













Introduction





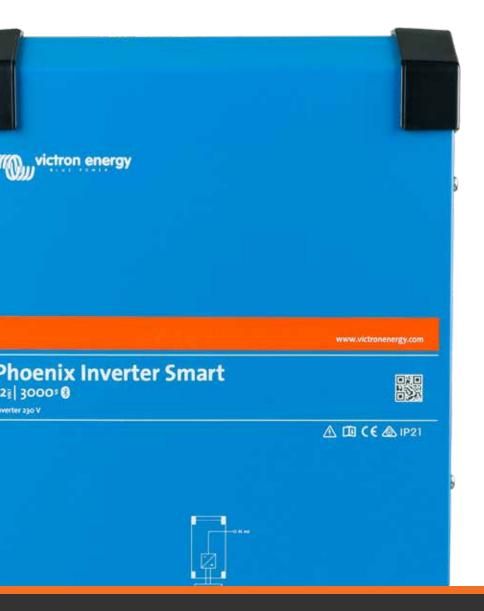


Automotive

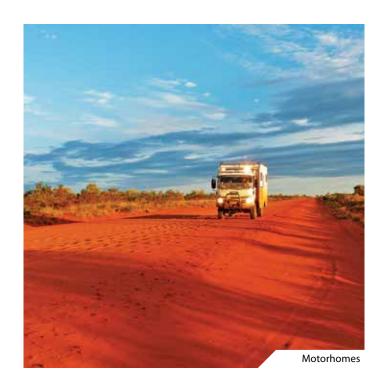
The automotive market comprises a broad range of applications requiring a reliable power supply. In vehicles such as fire engines, ambulances and police cars a human life may depend on an autonomous system. So it is vital that all systems function flawlessly. Victron Energy offers you such an answer. 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.



Application examples











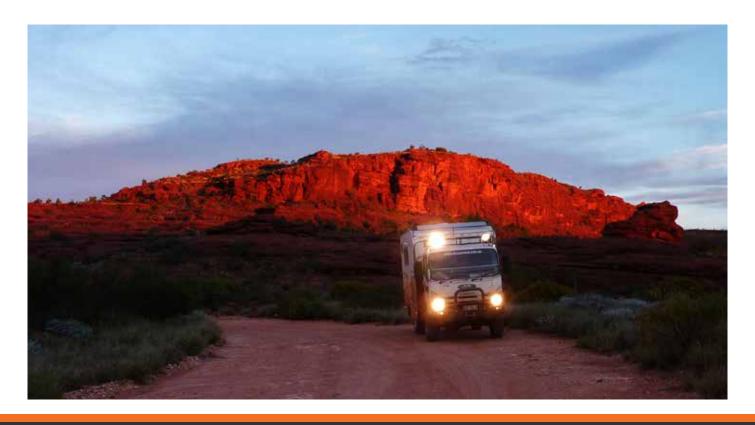
On adventure with a motorhome

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.







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.



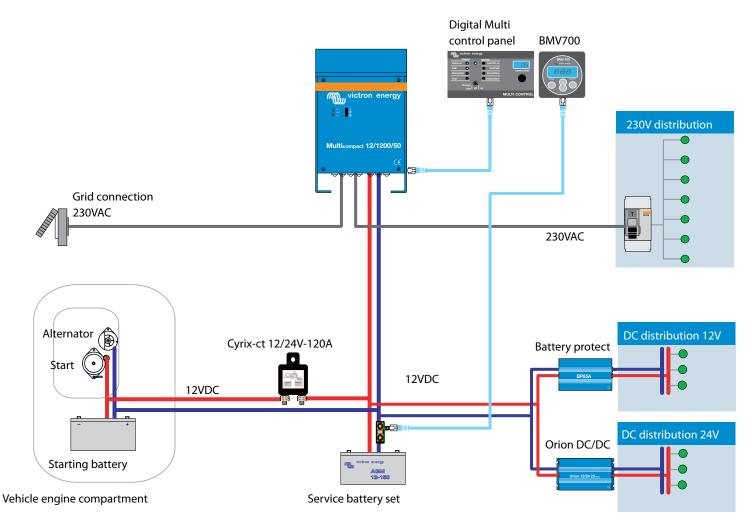






Global market leader in ambulances

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

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
- Coffee grinder
- Refrigeration system
- Lighting
- Sun screen
- 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.

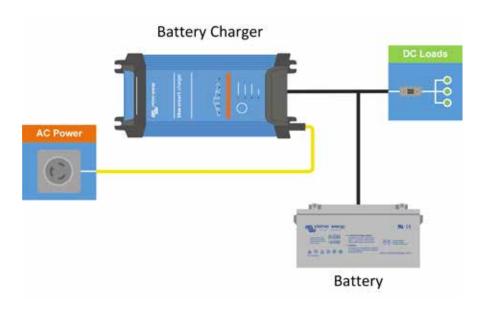




Systems

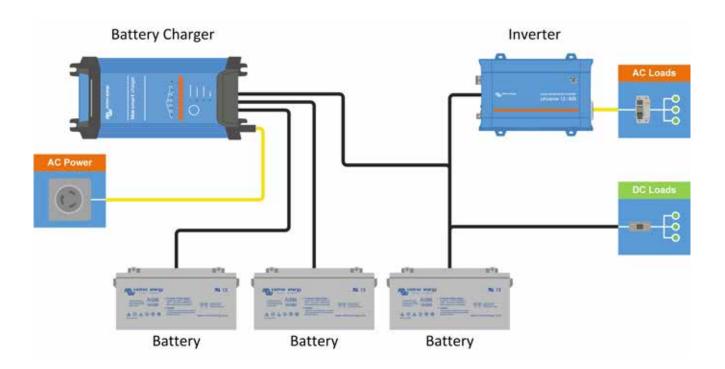
1. Simple system with only DC consumers

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



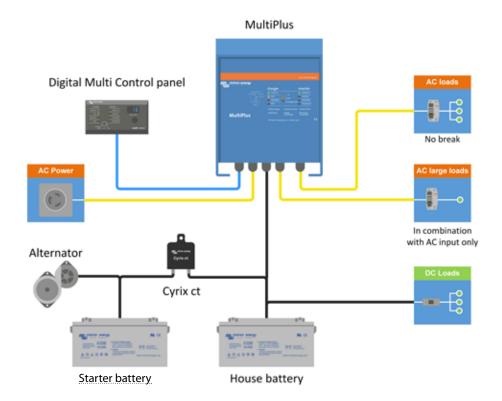
2. Charger system with inverter

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 PowerControl and PowerAssist.



MultiPlus vs Quattro

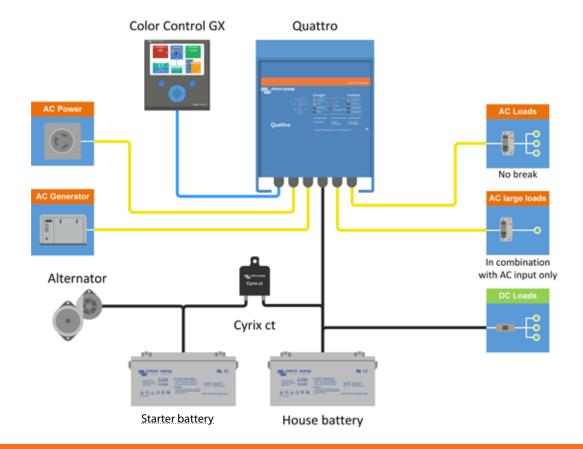
The MultiPlus and Quattro products play a central role in both AC and DC systems. They are both powerful battery chargers and inverters in one box.

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 addition: a transfer system which automatically selects the available input.

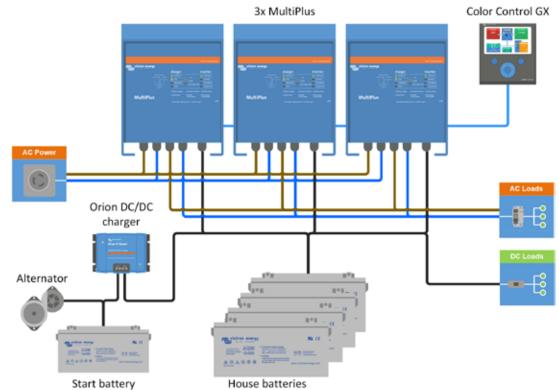




Systems

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.

