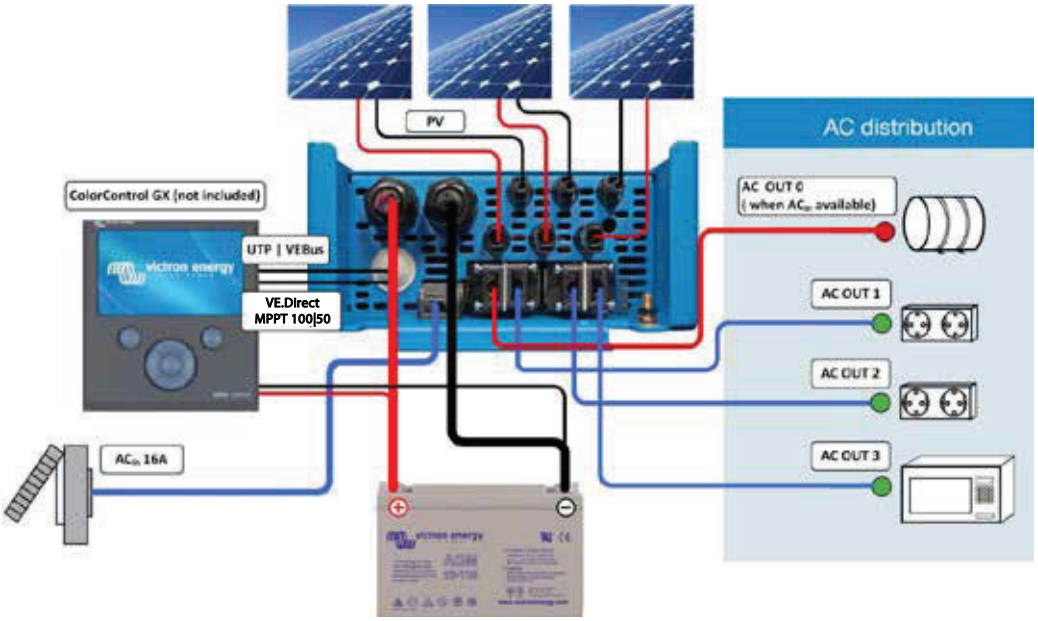
The AC distribution consists of a RCD (30 mA/16 A) and four AC outputs protected by two 10A and two 16A circuit breakers.
One 16A output is controlled by the AC input: it will switch on only when AC is available.

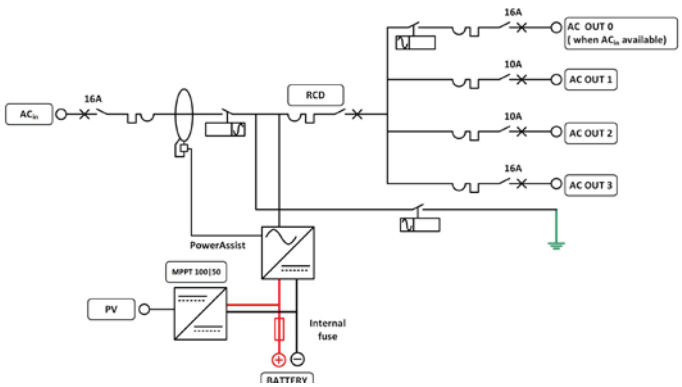
PowerAssist

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

Unique solar application software

Several software programs (Assistants) are available to configure the system for various grid interactive or stand-alone applications.





EasySolar	EasySolar 12/1600/70	EasySolar 24/1600/40
Inverter/charger		
Transfer switch	16A	
INVERTER		
Input voltage range	9,5 – 17V	19 – 33V
'Heavy duty' output AC 0	16A	
Output AC1, 2, 3	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	1600VA / 1300W	
Cont. output power at 40°C	1200W	
Peak power	3000W	
Maximum efficiency	92%	94%
Zero load power	8W	10W
Zero load power in search mode	2W	3W
CHARGER		
AC Input	Input voltage range: 187-265VAC Input frequency: 45 – 65Hz Power factor: 1	
Charge voltage 'absorption'	14,4V	28,8V
Charge voltage 'float'	13,8V	27,6V
Storage mode	13,2V	26,4V
Charge current house battery (4)	70A	40A
Charge current starter battery (A)	4	
Battery temperature sensor	Yes	
Programmable relay (5)	Yes	
Protection (2)	a – g	
Solar Charge Controller		
Model	MPPT 100/50	
Maximum output current	50A	
Maximum PV power, 6a,b)	700W	1400W
Maximum PV open circuit voltage	100V	100V
Maximum efficiency	98%	
Self-consumption	10 mA	
Charge voltage 'absorption', default setting	14,4V	28,8V
Charge voltage 'float', default setting	13,8V	27,6V
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16mV/°C	-32mV/°C
Protection	a - g	
COMMON CHARACTERISTICS		
Operating temp. range	-20 to +50°C (fan assisted cooling)	
Humidity (non-condensing):	max 95%	
ENCLOSURE		
Material & Colour	aluminium (blue RAL 5012)	
Protection category	IP 21	
Battery-connection	Battery cables of 1.5 meter	
PV connection	Three sets of MC4 (PV-ST01) PV connectors.	
230 V AC-connection	G-ST18i connector	
Weight	15kg	
Dimensions (hxwxd)	745 x 214 x 110mm	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29, EN 62109	
Emission / Immunity	EN 55014-1, EN 55014-2, EN 61000-3-3	
Automotive Directive	2004/104/EC	

1) Can be adjusted to 60Hz and to 240V
2) Protection
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 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) Programmable relay which can be set for general alarm, DC under voltage or genset start signal function
6a) If more PV power is connected, the controller will limit input power to 700W resp. 1400W
6b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V

EasySolar 3kVA & 5kVA with Color Control panel

EasySolar 3 kVA

The all-in-one solar power solution

The EasySolar combines a MPPT solar charge controller, an inverter/charger and AC distribution in one enclosure.
The product is easy to install, with a minimum of wiring.

Color Control panel

Two outstanding functions:
- Prioritizes battery charging by the MPPT charge controller
- Connects to the internet, enabling remote monitoring (VRM website) and remote control.

AC distribution

The AC distribution consists of a RCD (30mA / 63A) and four AC outputs protected by two 10A and two 16A circuit breakers.
An additional 16A output is controlled by the AC input: it will switch on only when AC is available.

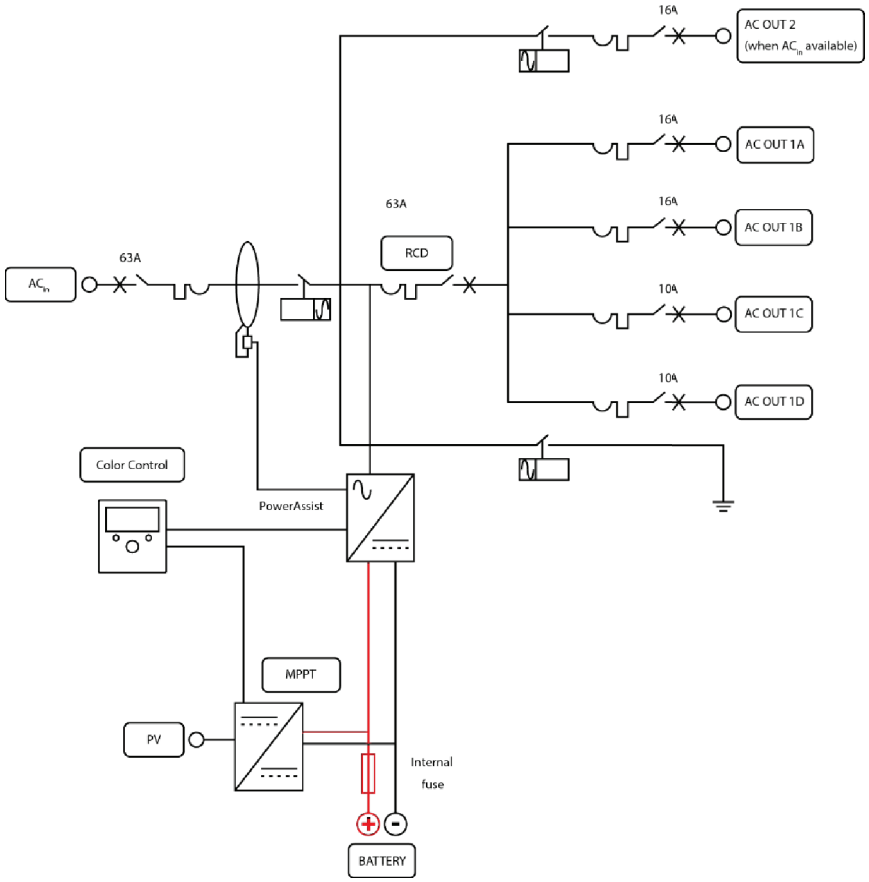
PowerAssist

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

Unique solar application software

Several software programs (Assistants) are available to configure the system for various grid interactive or stand-alone applications.

EasySolar 5 kVA



EasySolar	EasySolar 24/3000/70-50 MPPT150/70	EasySolar 48/3000/35-50 MPPT150/70	EasySolar 48/5000/70-100 MPPT150/100
INVERTER/CHARGER			
Transfer switch	50A	50A	100A
INVERTER			
Input voltage range	19 – 33V	38 – 66V	38 – 66V
'Heavy duty' output AC 2	16 A		
Output AC 1a, 1b, 1c, 1d	Output voltage: 230VAC ± 2% Frequency: 50 Hz ± 0,1% (1)		
Cont. output power at 25°C (3)	3000VA / 2400W	3000VA / 2400W	5000VA / 4000W
Cont. output power at 40°C	2200W	2200W	3700W
Cont. output power at 65°C	1700W	1700W	3000W
Peak power	6000W	6000W	10000W
Maximum efficiency	94%	95%	95%
Zero load power	20W	25W	35W
Zero load power in search mode	10W	12W	15W
CHARGER			
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1		
Charge voltage 'absorption'	28,8V	57,6V	57,6V
Charge voltage 'float'	27,6V	55,2V	55,2V
Storage mode	26,4V	52,8V	52,8V
Charge current	70A	35A	70A
Battery temperature sensor	yes		
Programmable relay (5)	yes		
Protection (2)	a - g		
SOLAR CHARGE CONTROLLER			
Model	MPPT 150/70-MC4	MPPT 150/70-MC4	MPPT 150/100-MC4
Maximum output current (4)	70A	70A	100A
Maximum PV power	2000W	4000W	5800W
Maximum PV open circuit voltage	150V		
Maximum efficiency	98%		
Self-consumption	10mA		
Charge voltage 'absorption', default setting	28,8V	57,6V	57,6V
Charge voltage 'float', default setting	27,6V	55,2V	55,2V
Charge algorithm	multi-stage adaptive		
Temperature compensation	-16 mV / °C	-32 mV / °C	-64 mV / °C
Protection	a – g		
COMMON CHARACTERISTICS			
Operating temp. range	-40 to +65°C (fan assisted cooling)		
Humidity (non-condensing):	max 95%		
ENCLOSURE			
Material & Colour	aluminium (blue RAL 5012)		
Protection category	IP 21		
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)		
PV connection	Two sets of MC4 PV connectors.		Three sets of MC4 PV connectors
230 V AC-connection	Screw terminals 13 mm² (6 AWG)		
Weight	28kg	28kg	48kg
Dimensions (hxwxd)	810 x 258 x 218	810 x 258 x 218	877 x 328 x 241
STANDARDS			
Safety	EN 60335-1, EN 60335-2-29, EN 62109-1		
Emission / Immunity	EN 55014-1, EN 55014-2, EN 61000-3-3, EN 61000-6-3, EN 61000-6-2, EN 61000-6-1		
Anti-islanding	See our website		

1) Can be adjusted to 60Hz and to 240V
2) Protection:
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 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) Programmable relay which can be set for general alarm, DC under voltage or genset start signal function

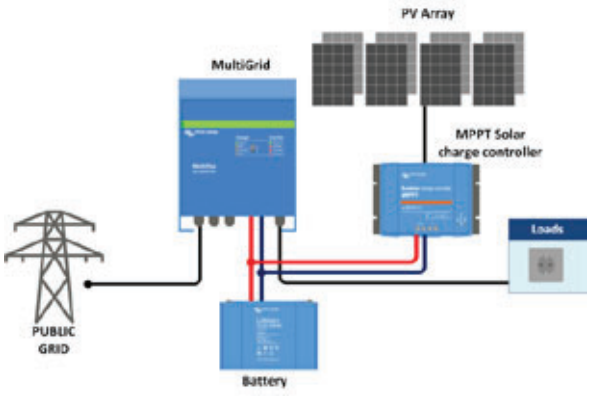
Combined with the flexibility of a MultiPlus bidirectional converter

The MultiPlus range of bidirectional converters is the worldwide product of choice on boats and vehicles to generate AC power, and to recharge batteries, either with shore power or an onboard AC generator.
The MultiPlus also is the industry standard in on-grid and off-grid energy storage systems and is approved for use in energy storage and self-consumption systems in the UK (G83/2 and G59-3-1 standards).

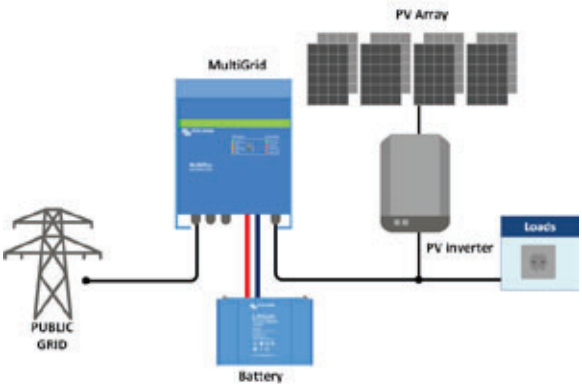
Several hardware and firmware modifications were needed to qualify for VDE-AR-N 4105 and several other country specific energy storage related standards.
The resulting product is the **MultiGrid**.

The MultiGrid fits seamlessly in all common energy storage topologies

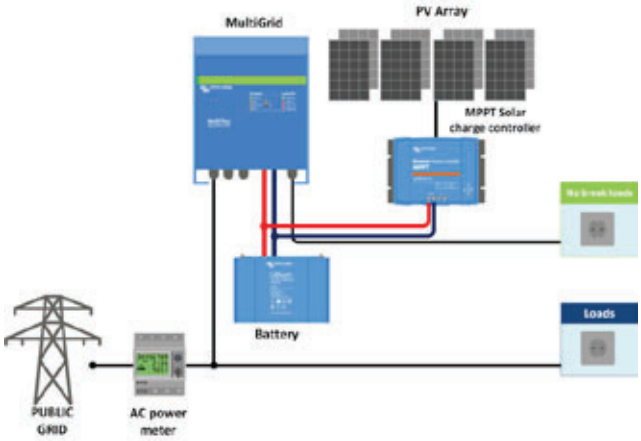
There is no one-size-fits-all solution to energy storage. The building blocks, topology and control systems will depend on local conditions and regulations.
The MultiGrid hardware, together with a wide range of software tools, seamlessly fits in all common topologies, shown in the pictures below.
More detail can be found in our Energy Storage brochure.



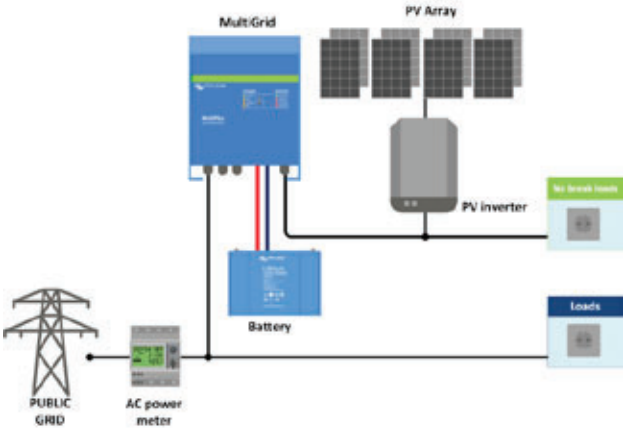
Grid in-line topology with MPPT solar charge controller
A solar charge controller supplies PV power to the battery.
The stored energy is used by the MultiGrid to supply AC power to the load and, if required, to feed excess solar power back into the grid.
In case of a utility power outage, the MultiGrid will disconnect the grid and continue to supply the load.



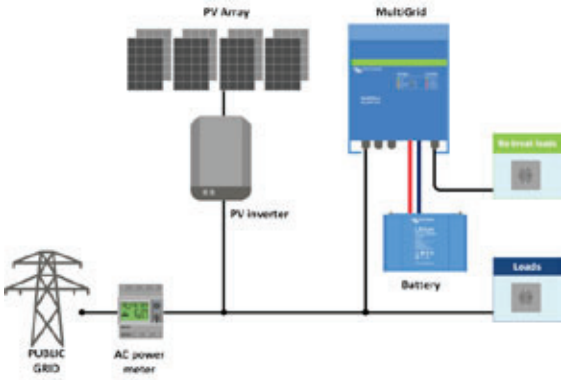
Grid in-line topology with PV inverter
PV power is converted to AC.
The MultiGrid will use excess PV power to charge the batteries or to feed power back into the grid, and will discharge the battery or use power from the grid to supplement a shortage of PV power.
In case of a power outage, the MultiGrid will disconnect the grid and continue to supply the load.



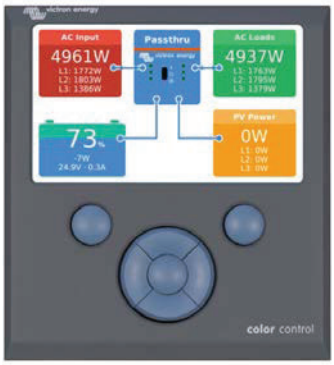
Grid parallel topology with MPPT solar charge controller
Certain critical loads only are protected against a power outage.
The MultiGrid will use data from the power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid.



Grid parallel topology with PV inverter
Certain critical loads only are protected against a power outage.
The MultiGrid will use data from the power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid.



Grid parallel topology with PV inverter
Similar to Hub 4-2 but in this topology the PV inverter will shut down in case of a power outage.
Certain critical loads only are protected against a power outage.
The MultiGrid will use data from the power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid.



Color Control Panel (CCGX)
Provides intuitive system control and monitoring
Besides system monitoring and control the CCGX enables access to our free remote monitoring website: the VRM Online Portal

VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet.
Available for both iOS and Android.

MultiGrid 24 Volt / 48 Volt	24/3000/70 / 48/3000/35
PowerControl & PowerAssist	Yes
Transfer switch	50 A
INVERTER	
Input voltage range	19 – 33 V 38 – 66 V
Output	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)
Cont. output power at 25°C (3)	3000 VA
Cont. output power at 25°C	2400 W
Cont. output power at 40°C	2200 W
Cont. output power at 65°C	1700 W
Peak power (W)	6000 W
Maximum efficiency	94 / 95 %
Zero load power	20 / 25 W
Zero load power in AES mode	15 / 20 W
Zero load power in Search mode	10 / 12 W
CHARGER	
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz
Charge voltage 'absorption'	28,8 / 57,6 V
Charge voltage 'float'	27,6 / 55,2 V
Storage mode	26,4 / 52,8 V
Maximum battery charge current (4)	70 / 35 A
Battery temperature sensor	yes
GENERAL	
Auxiliary output	Yes (16 A) Switches off when no external AC source available
Programmable relay (5)	Yes
Protection (2)	a - g
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration
General purpose com. port	Yes
Remote on-off	Yes
Operating temperature range	-40 to +65°C (fan assisted cooling)
Humidity (non-condensing)	max 95%
ENCLOSURE	
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)
Weight	18 kg
Dimensions (hxwxd)	362 x 258 x 218 mm
STANDARDS	
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2
Emission, Immunity	EN 55014-1, EN 55014-2 EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3
Uninterruptible power supply	IEC 62040-1, AS 620401.1
Anti-islanding	VDE-AR-N 4105, AS/NZS 4777.2, NRS 097-2-1, UTE C15-712-1, C10/11, RD 1699-RD 413, TOR D4

1) Can be adjusted to 60 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) 230 VAC on inverter output
   g) input voltage ripple too high3) Non-linear load, crest factor 3:1
3) Non-linear load, crest factor 3:1
4) At 25°C ambient
5) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function
   AC rating: 230V / 4A, DC rating: 4A up to 35VDC and 1A up to 60VDC

VRM Portal
Our free remote monitoring website (VRM) can display all your systems data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail.

MultiPlus-II 3000VA & 5000VA

A MultiPlus, plus ESS (Energy Storage System) functionality

The MultiPlus-II combines the functions of the MultiPlus and the MultiGrid.
It has all the features of the MultiPlus, plus an external current sensor option which extends the PowerControl and PowerAssist function to 50A resp 100A
It also has all the features of the MultiGrid with built-in anti-islanding and an increasingly long list of country approvals.

PowerControl and PowerAssist - Boosting the capacity of grid or generator power

A maximum generator or grid current can be set. The Multi will then take account of other AC loads and use whatever is extra for battery charging, thus preventing the generator or grid from being overloaded (PowerControl function).
PowerAssist takes the principle of PowerControl to a further dimension. Where peak power is so often required only for a limited period, the Multi will compensate insufficient generator, shore or grid power with power from the battery. When the load reduces, the spare power is used to recharge the battery.

ESS: Energy Storage Systems

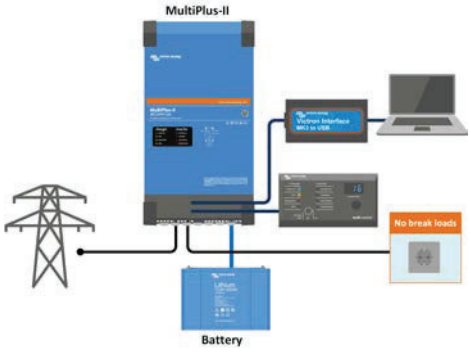
The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems.
Several system configurations are possible, for more detailed information see the ESS Design and configuration manual.

On-site monitoring and control

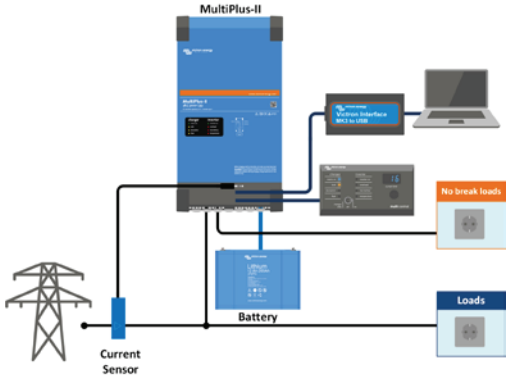
Several options are available: Battery Monitor, Digital Multi Control Panel, Color Control Panel, Bluetooth (Venus GX or Color Control panel needed), laptop or computer.

Remote configuring and monitoring

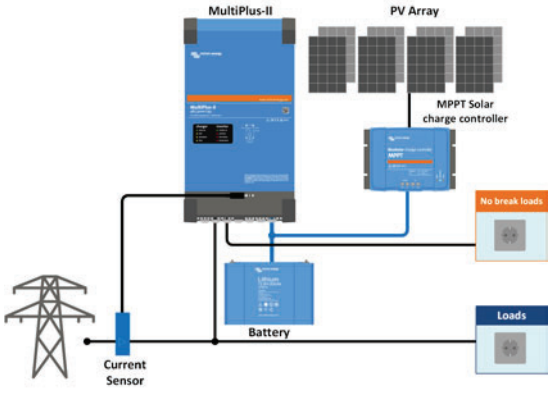
Install a Venus GX or a Color Control Panel to connect to the internet.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.
When connected to the Ethernet, systems can be accessed remotely and settings can be changed.



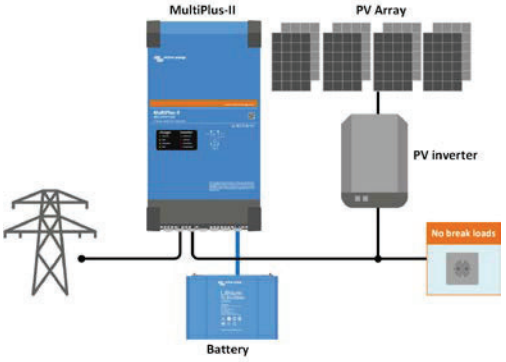
Standard mobile or off-grid application
Loads that should shut down when AC input power is not available can be connected to a second output (not shown). These loads will be taken into account by the PowerControl and PowerAssist function in order to limit AC input current to a safe value.



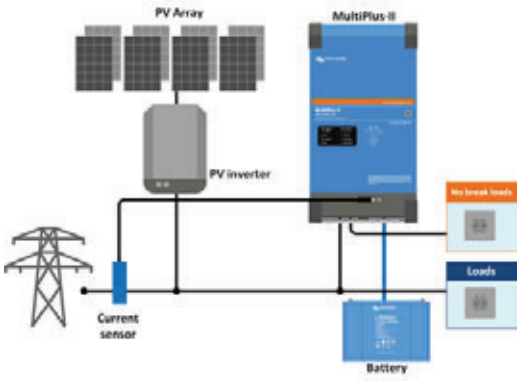
Standard mobile or off-grid application with external current sensor
Maximum current sensing range: 50A resp 100A



Grid parallel topology with MPPT solar charge controller
Certain critical loads only are protected against a power outage.
The MultiPlus-II will use data from an external AC current sensor or power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid. In case of a power outage, the MultiPlus-II will continue to supply the critical loads



Grid in-line topology with PV inverter
PV power is directly converted to AC.
The MultiPlus-II will use excess PV power to charge the batteries or to feed power back into the grid, and will discharge the battery or use power from the grid to supplement a shortage of PV power. In case of a power outage, the MultiPlus-II will disconnect the grid and continue to supply the loads.



Grid parallel topology with PV inverter
In this topology the PV inverter will shut down in case of a power outage.
The MultiPlus-II will use data from the external AC current sensor or power meter to optimise self-consumption and, if required, to prevent back feed of excess solar power into the grid.

Color Control Panel (CCGX)
Provides intuitive system control and monitoring
Besides system monitoring and control the CCGX enables access to our free remote monitoring website: the VRM Online Portal

VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet.
Available for both iOS and Android.

VRM Portal
Our free remote monitoring website (VRM) will display all your system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail.

MultiPlus-II	48/3000/35-32	48/5000/70-50
PowerControl & PowerAssist	Yes	
Transfer switch	32 A	50 A
Maximum AC input current	32 A	50 A
INVERTER		
DC Input voltage range	38 – 66 V	
Output	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	3000 VA	5000VA
Cont. output power at 25°C	2400 W	4000W
Cont. output power at 40°C	2200 W	3700W
Cont. output power at 65°C	1700 W	3000W
Maximum apparent feed-in power	2500VA	4000VA
Peak power	5500 W	9000W
Maximum efficiency	95 %	96%
Zero load power	11 W	18W
Zero load power in AES mode	7 W	12W
Zero load power in Search mode	2 W	2W
CHARGER		
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz	
Charge voltage 'absorption'	57,6 V	
Charge voltage 'float'	55,2 V	
Storage mode	52,8 V	
Maximum battery charge current (4)	35 A	70A
Battery temperature and voltage sensor	VE.Bus Smart dongle (optional)	
GENERAL		
Auxiliary output	Yes (32 A)	
External AC current sensor (optional)	50 A	100 A
Programmable relay (5)	Yes	
Protection (2)	a - g	
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration	
General purpose com. port	Yes, 2x	
Remote on-off	Yes	
Operating temperature range	-40 to +65°C (fan assisted cooling)	
Humidity (non-condensing)	max 95%	
ENCLOSURE		
Material & Colour	steel, blue RAL 5012	
Protection category	IP22	
Battery-connection	Two M6 bolts	
230 V AC-connection	Screw terminals 13 mm² (6 AWG)	
Weight	18 kg	29 kg
Dimensions (hxwxd)	499 x 268 x 141 mm	560 x 320 x 141 mm
STANDARDS		
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2	
Emission, Immunity	EN 55014-1, EN 55014-2 EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3	
Uninterruptible power supply	IEC 62040-1, AS 620401.1	
Anti-islanding	VDE-AR-N 4105, TOR-D4, AS/NZS 4777.2, NRS 097-2-1, UTE C15-712-1, C10/11, RD 1699-RD 413, G59/3-2, G83/2	

1) Can be adjusted to 60 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) 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) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. AC rating: 230V / 4A, DC rating: 4A up to 35VDC and 1A up to 60VDC

Current sensor 100A:50mA
To implement PowerControl and PowerAssist and to optimize self-consumption with external current sensing.
Maximum current: 50A resp. 100A
Length of connection cable: 1 m.

Digital Multi Control Panel
A convenient and low-cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

ECOmulti

BIDERECTIONAL CONVERTER	
GridAssist function	In case of overload the ECOmulti will import power from the grid to prevent system shutdown.
Maximum AC current feed-through	50 A
AC voltage	230 V 50 Hz single phase
Cont. output power at 25 °C	3000 VA
Cont. output power at 25 °C	2500 W
Cont. output power at 40 °C	2200 W
Peak power	6000 W
Maximum efficiency	94%
Power factor range (when connected to the grid)	0,7 inductive to 0,7 capacitive (programmable)
Zero-load power (W)	15 W
Zero load power in AES mode	10 W (island mode operation with AC output lowered to 200 V when load < 50 Watt)
Charge voltage 'absorption'	28,2 V
Charge voltage 'float'	26,7 V
Maximum charge current	70 A
Maximum battery depth of discharge (DoD)	80%
Auxiliary output	To connect additional loads once the battery has been fully charged: 16 A relay
Programmable relay	For monitoring, alarm or other purposes
VE.Bus communication port	For parallel and three phase operation, remote monitoring, remote control and system integration
General purpose communication port	Yes
Remote on-off	Yes
BATTERY	
Technology	Lithium Iron Phosphate
Nominal voltage	25,6 V
Nominal energy at 25°C	2,3 kWh
Nominal capacity at 25°C	90 Ah
Nominal capacity at 0°C	72 Ah
Nominal capacity at -20°C	45 Ah
Battery Management System	Cell balancing, and system shutdown in case of cell over voltage, cell under voltage and over temperature
Cycle life, 80% DoD	2000 cycles
Cycle life, 70% DoD	3000 cycles
Cycle life, 50% DoD	5000 cycles
Max storage time at 25 °C	1 year
OTHER	
Display	Graphical display Graphical User Interface (GUI) Ethernet (standard) and Wifi (optional) for remote monitoring and control Data storage and graphical display on vrm.victronenergy.com Android and iPhone apps
Operating temperature	-20 to + 40°C
Storage temperature	-40 to + 50°C
Protection category	IP22
Humidity	95% non condensing
Warranty	System: 5 years Battery: 3 years full warranty plus 7 years prorated warranty
ENCLOSURE	
Colour	Blue RAL 5012
Weight	Without battery: 28 kg With battery: 60 kg
Dimensions (hxwxd)	475 x 575 x 360 mm
STANDARDS	
Safety	EN 60335-1, EN 60335-2-29, VDE-AR-N 4105
Emission, Immunity	EN55014-1, EN 55014-2, EN 61000-3-3

victron energy
BLUE POWER

ECOmulti

simple wall mounted energy storage solution

Nighttime
During the night the **ECOmulti** is disconnected from the grid. The home is powered by energy stored in the battery. The **ECOmulti** will reconnect the grid when the battery is discharged.

Battery charging
The next day, when the PV array produces sufficient power to supply the loads and to start charging the battery, the **ECOmulti** will regulate charge current to absorb nearly 100% of the surplus PV power.

Discharging during the day
When PV output is reduced by clouds or when a power hungry load is switched on, resulting in no surplus PV power available, battery charging will stop. Insufficient PV power will be supplemented by power from the **ECOmulti**. In case of overload power will be imported from the grid to supplement power from the **ECOmulti** (GridAssist function), and system shut down due to overload will be prevented.

Battery fully charged
Once the battery is fully charged, additional loads (for example the water heater) can be switched on, or surplus power will be exported to the grid.

End of the day
The **ECOmulti** disconnects from the grid about 10 minutes after PV power has become insufficient to provide any charge current. In order to prevent false disconnections due to lack of sun during the day, the inverter/charger also uses an internal timer to predict the end of the day.

UPS function
When the grid fails, the **ECOmulti** will continue to power the home.

Sizing the PV array

Sufficient energy must be harvested to recharge the battery and to power the home, even on a reasonably clear winter day.

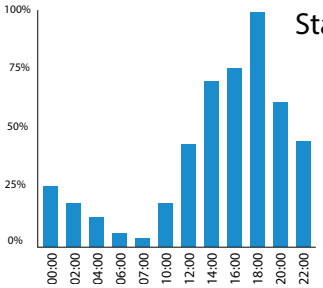
At roughly 50 degrees latitude (Seattle, London, Amsterdam, Berlin, München) the two person energy conscious household will need a 2,5 kWp array. A four person household would need a 5 kWp array.

At roughly 30 to 40 degrees latitude (Los Angeles, Marseille, Sevilla) a 1 kWp resp. 2 kWp array will do.

A larger PV array will increase feedback into the grid, but not substantially increase battery utilization and self sufficiency.

Increasing storage capacity

More battery storage capacity will reduce feedback into the grid and increase self sufficiency, especially during the summer season.
To increase self sufficiency during wintertime both the battery and the PV array have to be enlarged.



ECOmulti app

Why 2,3 kWh?

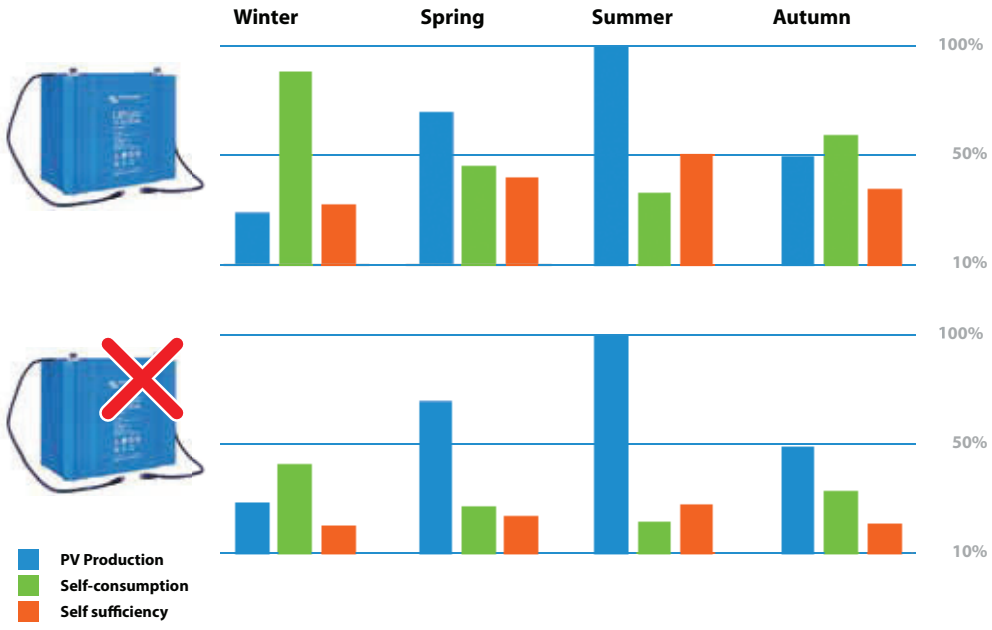
Whenever PV output exceeds consumption, storing excess output for later use will increase self-consumption.

However

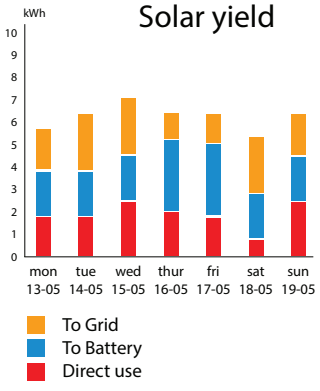
- PV harvest will fluctuate from season to season, from day to day and also within the day.
- Electricity consumption is likewise fluctuating: working days, weekends and holiday periods will all result in different consumption patterns.

A 2,3 kWh Li-ion battery is an efficient solution for a two person energy conscious household. Energy consumption from dusk to dawn will be 2 kWh or more, even when no energy hungry appliances like a dishwasher or clothes dryer are used. A fully charged 2,3 kWh battery will therefore be discharged before the sun starts shining again.

The average household with two children would fully utilize a 4,6 kWh Li-ion battery; one additional battery module.



Typical seasonal variations at roughly 50 degrees latitude ~ Seattle, London, Amsterdam, Berlin, München ~ with battery and without battery.



Two person energy conscious household		**Four person energy conscious household**	
Consumption:	2500 kWh per year	Consumption:	4500 kWh per year
PV array:	2,5 kWp	PV array:	5 kWp
Battery:	2,3 kWh Li-ion	Battery:	4,6 kWh Li-ion

A simple wall mounted energy storage solution

The **ECOmulti** can be wall mounted, is easy to install, easy to program and easy to operate.

Extremely flexible

- Energy storage can be increased by adding battery modules.
- AC power can be increased by paralleling **ECOmulti** modules.
- Three **ECOmulti** modules can be configured for three phase operation.
- Two **ECOmulti** modules can be configured for split phase operation.

More self-consumption, more independence

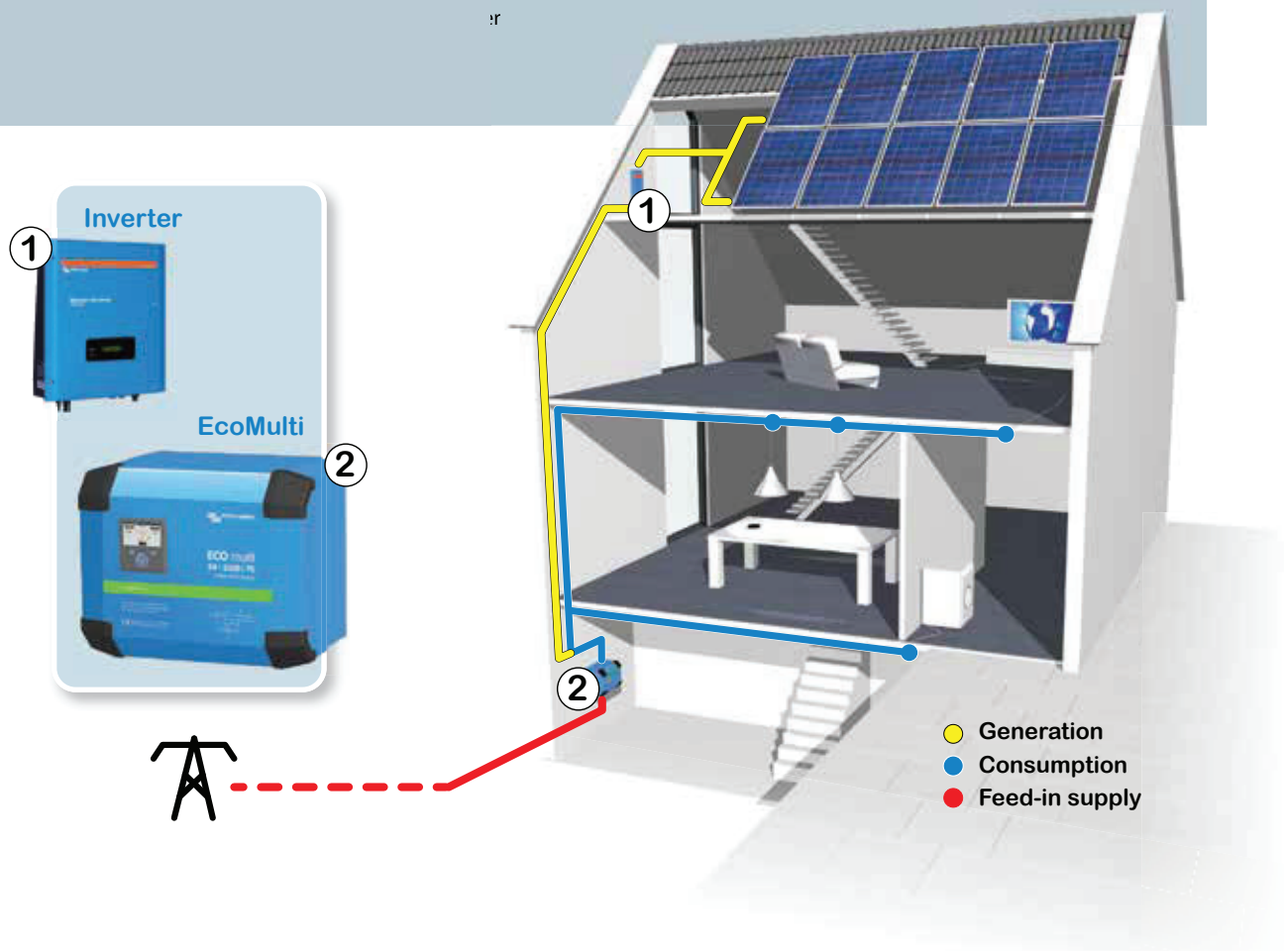
With 2,3 kWh Li-ion storage capacity and a 3 kVA bidirectional inverter, the **ECOmulti** reduces dependence on power from the grid.

The growing interest in self-consumption is driven by increasing retail electricity prices and simultaneously decreasing feed in tariffs. Feed in tariffs are decreasing a. o. because it becomes increasingly difficult, and expensive, to ensure stability of the grid as more solar and wind power comes on line. Simultaneously, the retail price of electricity is increasing, to cover these same costs plus the cost to keep conventional power plants in hot standby to back-up renewable power generation in case the sun is not shining and/or the wind is not blowing.

The **ECOmulti** meets the German interconnection standard *VDE-AR-N 4105* and the Incentive Program for Solar Energy Storage Systems *Marktanreizprogramm für Batteriespeicher.*

With Intelligent Battery and Load Management the **ECOmulti** can limit power export to the grid to at most 60% of the installed Wp capacity; *KfW-Programm Erneuerbare Energien "Speicher".*

According to the Fraunhofer-Institut für Solare Energiesysteme (ISE), a household that consumes 4500 kWh per year can reduce energy import from the grid by 60% when installing a 5 kWp solar array combined with 4 kWh usable energy storage.



Phoenix Inverter
Smart 12/2000

Bluetooth built-in: fully configurable with a tablet or smartphone

- Low battery voltage alarm
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage: 210 - 245V
- Frequency: 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level
- Alarm relay

Monitoring:

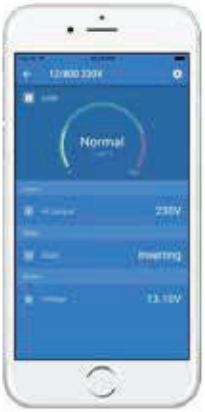
- In- and output voltage, load and alarms

VE.Direct communication port

The VE.Direct port can be connected to a computer (VE.Direct to USB interface cable needed) to configure and monitor the same parameters.

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.



High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value. Once in standby the inverter will switch on for a short period every 2,5 seconds (adjustable).
If the load exceeds the preset level, the inverter will remain on.

Remote on/off

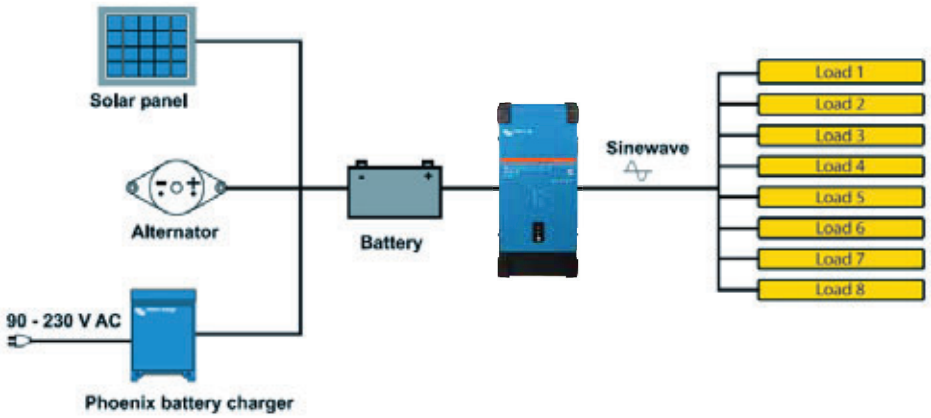
A remote on/off switch or relay contact can be connected to a two pole connector.
Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

LED diagnosis

Please see manual for a description.

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

For our low power inverters we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption. Alternatively use a MultiPlus with built-in transfer switch.



Phoenix Inverter Smart	12/1600 24/1600 48/1600	12/2000 24/2000 48/2000
Parallel and 3-phase operation	No	
INVERTER		
Input voltage range (1)	9,3 – 17V 18,6 – 34V 37,2 – 68V	
Output	Output voltage: 230VAC ±2% 50 Hz or 60Hz ± 0,1% (1)	
Cont. output power at 25°C (2)	1600VA	2000VA
Cont. output power at 25°C	1300W	1600W
Cont. output power at 40°C	1200W	1450W
Cont. output power at 65°C	800W	1000W
Peak power	3000VA	4000VA
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off,	
Max. efficiency 12/ 24 /48 V	92 / 94 / 94%	92 / 94 / 94%
Zero load power 12 / 24 / 48 V	8 / 9 / 11W	8 / 9 / 11W
Zero load power in ECO mode	0,6 / 1,3 / 2,1W	0,6 / 1,3 / 2,1W
GENERAL		
Programmable relay (2)	Yes	
Stop & start power ECO-mode	adjustable	
Protection (3)	a - g	
Bluetooth wireless communication	For remote monitoring and system integration	
VE.Direct communication port	For remote monitoring and system integration	
Remote on-off	Yes	
Common Characteristics	Operating temperature range: -40 to +65°C (fan assisted cooling) Humidity (non-condensing): max 95%	
ENCLOSURE		
Common Characteristics	Material & Colour: stainless steel (blue RAL 5012; and black RAL 9017) Protection category: IP 21	
Battery-connection	M8 bolts	
230 V AC-connection	Screw terminals	
Weight	12kg	13kg
Dimensions (hxwhd)	485x219x125mm	485x219x125mm
STANDARDS		
Safety	EN 60335-1	
Emission Immunity	EN 55014-1 / EN 55014-2/ IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3	
Automotive Directive	ECE R10-5	

1) Non-linear load, crest factor 3:1
2) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 1A up to 60VDC

3) 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 is intended for remote on/off control of all VE.Direct Phoenix inverters

Color Control GX
Provides monitor and control. Locally, and also remotely on the VRM Portal.

VE.Direct to USB interface
Connects to an USB port.

Bluetooth wireless communication
Connects to a smart phone (both iOS and Android).

BMV-712 Smart 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).

Phoenix inverters 1200VA - 5000VA 230V

Phoenix Inverter
24/5000

SinusMax - Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with 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 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).

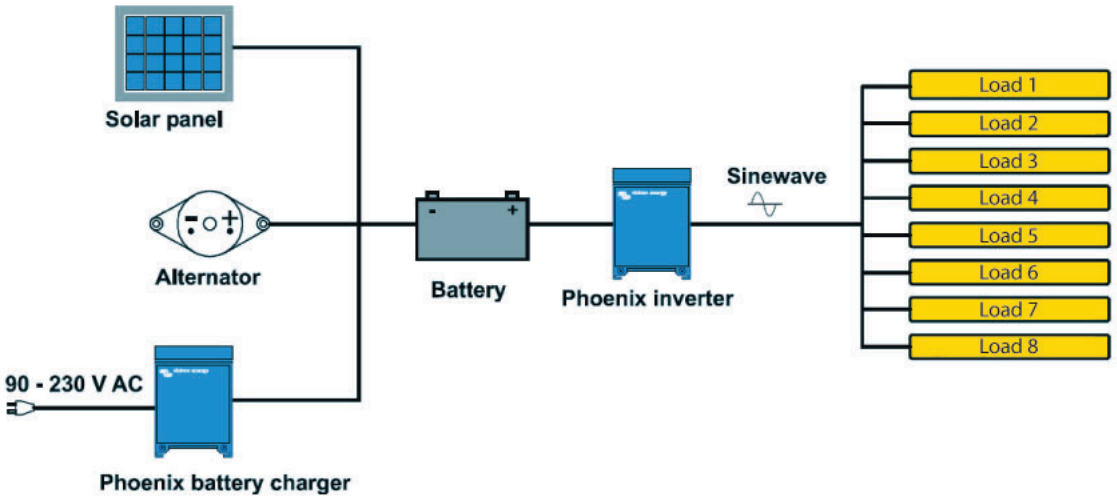
Computer interface

All models have a RS-485 port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VEConfigure software, which can be downloaded free of charge from our website, all parameters of the inverters can be customized. 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 computerized monitoring and control systems.

Phoenix Inverter Compact
24/1600

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'.



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 25ºC (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25ºC (W)	1000	1300	1600	2400	4000
Cont. output power at 40ºC (W)	900	1200	1450	2200	3700
Cont. output power at 65ºC (W)	600	800	1000	1700	3000
Peak power (W)	2400	3000	4000	6000	10000
Max. efficiency 12/ 24 /48 V (%)	92 / 94 / 94	92 / 94 / 94	92 / 92	93 / 94 / 95	94 / 95
Zero load power 12 / 24 / 48 V (W)	8 / 10 / 12	8 / 10 / 12	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8 / 10	5 / 8 / 10	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3 / 4	2 / 3 / 4	3 / 4	8 / 10 / 12	10 / 15
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 +65ºC (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 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 60 Hz and to 240 V
2) Non-linear load, crest factor 3:1
3) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 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:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA 2000 marine electronics network. See the NMEA 2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 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 24/3000/70

MultiPlus Compact 12/2000/80

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 3 kVA and more).

Virtually unlimited power thanks to parallel operation
Up to 6 Multis 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 10 A per 5 kVA Multi at 230 VAC). 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.

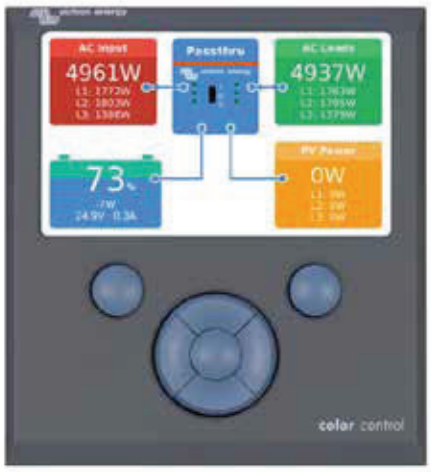
Solar energy: AC power available even during a grid failure
The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems. Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

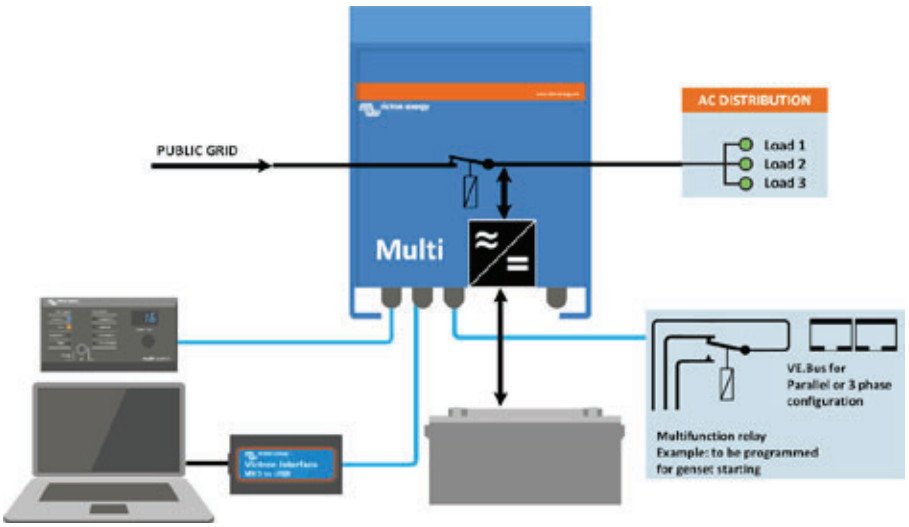
On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power Panel, Color Control Panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control panel can be accessed remotely and settings can be changed.



Color Control Panel, showing a PV application



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	100
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	2400	4000
Cont. output power at 40°C (W)	650	900	1200	1400	2200	3700
Cont. output power at 65°C (W)	400	600	800	1000	1700	3000
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	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
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 (12 V and 24 V models only)					
Battery temperature sensor	yes					
GENERAL						
Auxiliary output (5)	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
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	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	Yes					
Common Characteristics	Operating temp. range: -40 to +65°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)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375x214x110			520x255x125	362x258x218	444x328x240
STANDARDS						
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, IEC 62109-1					
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3					
Road vehicles	12V and 24V models: ECE R10-4					
Anti-islanding	See our website					

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 under voltage or genset start/stop function
AC rating: 230 V/4A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist 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:

Color Control GX
Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network.
See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 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 - 15kVA 230V

Lithium Ion battery compatible

Quattro 48/5000/70-100/100

Quattro 48/15000/200-100/100

Two AC inputs with integrated transfer switch

The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps 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 to a 'European' inverter programmed to supply 240V / 60Hz.

Three phase capability

Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.
Loss of mains detection software is available.

System configuring

- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control

Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power panel, Color Control panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

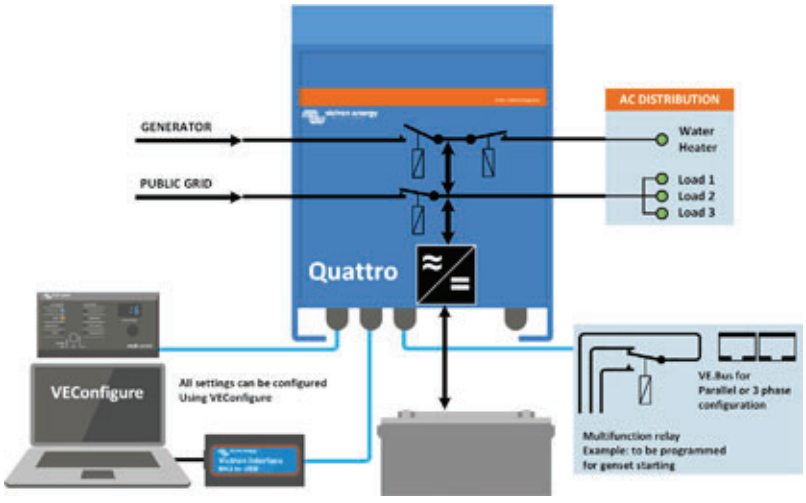
Remote Monitoring and control

Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring

When connected to the Ethernet, systems with a Color Control panel can be accessed and settings can be changed.

Color Control panel, showing a PV application



Quattro	12/3000/120-50/50 24/3000/70-50/50	12/5000/220-100/100 24/5000/120-100/100 48/5000/70-100/100	24/8000/200-100/100 48/8000/110-100/100	48/10000/140-100/100	48/15000/200-100/100
PowerControl / PowerAssist	Yes				
Integrated Transfer switch	Yes				
AC inputs (2x)	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1				
Maximum feed through current (A)	2x 50	2x100	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	15000
Cont. output power at 25°C (W)	2400	4000	6500	8000	12000
Cont. output power at 40°C (W)	2200	3700	5500	6500	10000
Cont. output power at 65°C (W)	1700	3000	3600	4500	7000
Peak power (W)	6000	10000	16000	20000	25000
Maximum efficiency (%)	93 / 94	94 / 94 / 95	94 / 96	96	96
Zero load power (W)	20 / 20	30 / 30 / 35	45 / 50	55	80
Zero load power in AES mode (W)	15 / 15	20 / 25 / 30	30 / 30	35	50
Zero load power in Search mode (W)	8 / 10	10 / 10 / 15	10 / 20	20	30
CHARGER					
Charge voltage 'absorption' (V DC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6	57,6
Charge voltage 'float' (V DC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
Storage mode (V DC)	13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8	52,8
Charge current house battery (A) (4)	120 / 70	220 / 120 / 70	200 / 110	140	200
Charge current starter battery (A)	4 (12V and 24V models only)				
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output (A) (5)	25	50	50	50	50
Programmable relay (6)	3x	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	2x	2x	2x	2x	2x
Remote on-off	Yes				
Common Characteristics	Operating temp.: -40 to +65°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	Bolts M6
Weight (kg)	19	34 / 30 / 30	45 / 41	51	72
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	572 x 488 x 344
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1				
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Road vehicles	12V and 24V models: ECE R10-4				
Anti-islanding	See our website				

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 under voltage or genset start/stop function
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

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

Computer controlled operation and monitoring
Several interfaces are available:

Color Control GX
Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

MultiPlus inverter/charger 2kVA and 3kVA 120V

Lithium Ion battery compatible

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

Multifunctional, 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 Multis 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 45 kW / 54 kVA three phase inverter and 1260 A charger can be built.

Split phase options

Two units can be stacked to provide 120-0-120 V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30 kW / 36 kVA of split phase power.
Alternatively, a split phase AC source can be obtained by connecting our autotransformer to a 'European' inverter programmed to supply 240 V / 60 Hz.

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 20 A per 3 kVA MultiPlus at 120 VAC). 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.

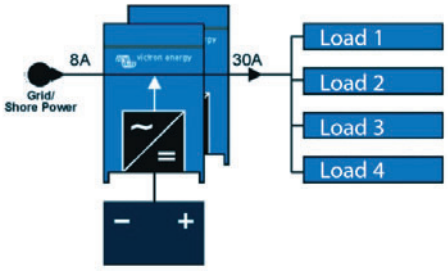
Four stage adaptive charger and dual bank battery charging

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.

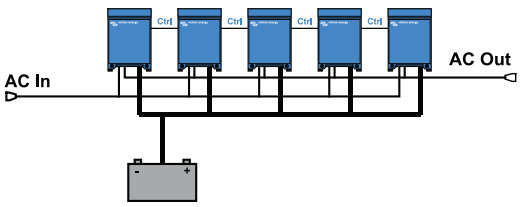
System configuring has never been easier

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	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 25°C / 77°F (VA) (3)		2000	3000
Cont. output power at 25°C / 77°F (W)		1600	2400
Cont. output power at 40°C / 104°F (W)		1450	2200
Cont. output power at 65°C / 150°F (W)		1100	1700
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero load power (W)		9 / 11	20 / 20
Zero load power in AES mode (W)		7 / 8	15 / 15
Zero load power in Search mode (W)		3 / 4	8 / 10
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: -40 - +65°C / -40 to 150°F (fan assisted cooling)	Humidity (non-condensing): max 95%
ENCLOSURE			
Common Characteristics		Material & Colour: aluminium (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 (13 mm²)	Screw-terminal 6 AWG (13mm²)
Weight		13 kg 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		EN 55014-1, 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 under voltage or genset start/stop function
AC rating: 230 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
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 PowerControl and PowerAssist 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:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 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
48/5000/70-100/100

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps charging capacity.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.
Loss of mains detection software is available.

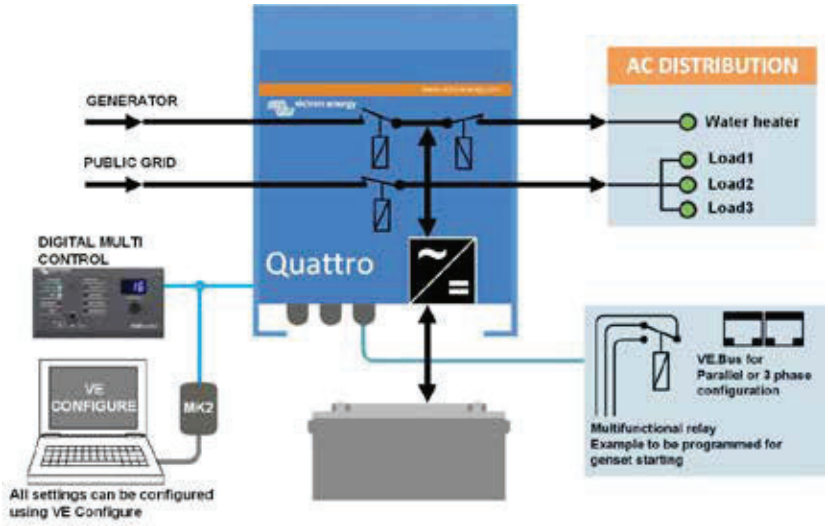
System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power panel, Color Control panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control panel can be accessed and settings can be changed.

Color Control panel, showing a PV application



Quattro	48/3000/35-50/50 120V	12/5000/220-100/100 120V 24/5000/120-100/100 120V 48/5000/70-100/100 120V	48/10000/140-100/100 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	2x 50 A	2x 100 A	2x 100 A
INVERTER			
Input voltage range	9,5 – 17 V 19 – 33V 38 – 66 V		
Output (1)	Output voltage: 120 VAC ± 2% Frequency: 60 Hz ± 0,1%		
Cont. output power at 25°C (3)	3000 VA	5000 VA	10000 VA
Cont. output power at 25°C	2400 W	4000 W	8000 W
Cont. output power at 40°C	2200 W	3700 W	6500 W
Cont. output power at 65°C	1700 W	3000 W	4500 W
Peak power	6000 W	10000 W	20000 W
Maximum efficiency	94 %	94 / 94 / 95 %	96 %
Zero load power	25 W	30 / 30 / 35 W	55 W
Zero load power in AES mode	20 W	20 / 25 / 30 W	35 W
Zero load power in Search mode	12 W	10 / 10 / 15 W	20 W
CHARGER			
Charge voltage 'absorption' (V DC)	57,6 V	14,4 / 28,8 / 57,6 V	57,6 V
Charge voltage 'float' (V DC)	55,2 V	13,8 / 27,6 / 55,2 V	55,2 V
Storage mode (V DC)	52,8 V	13,2 / 26,4 / 52,8 V	52,8 V
Charge current house battery (A) (4)	35 A	200 / 120 / 70 A	140 A
Charge current starter battery (A)	4 A (12V and 24V models only)		
Battery temperature sensor	Yes		
GENERAL			
Auxiliary output (5)	32 A	50 A	50 A
Programmable relay (6)	3x		
Protection (2)	a-g		
VE.Bus communication port	For parallel, split phase and three phase operation, remote monitoring and system integration		
General purpose com. port	2x		
Remote on-off	Yes		
Common Characteristics	Operating temp.: -40 to +65°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
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch 362 x 258 x 218 mm	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 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch 572 x 488 x 344 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1		
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	12V and 24V models: ECE R10-5		
Anti-islanding	See our website		

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel

A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

Blue Power Panel

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

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX

Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Color Control GX

Color Control GX

The Color Control (CCGX) provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VRM Online Portal

Besides monitoring and controlling products locally on the CCGX itself, all readings are also forwarded to our free remote monitoring website: the VRM Online Portal. T

Remote Console on VRM

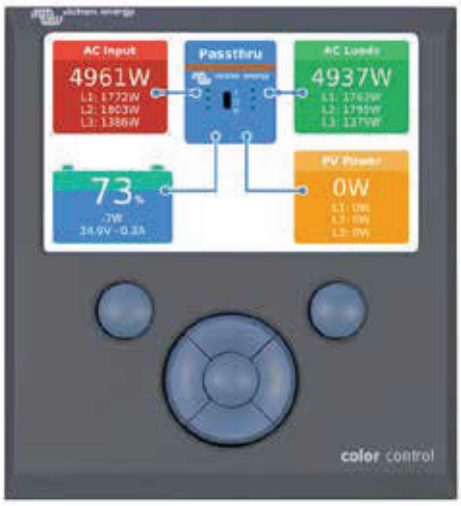
Monitor, control and configure the CCGX remotely, over the internet. Just like standing in front of the device, everything can also be done remotely. The same functionality is also available on the local network, Remote Console on LAN.

Automatic genset start/stop

A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System

The CCGX is the Energy Manager in an ESS system. More information in the ESS manual:



Data logging

When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the CCGX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port. When multiple BlueSolar MPPTs with VE.Can are used in parallel, the all information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the CCGX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the CCGX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. Location and speed will be visible on the display, and the data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

Internet connection

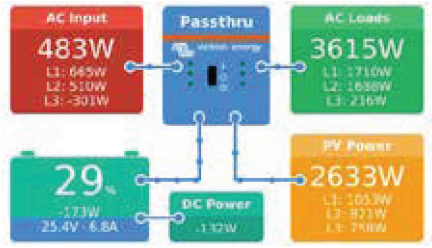
The CCGX can be connected to internet with an Ethernet cable and via Wi-Fi. To connect via Wi-Fi, a Wi-Fi USB accessory is required. The CCGX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Other highlights

- The CCGX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the CCGX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

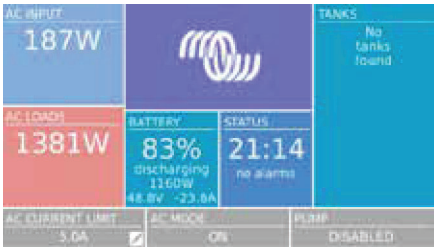
Color Control GX			
Power supply voltage range	9 – 70V DC		
Current draw	12V DC	24V DC	48V DC
Display off	140mA	80mA	40mA
Display at minimum intensity	160mA	90mA	45mA
Display at maximum intensity	245mA	125mA	65mA
Potential free contact	3A / 30V DC / 250V AC (Normally open)		
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Color Control GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	130 x 120 x 28mm		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	E4-10R-053535		

Overview - Multi with PV Inverter on output

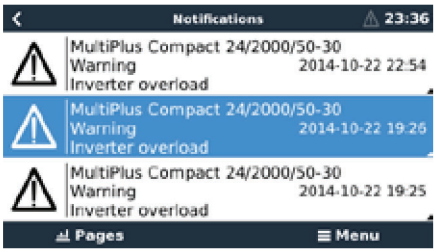


Main menu

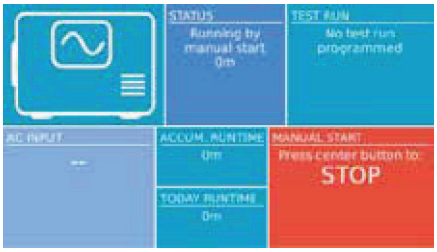
Mobile & boat overview



Alarm notifications

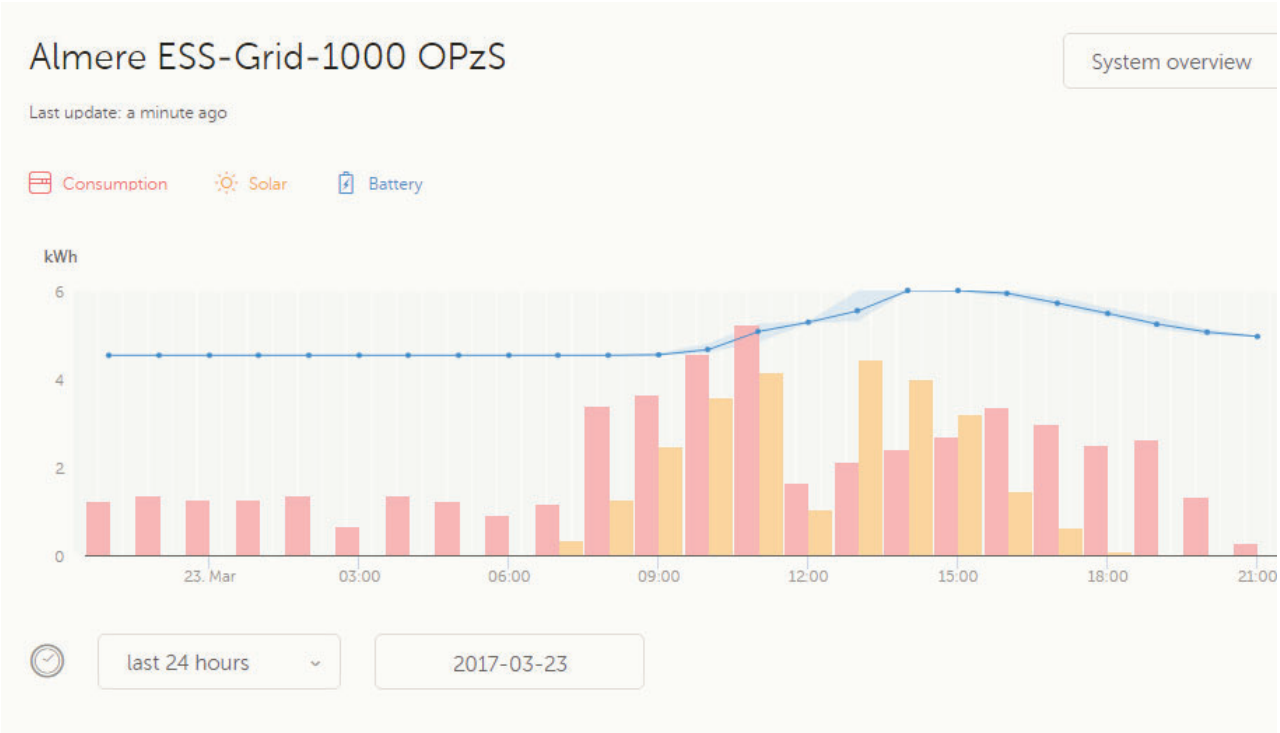


Genset control page

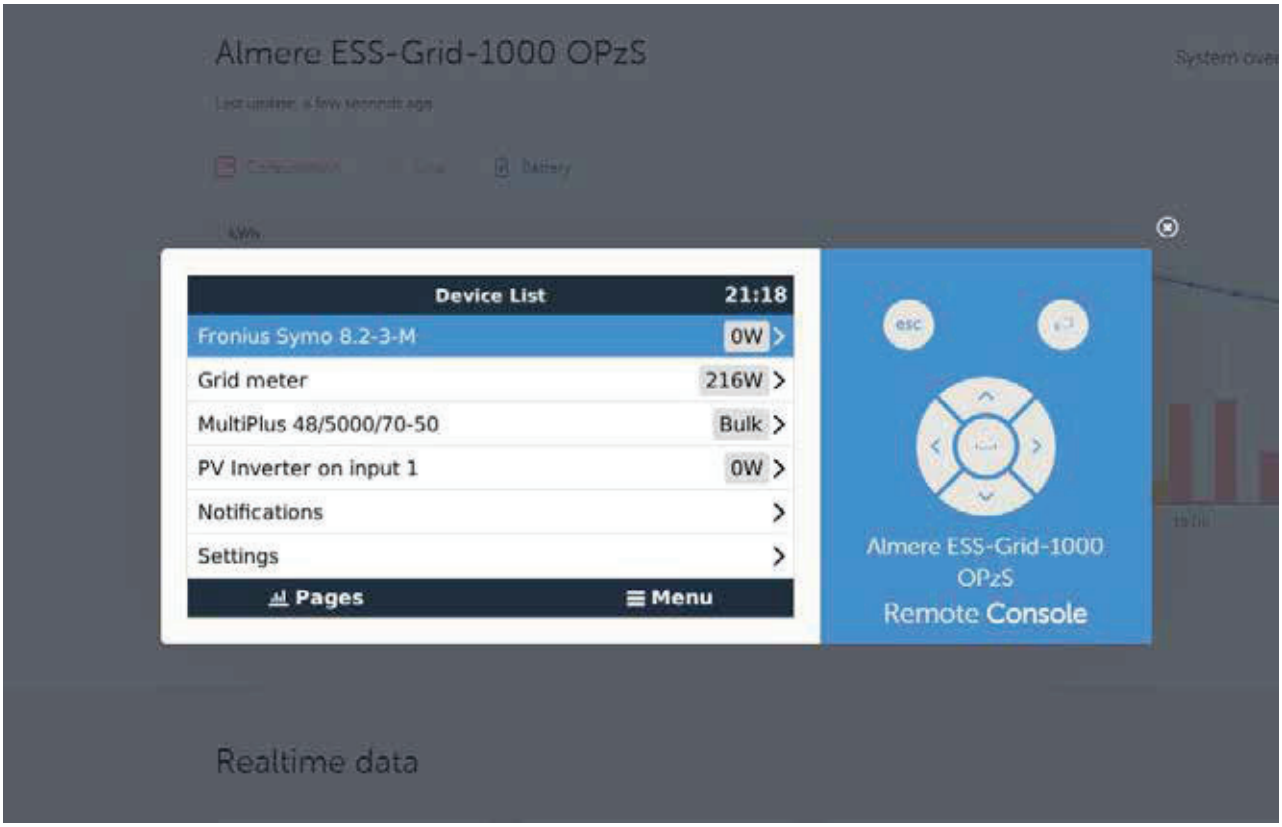


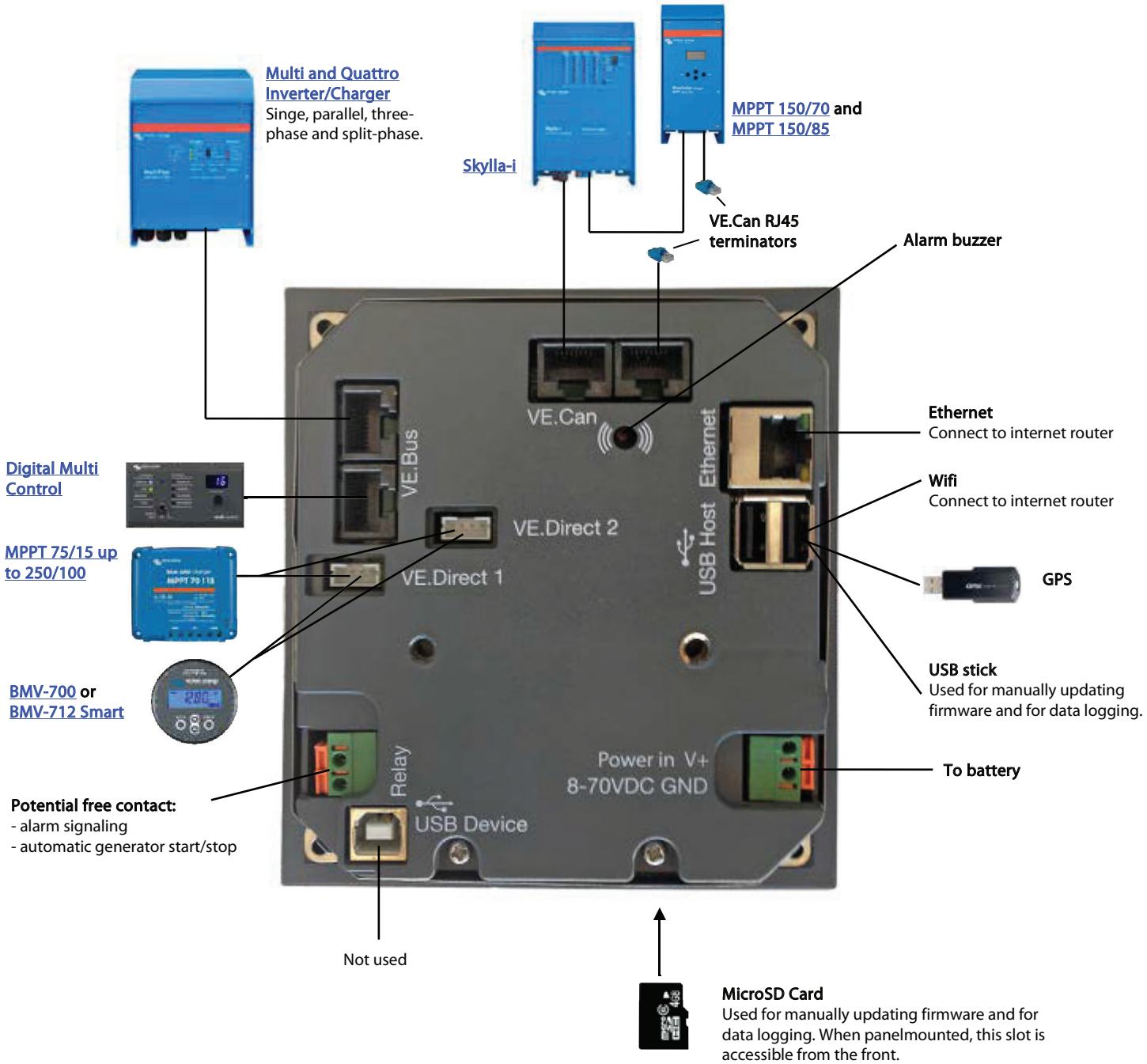
Tiles overview

VRM Portal - Dashboard



VRM Portal – Remote Console




Multi and Quattro Inverter/Charger
Singe, parallel, three-phase and split-phase.
Skylla-i
MPPT 150/70 and MPPT 150/85
VE.Can RJ45 terminators
Alarm buzzer
VE.Can
VE.Bus
VE.Direct 2
VE.Direct 1
USB Host
Ethernet
Digital Multi Control
MPPT 75/15 up to 250/100
BMV-700 or BMV-712 Smart
Ethernet
Connect to internet router
Wifi
Connect to internet router
GPS
USB stick
Used for manually updating firmware and for data logging.
Relay
Power in V+
8-70VDC GND
To battery
Potential free contact:
- alarm signaling
- automatic generator start/stop
USB Device
Not used
MicroSD Card
Used for manually updating firmware and for data logging. When panelmounted, this slot is accessible from the front.

Venus GX

Venus GX with connectors

Venus GX front angle

Venus GX
The Venus GX provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VRM Online Portal
All readings are forwarded to our free remote monitoring website: the VRM Online Portal.

Remote Console on VRM
The way to access the device for setting up, as well as monitoring, is via Remote Console. Either via VRM, via the built-in WiFi Access Point, or on the local LAN/WiFi network.

Automatic genset start/stop
A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System
The Venus GX is the Energy Manager in an ESS system. More information in the ESS manual:

Data logging
When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the Venus GX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- EasySolar 1600VA
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port. When multiple BlueSolar MPPTs with VE.Can are used in parallel, the all information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the Venus GX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the Venus GX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Ion BMS
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. The data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

Internet connection
The Venus GX can be connected to internet with an Ethernet cable and via Wi-Fi. The Venus GX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

The tank level inputs are resistive: connect them to a resistive tank sender. Such tank senders are not supplied by Victron. The tank level ports can each be configured to work with either European tank senders (0 - 180 Ohm), or US (240 - 30 Ohm).

- The Venus GX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the Venus GX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

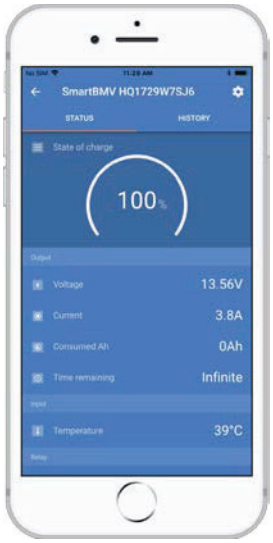
Venus GX			
Power supply voltage range	8 – 70V DC		
Current Draw	210 mA @ 12V	110 mA @ 24V	60 mA @ 48V
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
CAN	2nd CAN interface – non isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
WiFi Access Point	Use to connect to Remote Console		
WiFi Client	Connect the Venux GX to an existing WiFi network		
	IO		
Potential free contact	NO/COM/NC – 6 A 250 VAC/30 VDC		
Tank level inputs	3 x Configurable for European (0 - 180 Ohm) or US (240 - 30 Ohm)		
Temperature level inputs	2 x Requires ASS000001000.		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Venus GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	45 x 143 x 96		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	In progress		

BMV-712 Smart: Bluetooth inside

BMV-712 Smart

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb



See the VictronConnect BMV app Discovery Sheet for more screenshots

Bluetooth inside

With Bluetooth built-in, the BMV Smart is ready for the Internet of Things (IoT) era. With Bluetooth being implemented in most other Victron Energy products, wireless communication between products will simplify system installation and enhance performance.

Download the Victron Bluetooth app

Use a smartphone or other Bluetooth enabled device to

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Easy to install

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

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

Midpoint voltage monitoring

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our **Battery Balancer** (BMS012201000) to maximize service life of series-connected lead-acid batteries.