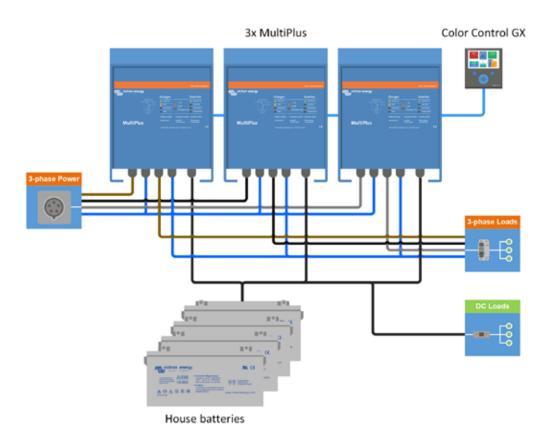


Easy to configure

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.

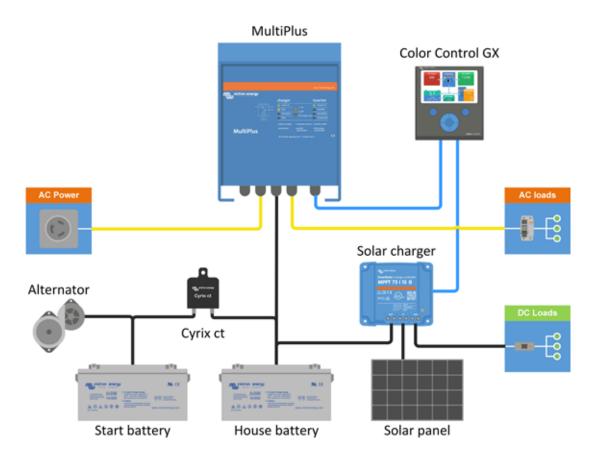
6. Three-phase system

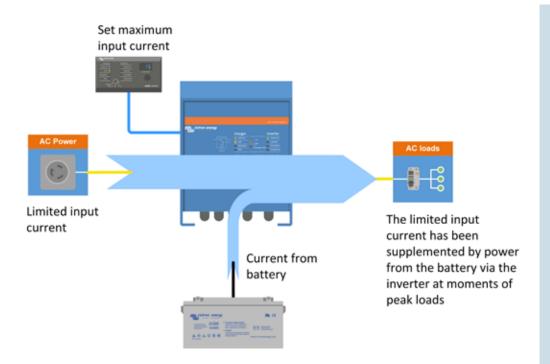
Similar to connecting units in parallel they can also be connected in split-phase and three-phase configurations.



7. MultiPlus system with a solar panel

In this configuration the batteries are being charged by solar power, the alternator and 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.



Accessories

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





Battery Monitor

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

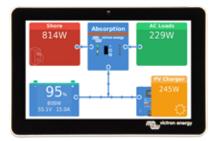


Color Control GX

The Color Control GX provides intuitive control and monitoring for all products connected to it. The list of Victron products that can be connected is endless: Inverters, 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.



GX Touch 50

The GX Touch 50 is the display accessory for our Cerbo GX. The five inch touch screen display gives an instant overview of your system and allows to adjust settings in the blink of an eye. Simply connected to the Cerbo GX with one cable, its super slim waterproof design, top-mountable setup and its simple installation bring a lot of flexibility when creating a crisp and clean dashboard.



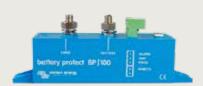
Digital Multi Control Panel GX

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.

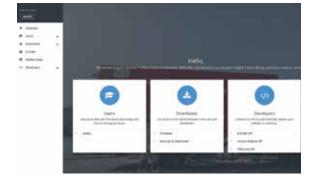
The portal is free of charge.



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. f you already use E-Order you can login with those credentials.



VRM World: View shared VRM sites around the world

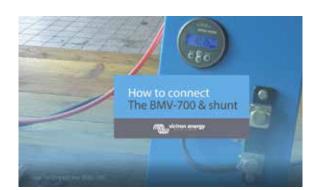
Ever wanted to show your clients, friends, colleagues how much solar energy your installation is generating or indeed any other data that you can see on your VRM site? Well now you can – using VRM World. You need a VRM account to be able to view shared VRM sites. In your VRM portal it is possible to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



Victron Community

The Victron Community is a place for questions and answers about Victron related subjects.

https://community.victronenergy.com/



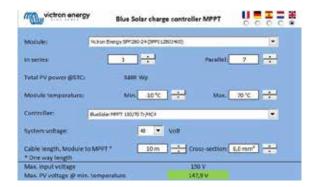
Instruction videos on Victron youtube channel

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



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.



MPPT Calculator Excel sheet

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

Download the Excel sheet from our software page:



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.











Phoenix Inverter Smart 12/3000





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

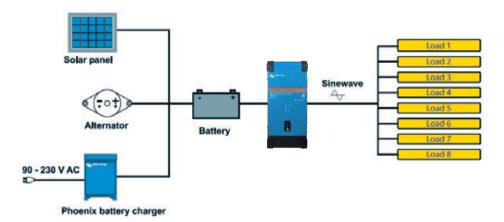
A remote on/off switch or relay contact can be connected to a two pole connector. Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

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	12/2000 24/2000	12/3000 24/3000	24/5000			
Prideriix iriverter Siriart	48/1600	48/2000	48/3000	48/5000			
Parallel and 3-phase operation		N	lo				
		INVERTER					
Input voltage range		9.3 – 17V 18.6 –	- 34V 37.2 – 68V				
Output		Output voltage: 230 VAC ±2% 50 Hz or 60 Hz ± 0.1% (1)					
Cont. output power at 25°C (1)	1600 VA	2000 VA	3000 VA	5000 VA			
Cont. output power at 25°C	1300 W	1600 W	2400 W	4000 W			
Cont. output power at 40°C	1200 W	1450 W	2200 W	3700 W			
Cont. output power at 65°C	800 W	1000 W	1700 W	2800 W			
Peak power	3000 W	4000 W	6000 W	10000 W			
Dynamic (load dependent) DC low shut down (fully configurable)							
Max. efficiency 12/ 24 /48 V	92 / 94 / 94%	92 / 94 / 94%	93 / 94 / 95%	95 / 96%			
Zero load power 12 / 24 / 48 V	8/9/11 W	8/9/11 W	12 / 13 / 15 W	18 / 20 W			
Zero load power in ECO mode	0.6 / 1.3 / 2.1 W	0.6 / 1.3 / 2.1 W	1.5 / 1.9 / 2.8 W	2.2 / 3.2 W			
		GENERAL					
Programmable relay (2)		Ye	es				
Stop & start power ECO-mode		adjus	table				
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: steel (blue RAL 5012; and	black RAL 9017) Protection categ	ory: IP21			
Battery-connection	M8 bolts	M8 bolts	12 V/24 V: 2+2 M8 bolts	24 V: 2+2 M8 bolts			
230 V AC-connection		Corourte	48 V: M8 bolts erminals	48 V: M8 bolts			
Weight	12kg	13kg	19kg	29kg / 28kg			
weight	12kg	13kg	-	595 x 295 x 160mm (24 V)			
Dimensions (hxwxd)	485 x 219 x 125mm	485 x 219 x 125mm	533 x 285 x 150mm (12 V) 485 x 285 x 150mm (24 V/48 V)	555 x 295 x 160mm (48 V)			
		STANDARDS					
Safety		EN 60	335-1				
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 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.

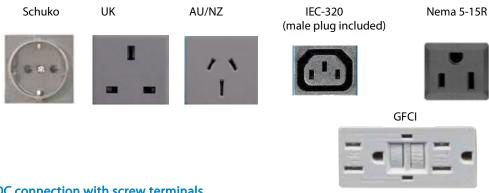
LED diagnosis

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



DC connection with screw terminals

No special tools needed for installation

	12 Volt	12/250	12/375	12/500	12/800	12/1200	
Phoenix Inverter	24 Volt 48 Volt	24/250 48/250	24/375 48/375	24/500 48/500	24/800 48/800	24/1200 48/1200	
Cont. power at 25°C (1)	46 VOIL	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)	40011		0VAC +/- 3% 50Hz o		2200W	
Input voltage range	(aujustable)	9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V					
DC low shut down (adjustable)		9,2 - 17 / 10,4 - 34,0 / 30,8 - 02,0V 9,3 / 18,6 / 37,2V					
Dynamic (load dependent) DC (fully configurable)		Dynamic cut-off, see					
DC low restart and alarm (adjus	stable)			10,9 / 21,8 / 43,6V			
Battery charged detect (adjusta	able)			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 ECC (default retry interval: 2,5 s, adj		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	er setting			Adjustable			
Protection (2)				a-f			
Operating temperature range		-40	to +65°C (fan assisted	d cooling) Derate	e 1,25% per °C above 4	0°C	
Humidity (non-condensing)				max 95%			
			ENCLOSURE				
Material & Colour			Steel chassi	s and plastic cover (b	lue 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			UK (BS	CEE 7/4), IEC-320 (mal 5 1363), AU/NZ (AS/NZ 120V: Nema 5-15R, GF	S 3112)		
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				EC 60335-1 / EN-IEC 62	2109-1		
EMC		EN	55014-1 / EN 55014-2	2 / IEC 61000-6-1 / IEC	61000-6-2 / IEC 61000-	6-3	
Automotive Directive		ECE R10-4					
1) Nonlinear load, crest factor 3 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	b:1						



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.





Phoenix Inverter 24/5000



Phoenix Inverter Compact 24/1600

SinusMax - Superior engineering

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

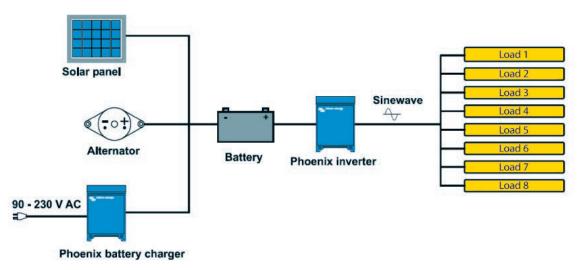
If an automatic transfer switch is required we recommend using the MultiPlus inverter/charger instead. The switch is included in these products and the charger function of the MultiPlus can be disabled. Computers and other electronic equipment will continue to operate without disruption because the MultiPlus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

Communications interface

These larger Phoenix inverter models come with a VE.Bus port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VictronConnect or VEConfigure software, which can be downloaded free of charge from our website, 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 a GX device (eg Cerbo GX) for monitoring and control.

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 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 / 48V (%)	92 / 94 / 94	92 / 94 / 94	92 / 92	93 / 94 / 95	94 / 95		
Zero load power 12 / 24 / 48V (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: alu	ıminium (blue RAL 5012) Pro	otection category: IP21			
Battery-connection	battery cables of 1	.5 meter included	M8 bolts	2+2 M8	3 bolts		
230 V AC-connection	G-ST18	Bi plug	Spring-clamp	Screw te	rminals		
Weight (kg)	1	0	12	18	30		
Dimensions (hxwhd in mm)	375 x 21	14 x 110	520 x 255 x 125	362 x 258 x 218	444 x 328 x 240		
		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 outpu g) input voltage ripple too h						



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 $\underline{\sf VRM\ Portal.}$



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 <u>NMEA 2000 & MFD integration guide</u>



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 - 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	12/800/3: 24/800/16 48/800/9	5 2	2/1200/50 4/1200/25 8/1200/13	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	Outpu	t voltage: 230VAC ± 2	2% Fre	equency: 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	% 9:	3 / 94 / 95%	93 / 94 / 95%			
Zero-load power	6/6/7W	7/7/8W	1	0/9/10W	10/9/10W			
Zero-load power in search mode	2/2/3W	2/2/3W		3 / 3 /3W	3 / 3 /3W			
	2,2,011	CHARGER		-,-,-,-				
AC Input	Input vo	oltage range: 187-265	VAC	Input frequency	y: 45 – 65 Hz			
Charge voltage 'absorption'	i i		4 / 28,8 / 57,6					
Charge voltage 'float'		13,8 / 27,6 / 55,2V						
Storage mode			2 / 26,4 /52,8					
Charge current house battery (4)	20/10/6A	35 / 16 / 9/		0 / 25 / 13A	70 / 40 / 20A			
Charge current starter battery	20, 10, 011		and 24V mod		707 107 2071			
Battery temperature sensor		171 (124	Yes	acis offiy)				
, and produce the second		GENERAL	165					
Programmable relay (5)			Yes					
Protection (2)			a – g					
VE.Bus communication port		d three phase operati	ion, remote n					
Remote on-off		On/off/charger	only		On/off			
DIP switches		Yes (6)			Yes (7)			
Internal DC fuse	125/60/30A	150/80/40A	20	0/100/50A	200/125/60A			
Common Characteristics	Ор	perating temp. range: Humidity (no			ooling)			
		ENCLOSURE						
Common Characteristics	Material &	Colour: Steel/ABS (bl	lue RAL 5012) Protection of	category: IP 21			
Battery-connection	16 / 10 / 10 mm	25 / 16 / 10 m	nm² 35,	/ 25 / 10 mm ²	50 / 35 / 16 mm ²			
230V AC-connection		G-S	T18i connect	or				
Weight	4,4 kg	6,4 kg		8,2 kg	10,2 kg			
Dimensions (h x w x d)	311 x 182 x 100 n	nm 360 x 240 x 100	0 mm 406 x	250 x 100 mm	470 x 265 x 120 mm			
		STANDARDS						
Safety		EN-IEC 60335-1, EI	N-IEC 60335-2	2-29, EN 62109-	1			
Juicty	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				000-3-3			
Emission / Immunity	LIV.	IEC 61000-6-1, IE	C 0 1000-0-2,					
·	LIV	IEC 61000-6-1, IE	ECE R10-5					







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 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.

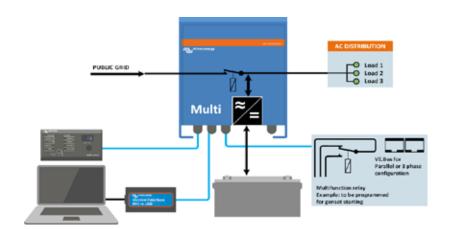
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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



12 Volt MultiPlus 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		Outpu	t voltage: 230 VAC ± 2%	Frequency: 50 I	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 ra	ange: 187-265 VAC	Input frequency: 45 - 65 I	Hz Power factor: 1	
Charge voltage 'absorption' (V DC)			14,4	1 / 28,8 / 57,6		
Charge voltage 'float' (V DC)			13,8	3 / 27,6 / 55,2		
Storage mode (V DC)			13,2	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 a	nd three phase operatio	on, remote monitoring and	d system integration	
General purpose com. port	n.a.	n.a.	n.a.	n.a.	Yes	Yes
Remote on-off				Yes		
Common Characteristics		Operating temp. ran-	ge: -40 to +65°C (fan ass	isted cooling) Humidity (non-condensing): max 9	5%
		Е	NCLOSURE			
Common Characteristics		Material & C	olour: aluminium (blue I	RAL 5012) Protec	tion category: IP 21	
Battery-connection		battery cables of 1.5 m	neter	M8 bolts	Four M8 bolts (2 plus a	nd 2 minus connections
230 V AC-connection		G-ST18i connecto	r	Spring-clamp	Screw terminals 13 mm² (6 AWG)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)		375 x 214 x 110		520 x 255 x 125	362 x 258 x 218	444 x 328 x 240
		S	TANDARDS			
Safety			EN-IEC 60335-1, EN	-IEC 60335-2-29, IEC 62109	9-1	
Emission, Immunity	El	N 55014-1, EN 55014-2,	EN-IEC 61000-3-2, EN-II	EC 61000-3-3, IEC 61000-6	-1, IEC 61000-6-2, IEC 610	000-6-3
Road vehicles			12V and 24	V models: ECE R10-4		
Anti-islanding			See	our website		
1) Can be adjusted to 60 HZ. 120 V models availal 2) Protection key: a) output short circuit b) overload c) battery voltage too high	ble on request	6) Programmable relay	st factor 3:1 no external AC source availal y that can a.o. be set for gen r genset start/stop function			

- 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

- 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 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 $\underline{\text{NMEA2000 \& MFD}}$ 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 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 (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

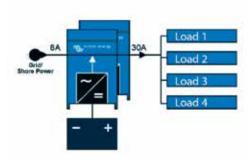
After installation, the MultiPlus is ready to go.

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!

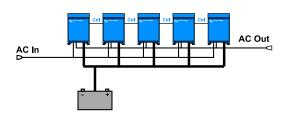
Alternatively, VE.Net can be used instead of the DIP switches.