Very low current draw from the battery

Current consumption: 0,7Ah per month (1mA) @12V and 0,6Ah per month (0,8mA) @ 24V
Especially Li-ion batteries have virtually no capacity left when discharged until low voltage shutdown. After shutdown due to low cell voltage, the capacity reserve of a Li-ion battery is approximately 1Ah per 100Ah battery capacity. The battery will be damaged if the remaining capacity reserve is drawn from the battery. A residual current of 10mA for example may damage a 200Ah battery if the system is left in discharged state during more than 8 days.

Bi-stable alarm relay

Prevents increased current draw in case of an alarm.

Other features

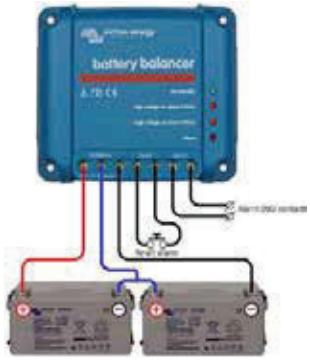
- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events**,** which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 70V
- High current measurement resolution: 10 mA (0,01A)
- Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings

Battery Monitor	BMV-712 Smart
Supply voltage range	6,5 - 70 VDC
Current draw, back light off	< 1mA
Input voltage range, auxiliary battery	6,5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50°C (-40 - 120°F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50°C
VE.Direct communication port	Yes
Bistable relay	60V / 1A normally open (function can be inverted)
RESOLUTION & ACCURACY (with a 500 A shunt)	
Current	± 0,01A
Voltage	± 0,01V
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)	± 1°C/°F
Accuracy of current measurement	± 0,4%
Accuracy of voltage measurement	± 0,3%
INSTALLATION & DIMENSIONS	
Installation	Flush mount
Front	63mm diameter
Front bezel	69 x 69mm (2.7 x 2.7 inch)
Body diameter	52mm (2.0 inch)
Body depth	31mm (1.2 inch)
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN 55014-1 / EN 55014-2
Automotive	ECE R10-4 / EN 50498
ACCESSORIES	
Shunt (included)	500A / 50mV
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection
Temperature sensor	Optional (ASS000100000)

1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 712 to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to the Color Control or to a computer.

Temperature sensor

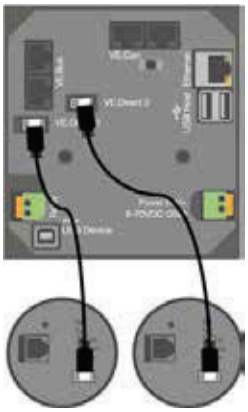


Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three Battery Balancers.

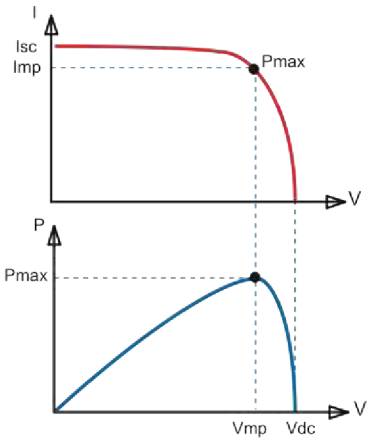
Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.



A maximum of four BMVs can be connected directly to the Color Control.
Even more BMVs can be connected to a USB Hub for central monitoring.

Venus GX
The Venus GX provides intuitive control and monitoring. It has the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

BlueSolar and SmartSolar MPPT Charge Controllers - Overview



Maximum Power Point Tracking (MPPT)

Upper curve:
Output current (I) of a solar panel as function of output voltage (V).
The Maximum Power Point (MPP) is the point Pmax along the curve where the product I 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 Vmp.

Feature highlights common to all models

- Ultra-fast Maximum Power Point Tracking (MPPT)
- Advanced Maximum Power Point Detection in case of partial shading conditions
- Outstanding conversion efficiency
- Natural convection cooling (except for the 150/70 and 150/85 CAN-bus models)
- Automatic battery voltage recognition
- Flexible charge algorithm
- Over temperature protection and power derating when temperature is high.

SmartSolar and BlueSolar:

- **SmartSolar** models have Bluetooth built-in.
- **BlueSolar** models can be made Bluetooth accessible by connecting a **VE.Direct Bluetooth Smart dongle**. Advantage: the products are not accessible when no dongle is connected.

Low Power models with load output (see table on page 2)

- See the appendix of the respective manuals for load output disconnect and reconnect options, including **BatteryLife algorithm**.

Day/night timing and light dimming on the low power models with a load output

- Use the **VE.Direct TX digital output cable**, and **VictronConnect** to configure.

Virtual load output, including day/night timing and BatteryLife algorithm on the higher power models

- Use the **VE.Direct TX digital output cable** and connect to **a BatteryProtect** or a solid state relay. Use **VictronConnect** to configure.

Display options

- **MPPT Control**: connects to all models with a VE.Direct port, except the BlueSolar MPPT 70/15. (Does not connect to the 150/70 and 150/85 CAN-bus models)
- **SmartSolar Control Display**: a plug-on display compatible with all models 150/45 and higher. Both displays can be connected to one controller simultaneously.
- **Color Control GX and other GX devices**: see the GX product family on our website.
- **VRM website**: see the VRM portal documentation on our website.

Remote firmware updating

- See **VRM: Remote firmware update** on our website.

To access the above-mentioned documents: press the search button on our website and enter the appropriate search word.

MPPT Control

SmartSolar Control

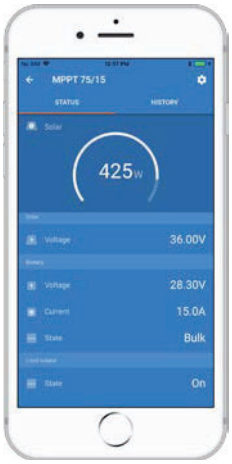
Color Control GX

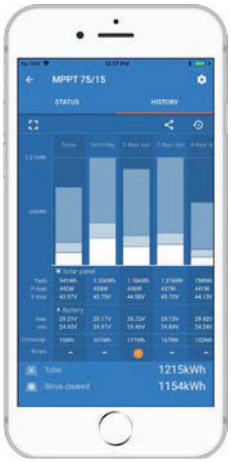
Venus GX

Octo GX

GX GSM

SmartSolar charge controller MPPT 75/10, 75/15, 100/15 & 100/20





SmartSolar Charge Controller
MPPT 75/15

Bluetooth Smart built-in: dongle not needed
The wireless solution to set-up, monitor and update the controller using Apple and Android smartphones, tablets or other devices.

VE.Direct
For a wired data connection to a Color Control panel, PC or other devices

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

Load output
Over-discharge of the battery can be prevented by connecting all loads to the load output. The load output will disconnect the load when the battery has been discharged to a pre-set voltage (48V model: interface with a relay).
Alternatively, an intelligent battery management algorithm can be chosen: see Battery Life.
The load output is short circuit proof.

Battery Life: intelligent battery management
When a solar charge controller is not able to recharge the battery to its full capacity within one day, the result is often that the battery will continually be cycled between a 'partially charged' state and the 'end of discharge' state. This mode of operation (no regular full recharge) will destroy a lead-acid battery within weeks or months.
The Battery Life algorithm will monitor the state of charge of the battery and, if needed, day by day slightly increase the load disconnect level (i.e. disconnect the load earlier) until the harvested solar energy is sufficient to recharge the battery to nearly the full 100%. From that point onwards the load disconnect level will be modulated so that a nearly 100% recharge is achieved about once every week.

Programmable battery charge algorithm
See the software section on our website for details

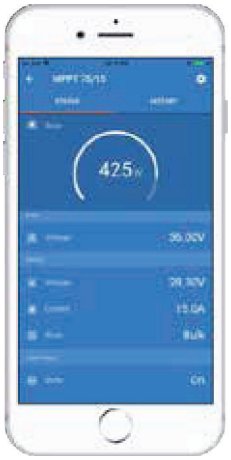
Day/night timing and light dimming option
See the software section on our website for details

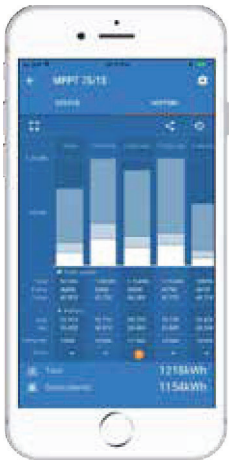
Programming, real-time data and history display options
- Modern Apple and Android smartphones, tablets, macbooks and other devices: see the VE.Direct Bluetooth Smart dongle and the MPPT app discovery sheet for screenshots.
- ColorControl panel

SmartSolar Charge Controller	MPPT 75/10	MPPT 75/15	MPPT 100/15	MPPT 100/20	MPPT 100/20 48V
Battery voltage	12/24V Auto Select				48V
Rated charge current	10A	15A	15A	20A	20A
Nominal PV power, 12V 1a,b)	145W	220W	220W	290W	n. a.
Nominal PV power, 24V 1a,b)	290W	440W	440W	580W	n. a.
Nominal PV power, 48V 1a,b)	n. a.	n. a.	n. a.	n. a.	1160W
Max. PV short circuit current 2)	13A	15A	15A	20A	20A
Automatic load disconnect	Yes				
Maximum PV open circuit voltage	75V		100V		
Peak efficiency	98%				
Self-consumption	12V: 25 mA 24V: 15 mA				15mA
Charge voltage 'absorption'	14,4V / 28,8V (adjustable)				57,6V (adj.)
Charge voltage 'float'	13,8V / 27,6V (adjustable)				55,2V (adj.)
Charge algorithm	multi-stage adaptive				
Temperature compensation	-16 mV / °C resp. -32 mV / °C				
Max. continuous load current	15A			20A	1A
Low voltage load disconnect	11,1V / 22,2V/44,4V or 11,8V / 23,6V/47,2V or Battery Life algorithm				
Low voltage load reconnect	13,1V / 26,2V/52,4V or 14V / 28V/56V or Battery Life algorithm				
Protection	Battery reverse polarity (fuse) / Output short circuit / Over temperature				
Operating temperature	-30 to +60°C (full rated output up to 40°C)				
Humidity	95%, non-condensing				
Data communication port	VE.Direct (see the data communication white paper on our website)				
ENCLOSURE					
Colour	Blue (RAL 5012)				
Power terminals	6 mm² / AWG10				
Protection category	IP43 (electronic components), IP22 (connection area)				
Weight	0,5 kg		0,6 kg	0,65 kg	
Dimensions (h x w x d)	100 x 113 x 40 mm		100 x 113 x 50 mm	100 x 113 x 60 mm	
STANDARDS					
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2				

1a) If more PV power is connected, the controller will limit input power.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V
2) A PV array with a higher short circuit current may damage the controller.

SmartSolar charge controller MPPT 100/30 & 100/50





Bluetooth Smart built-in: dongle not needed
The wireless solution to set-up, monitor and update the controller using Apple and Android smartphones, tablets or other devices.

VE.Direct
For a wired data connection to a Color Control panel, Venus GX, PC or other devices

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

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

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight pre-programmed algorithms, selectable with a rotary switch (see manual for details).

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

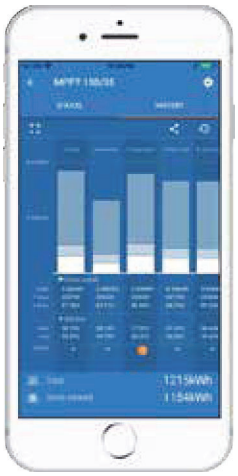
Internal temperature sensor
Compensates absorption and float charge voltage
for temperature.

Real-time data display options
- Apple and Android smartphones, tablets and other devices.
- Color Control panel.

SmartSolar Charge Controller
MPPT 100/50

SmartSolar Charge Controller	MPPT 100/30	MPPT 100/50
Battery voltage	12/24V Auto Select	
Rated charge current	30A	50A
Nominal PV power, 12V 1a,b)	440W	700W
Nominal PV power, 24V 1a,b)	880W	1400W
Maximum PV open circuit voltage	100V	100V
Max. PV short circuit current 2)	35A	60A
Maximum efficiency	98%	98%
Self-consumption	12V: 30 mA 24V: 20 mA	
Charge voltage 'absorption'	Default setting: 14,4V / 28,8V (adjustable)	
Charge voltage 'float'	Default setting: 13,8V / 27,6V (adjustable)	
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Protection	Battery reverse polarity (fuse, not user accessible) PV reverse polarity Output short circuit Over temperature	
Operating temperature	-30 to +60°C (full rated output up to 40°C)	
Humidity	95%, non-condensing	
Data communication port	VE.Direct See the data communication white paper on our website	
ENCLOSURE		
Colour	Blue (RAL 5012)	
Power terminals	16 mm² / AWG6	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	1,3 kg	
Dimensions (h x w x d)	130 x 186 x 70 mm	
STANDARDS		
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2	

1a) If more PV power is connected, the controller will limit input power.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V.
2) A PV array with a higher short circuit current may damage the controller.



Bluetooth Smart built-in: dongle not needed
The wireless solution to set-up, monitor and update the controller using Apple and Android smartphones, tablets or other devices.

VE.Direct
For a wired data connection to a Color Control panel, Venus GX, PC or other devices

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

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

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight preprogrammed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

Real-time data display options
- Apple and Android smartphones, tablets and other devices.
- Color Control panel.

SmartSolar Charge Controller MPPT 150/35

SmartSolar Charge Controller	MPPT 150/35
Battery voltage	12 / 24 / 48V Auto Select (software tool needed to select 36V)
Rated charge current	35A
Nominal PV power 1a, b)	12V: 500W / 24V: 1000W / 36V: 1500W / 48V: 2000W
Max. PV short circuit current 2)	40A
Maximum PV open circuit voltage	150V absolute maximum coldest conditions 145V start-up and operating maximum
Maximum efficiency	98%
Self-consumption	12V: 20mA 24V: 15mA 48V: 10mA
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6V (adjustable)
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2V (adjustable)
Charge algorithm	multi-stage adaptive (eight pre-programmed algorithms)
Temperature compensation	-16 mV / -32 mV / -64 mV / °C
Protection	Battery reverse polarity (fuse, not user accessible) PV reverse polarity Output short circuit Over-temperature
Operating temperature	-30 to +60°C (full rated output up to 40°C)
Humidity	95%, non-condensing
Data communication port	VE.Direct See the data communication white paper on our website
ENCLOSURE	
Colour	Blue (RAL 5012)
Power terminals	16 mm² / AWG6
Protection category	IP43 (electronic components), IP22 (connection area)
Weight	1,25 kg
Dimensions (h x w x d)	130 x 186 x 70 mm
STANDARDS	
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2

1a) If more PV power is connected, the controller will limit input power.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V.
2) A PV array with a higher short circuit current may damage the controller.

SmartSolar charge controller MPPT 150/45 & MPPT 150/100

SmartSolar Charge Controller
MPPT 150/100-Tr
with optional pluggable display

SmartSolar Charge Controller
MPPT 150/100-MC4
without display

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative SmartSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

Outstanding conversion efficiency
No cooling fan. Maximum efficiency exceeds 98%.

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight pre-programmed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

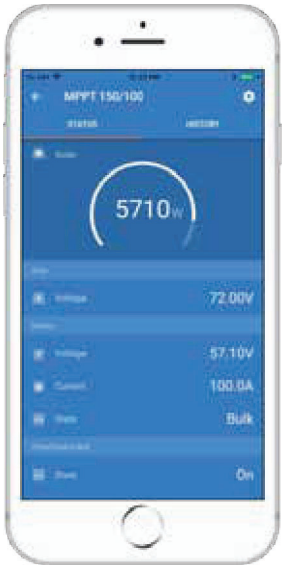
Bluetooth Smart built-in: dongle not needed
The wireless solution to set-up, monitor and update the controller using Apple and Android smartphones, tablets or other devices.

VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

Remote on-off
To connect for example to a VE.BUS BMS.

Programmable relay
Can be programmed (a.o. with a smartphone) to trip on an alarm, or other events.

Optional: pluggable LCD display
Simply remove the rubber seal that protects the plug on the front of the controller, and plug-in the display.



SmartSolar charge controller MPPT 250/60, 250/70, 250/85 & 250/100

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative SmartSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

Outstanding conversion efficiency
No cooling fan. Maximum efficiency exceeds 99%.

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight pre-programmed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

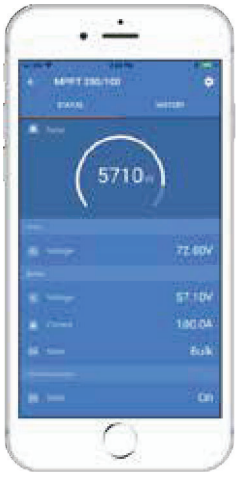
Bluetooth Smart built-in: dongle not needed
The wireless solution to set-up, monitor and update the controller using Apple and Android smartphones, tablets or other devices.

VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

Remote on-off
To connect for example to a VE.BUS BMS.

Programmable relay
Can be programmed (a.o. with a smartphone) to trip on an alarm, or other events.

Optional: pluggable LCD display
Remove the seal that protects the plug on the front of the controller, and plug-in the display.



SmartSolar Charge Controller
MPPT 250/100-Tr
with optional pluggable display

SmartSolar Charge Controller
MPPT 250/100-MC4
without display

SmartSolar Charge Controller	MPPT 250/60	MPPT 250/70	MPPT 250/85	MPPT 250/100
Battery voltage	12 / 24 / 48V Auto Select (software tool needed to select 36V)			
Rated charge current	60A	70A	85A	100A
Nominal PV power, 12V 1a,b)	860W	1000W	1200W	1450W
Nominal PV power, 24V 1a,b)	1720W	2000W	2400W	2900W
Nominal PV power, 48V 1a,b)	3440W	4000W	4900W	5800W
Max. PV short circuit current 2)	35A (max 30A per MC4 conn.)		70A (max 30A per MC4 conn.)	
Maximum PV open circuit voltage	250V absolute maximum coldest conditions 245V start-up and operating maximum			
Maximum efficiency	99%			
Self-consumption	Less than 35mA @ 12V / 20mA @ 48V			
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6V (adjustable with: rotary switch, display, VE.Direct or Bluetooth)			
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2V (adjustable: rotary switch, display, VE.Direct or Bluetooth)			
Charge algorithm	multi-stage adaptive			
Temperature compensation	-16 mV / -32 mV / -64 mV / °C			
Protection	Battery reverse polarity (fuse, not user accessible) PV reverse polarity / Output short circuit / Over temperature			
Operating temperature	-30 to +60°C (full rated output up to 40°C)			
Humidity	95%, non-condensing			
Data communication port	VE.Direct or Bluetooth			
Remote on/off	Yes (2 pole connector)			
Programmable relay	DPST AC rating: 240VAC / 4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Parallel operation	Yes (not synchronized)			
ENCLOSURE				
Colour	Blue (RAL 5012)			
PV terminals 3)	35 mm² / AWG2 (Tr models) Two sets of MC4 connectors (MC4 models 250/60 and 250/70) Three sets of MC4 connectors (MC4 models 250/85 and 250/100)			
Battery terminals	35 mm² / AWG2			
Protection category	IP43 (electronic components), IP22 (connection area)			
Weight	3 kg		4,5 kg	
Dimensions (h x w x d) in mm	Tr models: 185 x 250 x 95 MC4 models: 215 x 250 x 95		Tr models: 216 x 295 x 103 MC4 models: 246 x 295 x 103	
STANDARDS				
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2			

1a) If more PV power is connected, the controller will limit input power to the stated maximum.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V.
2) A PV array with a higher short circuit current may damage the controller.
3) MC4 models: several splitter pairs may be needed to parallel the strings of solar panels.
Maximum current per MC4 connector: 30A (the MC4 connectors are parallel connected to one MPPT tracker)

24V 180Ah Lithium-ion battery and Lynx-ion

24V 180Ah and 100Ah
Lithium-Ion Battery

Lynx Ion + Shunt

Ion control: Main screen

Ion control: History screen

Ion control: Lynx Ion Status

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

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

Why Lithium-Iron-Phosphate?

Lithium-Iron-Phosphate (LiFePO4 or LFP) is the safest of the mainstream Li-ion battery types.The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 25,6V LFP battery consists of 8 cells connected in series.

Complete system

A complete system consists of:

- One or more **24V 180Ah or 100Ah Lithium-Ion batteries**.
- (optional) The **Lynx Power In**, a modular dc bus bar.
- The **Lynx Ion + Shunt** is the Battery Management System (BMS) that controls the batteries. It contains a main safety contactor and a shunt. There are two models are available: a 350A model and a 600A model.
  (optional) The **Lynx Distributor**, a DC distribution system with fuses.
- (optional) The **Ion Control**, a digital control panel.
- (optional) The **Color Control GX**, a more advanced digital control panel

The advantages of the Victron Lynx Lithium-ion battery system

The modular system used adds the following advantages:

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

24V 180Ah/100Ah Lithium-Ion Batteries

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

Lynx Ion + Shunt

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

For both overcharging and depletion there is a last safety resort, the built-in 350A or 600 A contactor. In case signallingdoes not stop the imminent overcharge or depletion, it will open the contactor.

VE.Can / NMEA2000 Canbus

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

Ion Control

See the separate Ion Control datasheet for more information.

Color Control GX

See the separate Color Control GX datasheet for more information.

Lithium-Ion battery specifications

	Lithium-ion 24V 100Ah 2.6kWh battery	Lithium-ion 24V 180Ah 4.75kWh battery
Technology	Lithium iron phosphate (LiFePo4)	Lithium iron phosphate (LiFePo4)
Nominal voltage	25,6V	25,6V
Nominal capacity	100Ah	180Ah
Nominal power	2,6kWh	4,75kWh
Weight	30kg	55kg
Power/Weight ratio	86Wh/kg	86Wh/kg
Dimensions (lxwxh)	592x154x278mm	623x193x351mm
Charge/Discharge		
Charge cut-off voltage at 0.05C	28,8V	28,8V
Discharge cut-off voltage	20V	20V
Recommended charge/discharge current	30A (0,3C)	54A (0,3C)
Maximum charge current (1C)	100A	180A
Maximum discharge current (1.5C)	150A	270A
Pulse discharge current (10s)	500A	1000A
Cycle Life @80% DOD (0.3C)	3000	3000
Configuration		
Series configuration	Yes, up to 2 (more in series on request)	Yes, up to 2 (more in series on request)
Parallel configuration	Yes, easy up to 10 (more parallel on request)	Yes, easy up to 10 (more parallel on request)
Environmental		
Operating temp. charge	0~45°C	0~45°C
Operating temp. discharge	-20~55°C	-20~55°C
Storage temp.	-20~45°C	-20~45°C
Standards		
EMC: Emission	EN-IEC 61000-6-3:2007/A1:2011/C11:2012	
EMC: Immunity	EN-IEC 61000-6-1:2007	
Low voltage directive	EN 60335-1:2012/AC:2014	

Lynx Ion + Shunt specifications

Lynx Ion + Shunt	350A	600A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	48	
Supply voltage range	9 ... 60VDC	
Standby mode	73mW @ 26,2V and 138mW @ 52,4V	
Active mode	8,7 W	
Main safety contactor	350A	600A
Enclosure		
Material	ABS	
Weight	2,0kg	
Dimensions (lxwxh)	185 x 165 x 85 mm	
IO		
Aux. output	5A (output voltage = battery voltage), short circuit protection	
External safety contactor	5A (output voltage = battery voltage), short circuit protection	
Allow-to-charge	1A @ 60VDC, potential free	
Allow-to-discharge	1A @ 60VDC, potential free	
External status signal	12V / 140mA	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	IP20
Standards		
EMC: Emission	EN-IEC 61000-6-3:2007/A1:2011/C11:2012	
EMC: Immunity	EN-IEC 61000-6-1:2007	
Low voltage directive	EN 60335-1:2012/AC:2014	
RoHs	EN 50581:2012	

Lithium-Ion HE Battery and Lynx Ion BMS

24V/100Ah HE battery

24V/200Ah HE battery

Lynx-ion BMS 1000A

Ultra-high energy density

185Wh/kg thanks to Lithium Nickel Manganese Cobalt Oxide (NMC) technology

Fan cooled

For high charge and discharge currents (up to 2C for short periods)

Parallel and series connection

Up to 64 batteries can be parallel connected.
For 48V systems two batteries can be connected in series, and up to 32 strings of two batteries can be parallel connected.

Galvanically isolated CAN-Bus communication

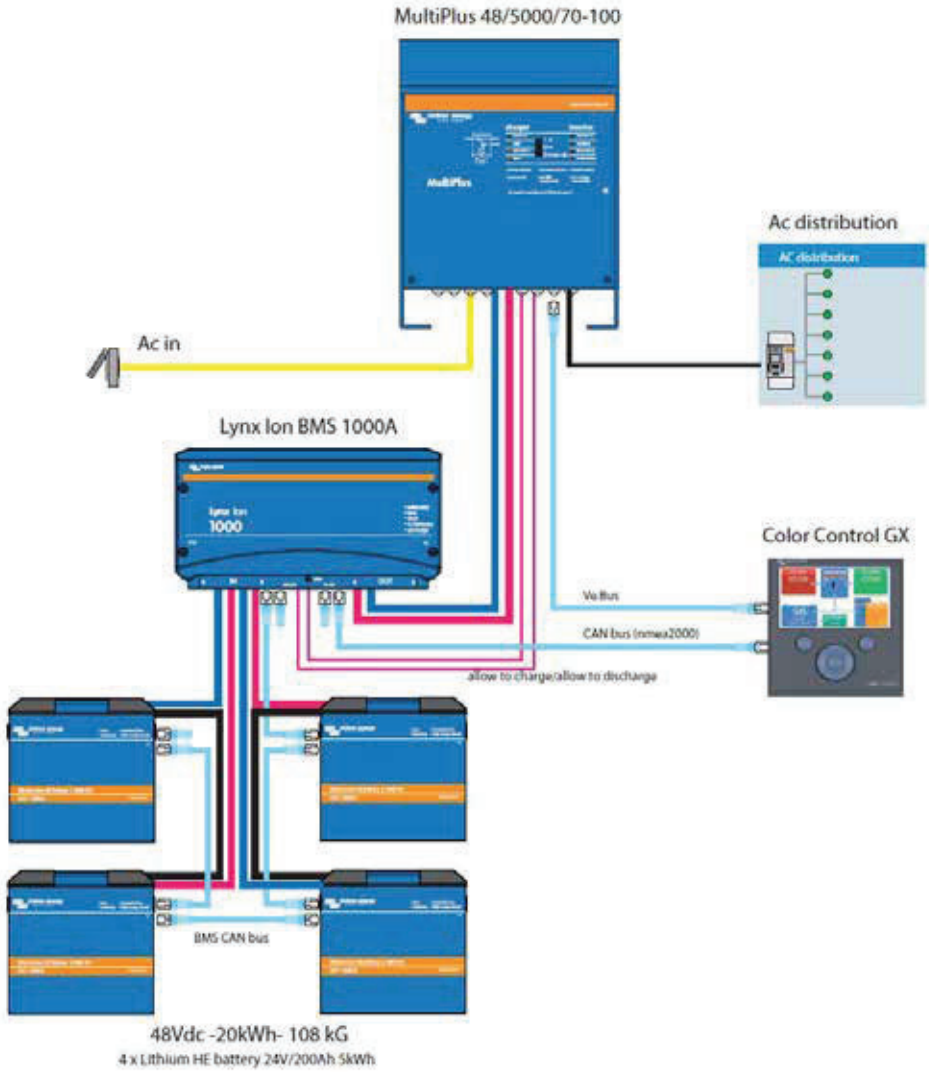
Protocol: VE.Can/NMEA2000

Lynx-ion BMS: 400A or 1000A

The Lynx-ion BMS reduces wiring and installation time to a minimum: it combines four fused battery connections, four fused DC load connections, a safety contactor and a current shunt with a BMS in one compact enclosure.

Monitoring: The Color Control GX or Venus GX

Monitors the complete system.
Is the gateway for remote monitoring on the VRM online portal.
Adds an amazing amount of useful functionality to system (such as a very sophisticated generator start-stop program
See the Color Control GX and Venus GX datasheet for more information.



Lithium HE battery	24V / 100Ah	24V / 200Ah
Technology	Lithium-Ion NMC	Lithium-Ion NMC
Cell configuration	7S32P	7S64P
Nominal voltage	25,2 V	25,2 V
Nominal capacity	100 Ah	200 Ah
Nominal energy	2,5 kWh	5,0 kWh
Cycle Life @80% DoD (0,3C)	2000	2000
Energy/weight ratio (incl. BMS and enclosure)	159 Wh/kg	175 Wh/kg
Weight (incl. BMS and enclosure)	15,7 kg	28,6 kg
Discharge		
Discharge cut-off voltage	21 V	21 V
Recommended discharge current	30 A (0.3 C)	60 A (0.3 C)
Maximum discharge current (10 minutes)	150 A (1.5 C)	300 A (1.5 C)
Fuses	150 A, fuse inside	300 A, fuse inside
Charge		
Absorption voltage (1 hour)	28,4 V	28,4 V
Float voltage	27,5 V	27,5 V
Maximum charge current	100 A (1 C)	200 A (1 C)
Recommended charge current	30 A (0.3 C)	60 A (0.3 C)
Configuration		
Series configuration	Yes, up to 2	
Parallel configuration	Yes, up to 96	
Temperature		
Operating temp. charge	0~45°C	
Operating temp. discharge	-20~55°C	
Storage temp.	-20~45°C	
Mechanical		
Power connections	M8 stud, Max. 15 Nm	M8 stud, Max. 15 Nm
Protection class	IP20	IP20
Cooling	Air, active (1x fan inside)	Air, active (2x fan inside)
Dimensions (l x w x h)	362 x 193 x 214 mm	362 x 193 x 355 mm
Safety		
Battery Management System (BMS)	Integrated slave BMS	
Balancing	Passive	
Compatible BMS master controller	Lynx Ion BMS	
Communication with Lynx Ion BMS	CAN bus	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

Lynx Ion BMS intended for both 100 Ah & 200Ah batteries	400A	1000A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	96 (48 V: 48 strings of two batteries	
Supply voltage range	18 to 58 VDC	
Power consumption, standby mode	73 mW @ 26,2V and 138 mW @ 52,4V	
Power consumption, active mode	8,7 W	
Main safety contactor	400A	1000A
Communication port	VE.CAN (NMEA2000, RJ45 connection, galvanically isolated)	
IO		
Auxiliary output	13,5 V / 1 A, short circuit protected	
Allow-to-charge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-discharge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-charge (relay output)	1 A @ 60 VDC, potential free	
Allow-to-discharge (relay output)	1 A @ 60 VDC, potential free	
Programmable contact (relay output)	1 A @ 60 VDC, potential free	
External status signal	13,5 V / 140 mA	
Enclosure		
Material	ABS	
Weight	4,6 kg	5,7 kg
Dimensions (lxwxh)	225 x 426 x 117 mm	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	
Standards		
EMC: Emission	EN-IEC 61000-6-3	

About Victron Energy

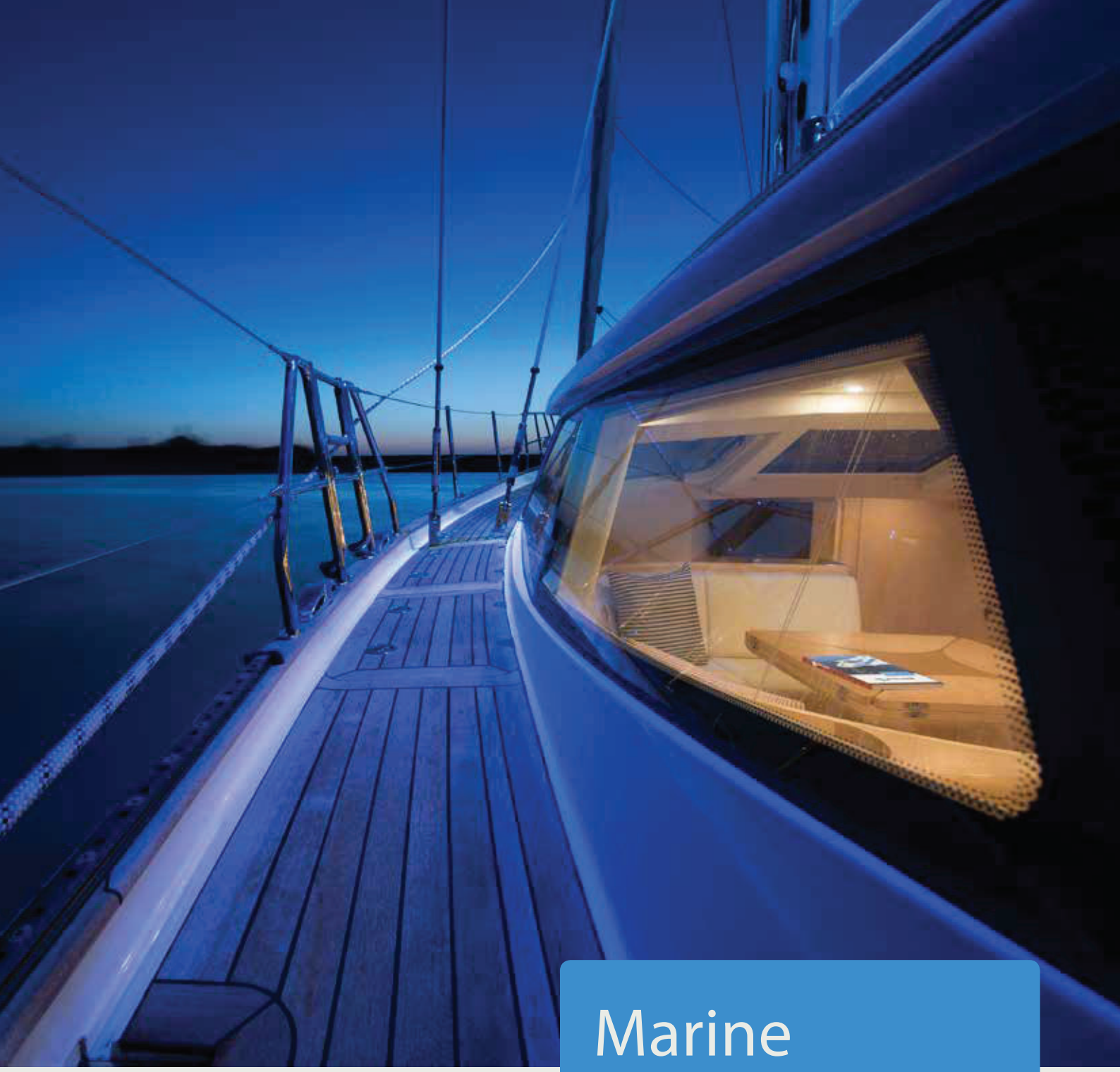
With over 44 years of experience, Victron Energy enjoys an unrivalled reputation for technical innovation, reliability and quality. Victron is a world leader in the supply of self-supporting electrical power. Our products have been designed to meet the most demanding situations faced by a diversity of 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, battery monitors, solar charge controllers, 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 44 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
BLUE POWER



Marine

victron energy
BLUE POWER

Energy. Anytime. Anywhere.


RESCUE ZONE

INDEX

Marine

Whether you sail for fun or on a professional basis, it is of the utmost importance to have a reliable power supply for all the electrical equipment to properly function, even in the middle of the sea. Victron Energy offers a broad range of products that are extremely suitable for your onboard power system. We proudly present you our modern translation for freedom and independence.

Our products are being used in many different kinds of vessels: sailing yachts, cruise ships, sloops, tugboats, motor boats and container ships. To give you an idea of the possibilities of the use of our products, we gathered a few application examples.

Sailing yacht Elektra

Motor yacht Nordhavn 68

Sailing yacht Elektra

Elektra

The electric propulsion sailing yacht Elektra is an example of a retail customer that chose to use Victron Energy products because we at Victron have a complete range of the products that were needed, along with good online technical information and support; all without having to go to multiple suppliers. And the idea that our products are integrated and can easily be added to or combined with the customer's personal boat project needs was also a big plus.

More power needed

As he got used to his original basic system he realised he needed more battery power for house loads rather than tapping off the old AGM propulsion bank, so a separate house bank of 2 x 130 Ah AGMs in series was fitted along with a 24/12 40A DC-DC converter. To bring the charge rate of this 24V house bank up a Blue Power 24V/12A IP67 Battery Charger was also added. Together with the 24/800/16 MultiPlus this gave a combined and decent charge rate of 28A (672 Watts) for the house bank. This also gave the added bonus of charger redundancy and choices for slower and faster charging. The propulsion bank was then upgraded to Lithium, as they are excellent at handling high loads, plus an extra Blue Power IP22 16A charger was added to the 25A Phoenix charger giving an improved and combined charge rate of 41A (1050 Watts).

MultiPlus magic

There can be good reasons for choosing a smaller Multi, depending on the type of appliances you might run from it's inverter. Instead of running typically larger sized home appliances on his boat, the customer opted for lower-rated appliances which are kinder to a small house battery bank.

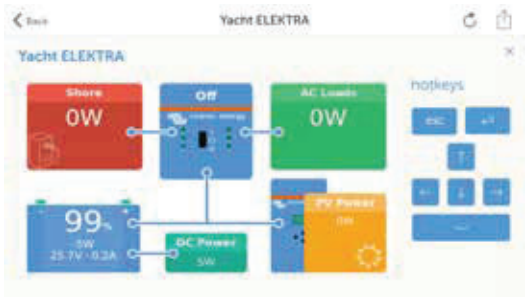
The Honda 1kVA generator shown in the photo is then a perfect partner for the compact 24/800/16 MultiPlus as when the AC load is greater than the 900 Watt continuously rated generator power its 800 Watt inverter part seamlessly kicks in through a fast transfer switch, to supplement that generator power, by taking the additional power from the house batteries; making for a total of 1700 Watts of 230V AC power. This allowed the customer to 'undersize' the generator for such short term higher loads, negating the need to purchase a larger 2kVA generator.

Monitoring and control

Adding a Color Control GX to the existing BMV battery monitors gave the customer additional monitoring and control; perfect partners. Together with an internet connection Elektra's data is also automatically uploaded to the free VRM Portal website.

Remote console

Furthermore there is no need to be concerned about battery SOC, as the customer can leave his boat at any point and control the system chargers remotely via a Smartphone or Laptop. This is called 'Remote Console', an example of which is shown below.



System components

The photo above shows the 2 x 12.8V 200 Ah Lithium-iron-phosphate (LiFePO4) propulsion batteries with cell balancing and BMS (shown centre).

Other system components from front to back on the left - Load & Charge under/over voltage cut off relays. Top left 1 x 10A and 1 x 6A 230V shore power breaker with galvanic isolator, then the electric motor controller box with solenoid and BMV-702 system shunt and at the rear a 600 Watt Phoenix charger.

Right from front - 12A extra charger for AGM house bank, 16A extra charger for Lithium propulsion bank, 75/15 MPPT Solar Charger Controller, and a 50 Watt tube heater behind the auto fire extinguisher to keep moisture at bay in the propulsion space.

Motor yacht Nordhavn 68

US, California: Pacific Asian Enterprises/Nordhavn Yachts

This 68 feet (20.73 meters) motor yacht is the forward pilothouse model of the Nordhavn 68 series. Everything you need for a comfortable stay is on board of this yacht: a large saloon, an outdoor living space, a galley, a laundry room, a master cabin and guest cabins. The rooms on board of the Nordhavn 68 series are finished in teak.

Appliances

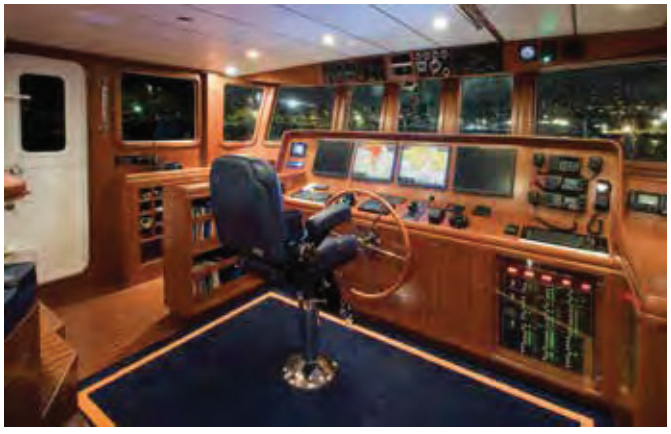
The yacht is modernly decorated and equipped with a long list of comfort and convenience features: the galley is fullly equipped with first-rate appliances, including a Sub-Zero side-by-side refrigerator/freezer and GE cook top and stainless steel convection wall oven. In the living area and in the cabins are large plasma TVs installed.

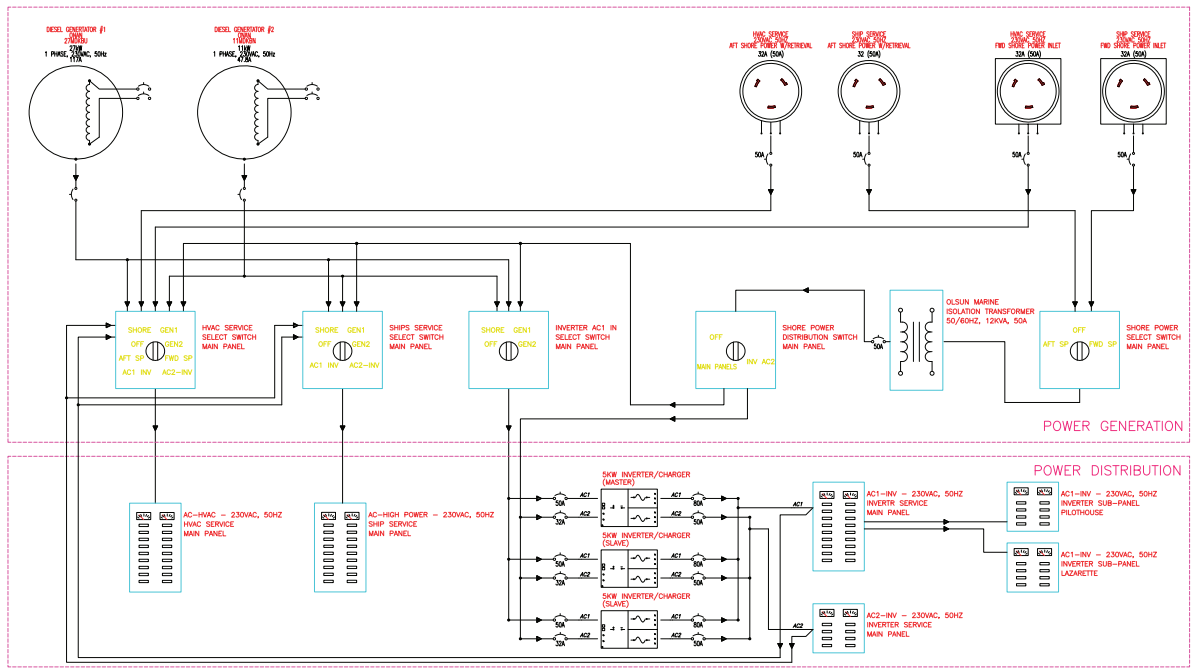
Victron equipment

3 x Quattro 24/5000/120-50/30
Digital Multi Control Panel

Specifications:

LOA:	68' / 20.73 M
LWL:	63' 2 ' / 19.25 M
BEAM:	20' 4" / 6.2 M
DRAFT:	6' 10" / 2.08 M
DISPLACEMENT:	190,000 lbs / 86.10 MT
HP:	425 hp @ 1,900 rpm



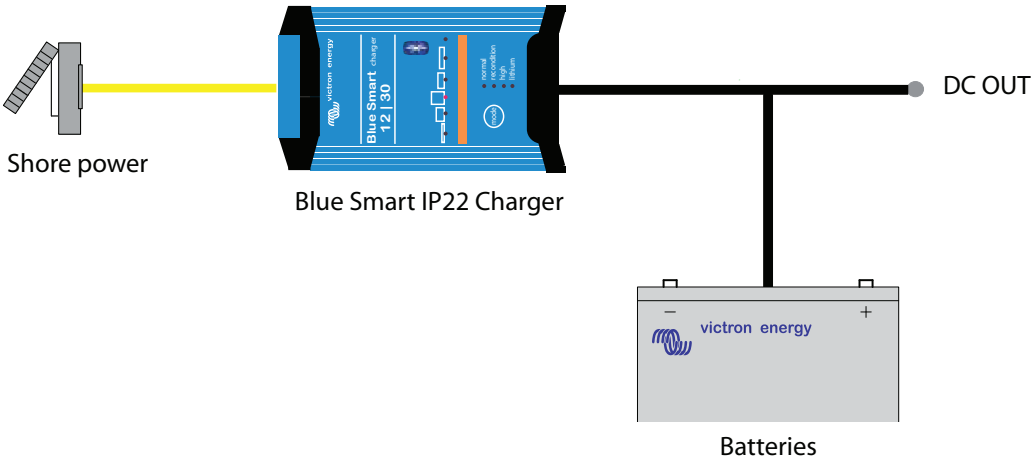


Photos: Stephen Cridland

There are many ways to build a Victron Energy system. Here are a few examples of different systems, from a simple system with only DC consumers to larger parallel and three-phase systems.

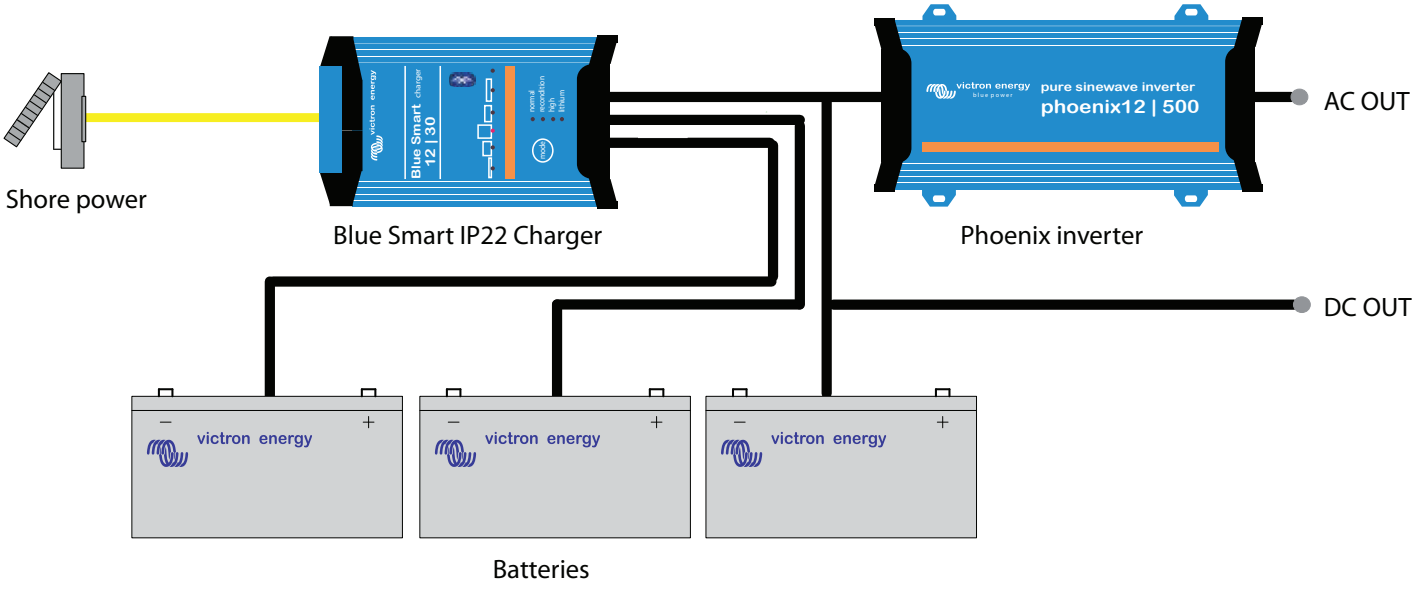
1. Simple system with only DC consumers

The battery charger charges the battery and functions as a power supply for the consumers.



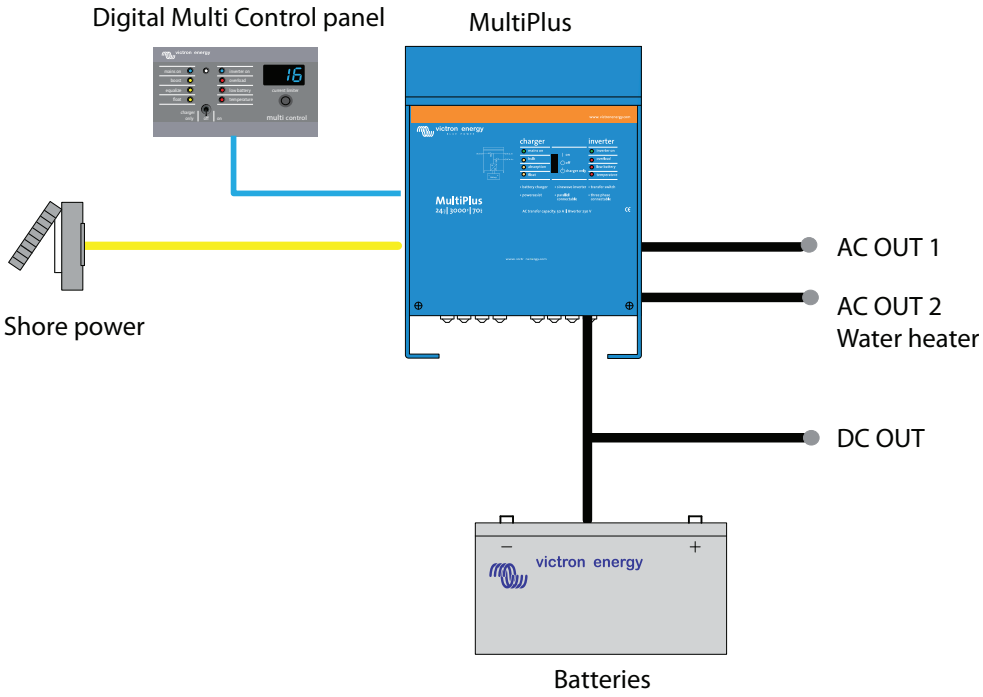
2. System with inverter

This system contains an inverter to ensure a supply of 230VAC at all times. Many charger models have three outputs which allow for several battery groups to be charged separately.



3. Multi-functional

The MultiPlus is a charger and inverter in one. It can function as a UPS (Uninterruptable Power Supply) to ensure power supply when the input power source fails. The MultiPlus also offers several other functional advantages such as PowerControl and PowerAssist.



PowerAssist:
boosting the capacity of shore or generator power

This unique Victron feature allows the MultiPlus to supplement the capacity of the shore or generator power. 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 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. System with generator

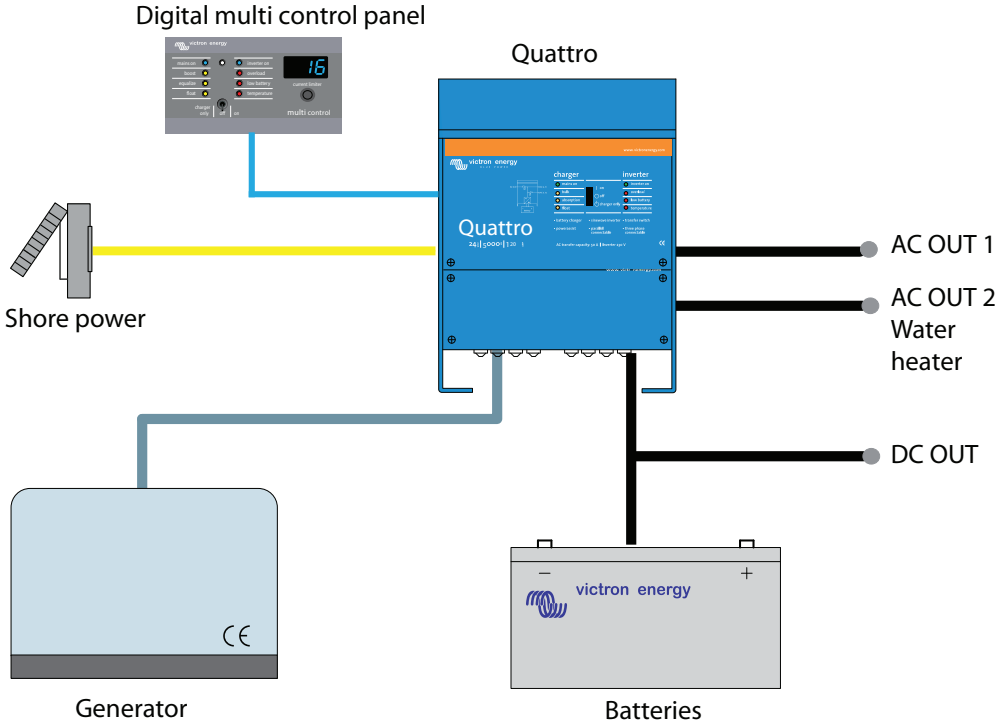
The Quattro has the same functions as the MultiPlus, but with an extra addition: a transfer system which can be directly connected to shore power and a generator.

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.

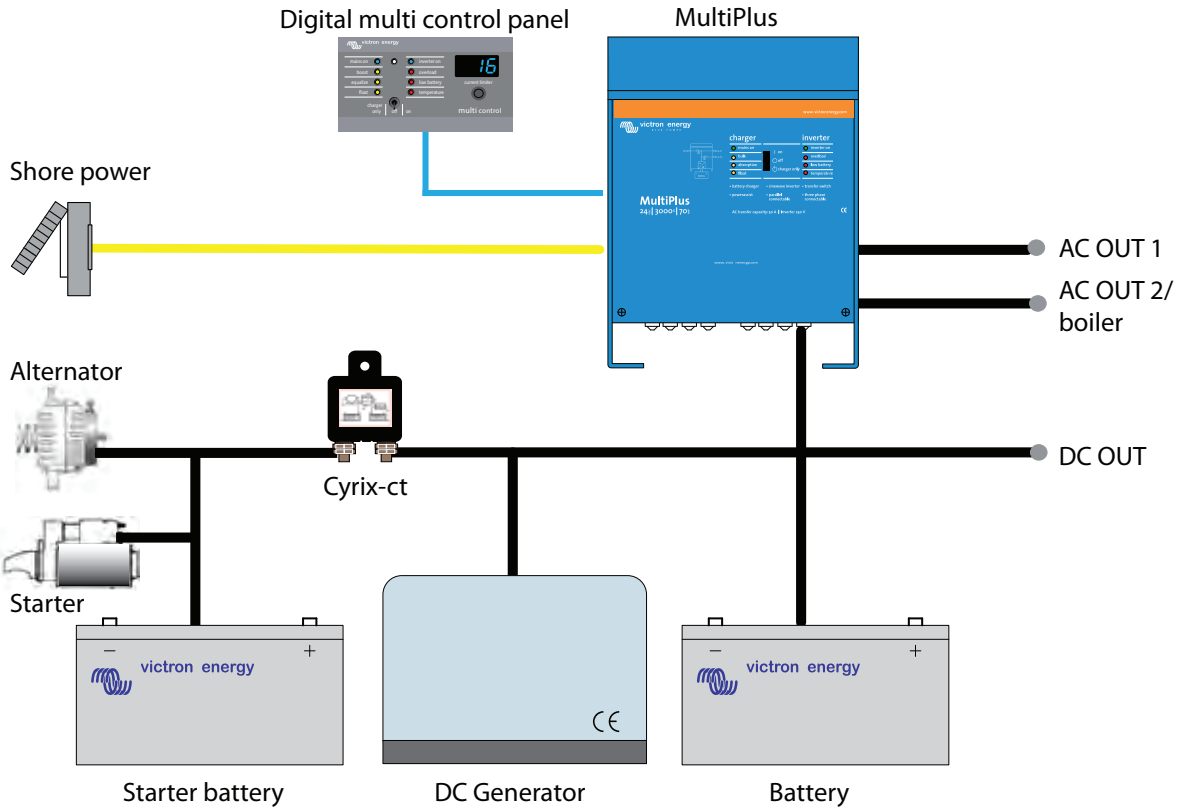
The amount of available AC sources is the deciding factor when choosing between the Quattro and the Multi.

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.



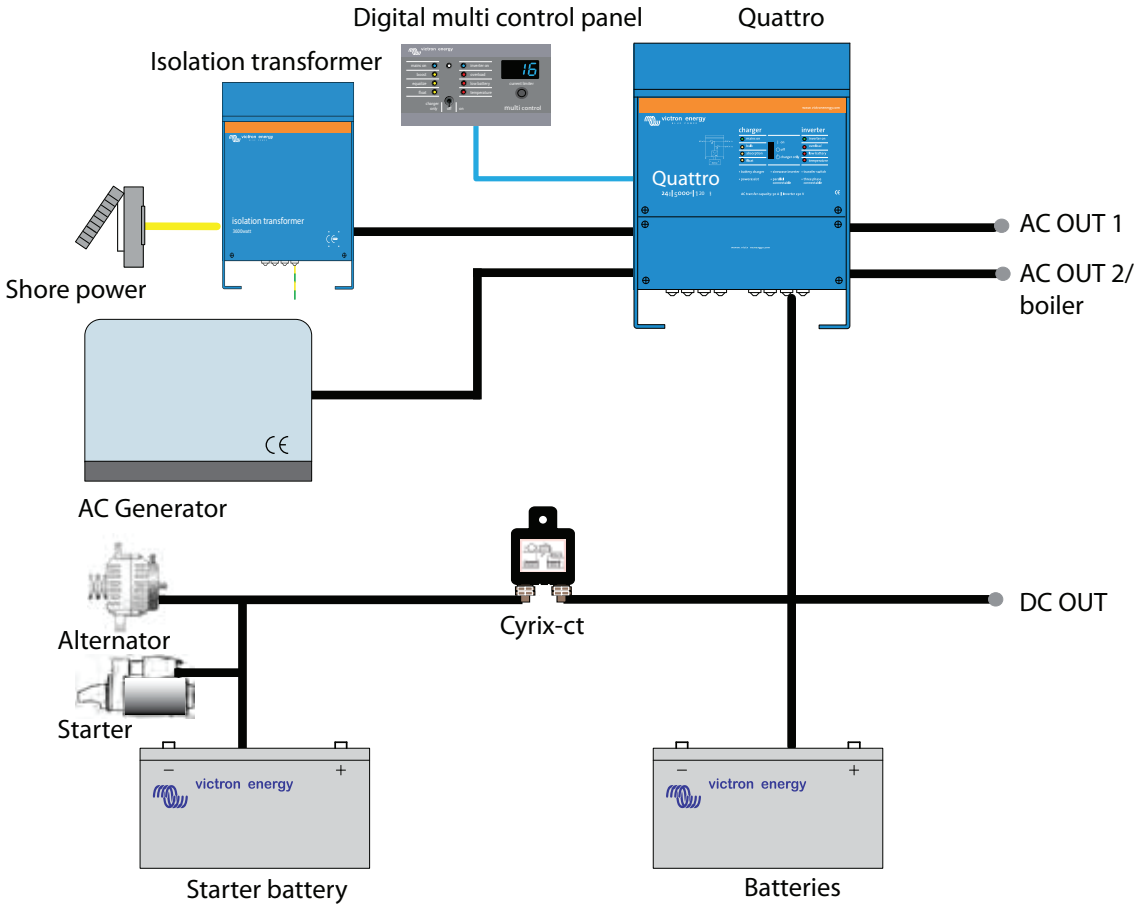
5. Using a DC Generator

In this MultiPlus-based system example the generator directly charges the batteries and/or feeds the inverters. This system offers a lot of advantages such as weight reduction and comfort.



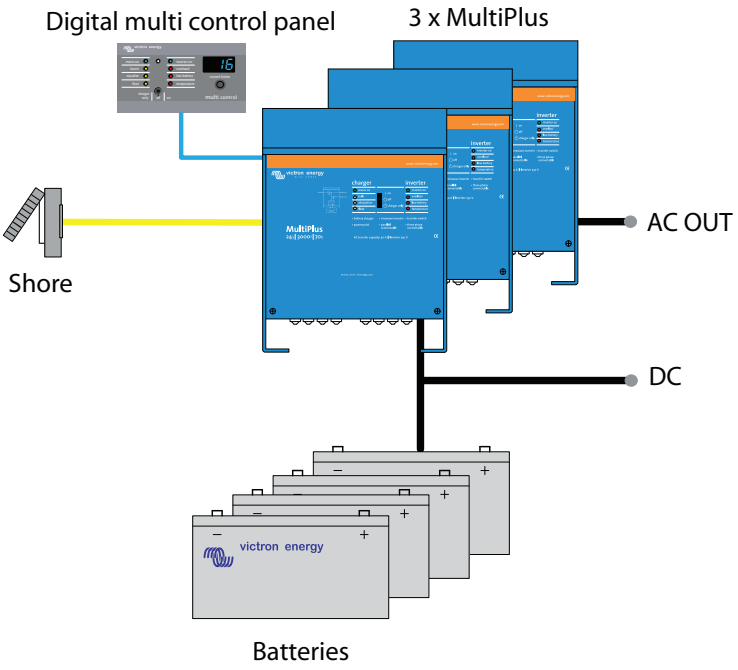
6. Using an AC Generator

This system example is based on a Quattro, which forms the heart of the system. Depending on how high the demand for power is, the Quattro will choose between battery-, shore- and generator power.



7. Parallel system

Our inverters, Multis and Quattros can be paralleled to meet higher power requirements. A simple setting with our VEConfigure configuration software is sufficient.

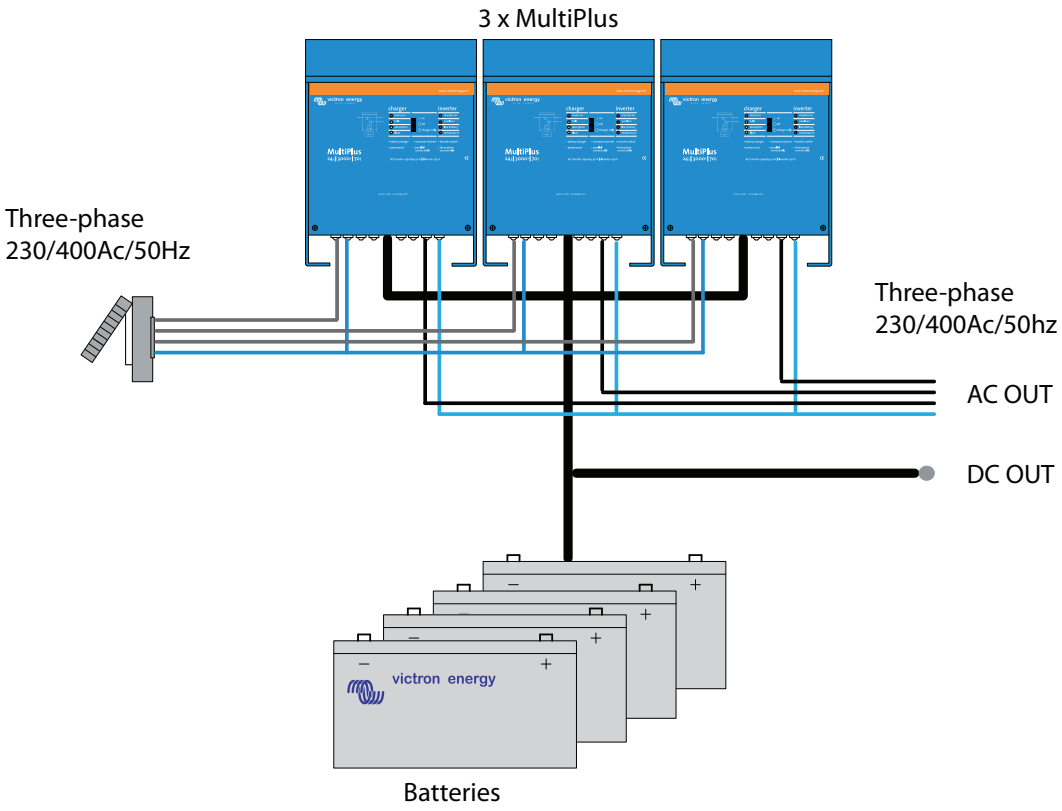


Easy to configure

Configuring parallel and three phase systems is easy. Our VEConfigure software tool allows the installer to put components together, without any hardware hanges or DIP switches. Just using standard products.

8. Three-phase system

Similar to connecting units in parallel they can also be connected in split-phase and three-phase configurations.



Accessories

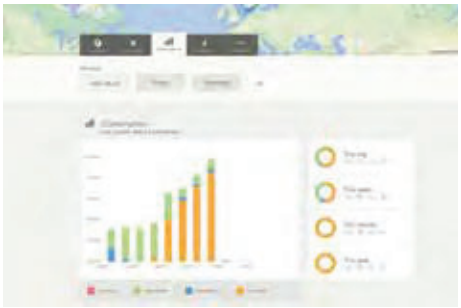
Our systems are comprised of various components. Some of which are specifically designed for specific markets. Other Victron components are applicable for a wide range of applications. You are able to find the specifications and other detailed information about these components in the 'Technical Information'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

Color Control GX

The Color Control GX provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPTs, BMV-series, Skylla-i, Lynx Ion and even more.
The Color Control GX is now also equipped with a generator start/stop function using the internal relay.
Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal.



VRM Online Portal

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

Digital Multi Control Panel GX

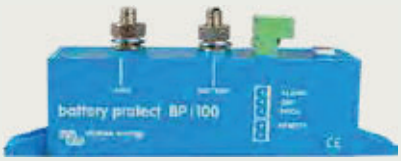
With this panel you are able to remotely monitor and control Multiplus and Quattro systems. A simple turn of the button can limit the power supply of for example a generator and/or shore-side current. The setting range is up to 200A.

VE.Can resistive tank sender adapter

The VE.Can resistive tank sender adapter allows a standard resistive tank level sender to connect to the Color Control GX. It is compatible with both European standard 0-180 Ohm and United States standard 240-30 Ohm tank level senders and is accurate to ±1%. It is easily configurable to resistive senders from fuel, fresh water, waste water, well water, oil and black water (sewage) tanks.

Filax 2: the ultra fast transfer switch

The Filax has been designed to switch sensitive loads, such as computers or modern entertainment equipment from one AC source to another. The priority source typically is the mains, a generator or shore power. The alternate source typically is an inverter.



BatteryProtect
Models 12/24V: 65A, 100A & 220A
Model 48V: 100A

The BatteryProtect disconnects the battery from non-essential loads before it is completely discharged (which would damage the battery) or before it has insufficient power left to crank the engine.

Shore power cable

- Waterproof Shore Power Cable and Inlet IP67
- Moulded Plug and Connector
- Power indication LED
- Protection Cap
- Stainless Steel Inlet

Smart Battery Sense

Smart Battery Sense is a wireless battery voltage and temperature sensor for Victron MPPT Solar Chargers.
With voltage and temperature sense in place, batteries will be better charged; improving charging-efficiency and prolonging battery life.

Tools

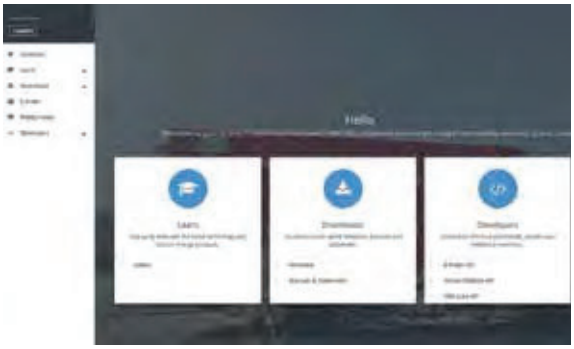
We have a couple of tools available that make it easy for Victron distributors, installers and customers to work with Victron Energy products. Whether you want to configure and read out your Victron products with VictronConnect using your smartphone, tablet or computer or you want to show your VRM site to friends and family, it is all possible with these Victron tools.

VRM Online Portal: Remotely monitor Victron equipment

Victron Remote Management (VRM) is provided by Victron Energy to remotely monitor electrical equipment all over the world.
Once you have a VRM account you will be able to view live feed from your installation, such as generated solar energy, state of charge of your batteries and the consumption.

VictronConnect

VictronConnect lets you get live status info and configure Victron products with built-in Bluetooth support, such as the SmartSolar and the Blue Smart IP65 Charger, or using a VE.Direct Bluetooth Smart dongle or VE.Direct USB interface.
Firmware updates are included inside VictronConnect.
VictronConnect is available for both Windows PCs, Max OS X, iOS and Android phones as well as tablets.



Victron Professional

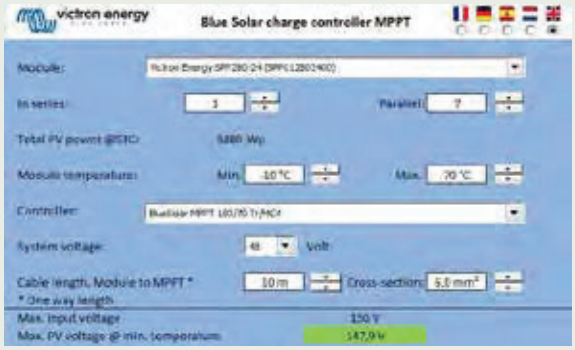
Victron Professional is a new online portal, available to both distributors as well as other professionals and end users that work with Victron equipment.
With Victron Professional you can get insight into training sessions, videos, firmware files, APIs and the latest news. If you already use E-Order you can login with those credentials.

VRM World: View shared VRM sites around the world

Ever wanted to show your clients, friends, colleagues how much solar energy your installation is generating or indeed any other data that you can see on your VRM site? Well now you can – using VRM World.
You need a VRM account to be able to view shared VRM sites. In your VRM portal it is possible to publicly share on VRM World.

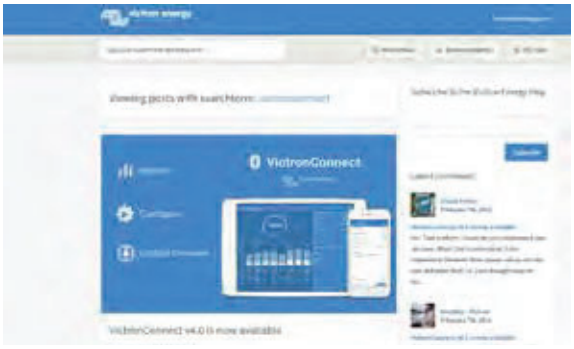
Instruction videos on Victron youtube channel

On our YouTube channel you can watch Victron Energy instruction videos.



MPPT Calculator Excel sheet

With the MPPT Calculator Excel sheet you can match solar modules to MPPT charge controllers.



Victron Energy Blog

On the Victron Energy Blog you can read about the latest news, new products and a lot of success stories with Victron Energy.

Victron Live

Victron Live is a living and growing website, which is a constantly evolving information store. It is a place where you can find manuals for VEConfigure3, Assistants and other software and software products.

TECHNICAL INFORMATION

Phoenix inverters Smart 1600VA & 2000VA
Phoenix inverters 250VA - 1200VA - 230V and 120V VE.Direct
Phoenix inverters 1200VA - 5000VA - 230V
MultiPlus inverter/charger 500VA - 1200VA 230V
MultiPlus inverter/charger 800VA - 5kVA 230V
MultiPlus inverter/charger 2kVA and 3kVA 120V
Quattro inverter/charger 3kVA - 15kVA 230V
Quattro inverter/charger 3kVA - 10kVA 120V
Blue Smart IP22 Charger
Blue Smart IP67 Charger
Blue Smart IP65 Charger with DC connector
Centaur charger 12/24V
Phoenix Smart Charger
Phoenix battery charger 12/24V
Skylla-IP44 battery charger
Skylla-i battery charger 24V
Skylla-TG charger 24/48V 230V
Skylla charger 24V universal input and GL approval
Skylla-TG 24/30 and 24/50 GMDSS
Isolation transformers
Orion-Tr DC-DC converters, low power, Non-isolated
Orion DC-DC converters, high power, Non-isolated
Orion-Tr DC-DC converters, isolated
Orion IP67 24/12 DC-DC converter, Non-isolated
Buck-Boost DC-DC Converter
Color Control GX
Venus GX
Wall mounted display enclosures
BatteryProtect 65A/100A/220A
Cyrix-ct 12/24V 120A and 230A
Cyrix-i 400A 12/24V and 24/48V
Cyrix Li-ion 230A series
BMV-700 series: Precision battery monitoring
BMV-712 Smart: Bluetooth inside
Argo diode battery isolators
Argo FET battery isolators
Battery Balancer
Lithium-Iron-Phosphate Batteries Smart 12,8 & 25,6 Volt: with Bluetooth
Lithium-Ion Battery 24V 180A/100Ah and Lynx Ion + Shunt
Lithium-Ion HE Battery and Lynx Ion BMS
VE.Bus BMS
BMS 12/200 for 12,8V Lithium-Iron-Phosphate Batteries
AGM Super Cycle battery
Telecom batteries
Gel and AGM batteries
BlueSolar & SmartSolar MPPT charge controllers - overview
BlueSolar monocrystalline panels
BlueSolar polycrystalline panels
MultiPlus principle

Phoenix Inverter
Smart 12/2000

Bluetooth built-in: fully configurable with a tablet or smartphone

- Low battery voltage alarm
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage: 210 - 245V
- Frequency: 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level
- Alarm relay

Monitoring:

- In- and output voltage, load and alarms

VE.Direct communication port

The VE.Direct port can be connected to a computer (VE.Direct to USB interface cable needed) to configure and monitor the same parameters.

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value. Once in standby the inverter will switch on for a short period every 2,5 seconds (adjustable).
If the load exceeds the preset level, the inverter will remain on.

Remote on/off

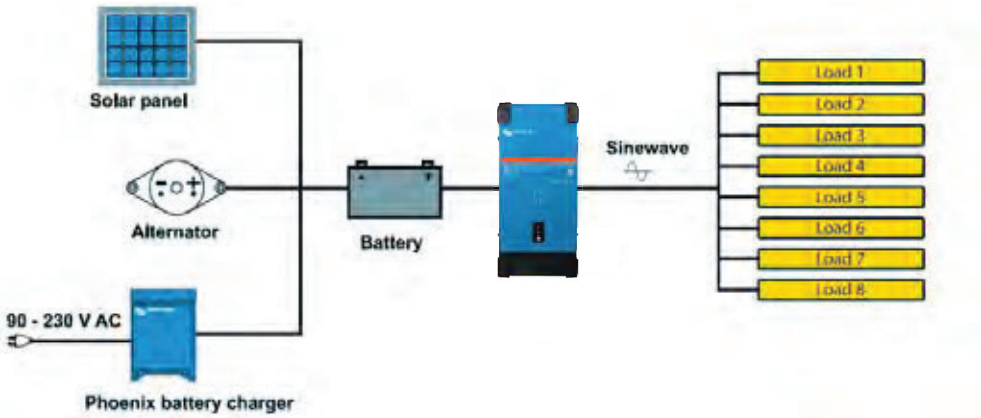
A remote on/off switch or relay contact can be connected to a two pole connector.
Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

LED diagnosis

Please see manual for a description.

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

For our low power inverters we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption. Alternatively use a MultiPlus with built-in transfer switch.



Phoenix Inverter Smart	12/1600 24/1600 48/1600	12/2000 24/2000 48/2000
Parallel and 3-phase operation	No	
INVERTER		
Input voltage range (1)	9,3 – 17V 18,6 – 34V 37,2 – 68V	
Output	Output voltage: 230VAC ±2% 50 Hz or 60Hz ± 0,1% (1)	
Cont. output power at 25°C (2)	1600VA	2000VA
Cont. output power at 25°C	1300W	1600W
Cont. output power at 40°C	1200W	1450W
Cont. output power at 65°C	800W	1000W
Peak power	3000VA	4000VA
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off	
Max. efficiency 12/ 24 /48 V	92 / 94 / 94%	92 / 94 / 94%
Zero load power 12 / 24 / 48 V	8 / 9 / 11W	8 / 9 / 11W
Zero load power in ECO mode	0,6 / 1,3 / 2,1W	0,6 / 1,3 / 2,1W
GENERAL		
Programmable relay (2)	Yes	
Stop & start power ECO-mode	adjustable	
Protection (3)	a - g	
Bluetooth wireless communication	For remote monitoring and system integration	
VE.Direct communication port	For remote monitoring and system integration	
Remote on-off	Yes	
Common Characteristics	Operating temperature range: -40 to +65°C (fan assisted cooling) Humidity (non-condensing): max 95%	
ENCLOSURE		
Common Characteristics	Material & Colour: stainless steel (blue RAL 5012; and black RAL 9017) Protection category: IP 21	
Battery-connection	M8 bolts	
230 V AC-connection	Screw terminals	
Weight	12kg	13kg
Dimensions (hxwhd)	485x219x125mm	485x219x125mm
STANDARDS		
Safety	EN 60335-1	
Emission Immunity	EN 55014-1 / EN 55014-2/ IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3	
Automotive Directive	ECE R10-5	

1) Non-linear load, crest factor 3:1
2) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 1A up to 60VDC

3) 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 is intended for remote on/off control of all VE.Direct Phoenix inverters

Color Control GX
Provides monitor and control. Locally, and also remotely on the VRM Portal.

VE.Direct to USB interface
Connects to an USB port.

Bluetooth wireless communication
Connects to a smart phone (both iOS and Android).

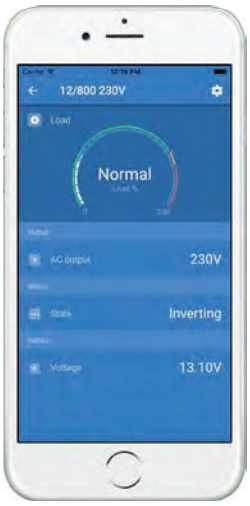
BMV-712 Smart Battery Monitor
The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly 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.

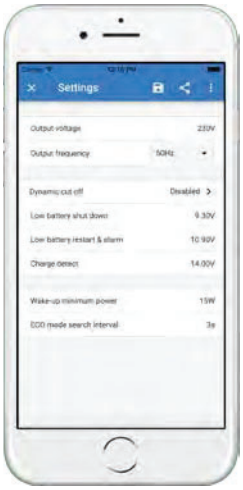
Several models available (see battery monitor documentation).

Phoenix inverters 250VA - 1200VA - 230V and 120V VE.Direct

Phoenix 12/375 VE.Direct

Phoenix 12/375 VE.Direct





VE.Direct communication port

The VE.Direct port can be connected to:

- A computer (VE.Direct to USB interface cable needed)
- Apple and Android smartphones, tablets, MacBook's and other devices (VE.Direct Bluetooth Smart dongle needed)

Fully configurable:

- Low battery voltage alarm trip and reset levels
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage 210 - 245V
- Frequency 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level

Monitoring:

- In- and output voltage, % load and alarms

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value (min load: 15W). Once in standby the inverter will switch on for a short period (adjustable, default: every 2,5 seconds). If the load exceeds a preset level, the inverter will remain on.

Remote on/off

A remote on/off switch can be connected to a two pole connector, or between battery plus and the left hand contact of the two pole connector.

LED diagnosis

Please see manual for a description.