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



AA JUDI	12 Volt	12/2000/80	12/3000/120				
MultiPlus	24 Volt	24/2000/50	24/3000/70				
PowerControl		Yes					
PowerAssist		Yes					
Transfer switch (A)		50					
Parallel and 3-phase	e 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)					
	rat 25°C / 77°F (VA) (3)	2000	3000				
Cont. output power		1600	2400				
Cont. output power		1450	2200				
Cont. output power	rat 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		7/8	15/15				
Zero load power in :	Search mode (W)	3/4	8 / 10				
AGI.		CHARGER	45 CELL D. C. 1. 4				
AC Input	.: 10100		t frequency: 45 – 65 Hz Power factor: 1				
Charge voltage 'abs			/ 28,8				
Charge voltage 'floa			/ 27,6				
Storage mode (V DC		13,2 / 80 / 50	120 / 70				
Charge current hou Charge current start			120770				
Battery temperature	* * * *						
battery temperature	e sensor	GENERAL	es				
Auxiliary output (5)	n. a.	Yes (32A)				
Programmable relay		Yes (1x)	Yes (3x)				
Protection (2)	, (0)	a-					
VE.Bus communicat	tion port		emote monitoring and system integration				
General purpose co	•	n. a.	Yes (2x)				
Remote on-off	•	Ye	es				
Common Character	istics	Operating temp. range: -40 - +65°C / -40 to 150°F (fan as	sisted cooling) Humidity (non-condensing): max 95%				
		ENCLOSURE					
Common Character	istics	Material & Colour: aluminium (blue RA	L 5012) Protection category: IP 21				
Battery-connection		M8 bolts	M8 bolts (2 plus and 2 minus connections)				
120 V AC-connectio	n	Screw-terminal 6 AWG (13 mm²)	Screw-terminal 6 AWG (13mm²)				
Weight		13 kg 25 lbs.	19kg 40 lbs.				
Dimensions (hxwxd	I 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 Immu	inity	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) Protection key:		2) Non-linear load, crest factor 3:1					
a) output short cir	rcuit	3) At 75°F ambient					
b) overloadc) battery voltage	too high	4) Switches off when no external AC source available					
d) battery voltage		5) Programmable relay that can a.o. be set for general alarm.					
e) temperature to		aiarm, DC under voltage or genset start/stop function					
f) 230 VAC on inve		AC rating: 230 V/4 A					
g) input voltage ri		DC rating: 4A up to 35 VDC, 1 A up to 60 VDC					
		6) 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.





Several interfaces are available:

Computer controlled operation and monitoring

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 inverter/charger 3kVA - 15kVA 230V

Lithium Ion battery compatible

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.



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 (see data sheet on www.victronenergy.com) 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.



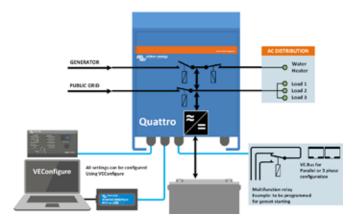
Quattro 48/5000/70-100/100



48/15000/200-100/100



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	48/15000/200-100/10		
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		
Input voltage range (V DC)		INVERTER	,5 – 17V 19 – 33V 38 -	- 66V			
Output (1)			,	ency: 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 Ales mode (W)	8/10	10/10/15	15 / 15	15	20		
zero load power in Search mode (w)	0/10	CHARGER	13/ 13	15	20		
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)	120 / 70	220/ 120/ 70	4 (12V and 24V models on		200		
Battery temperature sensor			Yes	19)			
battery temperature sensor		GENERAL	res				
Auxiliary output (A) (5)	25	50	50	50	50		
Programmable relay (6)	3x	3x	3x	3x	3x		
Protection (2)	3,4	J.	a-q	3^	37		
VE.Bus communication port		For parallel and three pha	se operation, remote monit	toring and system integration	on		
General purpose com. port	2x	2x	2x	2x	2x		
Remote on-off	ZA	27	Yes	27	2.4		
Common Characteristics		Operating temp: -40	0 to +65°C Humidity (non-	condensing): may 05%			
Collinoi Characteristics		ENCLOSURI		Condensing). max. 95%			
Common Characteristics			minium (blue RAL 5012) F	Protection category: IP 21			
Battery-connection			bolts (2 plus and 2 minus c				
230 V AC-connection	Screw terminals 13 mm ²	Bolts M6	Bolts M6	Bolts M6	Bolts M6		
Waight (kg)	(6 AWG)	34/30/30	45 / 41	51	72		
Weight (kg)	19	470 x 350 x 280	45 / 41	31	/2		
Dimensions (hxwxd in mm)	362 x 258 x 218	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		
		STANDARD:		EN 156 40400 4			
Safety			60335-1, EN-IEC 60335-2-29	'	2 150 (4000 5 2		
Emission, Immunity	EN 5501	4-1, EN 55014-2, EN-IEC 610	000-3-2, EN-IEC 61000-3-3,		2, IEC 61000-6-3		
Road vehicles			12V and 24V models: ECE	: R10-4			
Anti-islanding		a) N	See our website				
1) Can be adjusted to 60 HZ. 120 V models av 2) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low e) temperature too high	4) At 25°C ambient 5) Switches off when 6) Programmable rela DC under voltage o AC rating: 230 V / 4	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					
d) battery voltage too low AC			A				



Digital Multi Control Panel

g) input voltage ripple too high

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 <u>VRM Portal.</u>



MK3-USB (VE.Bus to USB interface)

Connects to a USB port <u>(see 'A guide to VEConfigure')</u>



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.



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

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.

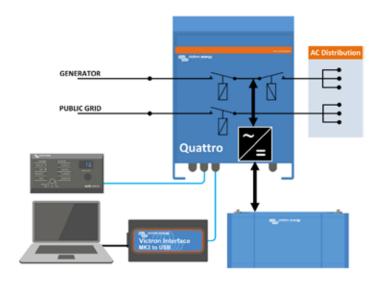
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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





48/5000/70-100/100

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							
Integrated Transfer switch	Yes						
AC inputs (2x)	Input voltage	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					
nput voltage range		9,5 – 17 V 19 – 33V 38 – 66 V					
Output (1)	Out	cput voltage: 120 VAC \pm 2% Frequency: 60 Hz \pm 0,	.1%				
Cont. output power at 25°C (3)	3000 VA	5000 VA	10000 VA				
Cont. output power at 25℃	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				
itorage 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 50 A					
Auxiliary output (5)	32 A	50 A					
Programmable relay (6)	3x						
Protection (2)		a-g					
E.Bus communication port	For parallel, split pha	se and three phase operation, remote monitoring an	d system integration				
General purpose com. port		2x					
Remote on-off		Yes					
Common Characteristics		emp.: -40 to +65°C Humidity (non-condensing): max. 95%				
		NCLOSURE					
Common Characteristics	Material &	Colour: aluminium (blue RAL 5012) Protection cate	gory: IP 21				
Battery-connection		Four M8 bolts (2 plus and 2 minus connections)					
20 V AC-connection	Screw terminals 13 mm ² (6 AWG)	Bolts M6	Bolts M6				
Veight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg				
	14.3 x 10.2 x 8.6 inch	18,5 x 14,0 x 11,2 inch 470 x 350 x 280 mm	22.6 x 19,2 x 13,6 inch				
Dimensions (hxwxd)	362 x 258 x 218 mm	17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	572 x 488 x 344 mm				
	302 X 238 X 218 IIIIII	17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	372 X 486 X 344 IIIIII				
	ST	TANDARDS					
afety		EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1					
mission, Immunity	EN 55014-1, EN 55014-2,	EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IE	EC 61000-6-2, IEC 61000-6-3				
oad vehicles		12V and 24V models: ECE R10-5					
inti-islanding		See our website					
) Can be adjusted to 60 HZ; 120 V 60 Hz on request) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low e) temperature too high f) 120 VAC on inverter output q) 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 <u>VRM Portal.</u>



MK3-USB VE.Bus to USB interface

Connects to a USB port <u>(see 'A guide to VEConfigure')</u>



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.





Blue Smart IP22 charger





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 (LiFePO₄) batteries

LiFePO₄ 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 – 2	265 VAC	180 – 265 VAC				
Charge current, normal mode	15 / 20	0/30 A	8/12	2/16 A			
Charge current, NIGHT or LOW	7,5 / 1	0 / 15 A	4/6	5/8A			
Efficiency	99	3%	g	94%			
No load power consumption	0.5	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	n: 14,7V Li-ion: 14,2V	Normal: 28,8V Hig	h: 29,4V Li-ion: 28,4V			
Charge voltage 'float'	Normal: 13,8V High	n: 13,8V Li-ion: 13,5V	Normal: 27,6V Hig	h: 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)		М	ax 98%				
		ENCLOSURE					
Material & Colour		Aluminium	(blue RAL 5012)				
Battery connection		Screw termina	als 13 mm² / 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 1	08 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	I-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 (LiFePO₄) batteries

LiFePO₄ 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	5 Hz			
Efficiency	93%	93%	95%	95%	94%	96%	96%	
No load power consumption				0.5W				
Charge voltage 'absorption'	Nor	mal: 14,4V Hig	h: 14,7V Li-ion:	14,2V	Normal: 28,8V	High: 29,4V	Li-ion: 28,4V	
Charge voltage 'float'	Nor	mal: 13,8V Hig	h: 13,8V Li-ion:	13,5V	Normal: 27,6V	High: 27,6V	Li-ion: 27,0V	
Charge voltage 'storage'	Nor	mal: 13,2V Hig	h: 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) (12/25 and 24/12 models only)		(uit proof, current ax one volt lowe	limit 0,5 A r than main output			
		EN	CLOSURE					
Material & Colour			alum	inium (blue RAL	5012)			
Battery-connection			Black ar	nd red cable of 1,	5 meter			
230 V AC-connection			Cable of 1	,5 meter with CE	E 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	
		STA	ANDARDS					
Safety			EN 60	335-1, EN 60335	-2-29			
Emission Immunity			EN 55014-1	EN 61000-6-3, E	N 61000-3-2			
Automotive Directive		E	N 55014-2, EN 610	000-6-1, EN 6100	0-6-2, EN 61000-3-3	3		



Blue Smart IP65 Charger

Blue Smart IP65 Charger	12 V 4/5/7/10/15/25 A	24 V 5/8/13 A			
Input voltage	230 V AC				
Efficiency	94%	95%			
Standby power consumption		5W			
Minimum battery voltage	·	from down to 0V			
Willim Battery Voltage	Normal: 14.4 V	Normal: 28.8 V			
Charge voltage 'absorption'	High: 14,7 V	High: 29,4 V			
gg	Li-ion: 14,2 V	Li-ion: 28,4 V			
	Normal: 13,8 V	Normal: 27,6 V			
Charge voltage 'float'	High: 13,8 V	High: 27,6 V			
	Li-ion: 13,5 V	Li-ion: 27,0 V			
Charge voltage 'storage'	Normal: 13,2 V High: 13,2 V	Normal: 26,4 V High: 26,4 V			
Charge voltage storage	Li-ion: 13,5 V	Li-ion: 27,0 V			
Charge current	4/5/7/10/15/25 A	5/8/13 A			
Charge current in low current mode	2/2/2/3/4/10A	2/3/4A			
Temperature compensation	16 mV/°C	32 mV/°C			
(lead-acid batteries only)					
Can be used as power supply	•	es			
Back current drain		onth (1 mA)			
Protection	Reverse polarity Over ten	Output short circuit nperature			
Operating temp. range		ed output up to 30 °C) ty at low temperature)			
Humidity (non condensing)	•	95%			
	ENCLOSURE				
Battery-connection	Black and red ca	able of 1,5 meter			
230 V AC-connection	•	i meter with JK) or AS/NZS 3112 plug			
Protection category	IP65 (splash a	nd dust proof)			
Weight	IP65 12 V 25 A - Other: 0,9 kg	24 V 13 A: 1,9 kg			
	IP65s 12 V 4/5 A	: 45 x 81 x 182 mm			
Dimensions (h x w x d)	IP65 12 V 7 A 24 V 5 A IP65 12 V 10/15 A 24 V 8 A	: 47 x 95 x 190 mm			
	IP65 12 V 10/15 A 24 V 8 A	: 75 x 140 x 240 mm			
	STANDARDS				
Safety	EN 60335-1, E	N 60335-2-29			
Emission	EN 55014-1, EN 6100	00-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1,	EN 61000-6-2, EN 61000-3-3			











MagCode Power Clip 12V



eyelet M8

Blue Smart IP65 Charger The professional's choice



- 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**















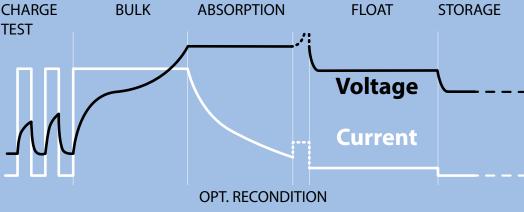






This is the best charger for this type of battery. The battery will be charged in the most efficient way.

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



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.

Reconditioning

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

Recovery function for fully discharged batteries

Most reverse polarity protected chargers will not

recognize, and therefore not recharge a battery which has been discharged to zero or nearly zero Volts. The **Blue 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.



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 REFRESH STORAGE



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 temperature during the charge process. The temperature is measured again when the charger is in low current mode during float or storage.

Special settings for a cold or hot environment are therefore not needed.

Li-ion battery mode

The **Blue Smart IP65 Charger** uses a specific charging algorithm for Li-ion (LiFePO₄) batteries, with automatic Li-ion under voltage protection reset.





Phoenix Smart IP43 charger



Section 19 Section 19



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

Each output can supply the full rated output current. But the total of the 3 outputs combined can never exceed the current rating of the charger.

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 (LiFePO₄) 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

The remote on/off consists of two terminals: Remote H and Remote L. A remote on/off switch or relay contact can be connected between H and L. Alternatively, terminal H can be pulled high, or terminal L can be pulled low. 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 IP43 Charger	12V, 2 outputs 12/30(1+1) 12/50(1+1)		12V, 3 outputs 12/30(3) 12/50(3)	24V, 2 out 24/16(1+ 24/25(1+	1)	24V, 3 outputs 24/16(3) 24/25(3)		
Input voltage		230 VAC (range: 210 – 250 V)						
DC input voltage range			290 – 3	355 VDC				
Frequency			45-	55 Hz				
Power factor			(),7				
Back current drain	AC disc	onnected:	< 0,1 mA AC	connected and ch	arger remo	te off: < 6 mA		
No load power consumption			1	W				
Efficiency	12/30: 94% 12/50: 92%		12/30: 94% 12/50: 92%	94%		94%		
Charge voltage 'absorption'	Normal: 14,4V	High: 14,7V	Li-ion: 14,2V	Normal: 28,8V	High: 29,4	V Li-ion: 28,4V		
Charge voltage 'float'	Normal: 13,8V H	High: 13,8V	Li-ion: 13,5V	Normal: 27,6V	High: 27,6	V Li-ion: 27,0V		
Storage mode	Normal: 13,2V	High: 13,2V	Li-ion: 13,5V	Normal: 26,4V	High: 26,4	V Li-ion: 27,0V		
Fully programmable			Yes, with Bluetoo	th and/or VE.Direct				
Charge current house battery	30 / 50 A		30 / 50 A	16 / 25 <i>F</i>	4	16 / 25 A		
Low current mode	15 / 25 A	15 / 25 A 15 / 25 A 8 / 12,5 A			Ą	8 / 12,5 A		
Charge current starter battery	3 A (1+1 output models only)							
Charge algorithm	5 stage adaptive							
Protection	Battery re	Battery reverse polarity (fuse, not user accessible) / Output short circuit / Over temperature						
Can be used as power supply		Yes, ou	tput voltage can be set	with Bluetooth and	l/or VE.Dire	ct		
Operating temp. range		Rated o	-20 to 60° output current up to 40°	C (0 - 140°F) C, derate linearly to	20% at 60°	C		
Humidity (non-condensing)			max	95%				
Relay (programmable)			DC rating: 5	up to 28 VDC				
		E	NCLOSURE					
Material & Colour			aluminium (l	olue RAL 5012)				
Battery-connection			Screw terminal	s 16 mm² (AWG6)				
AC-connection	IEC 320 C14 in	nlet with ret	ainer clip (AC cord with	country specific plu	ug must be	ordered separately)		
Protection category		IP4	43 (electronic compone	nts), IP22 (connecti	on area)			
Weight kg (lbs)			3,	5 kg				
Dimensions (hxwxd)			180 x 249 x 100 mm	(7.1 x 9.8 x 4.0 inc	h)			
		S	TANDARDS					
Safety			EN 60335-1,	EN 60335-2-29				
Emission			EN 55014-1, EN 610	00-6-3, EN 61000-3	-2			
Immunity		EN	55014-2, EN 61000-6-1,	EN 61000-6-2, EN 6	1000-3-3			
Vibration			IEC68-2-6:1	0-150Hz/1.0G				



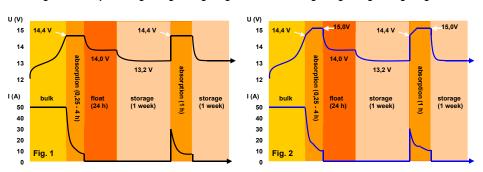
Retainer clip (included)



AC cord (must be ordered separately)

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

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.

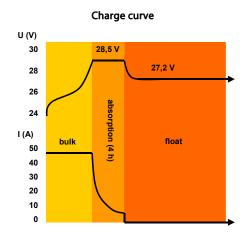
Three-stage charging, with temperature compensation

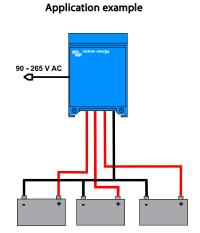
The Centaur charges at bulk rate until the output has reduced to 70% of the rated Amps, at which a 4 hour timer begins. After the timed period the charger switches to float rate.