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

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

Available with different output sockets

Schuko	UK	AU/NZ	IEC-320 (male plug included)	Nema 5-15R
				

DC connection with screw terminals

No special tools needed for installation

Phoenix Inverter 12 Volt / 24 Volt / 48 Volt	12/250 24/250 48/250	12/375 24/375 48/375	12/500 24/500 48/500	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. power at 25°C (1)	250VA	375VA	500VA	800VA	1200VA
Cont. power at 25°C / 40°C	200 / 175W	300 / 260W	400 / 350W	650 / 560W	1000 / 850W
Peak power	400W	700W	900W	1500W	2200W
Output AC voltage / frequency (adjustable)	230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0,1%				
Input voltage range	9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V				
DC low shut down (adjustable)	9,3 / 18,6 / 37,2V				
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off, see				
DC low restart and alarm (adjustable)	10,9 / 21,8 / 43,6V				
Battery charged detect (adjustable)	14,0 / 28,0 / 56,0V				
Max. efficiency	87 / 88 / 88%	89 / 89 / 90%	90 / 90 / 91%	90 / 90 / 91%	91 / 91 / 92%
Zero-load power	4,2 / 5,2 / 7,9W	5,6 / 6,1 / 8,5W	6 / 6,5 / 9W	6,5 / 7 / 9,5W	7 / 8 / 10W
Default zero-load power in ECO mode (default retry interval: 2,5 s, adjustable)	0,8 / 1,3 / 2,5W	0,9 / 1,4 / 2,6W	1 / 1,5 / 3,0	1 / 1,5 / 3,0	1 / 1,5 / 3,0
ECO mode stop and start power setting	Adjustable				
Protection (2)	a - f				
Operating temperature range	-40 to +65°C (fan assisted cooling) Derate 1,25% per °C above 40°C				
Humidity (non-condensing)	max 95%				
ENCLOSURE					
Material & Colour	Steel chassis and plastic cover (blue Ral 5012)				
Battery-connection	Screw terminals				
Maximum cable cross-section	10 mm² / AWG8	10 mm² / AWG8	10 mm² / AWG8	25/10/10mm² / AWG4/8/8	35/25/25 mm² / AWG 2/4/4
Standard AC outlets	230V: Schuko (CEE 7/4), IEC-320 (male plug included) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema 5-15R				
Protection category	IP 21				
Weight	2,4kg / 5,3lbs	3,0kg / 6,6lbs	3,9kg / 8.5lbs	5,5kg / 12lbs	7,4kg / 16,3lbs
Dimensions (hxwxd, mm) (hxwxd, inch)	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 172 x 275 3,4 x 6,8 x 10,8	105 x 216 x 305 4.1 x 8.5 x 12.1 (12V model: 105 x 230 x 325)	117 x 232 x 327 4.6 x 9.1 x 12.9 (12V model: 117 x 232 x 362)
ACCESSORIES					
Remote on-off	Yes				
Automatic transfer switch	Filax				
STANDARDS					
Safety	EN-IEC 60335-1 / EN-IEC 62109-1				
EMC	EN 55014-1 / EN 55014-2 / IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3				
Automotive Directive	ECE R10-4				

1) Nonlinear load, crest factor 3:1
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) DC ripple too high

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

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

VE.Direct Bluetooth Smart dongle (must be ordered separately)

Phoenix inverters 1200VA - 5000VA - 230V

Phoenix Inverter
24/5000

SinusMax - Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with 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 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).

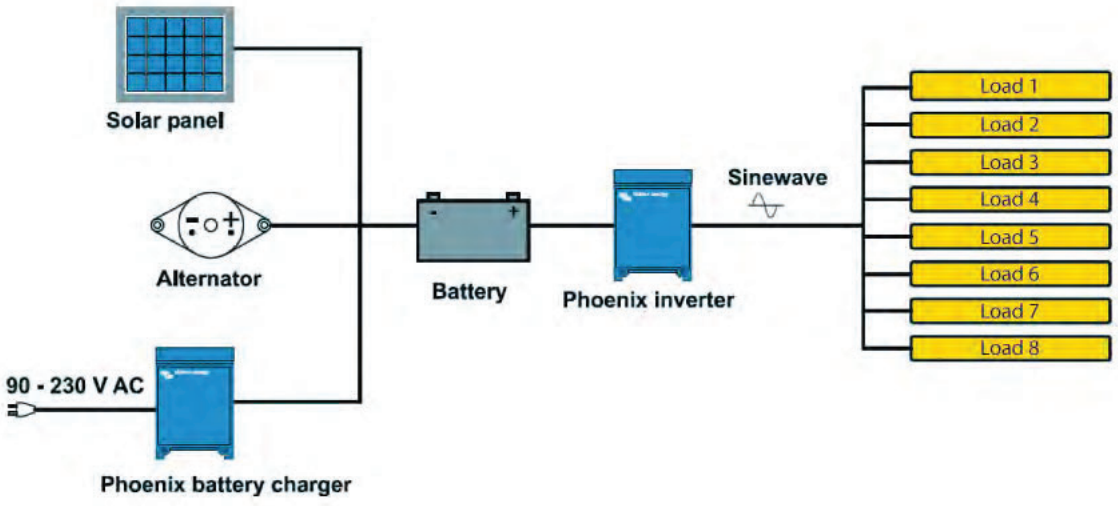
Computer interface

All models have a RS-485 port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VEConfigure software, which can be downloaded free of charge from our website, all parameters of the inverters can be customized. 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 computerized 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' .

Phoenix Inverter Compact
24/1600



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°C (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25°C (W)	1000	1300	1600	2400	4000
Cont. output power at 40°C (W)	900	1200	1450	2200	3700
Cont. output power at 65°C (W)	600	800	1000	1700	3000
Peak power (W)	2400	3000	4000	6000	10000
Max. efficiency 12/ 24 /48 V (%)	92 / 94 / 94	92 / 94 / 94	92 / 92	93 / 94 / 95	94 / 95
Zero load power 12 / 24 / 48 V (W)	8 / 10 / 12	8 / 10 / 12	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8 / 10	5 / 8 / 10	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3 / 4	2 / 3 / 4	3 / 4	8 / 10 / 12	10 / 15
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 +65°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 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 60 Hz and to 240 V
2) Non-linear load, crest factor 3:1
3) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 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:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA 2000 marine electronics network. See the NMEA 2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 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 500VA - 1200VA 230V

Proven reliability
The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverter is short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

PowerControl - Dealing with limited generator, shore side or grid power (800VA/1200VA)
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 (800VA/1200VA)
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.

High start-up power
Needed to start high inrush loads such as power converters for LED lamps, halogen lamps or electric tools.

Search Mode
When Search Mode is 'on', the power consumption of the inverter in no-load operation is decreased by approx. 70%. In this mode the Multi, when operating in inverter mode, is switched off in case of no load or very low load, and switches on every two seconds for a short period. If the output current exceeds a set level, the inverter will continue to operate. If not, the inverter will shut down again.

Programmable relay
By default, the programmable relay is set as an alarm relay, i.e. the relay will de-energise in the event of an alarm or a pre-alarm (inverter almost too hot, ripple on the input almost too high, battery voltage almost too low).

Remote on / off / charger on
Three pole connector.

12 Volt 24 Volt 48 Volt	MultiPlus 12/500/20 MultiPlus 24/500/10 MultiPlus 48/500/6	MultiPlus 12/800/35 MultiPlus 24/800/16 MultiPlus 48/800/9	MultiPlus 12/1200/50 MultiPlus 24/1200/25 MultiPlus 48/1200/13
PowerControl / PowerAssist	No	Yes	
Three Phase and parallel operation	No	Yes	
Transfer switch	16A		
INVERTER			
Input voltage range	9,5 – 17V	19 – 33V	38– 66V
Output	Output voltage: 230VAC ± 2%	Frequency: 50Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	500VA	800VA	1200VA
Cont. output power at 25°C	430W	700W	1000W
Cont. output power at 40°C	400W	650W	900W
Cont. output power at 65°C	300W	400W	600W
Peak power	900W	1600W	2400W
Maximum efficiency	90 / 91 / 92%	92 / 93 / 94%	93 / 94/95%
Zero-load power	6 / 6 / 7W	7 / 7 / 8W	10 / 9 / 10W
Zero-load power in search mode	2 / 2 / 3W	2 / 2 / 3W	3 / 3 /3W
CHARGER			
AC Input	Input voltage range: 187-265 VAC	Input frequency: 45 – 65 Hz	
Charge voltage 'absorption'	14,4 / 28,8 / 57,6V		
Charge voltage 'float'	13,8 / 27,6 / 55,2V		
Storage mode	13,2 / 26,4 /52,8V		
Charge current house battery (4)	20 / 10 / 6A	35 / 16 / 9A	50 / 25 / 13A
Charge current starter battery	1A (12V and 24V models only)		
Battery temperature sensor	Yes		
GENERAL			
Programmable relay (5)	Yes		
Protection (2)	a – g		
Common Characteristics	Operating temp. range: -40 to +65°C (fan assisted cooling) Humidity (non-condensing): max 95%		
ENCLOSURE			
Common Characteristics	Material & Colour: Steel/ABS (blue RAL 5012)	Protection category: IP 21	
Battery-connection	16 / 10 / 10 mm²	25 / 16 / 10 mm²	35 / 25 / 10 mm²
230V AC-connection	G-ST18i connector		
Weight	4,4 kg	6,4 kg	8,2 kg
Dimensions (h x w x d)	311 x 182 x 100 mm	360 x 240 x 100 mm	406 x 250 x 100 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN 62109-1		
Emission / Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	ECE R10-4		

1) Can be adjusted to 60Hz and to 240V
2) Protection
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 230VAC on inverter output
g. Input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) At 25°C ambient
5) Programmable relay which can be set for:
general alarm, DC under voltage or generator start/stop signal function
AC rating: 230V/4A
DC rating: 4A up to 35VDC, 1A up to 60VDC

MultiPlus inverter/charger 800VA - 5kVA 230V

Lithium-Ion battery compatible

MultiPlus 24/3000/70

MultiPlus Compact 12/2000/80

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 3 kVA and more).

Virtually unlimited power thanks to parallel operation

Up to 6 Multis 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 10 A per 5 kVA Multi at 230 VAC). 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.

Solar energy: AC power available even during a grid failure

The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring

- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control

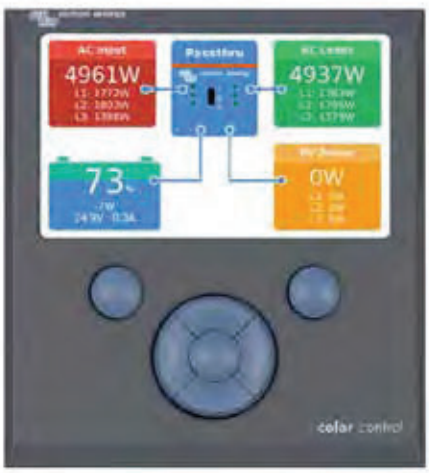
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power Panel, Color Control Panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control

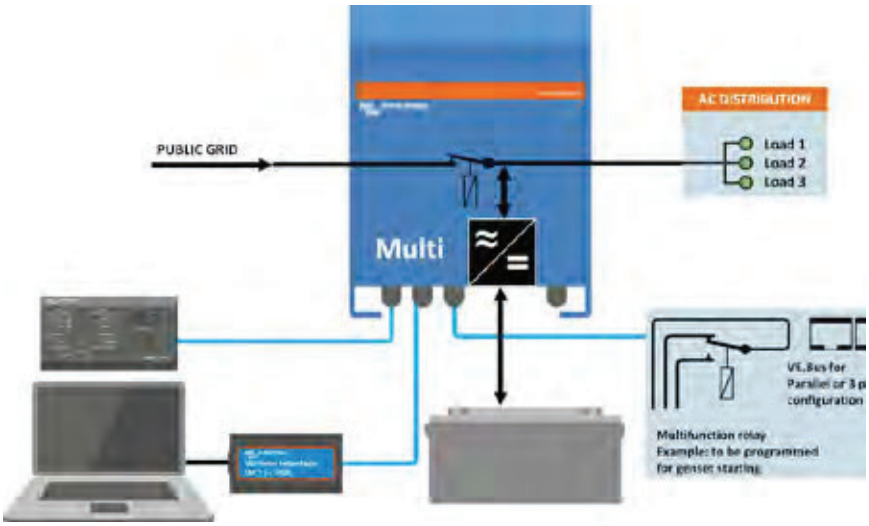
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring

When connected to the Ethernet, systems with a Color Control panel can be accessed remotely and settings can be changed.



Color Control Panel, showing a PV application



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	100
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	2400	4000
Cont. output power at 40°C (W)	650	900	1200	1400	2200	3700
Cont. output power at 65°C (W)	400	600	800	1000	1700	3000
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	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
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 (12 V and 24 V models only)					
Battery temperature sensor	yes					
GENERAL						
Auxiliary output (5)	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
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	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	Yes					
Common Characteristics	Operating temp. range: -40 to +65°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)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375x214x110			520x255x125	362x258x218	444x328x240
STANDARDS						
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, IEC 62109-1					
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3					
Road vehicles	12V and 24V models: ECE R10-4					
Anti-islanding	See our website					

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 under voltage or genset start/stop function
   AC rating: 230 V/4A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist 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:

Color Control GX
Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network.
See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.
Several models available (see battery monitor documentation).

MultiPlus inverter/charger 2kVA and 3kVA 120V

Lithium-Ion battery compatible

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

Multifunctional, 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 Multis 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 45 kW / 54 kVA three phase inverter and 1260 A charger can be built.

Split phase options

Two units can be stacked to provide 120-0-120 V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30 kW / 36 kVA of split phase power.
Alternatively, a split phase AC source can be obtained by connecting our autotransformer to a 'European' inverter programmed to supply 240 V / 60 Hz.

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 20 A per 3 kVA MultiPlus at 120 VAC). 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.

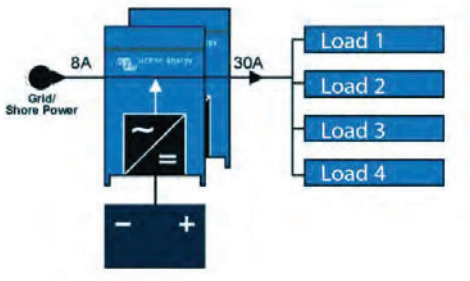
Four stage adaptive charger and dual bank battery charging

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.

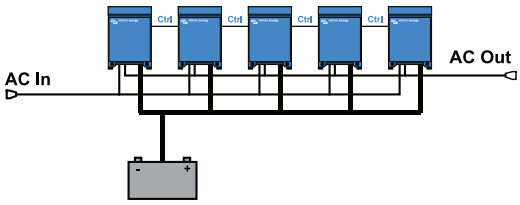
System configuring has never been easier

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	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 25°C / 77°F (VA) (3)		2000	3000
Cont. output power at 25°C / 77°F (W)		1600	2400
Cont. output power at 40°C / 104°F (W)		1450	2200
Cont. output power at 65°C / 150°F (W)		1100	1700
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero load power (W)		9 / 11	20 / 20
Zero load power in AES mode (W)		7 / 8	15 / 15
Zero load power in Search mode (W)		3 / 4	8 / 10
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: -40 - +65°C / -40 to 150°F (fan assisted cooling)	Humidity (non-condensing): max 95%
ENCLOSURE			
Common Characteristics		Material & Colour: aluminium (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 (13 mm^2)	Screw-terminal 6 AWG (13mm^2)
Weight		13 kg 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		EN 55014-1, 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 under voltage or genset start/stop function
AC rating: 230 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
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 PowerControl and PowerAssist 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:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 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 48/5000/70-100/100

Quattro 48/15000/200-100/100

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps 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 to a 'European' inverter programmed to supply 240V / 60Hz.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.

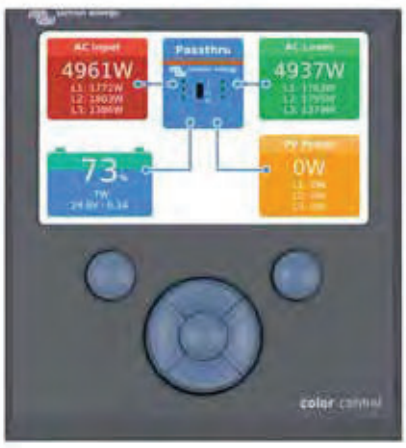
Solar energy: AC power available even during a grid failure
The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

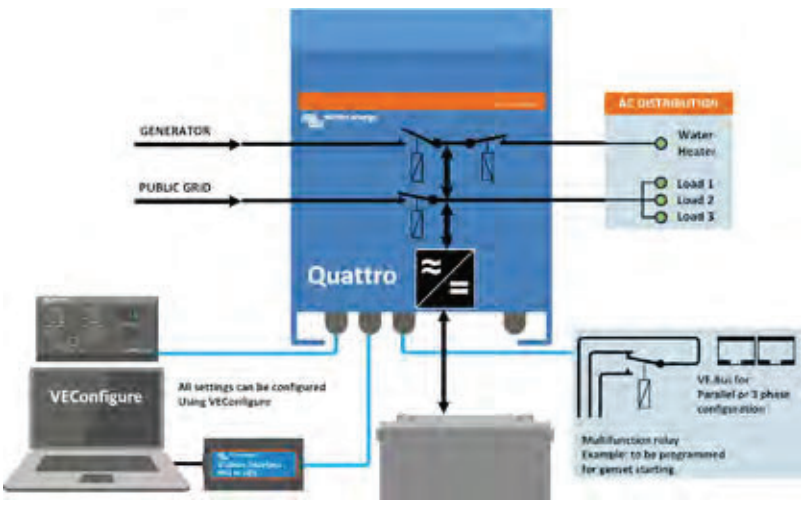
On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power panel, Color Control panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control panel can be accessed and settings can be changed.



Color Control panel, showing a PV application



Quattro	12/3000/120-50/50 24/3000/70-50/50	12/5000/220-100/100 24/5000/120-100/100 48/5000/70-100/100	24/8000/200-100/100 48/8000/110-100/100	48/10000/140-100/100	48/15000/200-100/100
PowerControl / PowerAssist	Yes				
Integrated Transfer switch	Yes				
AC inputs (2x)	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1				
Maximum feed through current (A)	2x 50	2x100	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	15000
Cont. output power at 25°C (W)	2400	4000	6500	8000	12000
Cont. output power at 40°C (W)	2200	3700	5500	6500	10000
Cont. output power at 65°C (W)	1700	3000	3600	4500	7000
Peak power (W)	6000	10000	16000	20000	25000
Maximum efficiency (%)	93 / 94	94 / 94 / 95	94 / 96	96	96
Zero load power (W)	20 / 20	30 / 30 / 35	45 / 50	55	80
Zero load power in AES mode (W)	15 / 15	20 / 25 / 30	30 / 30	35	50
Zero load power in Search mode (W)	8 / 10	10 / 10 / 15	10 / 20	20	30
CHARGER					
Charge voltage 'absorption' (V DC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6	57,6
Charge voltage 'float' (V DC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
Storage mode (V DC)	13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8	52,8
Charge current house battery (A) (4)	120 / 70	220 / 120 / 70	200 / 110	140	200
Charge current starter battery (A)	4 (12V and 24V models only)				
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output (A) (5)	25	50	50	50	50
Programmable relay (6)	3x	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	2x	2x	2x	2x	2x
Remote on-off	Yes				
Common Characteristics	Operating temp.: -40 to +65°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	Bolts M6
Weight (kg)	19	34 / 30 / 30	45 / 41	51	72
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	572 x 488 x 344
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1				
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Road vehicles	12V and 24V models: ECE R10-4				
Anti-islanding	See our website				

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

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

Computer controlled operation and monitoring
Several interfaces are available:

Color Control GX
Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Quattro inverter/charger 3kVA - 10kVA 120V

Lithium-Ion battery compatible

Quattro
48/5000/70-100/100

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps charging capacity.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.

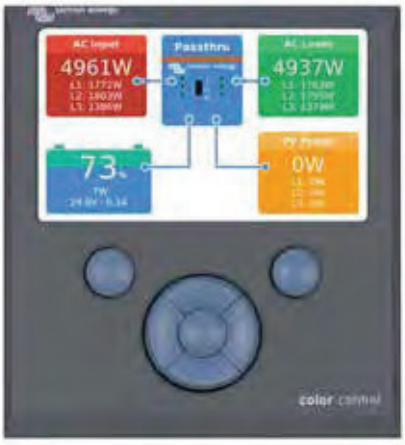
Solar energy: AC power available even during a grid failure
The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

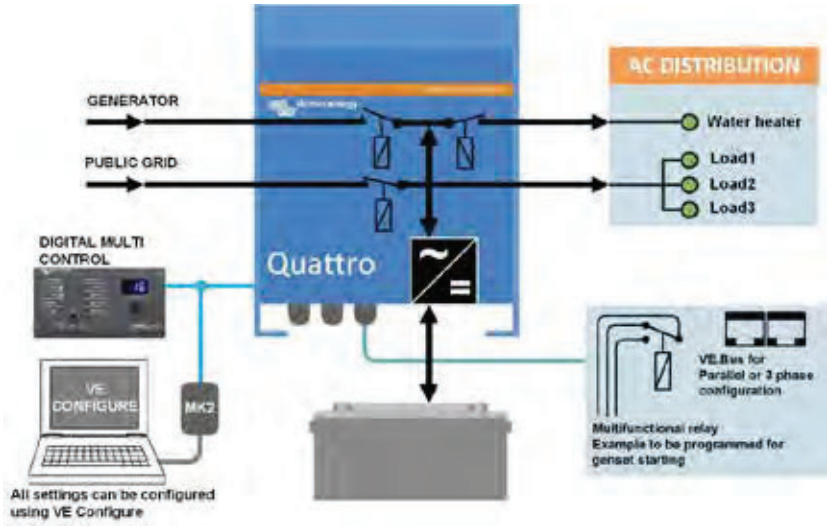
On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Ve.Net Blue Power panel, Color Control panel, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Victron Ethernet Remote, Venus GX and the Color Control Panel.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control panel can be accessed and settings can be changed.



Color Control panel, showing a PV application



Quattro	48/3000/35-50/50 120V	12/5000/220-100/100 120V 24/5000/120-100/100 120V 48/5000/70-100/100 120V	48/10000/140-100/100 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	2x 50 A	2x 100 A	2x 100 A
INVERTER			
Input voltage range	9,5 – 17 V 19 – 33V 38 – 66 V		
Output (1)	Output voltage: 120 VAC ± 2% Frequency: 60 Hz ± 0,1%		
Cont. output power at 25°C (3)	3000 VA	5000 VA	10000 VA
Cont. output power at 25°C	2400 W	4000 W	8000 W
Cont. output power at 40°C	2200 W	3700 W	6500 W
Cont. output power at 65°C	1700 W	3000 W	4500 W
Peak power	6000 W	10000 W	20000 W
Maximum efficiency	94 %	94 / 94 / 95 %	96 %
Zero load power	25 W	30 / 30 / 35 W	55 W
Zero load power in AES mode	20 W	20 / 25 / 30 W	35 W
Zero load power in Search mode	12 W	10 / 10 / 15 W	20 W
CHARGER			
Charge voltage 'absorption' (V DC)	57,6 V	14,4 / 28,8 / 57,6 V	57,6 V
Charge voltage 'float' (V DC)	55,2 V	13,8 / 27,6 / 55,2 V	55,2 V
Storage mode (V DC)	52,8 V	13,2 / 26,4 / 52,8 V	52,8 V
Charge current house battery (A) (4)	35 A	200 / 120 / 70 A	140 A
Charge current starter battery (A)	4 A (12V and 24V models only)		
Battery temperature sensor	Yes		
GENERAL			
Auxiliary output (5)	32 A	50 A	50 A
Programmable relay (6)	3x		
Protection (2)	a-g		
VE.Bus communication port	For parallel, split phase and three phase operation, remote monitoring and system integration		
General purpose com. port	2x		
Remote on-off	Yes		
Common Characteristics	Operating temp.: -40 to +65°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
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch 362 x 258 x 218 mm	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 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch 572 x 488 x 344 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1		
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	12V and 24V models: ECE R10-5		
Anti-islanding	See our website		

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel

A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

Blue Power Panel

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

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX

Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Blue Smart IP22 Charger

Blue Smart IP22
12/30 (3)

Bluetooth Smart
The Blue Smart IP22 Charger is the wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.

High efficiency
With up to 94% efficiency, these chargers generate up to four times less heat when compared to the industry standard. And once the battery is fully charged, power consumption reduces to 0,5 Watt, some five to ten times better than the industry standard.

Adaptive 6-stage charge algorithm: test - bulk – absorption - recondition – float – storage
The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The adaptive feature will automatically optimize the charging process relative to the way the battery is being used.

Storage Mode: less maintenance and aging when the battery is not in use
The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2V/cell (13,2V for a 12V battery) to minimize gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulfation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries
$LiFePO_4$ batteries are charged with a simple bulk – absorption – float algorithm.

NIGHT and LOW setting
When in NIGHT or LOW mode, the output current is reduced to max. 50% of the nominal output and the charger will be totally noiseless. The NIGHT mode automatically ends after 8 hours. The LOW mode can be ended manually.

Protected against overheating
Output current will reduce as temperature increases up to 50°C, but the Blue Smart Charger will not fail.

Eleven LEDs for status indication
Charge algorithm: TEST / BULK / ABSORPTION / RECONDITION / FLOAT / STORAGE / READY.
MODE button to set: NORMAL (14,4V) / HIGH (14,7V) / RECONDITION / LI-ION.

Blue Smart IP22 Charger	12V, 1 output 15 / 20 / 30A	12V, 3 outputs 15 / 20 / 30A	24V, 1 output 8 / 12 / 16A	24V, 3 outputs 16A
Input voltage range	180 – 265 VAC		180 – 265 VAC	
Charge current, normal mode	15 / 20 / 30 A		8/12/16 A	
Charge current, NIGHT or LOW	7,5 / 10 / 15 A		4 / 6 / 8 A	
Efficiency	93%		94%	
No load power consumption	0.5 W		0.5 W	
Frequency	45 – 65 Hz		45 – 65 Hz	
Number of outputs	1	3	1	3
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V		Normal: 28,8V High: 29,4V Li-ion: 28,4V	
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V		Normal: 27,6V High: 27,6V Li-ion: 27,0V	
Charge voltage 'storage'	Normal: 13,2V High: 13,2V Li-ion: 13,5V		Normal: 26,4V High: 26,4V Li-ion: 27,0V	
Charge algorithm	6-stage adaptive			
Can be used as power supply	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to +50°C			
Humidity (non-condensing)	Max 98%			
ENCLOSURE				
Material & Colour	Aluminium (blue RAL 5012)			
Battery connection	Screw terminals 13 mm^2 / AWG6			
230 V AC connection	Cable of 1,5 meter with CEE 7/7 plug, BS 1363 plug (UK) or AS/NZS 3112 plug (AU/NZ)			
Protection category	IP22			
Weight	1,3 kg			
Dimensions (h x w x d)	235 x 108 x 65 mm			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
Automotive	E4-10R		E4-10R	

Blue Smart IP67 Charger 12/25

Bluetooth Smart enabled

The Blue Smart IP67 Charger is the wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.
With Bluetooth, the functionality of the IP67 charger is enhanced and is similar to that of our IP22 and IP65 chargers.

Completely encapsulated: waterproof, shockproof and ignition protected

Water, oil or dirt will not damage the Blue Smart IP67 Charger. The casing is made of cast aluminium and the electronics are moulded in resin.

The highest efficiency ever!

Setting a new industry standard: with 92% efficiency or better, these chargers waste three to four times less heat. And once the battery is fully charged, power consumption reduces to less than a Watt, some five to ten times better than the industry standard.

Adaptive 5-stage charge algorithm: bulk – absorption – recondition – float – storage

The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The 'adaptive' feature will automatically optimise the charging process relative to the way the battery is being used.

Storage Mode: Less maintenance and aging when the battery is not in use

The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries

$LiFePO_4$ batteries are charged with a simple bulk – absorption – float algorithm.

Protected against overheating

Can be used in a hot environment such as a machine room. Output current will reduce as temperature increases up to 60°C, but the charger will not fail.

Two LEDs for status indication

Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off)
Green LED: power on

Blue Smart IP67 Charger	12/7	12/13	12/17	12/25	24/5	24/8	24/12
Input voltage range and frequency	180-265 VAC 45-65 Hz						
Efficiency	93%	93%	95%	95%	94%	96%	96%
No load power consumption	0.5W						
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V				Normal: 28,8V High: 29,4V Li-ion: 28,4V		
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V				Normal: 27,6V High: 27,6V Li-ion: 27,0V		
Charge voltage 'storage'	Normal: 13,2V High: 13,2V Li-ion: 13,5V				Normal: 26,4V High: 26,4V Li-ion: 27,0V		
Charge current, normal mode	7A	13A	17A	25A	5A	8A	12A
Charge current, LOW	2A	4A	6A	10A	2A	3A	4A
Charge algorithm	5-stage adaptive						
Can be used as power supply	yes						
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature						
Operating temp. range	-20 to +60°C (full rated output up to 40°C) Derate 3% per °C above 40°C						
Humidity	Up to 100%						
Start interrupt option (Si)	Short circuit proof, current limit 0,5 A Output voltage: max one volt lower than main output						
ENCLOSURE							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	Black and red cable of 1,5 meter						
230 V AC-connection	Cable of 1,5 meter with CEE 7/7 plug						
Protection category	IP67						
Weight (kg)	1,8	1,8	2,4	2,4	1,8	2,4	2,4
Dimensions (h x w x d in mm)	85 x 211 x 60	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65
STANDARDS							
Safety	EN 60335-1, EN 60335-2-29						
Emission Immunity	EN 55014-1, EN 61000-6-3, EN 61000-3-2						
Automotive Directive	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3						

victron energy
BLUE POWER

Blue Smart IP 65 Charger

Blue Smart IP65 Charger	12 V 4/5/7/10/15 A	24 V 5/8 A
Input voltage range	180 - 265 VAC	
Efficiency	94%	95%
Standby power consumption	0,5 W	
Charge voltage 'absorption'	Normal: 14,4 V High: 14,7 V Li-ion: 14,2 V	Normal: 28,8 V High: 29,4 V Li-ion: 28,4 V
Charge voltage 'float'	Normal: 13,8 V High: 13,8 V Li-ion: 13,5 V	Normal: 27,6 V High: 27,6 V Li-ion: 27,0 V
Charge voltage 'storage'	Normal: 13,2 V High: 13,2 V Li-ion: 13,5 V	Normal: 26,4 V High: 26,4 V Li-ion: 27,0 V
Charge current	4 / 5 / 7 / 10 / 15 A	5 / 8 A
Low current mode	2 / 2 / 2 / 3 / 4 A	2 / 3 A
Temperature compensation (lead-acid batteries only)	16 mV/ºC	32 mV/ºC
Can be used as power supply	Yes	
Back current drain	0,7 Ah/month (1 mA)	
Protection	Reverse polarity Output short circuit Over temperature	
Operating temp. range	-30 to +50°C (full rated output up to 30°C) (cables retain flexibility at low temperature)	
Humidity (non-condensing)	Max 95%	
ENCLOSURE		
Battery-connection	Black and red cable of 1,5 meter	
230 V AC-connection	Cable of 1,5 meter with CEE 7/7, BS 1363 plug (UK) or AS/NZS 3112 plug	
Protection category	IP65 (splash and dust proof)	
Weight	0,9 kg	0,9 kg
Dimensions (h x w x d)	IP65s 12V 4/5A : 45 x 81 x 182 mm IP65 12V 7A 24V 5A : 47 x 95 x 190 mm IP65 12V 10/15A 24V 8A : 60 x 105 x 190 mm	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2	
Immunity	EN 55014-2,EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	

victron energy
BLUE POWER

Included

Clamps

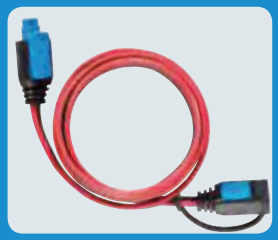
M8 eyelets

Optional

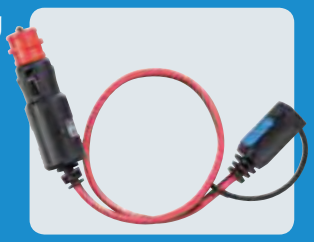
Fused clamps

Fused M6 or M8 eyelets

Extension cable, 2 m



Autoplug



Battery indicator panel

Battery indicator eyelet M8

Blue Smart Charger

IP65

The professional's choice

Bluetooth SMART

5 YEAR WARRANTY

- Water, dust and chemical resistant
- Seven step smart charge algorithm
- Recovery of fully discharged 'dead' batteries
- Automatic power supply function
- Severe cold performance: down to -30°C
- Several other battery life enhancing features
- Low power mode to charge smaller batteries
- ***Li-ion*** battery mode
- Setup and configure, readout of voltage and current by ***Bluetooth Smart***

victron energy
BLUE POWER

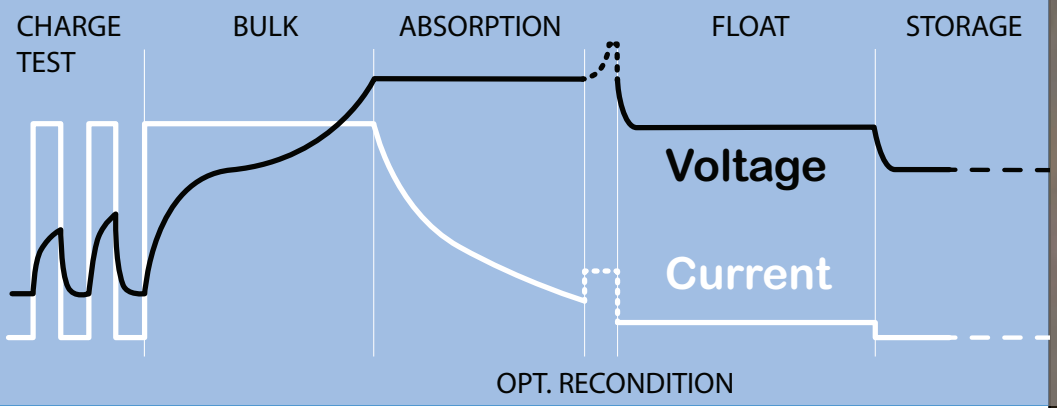
IP65 - Charger **Guide**

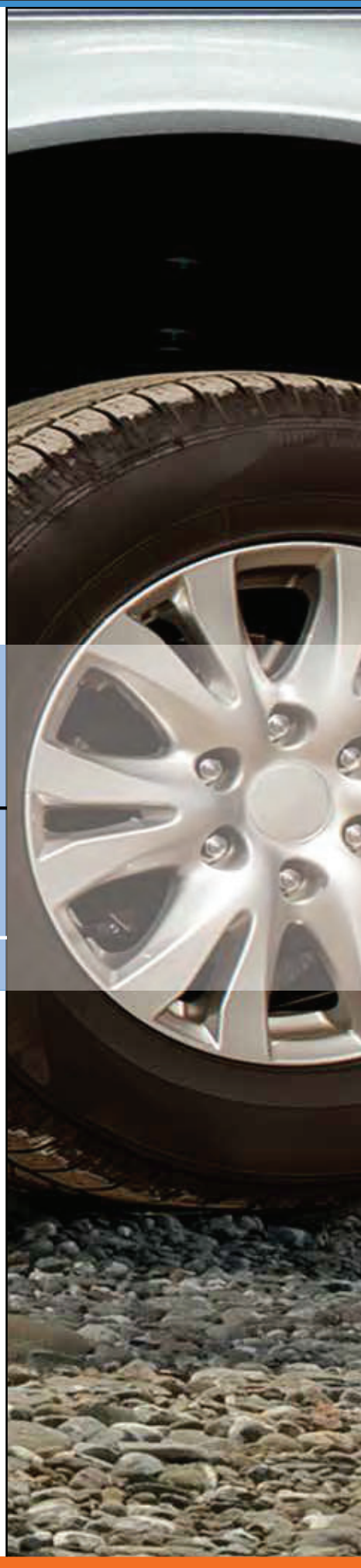
Blue Smart IP65 Charger

	12V				24V	
Battery size Ah	4 & 5 A 20 - 50 Ah	7 A 20 - 70 Ah	10 A 30 - 100 Ah	15 A 50 - 150 Ah	5 A 20 - 50 Ah	8 A 30 - 80 Ah
Your IP65 Charger »	12/4&5	12/7	12/10	12/15	24/5	24/8
	●	●	●	●		
	●	●	●	●		
CLASSIC	●	●	●	●		
MODERN	●	●	●	●		
	●	●	●	●	●	●
					●	●
	●	●	●	●	●	●

● **Recommended**
This is the best charger for this type of battery. The battery will be charged in the most efficient way.

● **OK**
This charger can be used for this battery. It is possible that it takes longer to charge the battery than using a recommended charger.





Reconditioning

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

Recovery function for fully discharged batteries

Most reverse polarity protected chargers will not recognize, and therefore not recharge a battery which has been discharged to zero or nearly zero Volts. The ***Blue Smart IP65 Charger*** however will attempt to recharge a fully discharged battery with low current and resume normal charging once sufficient voltage has developed across the battery terminals.

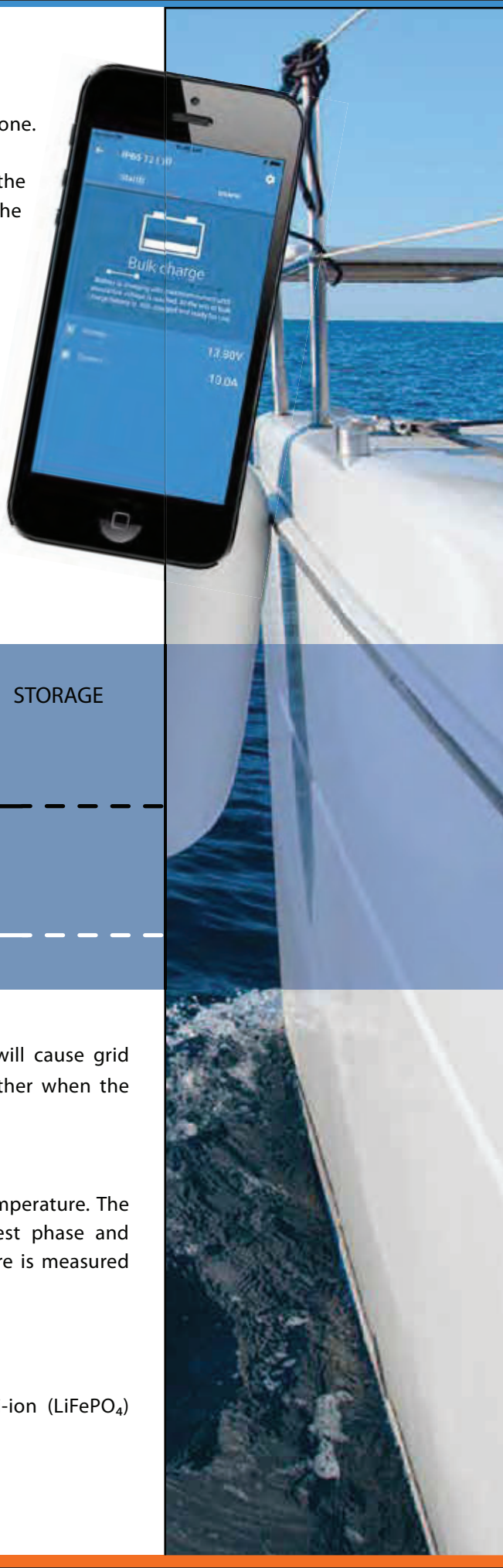
Ultra high efficiency "green" battery charger

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

The VictronConnect app

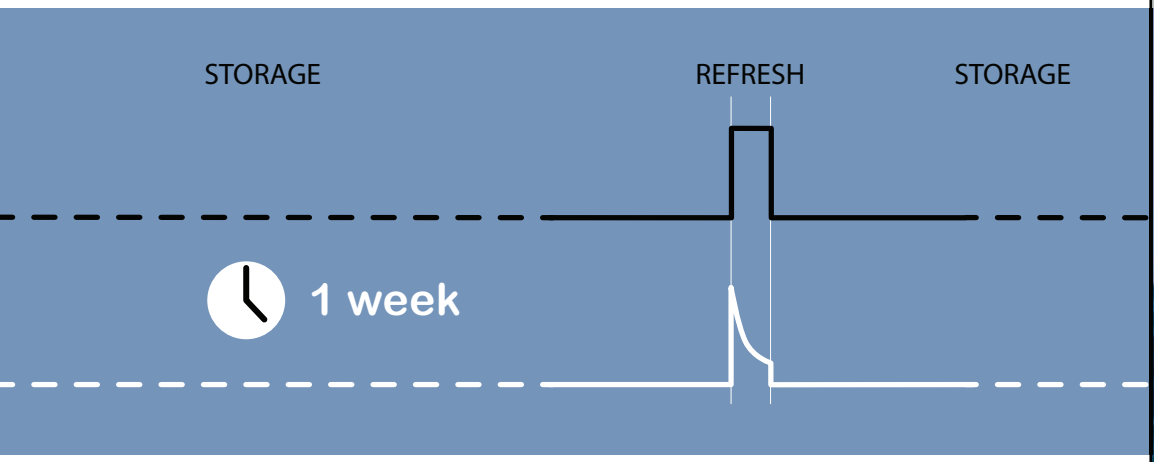
Setup, readout and configure your ***Blue Smart IP65 Charger*** via your smartphone.

You can display the status of your charger and battery and even control the functions of your charger using the VictronConnect app. On your screen the readout of voltage and current is default available.



Durable, safe and silent

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



Storage mode: less corrosion of the positive plates

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

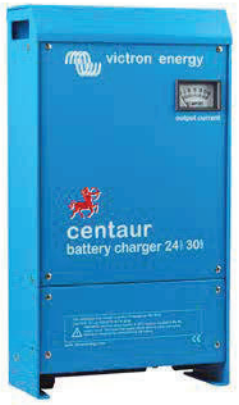
Temperature compensated charging

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

Li-ion battery mode

The ***Blue Smart IP65 Charger*** uses a specific charging algorithm for Li-ion ($LiFePO_4$) batteries, with automatic Li-ion under voltage protection reset.

Centaur charger 12/24V



Centaur
Battery Charger 24 30

Quality without compromise

Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

Universal 90-265V AC input voltage range and also suitable for DC supply (AC-DC and DC-DC operation)

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 also accept a 90-400 V DC supply.

Three outputs that each can supply the full output current

Three isolated outputs to simultaneously charge 3 battery banks
Each output is capable to supply the full rated current.

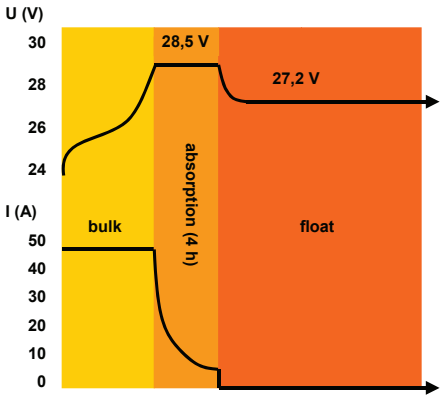
Three-stage charging, with temperature compensation

The Centaur charges at bulk rate until the output has reduced to 70% of the rated Amps, at which a 4 hour timer begins. After the timed period the charger switches to float rate.
An internal temperature sensor is used to compensate the charge voltage with – 2 mV/ºC (– 1 mV/ºF) per cell.
A DIP switch is available to select the optimum charge/float voltages for Flooded Lead-acid, Gel or AGM batteries.

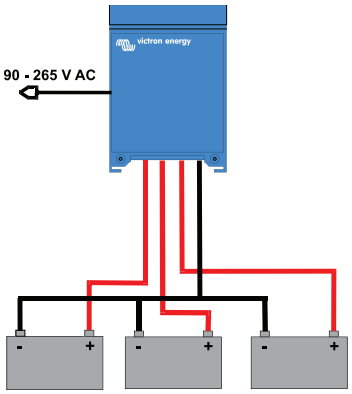
Learn more about batteries and battery charging

To learn more about batteries and charging batteries (including the pro's and cons of multi-bank charging and intelligent charging), please refer to our book 'Electricity on Board'.

Charge curve



Application example



Centaur Charger	12/20	12/30 24/16	12/40	12/50	12/60 24/30	12/80 24/40	12/100 24/60
Input voltage (V AC)	90 – 265						
Input voltage (V DC)	90 – 400						
Input frequency (Hz)	45 – 65						
Power factor	1						
Charge voltage 'absorption' (V DC)	14,3 / 28,5 (1)						
Charge voltage 'float' (V DC)	13,5 / 27,0 (1)						
Output banks	3						
Charge current (A) (2)	20	30 / 16	40	50	60 / 30	80 / 40	100 / 60
Total output ammeter	Yes						
Charge characteristic	IUoU (Three stage charging)						
Recommended battery capacity (Ah)	80 - 200	120 - 300 45 - 150	160 - 400	200 - 500	240 - 600 120 - 300	320 - 800 160 - 400	400 - 1000 240 - 600
Temperature sensor	Internal, - 2mV / °C (- 1mV / °F) per cell						
Forced cooling	Yes, temperature and current controlled fan						
Protection	Output short circuit, over temperature						
Operating temp. range	- 20 to 60°C (0 - 140°F)						
Ignition protected	Yes						
Humidity (non condensing)	max 95%						
ENCLOSURE							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	M6 studs	M6 studs	M8 studs	M8 studs	M8 studs	M8 studs	M8 studs
AC-connection	screw-clamp 4 mm² (AWG 6)						
Protection category	IP 20						
Weight kg (lbs)	3,8 (8.4)	3,8 (8.4)	5 (11)	5 (11)	5 (11)	12 (26)	12 (26)
Dimensions hxwxd in mm (hxwxd in inches)	355x215x110 (14.0x8.5x4.3)	355x215x110 (14.0x8.5x4.3)	426x239x135 (16.8x9.4x5.3)	426x239x135 (16.8x9.4x5.3)	426x239x135 (16.8x9.4x5.3)	505x255x130 (19.9x10.0x5.2)	505x255x130 (19.9x10.0x5.2)
STANDARDS							
Safety	EN 60335-1, EN 60335-2-29, UL 1236						
Emission Immunity	EN 55014-1, EN 61000-3-2						
Automotive Directive	EN 55014-2, EN 61000-3-3						

1) Standard setting. Optimum charge/float voltages for Flooded Lead-acid, Gel-Cell or AGM batteries selectable by DIP switch.
2) Up to 40°C (100°F) ambient. Output will reduce to approximately 80% of nominal at 50°C (120°F) and 60% of nominal at 60°C (140°F).

BMV-700 Battery Monitor

The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Battery Alarm

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

Installation made easy

1. Fasten the separate mounting plate (A) to the wall where you want to place the battery charger, and simply hook up the Centaur.
2. Secure the bottom of the backside (B) to the wall.

Phoenix Smart Charger

Phoenix Smart 12/50(1+1)

Phoenix Smart 12/50(3)

Bluetooth Smart enabled
Any Bluetooth enabled smart phone, tablet or other device can be used to monitor, to change settings and to update the charger when new software features become available.

Phoenix Smart (1+1): two outputs to charge 2 battery banks
The second output, limited to approximately 3A and with a slightly lower output voltage, is intended to top up a starter battery.

Phoenix Smart (3): three full current outputs to charge 3 battery banks
All outputs can supply the full rated output current.

Automatic voltage compensation
The charger compensates for voltage drop over the DC cabling by slightly increasing output voltage when the DC current increases. Please see the manual for details.

Adaptive 5-stage charge algorithm: bulk – absorption – recondition – float – storage
The Phoenix Smart Charger features our well-known 'adaptive' battery management system that can be preset to suit different types of batteries. The 'adaptive' feature will automatically optimise the charge process relative to the way the battery is being used.

The right amount of charge: variable absorption time
When only shallow discharges occur (a yacht connected to shore power for example) the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery will be fully charged.

Preventing damage due to excessive gassing: the BatterySafe mode (see fig. 2)
If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the charger will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached (see the charge curve between 14,4 V and 15,0 V in fig. 2).

Less maintenance and aging when the battery is not in use: the Storage mode (see fig. 1 & 2)
The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries
Charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-ion BMS to the remote on-off port.
Alternatively full control of voltage and current can be achieved with Bluetooth.

Fully programmable charge algorithm
The charge algorithm can be programmed with help of Bluetooth or the VE.Direct interface.
Three preprogrammed algorithms can be selected with the mode button (see specifications).

Remote on-off
Remote on-off can be implemented with a switch, a relay or with an open collector optocoupler signal. See manual for details.

VE.Direct interface
For a wired data connection to a Color Control panel, PC or other devices.
Please see the VictronConnect app under Downloads / Software on our website.

Programmable relay
Can be programmed using the VE.Direct interface or a Bluetooth enabled device to trip on an alarm or other events.

Learn more about batteries and battery charging
For more information about adaptive charging please look under Downloads / White papers on our website.

Phoenix Smart Charger	12V, 2 outputs 12/30(1+1) 12/50(1+1)	12V, 3 outputs 12/30(3) 12/50(3)	24V, 2 outputs 24/16(1+1) 24/25(1+1)	24V, 3 outputs 24/16(3) 24/25(3)
Input voltage	230 VAC (range: 200 – 250 V)			
DC input voltage range	250 – 375 VDC			
Frequency	45-65 Hz			
Power factor	0,7			
Back current drain	< 4 mA			
No load power consumption	1 W			
Efficiency	12/30: 95% 12/50: 93%	12/30: 95% 12/50: 93%	94%	94%
Charge voltage 'absorption'	Normal: 14,4V High: 14,7V Li-ion: 14,2V		Normal: 28,8V High: 29,4V Li-ion: 28,4V	
Charge voltage 'float'	Normal: 13,8V High: 13,8V Li-ion: 13,5V		Normal: 27,6V High: 27,6V Li-ion: 27,0V	
Storage mode	Normal: 13,2V High: 13,2V Li-ion: 13,5V		Normal: 26,4V High: 26,4V Li-ion: 27,0V	
Fully programmable	Yes, with Bluetooth and/or VE.Direct			
Charge current house battery	30 / 50 A	30 / 50 A	16 / 25 A	16 / 25 A
Charge current starter battery	3 A (1+1 output models only)			
Charge algorithm	5 stage adaptive			
Protection	Battery reverse polarity (fuse, not user accessible) / Output short circuit / Over temperature			
Can be used as power supply	Yes, output voltage can be set with Bluetooth and/or VE.Direct			
Voltage and temperature sense	Smart Battery Sense (optional)			
Operating temp. range	-20 to 60°C (0 - 140°F) Rated output current up to 40°C, derate linearly to 20% at 60°C			
Humidity (non-condensing)	max 95%			
Relay (programmable)	DC rating: 5A up to 28VDC			
Parallel operation	Yes (parallel redundant ready, via Bluetooth)			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	Screw terminals 16 mm² (AWG6)			
AC-connection	IEC 320 C14 inlet with retainer clip (AC cord with country specific plug must be ordered separately)			
Protection category	IP43 (electronic components), IP22 (connection area)			
Weight kg (lbs)	3,5 kg			
Dimensions (hxwxd)	180 x 249 x 100 mm (7.1 x 9.8 x 4.0 inch)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
Automotive Directive	E5-10R			
Vibration	IEC68-2-6:10-150Hz/1.0G			

Retainer clip
(included)

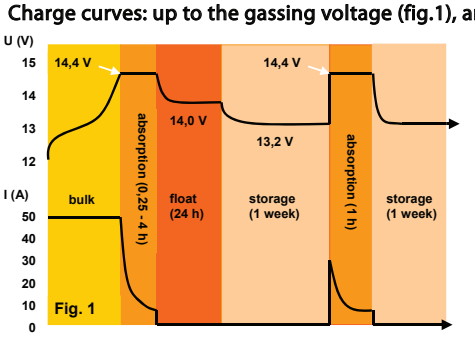
AC cord
(must be ordered separately)

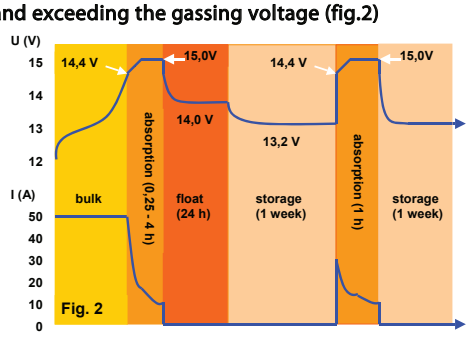
Plug options:
Europe: CEE 7/7
UK: BS 1363
Australia/New Zealand: AS/NZS 3112

Smart Battery Sense
(must be ordered separately)

For voltage and temperature compensation

Charge curves: up to the gassing voltage (fig.1), and exceeding the gassing voltage (fig.2)





Phoenix battery charger 12/24V

Phoenix Charger
12 V 30 A

Phoenix Charger
24 V 25 A

Adaptive 4-stage charge characteristic: bulk – absorption – float – storage

The Phoenix Charger features a microprocessor controlled 'adaptive' battery management system that can be preset to suit different types of batteries. The 'adaptive' feature will automatically optimise the process relative to the way the battery is being used.

The right amount of charge: variable absorption time

When only shallow discharges occur (a yacht connected to shore power for example) the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.

Preventing damage due to excessive gassing: the BatterySafe mode (see fig. 2 below)

If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the Phoenix Charger will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached (see the charge curve between 14,4 V and 15,0 V in fig. 2 below).

Less maintenance and aging when the battery is not in use: the Storage mode (see fig. 1 & 2 below)

The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for 12 V battery) to minimize gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

To increase battery life: temperature compensation

Every Phoenix 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 and/or when important fluctuations of battery temperature are expected.

Battery voltage sense

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

Universal 90-265 V AC input voltage range and also suitable for DC supply (AC-DC and DC-DC operation)

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

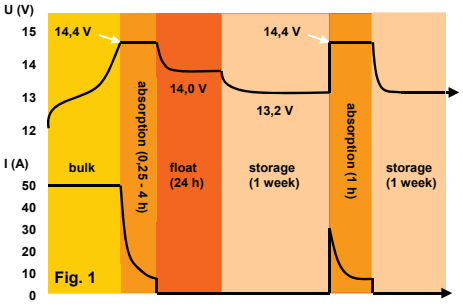
Computer interface

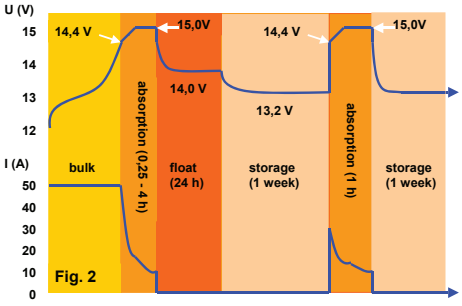
Every Phoenix Charger is ready to communicate with a computer through its RS-485 data port. Together with our VEConfigure software, which can be downloaded free of charge from our website and the data link MK2-USB (see accessories), all parameters of the chargers can be customised.

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). For more information about adaptive charging please look under Technical Information on our website.

Charge curves: up to the gassing voltage (fig.1), and exceeding the gassing voltage (fig.2)





Phoenix Charger	12/30	12/50	24/16	24/25
Input voltage range (V AC)	90-265			
Input voltage range (V DC)	90-400			
Frequency (Hz)	45-65			
Power factor	1			
Charge voltage 'absorption' (V DC)	14,4	14,4	28,8	28,8
Charge voltage 'float' (V DC)	13,8	13,8	27,6	27,6
Storage mode (V DC)	13,2	13,2	26,4	26,4
Charge current house batt. (A) (2)	30	50	16	25
Charge current starter batt. (A)	4	4	4	4
Charge characteristic	4 stage adaptive			
Battery capacity (Ah)	100-400	200-800	100-200	100-400
Temperature sensor	√	√	√	√
Can be used as power supply	√	√	√	√
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	M6 studs			
AC-connection	screw-clamp 4 mm² (AWG 11)			
Protection category	IP 21			
Weight kg (lbs)	3,8 (8)			
Dimensions (hxwxd in mm and inches)	350x200x108 mm (13.8x7.9x4.3 inch)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission Immunity	EN 55014-1, EN 61000-3-2,			
Automotive Directive	EN 55014-2, EN 61000-3-3			
Vibration	IEC68-2-6:10-150Hz/1.0G			
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		

Battery Alarm
An excessively high or low battery voltage is indicated by an audible and visual alarm, and potential free contacts.

Phoenix Charger Control
The PCC panel provides remote control and monitoring of the charge process with LED indication of the charger status. In addition, the remote panel also offers output current adjustment that can be used to limit the output current and thus the power drawn from the AC supply. This is particularly useful when operating the charger from limited shore power or small gensets. The panel can also be used to change the battery charging parameters.
The brightness of the LEDs is automatically reduced during night time. Connection to the charger is with a standard UTP–cable.

BMV-700 Battery Monitor
The BMV-700 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-700 selectively displays battery voltage, current, consumed Ah or time to go.

Skylla-IP44 battery charger

Skylla-IP44 12/60 (1+1)

Skylla-IP44 12/60 (1+1)

Skylla-IP44 (1+1): two outputs to charge 2 battery banks

The Skylla-IP44 (1+1) features 2 isolated outputs. The second output, limited to approximately 3A and with a slightly lower output voltage, is intended to top up a starter battery.

Skylla-IP44 (3): three full current outputs to charge 3 battery banks

The Skylla-IP44 (3) features 3 isolated outputs. All outputs can supply the full rated output current.

IP44 protection

Steel epoxy powder coated case and splash proof. Withstands the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

LCD display

For status monitoring and to easily adapt the charge algorithm to a particular battery and its conditions of use.

CAN bus interface (NMEA2000)

To connect to a CAN bus network, to a Skylla-i Control panel or to the Color Control digital display.

Synchronised parallel operation

Several chargers can be connected in parallel and synchronised with help of the CAN bus interface. This is achieved by simply interconnecting the chargers with RJ45 UTP-cables.

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

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

Preventing damage due to excessive gassing: the BatterySafe mode

If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the Skylla-IP44 will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached.

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

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

To increase battery life: temperature compensation

Every Skylla-IP44 comes with a battery temperature sensor. When connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed lead-acid batteries and/or when important fluctuations of battery temperature are expected.

Battery voltage sense

In order to compensate for voltage loss due to cable resistance, the Skylla-IP44 is provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Use as a power supply

As a result of the excellent control circuit, the Skylla-IP44 can be used as a power supply with perfectly stabilized output voltage if batteries or large buffer capacitors are not available.

Li-Ion (LiFePO4) ready

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

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' .

Skylla-IP44	12/60 (1+1)	12/60 (3)	24/30 (1+1)	24/30 (3)
Input voltage (VAC)	120/230 V			
Input voltage range (VAC)	90-265 V			
Maximum AC input current @ 100 VAC	10 A			
Frequency	45-65 Hz			
Power factor	0,98			
Charge voltage 'absorption' (1)	14,4 V		28,8 V	
Charge voltage 'float'	13,8 V		27,6 V	
Charge voltage 'storage'	13,2 V		26,4 V	
Charge current (2)	60 A	3 x 60A (max total output: 60 A)	30 A	3 x 30 A (max total output: 30 A)
Charge current starter batt. (A)	3 A	n. a.	3 A	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity	300-600 Ah		150-300 Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
CAN bus communication port (VE.Can)	Two RJ45 connectors, NMEA2000 protocol, not isolated			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST AC rating: 240VAC/4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Forced cooling	Yes (internal air circulation)			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	steel (blue RAL 5012)			
Battery-connection	M6 bolts			
230 VAC-connection	screw-clamp 6mm² (AWG 10)			
Protection category	IP44			
Weight	6kg (14 lbs)			
Dimensions (hxwxd)	401 x 375 x 265 mm 16 x 15 x 10.5 inch			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
1) Output voltage range 10-16V resp. 20-32V.	2) Up to 40°C (100°F) ambient. Output will reduce to 80% at 50°C, and to 60% at 60°C.			

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current.
The software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery.
The BMV-700 selectively displays battery voltage, battery current, consumed Ah or time to go.

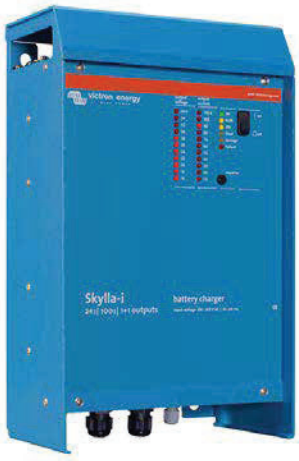
Skylla-i Control

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

Skylla-i battery charger 24V

Li-Ion ready

Skylla-i 24/100 (3)



Skylla-i 24/100 (1+1)

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

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

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

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

Rugged

Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

Flexible

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

Important features:

Synchronised parallel operation

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

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

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

Preventing damage due to excessive gassing: the BatterySafe mode

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

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

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

To increase battery life: temperature compensation

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

Battery voltage sense

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

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

The chargers also accept a DC supply.

Use as a power supply

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

Li-Ion (LiFePO4) ready

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

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' .

Skylla-i	24/80 (1+1)	24/80 (3)	24/100 (1+1)	24/100 (3)
Input voltage (VAC)	230V			
Input voltage range (VAC)	185-265V			
Input voltage range (VDC)	180-350V			
Maximum AC input current @ 180 VAC	16A		20A	
Frequency (Hz)	45-65Hz			
Power factor	0,98			
Charge voltage 'absorption' (VDC) (1)	28,8V			
Charge voltage 'float' (VDC)	27,6V			
Charge voltage 'storage' (VDC)	26,4V			
Charge current (A) (2)	80A	3 x 80A (max total output: 80A)	100A	3 x 100A (max total output: 100A)
Charge current starter batt. (A)	4A	n. a.	4	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity (Ah)	400-800Ah		500-1000Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
CAN bus communication port (VE.Can)	Two RJ45 connectors, NMEA2000 protocol, galvanically isolated			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST AC rating: 240VAC/4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Forced cooling	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	M8 bolts			
230 VAC-connection	screw-clamp 10mm² (AWG 7)			
Protection category	IP 21			
Weight kg (lbs)	7kg (16 lbs)			
Dimensions hxwxd in mm (hxwxd in inches)	405 x 250 x 150 (16.0 x 9.9 x 5.9)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			

1) Output voltage range 20-36V. Can be set with rotary switch or potentiometers.

2) Up to 40°C (100°F) ambient. Output will reduce to 80% at 50°C, and to 60% at 60°C.

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current.
The software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery.
The BMV-700 selectively displays battery voltage, battery current, consumed Ah or time to go.

Skylla-i Control

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

Skylla-TG charger 24/48V 230V

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 (24V models only)

The TG Chargers feature 2 isolated outputs. The second output, limited to approximately 4A 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.

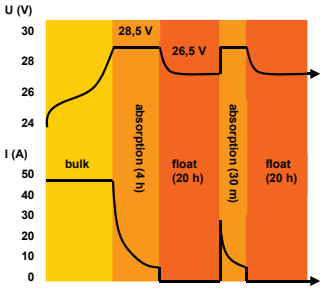
Battery voltage sense

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.

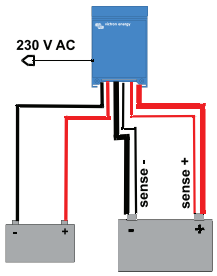
Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' .

Charge curve



Application example

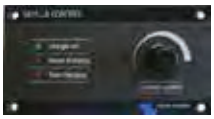


Skylla	24/30 TG 24/50 TG	24/50 TG 3 phase	24/80 TG	24/100 TG	24/100 TG 3 phase	48/25 TG	48/50 TG
Input voltage (V AC)	230	3 x 400	230	230	3 x 400	230	230
Input voltage range (V AC)	185-264	320-450	185-264	185-264	320-450	185-264	185-264
Input voltage range (V DC)	180-400	n. a.	180-400	180-400	n. a.	180-400	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	-40 to +50°C (-40 - 122°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

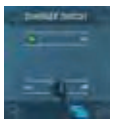
BMV-700 Battery Monitor

The BMV-700 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-700 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 charger 24V universal input and GL approval

Skylla Charger
24 V 50 A

Universal 90-265 V 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 90-400 V 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 185-265 V AC supply.

Other features

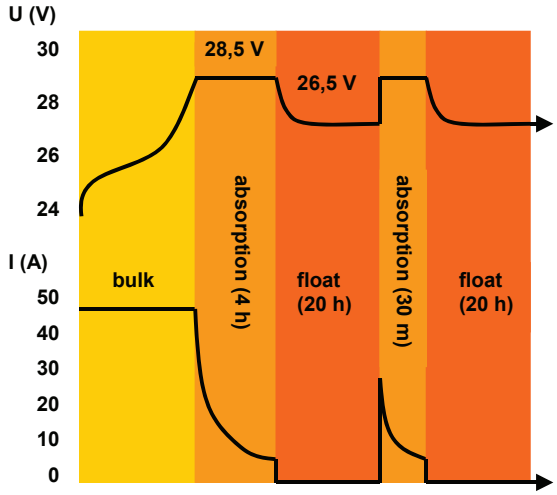
- Microprocessor control
- Can be used as power supply
- Battery temperature sensor for temperature compensated charging
- Battery voltage sensing to compensate for voltage loss due to cable resistance

- Standard 185-265 V 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'.

Charge curve



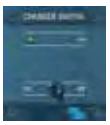
Skylla-TG	24/30 90-265 VAC	24/50 90-265 VAC	24/100-G 90-265 VAC
Input voltage (V AC)	230	230	230
Input voltage range (V AC)	90-265	90-265	90-265
Input voltage range (V DC)	90-400	90-400	90-400
Frequency (Hz)	45-65 Hz or DC		
Power factor	1		
Charge voltage 'absorption' (V DC)	28,5	28,5	28,5
Charge voltage 'float' (V DC)	26,5	26,5	26,5
Charge current house batt. (A) (2)	30 (limited to 22 A at 110V AC)	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	-40 to +%0°C (-40 - 122°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-700 Battery Monitor
The BMV-700 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-700 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 24/30 and 24/50 GMDSS

Skylla
TG 24 30 GMDSS

GMDSS

The Global Maritime Distress & Safety System (GMDSS) was developed by the International Maritime Organisation (IMO) to improve maritime distress and safety communications.

Power supply

The Skylla TG has proven itself to be an excellent battery charger and power supply for GMDSS applications. However, when using a standard Skylla Charger, additional equipment is needed to perform the monitoring and alarm functions required for GMDSS.

Installation made easy: the Skylla GMDSS

The Victron Skylla GMDSS Charger has been designed to provide all required monitoring and alarm data. Both the battery and the GMDSS system are connected directly to the charger. Data and alarms are displayed on a digital panel (VE.Net GMDSS panel, to be ordered separately). A standard eight wire UTP-cable connects the charger to the panel.

No adjustments needed

The whole system is 'click and go': the panels are pre-programmed for GMDSS functionality. A simple, intuitive menu allows changing of settings if required.

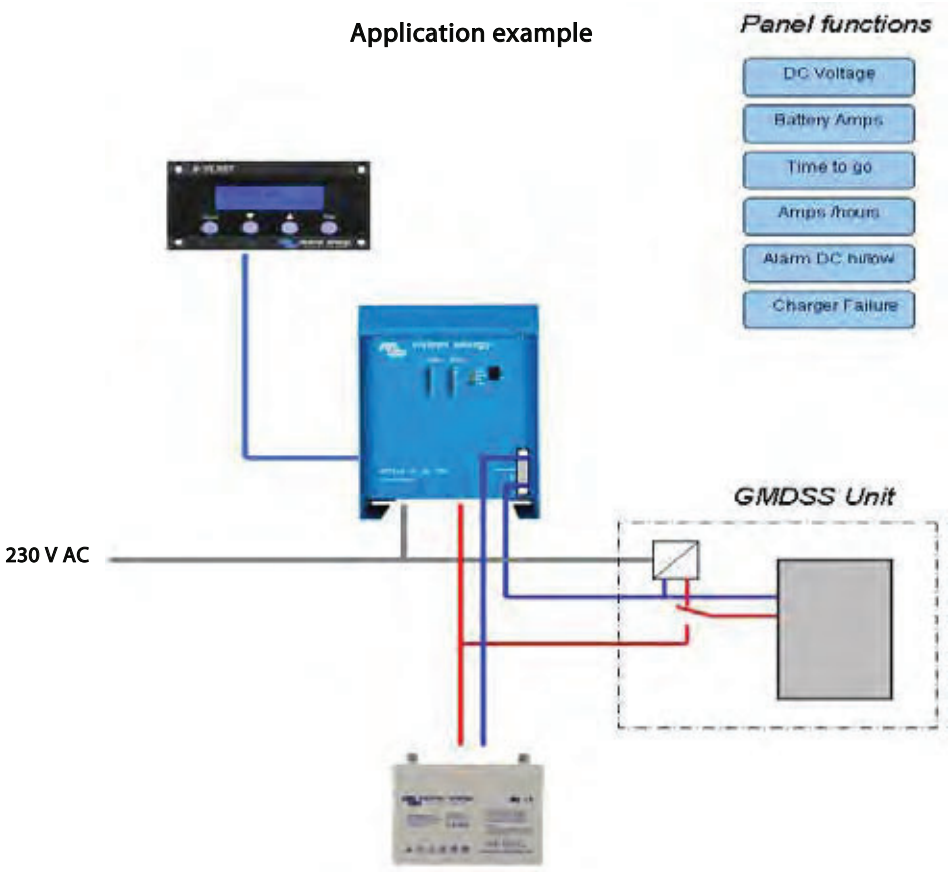
Battery time to go

The Skylla GMDSS charger has a built-in battery controller. The capacity of the battery is fully monitored so the panel can even indicate the 'time to go' in case of a power supply black out.

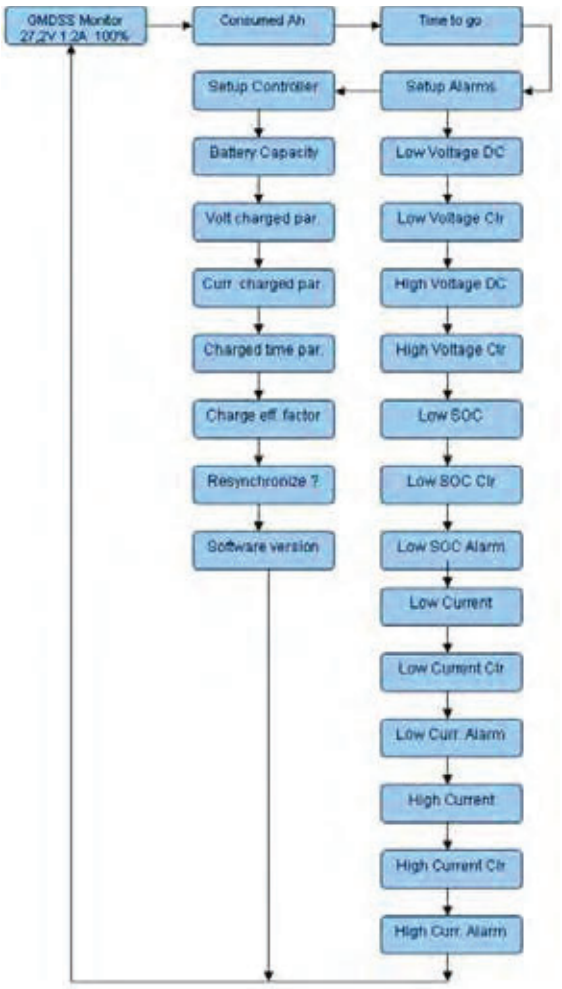
Perfect charger for any type of battery

Charge voltage can be precisely adjusted to suit any VRLA or flooded battery system.

Application example



Skylla-TG	24/30 GMDSS	24/50 GMDSS
Input voltage (V AC)	230	
Input voltage range (V AC)	90 - 265	
Frequency (Hz)	45-65	
Power factor	1	
Charge voltage 'absorption' (V DC)	28,5	
Charge voltage 'float' (V DC)	26,5	
Charge current (A)	30 (limited to 22 A at 110 V AC)	50
Charge characteristic	IUoUo (three step)	
Temperature sensor	√	
Can be used as power supply	√	
Forced cooling	√	
Protection (1)	a, b, c, d	
Operating temp. range	-40 to +50°C (-40 - 122°F)	
Humidity (non-condensing)	max 95%	
ENCLOSURE		
Material & Colour	aluminium (blue RAL 5012)	
Battery-connection	Two 1,5 m cables	
GMDSS connection	One 1,5 m cable (+ to be taken directly from the battery)	
230 V AC-connection	Three wire 2,5 mm² (AWG 6) cable Length: 2 m	
Protection category	IP 21	
Weight kg (lbs)	6 (13)	
Dimensions hxwxd in mm (hxwxd in inches)	485x250x147 (19.1x9.9x5.8)	
ACCESORIES		
VE.Net GMDSS panel	To be ordered separately	
UTP-cable	To be ordered separately	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29	
Emission Immunity	EN 55014-1, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-3-3	
Maritime Nav. & Radiocomm.	IEC 60945	
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



Remote panel GMDSS
The remote panel allows easy access to all important data.
Alarm settings are pre-set but can also be reprogrammed.

Isolation transformers

Isolation Transformer 2000W

Isolation Transformer 3600W

Safety and prevention of galvanic corrosion

The Isolation Transformer eliminates any electrical continuity between AC shore power and the boat. It is essential for safety and eliminates the need for galvanic isolators and polarity alarms.

Safety is taken for granted in case of a normal on-shore installation. A fuse will blow or a GFCI (Ground Fault Current Interrupter) will trip in case of a short circuit or current leakage to ground. Connecting the ground wire of the shore-side supply to the metal parts of the boat will result in galvanic corrosion (see below). Bringing only the live and neutral wire on board results in an unsafe situation because GFCIs will not work nor will a fuse blow in case of a short circuit to a metal part on the boat.

Galvanic corrosion occurs when two dissimilar metals in electrical contact are simultaneously exposed to an electrically conducting fluid. Seawater and, to a lesser extent, fresh water are such fluids. In general, the more active alloy of the couple corrodes preferentially while the less active (more noble) material is cathodically protected. The rate of galvanic corrosion is a function of several variables including area ratios, conductivity of the fluid, temperature, nature of the materials, etc.

It is a misunderstanding that galvanic corrosion occurs only in metal and aluminium hulls. In fact it can occur on any boat as soon as a metallic part (the shaft and propeller) is in contact with water. Galvanic corrosion will quickly dissolve your sacrificial anodes, and attack the shaft, propeller and other metal parts in contact with water as soon as the boat is connected to the shore-side supply.
It might therefore be tempting not to connect the ground conductor: this is however extremely dangerous because GFCIs will not work nor will a fuse blow in case of a short circuit to a metal part on the boat.

The best solution to avoid galvanic corrosion and at the same time prevent any unsafe situation is to install an Isolation Transformer to connect to the shore-side supply.

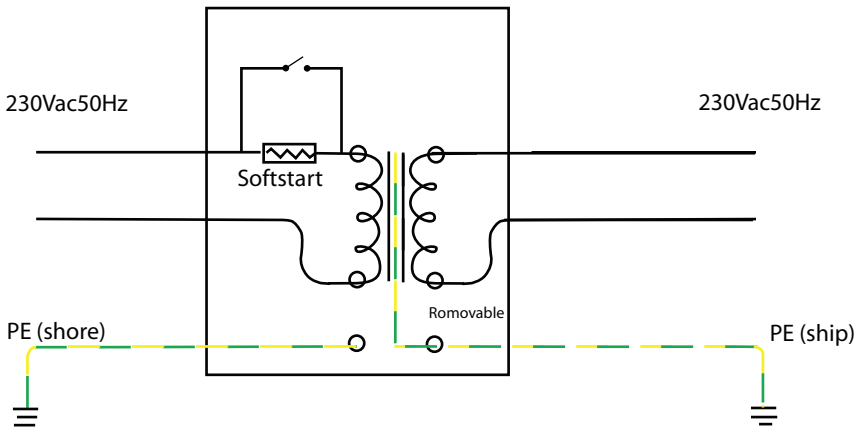
The Isolation Transformer eliminates any electrical continuity between shore power and the boat. The shore power is fed to the primary side of the transformer and the ship is connected to the secondary.
The Isolation Transformer completely isolates the boat from the shore ground. By connecting all metal parts to the neutral output on the secondary side of the transformer, a GFCI will trip or a fuse will blow in case of a short circuit.

Soft start is a standard feature of a Victron Energy isolation transformer. It will prevent the shore power fuse from blowing due to the inrush current of the transformer, which would otherwise occur.

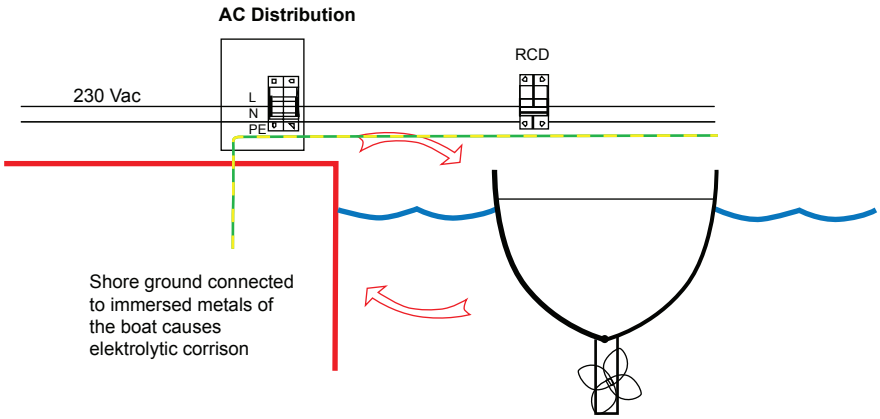
It is also recommended, for optimal safety, to connect the secondary neutral of the transformer to ground when the boat is out of the water.

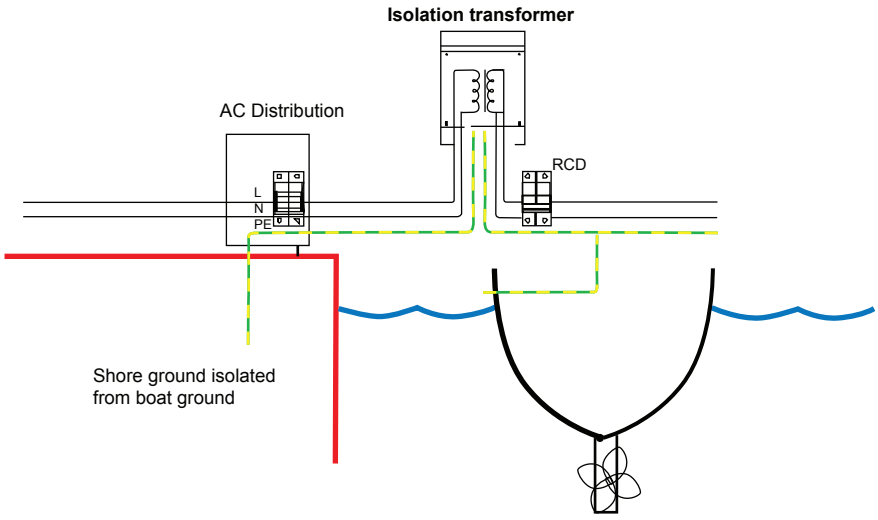
3600 Watt Auto 115/230 V

This model will automatically switch to 115 V or 230 V supply, depending on input voltage.
Supply 88 V – 130 V: switches to 115 V supply
Supply 185 – 250 V: switches to 230 V supply



Isolation Transformers	2000 Watt (1)	3600 Watt (1)	3600 Watt Auto 115/230 V (1)	7000 Watt
Input	115 or 230 V	115 or 230 V	115 / 230 V Automatic 115/230 V switching	230 V
Output	115 or 230 V	115 or 230 V	115 or 230 V	230 V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Rating	17 / 8,5 A	32 / 16 A	32 / 16 A	32 A
Soft start	Yes			
Transformer type	Toroidal (low noise, low weight)			
Input circuit breaker	yes			
ENCLOSURE				
Common Characteristics	Material: aluminium (blue RAL 5012)		Protection category: IP 21	
Weight	10 Kg	23 Kg	24 Kg	28 Kg
Dimensions (h x w x d), mm	375x214x110	362 x 258 x 218		
STANDARDS				
Safety	EN 60076			
1) Can be used as: 115 V to 115 V isolation transformer 115 V to 230 V isolation transformer	230 V to 230 V isolation transformer 230 V to 115 V isolation transformer			





Orion-Tr DC-DC converters, low power, Non-isolated

High efficiency
Using synchronous rectification, full load efficiency exceeds 95%.

IP43 protection
When installed with the screw terminals oriented downwards.

Screw terminals
No special tools needed for installation.