An internal temperature sensor is used to compensate the charge voltage with – $2 \text{ mV/}^{\circ}\text{C}$ (– $1 \text{ mV/}^{\circ}\text{F}$) 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





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 char	ging)				
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, temperat	ure and current c	ontrolled fan				
Protection			Output sho	ort circuit, over te	mperature				
Operating temp. range			- 20	to 60°C (0 - 140	°F)				
Ignition protected				Yes					
Humidity (non condensing)				max 95%					
			ENCLOSURE						
Material & Colour			alum	inium (blue RAL 5	012)				
Battery-connection	M6 studs	M6 studs	M8 studs	M8 studs	M8 studs	M8 studs	M8 studs		
AC-connection			screw	-clamp 4 mm² (AV	VG 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								



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.



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).

Battery Alarm

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

Installation made easy

- 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 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.

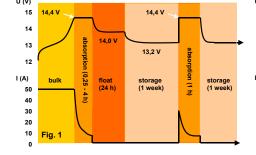
Computer interface

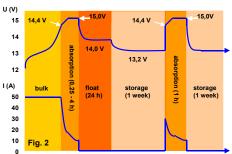
Every Phoenix Charger is ready to communicate with a computer through its RS-485 data port. Together with our VEConfigure software, which can be downloaded free of charge and the data link MK3-USB (see accessories), all parameters of the chargers can be customised.

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)		90-2	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 a	ndaptive				
Battery capacity (Ah)	100-400	200-800	100-200	100-400			
Temperature sensor	√	\checkmark	\checkmark	\checkmark			
Can be used as power supply	√	\checkmark	\checkmark	\checkmark			
Forced cooling	√	\checkmark	\checkmark	\checkmark			
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 (bl	lue RAL 5012)				
Battery-connection		M6 s	tuds				
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, E	N 60335-2-29				
Emission Immunity		EN 55014-1, E	N 61000-3-2,				
Automotive Directive		EN 55014-2, E	EN 61000-3-3				
Vibration		IEC68-2-6:10-150Hz/1.0G					
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 c) Battery voltage too high					



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 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-lon (LiFePO4) ready

Simple charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-lon 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	16	5A	20)A			
Frequency (Hz)		45-6	65Hz				
Power factor		0,	,98				
Charge voltage 'absorption' (VDC) (1)		28	3,8V				
Charge voltage 'float' (VDC)		27	7,6V				
Charge voltage 'storage' (VDC)		26	5,4V				
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)	400-8	00Ah	500-10	000Ah			
Charge algorithm, Li-lon		3 stage, with on-off cor	ntrol or CAN bus control				
Temperature sensor		Yes					
Can be used as power supply		Y	'es				
Remote on-off port		Yes (can be connec	ted to a Li-Ion BMS)				
CAN bus communication port (VE.Can)	Two RJ4	connectors, NMEA200	00 protocol, galvanically	isolated			
Synchronised parallel operation		Yes, wit	h VE.Can				
Alarm relay	DPST AC rati	ng: 240VAC/4A DC ra	ating: 4A up to 35VDC, 1	A up to 60VDC			
Forced cooling		Y	'es				
Protection	Battery reverse	polarity (fuse) Out	tput short circuit Ov	er temperature			
Operating temp. range		-20 to 60°C (Full outp	out current up to 40°C)				
Humidity (non-condensing)		max	95%				
	ENCLO	SURE					
Material & Colour		aluminium (b	olue RAL 5012)				
Battery-connection		M8	bolts				
230 VAC-connection		screw-clamp 1	10mm² (AWG 7)				
Protection category		IP	21				
Weight kg (lbs)		•	(16 lbs)				
Dimensions hxwxd in mm (hxwxd in inches)		405 x 250 x 150 (16.0 x 9.9 x 5.9)					
(IIXWXG III IIICIICS)	STAND		5.5 K 5.5)				
Safety			EN 60335-2-29				
Emission			00-6-3, EN 61000-3-2				
Immunity	EN 5	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3					
1) Output voltage range 20-36V. 2) Up to	o 40°C (100°F) ambient. ut will reduce to 80% at 50°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

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

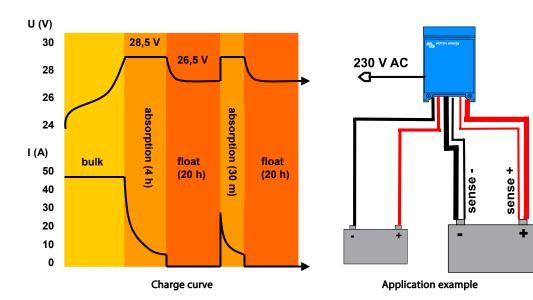
In order to compensate for voltage loss due to cable resistance, TG Chargers are provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Learn more about batteries and battery charging

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



Skylla TG 24 100



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)	120/230	3 x 400	230	230	3 x 400	230	230	
Input voltage range (V AC)	95-264	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		\checkmark						
Remote alarm		Potential free contacts 60V / 1A (1x NO and 1x NC)						
Forced cooling				\checkmark				
Protection (1)				a,b,c,d				
Operating temp. range			-41	0 to +50°C (-40 - 122	°F)			
Humidity (non-condensing)				max 95%				
			ENCLOSURE					
Material & Colour			aluı	minium (blue RAL 50	012)			
Battery-connection				M8 studs				
230 V AC-connection			screv	v-clamp 2,5 mm² (A\	WG 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)	365 x 250 x 147 (14.4x9.9x5.8)	365 x 250 x 257 (14.4x9.9x10.1)	365 x 250 x 257 (14.4x9.9x10.1)	365 x 250 x 257 (14.4x9.9x10.1)	515 x 260 x 265 (20x10.2x10.4)	365 x 250 x 147 (14.4x9.9x5.8)	365 x 250 x 257 (14.4x9.9x10.1)	
			STANDARDS					
Safety			EN	60335-1, EN 60335-2	2-29			
Emission		EN 55014-1, EN 61000-3-2						
Immunity			EN	55014-2, EN 61000-	3-3			
Protection a. Output short circuit b. Battery reverse polarity detection	c. Battery voltage too d. Temperature too h							



BMV-700 Battery MonitorThe 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 cinal ye/discriarge 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 AlarmAn excessively high or low battery voltage is indicated by an audible and visual alarm.







Orion-Tr Smart non-isolated 12/12-30



Orion-Tr Smart non-isolated 12/12-30



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.

Fully programmable

- Battery charge algorithm (configurable) or fixed output.
- Smart alternator compatibility: engine running detection mechanism.

Adaptive 3-stage charge algorithm: bulk - absorption - float

- For lead acid batteries it is important that during shallow discharges 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.
- For lithium batteries absorption time is fixed, default 2 hours.
- Alternatively, a fixed output voltage can be chosen.

Remote on-off

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

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.

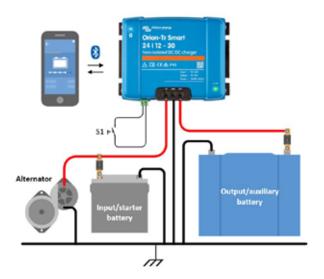
IP43 protection

When installed with the screw terminals oriented downwards.

Screw terminals

No special tools needed for installation.

Input fuse (not replaceable)



Orion-Tr Smart Chargers non-isolated 360 - 400 Watt	12/12-30 (360W)	12/24-15 (360W)	24/12-30 (360W)	24/24-17 (400W)	
Input voltage range (1)	10-17V	10-17V	20-35V	20-35V	
Under voltage shut down	7V	7V	14V	14V	
Under voltage restart	7,5V	7,5V	15V	15V	
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	
Output voltage tolerance		+/- 0	,2V		
Output noise		2mV ı	rms		
Cont. output current at nominal output voltage and 40°C	30A	15A	30A	17A	
Maximum output current (10 s) at nominal output voltage	40A	25A	45A	25A	
Short circuit output current	60A	40A	60A	40A	
Cont. output power at 25°C	430W	430W	430W	480W	
Cont. output power at 40°C	360W	360W	360W	400W	
Efficiency	87%	88%	88%	89%	
No load input current	< 80mA	< 100mA	< 100mA	< 80mA	
Standby current		Less tha	n 1mA		
Operating temperature range		-20 to +55°C (derate 3	% per °C above 40°C)		
Humidity		Max. 95% non-	-condensing		
DC connection		Screw ter	rminals		
Maximum cable cross-section		16 mm ²	(AWG6)		
Weight	12V input and/or	12V output models: 1,8 kg	g (3 lb) Other model	ls: 1,6 kg (3.5 lb)	
Dimensions hxwxd		130 x 186 x 80 mm (5.1 x 7.3 x 3.2 inch)		
Standards: Safety Emission	EN 60950 EN 61000-6-3, EN 55014-1				
Immunity Automotive Directive		EN 61000-6-2, EN 610 ECE R	,		

¹⁾ If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function). If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

Note 1: The VictronConnect App will not display current in or current out. Note 2: The Orion-Tr Smart is not equipped with a VE.Direct port.