Orion-Tr 24/12-5 (60W)

Orion-Tr 24/12-10 (120W)

Non isolated converters	Orion-Tr 24/12-5	Orion-Tr 24/12-10	Orion-Tr 24/12-15	Orion-Tr 24/12-20
Input voltage range	18-35V	18-35V	18-35V	18-35V
Output voltage	12.7V	12.5V	12.5V	12.5V
Efficiency	95%	97%	97%	97%
Continuous output current	5A	10A	15A	20A
Max. Output current	7A	12A	20A	25A
Galvanic isolation	no	no	no	no
Off load current	< 20mA	< 45mA	< 35mA	< 35mA
Operating temperature range (derate 3% per °C above 40°C)	-20 to +55°C			
DC connection	Screw terminals			
Maximum cable cross-section	3,3 mm² AWG12	6 mm² AWG10	6 mm² AWG10	6 mm² AWG10
Weight kg (lbs)	0,09 (0.20)	0,2 (0.44)	0,25 (0.55)	0,25 (0.55)
Dimensions hxwxd in mm (hxwxd in inches)	53x51x27 (2.1x2x1.1)	73x94x37 (2.9x3.7x1.5)	73x94x45 (2.9x3.7x1.8)	73x94x45 (2.9x3.7x1.8)
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-4			

Orion 24/12-25

Orion 24/12-40

Remote on-off connector
The remote on-off eliminates the need for a high current switch in the input wiring. The remote on-off can be operated with a low power switch or by the engine run/stop switch (see manual).

All models with adjustable output can also be used as a battery charger
For example to charge a 12 Volt starter or accessory battery in an otherwise 24V system.

All models with adjustable output can be paralleled to increase output current
Up to five units can be connected in parallel.

The Orion 12/27,6-12: a 24V battery charger (see page 2)
To charge a 24V battery from a 12V system.
The output voltage of this model can be adjusted with a potentiometer

A super wide input range buck-boost regulator: the Orion 7-35/12-3 (see page 2)
The Orion 7-35/12-3 is an isolated converter with a very wide input range, suitable for both 12V and 24V systems, and a fixed 12,6V output.

Easy to install
Delivery includes four Insulated Fastons Female Crimp 6.3mm (eight Fastons in case of the Orion 24/12-40).

Low power models: please see Orion-Tr series

Orion 24/12-70

Orion 24/12-70 with binding posts

Non isolated converters	Orion 24/12-25	Orion 24/12-40	Orion 24/12-70	Orion 12/24-8	Orion 12/24-10	Orion 12/24-20
Input voltage range (V)	18-35	18-35	18-35	9-18	9-18	9-18
Under voltage shutdown (V)	14	14	14	8	8	8
Under voltage restart (V)	18	18	18	10	10	10
Output voltage adjustable with potentiometer	yes	no	yes	no	yes	yes
Output voltage (V)	Adjustable 10–15V F set 13,2V	13,2	Adjustable 10–15V F set 13,2V	24	Adjustable 20-30V F set 26,4V	Adjustable 20-30V F set 26,4V
Efficiency (%)	96	95	92	95	95	93
Suitable to buffer-charge a battery	yes	no	yes	no	yes	yes
Can be connected in parallel	yes	no	yes	no	yes	yes
Continuous output current (A)	25	40	70	8	10	20
Max. Output current (A)	35	55	85	20	20	30
Fan assisted cooling (temp. controlled)	no	yes	yes	no	no	yes
Galvanic isolation	no	no	no	no	no	no
Off load current	< 15mA	< 20mA	< 20mA	< 10mA	< 15mA	< 30mA
Remote on-off	yes	yes	yes	no	no	yes
Operating temperature range (derate 3% per °C above 40°C)	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C
DC connection	Faston tabs 6.3 mm	Double Faston tabs 6.3 mm	M6 bolts	Faston tabs 6.3 mm	Faston tabs 6.3 mm	M6 bolts
Weight kg (lbs)	0,7 (1.55)	0,85 (1.9)	0,9 (2.0)	0,4 (0.8)	0,4 (0.9)	0,9 (2.0)
Dimensions hxwxd in mm (hxwxd in inches)	65x88x160 (2.6x3.5x6.3)	65x88x185 (2.6x3.5x7.3)	65x88x195 (2.6x3.5x7.7)	45x90x115 (1.8x3.5x4.5)	45x90x125 (1.8x3.5x4,5)	65x88x195 (2.6x3.5x7.7)
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-4					

Orion-Tr DC-DC converters, isolated

Orion-Tr 24/12-20 (240W)

Orion-Tr 24/12-20 (240W)

Remote on-off
The remote on-off eliminates the need for a high current switch in the input wiring. The remote on-off can be operated with a low power switch or by for example the engine run/stop switch (see manual).

Adjustable output voltage: can also be used as a battery charger
For example to charge a 12 Volt starter or accessory battery in an otherwise 24V system.

All models are short circuit proof and can be paralleled to increase output current
An unlimited number of units can be connected in parallel.

High temperature protected
The output current will reduce at high ambient temperature.

IP43 protection
When installed with the screw terminals oriented downwards.

Screw terminals
No special tools needed for installation.

Input fuse (not replaceable)
On 12V and 24V input models only.

Isolated converters 110 – 120W	Orion-Tr 12/12-9 (110W)	Orion-Tr 12/24-5 (120W)	Orion-Tr 24/12-9 (110W)	Orion-Tr 24/24-5 (120W)	Orion-Tr 24/48-2,5 (120W)	Orion-Tr 48/12-9 (110W)	Orion-Tr 48/24-5 (120W)	Orion-Tr 48/48-2,5 (120W)
Input voltage range	8-17V	8-17V	16-35V	16-35V	16-35V	32-70V	32-70V	32-70V
Under voltage shut down	7V	7V	14V	14V	14V	28V	28V	28V
Under voltage restart	7,5V	7,5V	15V	15V	15V	30V	30V	30V
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
Output voltage tolerance	+/- 0,2V							
Output noise	2mV rms							
Cont. output current at nominal output voltage and 25°C	9A	5A	9A	5A	2,5A	9A	5A	2,5A
Maximum output current (10 s) at nominal output voltage	12,5A	6,3A	12,5A	6,3A	3,0A	12,5A	6,3A	3,0A
Short circuit output current	32A	23A	39A	30A	19A	27A	25A	17A
Cont. output power at 25°C	110W	120W	110W	120W	120W	110W	120W	120W
Cont. output power at 40°C	85W	110W	85W	115W	115W	85W	100W	85W
Efficiency	87%	88%	85%	87%	88%	87%	86%	89%
Off load current	< 50mA	< 80mA	< 40mA	< 60 mA	< 120mA	< 50mA	< 60mA	< 80mA
Galvanic isolation	200V dc between input, output and case							
Operating temperature range	-20 to +55°C (derate 3% per °C above 40°C)							
Humidity	Max. 95% non-condensing							
DC connection	Screw terminals							
Maximum cable cross-section	6 mm² AWG10							
Weight	0,42 kg (1 lb)							
Dimensions hxwxd	100 x 113 x 47 mm (4.0 x 4.5 x 1.9 inch)							
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5							

Isolated converters 220 - 280 Watt	Orion-Tr 12/12-18 (220W)	Orion-Tr 12/24-10 (240W)	Orion-Tr 24/12-20 (240W)	Orion-Tr 24/24-12 (280W)	Orion-Tr 24/48-6 (280W)	Orion-Tr 48/12-20 (240W)	Orion-Tr 48/24-12 (280W)	Orion-Tr 48/48-6 (280W)
Input voltage range	8-17V	8-17V	16-35V	16-35V	16-35V	32-70V	32-70V	32-70V
Under voltage shut down	7V	7V	14V	14V	14V	28V	28V	28V
Under voltage restart	7,5V	7,5V	15V	15V	15V	30V	30V	30V
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
Output voltage tolerance	+/- 0,2V							
Output noise	2mV rms							
Cont. output current at nominal output voltage and 40°C	18A	10A	20A	12A	6A	20A	12A	6A
Maximum output current (10 s) at nominal output voltage	25A	15A	25A	15A	8A	25A	15A	8A
Short circuit output current	40A	25A	50A	30A	25A	50A	30A	25A
Cont. output power at 25°C	280W	280W	300W	320W	320W	280W	320W	320W
Cont. output power at 40°C	220W	240W	240W	280W	280W	240W	280W	280W
Efficiency	87%	88%	88%	89%	89%	87%	89%	89%
Off load current	< 80mA	< 100mA	< 100mA	< 80mA	< 120 mA	< 80mA	< 80mA	< 80mA
Galvanic isolation	200V dc between input, output and case							
Operating temperature range	-20 to +55°C (derate 3% per °C above 40°C)							
Humidity	Max. 95% non-condensing							
DC connection	Screw terminals							
Maximum cable cross-section	16 mm² AWG6							
Weight	1,3 kg (3 lb)							
Dimensions hxwxd	130 x 186 x 70 mm (5.1 x 7.3 x 2.8 inch)							
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5							

Isolated converters 360 - 400 Watt	Orion-Tr 12/12-30 (360W)	Orion-Tr 12/24-15 (360W)	Orion-Tr 24/12-30 (360W)	Orion-Tr 24/24-17 (400W)	Orion-Tr 24/48-8,5 (400W)	Orion-Tr 48/12-30 (360W)	Orion-Tr 48/24-16 (380W)	Orion-Tr 48/48-8 (380W)
Input voltage range	10-17V	10-17V	20-35V	20-35V	20-35V	40-70V	40-70V	40-70V
Under voltage shut down	7V	7V	14V	14V	14V	28V	28V	28V
Under voltage restart	7,5V	7,5V	15V	15V	15V	30V	30V	30V
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
Output voltage tolerance	+/- 0,2V							
Output noise	2mV rms							
Cont. output current at nominal output voltage and 40°C	30A	15A	30A	17A	8,5A	30A	16A	8A
Maximum output current (10 s) at nominal output voltage minus 20%	40A	25A	45A	25A	15A	40A	25A	15A
Short circuit output current	60A	40A	60A	40A	25A	60A	40A	25A
Cont. output power at 25°C	430W	430W	430W	480W	480W	430W	430W	430W
Cont. output power at 40°C	360W	360W	360W	400W	400W	360W	380W	380W
Efficiency	87%	88%	88%	89%	89%	87%	89%	89%
Off load current	< 80mA	< 100mA	< 100mA	< 80mA	< 120 mA	< 80mA	< 80mA	< 80mA
Galvanic isolation	200V dc between input, output and case							
Operating temperature range	-20 to +55°C (derate 3% per °C above 40°C)							
Humidity	Max. 95% non-condensing							
DC connection	Screw terminals							
Maximum cable cross-section	16 mm² (AWG6)							
Weight	12V input and/or 12V output models: 1,8 kg (3 lb) Other models: 1,6 kg (3.5 lb)							
Dimensions hxwxd	12V input and/or 12V output models: 130 x 186 x 80 mm (5.1 x 7.3 x 3.2 inch) Other models: 130 x 186 x 70 mm (5.1 x 7.3 x 2.8 inch)							
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5							

Orion IP67 24/12 DC-DC converter, Non-isolated

Orion IP67 24/12-10
Orion IP67 24/12-20

Completely encapsulated: waterproof, shockproof and ignition protected

Water, oil or dirt will not damage the Orion IP67 DC-DC Converter. The casing is made of cast aluminium and the electronics are moulded in resin.

Extra-long input and output cables

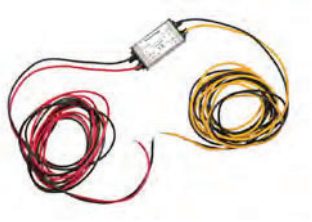
Thanks to the cables of 1.8 meters in length, intermediate cable interconnections to increase length even more will in most cases not be needed. This is an important reliability increasing feature in an area were IP67 protection grade is needed.

Wide input voltage range

With 15 to 40 Volts input range, a stable output is ensured during surges or sags due to other equipment connected to same battery.

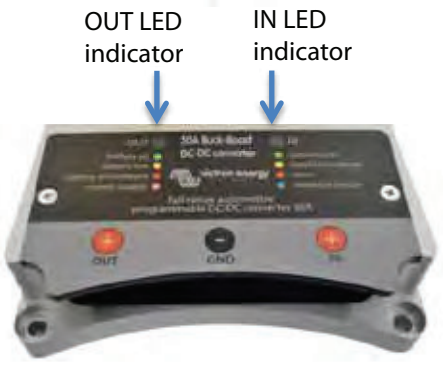
Protected against overheating

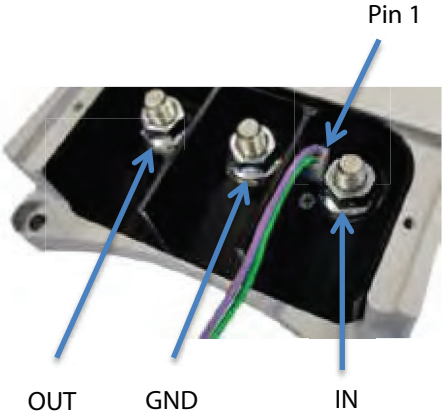
It can be used in a hot environment such as a machine room.

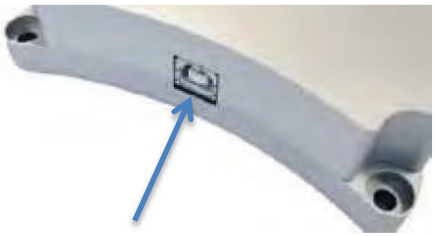


Orion IP67 24/12-5
with 1,8 m cables

Orion IP67	24/12-5	24/12-10	24/12-20
Input voltage range	15-40VDC		
Under voltage shutdown	13V		
Under voltage restart	14V		
No load current at 24V	1mA	20mA	50mA
DC output voltage	12V +/- 3%	12V +/- 3%	12V +/- 3%
Maximum continuous output current	5A	10A	20A
Efficiency	93%	93%	95%
Ripple & Noise	75mV pp		
Operating temperature range (derate 3% per °C above 40°C)	-20 to +70°C (full rated output up to 40°C)		
Overload protection	Hiccup mode, recovers automatically after fault condition is removed		
Short circuit proof	Yes		
Protection against reverse polarity connection	With external fuse or circuit breaker (not included)		
ENCLOSURE			
Material & Colour	Aluminium (blue RAL 5012)		
Protection category	IP67		
DC connection	Two input and two output cables, length 1,8m		
Cable cross section, input	0,8mm² (18 AWG)	1,5mm² (15 AWG)	2,6mm² (13 AWG)
Cable cross section, output	0,8mm² (18 AWG)	1,5mm² (15 AWG)	2,6mm² (13 AWG)
Weight (kg)	50 g	300 g	300 g
Dimensions (h x w x d in mm)	25 x 43 x 20	74 x 74 x 32	74 x 74 x 32
STANDARDS			
Safety	EN 60950		
Emission	EN 61000-6-3, EN 55014-1		
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2		
Automotive Directive	ECE R10-4		
Vibration	IEC 68-2-6: 10-150 Hz / 1.0 G		







DC-DC Converter for charging a 12V or 24V service battery in vehicles with a smart alternator (regenerative braking, Euro 5 and Euro 6 engines)

The Buck-Boost DC-DC Converter is a DC-DC Converter for charging a 12V or 24V service battery in vehicles with a smart alternator. The converter will charge the auxiliary battery with a pre-set charge voltage, eliminating high voltages (e.g. Mercedes: 15,4V) and low voltages.

'Engine running' detection system

Deep discharge of the vehicle's starting battery is avoided by a built-in 'engine running' detection system.
Instead of this detection system, the converter can also be activated by means of a programmable input (D+, CAN bus or (+)15 connection).

Fully programmable

The converter can be fully programmed by means of a simple and user-friendly PC application.
(USB type A male to USB type B male cable needed)

One product for 12V, 24V and 12/24V systems

The converter can be programmed to charge a 12V or a 24V auxiliary battery from either a 12V or a 24V alternator and starter battery.

Charge current and input current limiter

The output current is determined by the following factors:

- The maximum charge current setting.
- The maximum input current setting.
- The maximum operating temperature limit of the converter.

Input status indication (LED)

Green: converter on.
Yellow: input voltage below threshold, converter off.
Red: over temperature, converter off.
Blue, quick flash: engine running, converter will start after preset delay.
Blue, slow flash: the converter is OFF and activation is blocked due to low input voltage.

Output status indication (LED)

Green: converter off, battery voltage normal.
Yellow: converter off, battery voltage low.
Red: converter off, battery discharged or not connected.
Purple: converter on.

Buck-Boost DC-DC Converter	25A	50A
Input voltage range	7-35V	
Under voltage threshold	10V	
Output voltage range	2-30V	
Maximum charge current	12V : 25A 24V : 15A	12V : 50A 24V : 25A
Power consumption		
Converter off, LEDs off (power save mode)	7 mA	
On/off input (pin 1, purple wire)		
'On' threshold voltage	> 2V	
Maximum input voltage	60V	
Output pin 1 and pin 2		
Output voltage if activated	V_{pinout} = Vin	
Maximum current (per pin)	I_{pinout} = 1A	
GENERAL		
Operating temperature range	-25 +80°C	
Ambient temperature	Max current: up to 40°C	
Weight	1kg	1,1kg
Dimensions	165 x 120 x 30mm	213 x 120 x 30mm

Color Control GX

Color Control GX
The Color Control (CCGX) provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

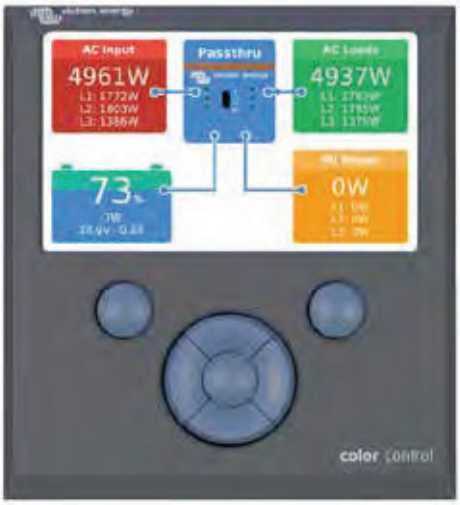
VRM Online Portal
Besides monitoring and controlling products locally on the CCGX itself, all readings are also forwarded to our free remote monitoring website: the VRM Online Portal.

Remote Console on VRM
Monitor, control and configure the CCGX remotely, over the internet. Just like standing in front of the device, everything can also be done remotely. The same functionality is also available on the local network, Remote Console on LAN.

Automatic genset start/stop
A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System
The CCGX is the Energy Manager in an ESS system. More information in the ESS manual.

Data logging
When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the CCGX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.



Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port. When multiple BlueSolar MPPTs with VE.Can are used in parallel, the all information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the CCGX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the CCGX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. Location and speed will be visible on the display, and the data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

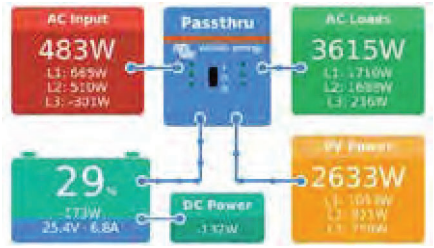
Internet connection
The CCGX can be connected to internet with an Ethernet cable and via Wi-Fi. To connect via Wi-Fi, a Wi-Fi USB accessory is required. The CCGX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Other highlights

- The CCGX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the CCGX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

Color Control GX			
Power supply voltage range	9 – 70V DC		
Current draw	12V DC	24V DC	48V DC
Display off	140mA	80mA	40mA
Display at minimum intensity	160mA	90mA	45mA
Display at maximum intensity	245mA	125mA	65mA
Potential free contact	3A / 30V DC / 250V AC (Normally open)		
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Color Control GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	130 x 120 x 28mm		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	E4-10R-053535		

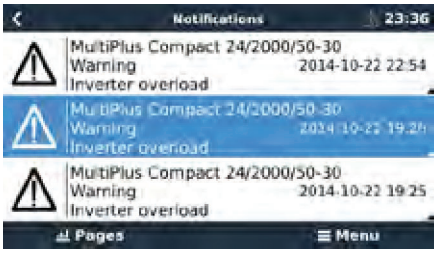
Overview - Multi with PV Inverter on output



Main menu

Mobile & boat overview

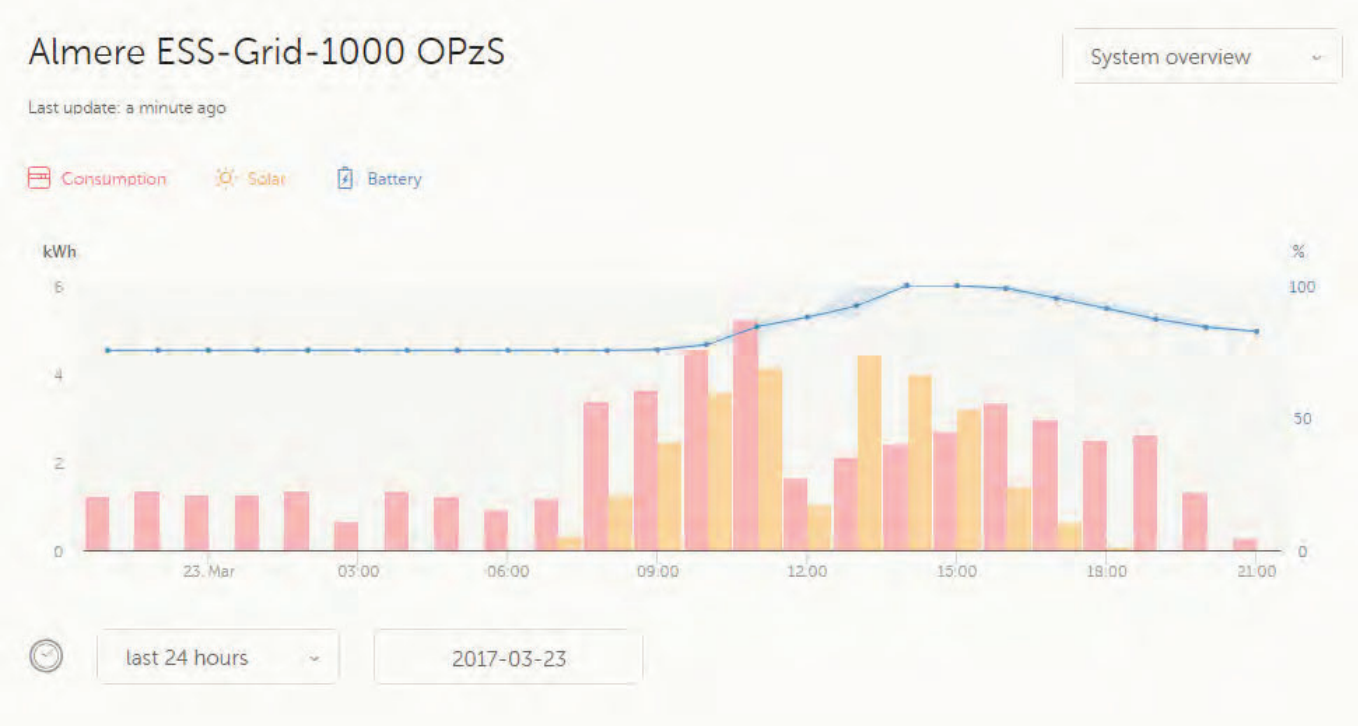
Alarm notifications



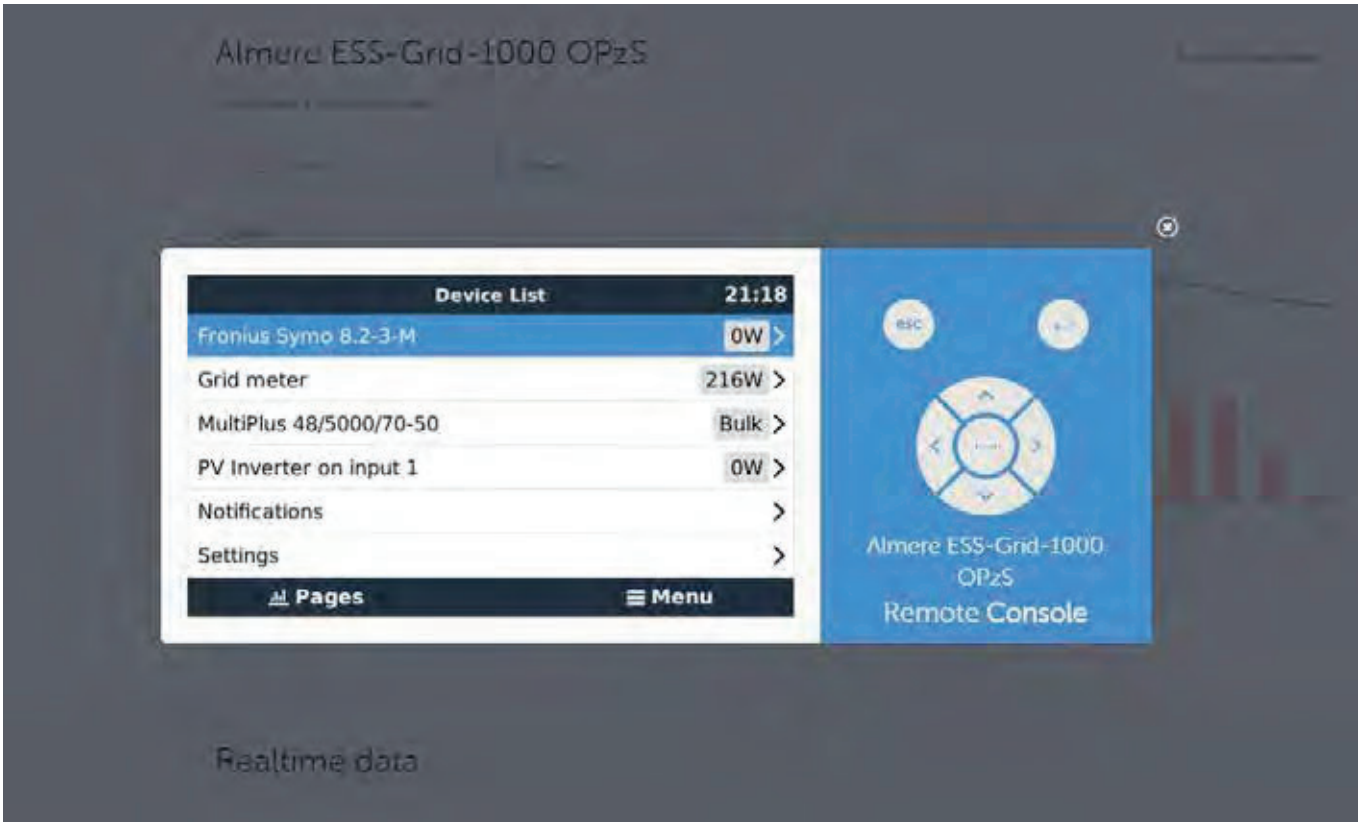
Genset control page

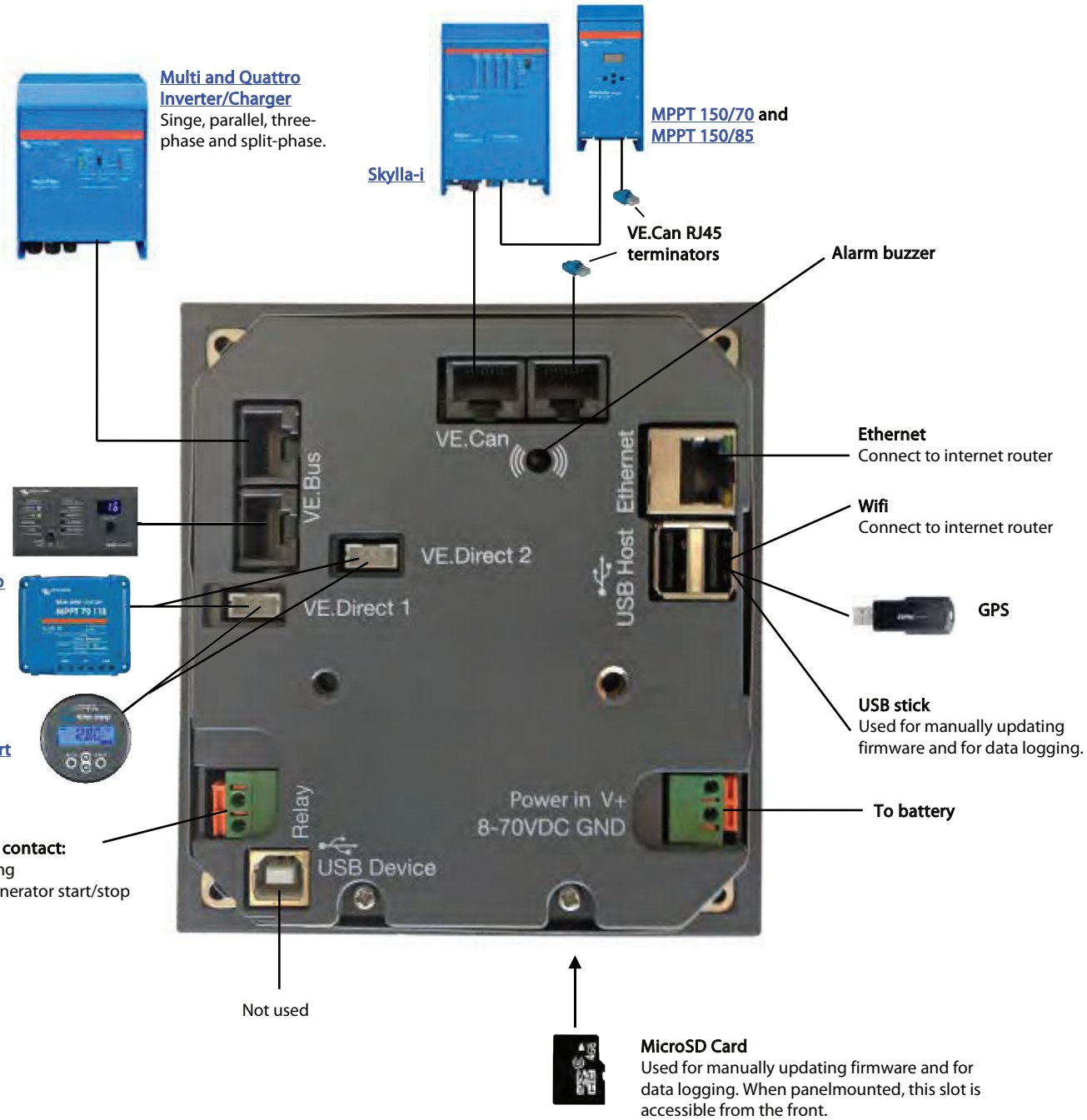
Tiles overview

VRM Portal - Dashboard



VRM Portal – Remote Console




Multi and Quattro Inverter/Charger
Singe, parallel, three-phase and split-phase.
Skylla-i
MPPT 150/70 and MPPT 150/85
VE.Can RJ45 terminators
Alarm buzzer
VE.Can
VE.Bus
VE.Direct 2
VE.Direct 1
USB Host
Ethernet
Digital Multi Control
MPPT 75/15 up to 250/100
BMV-700 or BMV-712 Smart
Ethernet
Connect to internet router
Wifi
Connect to internet router
GPS
USB stick
Used for manually updating firmware and for data logging.
Relay
Power in V+
8-70VDC GND
To battery
Potential free contact:
- alarm signaling
- automatic generator start/stop
USB Device
Not used
MicroSD Card
Used for manually updating firmware and for data logging. When panelmounted, this slot is accessible from the front.

Venus GX

Venus GX with connectors

Venus GX front angle

Venus GX
The Venus GX provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VRM Online Portal
All readings are forwarded to our free remote monitoring website: the VRM Online Portal. To get an impression, try the demo on. See also the screenshots below.

Remote Console on VRM
The way to access the device for setting up, as well as monitoring, is via Remote Console. Either via VRM, via the built-in WiFi Access Point, or on the local LAN/WiFi network.

Automatic genset start/stop
A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System
The Venus GX is the Energy Manager in an ESS system. More information in the ESS manual.

Data logging
When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the Venus GX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

Supported products
Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- EasySolar 1600VA
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port. When multiple BlueSolar MPPTs with VE.Can are used in parallel, the all information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the Venus GX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the Venus GX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Ion BMS
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. The data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

Internet connection
The Venus GX can be connected to internet with an Ethernet cable and via Wi-Fi. The Venus GX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Tank level inputs
The tank level inputs are resistive: connect them to a resistive tank sender. Such tank senders are not supplied by Victron. The tank level ports can each be configured to work with either European tank senders (0 - 180 Ohm), or US (240 - 30 Ohm).

Other highlights
- The Venus GX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the Venus GX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

Venus GX			
Power supply voltage range	8 – 70V DC		
Current Draw	210 mA @ 12V	110 mA @ 24V	60 mA @ 48V
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
CAN	2nd CAN interface – non isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
WiFi Access Point	Use to connect to Remote Console		
WiFi Client	Connect the Venux GX to an existing WiFi network		
	IO		
Potential free contact	NO/COM/NC – 6 A 250 VAC/30 VDC		
Tank level inputs	3 x Configurable for European (0 - 180 Ohm) or US (240 - 30 Ohm)		
Temperature level inputs	2 x Requires ASS000001000.		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Venus GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	45 x 143 x 96		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	In progress		

Wall mounted display enclosures

		Rectangular panels	Round panels	Rectangular panels	Round panels and Rectangular panels
Dimensions (h x w x d in mm)		88 x 130 x 40	88 x 130 x 47	163 x 135 x 72	244 x 135 x 75
Article code	Product	Suitable for:			
BPA000100000R	Battery Alarm GX	√			
REC000200000R	Skylla-i Control GX	√			
DMC000200000R	Digital Multi Control 200/200A GX	√			
BAM010700000	Battery Monitor BMV-700		√		√
BAM010702000	Battery Monitor BMV-702		√		√
SCC900500000	MPPT Control		√		√
BPP000300100R	Color Control GX			√	√
BPP000200100R	VE.Net Blue Power Panel GX			√	√

1

Enclosure for 65 x 120 mm GX panels

3

Enclosure for Color Control GX
(also accepts a VE.Net Blue Power Panel GX)

2

Enclosure for BMV battery monitor or MPPT Control

4

Enclosure for Color Control GX and a BMV or MPPT control
(also accepts a VE.Net Blue Power Panel GX)

BatteryProtect BP-65

BatteryProtect BP-100

BatteryProtect BP-220

Connector with preassembled DC minus cable (included)

The BatteryProtect disconnects the battery from non essential loads before it is completely discharged (which would damage the battery) or before it has insufficient power left to crank the engine.

12/24V auto ranging

The BatteryProtect automatically detects system voltage

Programming made easy

The BatteryProtect can be set to engage / disengage at several different voltages.
The seven segment display will indicate which setting has been chosen.

A special setting for Li-ion batteries

In this mode the BatteryProtect can be controlled by the VE.Bus BMS.
Note: the BatteryProtect can also be used as a charge interrupter in between a battery charger and a Li-ion battery. See connection diagram in the manual.

Ultra low current consumption

This is important in case of Li-ion batteries, especially after low voltage shutdown.
Please see our Li-ion battery datasheet and the VE.Bus BMS manual for more information.

Over voltage protection

To prevent damage to sensitive loads due to over voltage, the load is disconnected whenever the DC voltage exceeds 16V respectively 32V.

Ignition proof

No relays but MOSFET switches, and therefore no sparks.

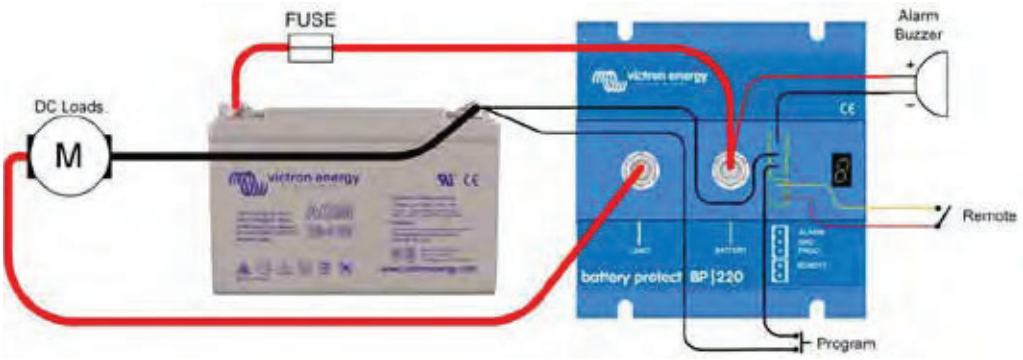
Delayed alarm output

The alarm output is activated if the battery voltage drops below the preset disconnect level during more than 12 seconds. Starting the engine will therefore not activate the alarm. The alarm output is a short circuit proof open collector output to the negative (minus) rail, max. current 50 mA. The alarm output is typically used to activate a buzzer, LED or relay.

Delayed load disconnect and delayed reconnect

The load will be disconnected 90 seconds after the alarm has been activated. If the battery voltage increases again to the connect threshold within this time period (after the engine has been started for example), the load will not be disconnected.
The load will be reconnected 30 seconds after the battery voltage has increased to more than the preset reconnect voltage.

BatteryProtect	BP-65	BP-100	BP-220
Maximum continuous load current	65A	100A	220A
Peak current (during 30 seconds)	250A	600A	600A
Operating voltage range	6 –35V		
Current consumption	When on: 1,5 mA	When off or low voltage shutdown : 0,6 mA	
Alarm output delay	12 seconds		
Maximum load on alarm output	50 mA (short circuit proof)		
Load disconnect delay	90 seconds (immediate if triggered by the VE.Bus BMS)		
Load reconnect delay	30 seconds		
Default thresholds	Disengage: 10,5V or 21V Engage: 12V or 24V		
Operating temperature range	Full load: -40°C to +40°C (up to 60% of nominal load at 50°C)		
Connection	M6	M8	M8
Weight	0,2 kg 0.5 lbs	0,5 kg 0.6 lbs	0,8 kg 1.8 lbs
Dimensions (hxwxd)	40 x 48 x 106 mm 1.6 x 1.9 x 4.2 inch	59 x 42 x 115 mm 2.4 x 1.7 x 4.6 inch	62 x 123 x 120 mm 2.5 x 4.9 x 4.8 inch



Cyrix-ct 12/24V 120A and 230A

Cyrix-ct 12/24-120

Cyrix-ct 12/24-230

Control cable for
Cyrix-ct 12/24-230
Length: 1 m

Intelligent battery monitoring to prevent unwanted switching

Some battery combiners (also called voltage controlled relay, or split charge relay) will disconnect a battery in case of a short but high amperage load. A battery combiner also may fail to connect a large but discharged battery bank because the DC voltage immediately drops below the disengage value once the batteries are connected.
The software of the Cyrix-ct 12/24 does more than simply connect and disconnect based on battery voltage and with a fixed time delay. The Cyrix-ct 12/24 looks at the general trend (voltage increasing or decreasing) and reverses a previous action only if the trend has reversed during a certain period of time. The time delay depends on the voltage deviation from the trend.
(for Battery Combiners with multiple engage/disengage profiles, please see the Cyrix-i 400)

Long bolts to allow connection of more than one power cable

Cyrix 12/24-120: 13 mm (M6) Cyrix 12/24-230: 16 mm (M8)

Protection against overheating (due to a long duration overload e.g.)

The Cyrix will disengage in case of excessive contact temperature, and reengage again after it has cooled down.

LED status indication (Cyrix 12/24 230 only)

LED on: engaged LED 10 s flash: disengaged
LED 2 s flash: connecting LED 2 s blink: disconnecting
LED 0,25 s blink: alarm (over temperature; voltage > 16 V; both batteries < 10 V; one battery < 2 V)
(multiply by two for 24 V)

12/24 V auto ranging

The Cyrix-ct 12/24 automatically detects system voltage.

No voltage loss

Cyrix battery combiners are an excellent replacement for diode isolators. The main feature is that there is virtually no voltage loss so that the output voltage of alternators or battery chargers does not need to be increased.

Prioritising the starter battery

In a typical setup the alternator is directly connected to the starter battery. The accessory battery, and possibly also a bow thruster and other batteries are each connected to the starter battery with Cyrix battery combiners. When a Cyrix senses that the starter battery has reached the connect voltage it will engage, to allow for parallel charging of the other batteries.

Bidirectional voltage sensing and power supply from both batteries

The Cyrix senses the voltage of both connected batteries. It will therefore also engage if for example the accessory battery is being charged by a battery charger.
The Cyrix-ct 12/24 has a dual power supply. It will therefore also close if the voltage on one battery is too low to operate the Cyrix.
In order to prevent unexpected operation during installation or when one battery has been disconnected, the Cyrix-ct 12/24 will not close if the voltage on one of the two battery connections is lower than 2 V (12 V battery) or 4 V (24 V battery).

Parallel connection in case of emergency (Start Assist)

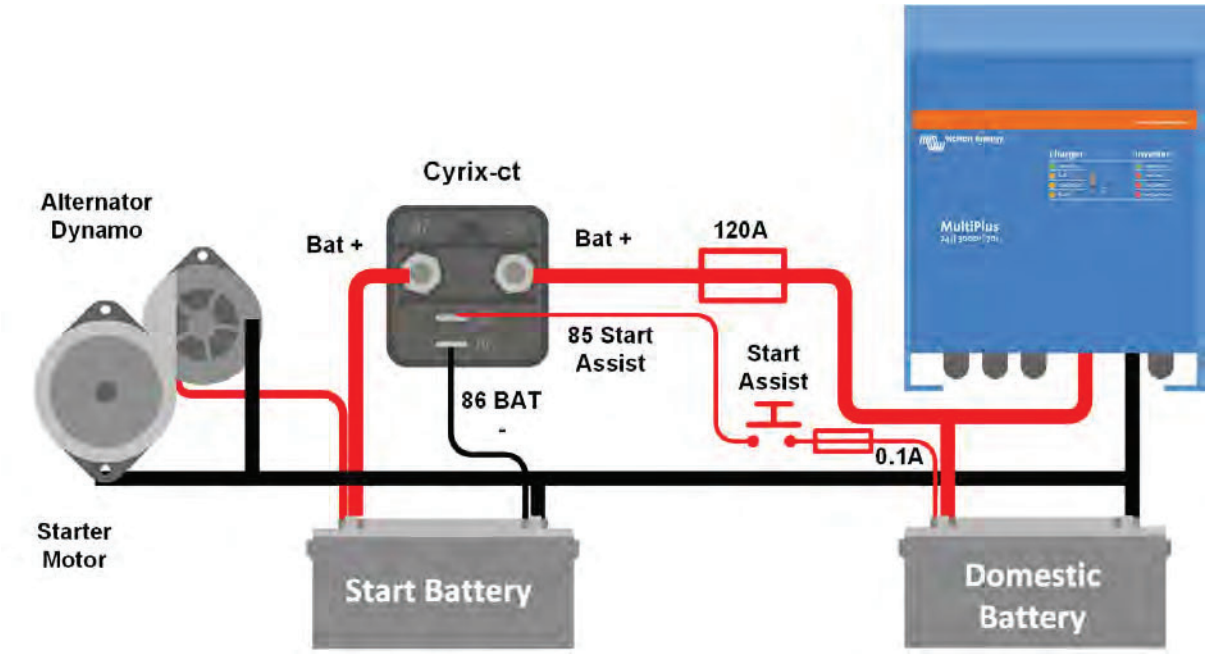
The Cyrix can also be engaged with a push button (Cyrix remains engaged during 30 seconds) or a switch to connect batteries in parallel manually.
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Cyrix Battery Combiner	Cyrix-ct 12/24-120	Cyrix-ct 12/24-230
LED status indication	No	Yes
Continuous current	120 A	230 A
Cranking rating (5 seconds)	180 A	500 A
Connect voltage	From 13 V to 13,8 V and 26 to 27,6 V with intelligent trend detection	
Disconnect voltage	From 11 V to 12,8 V and 22 to 25,7 V with intelligent trend detection	
Current consumption when open	<4 mA	
Current consumption when closed	12 V : 220 mA 24 V : 120 mA	12 V : 320 mA 24 V : 180 mA
Start Assist	Yes (Cyrix remains engaged during 30 seconds)	
Control cable included (length 1 m)	No	Yes
Protection category	IP54	
Weight kg (lbs)	0,11 (0.24)	0,27 (0.6)
Dimensions h x w x d in mm (h x w x d in inches)	46 x 46 x 80 (1.8 x 1.8 x 3.2)	65 x 100 x 50 (2.6 x 4.0 x 2.0)

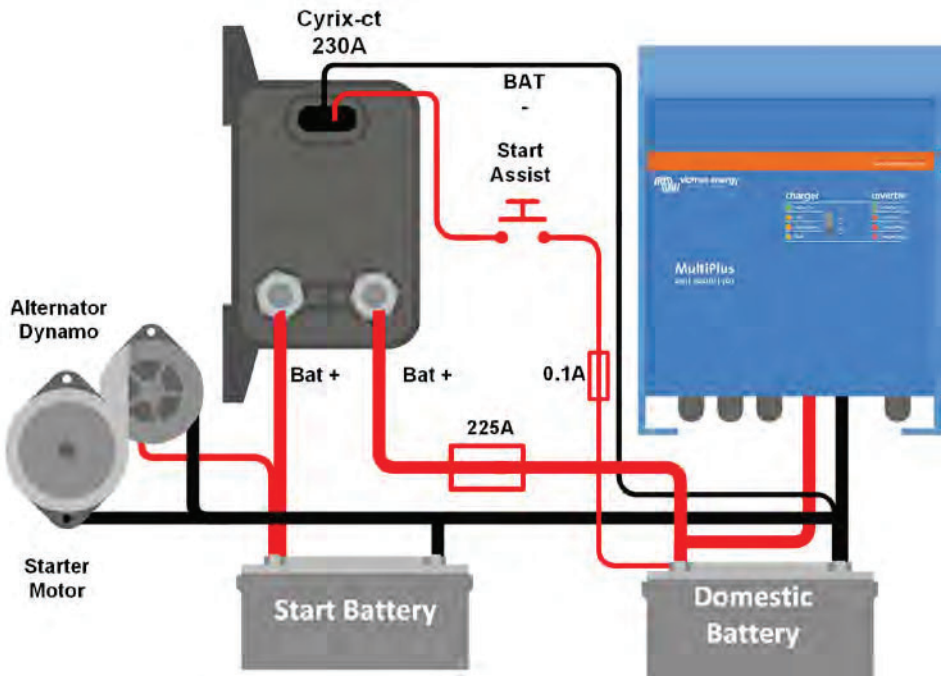
Connect (V)	Delay
V < 13 V	Remains open
13,0 V < V < 13,2 V	10 min
13,2 V < V < 13,4 V	5 min
13,4 V < V < 13,6 V	1 min
13,6 V < V < 13,8 V	4 sec

Disconnect (V)	Delay
V < 11 V	0 sec
11,0 V < V < 12,0 V	1 sec
12,0 V < V < 12,2 V	10 sec
12,2 V < V < 12,4 V	30 sec
12,4 V < V < 12,8 V	3 min
> 12,8 V	remains closed
> 16 V	over voltage disconnect

Approximate connect and disconnect delay
(multiply by two for a 24 V system)



Cyrix-ct 12/24-120: connection diagram



Cyrix-ct 12/24-230: connection diagram

Cyrix-i 400A 12/24V and 24/48V

Cyrix-i 24/48 V 400 A

New: intelligent battery monitoring to prevent unwanted switching

Some battery combiners will disconnect a battery in case of a short but high amperage load. A battery combiner also may fail to connect a large but discharged battery bank because the DC voltage immediately drops below the disengage value once the batteries are connected.
The software of the Cyrix-i does more than simply connect and disconnect based on battery voltage and with a fixed time delay. The Cyrix-i looks at the general trend (voltage increasing or decreasing) and reverses a previous action only if the trend has reversed during a certain period of time. The time delay depends on the voltage deviation from the trend.

In addition, four switch timing profiles can be chosen (see back page).

12/24 V and 24/48 V auto ranging

The Cyrix-i automatically detects system voltage.

No voltage loss

Cyrix battery combiners are an excellent replacement for diode isolators. The main feature is that there is virtually no voltage loss so that the output voltage of alternators or battery chargers does not need to be increased.

Prioritizing the starter battery

In a typical setup the alternator is directly connected to the starter battery. The accessory battery, and possibly also a bow thruster and other batteries are each connected to the starter battery with Cyrix battery combiners. When a Cyrix senses that the starter battery has reached the connect voltage it will engage, to allow for parallel charging of the other batteries.

Bidirectional voltage sensing and power supply from both batteries

The Cyrix senses the voltage of both connected batteries. It will therefore also engage if for example the accessory battery is being charged by a battery charger.
The Cyrix-i has a dual power supply. It will therefore also close if the voltage on one battery is too low to operate the Cyrix.
In order to prevent unexpected operation during installation or when one battery has been disconnected, the Cyrix-i will not close if the voltage on one of the two battery connections is lower than 2 V (12 V battery), or 4 V (24 V battery) or 8 V (48 V battery).

Parallel connection in case of emergency

The Cyrix can also be engaged with a push button (Cyrix remains engaged during 30 s) or a switch to connect batteries in parallel manually.
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Model	Cyrix-i 12/24-400 Cyrix-i 24/48-400
Continuous current	400A
Peak current	2000A during 1 second
Input voltage 12/24 V model Input voltage 24/48 V model	8-36 VDC 16-72 VDC
Connect/disconnect profiles	See table
Over voltage disconnect	16 V / 32 / 64 V
Current consumption when open	4 mA
Emergency start	Yes, 30 s
Micro switch for remote monitoring	Yes
Status indication	Bicolour LED
Weight kg (lbs)	0,9 (2.0)
Dimensions h x w x d in mm (h x w x d in inches)	78 x 102 x 110 (3.1 x 4.0 x 4.4)

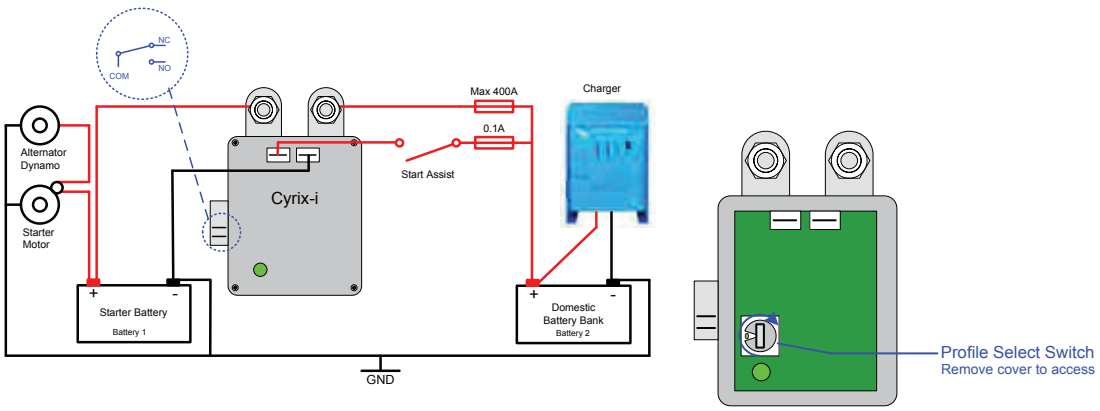
Profile 0			
Connect (V)*		Disconnect (V)*	
Less than 13 V	Remains open	More than 12,8 V	Remains closed
	Closes after		Opens after
13 V	10 min	12,8 V	10 min
13,2 V	5 min	12,4 V	5 min
13,4 V	3 min	12,2 V	1 min
13,6 V	1 min	12 V	4 sec
13,8 V	4 sec	Less than 11 V	Immediate

Profile 1			
Connect (V)*		Disconnect (V)*	
Less than 13,25 V	Remains open	More than 12,75 V	Remains closed
More than 13,25 V	Closes after 30 sec	From 10,5 V to 12,75 V	Opens after 2 min
		Less than 10,5 V	Immediate

Profile 2			
Connect (V)*		Disconnect (V)*	
Less than 13,2 V	Remains open	More than 12,8 V	Remains closed
More than 13,2 V	Closes after 6 sec	From 10,5 V to 12,8 V	Opens after 30 sec
		Less than 10,5 V	Immediate

Profile 3			
Connect (V)*		Disconnect (V)*	
Less than 13,25 V	Remains open	More than 13,5 V	Remains closed
	Closes after		Opens after
13 V	10 min	12,8 V	30 min
13,2 V	5 min	12,4 V	12 min
13,4 V	3 min	12,2 V	2 min
13,6 V	1 min	12 V	1 min
13,8 V	4 sec	Less than 10,5 V	Immediate

NOTES
1) After connecting 3 times, the minimum time to reconnect is 1 minute (to prevent 'rattling')
2) The Cyrix will not connect if the voltage on one of the battery connections is less than 2 V*. (to prevent unexpected switching during installation)
3) The Cyrix will always connect if the **start assist** is activated, as long as the voltage on one of the battery connections is sufficient to operate the Cyrix (approximately 10 V*)
* Multiply voltage x2 for 24 V systems and x4 for 48 V systems



Cyrix Li-ion 230A series

Cyrix-Li-load 12/24-230

Cyrix-Li-Charge 12/24-230

Cyrix-Li-ct 12/24-230

Control cable for Cyrix-ct 12/24-230
Length: 1 m

The LiFePO4 battery: preventing cell under voltage, overvoltage and over temperature

The first line of protection is cell balancing. All Victron LiFePO4 batteries have integrated cell balancing.
The second line of protection consists of:

- shut down of the load in case of imminent cell under voltage, and
- shut down or reduction of the charging current in case of imminent cell over voltage, high temperature (>50°C) or low temperature (<0°C).

The VE.Bus BMS is the core of the second protection line.
However, not all loads or chargers can be controlled directly by the VE.Bus BMS.
In order to shut down such loads or chargers several VE.Bus BMS controllable Cyrix switches are available.

Cyrix-Li-load

The Cyrix-Li-load will disengage when its control input becomes free floating.
If the battery voltage recovers after disconnection (which will happen when no other loads are connected to the battery), the output of the BMS will become high and the Cyrix will reengage after 30 seconds. After 3 attempts to reengage, the Cyrix will remain disengaged until battery voltage has increased to more than 13 V (resp. 26 V or 52 V) during at least 30 seconds (which is a sign that the battery is being recharged).
Alternatively, a BatteryProtect can be used (advantage: very low power consumption).

Cyrix-Li-Charge

The Cyrix-Li-Charge will connect a battery charger with 3 seconds delay:

- if the charge disconnect output of the VE.Bus BMS is high, and
- if it senses 13,7 V (resp. 27,4 V or 54,8 V) or more on its battery charger connection terminal, and
- if it senses 2 V or more on its battery terminal (the Cyrix will remain open if not connect to the battery).

The Cyrix-Li-Charge will disengage immediately whenever its control input becomes free floating, signalling cell over voltage or cell over temperature.
In general a cell over voltage alarm will reset shortly after charging has been stopped. The Cyrix will then reconnect the charger after a delay 3 seconds. After 2 attempts to reengage with 3 seconds delay, the delay increases to 10 minutes.
Whenever battery voltage is less than 13,5 V (resp. 27 V or 54 V), the Cyrix will disengage with a delay of 1 hour.
Note 1: In case of zero discharge current, or a small discharge current, the Cyrix will not disengage shortly after the charger has been switched off and/or disconnected, because battery voltage will remain higher than 13,5 V.
Note 2: If, after the Cyrix has disengaged, the output of the battery charger immediately increases to 13,7 V or more, the Cyrix will reengage, with 3 seconds delay.

Cyrix-Li-ct

The functionality of the Cyrix-Li-ct is analogous to the Cyrix-ct.
The Cyrix-Li-ct will parallel connect a lead acid starter battery and a LiFePO4 battery:

- if the charge disconnect output of the VE.Bus BMS is high, and
- if it senses 13,4 V (resp. 26,8 V) or more on one of its power terminals.

The Cyrix will disengage immediately:

- when its control output becomes free floating, signalling cell over voltage or cell over temperature, and/or
- when battery voltage drops below 13,2 V.

Start assist function: a short positive pulse will close the relay during 30 seconds (see figure on page 2).

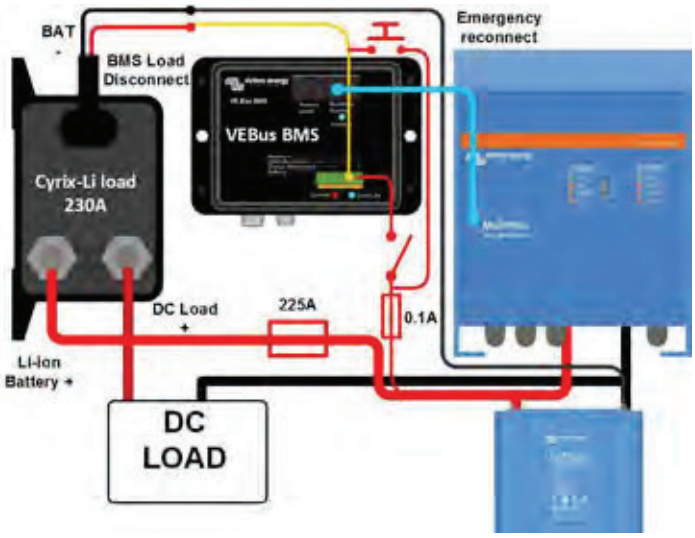
A built-in transient voltage suppressor will limit the voltage spike that may occur when the Cyrix suddenly disengages due to cell overvoltage or over temperature.

LED status indication

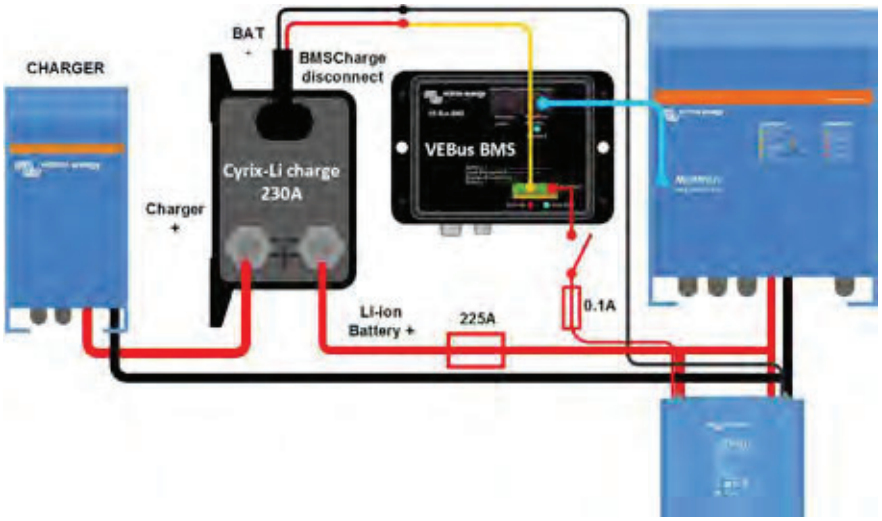
LED on: engaged
LED 10 s flash: disengaged
LED 2 s flash: connecting
LED 2 s blink: disconnecting
LED 0,25 s blink: alarm (over temperature; voltage > 16 V; both batteries < 10 V; one battery < 2 V)
(multiply by two for 24 V)

Cyrix Battery Combiner	Cyrix-Li-load 12/24-230 Cyrix-Li-load 24/48-230	Cyrix-Li-Charge 12/24-230 Cyrix-Li-Charge 24/48-230	Cyrix-Li-ct 12/24-230	
			12 V system	24 V system
Continuous current and breaking capacity at 12 V or 24 V	230 A	230.A	230 A	
Breaking capacity at 48 V	80 A	80 A	n. a.	
LED status indication	Yes			
Control cable	Included (length 1 meter)			
Control input	The Cyrix engages when the control input is high (appr. Battery voltage) The Cyrix disengages when the control input is left free floating or pulled low			
Connect voltage	See text	13,7 V / 27,4 V / 54,8 V	13,4 V < V < 13,7 V: 120 s 13,7 V < V < 13,9 V: 30 s V > 13,9 V: 4 s	26,8 V < V < 27,4 V: 120 s 27,4 V < V < 27,8 V: 30 s V > 27,8 V: 4 s
Disconnect voltage	See text	See text	13,3 V < V < 13,2 V: 10 s V < 13,2 V: immediate	26,6 V < V < 26,4 V: 10 s V < 26,4 V: immediate
Current consumption when open	<4 mA			
Protection category	IP54			
Weight kg (lbs)	0,27 (0.6)			
Dimensions h x w x d in mm (h x w x d in inches)	65 x 100 x 50 (2.6 x 4.0 x 2.0)			

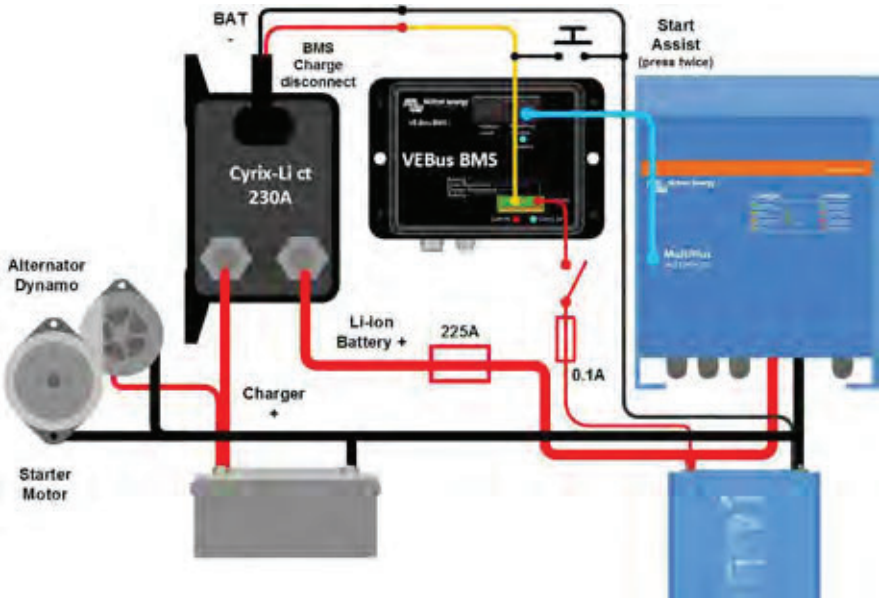
Cyrix-Li-load



Cyrix-Li-Charge



Cyrix-Li-ct



BMV-700 series: Precision battery monitoring

BMV-700

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

BMV-702 Black

BMV-700H

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

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

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

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

Bluetooth Smart

Use the Bluetooth Smart dongle to monitor your batteries on Apple or Android smartphones, tablets, macbooks and other devices.

Easy to install

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

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

Easy to program (with your smartphone!)

A quick install menu and a detailed setup menu with scrolling texts assist the user when going through the various settings.

Alternatively, choose the fast and easy solution: download the smartphone app (Bluetooth Smart dongle needed)

Midpoint voltage monitoring (BMV-702 only)

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

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

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

Standard features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events**,** which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 95V
- High current measurement resolution: 10 mA (0,01A)
- Low current consumption: 2,9Ah per month (4mA) @12V and 2,2Ah per month (3mA) @ 24V

BMV-702 additional features

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

BMV-700HS: 60 to 385 VDC voltage range

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

Other battery monitoring options

- VE.Net Battery Controller
- Lynx Shunt VE.Net
- Lynx Shunt VE.Can

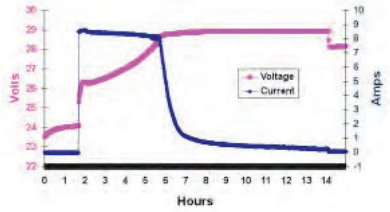
More about midpoint voltage

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our Battery Balancer (BMS012201000) to maximize service life of series-connected batteries.

Battery Monitor	BMV-700	BMV-702 BMV-702 BLACK	BMV-700HS
Supply voltage range	6,5 - 95 VDC	6,5 - 95 VDC	60 – 385 VDC
Current draw, back light off	< 4mA	< 4mA	< 4mA
Input voltage range, auxiliary battery	n. a.	6,5 - 95 VDC	n. a.
Battery capacity (Ah)	1 - 9999 Ah		
Operating temperature range	-40 +50°C (-40 - 120°F)		
Measures voltage of second battery, or temperature, or midpoint	No	Yes	No
Temperature measurement range	-20 +50°C		n. a.
VE.Direct communication port	Yes	Yes	Yes
Relay	60V / 1A normally open (function can be inverted)		
RESOLUTION & ACCURACY (with a 500 A shunt)			
Current	± 0,01A		
Voltage	± 0,01V		
Amp hours	± 0,1 Ah		
State of charge (0 – 100%)	± 0,1%		
Time to go	± 1 min		
Temperature (0 - 50°C or 30 - 120°F)	n. a.	± 1°C/°F	n. a.
Accuracy of current measurement	± 0,4%		
Accuracy of voltage measurement	± 0,3%		
INSTALLATION & DIMENSIONS			
Installation	Flush mount		
Front	63mm diameter		
Front bezel	69 x 69mm (2.7 x 2.7 inch)		
Body diameter	52mm (2.0 inch)		
Body depth	31mm (1.2 inch)		
STANDARDS			
Safety	EN 60335-1		
Emission / Immunity	EN 55014-1 / EN 55014-2		
Automotive	ECE R10-4 / EN 50498		
ACCESSORIES			
Shunt (included)	500A / 50mV		
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection		
Temperature sensor	Optional (ASS000100000)		

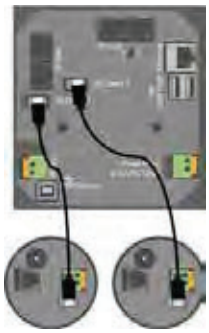
1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

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

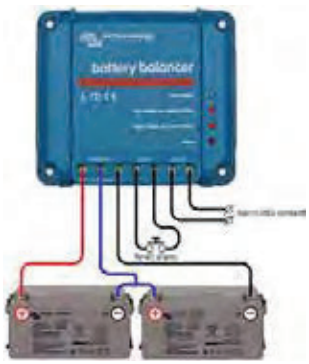


The PC application software **BMV-Reader** will show all current readings on a computer, including history data. It can also log the data to a CSV formatted file. It is available for free, and can be downloaded from our website at the Support and downloads section. Connect the BMV to the computer with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

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.



A maximum of four BMVs can be connected directly to the Color Control.
Even more BMVs can be connected to a USB Hub for central monitoring.



Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three Battery Balancers.

With the **VE.Direct to Bluetooth Smart dongle** real time data and alarms can be displayed on Apple and Android smartphones, tablets, macbooks and other devices.

Also use your smartphone to adjust settings!

(the VE.Direct to Bluetooth Smart dongle must be ordered separately)

See the VictronConnect BMV app Discovery Sheet for more screenshots

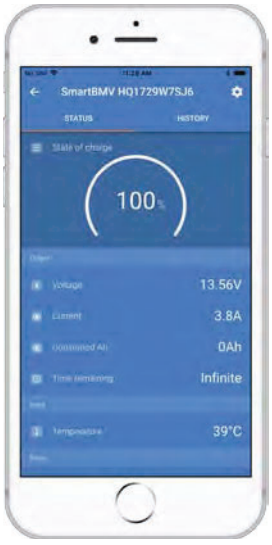
Temperature sensor

BMV-712 Smart: Bluetooth inside

BMV-712 Smart

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb



See the VictronConnect BMV app Discovery Sheet for more screenshots

Bluetooth inside

With Bluetooth built-in, the BMV Smart is ready for the Internet of Things (IoT) era. With Bluetooth being implemented in most other Victron Energy products, wireless communication between products will simplify system installation and enhance performance.

Download the Victron Bluetooth app

Use a smartphone or other Bluetooth enabled device to

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Easy to install

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

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

Midpoint voltage monitoring

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our **Battery Balancer** (BMS012201000) to maximize service life of series-connected lead-acid batteries.

Very low current draw from the battery

Current consumption: 0,7Ah per month (1mA) @12V and 0,6Ah per month (0,8mA) @ 24V
Especially Li-ion batteries have virtually no capacity left when discharged until low voltage shutdown. After shutdown due to low cell voltage, the capacity reserve of a Li-ion battery is approximately 1Ah per 100Ah battery capacity. The battery will be damaged if the remaining capacity reserve is drawn from the battery. A residual current of 10mA for example may damage a 200Ah battery if the system is left in discharged state during more than 8 days.

Bi-stable alarm relay

Prevents increased current draw in case of an alarm.

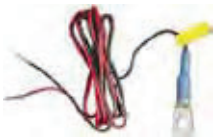
Other features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events**,** which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 70V
- High current measurement resolution: 10 mA (0,01A)
- Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings

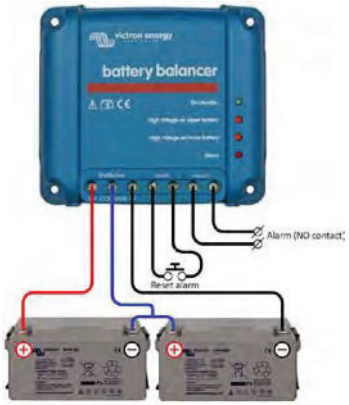
Battery Monitor	BMV-712 Smart
Supply voltage range	6,5 - 70 VDC
Current draw, back light off	< 1mA
Input voltage range, auxiliary battery	6,5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50°C (-40 - 120°F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50°C
VE.Direct communication port	Yes
Bistable relay	60V / 1A normally open (function can be inverted)
RESOLUTION & ACCURACY (with a 500 A shunt)	
Current	± 0,01A
Voltage	± 0,01V
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)	± 1°C/°F
Accuracy of current measurement	± 0,4%
Accuracy of voltage measurement	± 0,3%
INSTALLATION & DIMENSIONS	
Installation	Flush mount
Front	63mm diameter
Front bezel	69 x 69mm (2.7 x 2.7 inch)
Body diameter	52mm (2.0 inch)
Body depth	31mm (1.2 inch)
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN 55014-1 / EN 55014-2
Automotive	ECE R10-4 / EN 50498
ACCESSORIES	
Shunt (included)	500A / 50mV
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection
Temperature sensor	Optional (ASS000100000)

1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 712 to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to the Color Control or to a computer.



Temperature sensor

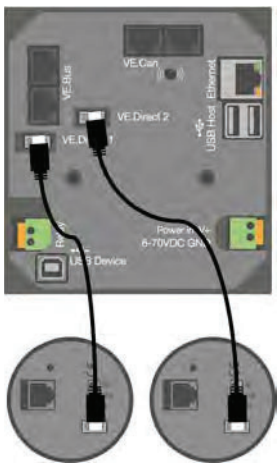


Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three Battery Balancers.

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.



A maximum of four BMVs can be connected directly to the Color Control.
Even more BMVs can be connected to a USB Hub for central monitoring.

Venus GX
The Venus GX provides intuitive control and monitoring. It has the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

Argo diode battery isolators

Argo Diode Isolator
120-2AC

Argo Diode Isolator
140-3AC

Diode battery isolators allow simultaneous charging of two or more batteries from one alternator, without connecting the batteries together. Discharging the accessory battery for example will not result in also discharging the starter battery.

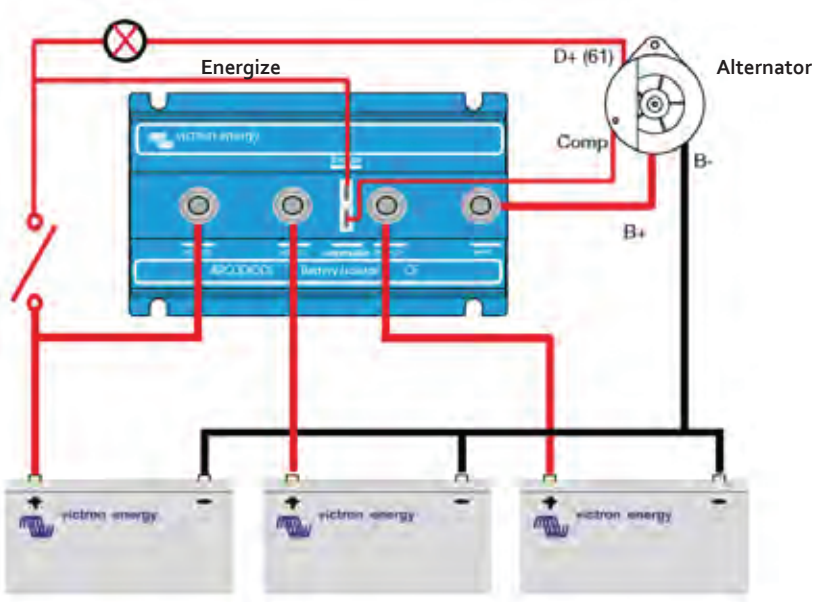
The Argo Battery Isolators feature a low voltage drop thanks to the use of Schottky diodes: at low current the voltage drop is approximately 0,3 V and at the rated output approximately 0,45 V.
All models are fitted with a compensation diode that can be used to slightly increase the output voltage of the alternator. This compensates for the voltage drop over the diodes in the isolator.

Please see our book 'Energy Unlimited' or ask for specialist advice when installing a diode isolator. Simply inserting the isolator in the cabling between the alternator and the batteries will slightly reduce charge voltage. The result can be that batteries are not charged to the full 100% and age prematurely.

Alternator energize input

Some alternators need DC voltage on the B+ output to start charging. Obviously, DC will be present when the alternator is directly connected to a battery. Inserting a Diode or FET splitter will however prevent any return voltage/current from the batteries to the B+, and the alternator will not start.
The new 'AC' diode isolators feature a special current limited energize input that will power the B+ when the engine run/stop switch is closed.

Argo Diode Battery Isolator	80-2SC	80-2AC	100-3AC	120-2AC	140-3AC	160-2AC	180-3AC
Maximum charge current (A)	80	80	100	120	140	160	180
Maximum alternator current (A)	80	80	100	120	140	160	180
Number of batteries	2	2	3	2	3	2	3
Alternator Energize Input	no	yes	yes	yes	yes	yes	yes
Connection	M6 Studs	M6 Studs	M6 Studs	M8 Studs	M8 Studs	M8 Studs	M8 Studs
Compensation diode and Energize connection	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston
Weight kg (lbs)	0,5 (1.3)	0,6 (1.3)	0,8 (1.8)	0,8 (1.8)	1,1 (2.5)	1,1 (2.5)	1,5 (3.3)
Dimensions h x w x d in mm (h x w x d in inches)	60 x 120 x 75 (2.4 x 4.7 x 3.0)	60 x 120 x 90 (2.4 x 4.7 x 3.9)	60 x 120 x 115 (2.4 x 4.7 x 4.5)	60 x 120 x 115 (2.4 x 4.7 x 4.5)	60 x 120 x 150 (2.4 x 4.7 x 5.9)	60 x 120 x 150 (2.4 x 4.7 x 5.9)	60 x 120 x 200 (2.4 x 4.7 x 7.9)



Argo FET 100-3
3bat 100A

Similarly to Diode Battery Isolators, FET Isolators allow simultaneous charging of two or more batteries from one alternator (or a single output battery charger), without connecting the batteries together. Discharging the accessory battery for example will not result in also discharging the starter battery.

In contrast with Diode Battery Isolators, FET Isolators have virtually no voltage loss. Voltage drop is less than 0,02 Volt at low current and averages 0,1 Volt at higher currents.

When using Argo FET Battery Isolators, there is no need to also increase the output voltage of the alternator. However, care should be taken to keep cable lengths short and of sufficient cross section.

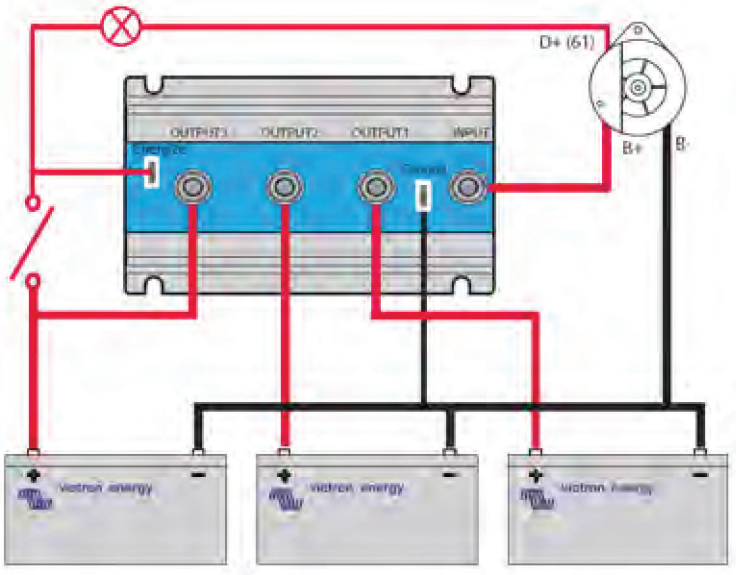
Example:
When a current of 100 A flows through a cable of 50 mm^2 cross section (AWG 0) and 10 m length (30 ft), the voltage drop over the cable will be 0,26 Volt. Similarly a current of 50 A through a cable of 10 mm^2 cross section (AWG 7) and 5 m length (15 ft) will result in a voltage drop of 0,35 Volt!

Alternator energize input

Some alternators need DC voltage on the B+ output to start charging. Obviously, DC will be present when the alternator is directly connected to a battery. Inserting a Diode or FET splitter will however prevent any return voltage/current from the batteries to the B+, and the alternator will not start.
The new Argo FET Isolators have a special current limited energize input that will power the B+ when the engine run/stop switch is closed.

Argo FET 100-3
3bat 100A

Argo FET Battery Isolator	Argo FET 100-2	Argo FET 100-3	Argo FET 200-2	Argo FET 200-3
Maximum charge current (A)	100	100	200	200
Maximum alternator current (A)	100	100	200	200
Number of batteries	2	3	2	3
Connection	M8 bolts	M8 bolts	M8 bolts	M8 bolts
Weight kg (lbs)	1,4 (3.1)	1,4 (3.1)	1,4 (3.1)	1,4 (3.1)
Dimensions: h x w x d in mm (h x w x d in inches)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)



Battery Balancer

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

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

The Solution: battery balancing

The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27,3V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 0,7A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

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

LED indicators

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

Alarm relay

Normally open. The alarm relay closes when the red LED switches on and opens when the red LED switches off.

Alarm reset

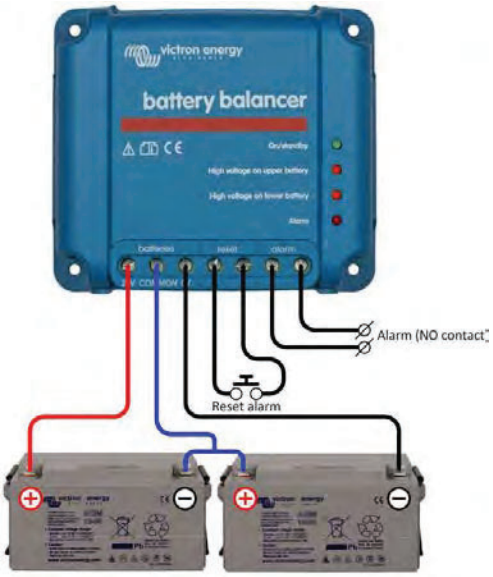
Two terminals are available to connect a push button. Interconnecting the two terminals resets the relay.
The reset condition will remain active until the alarm is over. Thereafter the relay will close again when a new alarm occurs.

Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

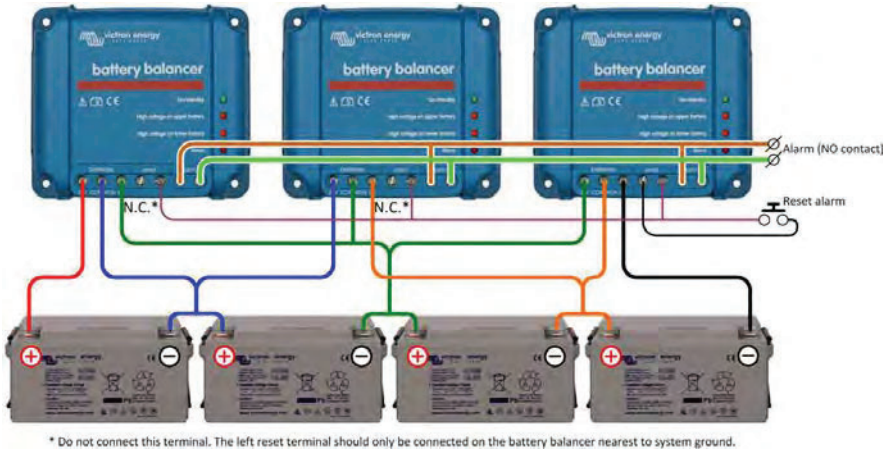
The BMV-702 measures the midpoint of a string of cells or batteries. It displays the deviation from the ideal midpoint in volts or percent. Separate deviation percentages can be set to trigger a visual/audible alarm and to close a potential free relay contact for remote alarm purposes.
Please see the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

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'.

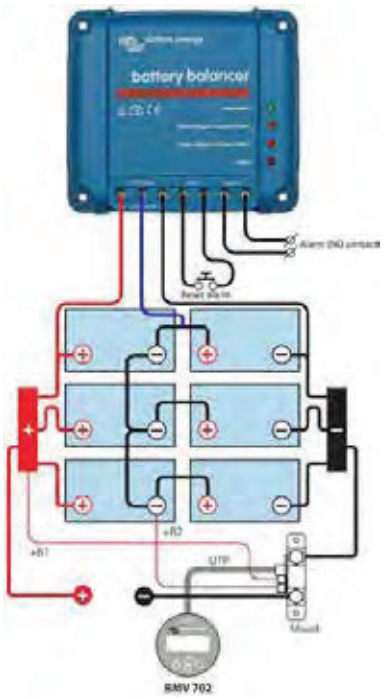


Battery Balancer connected to two series connected 12V batteries (24V system)



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

Victron Battery Balancer	
Input voltage range	Up to 18V per battery, 36V total
Turn on level	27,3V +/- 1%
Turn off level	26,6V +/- 1%
Current draw when off	0,7 mA
Midpoint deviation to start balancing	50 mV
Maximum balancing current	0,7A (when deviation > 100 mV)
Alarm trigger level	200 mV
Alarm reset level	140 mV
Alarm relay	60V / 1A normally open
Alarm relay reset	Two terminals to connect a push button
Over temperature protection	yes
Operating temperature	-30 t0 +50°C
Humidity (non-condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm² / AWG10
Protection category	IP22
Weight	0,4 kg
Dimensions (h x w x d)	100 x 113 x 47 mm
STANDARDS	
Safety	EN 60950
Emission	EN 61000-6-3, EN 55014-1
Immunity	EN 61000-6-2, EN 61000-6-1, EN 55014-2
Automotive Directive	EN 50498



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

Installation

1) The Battery Balancer(s) must be installed on a well-ventilated vertical surface close to the batteries (but, due to possible corrosive gasses, not above the batteries!)
2) **In case of series-parallel connection, the midpoint interconnecting cables must be sized to at least carry the current that arises when one battery becomes open-circuited.**
   - In case of 2 parallel strings: cross section 50% of the series interconnecting cables.
   - In case of 3 parallel strings: cross section 33% of the series interconnecting cables, etc.
3) If required: first wire the alarm contact and the alarm reset.
4) Use at least 0,75 mm² to wire the negative, positive and midpoint connections (in this order).
5) The balancer is operational.
   When the voltage over a string of two batteries is less than 26,6V the balancer switches to standby and all LEDs will be off.
   When the voltage over a string of two batteries increases to more than 27,3V (during charging) the green LED will turn on, indicating that the balancer is on.
   When on, a voltage deviation of more than 50 mV will start the balancing process and at 100 mV one of the two orange LEDs will turn on. A deviation of more than 200 mV will trigger the alarm relay.

What to do in case of an alarm during charging

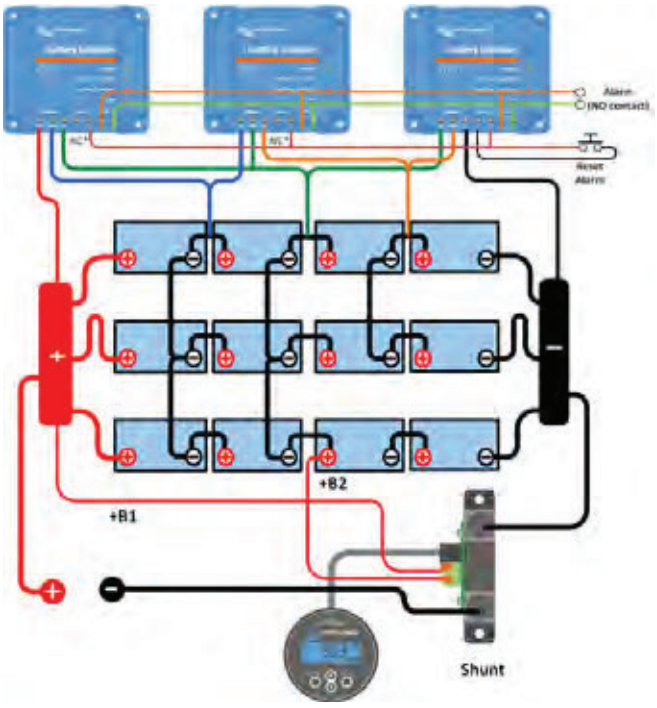
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially and allow the batteries to equalize over time.

If the problem persists after several charge-discharge cycles:

a) In case of series-parallel connection disconnect the midpoint parallel connection wiring and measure the individual midpoint voltages during absorption charge to isolate batteries or cells which need additional charging, or:
b) Charge and then test all batteries or cells individually or:
c) Connect two or more battery balancers in parallel (on average one balancer will take care of up to three parallel 200 Ah strings).

In case of an older battery bank which has performed well in the past, the problem may be due to:

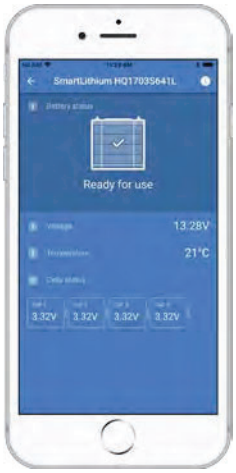
d) Systematic undercharge: more frequent charging needed (VRLA batteries), or equalization charge needed (flooded deep cycle flat plate or OPzS batteries). Better and regular charging will solve the problem.
e) One or more faulty cells: replace all batteries.



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

Lithium-Iron-Phosphate Batteries Smart 12,8 & 25,6 Volt: with Bluetooth

12,8V 300Ah LiFePO4 Battery



Li-ion app

Why lithium-iron-phosphate?

Lithium-iron-phosphate (LiFePO4 or LFP) is the safest of the mainstream li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 12,8V LFP battery therefore consists of 4 cells connected in series; and a 25,6V battery consists of 8 cells connected in series.

Rugged

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

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

A LFP battery does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of LFP compared to lead-acid.
Other advantages are the wide operating temperature range, excellent cycling performance, low internal resistance and high efficiency (see below).

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

Efficient

In several applications (especially off-grid solar and/or wind), energy efficiency can be of crucial importance.
The round trip energy efficiency (discharge from 100% to 0% and back to 100% charged) of the average lead-acid battery is 80%.
The round trip energy efficiency of a LFP battery is 92%.
The charge process of lead-acid batteries becomes particularly inefficient when the 80% state of charge has been reached, resulting in efficiencies of 50% or even less in solar systems where several days of reserve energy is required (battery operating in 70% to 100% charged state).
In contrast, a LFP battery will still achieve 90% efficiency under shallow discharge conditions.

Size and weight

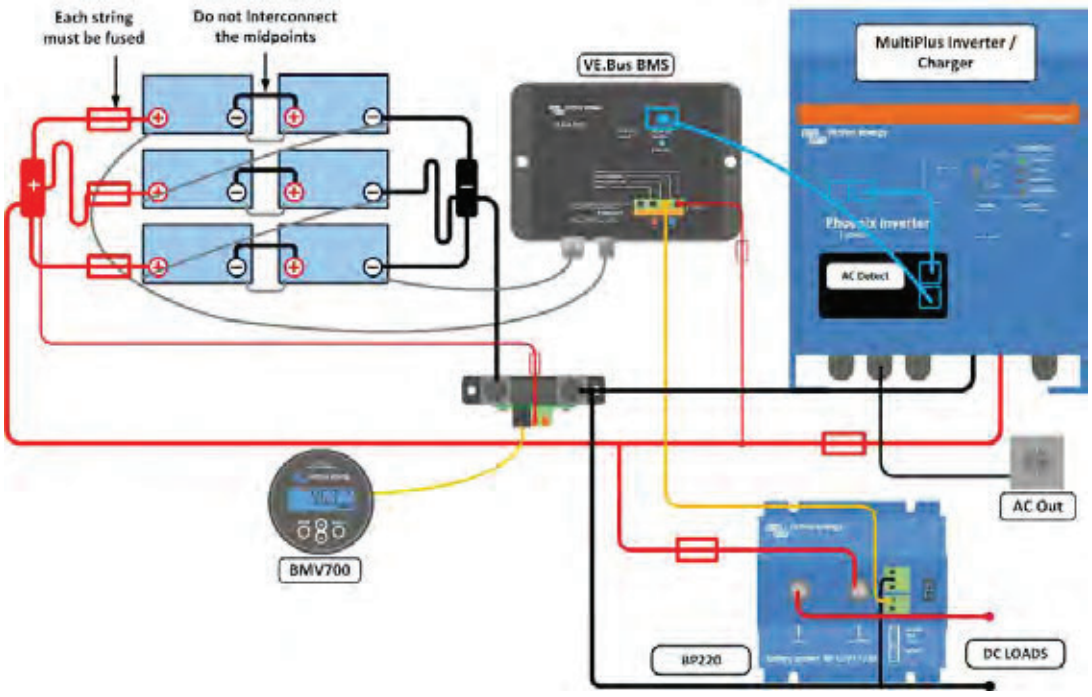
Saves up to 70% in space
Saves up to 70% in weight

Expensive?

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

Bluetooth

With Bluetooth cell voltages, temperature and alarm status can be monitored.
Very useful to localize a (potential) problem, such as cell imbalance.



Our LFP batteries have integrated cell balancing and cell monitoring. Up to 5 batteries can be paralleled and up to four batteries can be series connected, so that a 48V battery bank of up to 1500Ah can be assembled. The cell balancing/monitoring cables can be daisy-chained and must be connected to a Battery Management System (BMS).

Battery Management System (BMS)

The BMS will:

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

See the BMS datasheets for more features

Battery specification

VOLTAGE AND CAPACITY	LFP-Smart 12,8/60	LFP-Smart 12,8/90	LFP-Smart 12,8/100-a	LFP-Smart 12,8/150	LFP-Smart 12,8/160	LFP-Smart 12,8/200	LFP-Smart 12,8/300	LFP-Smart 25,6/200
Nominal voltage	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	25,6V
Nominal capacity @ 25°C*	60Ah	90Ah	100Ah	150Ah	160Ah	200Ah	300Ah	200Ah
Nominal capacity @ 0°C*	48Ah	72Ah	80Ah	125Ah	130Ah	160Ah	240Ah	160Ah
Nominal capacity @ -20°C*	30Ah	45Ah	50Ah	75Ah	80Ah	100Ah	150Ah	100Ah
Nominal energy @ 25°C*	768Wh	1152Wh	1280Wh	1920Wh	2048Wh	2560Wh	3840Wh	5120Wh
*Discharge current ≤1C								
CYCLE LIFE (capacity ≥ 80% of nominal)								
80% DoD	2500 cycles							
70% DoD	3000 cycles							
50% DoD	5000 cycles							
DISCHARGE								
Maximum continuous discharge current	120A	180A	200A	300A	320A	400A	600A	400A
Recommended continuous discharge current	≤60A	≤90A	≤100A	≤150A	≤160A	≤200A	≤300A	≤200A
End of discharge voltage	11V	11V	11V	11V	11V	11V	11V	22V
OPERATING CONDITIONS								
Operating temperature	Discharge: -20°C to +50°C Charge: +5°C to +50°C							
Storage temperature	-45°C to +70°C							
Humidity (non-condensing)	Max. 95%							
Protection class	IP 22							
CHARGE								
Charge voltage	Between 14V/28V and 14,4V/28,8V (14,2V/28,4V recommended)							
Float voltage	13,5V/27V							
Maximum charge current	120A	180A	200A	300A	320A	400A	600A	400A
Recommended charge current	≤30A	≤45A	≤50A	≤75A	≤80A	≤100A	≤150A	≤100A
OTHER								
Max storage time @ 25°C*	1 year							
BMS connection	Male + female cable with M8 circular connector, length 50cm							
Power connection (threaded inserts)	M8	M8	M8	M8	M10	M10	M10	M8
Dimensions (hxwxd) mm	240x285x132	249x285x168	197x321x152	237x321x152	320x338x233	297x425x274	347x425x274	317x631x208
Weight	12kg	16kg	15kg	20kg	33kg	42kg	51kg	56Kg
*When fully charged								

Lithium-Ion Battery 24V 180A/100Ah and Lynx Ion + Shunt

24V 180Ah and 100Ah
Lithium-Ion Battery

Lynx Ion + Shunt

Ion control: Main screen

Ion control: History screen

Ion control: Lynx Ion Status

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

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

Why Lithium-Iron-Phosphate?

Lithium-Iron-Phosphate (LiFePO4 or LFP) is the safest of the mainstream Li-ion battery types.The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 25,6V LFP battery consists of 8 cells connected in series.

Complete system

A complete system consists of:

- One or more **24V 180Ah or 100Ah Lithium-Ion batteries**.
- (optional) The **Lynx Power In**, a modular dc bus bar.
- The **Lynx Ion + Shunt** is the Battery Management System (BMS) that controls the batteries. It contains a main safety contactor and a shunt. There are two models are available: a 350A model and a 600A model.
  (optional) The **Lynx Distributor**, a DC distribution system with fuses.
- (optional) The **Ion Control**, a digital control panel.
- (optional) The **Color Control GX**, a more advanced digital control panel

The advantages of the Victron Lynx Lithium-ion battery system

The modular system used adds the following advantages:

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

24V 180Ah/100Ah Lithium-Ion Batteries

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

Lynx Ion + Shunt

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

For both overcharging and depletion there is a last safety resort, the built-in 350A or 600 A contactor. In case signallingdoes not stop the imminent overcharge or depletion, it will open the contactor.

VE.Can / NMEA2000 Canbus

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

Ion Control

See the separate Ion Control datasheet for more information.

Color Control GX

See the separate Color Control GX datasheet for more information.

Lithium-Ion battery specifications

	Lithium-ion 24V 100Ah 2.6kWh battery	Lithium-ion 24V 180Ah 4.75kWh battery
Technology	Lithium iron phosphate (LiFePo4)	Lithium iron phosphate (LiFePo4)
Nominal voltage	25,6V	25,6V
Nominal capacity	100Ah	180Ah
Nominal power	2,6kWh	4,75kWh
Weight	30kg	55kg
Power/Weight ratio	86Wh/kg	86Wh/kg
Dimensions (lxwxh)	592x154x278mm	623x193x351mm
Charge/Discharge		
Charge cut-off voltage at 0.05C	28,8V	28,8V
Discharge cut-off voltage	20V	20V
Recommended charge/discharge current	30A (0,3C)	54A (0,3C)
Maximum charge current (1C)	100A	180A
Maximum discharge current (1.5C)	150A	270A
Pulse discharge current (10s)	500A	1000A
Cycle Life @80% DOD (0.3C)	3000	3000
Configuration		
Series configuration	Yes, up to 2 (more in series on request)	Yes, up to 2 (more in series on request)
Parallel configuration	Yes, easy up to 10 (more parallel on request)	Yes, easy up to 10 (more parallel on request)
Environmental		
Operating temp. charge	0~45°C	0~45°C
Operating temp. discharge	-20~55°C	-20~55°C
Storage temp.	-20~45°C	-20~45°C
Standards		
EMC: Emission	EN-IEC 61000-6-3:2007/A1:2011/C11:2012	
EMC: Immunity	EN-IEC 61000-6-1:2007	
Low voltage directive	EN 60335-1:2012/AC:2014	

Lynx Ion + Shunt specifications

Lynx Ion + Shunt	350A	600A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	48	
Supply voltage range	9 ... 60VDC	
Standby mode	73mW @ 26,2V and 138mW @ 52,4V	
Active mode	8,7 W	
Main safety contactor	350A	600A
Enclosure		
Material	ABS	
Weight	2,0kg	
Dimensions (lxwxh)	185 x 165 x 85 mm	
IO		
Aux. output	5A (output voltage = battery voltage), short circuit protection	
External safety contactor	5A (output voltage = battery voltage), short circuit protection	
Allow-to-charge	1A @ 60VDC, potential free	
Allow-to-discharge	1A @ 60VDC, potential free	
External status signal	12V / 140mA	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	IP20
Standards		
EMC: Emission	EN-IEC 61000-6-3:2007/A1:2011/C11:2012	
EMC: Immunity	EN-IEC 61000-6-1:2007	
Low voltage directive	EN 60335-1:2012/AC:2014	
RoHs	EN 50581:2012	

Lithium-Ion HE Battery and Lynx Ion BMS

24V/100Ah HE battery

24V/200Ah HE battery

Lynx-ion BMS 1000A

Ultra-high energy density

185Wh/kg thanks to Lithium Nickel Manganese Cobalt Oxide (NMC) technology

Fan cooled

For high charge and discharge currents (up to 2C for short periods)

Parallel and series connection

Up to 64 batteries can be parallel connected.
For 48V systems two batteries can be connected in series, and up to 32 strings of two batteries can be parallel connected.

Galvanically isolated CAN-Bus communication

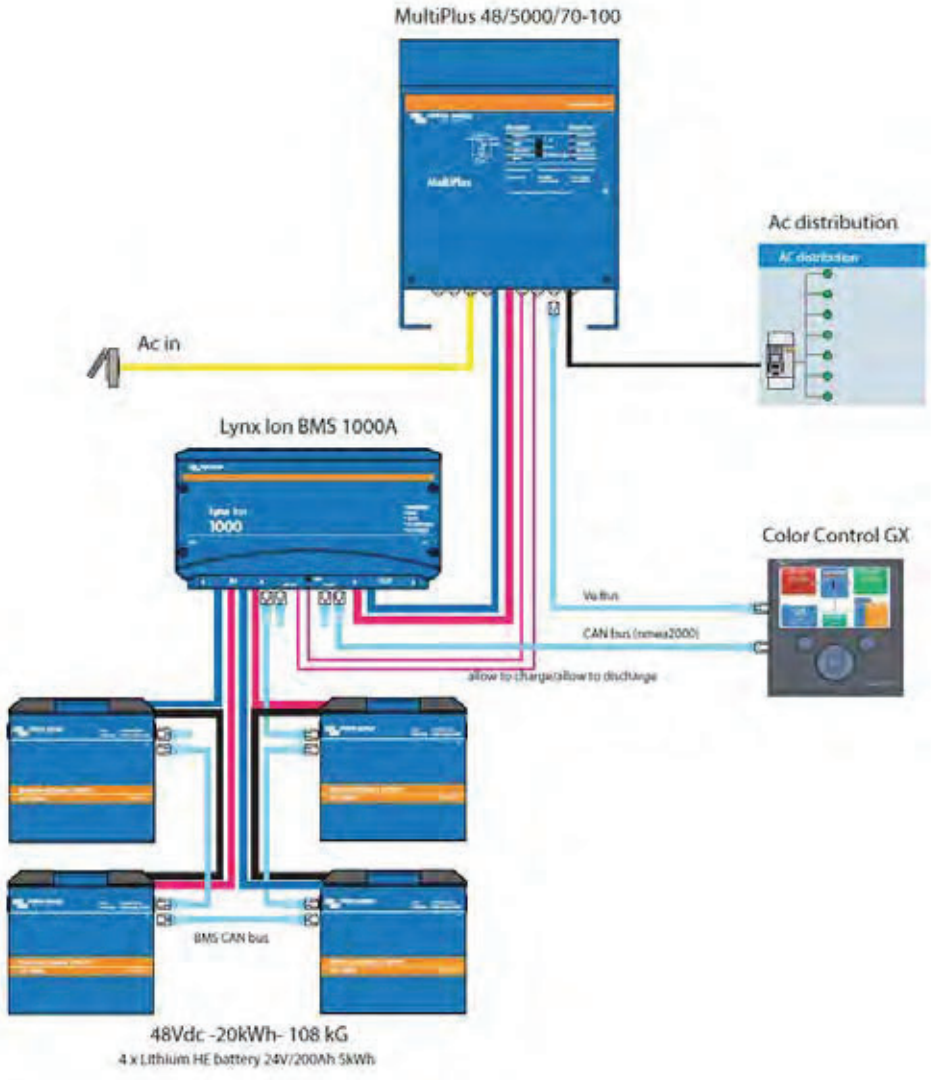
Protocol: VE.Can/NMEA2000

Lynx-ion BMS: 400A or 1000A

The Lynx-ion BMS reduces wiring and installation time to a minimum: it combines four fused battery connections, four fused DC load connections, a safety contactor and a current shunt with a BMS in one compact enclosure.

Monitoring: The Color Control GX or Venus GX

Monitors the complete system.
Is the gateway for remote monitoring on the VRM online portal.
Adds an amazing amount of useful functionality to system (such as a very sophisticated generator start-stop program
See the Color Control GX and Venus GX datasheet for more information.



Lithium HE battery	24V / 100Ah	24V / 200Ah
Technology	Lithium-Ion NMC	Lithium-Ion NMC
Cell configuration	7S32P	7S64P
Nominal voltage	25,2 V	25,2 V
Nominal capacity	100 Ah	200 Ah
Nominal energy	2,5 kWh	5,0 kWh
Cycle Life @80% DoD (0,3C)	2000	2000
Energy/weight ratio (incl. BMS and enclosure)	159 Wh/kg	175 Wh/kg
Weight (incl. BMS and enclosure)	15,7 kg	28,6 kg
Discharge		
Discharge cut-off voltage	21 V	21 V
Recommended discharge current	30 A (0.3 C)	60 A (0.3 C)
Maximum discharge current (10 minutes)	150 A (1.5 C)	300 A (1.5 C)
Fuses	150 A, fuse inside	300 A, fuse inside
Charge		
Absorption voltage (1 hour)	28,4 V	28,4 V
Float voltage	27,5 V	27,5 V
Maximum charge current	100 A (1 C)	200 A (1 C)
Recommended charge current	30 A (0.3 C)	60 A (0.3 C)
Configuration		
Series configuration	Yes, up to 2	
Parallel configuration	Yes, up to 96	
Temperature		
Operating temp. charge	0~45°C	
Operating temp. discharge	-20~55°C	
Storage temp.	-20~45°C	
Mechanical		
Power connections	M8 stud, Max. 15 Nm	M8 stud, Max. 15 Nm
Protection class	IP20	IP20
Cooling	Air, active (1x fan inside)	Air, active (2x fan inside)
Dimensions (l x w x h)	362 x 193 x 214 mm	362 x 193 x 355 mm
Safety		
Battery Management System (BMS)	Integrated slave BMS	
Balancing	Passive	
Compatible BMS master controller	Lynx Ion BMS	
Communication with Lynx Ion BMS	CAN bus	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

Lynx Ion BMS intended for both 100 Ah & 200Ah batteries	400A	1000A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	96 (48 V: 48 strings of two batteries	
Supply voltage range	18 to 58 VDC	
Power consumption, standby mode	73 mW @ 26,2V and 138 mW @ 52,4V	
Power consumption, active mode	8,7 W	
Main safety contactor	400A	1000A
Communication port	VE.CAN (NMEA2000, RJ45 connection, galvanically isolated)	
IO		
Auxiliary output	13,5 V / 1 A, short circuit protected	
Allow-to-charge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-discharge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-charge (relay output)	1 A @ 60 VDC, potential free	
Allow-to-discharge (relay output)	1 A @ 60 VDC, potential free	
Programmable contact (relay output)	1 A @ 60 VDC, potential free	
External status signal	13,5 V / 140 mA	
Enclosure		
Material	ABS	
Weight	4,6 kg	5,7 kg
Dimensions (lxwxh)	225 x 426 x 117 mm	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

VE.Bus BMS

Protects each individual cell of a Victron lithium iron phosphate ($LiFePO_4$ or LFP) battery

Each individual cell of a $LiFePO_4$ battery must be protected against over voltage, under voltage and over temperature.
Victron LiFePO4 batteries have integrated Balancing, Temperature and Voltage control (acronym: BTV) and connect to the VE.Bus BMS with two M8 circular connector cord sets.
The BTVs of several batteries can be daisy chained. Up to five batteries can be paralleled and up to four batteries can be series connected (BTVs are simply daisy-chained) so that a 48V battery bank of up to 1500Ah can be assembled. Please see our LiFePO4 battery documentation for details.
The BMS will:

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

Protects 12V, 24V and 48V systems

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

Communicates with all VE.Bus products

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

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

Load Disconnect

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

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

Charge Disconnect

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

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

LED indicators

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

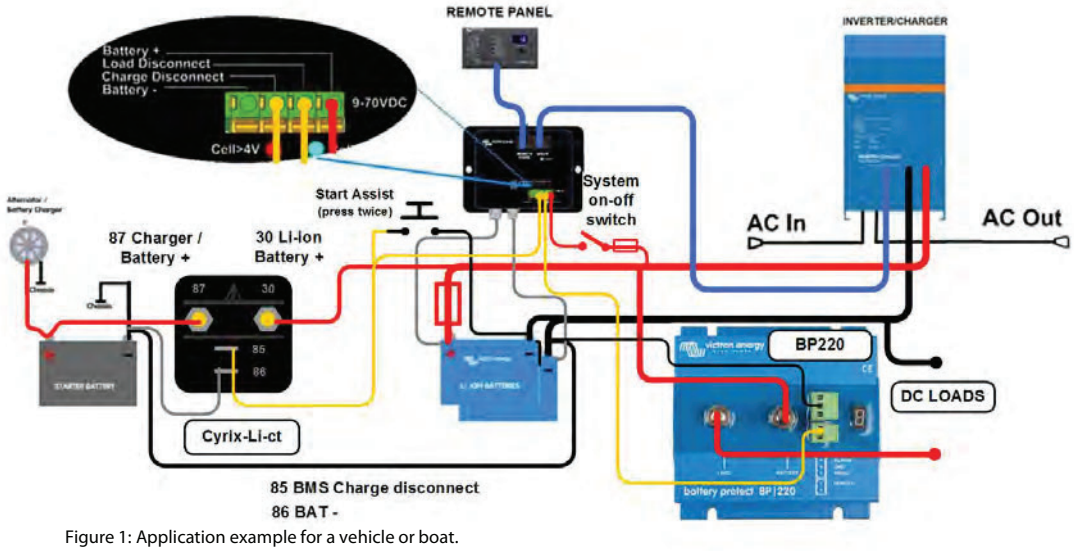


Figure 1: Application example for a vehicle or boat.
A Cyrix Li-ion Battery Combiner is used to connect to the starter battery and alternator.
The UTP cable to the inverter/charger also provides the minus connection to the BMS.

VE.Bus BMS	
Input voltage range	9 – 70V DC
Current draw, normal operation	10 mA (excluding Load Disconnect current)
Current draw, low cell voltage	2mA
Load Disconnect output	Normally high Source current limit: 2A Sink current: 0 A (output free floating)
Charge Disconnect output	Normally high Source current limit: 10mA Sink current: 0 A (output free floating)
GENERAL	
VE.Bus communication port	Two RJ45 sockets to connect to all VE.Bus products
Operating temperature	-20 to +50°C 0 - 120°F
Humidity	Max. 95% (non-condensing)
Protection grade	IP20
ENCLOSURE	
Material and colour	ABS, matt black
Weight	0,1kg
Dimensions (h x w x d)	105 x 78 x 32mm
STANDARDS	
Standards: Safety Emission Immunity Automotive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 Regulation UN/ECE-R10 Rev.4

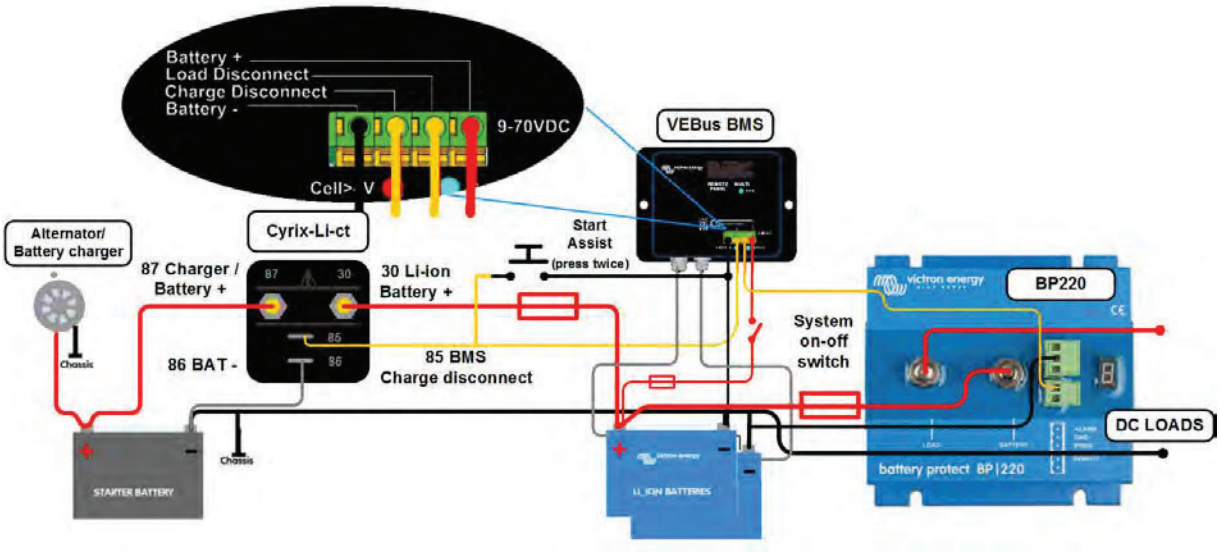


Figure 2: Application example for a vehicle or boat, without inverter/charger.

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

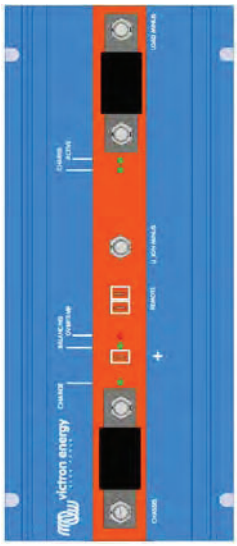
Cyrix-Li-ct (120A or 230A)
Is a battery combiner with a Li-ion adapted engage/disengage profile and a control terminal to connect to the Charge Disconnect of the BMS.

Cyrix-Li-Charge (120A or 230A)
Is a unidirectional combiner to insert in between a battery charger and the LFP battery. It will engage only when charge voltage from a battery charger is present on its charge-side terminal. A control terminal connects to the Charge Disconnect of the BMS.

BMS 12/200 for 12,8V Lithium-Iron-Phosphate Batteries

12,8V 90Ah LiFePO4 Battery

12,8V 60Ah LiFePO4 Battery



BMS 12/200 with:
- **12V 200A load output, short-circuit proof**
- **Li-ion battery over-discharge protection**
- **starter battery discharge protection**
- **adjustable alternator current limit**
- **remote on-off switch**

Why lithium-iron-phosphate?

Lithium-iron-phosphate (LiFePO4 or LFP) is the safest of the mainstream li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V / cell). A 12,8V LFP battery therefore consists of 4 cells connected in series; and a 25,6 V battery consists of 8 cells connected in series.

Why a Battery Management System (BMS) is needed:

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

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

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

The cells in a battery are not 100% identical. Therefore, when cycled, some cells will be fully charged or discharged earlier than others. The differences will increase if the cells are not balanced/equalized from time to time.
In a lead-acid battery a small current will continue to flow even after one or more cells are fully charged (the main effect of this current is decomposition of water into hydrogen and oxygen). This current helps to fully charge other cells that are lagging behind, thus equalizing the charge state of all cells.
The current which flows through a fully-charged LFP cell however, is nearly zero, and lagging cells will therefore not be fully charged. Over time the differences between cells may become so extreme that, even though the overall battery voltage is within limits, some cells will be destroyed due to over- or under voltage.

A LFP battery therefore must be protected by a BMS that actively balances the individual cells and prevents under- and over-voltage.

Rugged

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

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

A LFP battery does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of LFP compared to lead-acid.
Other advantages are the wide operating temperature range, excellent cycling performance, low internal resistance and high efficiency (see below).

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

Efficient

In several applications (especially off-grid solar and/or wind), energy efficiency can be of crucial importance.
The round trip energy efficiency (discharge from 100% to 0% and back to 100% charged) of the average lead-acid battery is 80%.
The round trip energy efficiency of a LFP battery is 92%.
The charge process of lead-acid batteries becomes particularly inefficient when the 80% state of charge has been reached, resulting in efficiencies of 50% or even less in solar systems where several days of reserve energy is required (battery operating in 70% to 100% charged state).
In contrast, a LFP battery will still achieve 90% efficiency under shallow discharge conditions.

Size and weight

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

Expensive?

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

Endless flexibility

LFP batteries are easier to charge than lead-acid batteries. The charge voltage may vary from 14V to 16V (as long as no cell is subjected to more than 4,2V), and they do not need to be fully charged.
Several batteries can be connected in parallel and no damage will occur if some batteries are less charged than others.
Our 12V BMS will support up to 10 batteries in parallel (BTVs are simply daisy-chained).

A 12V BMS that protects the alternator (and wiring), and supplies up to 200A in any DC load (including inverters and inverter/chargers)

Alternator/battery charger input (Power Port AB)

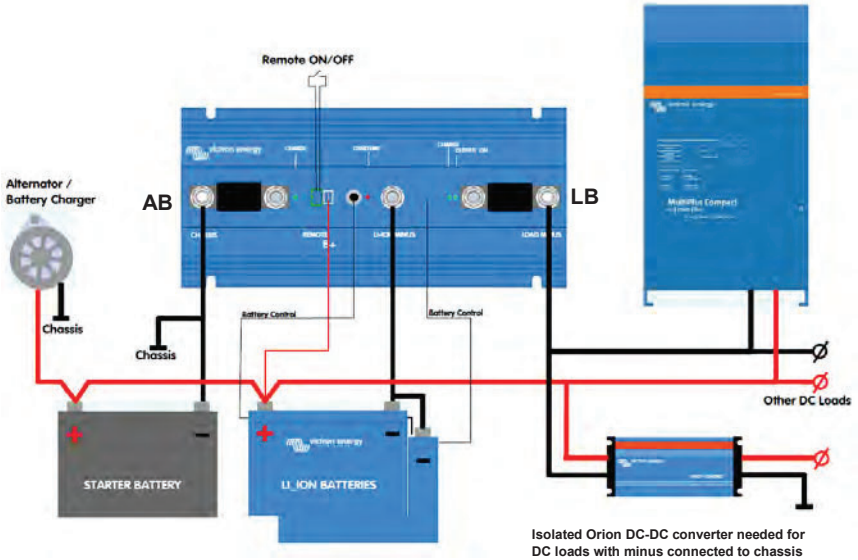
1. The first function of Power Port AB is to prevent the load connected to the LFP battery from discharging the starter battery. This function is similar to that of a Cyrix Battery Combiner or Argo FET Battery Isolator. Current can flow to the LFP battery only if the input voltage (= voltage on the starter battery) exceeds 13V.
2. Current cannot flow back from the LFP battery to the starter battery, thus preventing eventual damage to the LFP battery due to excessive discharge.
3. Excessive input voltage and transients are regulated down to a safe level.
4. Charge current is reduced to a safe level in case of cell unbalance or over temperature.
5. The input current is electronically limited to approximately 80% of the AB fuse rating. A 50A fuse, for example, will therefore limit the input current to 40A. Choosing the right fuse will therefore:
   a. Protect the LFP battery against excessive charge current (important in case of a low capacity LFP battery).
   b. Protect the alternator against overload in case of a high capacity LFP battery bank (most 12V alternators will overheat and fail if running at maximum output during more than 15 minutes).
   c. Limit charge current in order not to exceed the current handling capability of the wiring.

The maximum fuse rating is 100A (limiting charge current to approximately 80A).

Load/battery charger output/input (Power Port LB)

1. Maximum current in both directions: 200A continuous.
2. Peak discharge current electronically limited to 400A.
3. Battery discharge cut-off whenever the weakest cell falls below 3V.
4. Charge current is reduced to a safe level in case of cell unbalance or over temperature.

BMS 12/200 specification	
Maximum number of 12,8V batteries	10
Maximum charge current, Power Port AB	80A @ 40°C
Maximum charge current, Power Port LB	200A @ 40°C
Maximum continuous discharge current, LB	200A @ 40°C
Peak discharge current, LB (short circuit proof)	400A
Approximate cut-off voltage	11V
GENERAL	
No load current when operating	10mA
Current consumption when switched off (discharging is stopped and charging remains enabled, both through AB and LB, when switched off)	5mA
Current consumption after battery discharge cut-off due to low cell voltage	3mA
Operating temperature range	-40 to +60°C
Humidity, maximum	100%
Humidity, average	95%
Protection, electronics	IP65
DC connection AB, LB and battery minus	M8
DC connection battery plus	Faston female 6.3mm
LEDs	
Battery being charged through Power Port AB	green
Battery being charged through Power Port LB	green
Power port LB active	green
Over temperature	red
ENCLOSURE	
Weight (kg)	1,8
Dimensions (hxwxd in mm)	65 x 120 x 260
STANDARDS	
Emission	EN 50081-1
Immunity	EN 50082-1
Automotive Directive	2004/104/EC



AGM Super Cycle battery

A truly innovative battery

The AGM Super Cycle batteries are the result of recent battery electrochemistry developments.
The paste of the positive plates is less sensitive to softening, even in case of repeated 100% discharge of the battery, and new additives to the electrolyte reduce sulfation in case of deep discharge.

Exceptional 100% depth of discharge (DoD) performance

Tests have shown that the Super Cycle battery does withstand at least three hundred 100% DoD cycles.
The tests consist of a daily discharge to 10,8V with I = $0,2C_{20}$, followed by approximately two hours rest in discharged condition, and then a recharge with I = $0,2C_{20}$.
The two hours rest period in discharged condition will damage most batteries within 100 cycles, but not the Super Cycle battery.

We recommend the Super Cycle battery for applications where an occasional discharge to 100% DoD, or frequent discharge to 60-80% DoD is expected.

Smaller and lighter

An additional advantage of the new chemistry is a slightly smaller size and less weight compared to our standard deep cycle AGM batteries.

Low internal resistance

The internal resistance is also slightly lower compared to our standard deep cycle AGM batteries.

Recommended charge voltage:

	Float Service	Cycle service Normal	Cycle service Fast recharge
Absorption		14,2 - 14,6 V	14,6 - 14,9 V
Float	13,5 - 13,8 V	13,5 - 13,8 V	13,5 - 13,8 V
Storage	13,2 - 13,5 V	13,2 - 13,5 V	13,2 - 13,5 V

Specifications

Article number	V	Ah C5 (10,8V)	Ah C10 (10,8V)	Ah C20 (10,8V)	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Terminals
BAT412012080	12	10	11,5	12,5	151 x 100 x 103	4			Faston 6,3x0,83
BAT412025081	12	22	24	25	181 x 77 x 175	7			M5 insert
BAT412038081	12	34	36	38	267 x 77 x 175	10			M5 insert
BAT412060081	12	52	56	60	224 x 135 x 178	15	300	90	M5 insert
BAT412110081	12	82	90	100	260 x 168 x 215	25	500	170	M6 insert
BAT412112081	12	105	114	125	330 x 171 x 214	34	550	220	M8 insert
BAT412117081	12	145	153	170	336 x 172 x 280	45	600	290	M8 insert
BAT412123081	12	200	210	230	532 x 207 x 218	61	700	400	M8 insert

Cycle life

≥ 300 cycles @ 100% DoD (discharge to 10,8V with I = $0,2C_{20}$, followed by approximately two hours rest in discharged condition, and then a recharge with I = $0,2C_{20}$)
≥ 700 cycles @ 60% DoD (discharge during three hours with I = $0,2C_{20}$, immediately followed by recharge at I = $0,2C_{20}$)
≥ 1000 cycles @ 40% DoD (discharge during two hours with I = $0,2C_{20}$, immediately followed by recharge at I = $0,2C_{20}$)

Super Cycle Battery 12V 230Ah

Telecom Battery
Battery AGM 12V 200Ah

Telecom Battery
Battery AGM 12V 200Ah

Designed for telecom applications; excellent 'floor space savers' for marine and vehicle applications

The deep cycle AGM telecom series has been designed for use in telecom systems. With front access terminals and small footprint, the batteries are ideal for racked systems. Similarly, these batteries can help solve limited floor space and access problems on board boats and vehicles.

AGM technology

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action.

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 by 10°C.

Low internal resistance

Accepts very high charge and discharge rates.

High cyclic life capability

More than 500 cycles at 50% depth of discharge.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'.

12V AGM Telecom battery	115Ah	165Ah	200Ah
Capacity 1 / 3 / 5 / 10 / 20 hours (% of nominal)	60 / 75 / 82 / 91 / 100 (@ 70°F/25°C, end of discharge 10,5V)		
Capacity 10 / 20 / 30 / 40 minutes (% of nominal)	33 / 44 / 53 / 57 (@ 70°F/25°C, end of discharge 9,6V)		
Nominal capacity (77°F/25°C, 10,5V)	115Ah	165Ah	200Ah
Cold Cranking Amps @ 0°F/-18°C	1000	1500	1800
DIN cold start current (A) @ 0°F/-18°C	600	900	1000
Short Circuit Current (A)	3500	5000	6000
Reserve Capacity (minutes)	200	320	400
Shelf life @ 70°F/20°C	1 year		
Absorption voltage (V) @ 70°F/20°C	14,4 – 14,7		
Float voltage (V) @ 70°F/20°C	13,6 – 13,8		
Storage voltage (V) @ 70°F/20°C	13,2		
Float design life @ 70°F/20°C	12 years		
Cycle design life @ 80% discharge	500		
Cycle design life @ 50% discharge	750		
Cycle design life @ 30% discharge	1800		
Dimensions (lxwxh, mm)	395 x 110 x 293mm	548 x 105 x 316mm	546 x 125 x 323mm
Dimensions (lxwxh, inches)	15.37 x 4.33 x 11.53	21.57 x 4.13 x 12.44	21.49 x 4.92 x 12.71
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	60kg/132lbs

Gel and AGM batteries

AGM Battery
12V 90Ah

GEL OPzV 2V cell

1. VRLA technology

VRLA stands for Valve Regulated Lead Acid, which means that 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 high currents 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 by 10°C.
Victron VRLA batteries can therefore be stored for 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.
Nevertheless repeatedly deep and prolonged discharge has a very negative effect 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.

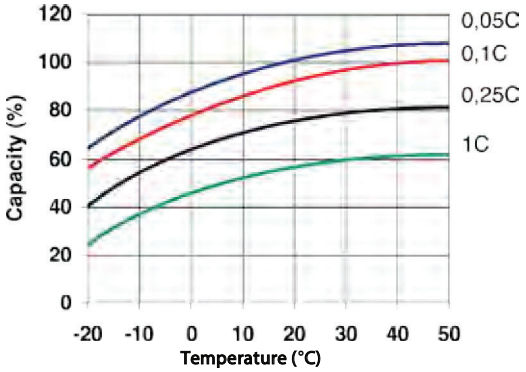


Fig. 1: Effect of temperature on capacity

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.

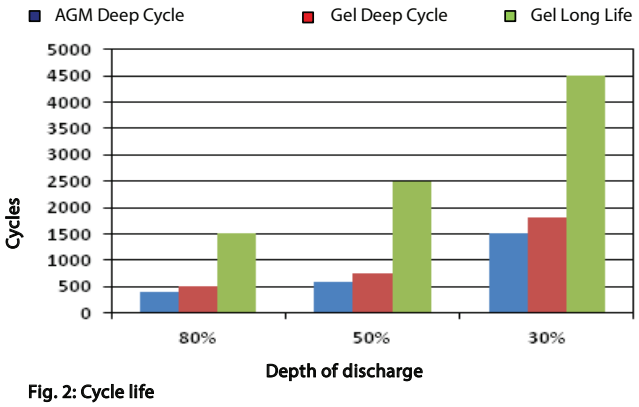


Fig. 2: Cycle life

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.

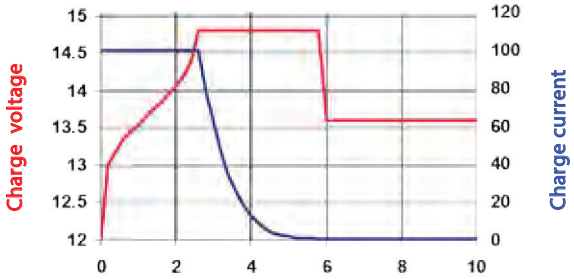


Fig. 3: Three step charge curve

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.

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

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

Victron developed the adaptive charge curve. The 4-step adaptive 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 pre-set 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).

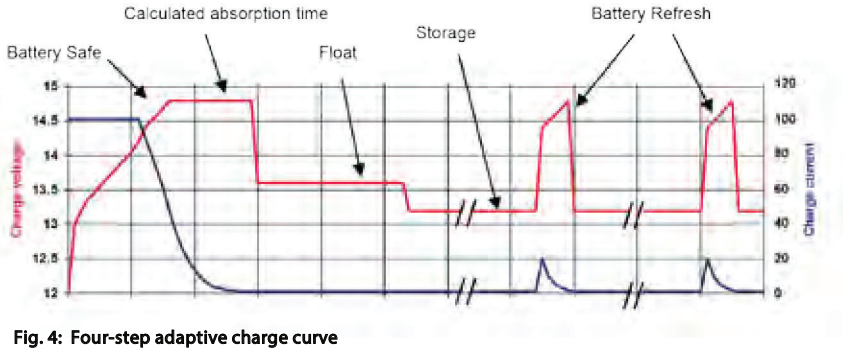


Fig. 4: Four-step adaptive charge curve

13. Optimum charge voltage of Victron VRLA batteries

The recommended charge voltage settings for a 12V 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 12V battery).
The centre point for temperature compensation is 25°C / 70°F.

15. Charge current

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

	Float Service (V)	Cycle service Normal (V)	Cycle service Fastest recharge (V)
Victron AGM 'Deep Cycle'			
Absorption		14,2 - 14,6	14,6 - 14,9
Float	13,5 - 13,8	13,5 - 13,8	13,5 - 13,8
Storage	13,2 - 13,5	13,2 - 13,5	13,2 - 13,5
Victron Gel 'Deep Cycle'			
Absorption		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'			
Absorption		14,0 - 14,2	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	

Table 3: Recommended charge voltage

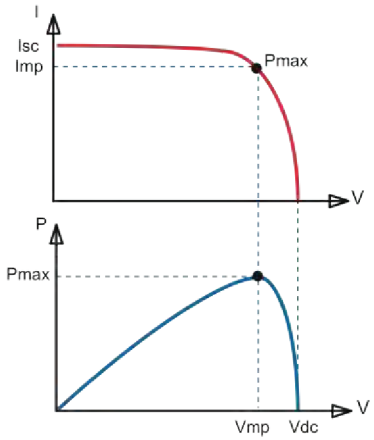
12 Volt Deep Cycle AGM							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate AGM Terminals: copper
BAT406225084	**240**	6	320x176x247	31	700	270	Rated capacity: 20 hr. discharge at 25°C Float design life: 7-10 years at 20°C Cycle design life: 400 cycles at 80% discharge 600 cycles at 50% discharge 1500 cycles at 30% discharge
BAT212070084	**8**	12	151x65x101	2,5			
BAT212120084	**14**	12	151x98x101	4,1			
BAT212200084	**22**	12	181x77x167	5,8			
BAT412350084	**38**	12	197x165x170	12,5			
BAT412550084	**60**	12	229x138x227	20	280	80	
BAT412600084	**66**	12	258x166x235	24	300	90	
BAT412800084	**90**	12	350x167x183	27	400	130	
BAT412101084	**110**	12	330x171x220	32	500	170	
BAT412121084	**130**	12	410x176x227	38	550	200	
BAT412151084	**165**	12	485x172x240	47	600	220	
BAT412201084	**220**	12	522x238x240	65	650	250	
BAT412124081	**240**	12	522 x 240 x 224	67	650	250	

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
BAT412550104	**60**	12	229x138x227	20	250	70	Rated capacity: 20 hr. discharge at 25°C Float design life: 12 years at 20°C Cycle design life: 500 cycles at 80% discharge 750 cycles at 50% discharge 1800 cycles at 30% discharge
BAT412600100	**66**	12	258x166x235	24	270	80	
BAT412800104	**90**	12	350x167x183	26	360	120	
BAT412101104	**110**	12	330x171x220	33	450	150	
BAT412121104	**130**	12	410x176x227	38	500	180	
BAT412151104	**165**	12	485x172x240	48	550	200	
BAT412201104	**220**	12	522x238x240	66	600	220	
BAT412126101	**265**	12	520x268x223	75	650	250	

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

Other capacities and terminal types: at request

BlueSolar & SmartSolar MPPT charge controllers - overview



Maximum Power Point Tracking (MPPT)

Upper curve:
Output current (I) of a solar panel as function of output voltage (V).
The Maximum Power Point (MPP) is the point Pmax along the curve where the product I 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 Vmp.

Feature highlights common to all models

- Ultra-fast Maximum Power Point Tracking (MPPT)
- Advanced Maximum Power Point Detection in case of partial shading conditions
- Outstanding conversion efficiency
- Natural convection cooling (except for the 150/70 and 150/85 CAN-bus models)
- Automatic battery voltage recognition
- Flexible charge algorithm
- Over temperature protection and power derating when temperature is high.

SmartSolar and BlueSolar:

- **SmartSolar** models have Bluetooth built-in.
- **BlueSolar** models can be made Bluetooth accessible by connecting a **VE.Direct Bluetooth Smart dongle**. Advantage: the products are not accessible when no dongle is connected.

Low Power models with load output (see table on page 2)

- See the appendix of the respective manuals for load output disconnect and reconnect options, including **BatteryLife algorithm**.

Day/night timing and light dimming on the low power models with a load output

- Use the **VE.Direct TX digital output cable**, and **VictronConnect** to configure.

Virtual load output, including day/night timing and BatteryLife algorithm on the higher power models

- Use the **VE.Direct TX digital output cable** and connect to **a BatteryProtect** or a solid state relay. Use **VictronConnect** to configure.

Display options

- **MPPT Control**: connects to all models with a VE.Direct port, except the BlueSolar MPPT 70/15. (Does not connect to the 150/70 and 150/85 CAN-bus models)
- **SmartSolar Control Display**: a plug-on display compatible with all models 150/45 and higher. Both displays can be connected to one controller simultaneously.
- **Color Control GX and other GX devices**: see the GX product family on our website.
- **VRM website**: see the VRM portal documentation on our website.

Remote firmware updating

- See **VRM: Remote firmware update** on our website.

To access the above-mentioned documents: press the search button on our website and enter the appropriate search word.

MPPT Control

SmartSolar Control

Color Control GX

Venus GX

Octo GX

GX GSM

BlueSolar Charge Controller	Load output	Fan	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	Yes	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	Yes	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	Yes	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/30	No	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	M
100/50	No	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	M
150/35	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	M
150/45-Tr	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/45-MC4	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-Tr	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70 CAN-bus	No	Yes	12/24/36/48	Integrated display	n.a.	VE.Can	Yes	Yes	n.a.
150/85 CAN-bus	No	Yes	12/24/36/48	Integrated display	n.a.	VE.Can	Yes	Yes	n.a.
SmartSolar Charge Controller	Load output	Fan	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20	Yes	No	12/24	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/20_48V	Yes, 100mA	No	48	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	No	12/24	MPPT control	Built-in	VE.Direct	No	No	M
100/50	No	No	12/24	MPPT control	Built-in	VE.Direct	No	No	M
150/35	No	No	12/24/36/48	MPPT control	Built-in	VE.Direct	No	No	M
150/45-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/45-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/85-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/85-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/60-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/60-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/85-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/85-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/100-Tr	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/100-MC4	No	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL

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.
- 5-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 aluminium 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.
- High power models with pre wired quick-connect system with MC4 (PV-ST01) connectors.

MC4 connectors

Article Number	Description	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
		Kg	W	V	A	V	A
SPM030301200	30W-12V Mono 430×545×25mm series 3a	2.5	30	18	1.67	22.5	2
SPM030501200	50W-12V Mono 630×545×25mm series 3a	4	50	18	2.78	22.2	3.16
SPM030801200	80W-12V Mono 1195×545×35mm series 3a	8	80	18	4.45	22.3	4.96
SPM031001200	100W-12V Mono 1195x545x35mm series 3a	8	100	18	5.56	22.4	6.53
SPM031601200	160W-12V Mono 1480x673x35mm series 3a	12	160	18	8.90	22.4	9.90
SPM032002400	200W-24V Mono 1580x808x35mm series 3a	15	200	36	5.55	43.2	6.10
SPM033402400	340W-24V Mono 1956x992x45mm series 3a	24	340	36	9.44	45.5	10.30

Module	SPM 030301200	SPM 030501200	SPM 030801200	SPM 031001200	SPM 031601200	SPM 032002400	SPM 033402400
Nominal Power (±3% tolerance)	30W	50W	80W	100W	160W	200W	340W
Cell type	Monocrystalline						
Number of cells in series	36					72	
Maximum system voltage (V)	1000 V						
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 +85°C						
Surface Maximum Load Capacity	200 kg/m²						
Allowable Hail Load	23 m/s, 7.53 g						
Junction Box Type	PV-LH0801		PV-LH0808			PV-JB002	
Length of Cables / Connector Type	No cable	No cable	900 mm MC4				
Output tolerance	+/-3%						
Frame	Aluminium						
Product warranty	5 years						
Warranty on electrical performance	10 years 90% + 25 years 80% of power output						
Smallest packaging unit	1 panel						
Quantity per pallet	100		40		20		18

1) STC (Standard Test Conditions): 1000 W/m², 25°C, AM (Air Mass) 1.5

BlueSolar Polycrystalline 140W

- 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.
- 5-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 aluminium 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.
- High power models with pre wired quick-connect system with MC4 (PV-ST01) connectors.

MC4 connectors

Article Number	Description	Net 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
		Kg	W	V	A	V	A
SPP030201200	20W-12V Poly 480x350x25 mm series 3a	2.2	20	18	1.11	22.5	1.23
SPP030301200	30W-12V Poly 410×670×25 mm series 3a	3.7	30	18	1.67	22.5	1.85
SPP030401200	40W-12V Poly 450×670×25mm series 3a	4.2	40	18	2.22	22.5	2,46
SPP030501200	50W-12V Poly 540×670×25 mm series 3a	4.3	50	18	2.78	22.2	3.09
SPP030801200	80W-12V Poly 840×670×35 mm series 3a	6.8	80	18	4.44	21.6	5.06
SPP031001200	100W-12V Poly 1000×670×35 mm series 3a (2)	8.9	100	18	5.56	21.6	6.32
SPP031001201	100W-12V Poly 1000×670×35 mm series 3b (2)	8.9	100	18	5.56	21.6	6.32
SPP031501200	150W-12V Poly 1480×673×35 mm series 3a	12	150	20	7.50	21.6	9.48
SPP032602000	260W-20V Poly 1640x992x40mm series 3b	17	260	30	8.66	36.75	9.30
SPP033202400	320W-24V Poly 1956×992×45 mm series 3a	24	320	36	10.66	44,10	9.44

Module	SPP 030201200	SPP 030301200	SPP 030401200	SPP 030501200	SPP 030801200	SPP 031001200	SPP 031001201	SPP 031501200	SPP 032602400	SPP 033202400
Nominal Power (± 3% tolerance)	20W	30W	40W	50W	80W	100W	100W	150W	260W	320W
Cell type	Polycrystalline									
Number of cells in series	36								60	72
Maximum system voltage (V)	1000V									
Temperature coefficient of PMPP (%)	-0.47/°C	-0.48/°C			-0.48/°C		-0.48/°C		-0.47/°C	
Temperature coefficient of Voc (%)	-0.34/°C	-0.34/°C			-0.34/°C		-0.35/°C		-0.34/°C	
Temperature coefficient of Isc (%)	+0.045/°C	+0.037/°C			+0.037/°C		+0.037/°C		+0.045/°C	
Temperature Range	-40°C to +85°C									
Surface Maximum Load Capacity	200 kg/m²									
Allowable Hail Load	23 m/s, 7.53 g									
Junction Box Type	PV-LH0801				PV-JH02	PV-LH0808			PV-JB002	
Length of Cable / connector	No cable	No cable	No cable	No cable	900 mm / MC4					
Output tolerance	+/-3%									
Frame	Aluminium									
Product warranty	5 years									
Warranty on electrical performance	10 years 90% + 25 years 80% of power output									
Smallest packaging unit	1 panel									
Quantity per pallet	150	100				20			19	18

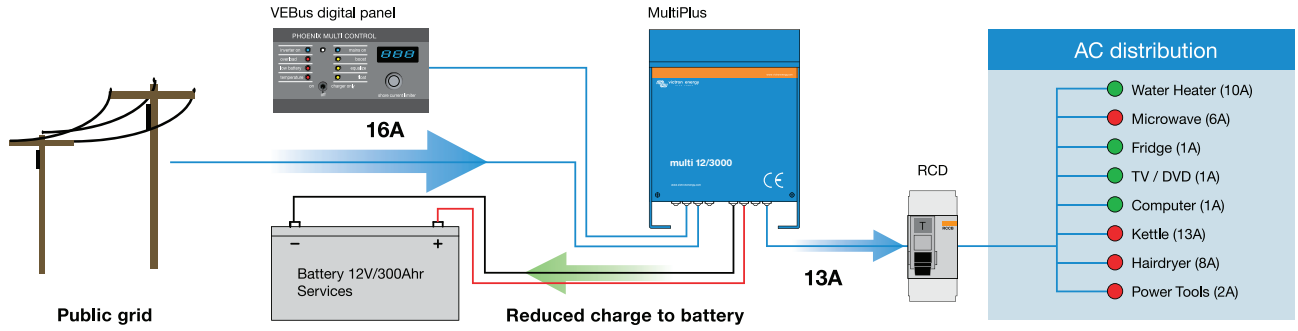
1) STC (Standard Test Conditions): 1000 W/m², 25ºC, AM (Air Mass) 1.5
2) Cell appearance of model b slightly different from model a

Inverter/charger system with intelligent shore and generator power management

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

PowerControl ©

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

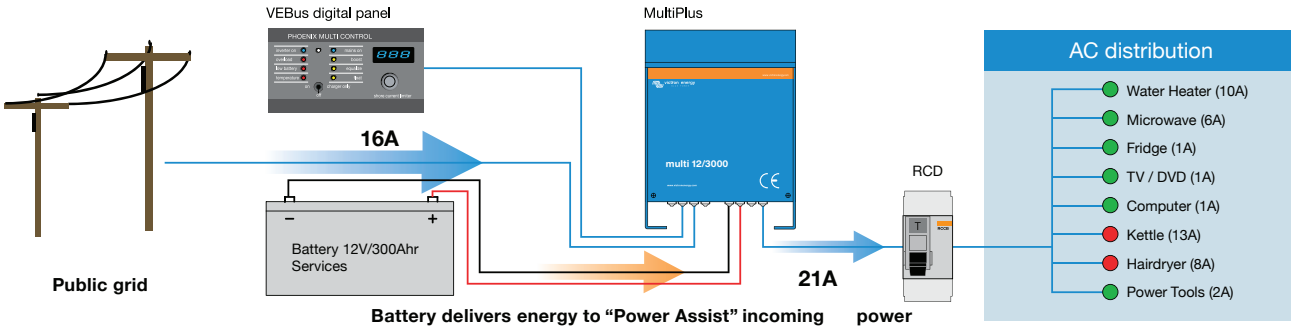


PowerAssist: Boosting the power available from mains or generator, an innovative feature of Multiplus. The feature that most distinguishes the MultiPlus from other inverter/chargers is PowerAssist. This feature takes the principle of PowerControl to a further dimension by allowing a MultiPlus to supplement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

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

PowerAssist ©

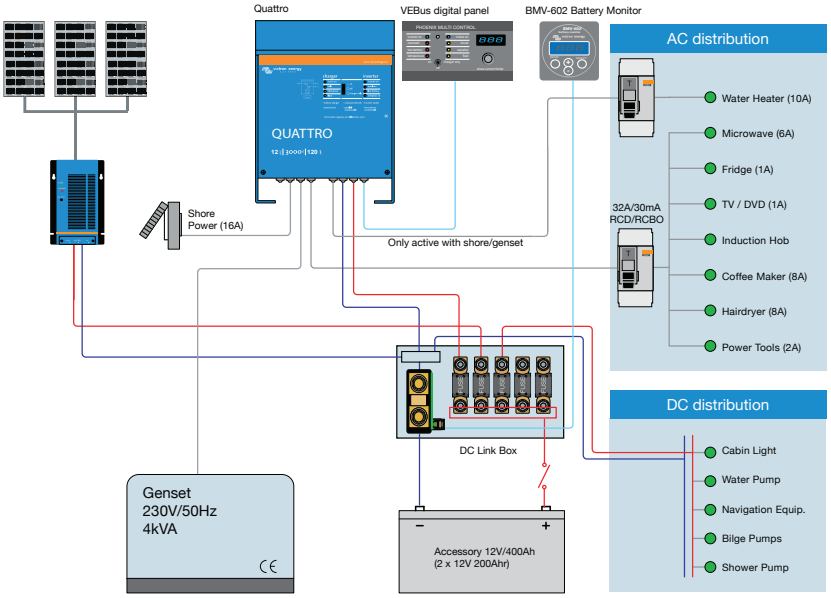
Inverter boosts incoming power, if required, to avoid overload of supply when system consumption exceeds supply.



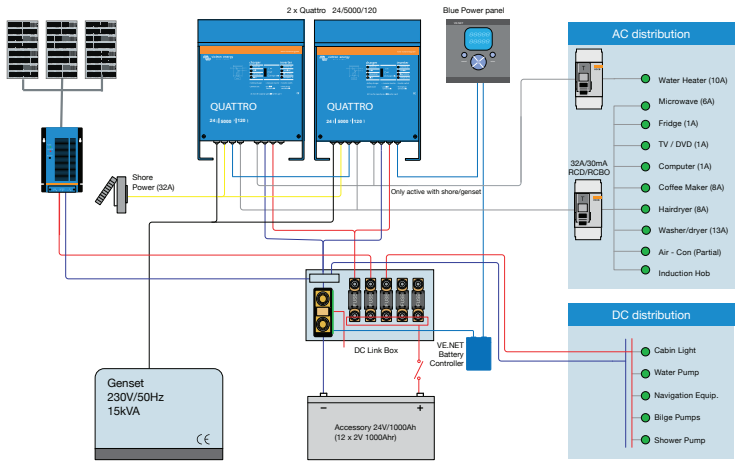
Comfort system	
Appliance	System
Lighting	Quattro 12/3000/120
Communication & navigation	BMV-712 battery monitor
Water heater	2x12V/200AH and 1X80AH batteries
Microwave oven	Digital control remote panel
2 ring introduction hob	Alternator 12/150
Coffee machine/Kettle	DC Link Box
TV/DVD	Isolation transformer
Laptop	Cyrix battery separator
Smal chargers (mobile phone, electric shaver)	
Refrigerator and freezer	Solarpanel and MPTT Solar charger

Comfort plus system	
Appliance	System
Lighting	2 xQuattro 24/5000/120
Communication & navigation	Color Control GX
Water heater	4x12V/200AH and 1X80AH batteries
Electric gallery with 4 ring induction hob, microwave/combi oven, refrig-erator, freezer, washer/dryer.	Color Control GX
Coffee machine and kettle	Alternator 12/150
TV/DVD	DC Link box
Multimedia PC	Isolation transformers
Small chargers (mobile, phone, shaver etc)	
Modest air-conditioning	Solarpanel and MPPT Solar charger

Comfort system - 7 kVA (30A) capacity



Comfort plus system - 25 kVA capacity



About Victron Energy

With over 44 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, battery monitors, solar charge controllers, 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 44 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.


BMV-712 Smart
85
25.46V
7.5A
254h
5h 0m
12.80V
Open

SAL064136020
REV 01
2019-01

victron energy
BLUE POWER

Mobility

victron energy
BLUE POWER

Energy. Anytime. Anywhere.

INDEX

Mobility and independence are the keywords when it comes to using an electric wheelchair or scooter; the freedom to decide for yourself where to go. So of course, it's important to be able to take your mobility scooter with you. To this end, you can rely on smart solutions from Victron Energy

- **Impulse II battery charger:** a reliable battery charger with a long service life. This charger is also available with built-in Bluetooth: the Impulse II Smart. The Smart model can be operated from your smartphone.
- **XLR Charger Tester:** a smart and quick solution for testing your battery.

Products supplied by Victron Energy are reliable and easy-to-use. A fully charged battery will ease your mind when travelling. Our solutions give you the energy to go where you want.

Impulse II charger

The multifunctional Impulse II battery charger is suitable for mobility scooters and electric wheelchairs. Most mobility scooters are fitted with two 12-volt batteries which are connected in series.
Together they generate a current of 24 volts. The Impulse II is suitable for 24 volts and a variety of batteries, such as GEL batteries, AGM batteries and wet batteries.
The Impulse II combines versatility with safety. For example, the battery charger has double insulation and is protected against reversed polarity, overvoltage and overheating. The Impulse II's compact and lightweight design allows you to store it without any problem in a shed or storage space. The charger can be quite easily moved or taken with you.

XLR plug

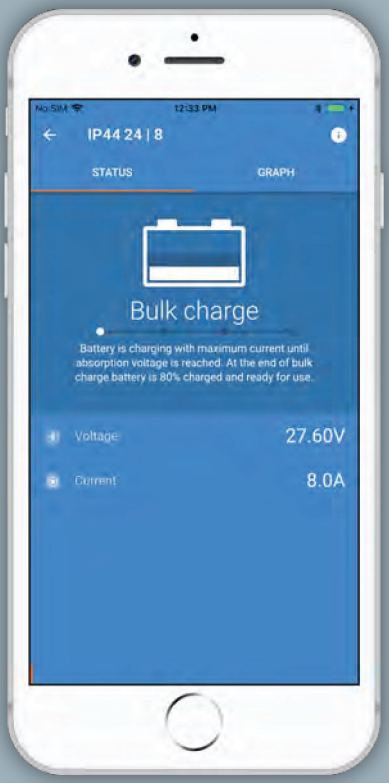
The Impulse II comes with a so-called "XLR plug" which is the universal standard for mobility scooters and electric wheelchairs.

The Impulse II is a battery to set your mind at ease. It has a fully automated charging programme which optimises battery recharging. This 4-phase charging curve guarantees the best possible service life for your battery.

During the charging process, the charger goes through three different phases. The first sees high-power charging of the battery up to approx. 80% capacity. The last 20% or so is charged at lower power as part of the second phase. The third and final phase ensures that the batteries stay fully charged. During the last phase you can disconnect the charger from the mobility scooter.

Built-in Bluetooth

The Impulse II Smart is the charger model that has built-in Bluetooth. The VictronConnect app allows you to read the charger remotely and operate it using a smartphone, tablet or laptop. This can be ideal for different purposes, such as service and maintenance.



VictronConnect App

VictronConnect is an easy-to-use app that allows you to check the charging status. The Impulse Smart charger can be connected to your smartphone, tablet or laptop by means of built-in Bluetooth*.

* Only the Impulse II Smart models have built-in Bluetooth.

Impulse II mobility charger

Adaptive 4-stage charge algorithm: bulk – absorption – float – storage

The Impulse II charger features a microprocessor controlled 'adaptive' battery management system. The adaptive feature will automatically optimize the charging process relative to the way the battery is being used.

Storage mode: less maintenance and aging when the battery is not in use

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

Protected against overheating

Output current will reduce as ambient temperature increases up to more than 30°C, but the charger will not be disabled.

Two LED's for status indication

Red LED: bulk, absorption
Green LED: float, storage en repeated absorption (refresh)
Both LEDs flashing: connected with reverse polarity, short circuit, over voltage

Adjustable en readable (Smart version)

The Impulse II Smart is equipped with Bluetooth Smart wireless communication. With this you can get a read out of the state and settings can be changed with a smart phone, tablet or laptop.

Impulse II	24/6 24/6 Smart	24/8 24/8 Smart
Input voltage	230 VAC (range 180-265 VAC)	
Frequency	50/60 Hz (range 45-65 Hz)	
Efficiency	95%	
Power consumption in no-load operation	0.5 W	
Charge voltage 'absorption'	28.8 V	
Charge voltage 'float'	27.6 V	
Charge voltage 'storage'	26.4 V	
Temperature compensation	-32 mV/°C	
Charge algorithm	4-stage adaptive	
Charge current	6 A	8 A
Minimum battery capacity	40 Ah	50 Ah
Back current drain	1 mA (0,7 Ah/month)	
Protection	Reverse polarity Output short circuit Over temperature	
Temperature range	-30 to +60°C (rated output current up to 30°C)	
Cooling	Natural convection	
Bluetooth communication	Smart version only	
ENCLOSURE		
Material and colour	PC-ABS, dark grey (RAL7021)	
Battery connection	Black cable with XLR connector, length 1.9 meter	
230 V AC connection	Cable of 1,9 meter with CEE 7/17 plug	
Protection category	IP44	
Weight	1.3 kg	
Dimensions (h x w x d)	60 x 105 x 190 mm	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29, EN 12184, ISO 7176-14	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2, ISO 7176-26	
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	

With over 43 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

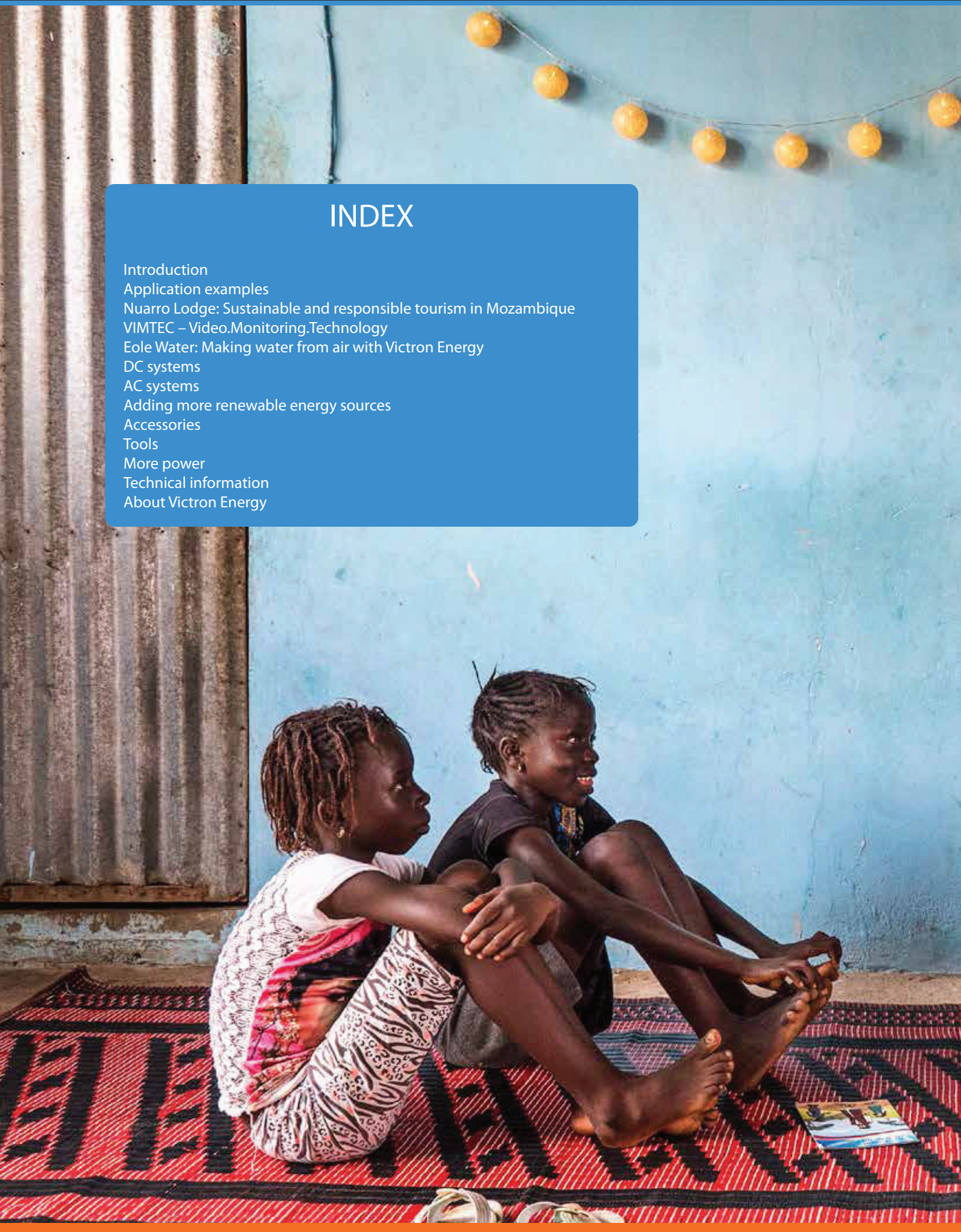
Having served the off-grid, industrial and vehicle markets as well as both the commercial and leisure marine sectors for over 43 years, Victron has an established network of dealers and distributors covering the whole world. Our customer base is such that providing prompt and competent local service 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
BLUE POWER

Off-grid, backup & island systems

victron energy
BLUE POWER

Energy. Anytime. Anywhere.



INDEX

Photo: Ewien van Bergeijk – Kwant

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.

Nuarro Lodge

Video Monitoring Technology

Eole Water

Nuarro Lodge: Sustainable and responsible tourism in Mozambique

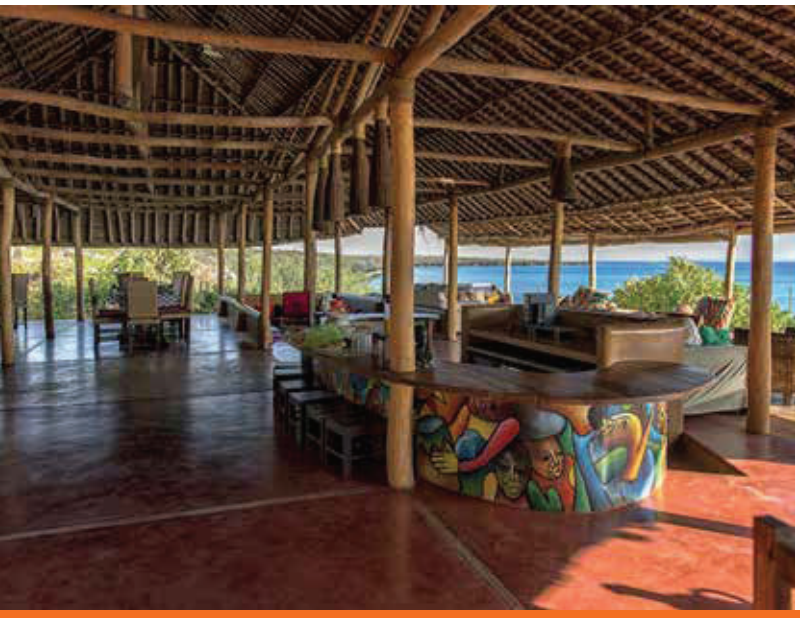
Nuarro Lodge

Located on the shores of the warm and azure Indian Ocean in northern Mozambique, lies the remotely, but specifically chosen Nuarro Lodge. Backed by the wild Mozambican bush, fringed with old and established baobab trees to the back; and fronted by the calm and aquamarine bay of Nanatha, the lodge is peppered along a more than 2 km-long, powdery-white beach in the middle.

Behind the scenes, powering the Nuarro Lodge lighting, is a newly upgraded Victron Energy hybrid-30kVA, 3-phase system with 38kWp of solar power. The Lodge though is but one part of the Nuarro project that Victron Energy and their partner companies are involved with.

Pristine, off-grid and remote

Nuarro is built from natural materials (by the local community) in an 800 hectare (8 sq km) environmentally sensitive concession area of the Baixo da Pinda peninsula.



In the words of the company, working in and being considerate of such an area is all about friendly people, top-class activities and fantastic food, whilst showcasing a spectacular, pristine environment in the most responsible way possible.

Even though it is off-grid and remote, Nuarro generates its own electricity and clean water using renewable energy which helps bring sustainable tourism to the area without compromising the basic needs and comforts of guests. This ensures the local people and community benefit also, by bringing work to the surrounding area.

Upgrading Nuarro Lodge's energy systems

Building of the lodge started in 2007 and the owners of the lodge have over the years upgraded the renewable energy and water system to fit the needs of the guests, community and employees. The best choice for this is a hybrid-system for the reliable generation of electricity with the lowest carbon footprint, with hot water being supplied by solar geysers directly to the buildings.
During the recent upgrades Nuarro's owners decided to install a new inverter and solar charge system. Reliability and remote monitoring have been missing for years and the decision was therefore made to invest in Victron Energy products for their known reliability in off-grid applications in harsh and remote environments.

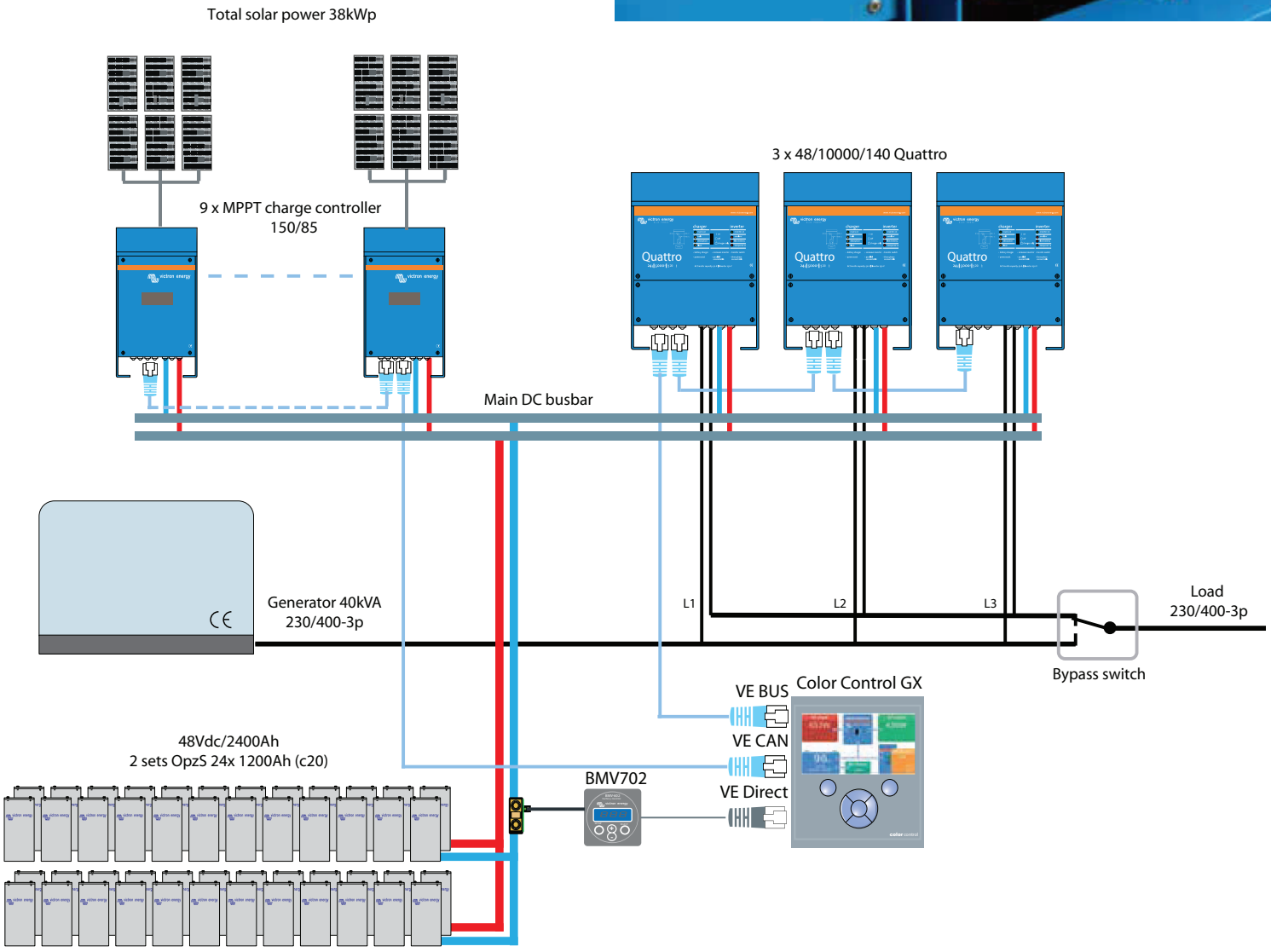
Energy system configuration

The off-grid system consists of a three phase 30kVA system with 38kWp solar power, 2,400 Ah battery bank with a 40kVA backup generator. Three Victron 10kVA Quattros in a 3-phase configuration and nine DC-coupled 150/85 MPPT Victron Energy solar charge controllers are all installed in/on one cabinet, including two battery monitors and a Color Control GX.