Orion-Tr Smart 12/12-30



Orion-Tr Smart 12/12-30



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.

Fully programmable

- Battery charge algorithm (configurable) or fixed output.
- Smart alternator compatibility: engine running detection mechanism.

Adaptive 3-stage charge algorithm: bulk - absorption - float

- For lead acid batteries it is important that during shallow discharges 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.
- For lithium batteries absorption time is fixed, default 2 hours.
- Alternatively, a fixed output voltage can be chosen.

Suitable for use in vehicles with a smart alternator (Euro 5 and Euro 6 engines)

The built-in engine shutdown detection will stop the converter when the engine is not running. This prevents unwanted discharge of the starter battery (see manual for details).

Remote on-off

A remote on/off switch or relay contact can be connected to a two-pole connector.

Alternatively, the H terminal (right) of the two-pole connector can be switched to battery plus, or the L terminal (left) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

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.

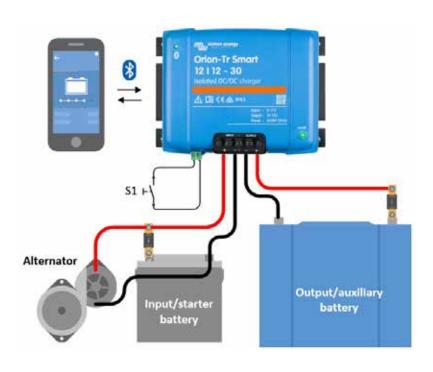
IP43 protection

When installed with the screw terminals oriented downwards.

Screw terminals

No special tools needed for installation.

Input fuse (not replaceable)



Orion-Tr Smart Chargers Isolated 220 - 280 Watt	12/12-18 (220W)	12/24-10 (240W)	24/12-20 (240W)	24/24-12 (280W)	
Input voltage range (1)	8-17V	8-17V	16-35V	16-35V	
Under voltage shut down	7V	7V	14V	14V	
Under voltage restart	7,5V	7,5V	15V	15V	
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	
Output voltage tolerance		+/- 0,	2V		
Output noise		2mV r	ms		
Cont. output current at nominal output voltage and 40°C	18A	10A	20A	12A	
Maximum output current (10 s) at nominal output voltage	25A	15A	25A	15A	
Short circuit output current	40A	25A	50A	30A	
Cont. output power at 25°C	280W	280W	300W	320W	
Cont. output power at 40°C	220W	240W	240W	280W	
Efficiency	87%	88%	88%	89%	
No load input current	< 80mA	< 100mA	< 100mA	< 80mA	
Standby current		Less than	n 1mA		
Galvanic isolation		200V dc between inpu	ut, 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 ter	minals		
Maximum cable cross-section		16 mm ²	AWG6		
Weight		1,3 kg (3 lb)		
Dimensions hxwxd		130 x 186 x 70 mm (5	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 Smart Chargers Isolated 360 - 400 Watt	12/12-30 (360W)	12/24-15 (360W)	24/12-30 (360W)	24/24-17 (400W)	
Input voltage range (1)	10-17V	10-17V	20-35V	20-35V	
Under voltage shut down	7V	7V	14V	14V	
Under voltage restart	7,5V	7,5V	15V	15V	
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	
Output voltage tolerance			+/- 0,2V		
Output noise		2	2mV rms		
Cont. output current at nominal output voltage and 40°C	30A	15A	30A	17A	
Maximum output current (10 s) at nominal output voltage minus 20%	40A	25A	45A	25A	
Short circuit output current	60A	40A	60A	40A	
Cont. output power at 25°C	430W	430W	430W	480W	
Cont. output power at 40°C	360W	360W	360W	400W	
Efficiency	87%	88%	88%	89%	
No load input current	< 80mA	< 100mA	< 100mA	< 80mA	
Standby current		Less	than 1mA		
Galvanic isolation		200V dc betweer	n input, output and case		
Operating temperature range		-20 to +55°C (dera	ate 3% per °C above 40°C)		
Humidity		Max. 95%	non-condensing		
DC connection		Scre	w terminals		
Maximum cable cross-section		16 m	m ² (AWG6)		
Weight	12V input and	or 12V output models: 1	1,8 kg (3 lb) Other mod	dels: 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		E	N 60950		
Emission			-6-3, EN 55014-1		
Immunity			N 61000-6-1, EN 55014-2		
Automotive Directive		E	CE R10-5		

If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function). If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

Note 1) The VictronConnect App will not display current in or current out. Note 2) The Orion-Tr Smart is not equipped with a VE.Direct port.

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.

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)
8-17V	8-17V	16-35V	16-35V	16-35V	32-70V	32-70V	32-70V
7V	7V	14V	14V	14V	28V	28V	28V
7,5V	7,5V	15V	15V	15V	30V	30V	30V
12,2V	24,2V	12,2V	24,2V	48,2V	12,2V	24,2V	48,2V
10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
			+/-	0,2V			
			2m\	/ rms			
9A	5A	9A	5A	2,5A	9A	5A	2,5A
12,5A	6,3A	12,5A	6,3A	3,0A	12,5A	6,3A	3,0A
32A	23A	39A	30A	19A	27A	25A	17A
110W	120W	110W	120W	120W	110W	120W	120W
85W	110W	85W	115W	115W	85W	100W	85W
87%	88%	85%	87%	88%	87%	86%	89%
< 50mA	< 80mA	< 40mA	< 60 mA	< 120mA	< 50mA	< 60mA	< 80mA
		200V	dc between in	put, output and	d case		
		-20 to +5	5°C (derate	3% per °C ab	ove 40°C)		
			Max. 95% no	n-condensing)		
			Screw t	erminals			
6 mm ² AWG10							
0,42 kg (1 lb)							
		100 x 1	13 x 47 mm	(4.0 x 4.5 x 1.	9 inch)		
EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2							
	12/12-9 (110W) 8-17V 7V 7,5V 12,2V 10-15V 9A 12,5A 32A 110W 85W 87%	12/12-9 (120W) 8-17V (120W) 8-17V 7V 7V 7,5V 7,5V 12,2V 24,2V 10-15V 20-30V 9A 5A 12,5A 6,3A 32A 23A 110W 120W 85W 110W 87% 88%	12/12-9 (110W) (120W) (110W) 8-17V 8-17V 16-35V 7V 7V 14V 7,5V 7,5V 15V 12,2V 24,2V 12,2V 10-15V 20-30V 10-15V 9A 5A 9A 12,5A 6,3A 12,5A 32A 23A 39A 110W 120W 110W 85W 110W 85W 87% 88% 85% < 50mA < 80mA < 40mA 200V -20 to +5	12/12-9	12/12-9	12/12-9	12/12-9

If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function).
 If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

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 (1)	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				2m\	/ 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 d	dc between in	put, output ar	nd case		
Operating temperature range			-20 to +	55°C (derate	3% per ℃ abo	ove 40°C)		
Humidity				Max. 95% no	n-condensing			
DC connection		Screw terminals						
Maximum cable cross-section				16 mm ²	² AWG6			
Weight				1,3 kg	g (3 lb)			
Dimensions hxwxd			130 x	186 x 70 mm	(5.1 x 7.3 x 2.8	3 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 (1)	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				2m\	/ 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 d	lc between in	put, output an	d case		
Operating temperature range			-20 to +5	55°C (derate	3% per °C abo	ve 40°C)		
Humidity				Max. 95% no	n-condensing			
DC connection				Screw to	erminals			
Maximum cable cross-section				16 mm ²	(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					0950			
Emission					3, EN 55014-1			
Immunity Automotive Directive			EN 610	•	000-6-1, EN 55 R10-5	5014-2		

¹⁾ If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function).

If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.



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		Screv	w 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

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.