The 38 kWp solar power is generating an average energy of 180kWh per day, which is partly used by the lodge during the day and also stored in the battery bank for night use.

During overcast days and high night loads the generator automatically starts based on the SOC (State of Charge) setting in the BMV battery monitors. The Color Control GX is connected via long range Wi-Fi to the Wi-Fi satellite router which connects to the internet for remote monitoring and management.

The entire lodge can run from solar including the borehole pump, water treatment plant, the diving compressor, the cold and freezer rooms, fridges and other restaurant and bar equipment. During the night the load is minimised by using timers switching off non-essentials to minimise the use of energy from the battery bank during the night.



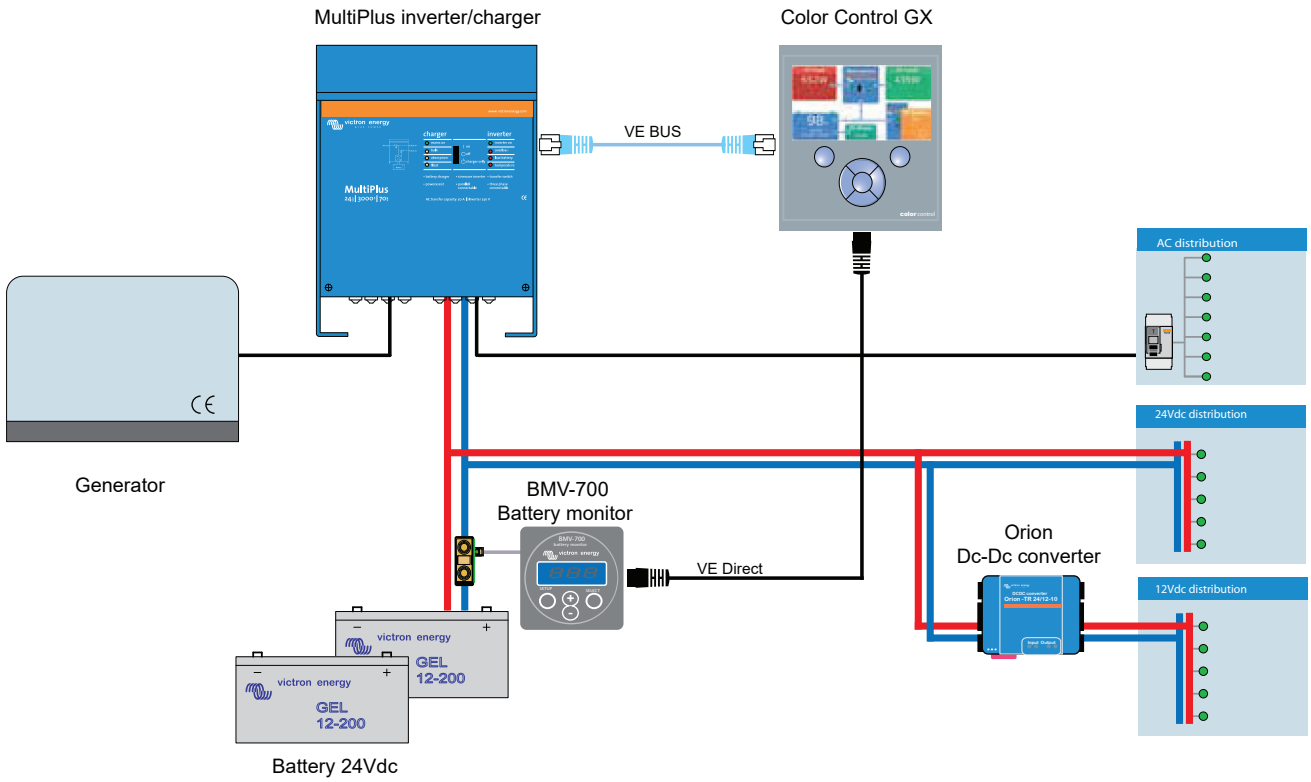
VIMTEC – Video.Monitoring.Technology

GEMTEC GmbH, a customer of Service Team Döbeln, is a mid-sized, family-owned firm specializing in security and communication systems. Over the years this company has grown steadily to become one of the largest providers of security equipment in Saxony.

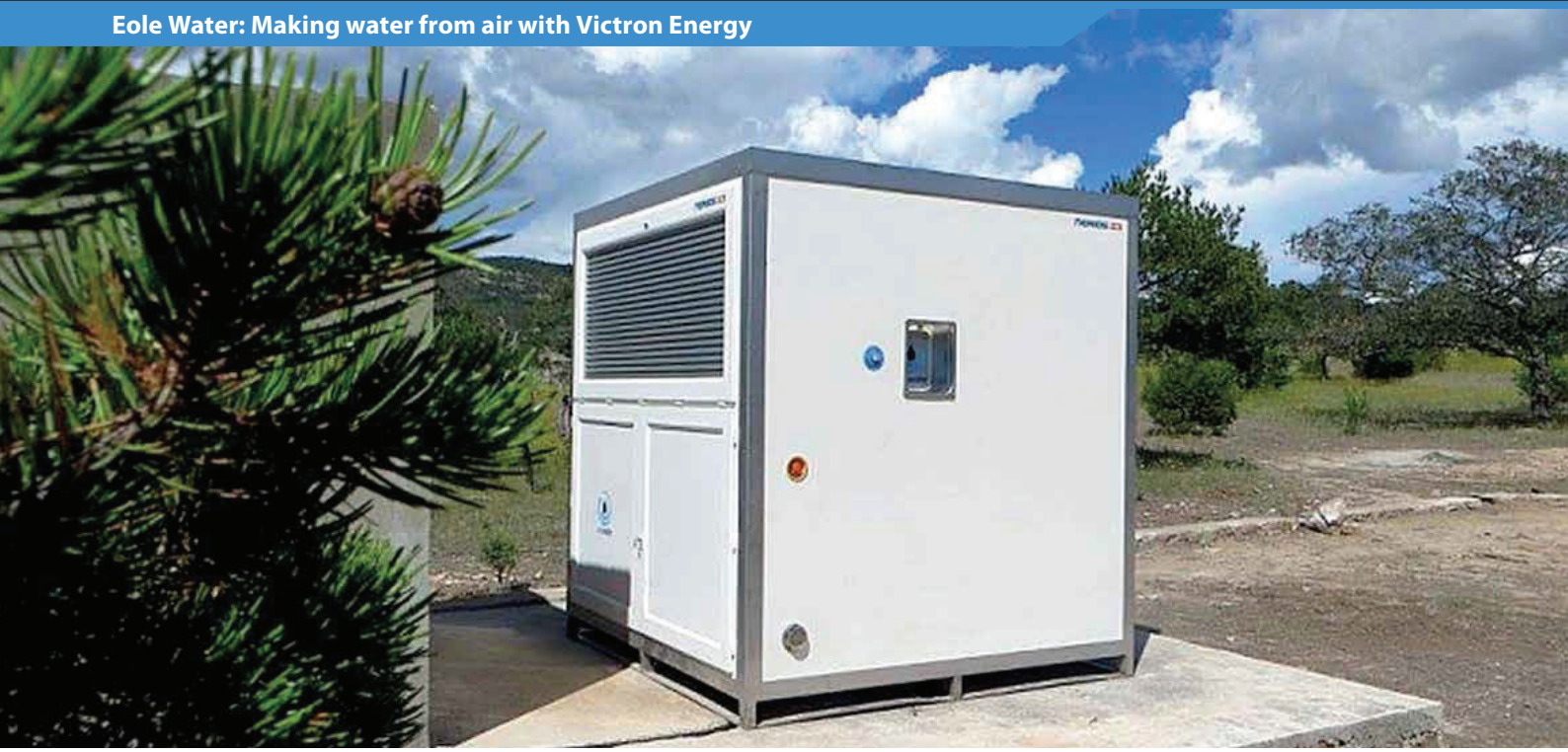
In its quest for new solutions, GEMTEC has devised a totally new product which uses Victron Energy products supplied by Service Team Döbeln. This product is called the VIMTEC MBE, which is a mobile and autonomous surveillance unit. This highly versatile system is designed to monitor construction sites, large events, traffic, and much more besides.

Hybrid autonomy with Victron Energy

Standalone power for the VIMTEC MBE is provided by a hybrid system consisting of a diesel generator with Victron Energy battery storage. This enables the unit to operate in isolation for up to 120 days in areas where no currently installed surveillance infrastructure exists.


MultiPlus inverter/charger
Color Control GX
VE BUS
AC distribution
24Vdc distribution
12Vdc distribution
Generator
BMV-700
Battery monitor
VE Direct
Orion
Dc-Dc converter
GEL
12-200
Battery 24Vdc

Eole Water: Making water from air with Victron Energy



Eole Water

Eole Water is the pioneer in the field of water making systems using air as a source of water. The company has invented the first wind turbine able to create drinking water from condensed air. Today, 150 million of people worldwide live in remote areas without any access to safe drinking water. The Eole Water's mission is to provide these isolated communities with drinking water.
An atmospheric water generator (AWG) is a device that extracts water from humid ambient air. We at Victron Energy are delighted that Eole Water of France has chosen our products to assist in this process of making water from air, particularly in locations where other sources of water are scarce.

The NERIOS.S3 – A self-consumption machine

The NERIOS.S3 EVO version primarily uses standalone PV to power it. The minimum installed solar power required for self-sufficiency is 5.1kWp. The potable drinking water produced can range from 0.5l/h to 13.2l/h subject to the power used and the temperature and humidity of the air. The water tank capacity is 1,000 litres.

The EVO has three operating modes:

Primary operating mode: smart standalone machine
The machine only works with solar energy from photovoltaic panels. Following the curve of the sun (MPPT) during the day, solar photovoltaic energy feeds a variable speed cooling system that converts and stores this energy in an ice accumulator. During the night, a period which is cooler and damper, cold stored in the accumulator cools the outside air, which has been sucked in, down to its dew point, causing condensation and the formation of water.

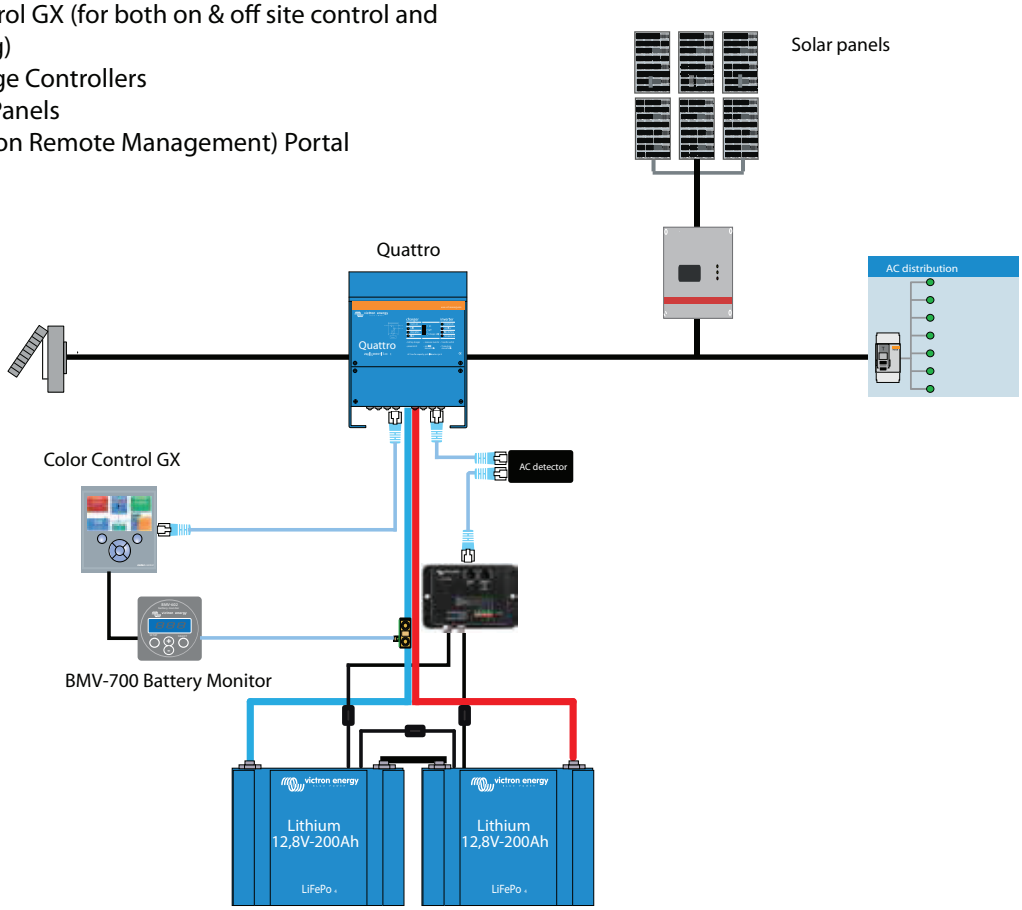
Secondary operating mode: smart switchable machine
If a regular connection to the grid is possible, the electrical grid is used to stabilise the energy coming from the solar panels during the day (stored in the ice accumulator) and supply the energy needed at night to regulate the system.
In the event of an extended period without sun, the machine can be powered directly from the grid.

Emergency Mode: ever ready machine
In the event of a lack of water during a period without sun and without the grid, the machine can be powered by a backup generator.

Victron inside and out

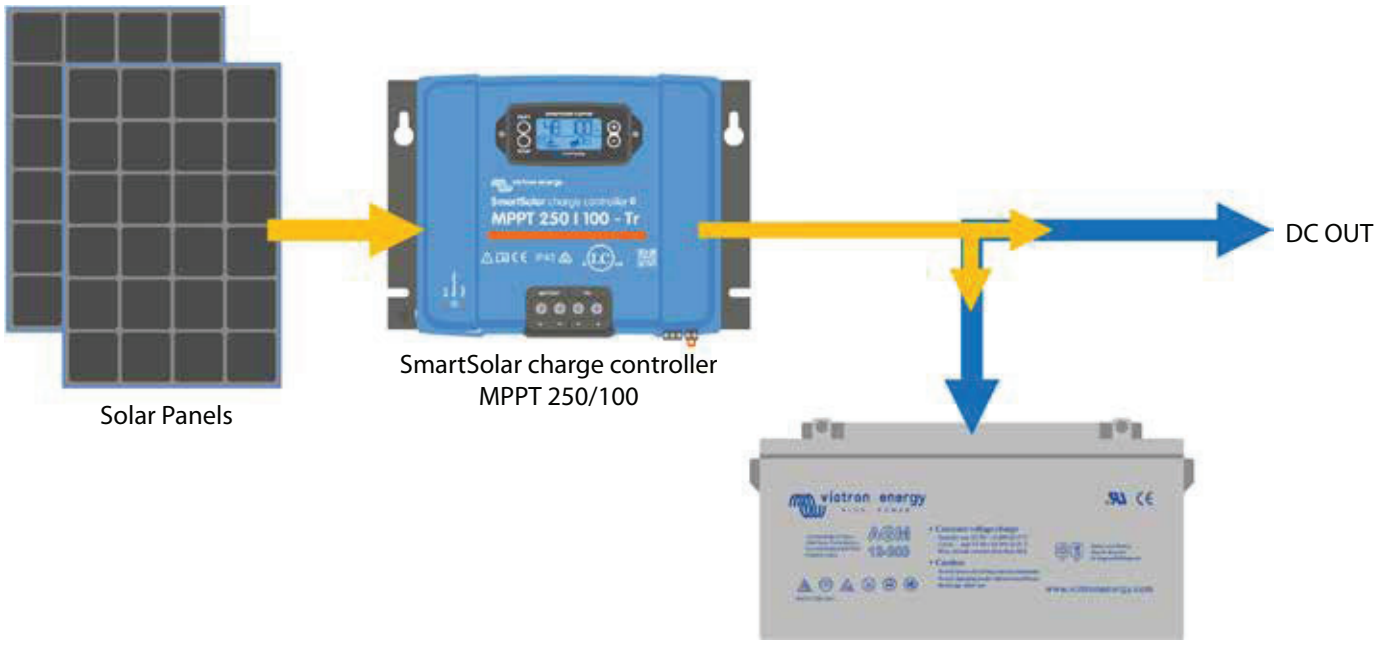
Depending on the model, Eole Water uses a range of Victron Energy products inside and out in their automatic water generators:

- Autotransformers
- MultiPlus inverter/chargers
- Lithium batteries (with cell balancing and Battery Management Systems [BMS])
- BMV-700 battery monitor
- Color Control GX (for both on & off site control and monitoring)
- Solar Charge Controllers
- BlueSolar Panels
- VRM (Victron Remote Management) Portal



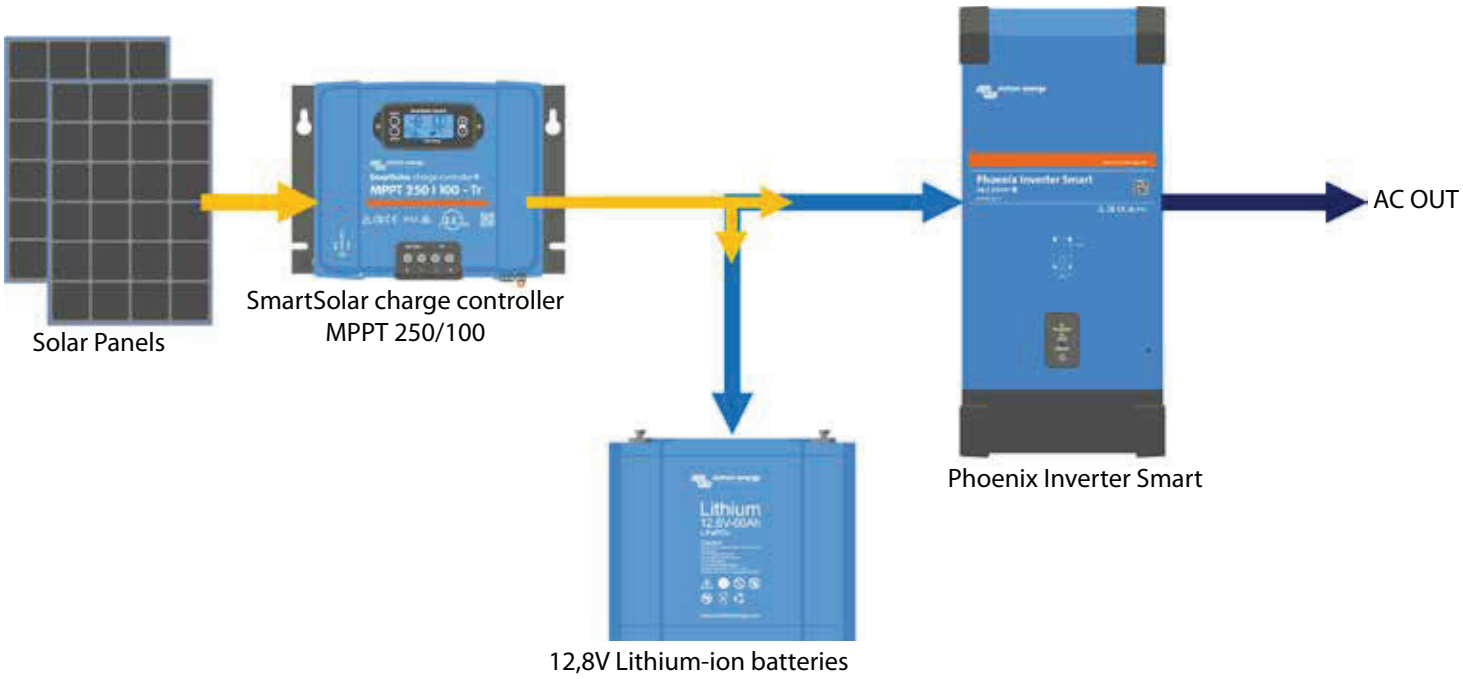
DC Systems

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.



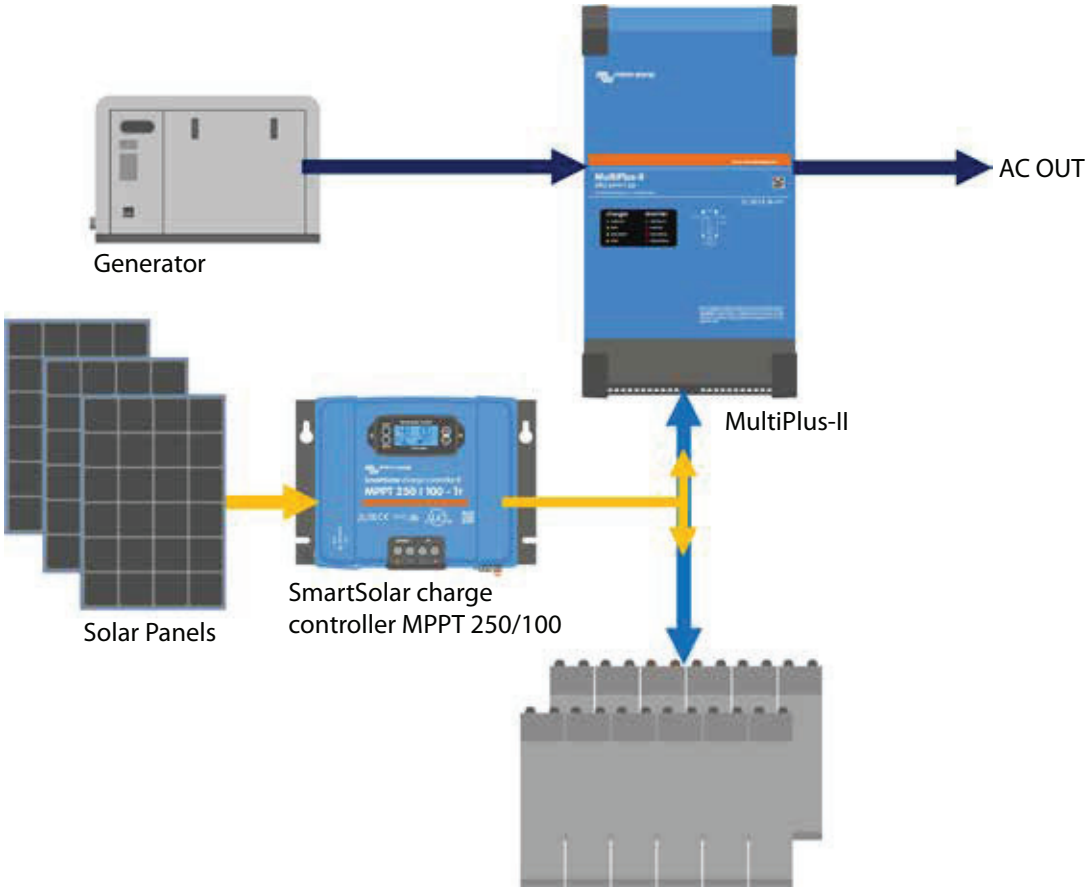
1. DC consumers

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



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

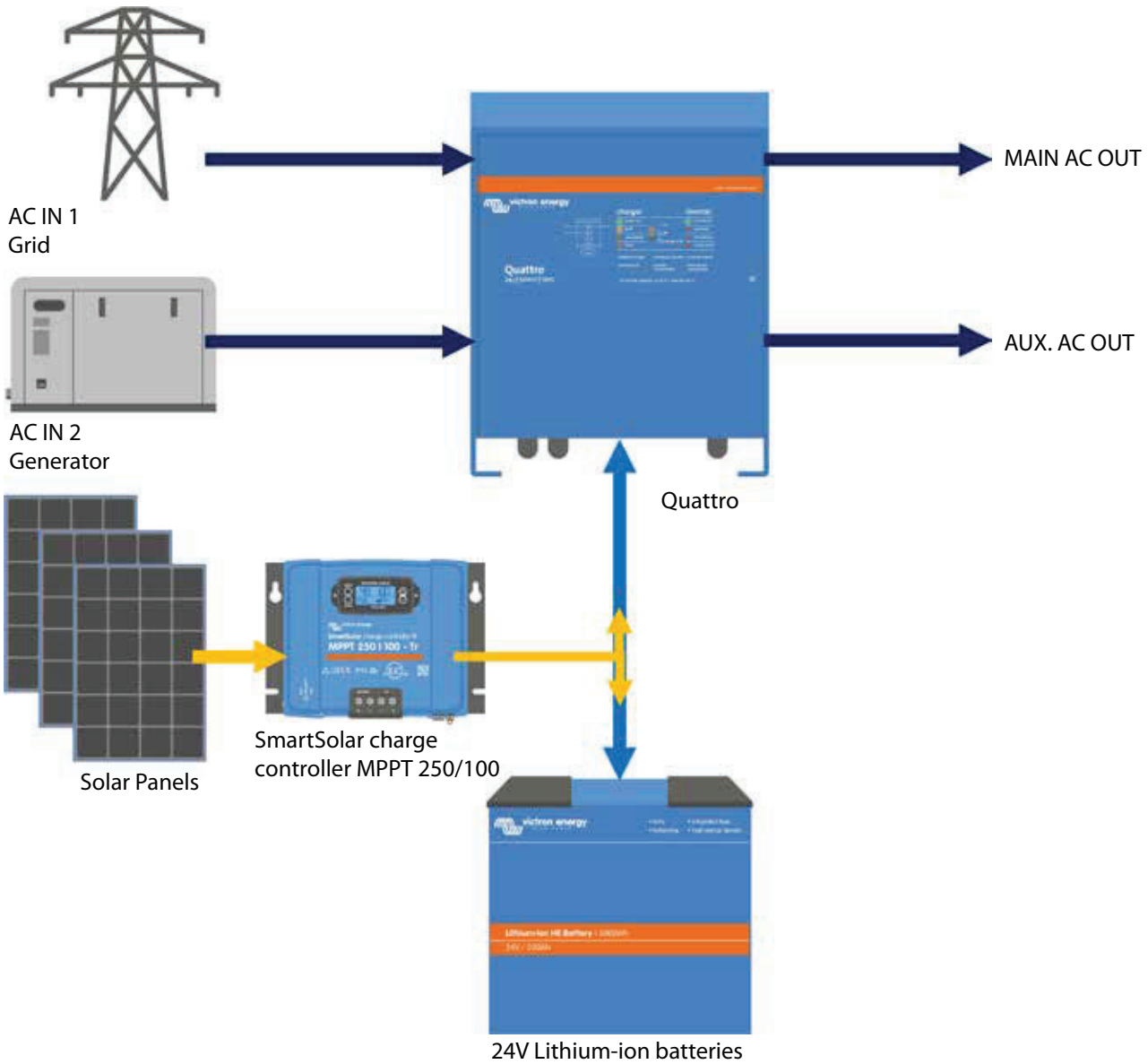
If the sun isn't providing you with enough energy, a generator is added to the system. In this case a MultiPlus inverter/charger is used instead of an inverter. The generator is connected directly to the MultiPlus. The MultiPlus automatically regulates the starting and stopping of the generator, while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

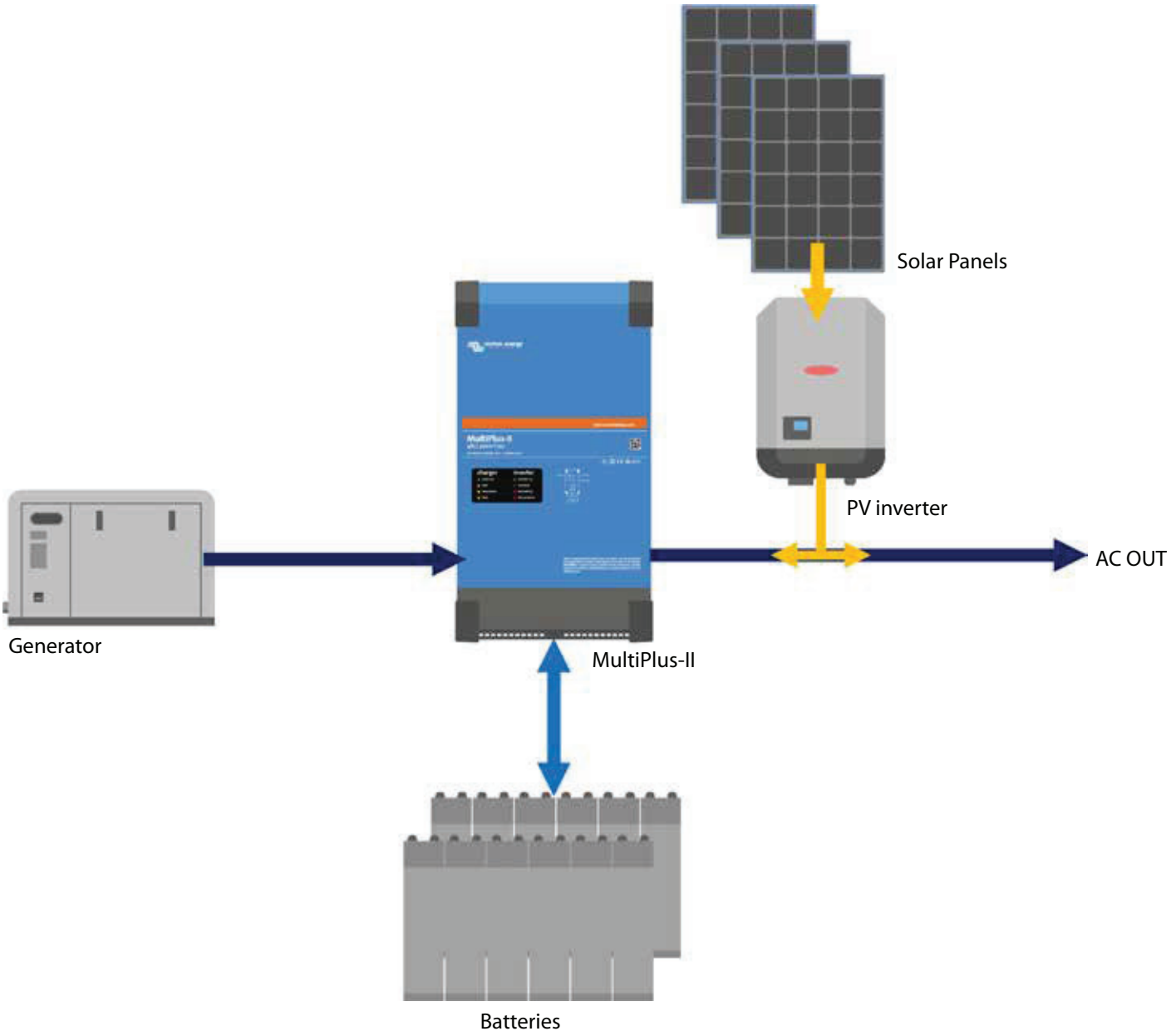


4. Backup system

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.

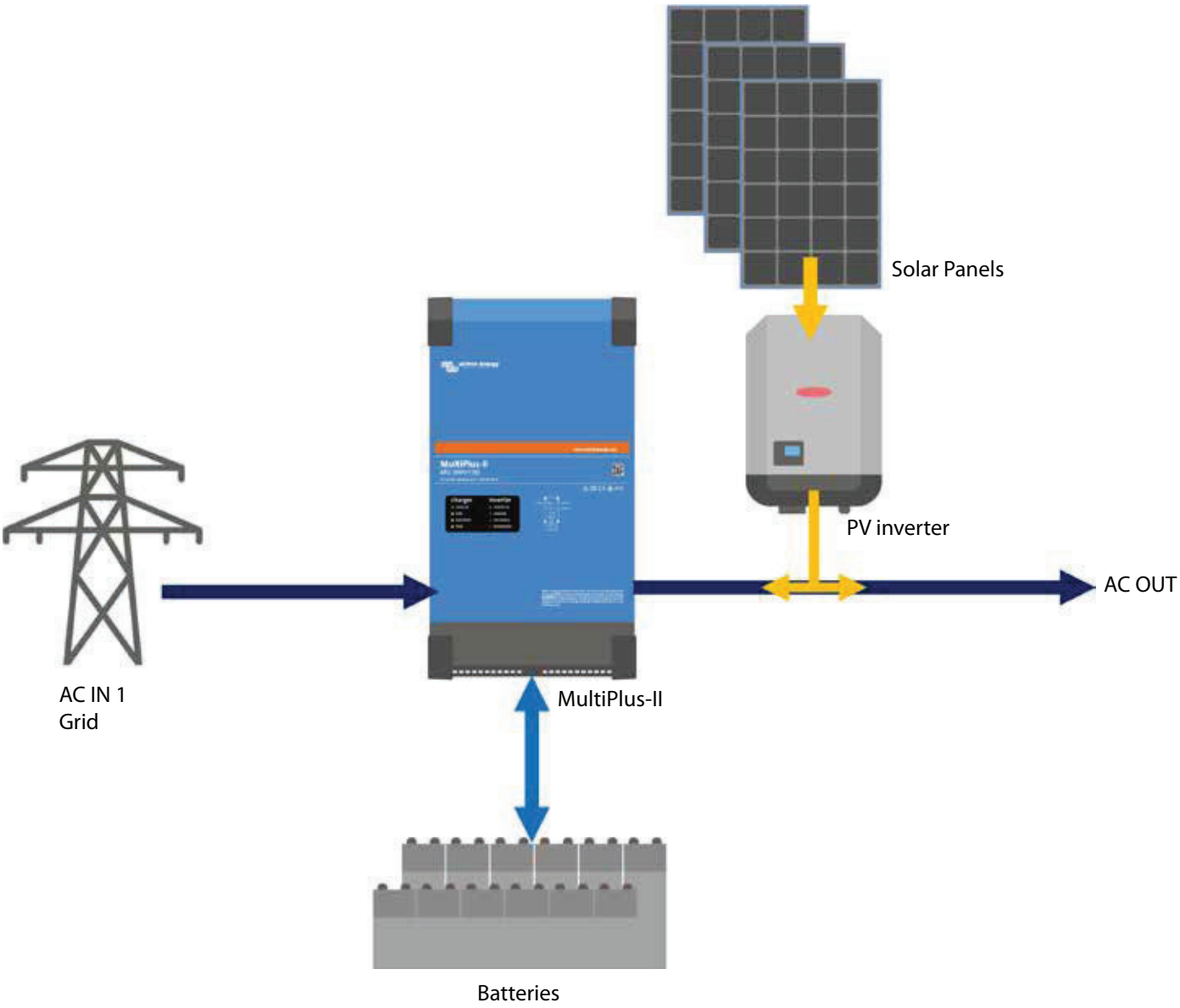
AC Systems

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 PV 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 PV 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.



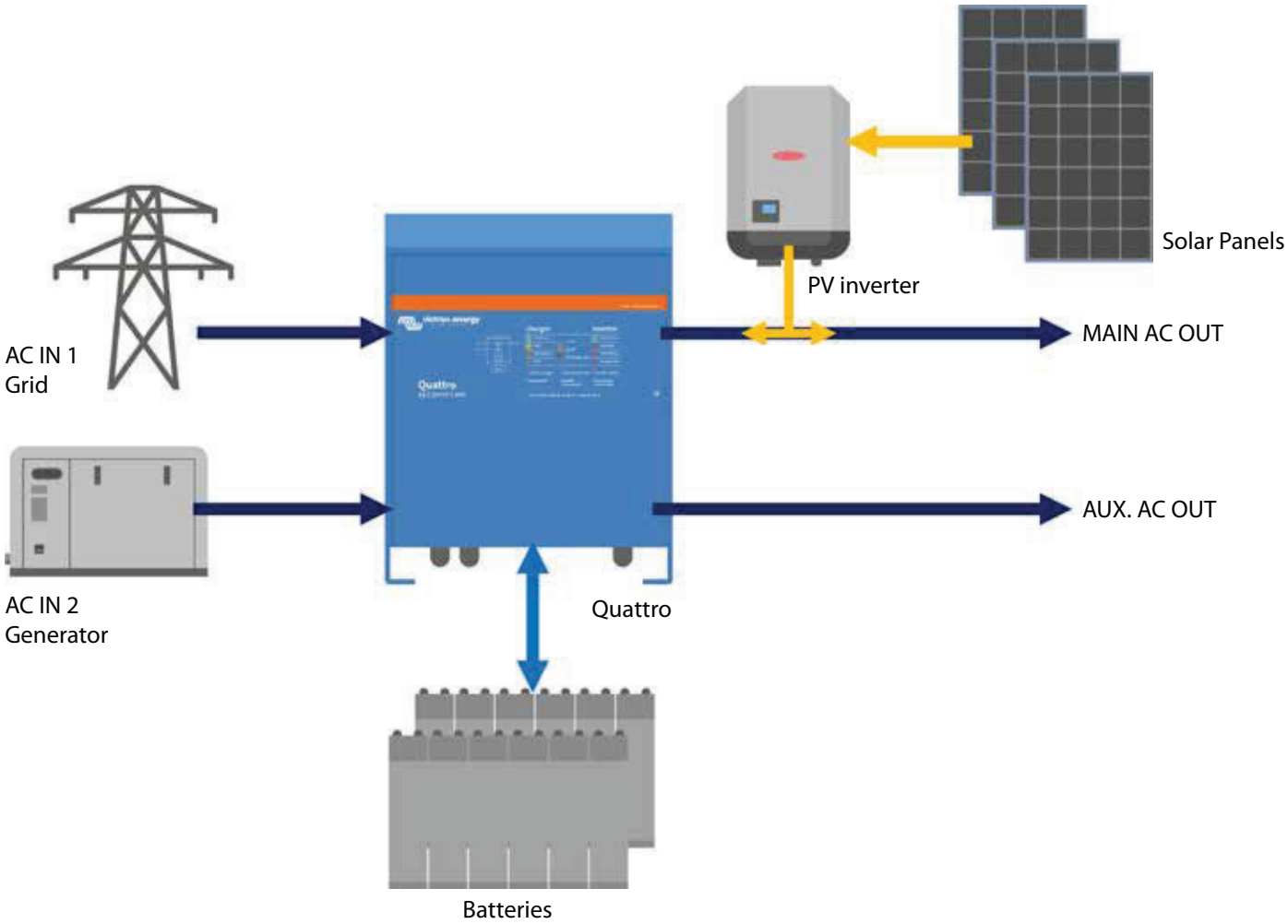
2. Solar and grid

In this backup 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.

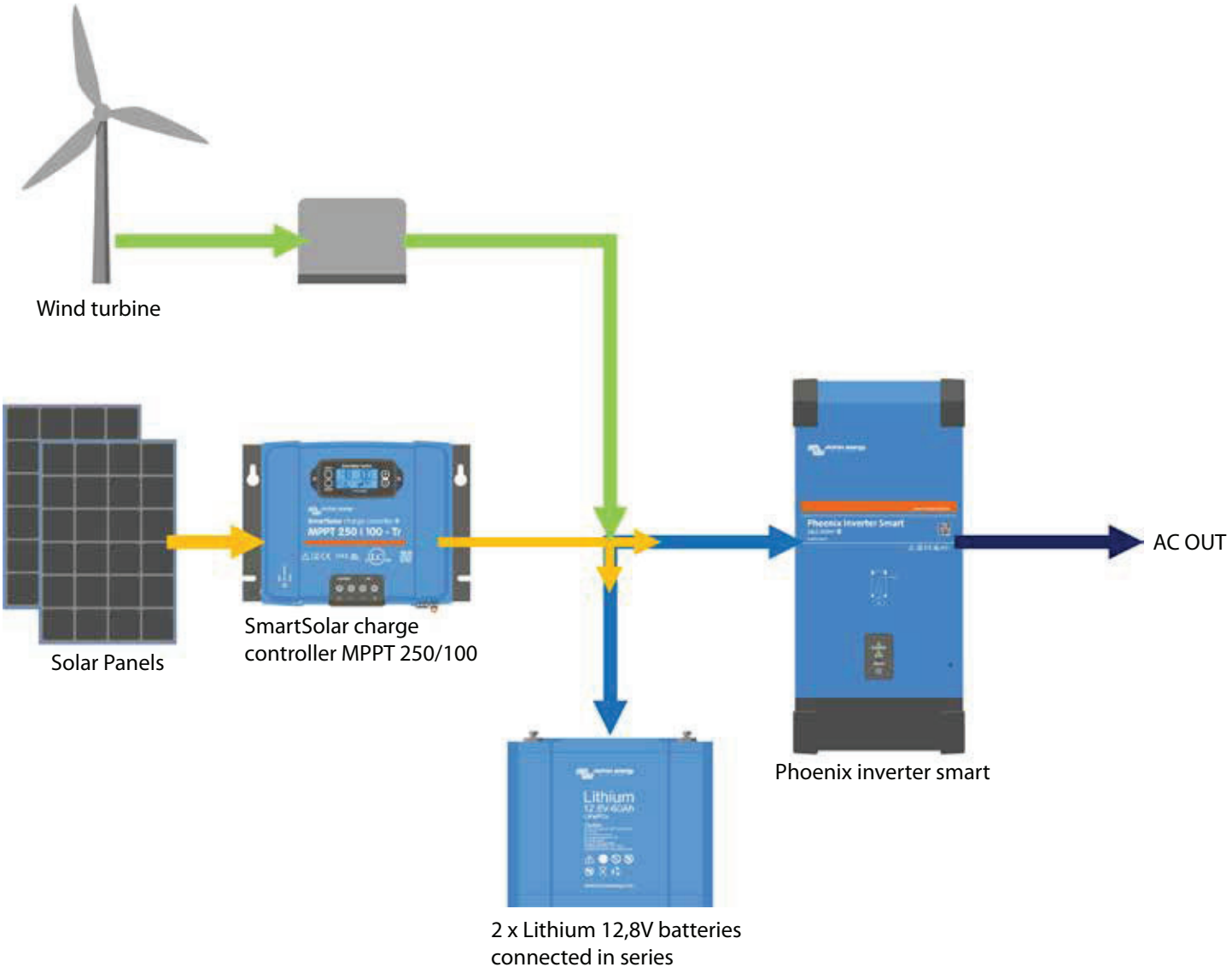
MultiPlus vs Quattro
The MultiPlus and Quattro products play a central role in both AC and DC systems. They are both powerful battery chargers and inverters in one box.

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 backup 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.



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 to a wide range of applications. You are able to find the specifications and other detailed information about these components in the 'Technical Information' section.

Color Control GX

The Color Control GX provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPTs, BMV-600 series, BMV-700 series, Skylla-i, Lynx Ion and even more. The Color Control GX is now also equipped with a generator start/stop function using the internal relay.
Besides monitoring and controlling products on the Color Control GX, the information is also forwarded to our free remote monitoring website: the VRM Online Portal.

Venus GX

The Venus GX is the communication-centre of your installation. Venus allows you to talk to all components in your system and ensure they are working in harmony. Monitoring of live data, and changing settings is performed by using your smartphone (or other device) via our free-to-use Victron Remote Management Portal (VRM).

MPPT Control

The MPPT Control lets you see the status as well as setup all BlueSolar MPPT Charge Controllers that have a VE.Direct communications port. The new MPPT Control is mounted in the familiar BMV-700 series housing, maintaining a consistent and professional look to your panels and systems monitoring equipment.

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.

MPPT Wire box MC4 or Tr

The MPPT Wire box is for extra safety: without the box the MPPT is not touch-safe. There two versions of the wire box: for the MC4 or the Tr model. Both models are available in different sizes:

Wirebox	S	M	L	XL
MPPT model	**MPPT 75/10** **MPPT 75/15** **MPPT 100/15**	**MPPT 75/50** **MPPT 100/30** **MPPT 100/50** **MPPT 150/35**	**MPPT 150/45** **MPPT 150/60** **MPPT 150/70** **MPPT 250/70**	**MPPT 150/85** **MPPT 150/100** **MPPT 250/85** **MPPT 250/100**

SmartSolar Control Display

The SmartSolar Control Display is a pluggable LCD display for the SmartSolar Charge Controllers. Simply remove the rubber seal that protects the plug on the front of the controller and plug-in the display.

Smart Battery Sense

Smart Battery Sense is a wireless battery voltage and temperature sensor for Victron MPPT Solar Chargers.

With voltage and temperature sense in place, batteries will be better charged; improving charging-efficiency and prolonging battery life.

VE.Direct Bluetooth Smart dongle

Using the VE.Direct Bluetooth Smart dongle you can display your BMV or MPPT information on iOS and Android devices, using the **VictronConnect app.** View information wirelessly such as battery status and solar panel power, plus other useful data.

The dongle is able to read data from the BMV-70x series battery monitors, Phoenix Inverters with VE.Direct port, MPPT Solar Charge Controllers (except for the 150/70 and 150/85) using the VE.Direct communication port and the Blue Smart IP65 Charger.

Tools

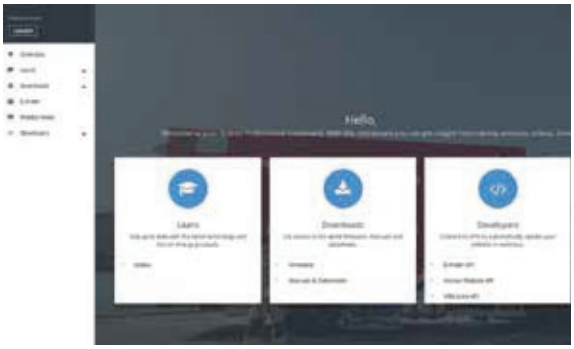
We have a couple of tools available that make it easy for Victron distributors, installers and customers to work with Victron Energy products. Whether you want to configure and read out your Victron products with VictronConnect using your smartphone, tablet or computer or you want to show your VRM site to friends and family, it is all possible with these Victron tools.

VRM Online Portal: Remotely monitor Victron equipment

Victron Remote Management (VRM) is provided by Victron Energy to remotely monitor electrical equipment all over the world.
Once you have a VRM account you will be able to view live feed from your installation, such as generated solar energy, state of charge of your batteries and the consumption.

VictronConnect

VictronConnect lets you get live status info and configure Victron products with built-in bluetooth support, such as the SmartSolar and the Blue Smart IP65 Charger, or using a VE.Direct Bluetooth Smart dongle or VE.Direct USB interface. Firmware updates are included inside VictronConnect.
VictronConnect is available for both Windows PCs, Max OS X, iOS and Android phones as well as tablets.



Victron Professional

Victron Professional is a new online portal, available to both distributors as well as other professionals and end users that work with Victron equipment.
With Victron Professional you can get insight into training sessions, videos, firmware files, APIs and the latest news. If you already use E-Order you can login with those credentials.

VRM World: View shared VRM sites around the world

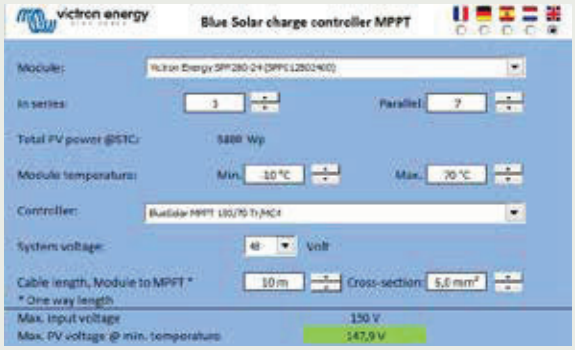
Ever wanted to show your clients, friends, colleagues how much solar energy your installation is generating or indeed any other data that you can see on your VRM site? Well now you can – using VRM World.
You need a VRM account to be able to view shared VRM sites. In your VRM portal it is possible to publicly share on VRM World.

Victron Community

The Victron Community is a place for questions and answers about Victron related subjects.

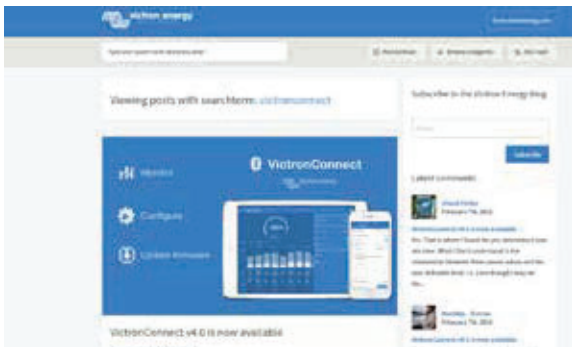
Instruction videos on Victron youtube channel

On our youtube channel you can watch Victron Energy instruction videos.



MPPT Calculator Excel sheet

With the MPPT Calculator Excel sheet you can match solar modules to MPPT charge controllers.



Victron Energy Blog

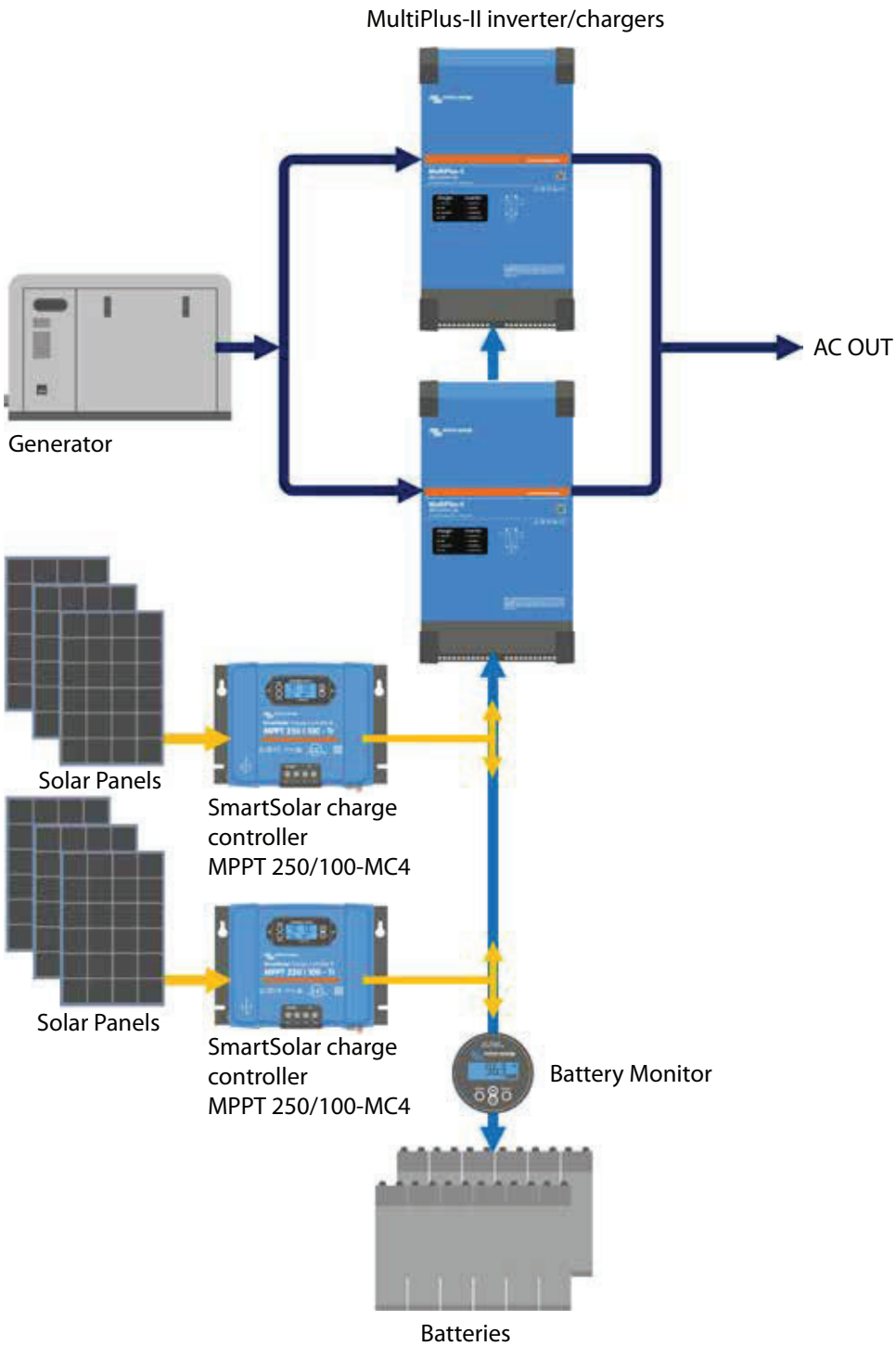
On the Victron Energy Blog you can read about the latest news, new products and a lot of success stories with Victron Energy.

Victron Live

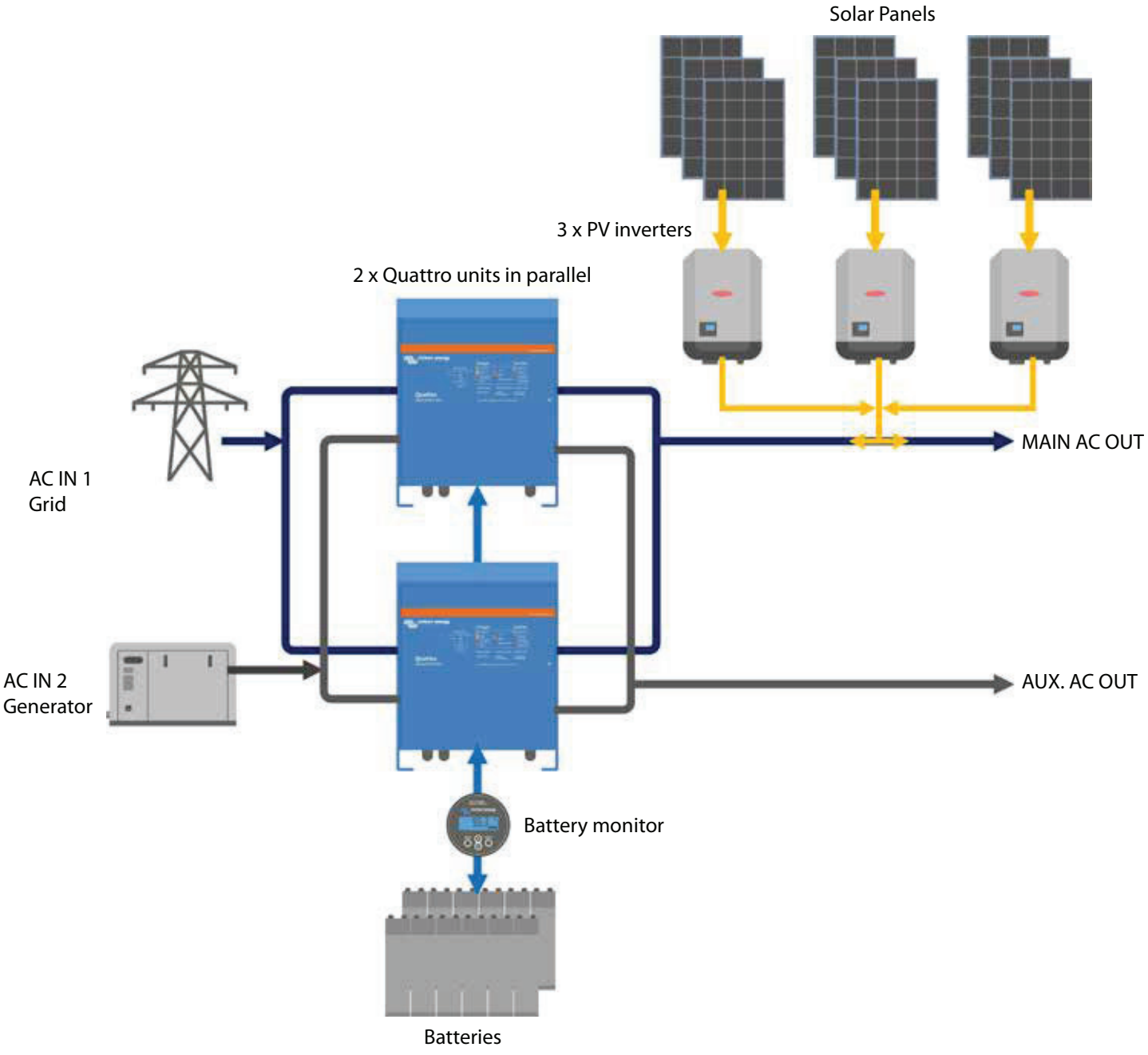
Victron Live is a living and growing website, which is a constantly evolving information store. It is a place where you can find manuals for VEConfigure3, Assistants and other software and software products.

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

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

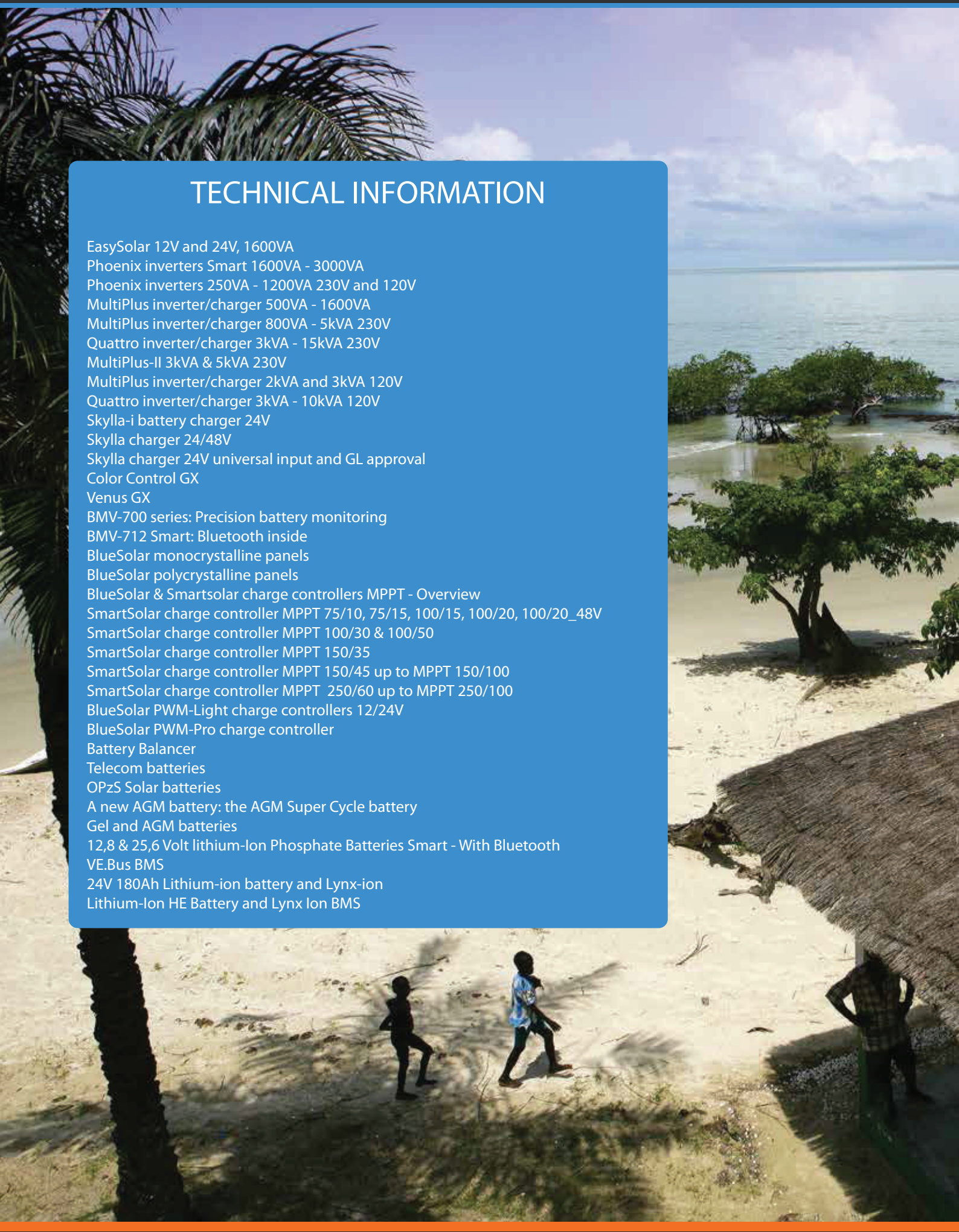


1. DC system
The illustration above shows a DC system with three charge controllers, two MultiPlus inverter/chargers configured in parallel and one generator.



2. AC system

The illustration above shows an AC system with three PV inverters and two Quattros in parallel.



TECHNICAL INFORMATION

EasySolar 12V and 24V, 1600VA
Phoenix inverters Smart 1600VA - 3000VA
Phoenix inverters 250VA - 1200VA 230V and 120V
MultiPlus inverter/charger 500VA - 1600VA
MultiPlus inverter/charger 800VA - 5kVA 230V
Quattro inverter/charger 3kVA - 15kVA 230V
MultiPlus-II 3kVA & 5kVA 230V
MultiPlus inverter/charger 2kVA and 3kVA 120V
Quattro inverter/charger 3kVA - 10kVA 120V
Skylla-i battery charger 24V
Skylla charger 24/48V
Skylla charger 24V universal input and GL approval
Color Control GX
Venus GX
BMV-700 series: Precision battery monitoring
BMV-712 Smart: Bluetooth inside
BlueSolar monocrystalline panels
BlueSolar polycrystalline panels
BlueSolar & Smartsolar charge controllers MPPT - Overview
SmartSolar charge controller MPPT 75/10, 75/15, 100/15, 100/20, 100/20_48V
SmartSolar charge controller MPPT 100/30 & 100/50
SmartSolar charge controller MPPT 150/35
SmartSolar charge controller MPPT 150/45 up to MPPT 150/100
SmartSolar charge controller MPPT 250/60 up to MPPT 250/100
BlueSolar PWM-Light charge controllers 12/24V
BlueSolar PWM-Pro charge controller
Battery Balancer
Telecom batteries
OPzS Solar batteries
A new AGM battery: the AGM Super Cycle battery
Gel and AGM batteries
12,8 & 25,6 Volt lithium-Ion Phosphate Batteries Smart - With Bluetooth
VE.Bus BMS
24V 180Ah Lithium-ion battery and Lynx-ion
Lithium-Ion HE Battery and Lynx Ion BMS

EasySolar 12V and 24V, 1600VA

The all-in-one solar power solution

The EasySolar combines a MPPT solar charge controller, an inverter/charger and AC distribution in one enclosure.
The product is easy to install, with a minimum of wiring.

Color Control panel

Two outstanding functions:
- Prioritizes battery charging by the MPPT charge controller
- Connects to the internet, enabling remote monitoring (VRM website) and remote control.

AC distribution

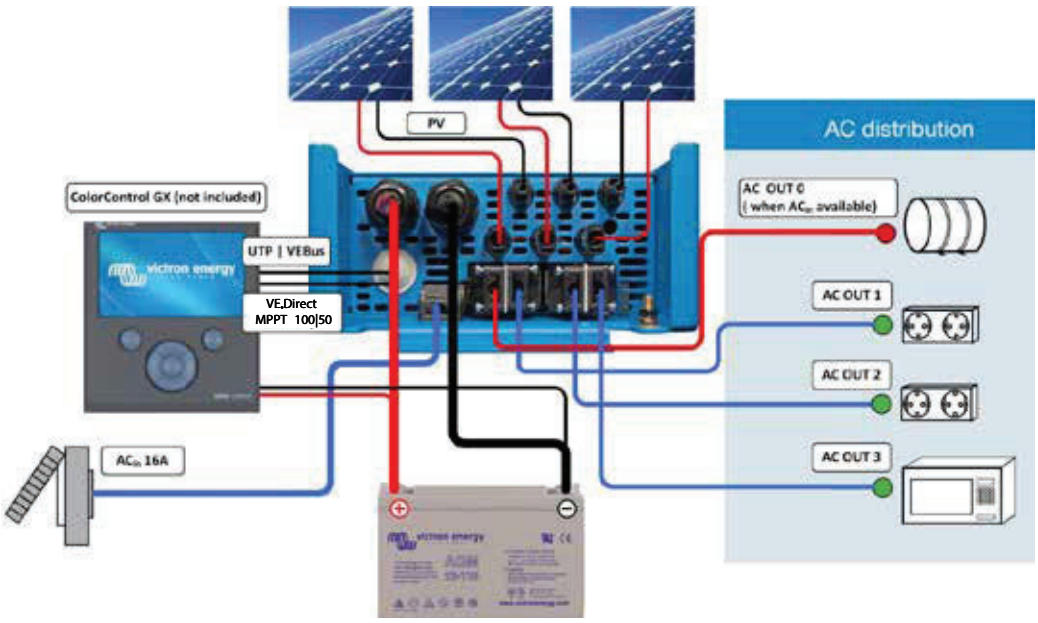
The AC distribution consists of a RCD (30mA / 63A) and four AC outputs protected by two 10A and two 16A circuit breakers.
An additional 16A output is controlled by the AC input: it will switch on only when AC is available.

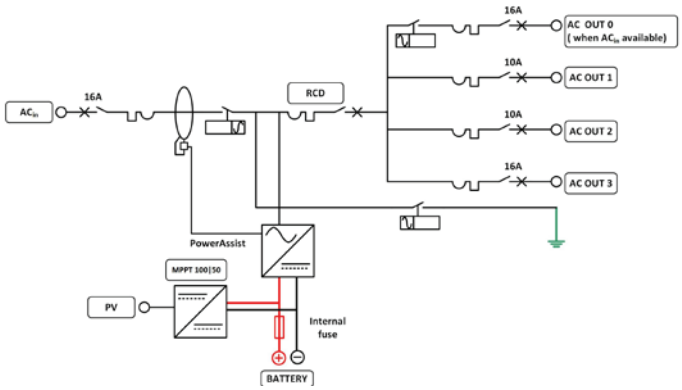
PowerAssist

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

Unique solar application software

Several software programs (Assistants) are available to configure the system for various grid interactive or stand-alone applications.





EasySolar	EasySolar 12/1600/70	EasySolar 24/1600/40
Inverter/charger		
Transfer switch	16A	
INVERTER		
Input voltage range	9,5 – 17V	19 – 33V
'Heavy duty' output AC 0	16A	
Output AC1, 2, 3	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	1600VA / 1300W	
Cont. output power at 40°C	1200W	
Peak power	3000W	
Maximum efficiency	92%	94%
Zero load power	8W	10W
Zero load power in search mode	2W	3W
CHARGER		
AC Input	Input voltage range: 187-265VAC Input frequency: 45 – 65Hz Power factor: 1	
Charge voltage 'absorption'	14,4V	28,8V
Charge voltage 'float'	13,8V	27,6V
Storage mode	13,2V	26,4V
Charge current house battery (4)	70A	40A
Charge current starter battery (A)	4	
Battery temperature sensor	Yes	
Programmable relay (5)	Yes	
Protection (2)	a – g	
Solar Charge Controller		
Model	MPPT 100/50	
Maximum output current	50A	
Maximum PV power, 6a,b)	700W	1400W
Maximum PV open circuit voltage	100V	100V
Maximum efficiency	98%	
Self-consumption	10 mA	
Charge voltage 'absorption', default setting	14,4V	28,8V
Charge voltage 'float', default setting	13,8V	27,6V
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16mV/°C	-32mV/°C
Protection	a - g	
COMMON CHARACTERISTICS		
Operating temp. range	-20 to +50°C (fan assisted cooling)	
Humidity (non-condensing):	max 95%	
ENCLOSURE		
Material & Colour	aluminium (blue RAL 5012)	
Protection category	IP 21	
Battery-connection	Battery cables of 1.5 meter	
PV connection	Three sets of MC4 (PV-ST01) PV connectors.	
230 V AC-connection	G-ST18i connector	
Weight	15kg	
Dimensions (hxwxd)	745 x 214 x 110mm	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29, EN 62109	
Emission / Immunity	EN 55014-1, EN 55014-2, EN 61000-3-3	
Automotive Directive	2004/104/EC	

1) Can be adjusted to 60Hz and to 240V
2) Protection
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 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) Programmable relay which can be set for general alarm, DC under voltage or genset start signal function
6a) If more PV power is connected, the controller will limit input power to 700W resp. 1400W
6b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V

EasySolar 3kVA & 5kVA with Color Control panel

EasySolar 3 kVA

The all-in-one solar power solution

The EasySolar combines a MPPT solar charge controller, an inverter/charger and AC distribution in one enclosure.
The product is easy to install, with a minimum of wiring.

Color Control panel

Two outstanding functions:
- Prioritizes battery charging by the MPPT charge controller
- Connects to the internet, enabling remote monitoring (VRM website) and remote control.

AC distribution

The AC distribution consists of a RCD (30mA / 63A) and four AC outputs protected by two 10A and two 16A circuit breakers.
An additional 16A output is controlled by the AC input: it will switch on only when AC is available.

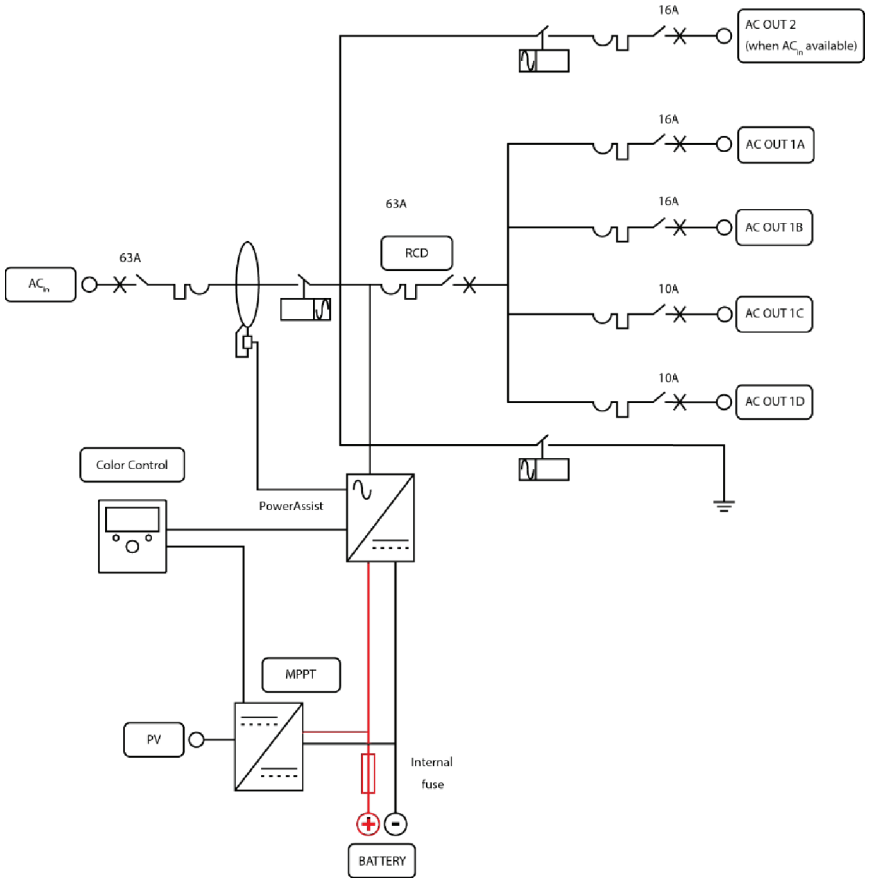
PowerAssist

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

Unique solar application software

Several software programs (Assistants) are available to configure the system for various grid interactive or stand-alone applications.

EasySolar 5 kVA



EasySolar	EasySolar 24/3000/70-50 MPPT150/70	EasySolar 48/3000/35-50 MPPT150/70	EasySolar 48/5000/70-100 MPPT150/100
INVERTER/CHARGER			
Transfer switch	50A	50A	100A
INVERTER			
Input voltage range	19 – 33V	38 – 66V	38 – 66V
'Heavy duty' output AC 2	16 A		
Output AC 1a, 1b, 1c, 1d	Output voltage: 230VAC ± 2% Frequency: 50 Hz ± 0,1% (1)		
Cont. output power at 25°C (3)	3000VA / 2400W	3000VA / 2400W	5000VA / 4000W
Cont. output power at 40°C	2200W	2200W	3700W
Cont. output power at 65°C	1700W	1700W	3000W
Peak power	6000W	6000W	10000W
Maximum efficiency	94%	95%	95%
Zero load power	20W	25W	35W
Zero load power in search mode	10W	12W	15W
CHARGER			
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1		
Charge voltage 'absorption'	28,8V	57,6V	57,6V
Charge voltage 'float'	27,6V	55,2V	55,2V
Storage mode	26,4V	52,8V	52,8V
Charge current	70A	35A	70A
Battery temperature sensor	yes		
Programmable relay (5)	yes		
Protection (2)	a - g		
SOLAR CHARGE CONTROLLER			
Model	MPPT 150/70-MC4	MPPT 150/70-MC4	MPPT 150/100-MC4
Maximum output current (4)	70A	70A	100A
Maximum PV power	2000W	4000W	5800W
Maximum PV open circuit voltage	150V		
Maximum efficiency	98%		
Self-consumption	10mA		
Charge voltage 'absorption', default setting	28,8V	57,6V	57,6V
Charge voltage 'float', default setting	27,6V	55,2V	55,2V
Charge algorithm	multi-stage adaptive		
Temperature compensation	-16 mV / °C	-32 mV / °C	-64 mV / °C
Protection	a – g		
COMMON CHARACTERISTICS			
Operating temp. range	-40 to +65°C (fan assisted cooling)		
Humidity (non-condensing):	max 95%		
ENCLOSURE			
Material & Colour	aluminium (blue RAL 5012)		
Protection category	IP 21		
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)		
PV connection	Two sets of MC4 PV connectors.		Three sets of MC4 PV connectors
230 V AC-connection	Screw terminals 13 mm^2 (6 AWG)		
Weight	28kg	28kg	48kg
Dimensions (hxwxd)	810 x 258 x 218	810 x 258 x 218	877 x 328 x 241
STANDARDS			
Safety	EN 60335-1, EN 60335-2-29, EN 62109-1		
Emission / Immunity	EN 55014-1, EN 55014-2, EN 61000-3-3, EN 61000-6-3, EN 61000-6-2, EN 61000-6-1		
Anti-islanding	See our website		

1) Can be adjusted to 60Hz and to 240V
2) Protection:
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 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) Programmable relay which can be set for general alarm, DC under voltage or genset start signal function

Phoenix Inverter
Smart 12/2000

Bluetooth built-in: fully configurable with a tablet or smartphone

- Low battery voltage alarm
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage: 210 - 245V
- Frequency: 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level
- Alarm relay

Monitoring:

- In- and output voltage, load and alarms

VE.Direct communication port

The VE.Direct port can be connected to a computer (VE.Direct to USB interface cable needed) to configure and monitor the same parameters.

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value. Once in standby the inverter will switch on for a short period every 2,5 seconds (adjustable).
If the load exceeds the preset level, the inverter will remain on.

Remote on/off

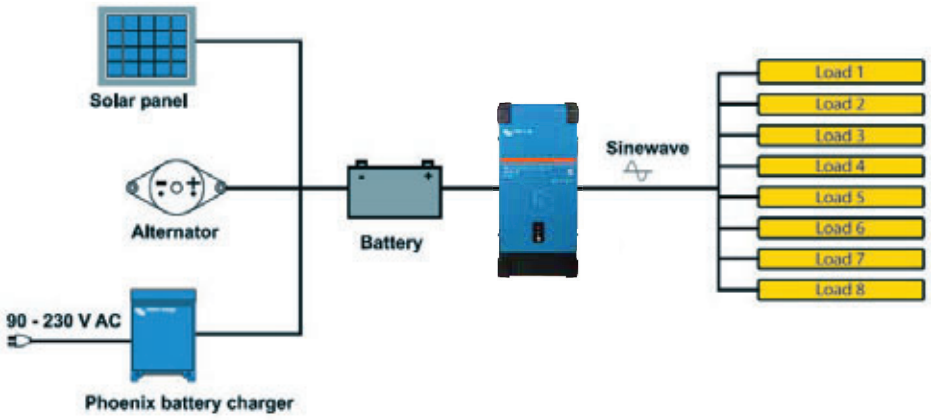
A remote on/off switch or relay contact can be connected to a two pole connector.
Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

LED diagnosis

Please see manual for a description.

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

For our low power inverters we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption. Alternatively use a MultiPlus with built-in transfer switch.



Phoenix Inverter Smart	12/1600 24/1600 48/1600	12/2000 24/2000 48/2000	12/3000 24/3000 48/3000
Parallel and 3-phase operation	No		
INVERTER			
Input voltage range (1)	9,3 – 17V 18,6 – 34V 37,2 – 68V		
Output	Output voltage: 230VAC ±2% 50 Hz or 60Hz ± 0,1% (1)		
Cont. output power at 25ºC (2)	1600VA	2000VA	3000VA
Cont. output power at 25ºC	1300W	1600W	2400W
Cont. output power at 40ºC	1200W	1450W	2200W
Cont. output power at 65ºC	800W	1000W	1700W
Peak power	3000VA	4000VA	6000VA
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off		
Max. efficiency 12/ 24 /48 V	92 / 94 / 94%	92 / 94 / 94%	93 / 94 / 95%
Zero load power 12 / 24 / 48 V	8 / 9 / 11W	8 / 9 / 11W	12 / 13 / 15W
Zero load power in ECO mode	0,6 / 1,3 / 2,1W	0,6 / 1,3 / 2,1W	1,5 / 1,9 / 2,8W
GENERAL			
Programmable relay (2)	Yes		
Stop & start power ECO-mode	adjustable		
Protection (3)	a - g		
Bluetooth wireless communication	For remote monitoring and system integration		
VE.Direct communication port	For remote monitoring and system integration		
Remote on-off	Yes		
Common Characteristics	Operating temperature range: -40 to +65ºC (fan assisted cooling) Humidity (non-condensing): max 95%		
ENCLOSURE			
Common Characteristics	Material & Colour: steel (blue RAL 5012; and black RAL 9017) Protection category: IP21		
Battery-connection	M8 bolts	M8 bolts	2+2 M8 bolts
230 V AC-connection	Screw terminals		
Weight	12kg	13kg	19kg
Dimensions (hxwxd)	485 x 219 x 125mm	485 x 219 x 125mm	533 x 285 x 150mm (12V) 485 x 285 x 150mm (24V/48V)
STANDARDS			
Safety	EN 60335-1		
Emission Immunity	EN 55014-1 / EN 55014-2/ EN-IEC 61000-6-1 / EN-IEC 61000-6-2 / EN-IEC 61000-6-3		
Automotive Directive	ECE R10-5		

1) Non-linear load, crest factor 3:1
2) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A / 35 VDC, 1A / 60VDC

3) 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 is intended for remote on/off control of all Phoenix inverters Smart

Color Control GX and other GX devices
Provides monitoring and control.
Locally, and remotely on the VRM Portal.

VE.Direct to USB interface
Connects to a USB port.

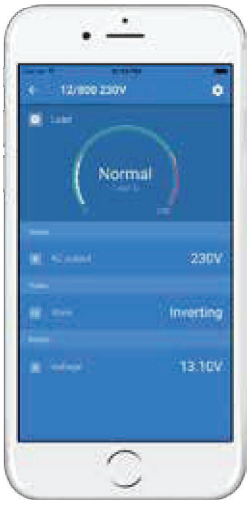
Bluetooth wireless communication
Connects to a smart phone (both iOS and Android).

BMV-712 Smart 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.

Phoenix inverters 250VA - 1200VA 230V and 120V

Phoenix 12/375 VE.Direct

Phoenix 12/375 VE.Direct



VE.Direct communication port

The VE.Direct port can be connected to:

- A computer (VE.Direct to USB interface cable needed)
- Apple and Android smartphones, tablets, MacBook's and other devices (VE.Direct Bluetooth Smart dongle needed)

Fully configurable:

- Low battery voltage alarm trip and reset levels
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage 210 - 245V
- Frequency 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level

Monitoring:

- In- and output voltage, % load and alarms

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value (min load: 15W). Once in standby the inverter will switch on for a short period (adjustable, default: every 2,5 seconds). If the load exceeds a preset level, the inverter will remain on.

Remote on/off

A remote on/off switch can be connected to a two-pole connector, or between battery plus and the left-hand contact of the two-pole connector.

LED diagnosis

Please see manual for a description.

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

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

Available with different output sockets

Schuko	UK	AU/NZ	IEC-320 (male plug included)	Nema 5-15R
				

DC connection with screw terminals

No special tools needed for installation

Phoenix Inverter 12 Volt / 24 Volt / 48 Volt	12/250 24/250 48/250	12/375 24/375 48/375	12/500 24/500 48/500	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. power at 25°C (1)	250VA	375VA	500VA	800VA	1200VA
Cont. power at 25°C / 40°C	200 / 175W	300 / 260W	400 / 350W	650 / 560W	1000 / 850W
Peak power	400W	700W	900W	1500W	2200W
Output AC voltage / frequency (adjustable)	230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0,1%				
Input voltage range	9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V				
DC low shut down (adjustable)	9,3 / 18,6 / 37,2V				
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off, see				
DC low restart and alarm (adjustable)	10,9 / 21,8 / 43,6V				
Battery charged detect (adjustable)	14,0 / 28,0 / 56,0V				
Max. efficiency	87 / 88 / 88%	89 / 89 / 90%	90 / 90 / 91%	90 / 90 / 91%	91 / 91 / 92%
Zero-load power	4,2 / 5,2 / 7,9W	5,6 / 6,1 / 8,5W	6 / 6,5 / 9W	6,5 / 7 / 9,5W	7 / 8 / 10W
Default zero-load power in ECO mode (default retry interval: 2,5 s, adjustable)	0,8 / 1,3 / 2,5W	0,9 / 1,4 / 2,6W	1 / 1,5 / 3,0W	1 / 1,5 / 3,0W	1 / 1,5 / 3,0W
ECO mode stop and start power setting	Adjustable				
Protection (2)	a - f				
Operating temperature range	-40 to +65°C (fan assisted cooling) Derate 1,25% per °C above 40°C				
Humidity (non-condensing)	max 95%				
ENCLOSURE					
Material & Colour	Steel chassis and plastic cover (blue Ral 5012)				
Battery-connection	Screw terminals				
Maximum cable cross-section	10mm² / AWG8	10mm² / AWG8	10mm² / AWG8	25 / 10 / 10mm² / AWG4 / 8 / 8	35 / 25 / 25mm² / AWG2 / 4 / 4
Standard AC outlets	230V: Schuko (CEE 7/4), IEC-320 (male plug included) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema 5-15R				
Protection category	IP 21				
Weight	2,4kg / 5,3lbs	3,0kg / 6,6lbs	3,9kg / 8.5lbs	5,5kg / 12lbs	7,4kg / 16,3lbs
Dimensions (h x w x d, mm) (h x w x d, inch)	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 172 x 275 3,4 x 6,8 x 10,8	105 x 216 x 305 4.1 x 8.5 x 12.1 (12V model: 105 x 230 x 325)	117 x 232 x 327 4.6 x 9.1 x 12.9 (12V model: 117 x 232 x 362)
ACCESSORIES					
Remote on-off	Yes				
Automatic transfer switch	Filax				
STANDARDS					
Safety	EN-IEC 60335-1 / EN-IEC 62109-1				
EMC	EN 55014-1 / EN 55014-2 / IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3				
Automotive Directive	ECE R10-4				

1) Nonlinear load, crest factor 3:1
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) DC ripple too high

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

VE.Direct Bluetooth Smart dongle (must be ordered separately)

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.

MultiPlus inverter/charger 500VA - 1600VA

Proven reliability
The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverter is short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

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

High start-up power
Needed to start high inrush loads such as power converters for LED lamps, halogen lamps or electric tools.

Search Mode
When Search Mode is 'on', the power consumption of the inverter in no-load operation is decreased by approx. 70%. In this mode the Multi, when operating in inverter mode, is switched off in case of no load or very low load, and switches on every two seconds for a short period. If the output current exceeds a set level, the inverter will continue to operate. If not, the inverter will shut down again.

Programmable relay
By default, the programmable relay is set as an alarm relay, i.e. the relay will de-energise in the event of an alarm or a pre-alarm (inverter almost too hot, ripple on the input almost too high, battery voltage almost too low).

12 Volt 24 Volt 48 Volt	12/500/20 24/500/10 48/500/6	12/800/35 24/800/16 48/800/9	12/1200/50 24/1200/25 48/1200/13	12/1600/70 24/1600/40 48/1600/20
PowerControl / PowerAssist	Yes / No	Yes / Yes		
Three Phase and parallel operation	Yes			
Transfer switch	16A			
INVERTER				
Input voltage range	9,5 – 17V	19 – 33V	38– 66V	
Output	Output voltage: 230VAC ± 2%	Frequency: 50Hz ± 0,1% (1)		
Cont. output power at 25°C (3)	500VA	800VA	1200VA	1600VA
Cont. output power at 25°C	430W	700W	1000W	1300W
Cont. output power at 40°C	400W	650W	900W	1100W
Cont. output power at 65°C	300W	400W	600W	800W
Peak power	900W	1600W	2400W	2800W
Maximum efficiency	90 / 91 / 92%	92 / 93 / 94%	93 / 94 / 95%	93 / 94 / 95%
Zero-load power	6 / 6 / 7W	7 / 7 / 8W	10 / 9 / 10W	10 / 9 / 10W
Zero-load power in search mode	2 / 2 / 3W	2 / 2 / 3W	3 / 3 /3W	3 / 3 /3W
CHARGER				
AC Input	Input voltage range: 187-265 VAC	Input frequency: 45 – 65 Hz		
Charge voltage 'absorption'	14,4 / 28,8 / 57,6V			
Charge voltage 'float'	13,8 / 27,6 / 55,2V			
Storage mode	13,2 / 26,4 /52,8V			
Charge current house battery (4)	20 / 10 / 6A	35 / 16 / 9A	50 / 25 / 13A	70 / 40 / 20A
Charge current starter battery	1A (12V and 24V models only)			
Battery temperature sensor	Yes			
GENERAL				
Programmable relay (5)	Yes			
Protection (2)	a – g			
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration (RJ45-spliter ASS030065510 needed for 500/800/1200VA models)			
Remote on-off	On/off/charger only			On/off
DIP switches	Yes (6)			Yes (7)
Internal DC fuse	125/60/30A	150/80/40A	200/100/50A	200/125/60A
Common Characteristics	Operating temp. range: -40 to +65°C (fan assisted cooling) Humidity (non-condensing): max 95%			
ENCLOSURE				
Common Characteristics	Material & Colour: Steel/ABS (blue RAL 5012) Protection category: IP 21			
Battery-connection	16 / 10 / 10 mm²	25 / 16 / 10 mm²	35 / 25 / 10 mm²	50 / 35 / 16 mm²
230V AC-connection	G-ST18i connector			
Weight	4,4 kg	6,4 kg	8,2 kg	10,2 kg
Dimensions (h x w x d)	311 x 182 x 100 mm	360 x 240 x 100 mm	406 x 250 x 100 mm	470 x 265 x 120 mm
STANDARDS				
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN 62109-1			
Emission / Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3			
Road vehicles	ECE R10-5			

1) Can be adjusted to 60Hz and to 240V
2) Protection
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 230VAC on inverter output
g. Input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) At 25°C ambient
5) Programmable relay which can be set for:
general alarm, DC under voltage or generator start/stop signal function
AC rating: 230V/4A
DC rating: 4A up to 35VDC, 1A up to 60VDC
6) Remote / Battery charge voltage / Inverter frequency / search mode
7) Battery charge voltage / search mode

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

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 3 kVA and more).

Virtually unlimited power thanks to parallel operation
Up to 6 Multis 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 10 A per 5 kVA Multi at 230 VAC). 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.

Solar energy: AC power available even during a grid failure
The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems. Loss of mains detection software is available.

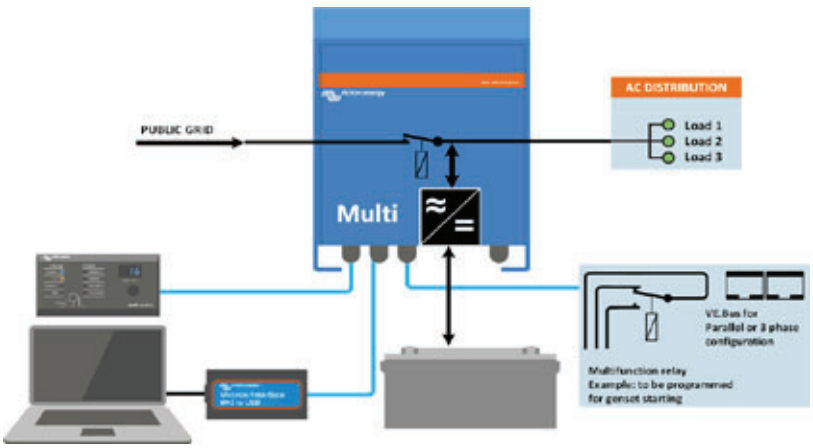
System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Color Control GX or other GX devices, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Color Control GX or other GX devices.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control GX or other GX device can be accessed and settings can be changed remotely.

Color Control GX, showing a
PV application



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	100
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	2400	4000
Cont. output power at 40°C (W)	650	900	1200	1400	2200	3700
Cont. output power at 65°C (W)	400	600	800	1000	1700	3000
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	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
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 (12 V and 24 V models only)					
Battery temperature sensor	yes					
GENERAL						
Auxiliary output (5)	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
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	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	Yes					
Common Characteristics	Operating temp. range: -40 to +65°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)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375x214x110			520x255x125	362x258x218	444x328x240
STANDARDS						
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, IEC 62109-1					
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3					
Road vehicles	12V and 24V models: ECE R10-4					
Anti-islanding	See our website					

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 under voltage or genset start/stop function
   AC rating: 230 V/4A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
Measures battery voltage and temperature and allows monitoring and control of Multis and Quattros with a smartphone or other

Bluetooth enabled device.

Computer controlled operation and monitoring
Several interfaces are available:

Color Control GX or other GX device
Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface
Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface
Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-712 Smart Battery Monitor
Use a smartphone or other Bluetooth enabled device to:
- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Quattro inverter/charger 3kVA - 15kVA 230V

Lithium Ion battery compatible

Quattro
48/5000/70-100/100

Quattro
48/15000/200-100/100

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps 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 to a 'European' inverter programmed to supply 240V / 60Hz.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A 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 mains 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 mains 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.
Loss of mains detection software is available.

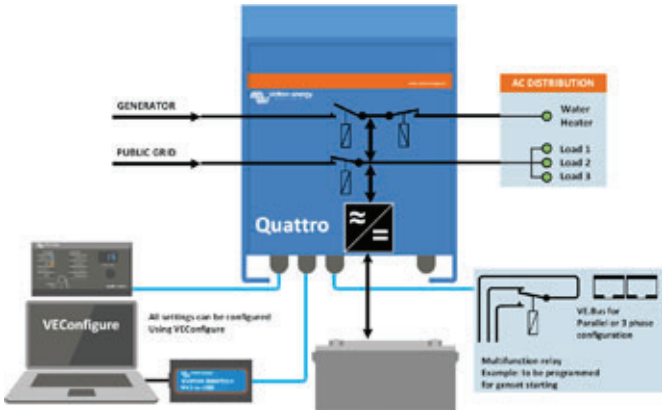
System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Color Control GX or other GX devices, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Color Control GX or other GX devices.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control GX or other GX device can be accessed and settings can be changed remotely.

Color Control GX, showing a PV application



Quattro	12/3000/120-50/50 24/3000/70-50/50	12/5000/220-100/100 24/5000/120-100/100 48/5000/70-100/100	24/8000/200-100/100 48/8000/110-100/100	48/10000/140-100/100	48/15000/200-100/100
PowerControl / PowerAssist	Yes				
Integrated Transfer switch	Yes				
AC inputs (2x)	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1				
Maximum feed through current (A)	2x 50	2x100	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	15000
Cont. output power at 25°C (W)	2400	4000	6500	8000	12000
Cont. output power at 40°C (W)	2200	3700	5500	6500	10000
Cont. output power at 65°C (W)	1700	3000	3600	4500	7000
Peak power (W)	6000	10000	16000	20000	25000
Maximum efficiency (%)	93 / 94	94 / 94 / 95	94 / 96	96	96
Zero load power (W)	20 / 20	30 / 30 / 35	60 / 60	60	110
Zero load power in AES mode (W)	15 / 15	20 / 25 / 30	40 / 40	40	75
Zero load power in Search mode (W)	8 / 10	10 / 10 / 15	15 / 15	15	20
CHARGER					
Charge voltage 'absorption' (V DC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6	57,6
Charge voltage 'float' (V DC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
Storage mode (V DC)	13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8	52,8
Charge current house battery (A) (4)	120 / 70	220 / 120 / 70	200 / 110	140	200
Charge current starter battery (A)	4 (12V and 24V models only)				
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output (A) (5)	25	50	50	50	50
Programmable relay (6)	3x	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	2x	2x	2x	2x	2x
Remote on-off	Yes				
Common Characteristics	Operating temp.: -40 to +65˚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	Bolts M6
Weight (kg)	19	34 / 30 / 30	45 / 41	51	72
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	572 x 488 x 344
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1				
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Road vehicles	12V and 24V models: ECE R10-4				
Anti-islanding	See our website				

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel

A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle

Measures battery voltage and temperature and allows monitoring and control of Multis and Quattros with a smartphone or other

Bluetooth enabled device.

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX and other GX devices

Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB (VE.Bus to USB interface)

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-712 Smart Battery Monitor

Use a smartphone or other Bluetooth enabled device to:

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

MultiPlus-II 3kVA & 5kVA 230V

A MultiPlus, plus ESS (Energy Storage System) functionality

The MultiPlus-II is a multifunctional inverter/charger with all the features of the MultiPlus, plus an external current sensor option which extends the PowerControl and PowerAssist function to 50A resp. 100A.
The MultiPlus-II is ideally suited for professional marine, yachting, vehicle and land based off-grid applications.
It also has built-in anti-islanding functionality, and an increasingly long list of country approvals for ESS application.
Several system configurations are possible. For more detailed information see the ESS Design and configuration manual.

PowerControl and PowerAssist - Boosting the capacity of the grid or a generator

A maximum grid or generator current can be set. The MultiPlus-II will then take account of other AC loads and use whatever is extra for battery charging, thus preventing the generator or grid from being overloaded (PowerControl function).
PowerAssist takes the principle of PowerControl to a further dimension. Where peak power is so often required only for a limited period, the MultiPlus-II will compensate insufficient generator, shore or grid power with 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 MultiPlus-II can be used in off grid as well as grid connected PV and other alternative energy systems. It is compatible with both solar charger controllers and grid-tie inverters.

Two AC Outputs

The main output has no break functionality. The MultiPlus-II 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-II. 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 and three phase operation

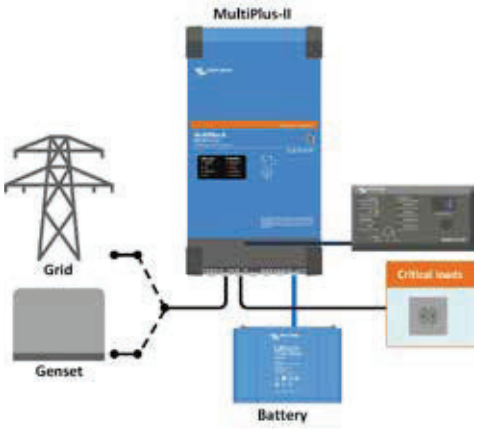
Up to 6 Multis can operate in parallel to achieve higher power output. Six 48/5000/70 units, for example, will provide 25 kW / 30 kVA output power with 420 Amps charging capacity.
In addition to parallel connection, three units of the same model can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected for a 75 kW / 90 kVA inverter and more than 1200 Amps charging capacity.

On-site system configuring, monitoring and control

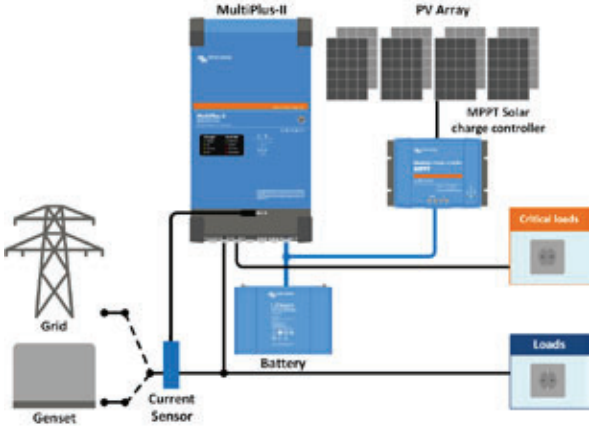
Settings can be changed in a matter of minutes with VEConfigure software (computer or laptop and MK3-USB interface needed).
Several monitoring and control options are available: Color Control GX, Venus GX, Octo GX, CANvu GX, laptop, computer, Bluetooth (with the optional VE.Bus Smart dongle), Battery Monitor, Digital Multi Control Panel.

Remote configuring and monitoring

Install a Color Control GX or other GX product to connect to the internet.
Operational data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.
When connected to the internet, systems can be accessed remotely, and settings can be changed.



Standard marine, mobile or off-grid application
Loads that should shut down when AC input power is not available can be connected to a second output (not shown). These loads will be taken into account by the PowerControl and PowerAssist function in order to limit AC input current to a safe value when AC power is available.



Grid parallel topology with MPPT solar charge controller
The MultiPlus-II will use data from the external AC current sensor (must be ordered separately) or power meter to optimise self-consumption and, if required, to prevent grid feed. In case of a power outage, the MultiPlus-II will continue to supply the critical loads

Color Control Panel (CCGX)
Provides intuitive system control and monitoring
Besides system monitoring and control the CCGX enables access to our free remote monitoring website: the VRM Online Portal

VRM Portal
Our free remote monitoring website (VRM) will display all your system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail.

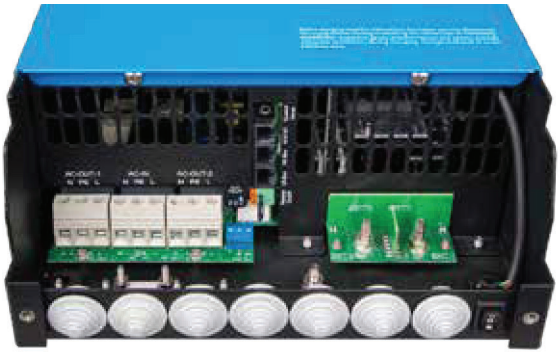
VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet. Available for both iOS and Android.

VE.Bus Smart Dongle
Measures battery voltage and temperature and allows monitoring and control with a smart phone or other Bluetooth enabled device.

MultiPlus-II	48/3000/35-32	48/5000/70-50
PowerControl & PowerAssist	Yes	
Transfer switch	32 A	50 A
Maximum AC input current	32 A	50 A
INVERTER		
DC Input voltage range	38 – 66 V	
Output	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0,1% (1)	
Cont. output power at 25°C (3)	3000 VA	5000VA
Cont. output power at 25°C	2400 W	4000W
Cont. output power at 40°C	2200 W	3700W
Cont. output power at 65°C	1700 W	3000W
Maximum apparent feed-in power	2500VA	4000VA
Peak power	5500 W	9000W
Maximum efficiency	95 %	96%
Zero load power	11 W	18W
Zero load power in AES mode	7 W	12W
Zero load power in Search mode	2 W	2W
CHARGER		
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz	
Charge voltage 'absorption'	57,6 V	
Charge voltage 'float'	55,2 V	
Storage mode	52,8 V	
Maximum battery charge current (4)	35 A	70A
Battery temperature sensor	Yes	
GENERAL		
Auxiliary output	Yes (32 A)	
External AC current sensor (optional)	50 A	100 A
Programmable relay (5)	Yes	
Protection (2)	a - g	
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration	
General purpose com. port	Yes, 2x	
Remote on-off	Yes	
Operating temperature range	-40 to +65°C (fan assisted cooling)	
Humidity (non-condensing)	max 95%	
ENCLOSURE		
Material & Colour	Steel, blue RAL 5012	
Protection category	IP22	
Battery-connection	M8 bolts	
230 V AC-connection	Screw terminals 13 mm² (6 AWG)	
Weight	18 kg	29 kg
Dimensions (hxwxd)	506 x 275 x 147 mm	565 x 323 x 148 mm
STANDARDS		
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2	
Emission, Immunity	EN 55014-1, EN 55014-2 EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3	
Uninterruptible power supply	IEC 62040-1, AS 620401.1	
Anti-islanding	VDE-AR-N 4105, TOR-D4, AS/NZS 4777.2, NRS 097-2-1, UTE C15-712-1, C10/11, RD 1699-RD 413, G59/3-2, G83/2, EN 50549	

1) Can be adjusted to 60 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) 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) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. AC rating: 230V / 4A, DC rating: 4A up to 35VDC and 1A up to 60VDC



Connection Area

Current sensor 100A:50mA
To implement PowerControl and PowerAssist and to optimize self-consumption with external current sensing.
Maximum current: 50A resp. 100A.
Length of connection cable: 1 m.

Digital Multi Control Panel
A convenient and low-cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

MultiPlus inverter/charger 2kVA and 3kVA 120V

Lithium Ion battery compatible

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

Multifunctional, 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 Multis 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 45 kW / 54 kVA three phase inverter and 1260 A charger can be built.

Split phase options

Two units can be stacked to provide 120-0-120 V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30 kW / 36 kVA 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 240 V / 60 Hz.

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 20 A per 3 kVA MultiPlus at 120 VAC). 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.

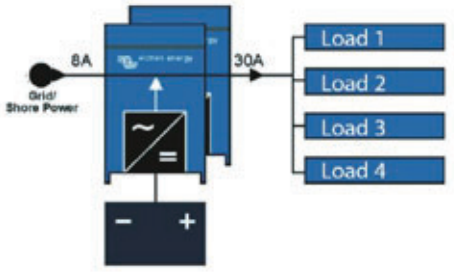
Four stage adaptive charger and dual bank battery charging

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.

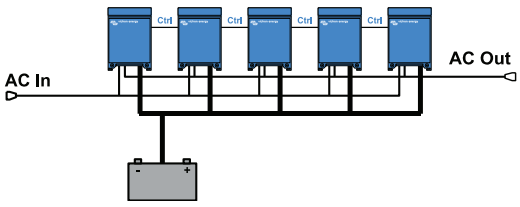
System configuring has never been easier

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	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 25°C / 77°F (VA) (3)		2000	3000
Cont. output power at 25°C / 77°F (W)		1600	2400
Cont. output power at 40°C / 104°F (W)		1450	2200
Cont. output power at 65°C / 150°F (W)		1100	1700
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero load power (W)		9 / 11	20 / 20
Zero load power in AES mode (W)		7 / 8	15 / 15
Zero load power in Search mode (W)		3 / 4	8 / 10
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: -40 - +65°C / -40 to 150°F (fan assisted cooling)	Humidity (non-condensing): max 95%
ENCLOSURE			
Common Characteristics		Material & Colour: aluminium (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 (13 mm²)	Screw-terminal 6 AWG (13mm²)
Weight		13 kg 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-IEC 60335-1, EN-IEC 60335-2-29	UL 1741, UL 458, EN-IEC 60335-1, EN-IEC 60335-2-29
Emission and Immunity		EN-IEC 61000-3-2/3-3, EN-IEC 61000-6-1/6-2/6-3	EN-IEC 61000-3-2/3-3, EN-IEC 61000-6-1/6-2/6-3

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 under voltage or genset start/stop function
   AC rating: 230 V/4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
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 PowerControl and PowerAssist levels.

VE.Bus Smart Dongle

Measures battery voltage and temperature and allows monitoring and control of Multis and Quattros with a smartphone or other

Bluetooth enabled device.

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX and other GX devices

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-712 Smart Battery Monitor

Use a smartphone or other Bluetooth enabled device to:

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Quattro
48/5000/70-100/100

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid 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 6 Quattro units can operate in parallel. Six units 48/10000/140, for example, will provide 48kW / 60kVA output power and 840 Amps charging capacity.

Split phase and three phase capability
Two units can be configured for split phase, and three units can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected to provide 144kW / 180kVA inverter power and more than 2500A charging capacity. For more detail please enter *parallel* in the search box on our website.

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 mains 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 mains 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.
Loss of mains detection software is available.

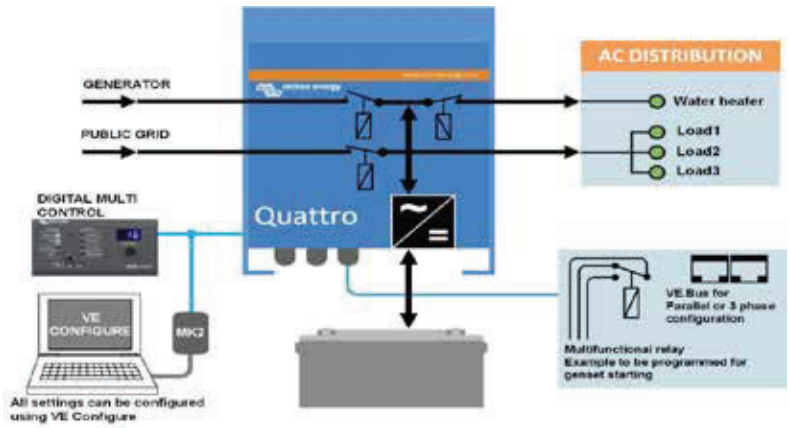
System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Color Control GX or other GX devices, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Color Control GX or other GX devices.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control GX or other GX device can be accessed and settings can be changed remotely.

Color Control GX, showing a PV application



Quattro	48/3000/35-50/50 120V	24/5000/120-100/100 120V 48/5000/70-100/100 120V	48/10000/140-100/100 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	2x 50 A	2x 100 A	2x 100 A
INVERTER			
Input voltage range	9,5 – 17 V 19 – 33V 38 – 66 V		
Output (1)	Output voltage: 120 VAC ± 2% Frequency: 60 Hz ± 0,1%		
Cont. output power at 25°C (3)	3000 VA	5000 VA	10000 VA
Cont. output power at 25°C	2400 W	4000 W	8000 W
Cont. output power at 40°C	2200 W	3700 W	6500 W
Cont. output power at 65°C	1700 W	3000 W	4500 W
Peak power	6000 W	10000 W	20000 W
Maximum efficiency	94 %	94 / 94 / 95 %	96 %
Zero load power	25 W	30 / 30 / 35 W	60 W
Zero load power in AES mode	20 W	20 / 25 / 30 W	40 W
Zero load power in Search mode	12 W	10 / 10 / 15 W	15 W
CHARGER			
Charge voltage 'absorption' (V DC)	57,6 V	14,4 / 28,8 / 57,6 V	57,6 V
Charge voltage 'float' (V DC)	55,2 V	13,8 / 27,6 / 55,2 V	55,2 V
Storage mode (V DC)	52,8 V	13,2 / 26,4 / 52,8 V	52,8 V
Charge current house battery (A) (4)	35 A	200 / 120 / 70 A	140 A
Charge current starter battery (A)	4 A (12V and 24V models only)		
Battery temperature sensor	Yes		
GENERAL			
Auxiliary output (5)	32 A	50 A	50 A
Programmable relay (6)	3x		
Protection (2)	a-g		
VE.Bus communication port	For parallel, split phase and three phase operation, remote monitoring and system integration		
General purpose com. port	2x		
Remote on-off	Yes		
Common Characteristics	Operating temp.: -40 to +65°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
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch 362 x 258 x 218 mm	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 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch 572 x 488 x 344 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1		
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	12V and 24V models: ECE R10-5		
Anti-islanding	See our website		

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 under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel

A convenient and low cost solution for remote monitoring, with a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle

Measures battery voltage and temperature and allows monitoring and control of Multis and Quattros with a smartphone or other

Bluetooth enabled device.

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX and other GX devices

Monitoring and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA2000 marine electronics network. See the NMEA2000 & MFD integration guide

BMV-712 Smart Battery Monitor

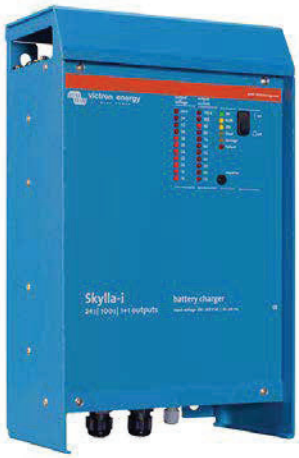
Use a smartphone or other Bluetooth enabled device to:

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Skylla-i battery charger 24V

Li-Ion ready

Skylla-i 24/100 (3)



Skylla-i 24/100 (1+1)

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

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

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

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

Rugged

Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

Flexible

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

Important features:

Synchronised parallel operation

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

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

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

Preventing damage due to excessive gassing: the BatterySafe mode

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

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

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

To increase battery life: temperature compensation

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

Battery voltage sense

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

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

The chargers also accept a DC supply.

Use as a power supply

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

Li-Ion (LiFePO4) ready

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

Skylla-i	24/80 (1+1)	24/80 (3)	24/100 (1+1)	24/100 (3)
Input voltage (VAC)	230V			
Input voltage range (VAC)	185-265V			
Input voltage range (VDC)	180-350V			
Maximum AC input current @ 180 VAC	16A		20A	
Frequency (Hz)	45-65Hz			
Power factor	0,98			
Charge voltage 'absorption' (VDC) (1)	28,8V			
Charge voltage 'float' (VDC)	27,6V			
Charge voltage 'storage' (VDC)	26,4V			
Charge current (A) (2)	80A	3 x 80A (max total output: 80A)	100A	3 x 100A (max total output: 100A)
Charge current starter batt. (A)	4A	n. a.	4	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity (Ah)	400-800Ah		500-1000Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
CAN bus communication port (VE.Can)	Two RJ45 connectors, NMEA2000 protocol, galvanically isolated			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST AC rating: 240VAC/4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Forced cooling	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	M8 bolts			
230 VAC-connection	screw-clamp 10mm² (AWG 7)			
Protection category	IP 21			
Weight kg (lbs)	7kg (16 lbs)			
Dimensions hxwxd in mm (hxwxd in inches)	405 x 250 x 150 (16.0 x 9.9 x 5.9)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			

1) Output voltage range 20-36V. Can be set with rotary switch or potentiometers.

2) Up to 40°C (100°F) ambient. Output will reduce to 80% at 50°C, and to 60% at 60°C.

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current.
The software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery.
The BMV-700 selectively displays battery voltage, battery current, consumed Ah or time to go.

Skylla-i Control

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

Skylla charger 24/48V

Skylla TG 24 50

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 (24V models only)

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

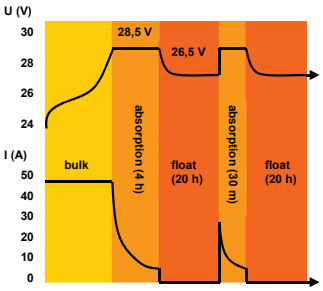
To increase battery life: temperature compensation

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.

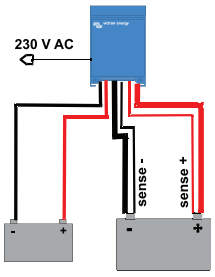
Battery voltage sense

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.

Charge curve



Application example



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	-40 to +50°C (-40 - 122°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-700 Battery Monitor

The BMV-700 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-700 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 charger 24V universal input and GL approval

Skylla Charger
24 V 50 A

Universal 90-265 V 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 90-400 V 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 185-265 V AC supply.

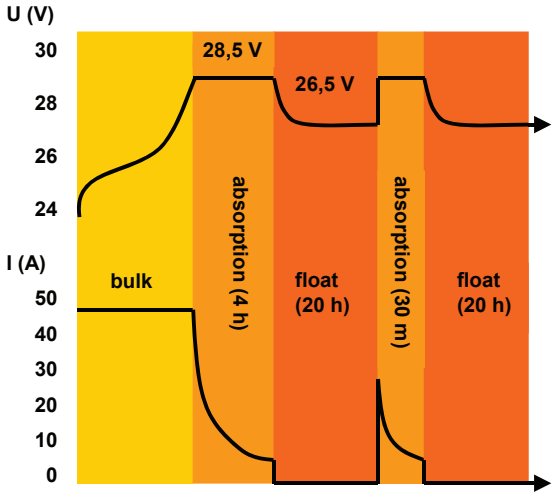
Other features

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

Charge curve



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 (limited to 22 A at 110V AC)	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	-40 to +50°C (-40 - 122°F) (Full output current up to 40°C)		
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)	365 x 250 x 147 (14.4 x 9.9 x 5.8)	365 x 250 x 147 (14.4 x 9.9 x 5.8)	365 x 250 x 257 (14.4 x 9.9 x 10.1)
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-700 Battery Monitor

The BMV-700 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-700 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.

Photo: Tomo Jeseničnik

Color Control GX

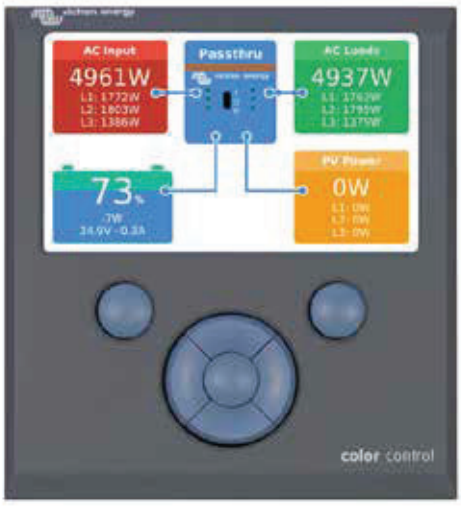
Color Control GX
The Color Control (CCGX) provides intuitive control and monitoring for all Victron power systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VRM Online Portal
Besides monitoring and controlling products locally on the CCGX itself, all readings are also forwarded to our free remote monitoring website: the VRM Online Portal. T

Remote Console on VRM
Monitor, control and configure the CCGX remotely, over the internet. Just like standing in front of the device, everything can also be done remotely. The same functionality is also available on the local network, Remote Console on LAN.

Automatic genset start/stop
A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

The heart of ESS – Energy Storage System
The CCGX is the Energy Manager in an ESS system. More information in the ESS manual:



Data logging
When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the CCGX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

Supported products

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port.
- SmartSolar MPPT 150/70 and the MPPT 150/100 with VE.Can port. When multiple BlueSolar MPPTs or SmartSolar MPPTs with VE.Can are used in parallel, all the information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the CCGX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the CCGX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. Location and speed will be visible on the display, and the data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

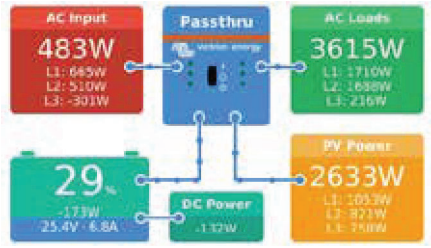
When more than two VE.Direct products must be connected, USB can be used.

Internet connection
The CCGX can be connected to internet with an Ethernet cable and via wifi. To connect via wifi, a wifi USB accessory is required. The CCGX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Other highlights
- The CCGX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the CCGX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

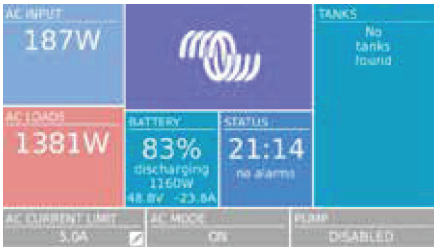
Color Control GX			
Power supply voltage range	8 – 70V DC		
Current draw	12V DC	24V DC	48V DC
Display off	140mA	80mA	40mA
Display at minimum intensity	160mA	90mA	45mA
Display at maximum intensity	245mA	125mA	65mA
Potential free contact	3A / 30V DC / 250V AC (Normally open)		
	Communication ports		
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
	3rd party interfacing		
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Color Control GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
	Other		
Outer dimensions (h x w x d)	130 x 120 x 28mm		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	E4-10R-053535		

Overview - Multi with PV Inverter on output

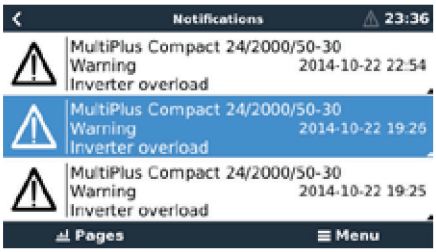


Main menu

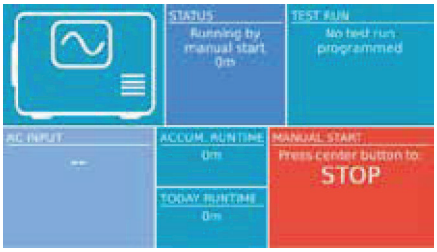
Mobile & boat overview



Alarm notifications

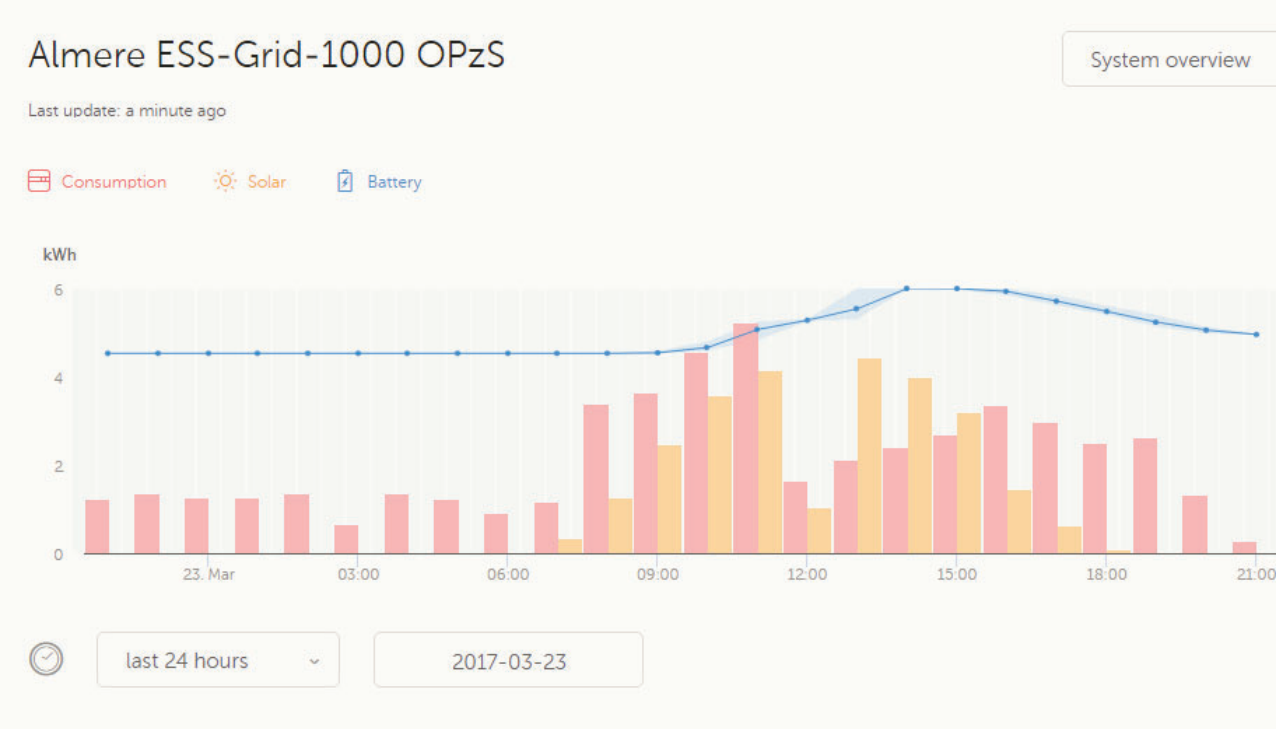


Genset control page

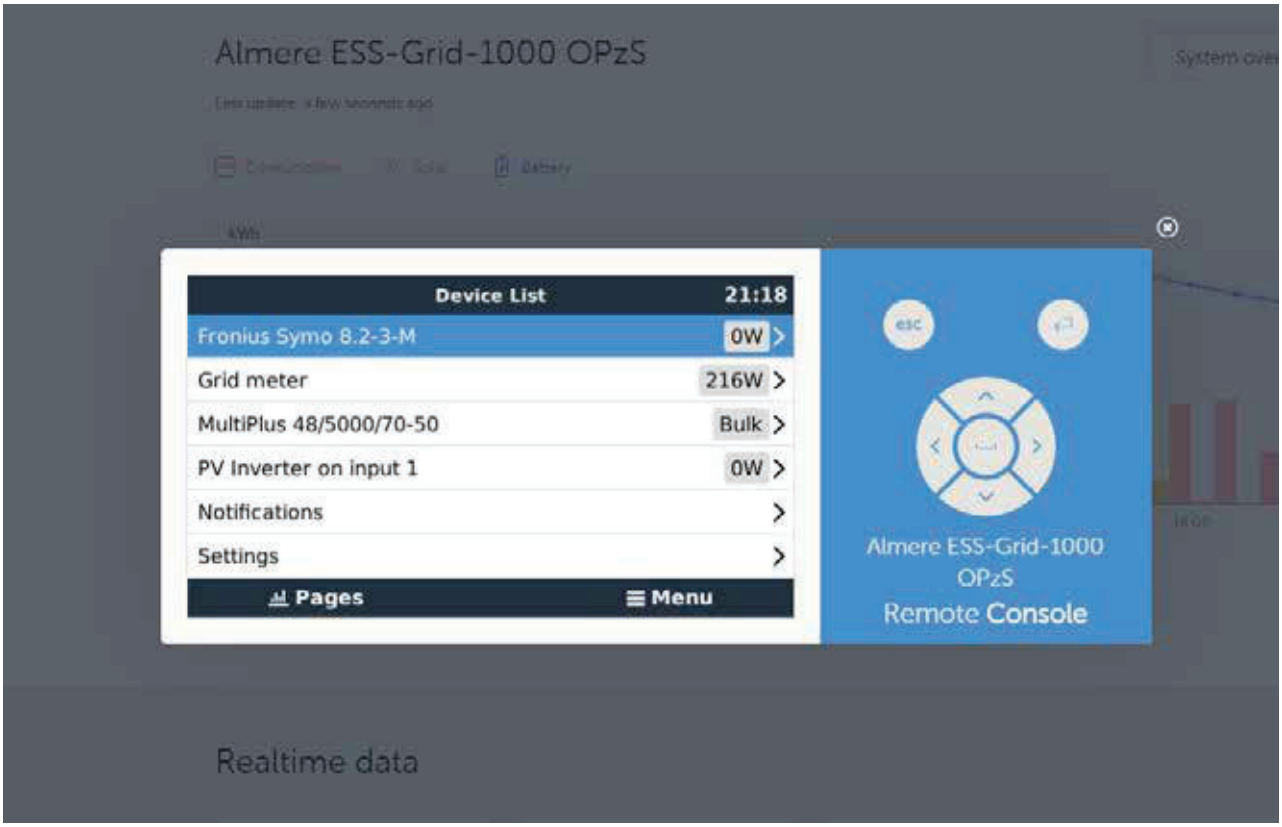


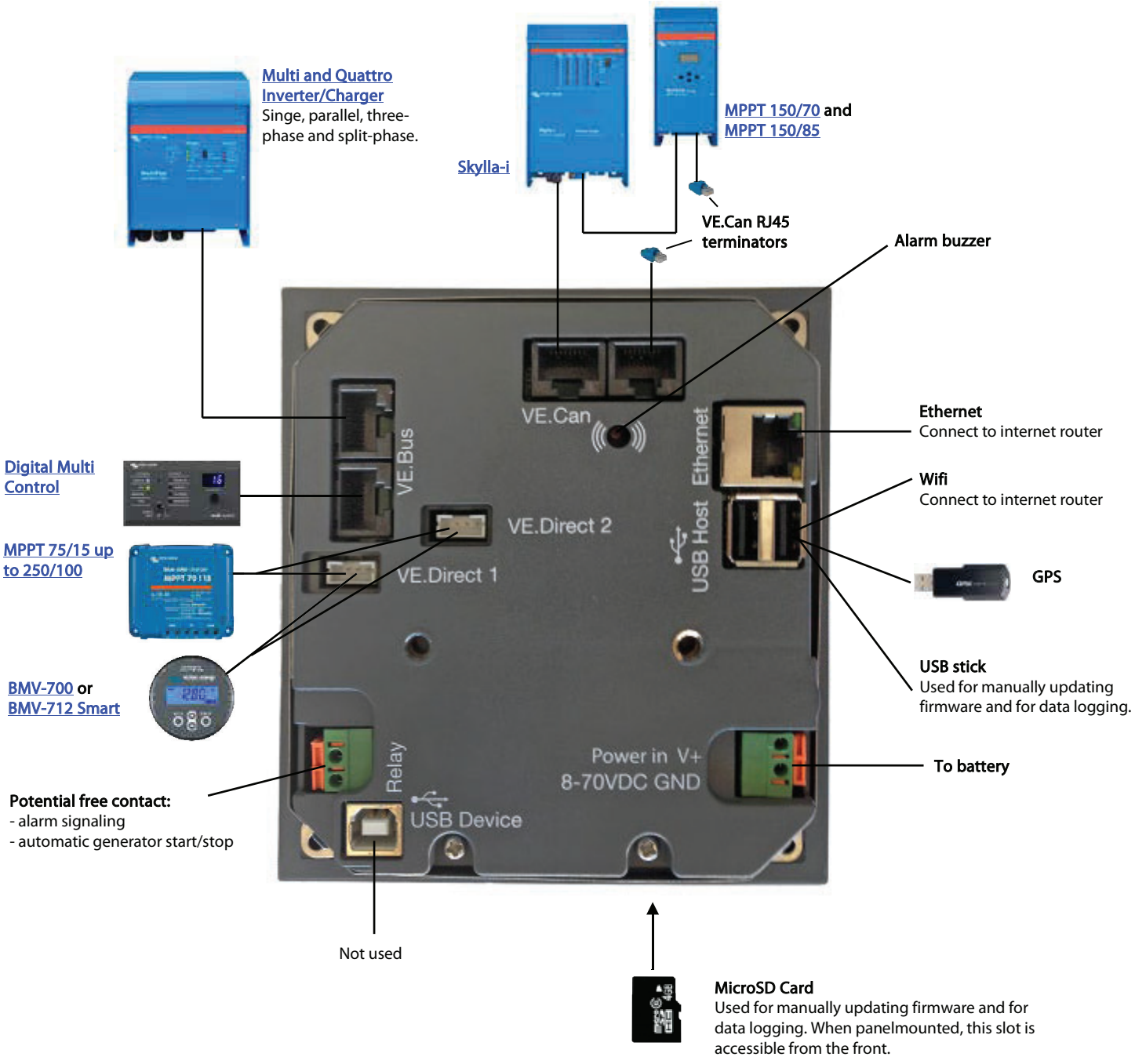
Tiles overview

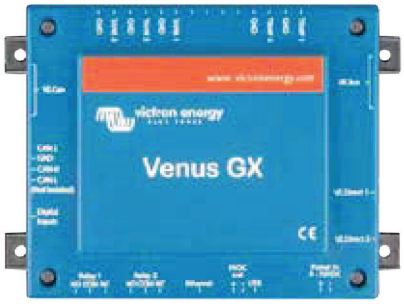
VRM Portal - Dashboard



VRM Portal – Remote Console




Multi and Quattro Inverter/Charger
Singe, parallel, three-phase and split-phase.
Skylla-i
MPPT 150/70 and MPPT 150/85
VE.Can RJ45 terminators
Alarm buzzer
VE.Can
VE.Bus
VE.Direct 2
VE.Direct 1
USB Host
Ethernet
Digital Multi Control
MPPT 75/15 up to 250/100
BMV-700 or BMV-712 Smart
Ethernet
Connect to internet router
Wifi
Connect to internet router
GPS
USB stick
Used for manually updating firmware and for data logging.
Relay
Power in V+
8-70VDC GND
To battery
Potential free contact:
- alarm signaling
- automatic generator start/stop
USB Device
Not used
MicroSD Card
Used for manually updating firmware and for data logging. When panelmounted, this slot is accessible from the front.



Venus GX

Venus GX with connectors

Venus GX front angle

VVeennuuss GGXX

The Venus GX provides intuiti ve control and monitoring for all Victron po wer systems. The list of Victron products that can be connected is endless: Inverters, Multis, Quattros, MPPT solar chargers, BMV battery monitors, Lynx Ion + Shunt and more.

VVRRMM OOnnlliinnee PPoorrttaall

All readings are forwarded to our free remote monitoring website: the VRM Online Portal.

RReemmoottee CCoonnssoollee oonn VVRRMM

The way to access the device for setting up, as well as monitoring, is via Remote Console. Either via VRM, via the built-in WiFi Access Point, or on the local LAN/WiFi network.

AAuuttoommaattiicc ggeennssee tt sstt aarrtt//ssttoopp

A highly customizable start/stop system. Use state of charge, voltage, load and other parameters. Define a special set of rules for quiet times, and optionally a monthly test run.

TThhee hheeaarrtt ooff EESSSS –– EEnneerrggyy SSttoorraaggee SSyyssttemm

The Venus GX is the Energy Manager in an ESS system.

DDaattaa lloogggiinngg

When connected to the internet, all data is sent to the VRM Portal. When there is no internet connection available, the Venus GX will store the data internally, up to 48 hours. By inserting a micro SD-card or USB stick, more data can be stored. These files can then be uploaded to the VRM Portal, or offline converted with the VictronConnect app, for analysis.

SSuuppppoorrtteedd pprroodduucctts

- Multis and Quattros, including split-phase and three-phase systems. Monitoring and control (on/off and current limiter). Changing configuration is possible (only remotely via the internet, not without an internet connection).
- EasySolar 1600VA
- BlueSolar MPPT Solar Chargers with a VE.Direct port.
- BlueSolar MPPT 150/70 and the MPPT 150/85 with VE.Can port.
- SmartSolar MPPT 150/70 and the MPPT 150/100 with VE.Can port. When multiple BlueSolar MPPTs or SmartSolar MPPTs with VE.Can are used in parallel, all the information is combined as one. See also our blog-post about synchronizing multiple MPPT 150/70 solar chargers.
- BMV-700 family can be connected directly to the VE.Direct ports on the Venus GX. Use the VE.Direct Cable for this.
- BMV-600 family can be connected to the VE.Direct ports on the Venus GX. Requires an accessory cable.
- Lynx Ion + Shunt
- Lynx Ion BMS
- Lynx Shunt VE.Can
- Skylla-i battery chargers
- NMEA2000 tank sensors
- A USB GPS can be connected to the USB port. The data is sent to the VRM Portal for tracking purposes. The map on VRM will show the latest position.
- Fronius PV Inverters

When more than two VE.Direct products must be connected, USB can be used.

Internet connection

The Venus GX can be connected to internet with an Ethernet cable and via Wi-Fi. The Venus GX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

Tank level inputs

The tank level inputs are resistive: connect them to a resistive tank sender. Such tank senders are not supplied by Victron. The tank level ports can each be configured to work with either European tank senders (0 - 180 Ohm), or US (240 - 30 Ohm).

Other highlights

- The Venus GX can automatically update itself from the internet, when there is a new software version available.
- Multiple languages: English, Czech, German, Spanish, French, Italian, Dutch, Russian, Swedish, Turkish, Chinese, Arabic.
- Use the Venus GX as a Modbus-TCP gateway to all connected Victron products. See our Modbus-TCP FAQ for more information.
- Powered by the Venus OS – embedded linux.

Venus GX			
Power supply voltage range	8 – 70V DC		
Current Draw	210 mA @ 12V	110 mA @ 24V	60 mA @ 48V
Communication ports			
VE.Direct	2 separate VE.Direct ports – isolated		
VE.Can	2 paralleled RJ45 sockets – isolated		
CAN	2nd CAN interface – non isolated		
VE.Bus	2 paralleled RJ45 sockets – isolated		
USB	2 USB Host ports – not isolated		
Ethernet	10/100/1000MB RJ45 socket – isolated except shield		
WiFi Access Point	Use to connect to Remote Console		
WiFi Client	Connect the Venux GX to an existing WiFi network		
IO			
Potential free contact	NO/COM/NC – 6 A 250 VAC/30 VDC		
Tank level inputs	3 x Configurable for European (0 - 180 Ohm) or US (240 - 30 Ohm)		
Temperature level inputs	2 x Requires ASS000001000.		
3rd party interfacing			
Modbus-TCP	Use Modbus-TCP to monitor and control all products connected to the Venus GX		
JSON	Use the VRM JSON API to retrieve data from the VRM Portal		
Other			
Outer dimensions (h x w x d)	45 x 143 x 96		
Operating temperature range	-20 to +50°C		
Standards			
Safety	EN 60950-1:2005+A1:2009+A2:2013		
EMC	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2		
Automotive	In progress		

BMV-700 series: Precision battery monitoring

BMV-700

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

BMV-702 Black

BMV-700H

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

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

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

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

Bluetooth Smart

Use the Bluetooth Smart dongle to monitor your batteries on Apple or Android smartphones, tablets, macbooks and other devices.

Easy to install

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

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

Easy to program (with your smartphone!)

A quick install menu and a detailed setup menu with scrolling texts assist the user when going through the various settings.

Alternatively, choose the fast and easy solution: download the smartphone app (Bluetooth Smart dongle needed)

Midpoint voltage monitoring (BMV-702 only)

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

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

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

Standard features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events**,** which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 95V
- High current measurement resolution: 10 mA (0,01A)
- Low current consumption: 2,9Ah per month (4mA) @12V and 2,2Ah per month (3mA) @ 24V

BMV-702 additional features

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

BMV-700H: 60 to 385 VDC voltage range

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

Other battery monitoring options

- Lynx Shunt VE.Can

More about midpoint voltage

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our Battery Balancer (BMS012201000) to maximize service life of series-connected batteries.

Battery Monitor	BMV-700	BMV-702 BMV-702 BLACK	BMV-700H
Supply voltage range	6,5 - 95 VDC	6,5 - 95 VDC	60 – 385 VDC
Current draw, back light off	< 4mA	< 4mA	< 4mA
Input voltage range, auxiliary battery	n. a.	6,5 - 95 VDC	n. a.
Battery capacity (Ah)	1 - 9999 Ah		
Operating temperature range	-40 +50°C (-40 - 120°F)		
Measures voltage of second battery, or temperature, or midpoint	No	Yes	No
Temperature measurement range	-20 +50°C		n. a.
VE.Direct communication port	Yes	Yes	Yes
Relay	60V / 1A normally open (function can be inverted)		
RESOLUTION & ACCURACY (with a 500 A shunt)			
Current	± 0,01A		
Voltage	± 0,01V		
Amp hours	± 0,1 Ah		
State of charge (0 – 100%)	± 0,1%		
Time to go	± 1 min		
Temperature (0 - 50°C or 30 - 120°F)	n. a.	± 1°C/°F	n. a.
Accuracy of current measurement	± 0,4%		
Accuracy of voltage measurement	± 0,3%		
INSTALLATION & DIMENSIONS			
Installation	Flush mount		
Front	63mm diameter		
Front bezel	69 x 69mm (2.7 x 2.7 inch)		
Body diameter and depth	52mm (2.0 inch) and 31mm (1.2 inch)		
Protection category	IP55 (not intended for outdoor use)		
STANDARDS			
Safety	EN 60335-1		
Emission / Immunity	EN 55014-1 / EN 55014-2		
Automotive	ECE R10-4 / EN 50498		
ACCESSORIES			
Shunt (included)	500A / 50mV		
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection		
Temperature sensor	Optional (ASS000100000)		

1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 70x to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to a Color Control GX or to a computer.

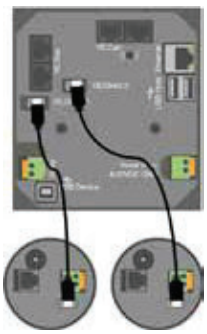
With the **VE.Direct to Bluetooth Smart dongle** real time data and alarms can be displayed on Apple and Android smartphones, tablets, macbooks and other devices.

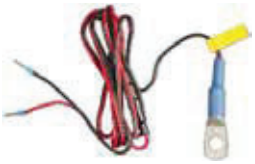
Also use your smartphone to adjust settings!

(the VE.Direct to Bluetooth Smart dongle must be ordered separately)

See the VictronConnect BMV app Discovery Sheet for more screenshots

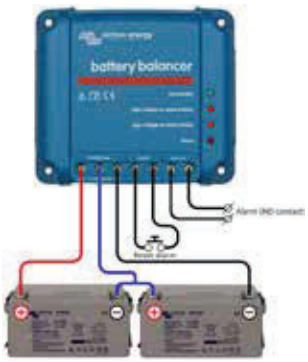
Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.





Temperature sensor

A maximum of four BMVs can be connected directly to a Color Control GX.
Even more BMVs can be connected to a USB Hub for central monitoring.



Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

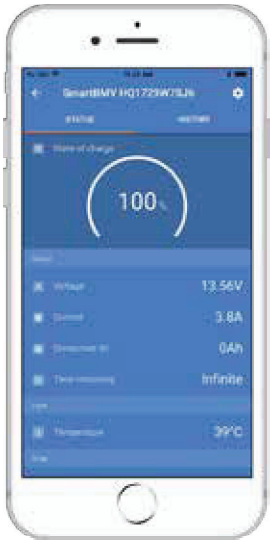
A 48V battery bank can be balanced with three Battery Balancers.

BMV-712 Smart: Bluetooth inside

BMV-712 Smart

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb



See the VictronConnect BMV app Discovery Sheet for more screenshots

Bluetooth inside

With Bluetooth built-in, the BMV Smart is ready for the Internet of Things (IoT) era. With Bluetooth being implemented in most other Victron Energy products, wireless communication between products will simplify system installation and enhance performance.

Download the Victron Bluetooth app

Use a smartphone or other Bluetooth enabled device to

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Easy to install

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

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

Midpoint voltage monitoring

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our **Battery Balancer** (BMS012201000) to maximize service life of series-connected lead-acid batteries.

Very low current draw from the battery

Current consumption: 0,7Ah per month (1mA) @12V and 0,6Ah per month (0,8mA) @ 24V
Especially Li-ion batteries have virtually no capacity left when discharged until low voltage shutdown. After shutdown due to low cell voltage, the capacity reserve of a Li-ion battery is approximately 1Ah per 100Ah battery capacity. The battery will be damaged if the remaining capacity reserve is drawn from the battery. A residual current of 10mA for example may damage a 200Ah battery if the system is left in discharged state during more than 8 days.

Bi-stable alarm relay

Prevents increased current draw in case of an alarm.

Other features

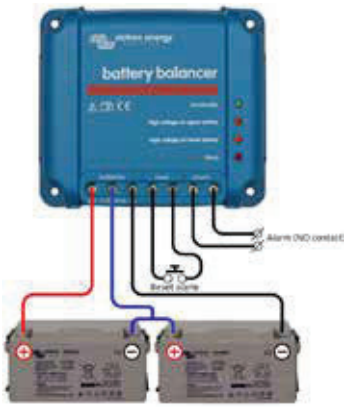
- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10.000 Amps
- VE.Direct communication port
- Stores a wide range of historical events, which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6,5 – 70V
- High current measurement resolution: 10 mA (0,01A)
- Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings

Battery Monitor	BMV-712 Smart
Supply voltage range	6,5 - 70 VDC
Current draw, back light off	< 1mA
Input voltage range, auxiliary battery	6,5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50°C (-40 - 120°F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50°C
VE.Direct communication port	Yes
Bistable relay	60V / 1A normally open (function can be inverted)
RESOLUTION & ACCURACY (with a 500 A shunt)	
Current	± 0,01A
Voltage	± 0,01V
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)	± 1°C/°F
Accuracy of current measurement	± 0,4%
Accuracy of voltage measurement	± 0,3%
INSTALLATION & DIMENSIONS	
Installation	Flush mount
Front	63mm diameter
Front bezel	69 x 69mm (2.7 x 2.7 inch)
Body diameter and depth	52mm (2.0 inch) and 31mm (1.2 inch)
Protection category	IP55 (not intended for outdoor use)
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN 55014-1 / EN 55014-2
Automotive	ECE R10-4 / EN 50498
ACCESSORIES	
Shunt (included)	500A / 50mV
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with fuse for '+' connection
Temperature sensor	Optional (ASS000100000)

1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 712 to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to a Color Control GX or to a computer.

Temperature sensor



Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

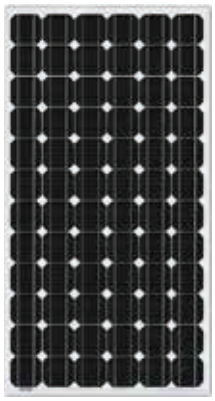
A 48V battery bank can be balanced with three Battery Balancers.

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.

A maximum of four BMVs can be connected directly to a Color Control GX.
Even more BMVs can be connected to a USB Hub for central monitoring.

Venus GX
The Venus GX provides intuitive control and monitoring. It has the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

BlueSolar monocrystalline panels



BlueSolar Monocrystalline 305W

- 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.
- 5-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 aluminium 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.
- High power models with pre-wired quick-connect system with MC4 (PV-ST01) connectors.

MC4 connectors

Article Number	Description	Net Weight	Electrical data under STC (1)				
			Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-Circuit Current
			PMPP	VMPP	IMPP	Voc	Isc
		Kg	W	V	A	V	A
SPM040201200	20W-12V Mono 440 x 350 x 25mm series 4a	1.9	20	18.5	1.09	22.6	1.19
SPM040301200	30W-12V Mono 560 x 350 x 25mm series 4a	2.2	30	18.7	1.61	22.87	1.76
SPM040401200	40W-12V Mono 425 x 668 x 25mm series 4a	3.1	40	18.3	2.19	22.45	2.40
SPM040551200	55W-12V Mono 545 x 668 x 25mm series 4a	4	55	18.8	2.94	22.9	3.22
SPM040901200	90W-12V Mono 780 x 668 x 30mm series 4a	6.1	90	19.6	4.59	24.06	5.03
SPM041151200	115W-12V Mono 1015 x 668 x 30mm series 4a	8	115	19.0	6.04	23.32	6.61
SPM041751200	175W-12V Mono 1485 x 668 x 30mm series 4a	11	175	19.4	9.03	23.7	9.89
SPM042152400	215W-24V Mono 1580 x 808 x 35mm series 4a	15	215	37.4	5.75	45.82	6.30
SPM043052000	305W-20V Mono 1640 x 992 x 35mm series 4a	18	305	32.5	9.38	39.7	10.27
SPM043602400	360W-24V Mono 1956 x 992 x 40mm series 4a	22	360	38.4	9.38	47.4	10.24

Module	SPM 040201200	SPM 040301200	SPM 04040120	SPM 040551200	SPM 040901200	SPM 041151200	SPM 041751200	SPM 042152400	SPM 043052000	SPM 043602400
Nominal Power (±3% tolerance)	20W	30W	40W	55W	90W	115W	175W	215W	305W	360W
Cell type	Monocrystalline									
Number of cells in series	36							72	60	72
Maximum system voltage	1000V									
Temperature coefficient of MPP (%)	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C
Temperature coefficient of Voc (%)	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C
Temperature coefficient of Isc (%)	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C
Temperature Range	-40°C to +85°C									
Surface Maximum Load Capacity	200 kg/m²									
Allowable Hail Load	23 m/s, 7.53 g									
Junction Box Type	PV-LH0805	PV-LH0806			PV-LH0801	PV-LH0808		PV-LH0701	PV-JB002	
Length of Cables / Connector Type	No cable				900 mm MC4					
Output tolerance	+/-3%									
Frame	Aluminium									
Product warranty	5 years									
Warranty on electrical performance	10 years 90% + 25 years 80% of power output									

BlueSolar Polycrystalline 175W

- 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.
- 5-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 aluminium 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.
- High power models with pre-wired quick-connect system with MC4 (PV-ST01) connectors.

MC4 connectors

Article Number	Description	Net 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
		Kg	W	V	A	V	A
SPP040201200	20W-12V Poly 440 x 350 x 25mm series 4a	1.9	20	18.4	1.09	21.96	1.18
SPP040301200	30W-12V Poly 655 x 350 x 25mm series 4a	2.8	30	18.2	1.66	21.80	1.80
SPP040451200	45W-12V Poly 425 x 668 x 25mm series 4a	3.1	45	19.1	2.36	22.90	2.55
SPP040601200	60W-12V Poly 545 x 668 x 25mm series 4a	4	60	19.3	3.12	23.10	3.37
SPP040901200	90W-12V Poly 780 x 668 x 30mm series 4a	6.1	90	19.5	4.61	23.44	4.98
SPP041151200	115W-12V Poly 1015 x 668 x 30mm series 4a	8	115	18.94	6.08	22.73	6.56
SPP041751200	175W-12V Poly 1485 x 668 x 30mm series 4a	12	175	18,3	9.56	21.9	10.24
SPP032602000	260W-20V Poly 1640 x 992 x 40mm series 3a	17	260	30	8.66	36.75	9.30
SPP042702000	270W-20V Poly 1640 x 992 x 35mm series 4a	18.4	270	31.7	8.52	38.04	9.21
SPP043302400	330W-24V Poly 1956 x 992 x 40mm series 4a	22.5	330	37.3	8.86	44.72	9.57

Module	SPP 040201200	SPP 040301200	SPP 040451200	SPP 040601200	SPP 040901200	SPP 041151200	SPP 041751200	SPP 032601200	SPP 042702000	SPP 043302400
Nominal Power (± 3% tolerance)	20W	30W	45W	60W	90W	115W	175W	260W	270W	330W
Cell type	Polycrystalline									
Number of cells in series	36							60	60	72
Maximum system voltage (V)	1000V									
Temperature coefficient of PMPP (%)	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.47/°C	-0.45/°C
Temperature coefficient of Voc (%)	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.34/°C	-0.35/°C
Temperature coefficient of Isc (%)	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.045/°C	+0.04/°C
Temperature Range	-40°C to +85°C									
Surface Maximum Load Capacity	200 kg/m²									
Allowable Hail Load	23 m/s, 7.53 g									
Junction Box Type	PV-LH0805	PV-LH0806			PV-LH0801	PV-LH0808			PV-JB002	
Length of Cable / connector	No cable				900 mm / MC4					
Output tolerance	+/-3%									
Frame	Aluminium									
Product warranty	5 years									
Warranty on electrical performance	10 years 90% + 25 years 80% of power output									
Smallest packaging unit	1 panel									
Quantity per pallet	380	240	180	140	90	80	36	20	32	37

1) STC (Standard Test Conditions): 1000 W/m², 25°C, AM (Air Mass) 1.5

BlueSolar & Smartsolar charge controllers MPPT - Overview

BlueSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/30	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	M
100/50	No	12/24	MPPT control	Optional dongle	VE.Direct	No	No	M
150/35	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	M
150/45-Tr	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/45-MC4	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-Tr	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	12/24/36/48	MPPT control	Optional dongle	VE.Direct	No	No	L

SmartSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20	20A	12/24	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/20-48V	1A	48	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	12/24	MPPT control	Built-in	VE.Direct	No	No	M
100/50	No	12/24	MPPT control	Built-in	VE.Direct	No	No	M
150/35	No	12/24/36/48	MPPT control	Built-in	VE.Direct	No	No	M
150/45-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/45-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr-CAN	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/85-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/85-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
150/100-Tr-CAN	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/60-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/60-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/85-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/85-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/100-Tr	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL
250/100-MC4	No	12/24/36/48	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	XL

Color Control GX

Venus GX

Octo GX

Smart Battery Sense

VE.Direct Bluetooth Smart Dongle

VE.Direct to USB interface

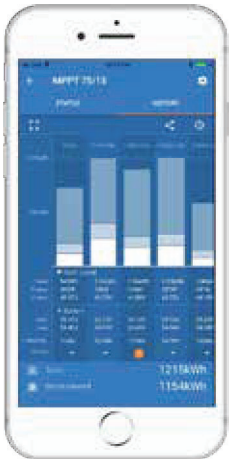
With load output

SmartSolar charge controller MPPT 75/10, 75/15, 100/15, 100/20, 100/20_48V

SmartSolar Charge Controller
MPPT 75/15

Bluetooth sensing
Smart Battery Sense

Bluetooth sensing
BMV-712 Smart Battery Monitor



Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

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

Load output
Over-discharge of the battery can be prevented by connecting all loads to the load output. The load output will disconnect the load when the battery has been discharged to a pre-set voltage (48V model: interface with a relay).
Alternatively, an intelligent battery management algorithm can be chosen: see Battery Life.
The load output is short circuit proof.

Battery Life: intelligent battery management
When a solar charge controller is not able to recharge the battery to its full capacity within one day, the result is often that the battery will continually be cycled between a 'partially charged' state and the 'end of discharge' state. This mode of operation (no regular full recharge) will destroy a lead-acid battery within weeks or months.
The Battery Life algorithm will monitor the state of charge of the battery and, if needed, day by day slightly increase the load disconnect level (i.e. disconnect the load earlier) until the harvested solar energy is sufficient to recharge the battery to nearly the full 100%. From that point onwards, the load disconnect level will be modulated so that a nearly 100% recharge is achieved about once every week.

Programmable battery charge algorithm
See the software section on our website for details

Day/night timing and light dimming option
See the software section on our website for details

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

SmartSolar Charge Controller	MPPT 75/10	MPPT 75/15	MPPT 100/15	MPPT 100/20	MPPT100/20-48V
Battery voltage (auto select)	12/24V				12/24/48V
Rated charge current	10A	15A	15A	20A	20A
Nominal PV power, 12V 1a,b)	145W	220W	220W	290W	290W
Nominal PV power, 24V 1a,b)	290W	440W	440W	580W	580W
Nominal PV power, 48V 1a,b)	n. a.	n. a.	n. a.	n. a.	1160W
Max. PV short circuit current 2)	13A	15A	15A	20A	20A
Automatic load disconnect	Yes				
Max. PV open circuit voltage	75V		100V		
Peak efficiency	98%				
Self-consumption	12V: 25 mA 24V: 15 mA				25 / 15 / 10 mA
Charge voltage 'absorption'	14,4V / 28,8V (adjustable)				14,4V / 28,8V / 57,6V (adj.)
Charge voltage 'float'	13,8V / 27,6V (adjustable)				13,8V / 27,6V / 55,2V (adj.)
Charge algorithm	multi-stage adaptive				
Temperature compensation	-16 mV / °C resp. -32 mV / °C				
Max. continuous load current	15A			20A	20A / 20A / 1A
Low voltage load disconnect	11,1V / 22,2V / 44,4V or 11,8V / 23,6V / 47,2V or Battery Life algorithm				
Low voltage load reconnect	13,1V / 26,2V / 52,4V or 14V / 28V / 56V or Battery Life algorithm				
Protection	Output short circuit / Over temperature				
Operating temperature	-30 to +60°C (full rated output up to 40°C)				
Humidity	95%, non-condensing				
Data communication port	VE.Direct (see the data communication white paper on our website)				
ENCLOSURE					
Colour	Blue (RAL 5012)				
Power terminals	6 mm² / AWG10				
Protection category	IP43 (electronic components), IP22 (connection area)				
Weight	0,5 kg		0,6 kg	0,65 kg	
Dimensions (h x w x d)	100 x 113 x 40 mm		100 x 113 x 50 mm	100 x 113 x 60 mm	
STANDARDS					
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2				

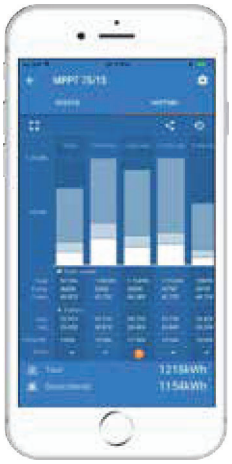
1a) If more PV power is connected, the controller will limit input power.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V
2) A PV array with a higher short circuit current may damage the controller.

SmartSolar charge controller MPPT 100/30 & 100/50

SmartSolar Charge Controller
MPPT 100/50

Bluetooth sensing
Smart Battery Sense

Bluetooth sensing
BMV-712 Smart Battery Monitor



Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

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

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight pre-programmed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

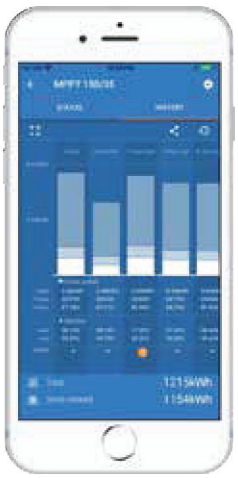
SmartSolar Charge Controller	MPPT 100/30	MPPT 100/50
Battery voltage	12/24V Auto Select	
Rated charge current	30A	50A
Nominal PV power, 12V 1a,b)	440W	700W
Nominal PV power, 24V 1a,b)	880W	1400W
Maximum PV open circuit voltage	100V	100V
Max. PV short circuit current 2)	35A	60A
Maximum efficiency	98%	98%
Self-consumption	12V: 30 mA 24V: 20 mA	
Charge voltage 'absorption'	Default setting: 14,4V / 28,8V (adjustable)	
Charge voltage 'float'	Default setting: 13,8V / 27,6V (adjustable)	
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Protection	PV reverse polarity Output short circuit Over temperature	
Operating temperature	-30 to +60°C (full rated output up to 40°C)	
Humidity	95%, non-condensing	
Data communication port	VE.Direct See the data communication white paper on our website	
ENCLOSURE		
Colour	Blue (RAL 5012)	
Power terminals	16 mm^2 / AWG6	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	1,3 kg	
Dimensions (h x w x d)	130 x 186 x 70 mm	
STANDARDS		
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2	

1a) If more PV power is connected, the controller will limit input power.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V.
2) A PV array with a higher short circuit current may damage the controller.

SmartSolar Charge Controller
MPPT 150/35

Bluetooth sensing
Smart Battery Sense

Bluetooth sensing
BMV-712 Smart Battery Monitor



Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative BlueSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

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

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight preprogrammed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage
for temperature.

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

SmartSolar Charge Controller	MPPT 150/35
Battery voltage	12 / 24 / 48V Auto Select (software tool needed to select 36V)
Rated charge current	35A
Nominal PV power 1a, b)	12V: 500W / 24V: 1000W / 36V: 1500W / 48V: 2000W
Max. PV short circuit current 2)	40A
Maximum PV open circuit voltage	150V absolute maximum coldest conditions 145V start-up and operating maximum
Maximum efficiency	98%
Self-consumption	12V: 20mA 24V: 15mA 48V: 10mA
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6V (adjustable)
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2V (adjustable)
Charge algorithm	multi-stage adaptive (eight pre-programmed algorithms)
Temperature compensation	-16 mV / -32 mV / -64 mV / °C
Protection	PV reverse polarity Output short circuit Over-temperature
Operating temperature	-30 to +60°C (full rated output up to 40°C)
Humidity	95%, non-condensing
Data communication port	VE.Direct See the data communication white paper on our website
ENCLOSURE	
Colour	Blue (RAL 5012)
Power terminals	16 mm² / AWG6
Protection category	IP43 (electronic components), IP22 (connection area)
Weight	1,25 kg
Dimensions (h x w x d)	130 x 186 x 70 mm
STANDARDS	
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2

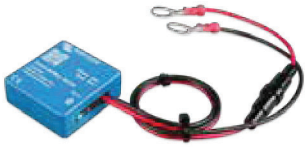
1a) If more PV power is connected, the controller will limit input power.
1b) The PV voltage must exceed Vbat + 5V for the controller to start.
Thereafter the minimum PV voltage is Vbat + 1V.
2) A PV array with a higher short circuit current may damage the controller.

SmartSolar charge controller MPPT 150/45 up to MPPT 150/100

with screw- or MC4 PV connection

SmartSolar Charge Controller
MPPT 150/100-Tr
with optional pluggable display

SmartSolar Charge Controller
MPPT 150/100-MC4
without display



Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points (MPP) may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative SmartSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

Outstanding conversion efficiency
No cooling fan. Maximum efficiency exceeds 98%.

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight pre-programmed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

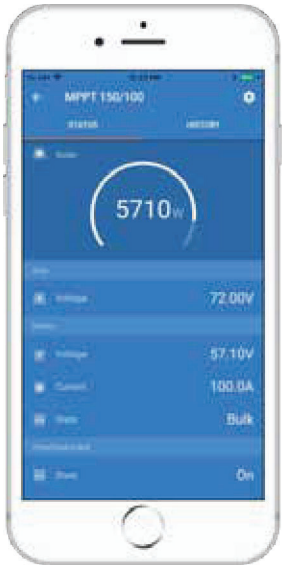
VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

Remote on-off
To connect for example to a VE.BUS BMS.

Programmable relay
Can be programmed to trip on an alarm, or other events.

Optional: SmartSolar pluggable LCD display
Simply remove the rubber seal that protects the plug on the front of the controller, and plug-in the display.

SmartSolar pluggable display



SmartSolar Charge Controller
MPPT 250/100-Tr
with optional pluggable display

SmartSolar Charge Controller
MPPT 250/100-MC4
without display

Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

Advanced Maximum Power Point Detection in case of partial shading conditions
If partial shading occurs, two or more maximum power points (MPP) may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative SmartSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

Outstanding conversion efficiency
No cooling fan. Maximum efficiency exceeds 99%.

Flexible charge algorithm
Fully programmable charge algorithm (see the software page on our website), and eight pre-programmed algorithms, selectable with a rotary switch (see manual for details).

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

Internal temperature sensor
Compensates absorption and float charge voltage for temperature.

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

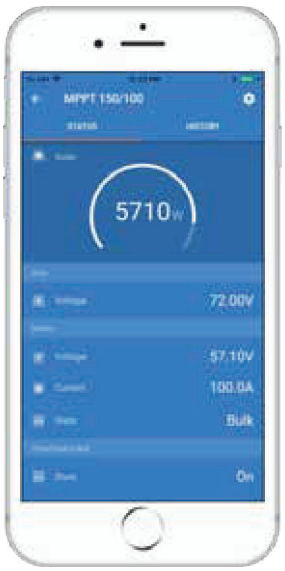
VE.Direct
For a wired data connection to a Color Control GX, other GX products, PC or other devices

Remote on-off
To connect for example to a VE.BUS BMS.

Programmable relay
Can be programmed (a.o. with a smartphone) to trip on an alarm, or other events.

Optional: SmartSolar pluggable LCD display
Simply remove the rubber seal that protects the plug on the front of the controller, and plug-in the display.

SmartSolar pluggable display



BlueSolar PWM-Light charge controllers 12/24V

BlueSolar PWM-Light 10A

Features

- Load output with low battery voltage disconnect function.
- Lighting control function, one timer only.
- Two digit seven segment display for quick and easy setting of the load output functionality, including timer setting.
- Three stage battery charging (bulk, absorption, float), not programmable.
- Load output protected against over load and short circuit.
- Protected against reverse polarity connection of the solar array and/or battery.

Day/night timing options

See manual for details

BlueSolar PWM-Light	12/24-5	12/24-10	12/24-20	12/24-30
Battery Voltage	12/24 V with automatic system voltage detection			
Rated charge current	5A	10A	20A	30A
Automatic load disconnect	Yes			
Maximum solar voltage	28V / 55V (1)			
Self-consumption	< 10 mA			
Load output	Manual control + low voltage disconnect			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Overload protection	Shut down after 60 s in case of 130% load			
	Shut down after 5 s in case of 160% load			
	Short circuit: immediate shut down			
Grounding	Common positive			
Operating temp. range	-20 to +50°C (full load)			
Humidity (non-condensing)	Max 95%			
BATTERY				
Charge voltage 'absorption'	14.2V / 28,4V			
Charge voltage 'float'	13.8V / 27,6V			
Low voltage load disconnect	11,2V / 22,4V			
Low voltage load reconnect	12,6V / 25,2V (manual) 13,1V / 26,2V (automatic)			
ENCLOSURE				
Protection class	IP20			
Terminal size	5 mm² / AWG10			
Weight	0,15kg			0,2kg
Dimensions (h x w x d)	70 x 133 x 33,5 mm (2.8 x 5.3 x 1.3 inch)			
STANDARDS				
Safety	IEC 62109-1			
EMC	EN 61000-6-1, EN 61000-6-3, ISO 7637-2			

1) For 12V use 36 cell solar panels
For 24V use 72 cell solar panels
or 2x 36 cell in series

2) The controller switches to the lower float voltage level 2 hours after the absorption voltage has been reached.
Whenever the battery voltage becomes lower than 13V, a new charge cycle is triggered.

BlueSolar PWM-Pro 10A

BlueSolar Pro Remote Panel

Programmable

The BlueSolar PWM-Pro series is ready for use with its default settings.
It also is fully programmable:

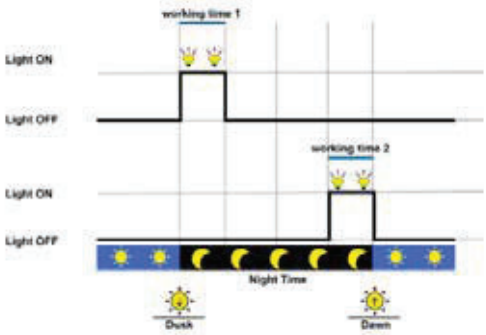
- With help of a computer and software (available free of charge from our website)
- With the dedicated BlueSolar Pro Remote Panel (see features below).

Features

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

Day/night timing options

See Remote Panel manual for details



BlueSolar PWM-Pro	12/24-5	12/24-10	12/24-20	12/24-30
Battery Voltage	12/24V with automatic system voltage detection			
Rated charge current	5A	10A	20A	30A
Automatic load disconnect	Yes			
Maximum solar voltage	28V / 55V (1)			
Self-consumption	< 10mA			
Load output	Manual control + low voltage disconnect			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Battery temperature sensor	Optional (article SCC940100100)			
Temperature compensation	-30 mV / °C resp. -60 mV / °C (if temperature sensor installed)			
Remote panel	Optional (article SCC900300000)			
Grounding	Common positive			
Operating temp. range	-20 to +50°C			
Humidity (non-condensing)	Max 98%			
DEFAULT SETTINGS				
Absorption charge (2)	14.4V / 28,8V			
Float charge (2)	13.8V / 27,6V			
Equalization charge (2)	14,6V / 29,2V			
Low voltage load disconnect	11,1V / 22,2V			
Low voltage load reconnect	12,6V / 25,2V			
ENCLOSURE				
Terminal size	4mm²	4mm²	10mm²	10mm²
Protection category	IP30			
Weight	0,13kg	0,13kg	0,3kg	0,5kg
Dimensions (h x w x d)	138x70x37 mm 5.4x2.7x1.4 inch	138x70x37 mm 5.4x2.7x1.4 inch	160x82x48 mm 6.3x3.2x1.9 inch	200x100x57 mm 7.9x4.0x2.3 inch
STANDARDS				
Safety	IEC 62109-1			
Emission	EN 61000-6-1, EN 61000-6-3, ISO 7637-2			

1) For 12V use 36 cell Solar panels
For 24V use 72 cell Solar panels

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

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

The Solution: battery balancing

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

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

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three Battery Balancers.

LED indicators

Green: on (battery voltage > 27,3V)

Orange: lower battery leg active (deviation > 0,1V)

Orange: upper battery leg active (deviation > 0,1V)

Red: alarm (deviation > 0,2V). Remains on until the deviation has reduced to less than 0,14V, or until system voltage drops to less than 26,6V.

Alarm relay

Normally open. The alarm relay closes when the red LED switches on and opens when the red LED switches off.

Alarm reset

Two terminals are available to connect a push button. Interconnecting the two terminals resets the relay.

The reset condition will remain active until the alarm is over. Thereafter the relay will close again when a new alarm occurs.

Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

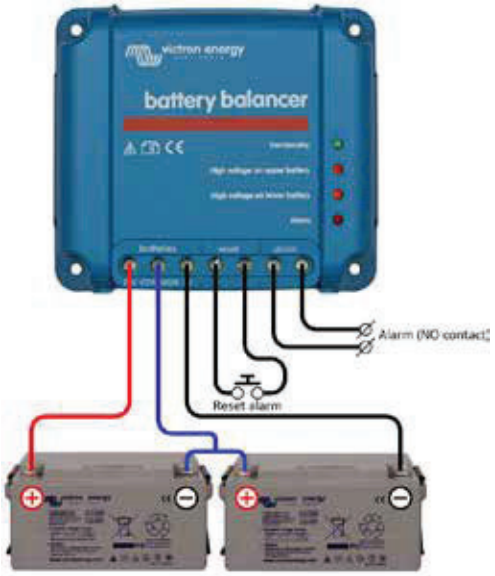
The BMV-702 measures the midpoint of a string of cells or batteries. It displays the deviation from the ideal midpoint in volts or percent.

Separate deviation percentages can be set to trigger a visual/audible alarm and to close a potential free relay contact for remote alarm purposes.

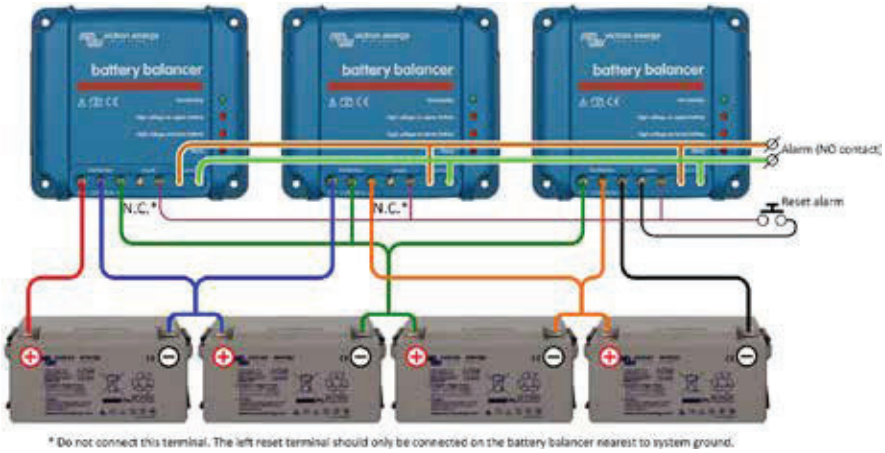
Please see the manual of the BMV-702 for more information about battery balancing.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'

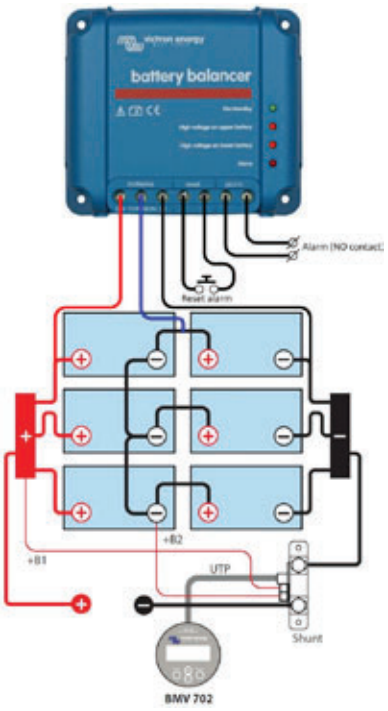


Battery Balancer connected to two series connected 12V batteries (24V system)



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

Victron Battery Balancer	
Input voltage range	Up to 18V per battery, 36V total
Turn on level	27,3V +/- 1%
Turn off level	26,6V +/- 1%
Current draw when off	0,7 mA
Midpoint deviation to start balancing	50 mV
Maximum balancing current	0,7A (when deviation > 100 mV)
Alarm trigger level	200 mV
Alarm reset level	140 mV
Alarm relay	60V / 1A normally open
Alarm relay reset	Two terminals to connect a push button
Over temperature protection	yes
Operating temperature	-30 to +50°C
Humidity (non-condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm² / AWG10
Protection category	IP22
Weight	0,4 kg
Dimensions (h x w x d)	100 x 113 x 47 mm
STANDARDS	
Safety	EN 60950, CSA/UL 62368-1
Emission	EN 61000-6-3, EN 55014-1
Immunity	EN 61000-6-2, EN 61000-6-1, EN 55014-2
Automotive Directive	EN 50498



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

Installation

1) The Battery Balancer(s) must be installed on a well-ventilated vertical surface close to the batteries (but, due to possible corrosive gasses, not above the batteries!)
2) **In case of series-parallel connection, the midpoint interconnecting cables must be sized to at least carry the current that arises when one battery becomes open-circuited.**
   - In case of 2 parallel strings: cross section 50% of the series interconnecting cables.
   - In case of 3 parallel strings: cross section 33% of the series interconnecting cables, etc.
3) If required: first wire the alarm contact and the alarm reset.
4) Use at least 0,75 mm² to wire the negative, positive and midpoint connections (in this order). Additionally, if in your application it is needed to comply with UL, also fuse these wires near the batteries with a 10A fuse suitable for DC current (e.g. Littelfuse ATOF series automotive blade fuse in combination with an inline fuse holder).
5) The balancer is operational.
   When the voltage over a string of two batteries is less than 26,6V the balancer switches to standby and all LEDs will be off.
   When the voltage over a string of two batteries increases to more than 27,3V (during charging) the green LED will turn on, indicating that the balancer is on.
   When on, a voltage deviation of more than 50 mV will start the balancing process and at 100 mV one of the two orange LEDs will turn on. A deviation of more than 200 mV will trigger the alarm relay.

What to do in case of an alarm during charging

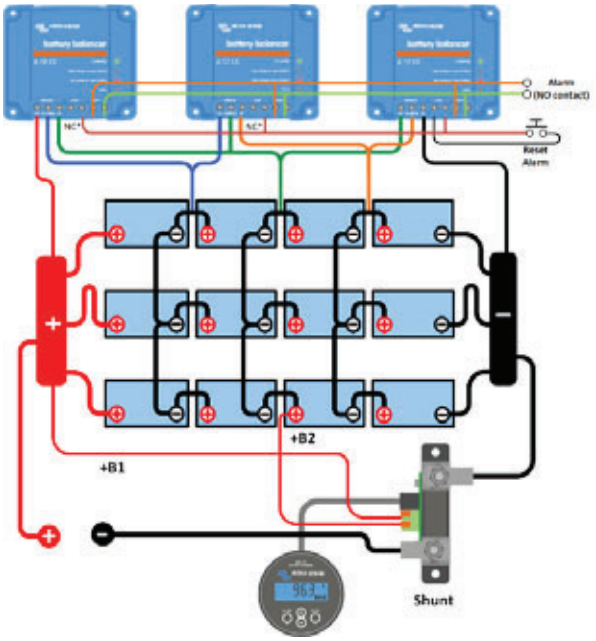
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially and allow the batteries to equalize over time.

If the problem persists after several charge-discharge cycles:

a) In case of series-parallel connection disconnect the midpoint parallel connection wiring and measure the individual midpoint voltages during absorption charge to isolate batteries or cells which need additional charging, or:
b) Charge and then test all batteries or cells individually or:
c) Connect two or more battery balancers in parallel (on average one balancer will take care of up to three parallel 200 Ah strings).

In case of an older battery bank which has performed well in the past, the problem may be due to:

d) Systematic undercharge: more frequent charging needed (VRLA batteries), or equalization charge needed (flooded deep cycle flat plate or OPzS batteries). Better and regular charging will solve the problem.
e) One or more faulty cells: replace all batteries.



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

Telecom batteries

Telecom Battery
Battery AGM 12V 200Ah

Designed for telecom applications; excellent 'floor space savers' for marine and vehicle applications

The deep cycle AGM telecom series has been designed for use in telecom systems. With front access terminals and small footprint, the batteries are ideal for racked systems. Similarly, these batteries can help solve limited floor space and access problems on board boats and vehicles.

AGM technology

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action.

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 by 10°C.

Low internal resistance

Accepts very high charge and discharge rates.

High cyclic life capability

More than 500 cycles at 50% depth of discharge.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'

Telecom Battery
Battery AGM 12V 200Ah

12V AGM Telecom battery	115Ah	165Ah	200Ah
Capacity 1 / 3 / 5 / 10 / 20 hours (% of nominal)	60 / 75 / 82 / 91 / 100 (@ 70°F/25°C, end of discharge 10,5V)		
Capacity 10 / 20 / 30 / 40 minutes (% of nominal)	33 / 44 / 53 / 57 (@ 70°F/25°C, end of discharge 9,6V)		
Nominal capacity (77°F/25°C, 10,5V)	115Ah	165Ah	200Ah
Cold Cranking Amps @ 0°F/-18°C	1000	1500	1800
DIN cold start current (A) @ 0°F/-18°C	600	900	1000
Short Circuit Current (A)	3500	5000	6000
Reserve Capacity (minutes)	200	320	400
Shelf life @ 70°F/20°C	1 year		
Absorption voltage (V) @ 70°F/20°C	14,4 – 14,7		
Float voltage (V) @ 70°F/20°C	13,6 – 13,8		
Storage voltage (V) @ 70°F/20°C	13,2		
Float design life @ 70°F/20°C	12 years		
Cycle design life @ 80% discharge	500		
Cycle design life @ 50% discharge	750		
Cycle design life @ 30% discharge	1800		
Dimensions (lxwxh, mm)	395 x 110 x 293mm	548 x 105 x 316mm	546 x 125 x 323mm
Dimensions (lxwxh, inches)	15.37 x 4.33 x 11.53	21.57 x 4.13 x 12.44	21.49 x 4.92 x 12.71
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	60kg/132lbs

OPzS Solar Batteries 910

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 61427.

Low maintenance

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

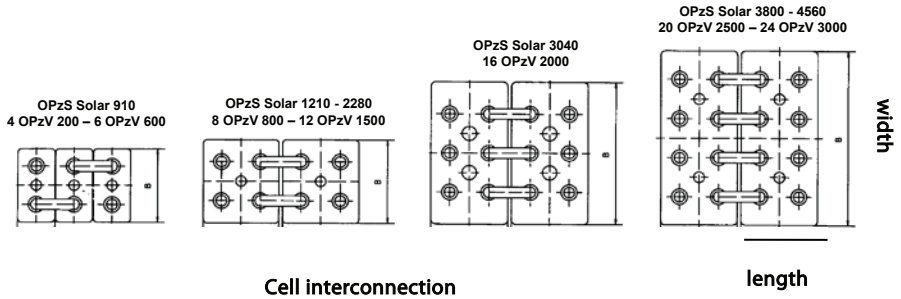
Dry-charged or ready for use electrolyte filled

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 sulfuric 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'

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 (120hr / 20ºC)	910Ah	1210Ah	1520Ah	1830Ah	2280Ah	3040Ah	3800Ah	4560Ah
Capacity (10 hr / 20ºC)	640Ah	853Ah	1065Ah	1278Ah	1613Ah	2143Ah	2675Ah	3208Ah
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 2,50V/cell (28,2 to 30,0V for a 24 Volt battery)							
Float voltage (V) @ 70ºF/20ºC	2,23 to 2,30V/cell (26,8 to 27,6V for a 24 Volt battery)							
Storage voltage (V) @ 70ºF/20ºC	2,18 to 2,22V/cell (26,2 to 26,6V for a 24 Volt battery)							
Float design life @ 70ºF/20ºC	20 years							
Cycle design life @ 80% discharge	1500							
Cycle design life @ 50% discharge	2800							
Cycle design life @ 30% discharge	5200							
Dimensions (lxwxh, mm)	145 x 206 x 711	210 x 191 x 711	210 x 233 x 711	210 x 275 x 711	210 x 275 x 861	212 x 397 x 837	212 x 487 x 837	212 x 576 x 837
Dimensions (lxwxh, inches)	5,7 x 8,1 x 28	8,3 x 7,5 x 28	8,3 x 9,2 x 28	8,3 x 10,8 x 28	8,3 x 10,8 x 33,9	8,4 x15,6 x 32,9	8,4 x 19,2 x 32,9	8,4 x 22,7 x 32,9
Weight without acid (kg / pounds)	35 / 77	46 / 101	57 / 126	66 / 146	88 / 194	115 / 254	145 / 320	170 / 375
Weight with acid (kg / pounds)	50 / 110	65 / 143	80 / 177	93 / 205	119 / 262	160 / 253	200 / 441	240 / 530



A new AGM battery: the AGM Super Cycle battery

A truly innovative battery

The AGM Super Cycle batteries are the result of recent battery electrochemistry developments.
The paste of the positive plates is less sensitive to softening, even in case of repeated 100% discharge of the battery, and new additives to the electrolyte reduce sulfation in case of deep discharge.

Exceptional 100% depth of discharge (DoD) performance

Tests have shown that the Super Cycle battery does withstand at least three hundred 100% DoD cycles.
The tests consist of a daily discharge to 10,8V with $I = 0,2C_{20}$, followed by approximately two hours rest in discharged condition, and then a recharge with $I = 0,2C_{20}$.
The two hours rest period in discharged condition will damage most batteries within 100 cycles, but not the Super Cycle battery.

We recommend the Super Cycle battery for applications where an occasional discharge to 100% DoD, or frequent discharge to 60-80% DoD is expected.

Smaller and lighter

An additional advantage of the new chemistry is a slightly smaller size and less weight compared to our standard deep cycle AGM batteries.

Low internal resistance

The internal resistance is also slightly lower compared to our standard deep cycle AGM batteries.

Recommended charge voltage:

	Float Service	Cycle service Normal	Cycle service Fast recharge
Absorption		14,2 - 14,6 V	14,6 - 14,9 V
Float	13,5 - 13,8 V	13,5 - 13,8 V	13,5 - 13,8 V
Storage	13,2 - 13,5 V	13,2 - 13,5 V	13,2 - 13,5 V

Specifications

Article number	V	Ah C5 (10,8V)	Ah C10 (10,8V)	Ah C20 (10,8V)	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Terminals
BAT412015080	12	13	14	15	151 x 100 x 103	4,1			Faston
BAT412025081	12	22	24	25	181 x 77 x 175	6,5			M5 insert
BAT412038081	12	34	36	38	267 x 77 x 175	9,5			M5 insert
BAT412060081	12	52	56	60	224 x 135 x 178	14	300	90	M5 insert
BAT412110081	12	82	90	100	260 x 168 x 215	26	500	170	M6 insert
BAT412112081	12	105	114	125	330 x 171 x 214	33	550	220	M8 insert
BAT412117081	12	145	153	170	336 x 172 x 280	45	600	290	M8 insert
BAT412123081	12	200	210	230	532 x 207 x 226	57	700	400	M8 insert

Cycle life

≥ 300 cycles @ 100% DoD (discharge to 10,8V with $I = 0,2C_{20}$, followed by approximately two hours rest in discharged condition, and then a recharge with $I = 0,2C_{20}$)
≥ 700 cycles @ 60% DoD (discharge during three hours with $I = 0,2C_{20}$, immediately followed by recharge at $I = 0,2C_{20}$)
≥ 1000 cycles @ 40% DoD (discharge during two hours with $I = 0,2C_{20}$, immediately followed by recharge at $I = 0,2C_{20}$)

Super Cycle Battery 12V 230Ah

Gel and AGM batteries

AGM Battery
12V 90Ah

GEL OPzV 2V cell

1. VRLA technology

VRLA stands for Valve Regulated Lead Acid, which means that 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 high currents 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 by 10°C.
Victron VRLA batteries can therefore be stored for 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.
Nevertheless repeatedly deep and prolonged discharge has a very negative effect 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.

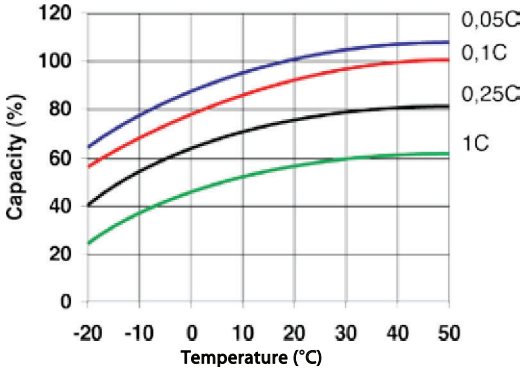


Fig. 1: Effect of temperature on capacity

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.

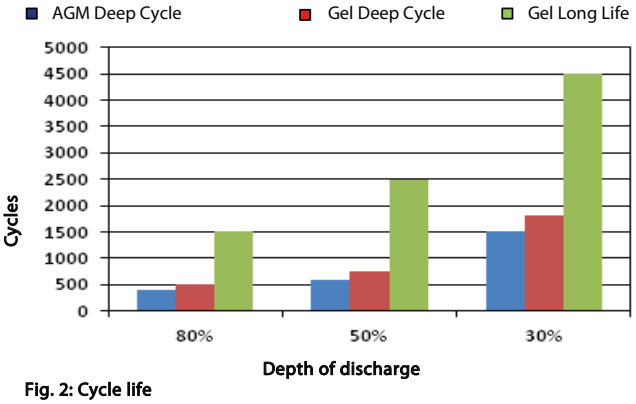


Fig. 2: Cycle life

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.

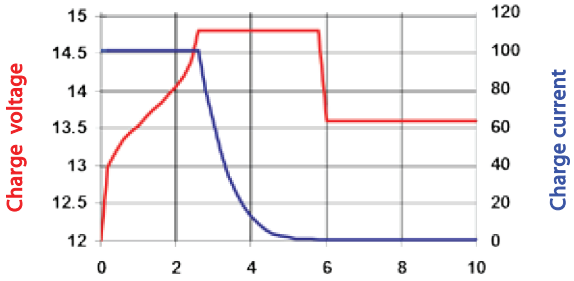


Fig. 3: Three step charge curve

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.

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

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

Victron developed the adaptive charge curve. The 4-step adaptive 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 pre-set 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).

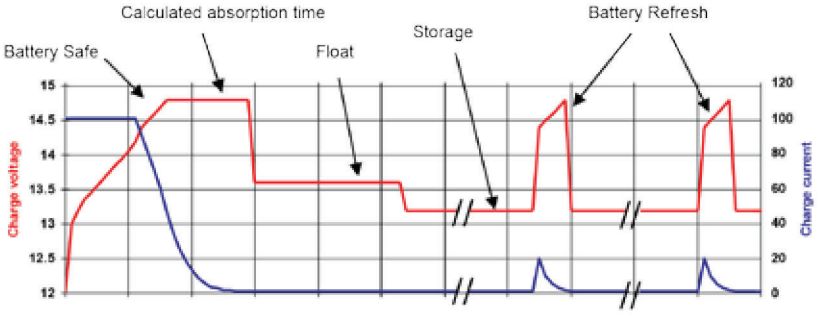


Fig. 4: Four-step adaptive charge curve

13. Optimum charge voltage of Victron VRLA batteries

The recommended charge voltage settings for a 12V 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 12V battery).
The centre point for temperature compensation is 25°C / 70°F.

15. Charge current

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

	Float Service (V)	Cycle service Normal (V)	Cycle service Fastest recharge (V)
Victron AGM 'Deep Cycle'			
Absorption		14,2 - 14,6	14,6 - 14,9
Float	13,5 - 13,8	13,5 - 13,8	13,5 - 13,8
Storage	13,2 - 13,5	13,2 - 13,5	13,2 - 13,5
Victron Gel 'Deep Cycle'			
Absorption		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'			
Absorption		14,0 - 14,2	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	

Table 3: Recommended charge voltage

12 Volt Deep Cycle AGM							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate AGM Terminals: copper
BAT406225084	**240**	6	320 x 176 x 247	31	700	270	Rated capacity: 20 hr. discharge at 25°C Float design life: 7-10 years at 20°C Cycle design life: 400 cycles at 80% discharge 600 cycles at 50% discharge 1500 cycles at 30% discharge
BAT212070084	**8**	12	151 x 65 x 101	2,5			
BAT212120084	**14**	12	151 x 98 x 101	4,1			
BAT212200084	**22**	12	181 x 77 x 167	5,8			
BAT412350084	**38**	12	197 x 165 x 170	12,5			
BAT412550084	**60**	12	229 x 138 x 227	20	280	80	
BAT412600084	**66**	12	258 x 166 x 235	24	300	90	
BAT412800084	**90**	12	350 x 167 x 183	27	400	130	
BAT412101084	**110**	12	330 x 171 x 220	32	500	170	
BAT412121084	**130**	12	410 x 176 x 227	38	550	200	
BAT412151084	**165**	12	485 x 172 x 240	47	600	220	
BAT412201084	**220**	12	522 x 238 x 240	65	650	250	
BAT412124081	**240**	12	522 x 240 x 224	67	650	250	

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
BAT412550104	**60**	12	229 x 138 x 227	20	250	70	Rated capacity: 20 hr. discharge at 25°C Float design life: 12 years at 20°C Cycle design life: 500 cycles at 80% discharge 750 cycles at 50% discharge 1800 cycles at 30% discharge
BAT412600100	**66**	12	258 x 166 x 235	24	270	80	
BAT412800104	**90**	12	350 x 167 x 183	26	360	120	
BAT412101104	**110**	12	330 x 171 x 220	33	450	150	
BAT412121104	**130**	12	410 x 176 x 227	38	500	180	
BAT412151104	**165**	12	485 x 172 x 240	48	550	200	
BAT412201104	**220**	12	522 x 238 x 240	66	600	220	
BAT412126101	**265**	12	520 x 268 x 223	75	650	250	

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	145 x 206 x 688	49	Rated capacity: 10 hr. discharge at 25°C Float design life: 20 years at 20°C Cycle design life: 1500 cycles at 80% discharge 2500 cycles at 50% discharge 4500 cycles at 30% discharge
BAT702801260	**800**	2	210 x 191 x 688	65	
BAT702102260	**1000**	2	210 x 233 x 690	80	
BAT702122260	**1200**	2	210 x 275 x 690	93	
BAT702152260	**1500**	2	210 x 275 x 840	115	
BAT702202260	**2000**	2	215 x 400 x 815	155	
BAT702252260	**2500**	2	215 x 490 x 815	200	
BAT702302260	**3000**	2	215 x 580 x 815	235	

Other capacities and terminal types: at request

12,8V 300Ah LiFePO4 Battery

Li-ion app

Why lithium-iron-phosphate?

Lithium-iron-phosphate (LiFePO4 or LFP) is the safest of the mainstream li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 12,8V LFP battery therefore consists of 4 cells connected in series; and a 25,6V battery consists of 8 cells connected in series.

Rugged

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

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

A LFP battery does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of LFP compared to lead-acid.
Other advantages are the wide operating temperature range, excellent cycling performance, low internal resistance and high efficiency (see below).

LFP is therefore the chemistry of choice for demanding applications.

Efficient

In several applications (especially off-grid solar and/or wind), energy efficiency can be of crucial importance.
The round-trip energy efficiency (discharge from 100% to 0% and back to 100% charged) of the average lead-acid battery is 80%.
The round-trip energy efficiency of a LFP battery is 92%.
The charge process of lead-acid batteries becomes particularly inefficient when the 80% state of charge has been reached, resulting in efficiencies of 50% or even less in solar systems where several days of reserve energy is required (battery operating in 70% to 100% charged state).
In contrast, a LFP battery will still achieve 90% efficiency under shallow discharge conditions.

Size and weight

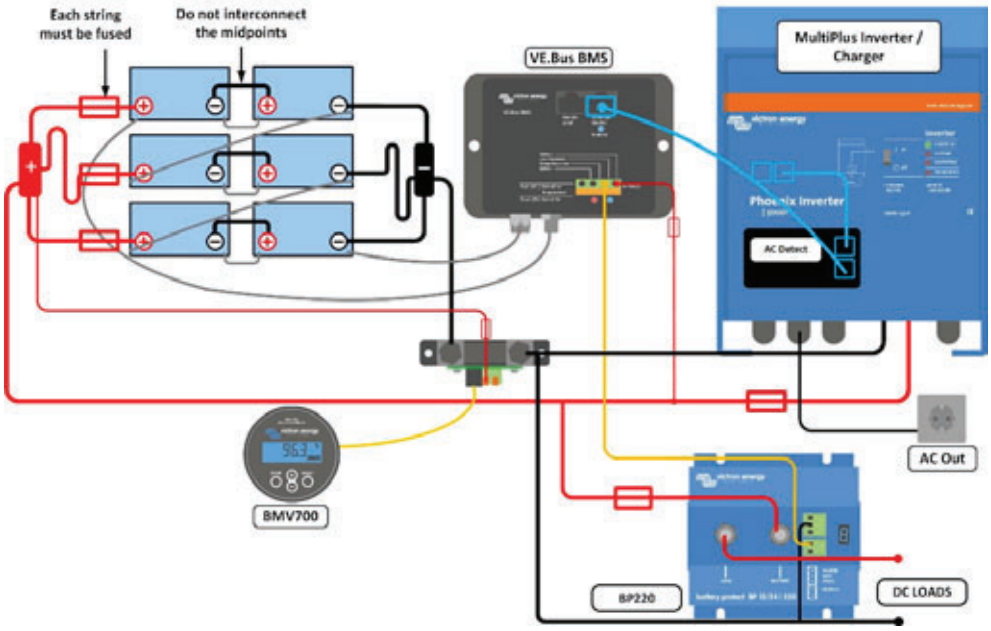
Saves up to 70% in space
Saves up to 70% in weight

Expensive?

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

Bluetooth

With Bluetooth cell voltages, temperature and alarm status can be monitored.
Very useful to localize a (potential) problem, such as cell imbalance.



Our LFP batteries have integrated cell balancing and cell monitoring. Up to 5 batteries can be paralleled and up to four 12V batteries or two 24V batteries can be series connected, so that a 48V battery bank of up to 1500Ah can be assembled. The cell balancing/monitoring cables can be daisy-chained and must be connected to a Battery Management System (BMS).

Battery Management System (BMS)

The BMS will:

1. Generate a pre-alarm whenever the voltage of a battery cell decreases to less than 3,1V (adjustable 2,85-3,15V).
2. Disconnect or shut down the load whenever the voltage of a battery cell decreases to less than 2,8V (adjustable 2,6V-2,8V).
3. Stop the charging process whenever the voltage of a battery cell increases to more than 4,2V.
4. Shut down the system whenever the temperature of a cell exceeds 50°C.

See the BMS datasheets for more features

Battery specification

VOLTAGE AND CAPACITY	LFP-Smart 12,8/60	LFP-Smart 12,8/100	LFP-Smart 12,8/150	LFP-Smart 12,8/160-a	LFP-Smart 12,8/200-a	LFP-Smart 12,8/300	LFP-Smart 25,6/200
Nominal voltage	12,8V	12,8V	12,8V	12,8V	12,8V	12,8V	25,6V
Nominal capacity @ 25°C*	60Ah	100Ah	150Ah	160Ah	200Ah	300Ah	200Ah
Nominal capacity @ 0°C*	48Ah	80Ah	125Ah	130Ah	160Ah	240Ah	160Ah
Nominal capacity @ -20°C*	30Ah	50Ah	75Ah	80Ah	100Ah	150Ah	100Ah
Nominal energy @ 25°C*	768Wh	1280Wh	1920Wh	2048Wh	2560Wh	3840Wh	5120Wh
*Discharge current ≤1C							
CYCLE LIFE (capacity ≥ 80% of nominal)							
80% DoD	2500 cycles						
70% DoD	3000 cycles						
50% DoD	5000 cycles						
DISCHARGE							
Maximum continuous discharge current	120A	200A	300A	320A	400A	600A	400A
Recommended continuous discharge current	≤60A	≤100A	≤150A	≤160A	≤200A	≤300A	≤200A
End of discharge voltage	11,2V	11,2V	11,2V	11,2V	11,2V	11,2V	22,4V
OPERATING CONDITIONS							
Operating temperature	Discharge: -20°C to +50°C Charge: +5°C to +50°C						
Storage temperature	-45°C to +70°C						
Humidity (non-condensing)	Max. 95%						
Protection class	IP 22						
CHARGE							
Charge voltage	Between 14V/28V and 14,4V/28,8V (14,2V/28,4V recommended)						
Float voltage	13,5V/27V						
Maximum charge current	120A	200A	300A	320A	400A	600A	400A
Recommended charge current	≤30A	≤50A	≤75A	≤80A	≤100A	≤150A	≤100A
OTHER							
Max storage time @ 25°C*	1 year						
BMS connection	Male + female cable with M8 circular connector, length 50cm						
Power connection (threaded inserts)	M8	M8	M8	M10	M10	M10	M8
Dimensions (hxwxd) mm	240 x 285 x132	197 x 321 x 152	237 x 321 x 152	237 x 321 x 152	237 x 321 x 152	347 x 425 x 274	317 x 631 x 208
Weight	12kg	15kg	20kg	20kg	22kg	51kg	56kg
*When fully charged							

VE.Bus BMS

Protects each individual cell of a Victron lithium iron phosphate ($LiFePO_4$ or LFP) battery

Each individual cell of a $LiFePO_4$ battery must be protected against over voltage, under voltage and over temperature.
Victron LiFePO4 batteries have integrated Balancing, Temperature and Voltage control (acronym: BTV) and connect to the VE.Bus BMS with two M8 circular connector cord sets.
The BTVs of several batteries can be daisy chained. Up to five batteries can be paralleled and up to four batteries can be series connected (BTVs are simply daisy-chained) so that a 48V battery bank of up to 1500Ah can be assembled. Please see our LiFePO4 battery documentation for details.
The BMS will:

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

Protects 12V, 24V and 48V systems

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

Communicates with all VE.Bus products

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

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

Load Disconnect

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

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

Charge Disconnect

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

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

LED indicators

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

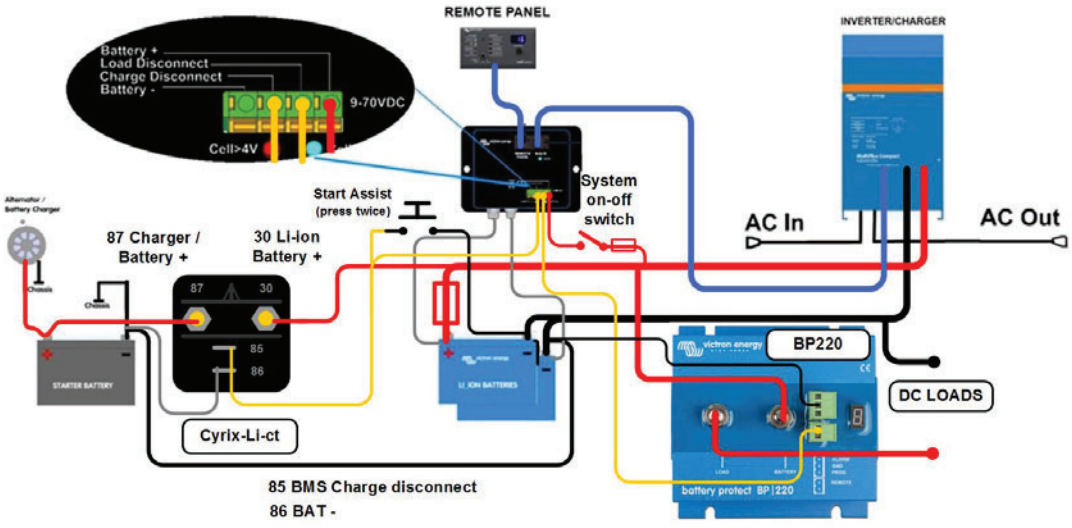


Figure 1: Application example for a vehicle or boat.
A Cyrix Li-ion Battery Combiner is used to connect to the starter battery and alternator.
The UTP cable to the inverter/charger also provides the minus connection to the BMS.

VE.Bus BMS	
Input voltage range	9 – 70V DC
Current draw, normal operation	10 mA (excluding Load Disconnect current)
Current draw, low cell voltage	2mA
Load Disconnect output	Normally high Source current limit: 2A Sink current: 0 A (output free floating)
Charge Disconnect output	Normally high Source current limit: 10mA Sink current: 0 A (output free floating)
GENERAL	
VE.Bus communication port	Two RJ45 sockets to connect to all VE.Bus products
Operating temperature	-20 to +50°C 0 - 120°F
Humidity	Max. 95% (non-condensing)
Protection grade	IP20
ENCLOSURE	
Material and colour	ABS, matt black
Weight	0,1kg
Dimensions (h x w x d)	105 x 78 x 32mm
STANDARDS	
Standards: Safety Emission Immunity Automotive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 Regulation UN/ECE-R10 Rev.4

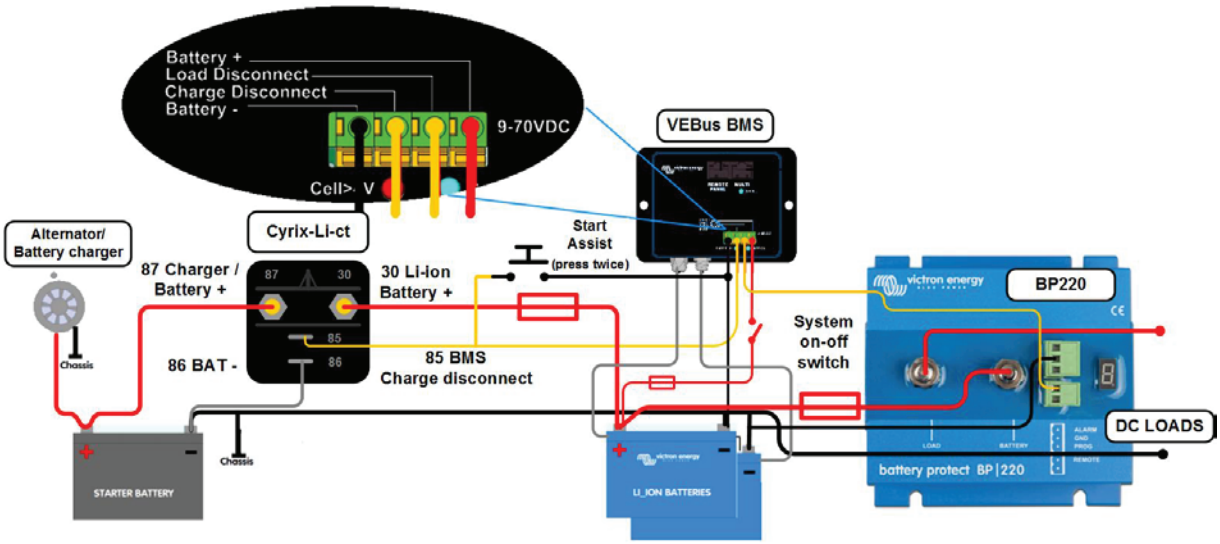


Figure 2: Application example for a vehicle or boat, without inverter/charger.

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

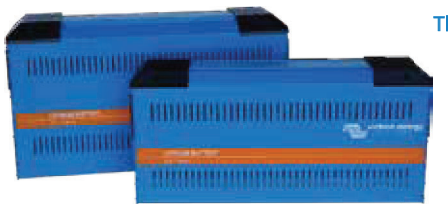
Cyrix-Li-ct (120A or 230A)

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

Cyrix-Li-Charge (120A or 230A)

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

24V 180Ah Lithium-ion battery and Lynx-ion



24V 180Ah and 100Ah
Lithium-Ion Battery

Lynx Ion + Shunt

Ion control: Main screen

Ion control: History screen

Ion control: Lynx Ion Status

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

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

Why Lithium-Iron-Phosphate?

Lithium-Iron-Phosphate (LiFePO4 or LFP) is the safest of the mainstream Li-ion battery types. The nominal voltage of a LFP cell is 3,2V (lead-acid: 2V/cell). A 25,6V LFP battery consists of 8 cells connected in series.

Complete system

A complete system consists of:

- One or more **24V 180Ah or 100Ah Lithium-Ion batteries**.
- (optional) The **Lynx Power In**, a modular dc bus bar.
- The **Lynx Ion + Shunt** is the Battery Management System (BMS) that controls the batteries. It contains a main safety contactor and a shunt. There are two models are available: a 350A model and a 600A model.
  (optional) The **Lynx Distributor**, a DC distribution system with fuses.
- (optional) The **Ion Control**, a digital control panel.
- (optional) The **Color Control GX**, a more advanced digital control panel

The advantages of the Victron Lynx Lithium-ion battery system

The modular system used adds the following advantages:

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

24V 180Ah/100Ah Lithium-Ion Batteries

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

Lynx Ion + Shunt

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

For both overcharging and depletion there is a last safety resort, the built-in 350A or 600 A contactor. In case signalling does not stop the imminent overcharge or depletion, it will open the contactor.

VE.Can / NMEA2000 Canbus

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

Ion Control

See the separate Ion Control datasheet for more information.

Color Control GX

See the separate Color Control GX datasheet for more information.

Lithium-Ion battery specifications

	Lithium-ion 24V 100Ah 2.6kWh battery	Lithium-ion 24V 180Ah 4.75kWh battery
Technology	Lithium iron phosphate (LiFePO4)	Lithium iron phosphate (LiFePO4)
Nominal voltage	25,6V	25,6V
Nominal capacity	100Ah	180Ah
Nominal power	2,6kWh	4,75kWh
Weight	30kg	55kg
Power/Weight ratio	86Wh/kg	86Wh/kg
Dimensions (lxwxh)	592 x 154 x 278 mm	623 x 193 x 351 mm
Charge/Discharge		
Charge cut-off voltage at 0.05C	28,8V	28,8V
Discharge cut-off voltage	20V	20V
Recommended charge/discharge current	30A (0,3C)	54A (0,3C)
Maximum charge current (1C)	100A	180A
Maximum discharge current (1.5C)	150A	270A
Pulse discharge current (10s)	500A	1000A
Cycle Life @80% DOD (0.3C)	3000	3000
Configuration		
Series configuration	Yes, up to 2 (more in series on request)	Yes, up to 2 (more in series on request)
Parallel configuration	Yes, easy up to 10 (more parallel on request)	Yes, easy up to 10 (more parallel on request)
Environmental		
Operating temp. charge	0~45°C	0~45°C
Operating temp. discharge	-20~55°C	-20~55°C
Storage temp.	-20~45°C	-20~45°C
Standards		
EMC: Emission	EN-IEC 61000-6-3:2007/A1:2011/C11:2012	
EMC: Immunity	EN-IEC 61000-6-1:2007	
Low voltage directive	EN 60335-1:2012/AC:2014	

Lynx Ion + Shunt specifications

Lynx Ion + Shunt	350A	600A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	48	
Supply voltage range	9 ... 60VDC	
Standby mode	73mW @ 26,2V and 138mW @ 52,4V	
Active mode	8,7 W	
Main safety contactor	350A	600A
Enclosure		
Material	ABS	
Weight	2,0kg	
Dimensions (lxwxh)	185 x 165 x 85 mm	
IO		
Aux. output	5A (output voltage = battery voltage), short circuit protection	
External safety contactor	5A (output voltage = battery voltage), short circuit protection	
Allow-to-charge	1A @ 60VDC, potential free	
Allow-to-discharge	1A @ 60VDC, potential free	
External status signal	12V / 140mA	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	IP20
Standards		
EMC: Emission	EN-IEC 61000-6-3:2007/A1:2011/C11:2012	
EMC: Immunity	EN-IEC 61000-6-1:2007	
Low voltage directive	EN 60335-1:2012/AC:2014	
RoHs	EN 50581:2012	

Lithium-Ion HE Battery and Lynx Ion BMS

24V/100Ah HE battery

24V/200Ah HE battery

Lynx-ion BMS 1000A

Ultra-high energy density

185Wh/kg thanks to Lithium Nickel Manganese Cobalt Oxide (NMC) technology

Fan cooled

For high charge and discharge currents (up to 2C for short periods)

Parallel and series connection

Up to 64 batteries can be parallel connected.
For 48V systems two batteries can be connected in series, and up to 32 strings of two batteries can be parallel connected.

Galvanically isolated CAN-Bus communication

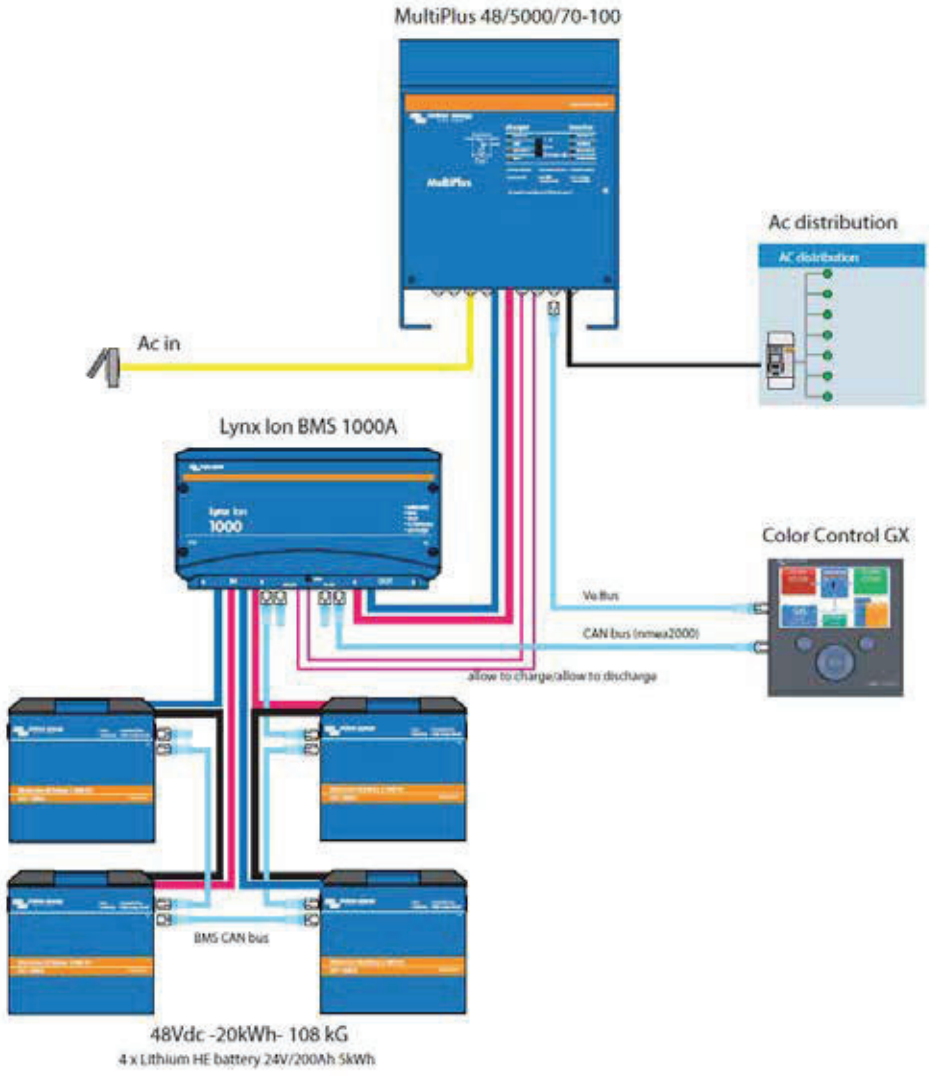
Protocol: VE.Can/NMEA2000

Lynx-ion BMS: 400A or 1000A

The Lynx-ion BMS reduces wiring and installation time to a minimum: it combines four fused battery connections, four fused DC load connections, a safety contactor and a current shunt with a BMS in one compact enclosure.

Monitoring: The Color Control GX or Venus GX

Monitors the complete system.
Is the gateway for remote monitoring on the VRM online portal.
Adds an amazing amount of useful functionality to system (such as a very sophisticated generator start-stop program
See the Color Control GX and Venus GX datasheet for more information.



Lithium HE battery	24V / 100Ah	24V / 200Ah
Technology	Lithium-Ion NMC	Lithium-Ion NMC
Cell configuration	7S32P	7S64P
Nominal voltage	25,2 V	25,2 V
Nominal capacity	100 Ah	200 Ah
Nominal energy	2,5 kWh	5,0 kWh
Cycle Life @80% DoD (0,3C)	2000	2000
Energy/weight ratio (incl. BMS and enclosure)	159 Wh/kg	175 Wh/kg
Weight (incl. BMS and enclosure)	15,7 kg	28,6 kg
Discharge		
Discharge cut-off voltage	21 V	21 V
Recommended discharge current	30 A (0.3 C)	60 A (0.3 C)
Maximum discharge current (10 minutes)	150 A (1.5 C)	300 A (1.5 C)
Fuses	150 A, fuse inside	300 A, fuse inside
Charge		
Absorption voltage (1 hour)	28,4 V	28,4 V
Float voltage	27,5 V	27,5 V
Maximum charge current	100 A (1 C)	200 A (1 C)
Recommended charge current	30 A (0.3 C)	60 A (0.3 C)
Configuration		
Series configuration	Yes, up to 2	
Parallel configuration	Yes, up to 96	
Temperature		
Operating temp. charge	0~45°C	
Operating temp. discharge	-20~55°C	
Storage temp.	-20~45°C	
Mechanical		
Power connections	M8 stud, Max. 15 Nm	M8 stud, Max. 15 Nm
Protection class	IP20	IP20
Cooling	Air, active (1x fan inside)	Air, active (2x fan inside)
Dimensions (l x w x h)	362 x 193 x 214 mm	362 x 193 x 355 mm
Safety		
Battery Management System (BMS)	Integrated slave BMS	
Balancing	Passive	
Compatible BMS master controller	Lynx Ion BMS	
Communication with Lynx Ion BMS	CAN bus	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

Lynx Ion BMS intended for both 100 Ah & 200Ah batteries	400A	1000A
Maximum number batteries in series	2 (= 48 VDC)	
Maximum number batteries in parallel	96 (48 V: 48 strings of two batteries	
Supply voltage range	18 to 58 VDC	
Power consumption, standby mode	73 mW @ 26,2V and 138 mW @ 52,4V	
Power consumption, active mode	8,7 W	
Main safety contactor	400A	1000A
Communication port	VE.CAN (NMEA2000, RJ45 connection, galvanically isolated)	
IO		
Auxiliary output	13,5 V / 1 A, short circuit protected	
Allow-to-charge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-discharge (switched voltage)	13,5 V / 1 A, short circuit protected	
Allow-to-charge (relay output)	1 A @ 60 VDC, potential free	
Allow-to-discharge (relay output)	1 A @ 60 VDC, potential free	
Programmable contact (relay output)	1 A @ 60 VDC, potential free	
External status signal	13,5 V / 140 mA	
Enclosure		
Material	ABS	
Weight	4,6 kg	5,7 kg
Dimensions (lxwxh)	225 x 426 x 117 mm	
Environmental		
Operating temperature range	-20 °C to 50 °C	
Humidity	Max. 95% (non-condensing)	
Protection class	IP22	
Standards		
EMC: Emission	EN-IEC 61000-6-3	
EMC: Immunity	EN-IEC 61000-6-1	
Low voltage directive	EN 60335-1	

About Victron Energy

With over 45 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, 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 45 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 market leading. 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.

Basecamp Xtreme Everest

victron energy
BLUE POWER

40 YEARS

FREEDOM OF YACHTING

POWERED BY

victron energy BLUE POWER

Fischer Panda

FREEDOM OF YACHTING

Enjoying the power of the sea, the serenity of a lake,

the soothing sounds of lapping waves, sun on your face,

the freedom of the nature that surrounds you.

These are the reasons we invest – every day anew – in our products

and solutions; taking care to empower your yachting freedom.

F
V E
P

TAILOR MADE

Every boat has its own character and each owner has their own demands for ease of use and system quality of their onboard energy system. Fischer Panda and Victron Energy have been developing energy systems with all this in mind, based on their long-term relationship and experience. Because of this, you can be assured of the latest technology all configured to your personal needs.

Development, supply and service, all under one roof.

Your wishes are being translated to a high-quality tailor-made end product. No solitary instruments, but a complete solution based on the ‘plug and play’ concept.

40 YEARS

Over 40 years experience in the marine industry

F
V E
P

BEST OF BOTH WORLDS

The goal of having a coherently designed energy system is based on the philosophy of operational overlap and monitoring results in ever smarter systems. Due to the unique worldwide cooperation between both companies, we are able to not only design the optimal energy system but also ensure worldwide support.

Two brands, one goal; to deliver yachting freedom.

We deliver:

- **tailor-made**
- **plug-and-play solutions**
- **high-end products**
- **one support contact**
- **world wide service**

F
V E
P

INNOVATIVE

For more than 40 years we have been working on the best solutions for energy services and support in the nautical world.
From pleasure yachts to professional use, we know the true value of reliability and user experience – like no one else.

That is why our developers are researching for the newest and best solutions for your needs every day. Our search for more capacity, greater ease and ever improving durability is driven by our technical passion and our love of sailing.

Only the best is good enough.


Water in Fuel
Bilge Alarm
Exhaust Temp
Fireboy Discharged
Raymarine
victron energy
Fischer Panda
80%
11:26
FRESH WATER
80%
BLACK WATER
85%

ALL IN ONE

Everything at a glance and under control; be that from the helm

of your boat or remotely from your mobile phone or tablet,

you can check and configure your energy systems.

By using our internet connected online services you can be assured of

full remote control and configuration of your onboard energy system;

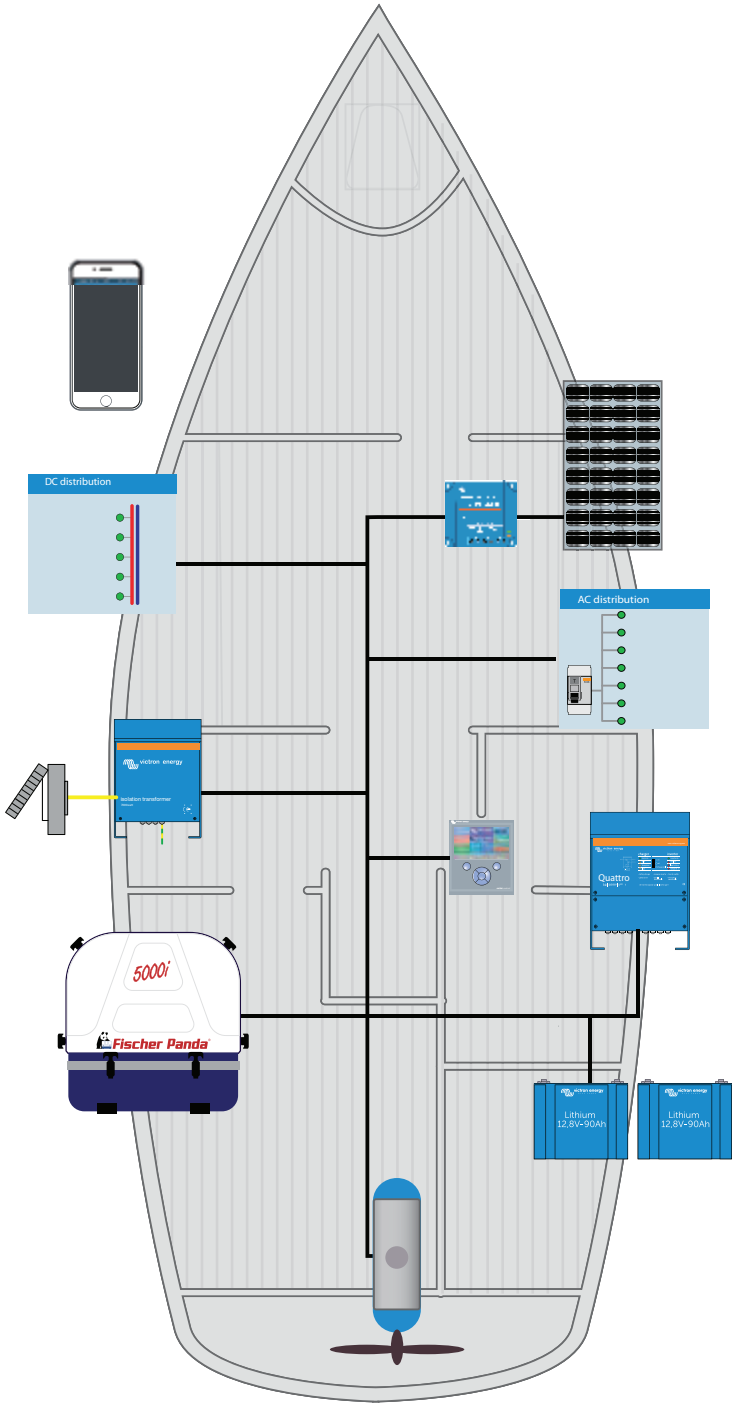
Anywhere, Anytime.

STANDARD SYSTEM

The Standard System is designed for yachts from 25 up to 35 ft.

The system provides energy for all household equipment (230V) onboard. You can easily make use of your coffee machine just like you would do at home. Both shore power and onboard generator can be supported by your inverter (PowerAssist).

The Standard System also supports PV panels.

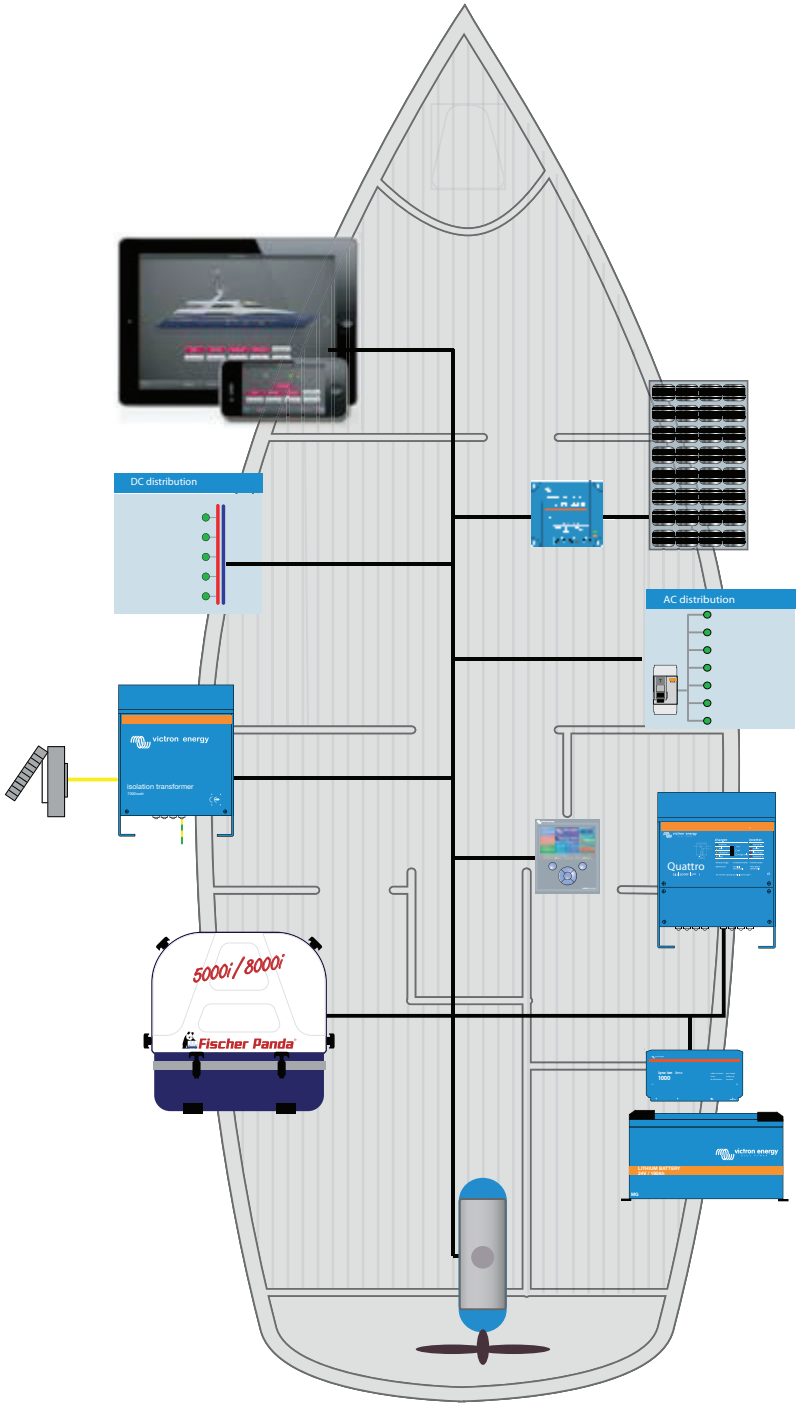



Jeppe
Hadersley

PREMIUM SYSTEM

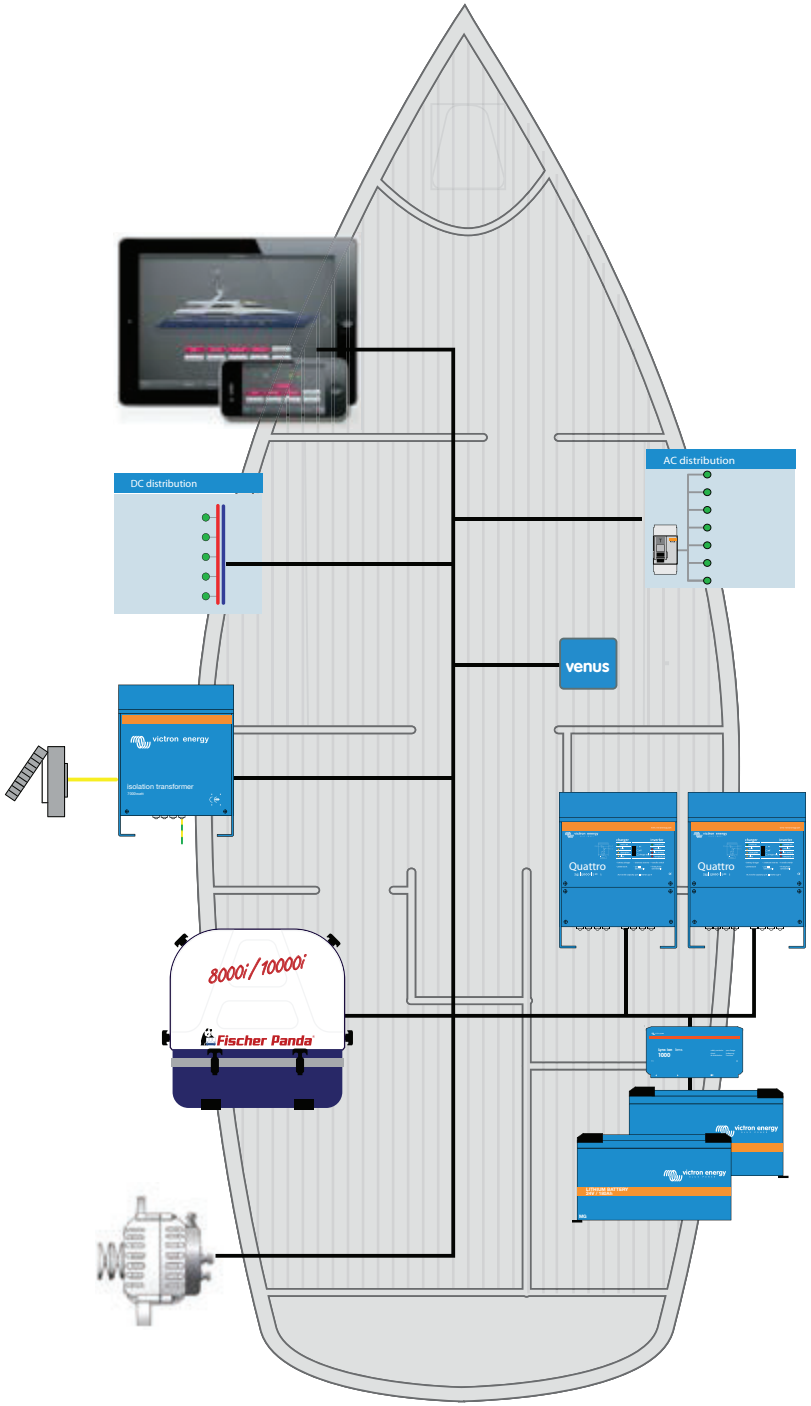
The Premium System is suggested for yachts from 35 up to 45 ft.

It enables more capacity for greater energy needs on board. It is especially designed for the needs of world travellers, to be able to use air-conditioning and an electric hob for example.



DISCOVERY SYSTEM

The Discovery System is recommended for yachts from 45 to 55 ft with a high energy need. This system is for people who are seeking a high level of independence without compromising comfort. A maximum overlap between components provides a high reliability and comfort level, increasing even more with our super silent generator solution.



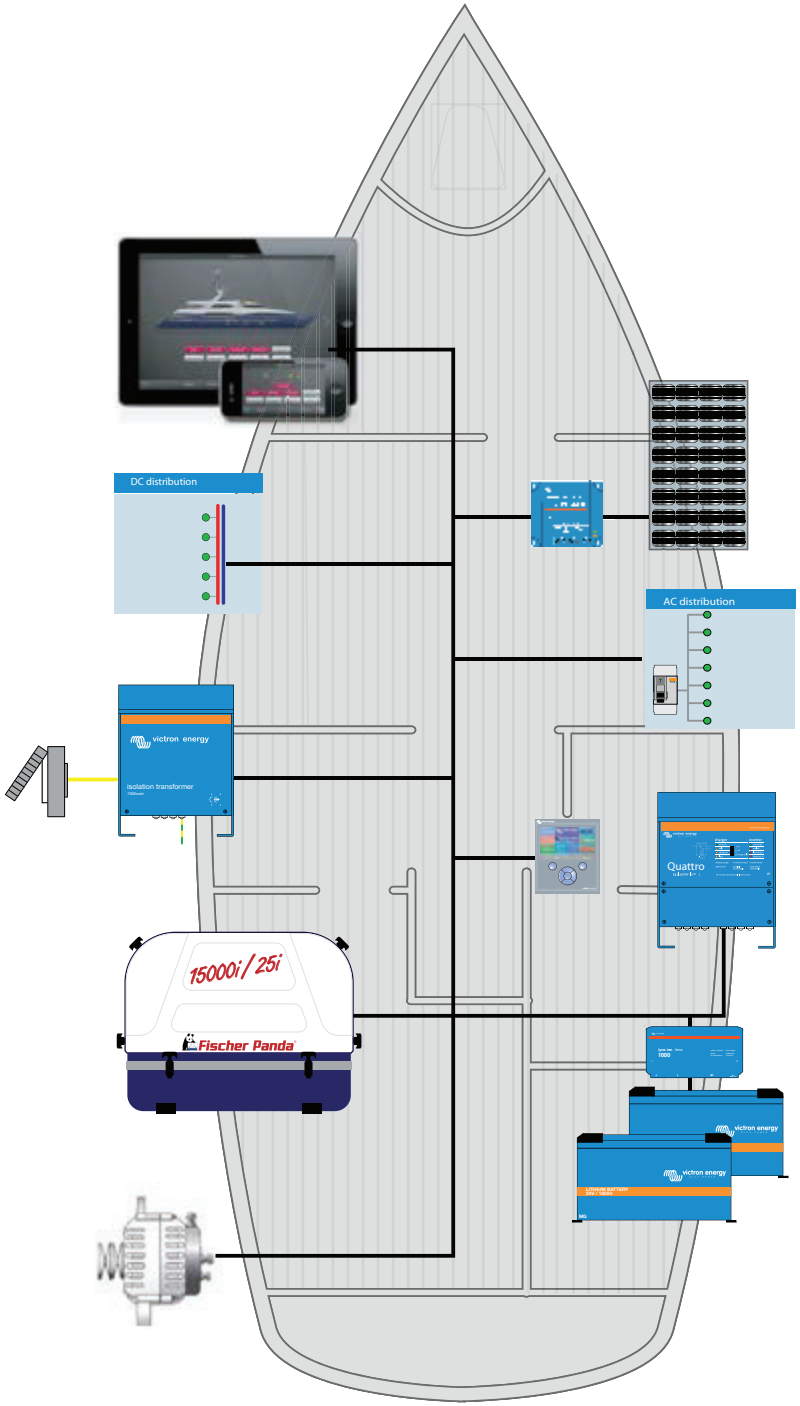
BLUE WATER SYSTEM

The Blue Water System is designed for yachts from 55 up to 65 ft.

It surpasses the system for slightly smaller yachts with its capacity.

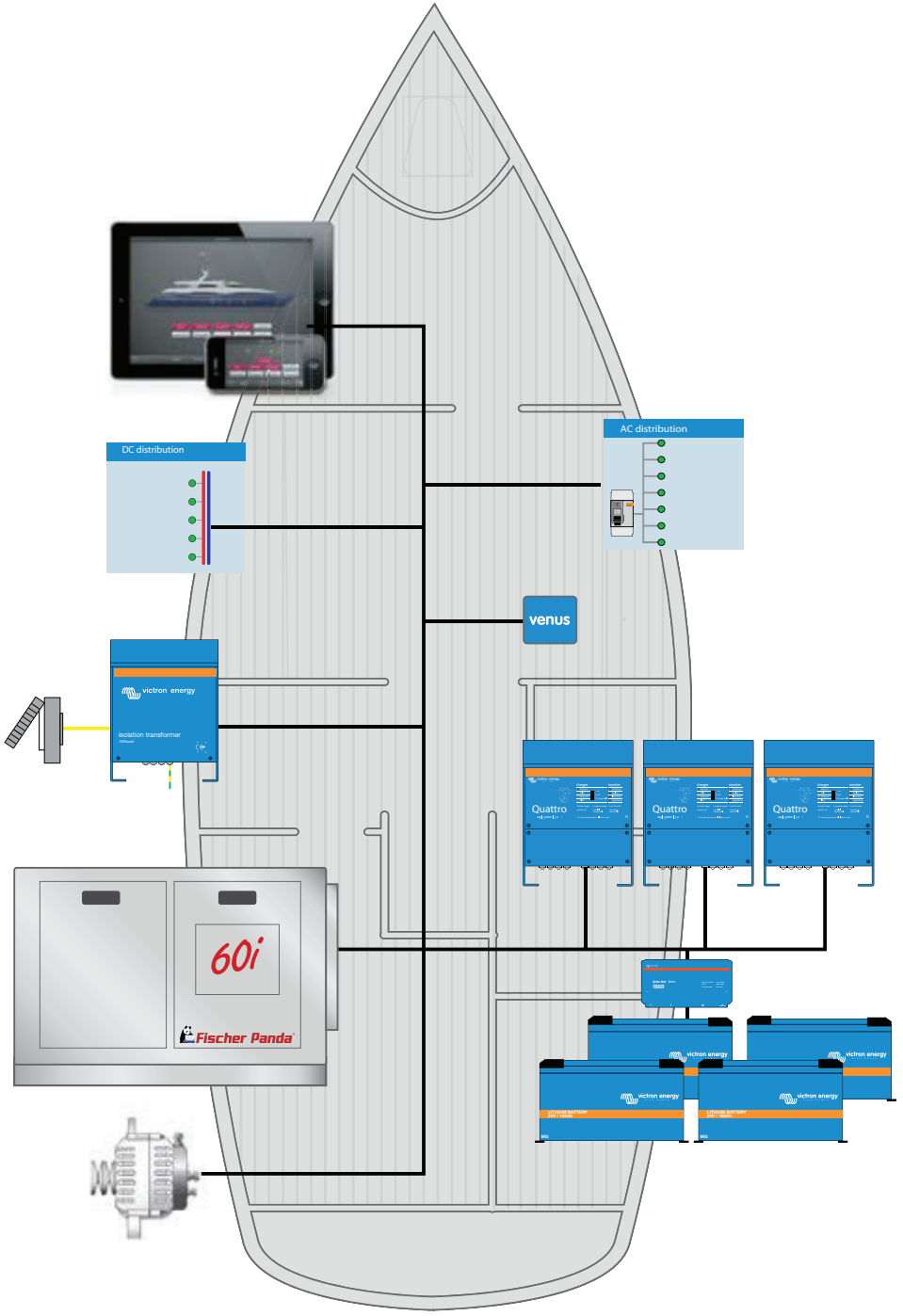
It enables owners to use even more energy onboard and

worldwide use is catered for.



SUPERYACHT SYSTEM

The Superyacht System is for yachts larger than 65 ft. No matter what the needs or wishes for your energy system are, this system is the best solution, providing a quiet, highest quality, highest energy capacity system. The system is also applicable for hybrid propulsion.




40
YEARS
Over 40 years experience
in the marine industry
FREEDOM
OF YACHTING
Fischer Panda®
victron energy
BLUE POWER

Optional

Bluetooth dongle

The ***VE.Direct to Bluetooth Smart dongle*** allows you to monitor the status of your ***Peak Power Pack*** and operate it from your smartphone.

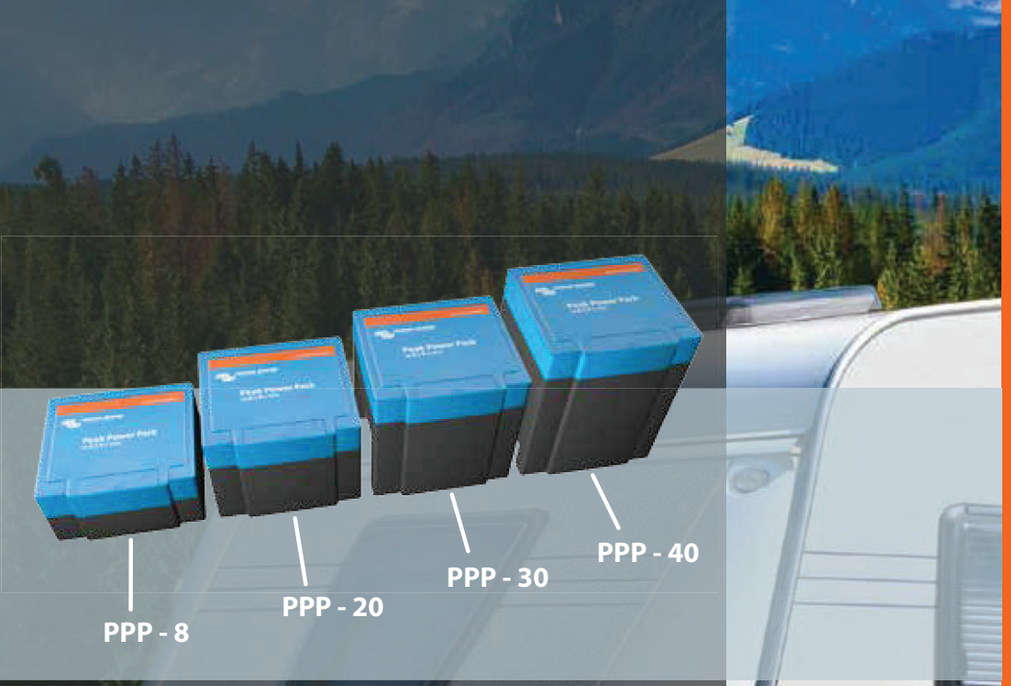
Peak Power Pack	PPP-8	PPP-20	PPP-30	PPP-40
Capacity	8Ah	20Ah	30Ah	40Ah
Stored energy	102Wh	256Wh	384Wh	512Wh
Battery type	Lithium-ion (LiFePO4)			
Nominal voltage	12.8V			
Self-discharge when activated	< 13 Ah /year (< 1.4 mA)			
Self-discharge in storage mode	< 6.5 Ah /year (< 0.7 mA)			
Output 1: high capacity "mover"				
Continuous output current	150A			
Maximum output current (10 seconds)	200A			
Short-circuit current	300A			
Safety features	Overload / short-circuiting / temperature / excessive discharge			
Maximum charging current	n.a.	n.a.	15A	20A
Recommended charging voltage	14V (no protection)			
Maximum charging voltage	14.2V (no protection)			
Maximum cable diameter	16mm² (screw clamps)			
Output 2: on-board power network "domestic"				
Continuous output current	n.a.	30A		
Maximum output current (10 seconds)	n.a.	50A		
Short-circuit current	n.a.	80A		
Safety features	n.a.	Overload / short-circuiting / temperature / excessive discharge		
Maximum charging current	n.a.	n.a.	10A	10A
Recommended charging voltage	n.a.	14V (no protection)		
Maximum charging voltage	n.a.	14.2V (no protection)		
Maximum cable diameter	n.a.	6mm²(screw clamps)		
Input 1: "car/solar"				
Input voltage range	11 V < Vin < 25 V			
Current limitation	7A			
Input 2: "adapter"				
Output voltage	15V			
Output current	3A			
Input voltage	110 / 230 V 50 / 60 Hz			
General				
Operation	Multifunctional push-button with dual-colour LED			
VE.Direct port	Communication with a smartphone (VE.Direct Bluetooth Smart-dongle required) Connection to a PC (VE.Direct to USB cable required)			
Operating temperature	Battery charging: 0°C to 40°C Battery discharge: -20°C to +40°C Storage: -20°C to +40°C (charging and discharging not possible outside the given temperature range)			
Humidity (no condensation)	Max. 95%			
Weight	2.2kg	3.8kg	5.4kg	8.6kg
Dimensions h x w x d (mm)	92 x 190 x 172	132 x 190 x 172	172 x 190 x 172	212 x 190 x 172
Standards				
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1			
Emission / Immunity	EN 55014-1, EN 55014-2, IEC 61000-3-2, IEC 61000-3-3, EN 50498			

Peak Power Pack

Power on demand

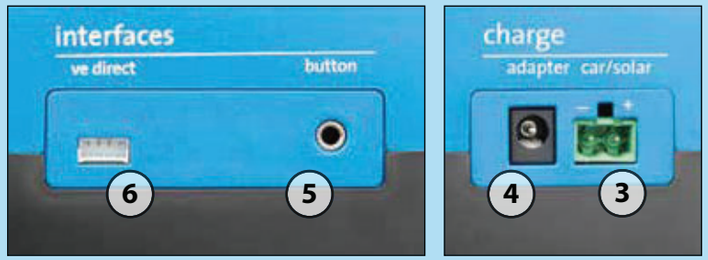
- Lightweight, high-performance battery.
- Space-saving.
- Maintenance-free.
- Built-in solar energy, regulating and charge unit.
- Can be kept in storage for a year (low self-discharge).
- Regulating system for extra-long service life.
- Li-ion system with internal charger.

victron energy
BLUE POWER



Peak Power Pack

The Peak Power Pack is a lithium-ion battery and battery charger housed in a single unit. The Peak Power Pack has been specially designed to provide high current over a short space of time, ideal for a caravan mover. The Peak Power Pack is also extremely suitable for powering your caravan and ensures additional comfort, both on the road and at your holiday destination. It is even possible to monitor the status of the Peak Power Pack from your smartphone (see Bluetooth dongle).



Easy to use

The Peak Power Pack can be charged from your car, and likewise via a solar panel or from the mains connection on your campsite. If you charge the battery whilst driving, the battery will be fully charged for manoeuvring your caravan when you arrive.

Thanks to the cable supplied, the Peak Power Pack is extremely easy to use. A push button operates a built-in LED light with different colours which indicates the status of the battery.

Connections

1. 200A mover connection
2. 30A on-board connection
3. 7A universal charger input
4. Connection for 3A universal adapter
5. Connection for the operating cable
6. VE.Direct connection, e.g. for the Bluetooth dongle

Includes

Means of attachment

110/230V adapter

Mains power cable

Cable with push button

Learn more about RV electrical and lighting we have.