Easy to instal

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 24/12-40





Orion 24/12-70 with binding posts

Non isolated	Orion	Orion	Orion	Orion	Orion	Orion
converters	24/12-25	24/12-40	24/12-70	12/24-8	12/24-10	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 61000-6-3 EN 61000-6-2, EN 61	0950 3, EN 55014-1 1000-6-1, EN 55014-2 R10-4		

Orion IP67 24/12 and 12/24 DC-DC converters

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	24/12-10	24/12-20	24/12-100	12/24-50	
Input voltage range		18-35VDC	10-15VDC			
Under voltage shutdown		13V	15V	8V		
Under voltage restart		14V		16V	9V	
No load current at 24V	1mA	20mA	85mA	45mA		
DC output voltage	12V +/- 3%	12V +/- 3%	12V +/- 3%	12V +/- 3%	24V +/- 3%	
Maximum continuous output current	5A	10A	20A	100A	50A	
Efficiency	93%	93%	95%	96%	96%	
Ripple & Noise		75mVpp		150	mVpp	
Operating temperature range (derate 3% per °C above 40°C)		-40 to +70°	C (full rated output up to	40°C)		
Overload protection		Hiccup mode, recovers a	utomatically after fault co	ondition is removed		
Short circuit proof	Yes					
Protection against reverse polarity connection	With external fuse or circuit breaker (not included)					
CONNECTION						
Connection		ENCLOSURE				
			minium (blue RAL 5012)			
Material & Colour			minium (blue RAL 5012) IP67			
Material & Colour Protection category	Two input		IP67	Bol	ts M6	
Material & Colour Protection category DC connection	Two input 0,8mm² (18 AWG)	Aluı	IP67	Bol n.a.	ts M6 n.a.	
Material & Colour Protection category DC connection Cable cross section, input	·	Alur and two output cables, I	IP67 ength 1,8m			
Material & Colour Protection category DC connection Cable cross section, input Cable cross section, output	0,8mm² (18 AWG)	Alur and two output cables, l 1,5mm² (15 AWG)	IP67 ength 1,8m 2,6mm² (13 AWG)	n.a.	n.a.	
Material & Colour Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg)	0,8mm² (18 AWG) 0,8mm² (18 AWG)	Alui and two output cables, l 1,5mm² (15 AWG) 1,5mm² (15 AWG)	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG)	n.a. n.a.	n.a. n.a.	
Material & Colour Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg)	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, l 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g	n.a. n.a. 2,15 kg	n.a. n.a. 3 kg	
Material & Colour Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg) Dimensions (h x w x d in mm)	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, l 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g	n.a. n.a. 2,15 kg	n.a. n.a. 3 kg	
Material & Colour Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg) Dimensions (h x w x d in mm)	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, l 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32 STANDARDS	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g 74 x 74 x 32	n.a. n.a. 2,15 kg	n.a. n.a. 3 kg	
Material & Colour Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg) Dimensions (h x w x d in mm) Safety Emission	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, le 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32 STANDARDS	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g 74 x 74 x 32 EN 60950	n.a. n.a. 2,15 kg 265 x 127 x 63	n.a. n.a. 3 kg	
Material & Colour Protection category DC connection Cable cross section, input Weight (kg) Dimensions (h x w x d in mm) Safety Emission Immunity Automotive Directive	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, le 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32 STANDARDS	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g 74 x 74 x 32 EN 60950 61000-6-3, EN 55014-1	n.a. n.a. 2,15 kg 265 x 127 x 63	n.a. n.a. 3 kg	



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



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



Orion IP67 24/12-100 Orion IP67 12/24-50







Cerbo GX



Accessories included with the Cerbo GX



GX Touch 50 (optional display for Cerbo GX)



Accessories included with the GX Touch 50

Cerbo GX: communication-centre

This communication-centre allows you to always have perfect control over your system from wherever you are and to maximise its performance. Simply access your system via our Victron Remote Management (VRM) portal, or access it directly, using the optional GX Touch 50 screen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its Bluetooth capability.

GX Touch 50: display accessory

The GX Touch 50 is a display accessory for the Cerbo GX. The five inch touch screen display gives an instant overview of your system and allows you to adjust settings. Simply connect the display to the Cerbo GX with just one cable. The GX Touch 50 has a waterproof design, has a top-mountable setup and is simple to install.

Remote Console on VRM

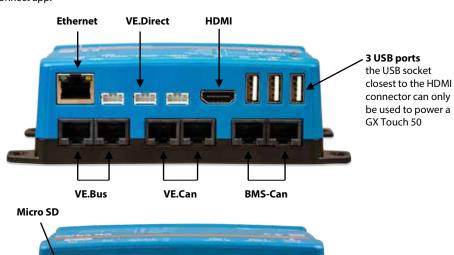
Monitor, control and configure the Cerbo GX remotely, over the internet. Just like if you were standing in front of the device, using Remote Console. The same functionality is also available on the local network LAN, or using the WiFi Access Point of the Cerbo GX.

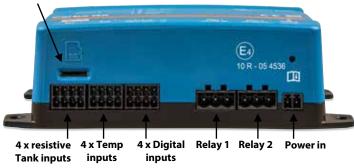
Perfect monitoring & control

Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements. Easily control the shore power input current limit, (auto)start/stop generator(s) or change any setting to optimise the system. Follow up on alerts, perform diagnostic checks and resolve complications remotely.

Simple mounting and configuration

The Cerbo GX is easily mountable and can also be mounted on a DIN-Rail using the DIN35 adapter small, (not included). Its separate touchscreen can be bolted on a dashboard, eliminating the need to create perfect cutouts (like with the Color Control GX). Connection is easy via just one cable, taking away the hassle of having to bring many wires to the dashboard. The Bluetooth feature enables a quick connection and configuration via our VictronConnect app.







Cerbo GX					
Supply voltage	8 – 70V DC				
Mounting	Wall or DIN rail (35mm) ⁽²⁾				
Communication ports					
VE.Direct ports (always isolated)	3 (3)				
VE.Bus (always isolated)	2 paralleled RJ45 sockets				
VE.Can	yes - non isolated				
Other					
Outer dimensions (h x w x d)	78 x 154 x 48 mm				
Operating temperature range	-20 to +50°C				
Standards					
Safety	tbd				
EMC	tbd				
Automotive	tbd				
GX Touch 50					
Mounting	With included mounting accessories				
Display Resolution	800x480				
	Other				
Outer dimensions (h x w x d)	87 x 128 x 12.4 mm				
Cable length	2 meter				
Notes 1 For more detailed information a	shout the Cerbo GX and the GX Touch 50 please visit the Victron				

- For more detailed information about the Cerbo GX and the GX Touch 50, please visit the Victron GX product range page at Victron live:
- 2. DIN rail mounting requires additional accessory DIN35 Adapter.
- 3. The listed maximum on the 'Performance' section in above table is the total connected VE.Direct devices such as MPPT Solar Charge controllers. Total means all directly connected devices plus the devices connected over USB. The limit is mostly bound by CPU processing power. Note that there is also a limit to the other type of devices of which often multiple are connected: PV Inverters. Up to three or four three phase inverters can typically be monitored on a CCGX. Higher power CPU devices can monitor more.

Optional accessories





GX Touch 50 adapter for CCGX cut-outThis adapter is designed to easily replace the CCGX display with the newer GX Touch 50.
Contents of the packaging are the metal bracket, the plastic bezel, and four mounting screws.



Temperature sensor for Quattro, MultiPlus and GX Device (such as the Cerbo GX)



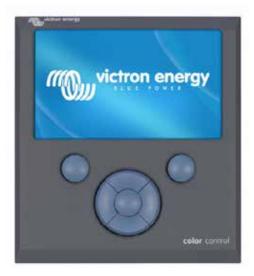


DIN35 adapter small

DIN-Rail adapter to easily mount a device on a DIN-Rail. Suitable for the Cerbo GX.



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. See also the screenshots below.

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

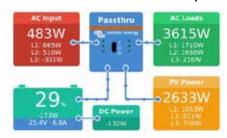
The CCGX can be connected to internet with an Ethernet cable and via wifi. To connect via wifi, a wifi USB accessory is required. The CCGX has no internal cellular modem: there is no slot for a sim-card. Use an off-the-shelf GPRS or 3G router instead. See the blog post about 3G routers.

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 FAO for more information.
- Powered by the Venus OS embedded linux.

Color Control GX						
Power supply voltage range		8 – 70V DC				
Current draw	12V DC	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/30	3A / 30V DC / 250V AC (Normally open)				
		Communication ports				
VE.Direct	2 sep	arate VE.Direct ports	– isolated			
VE.Can	2 par	2 paralleled RJ45 sockets – isolated				
VE.Bus	2 par	2 paralleled RJ45 sockets – isolated				
USB	2 U	2 USB Host ports – not isolated				
Ethernet	10/100/1000	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 JSO	N API to retrieve dat	a from the <u>VRM Portal</u>			
		Other				
Outer dimensions (h x w x d)		130 x 120 x 28mr	m			
Operating temperature range		-20 to +50°C				
		Standards				
Safety	EN 60	950-1:2005+A1:2009	9+A2:2013			
EMC	EN 61000-6-3, EN 5	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



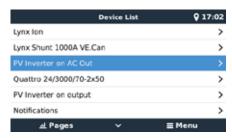
Mobile & boat overview



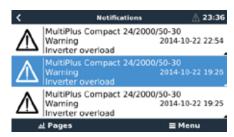
Genset control page



Main menu



Alarm notifications

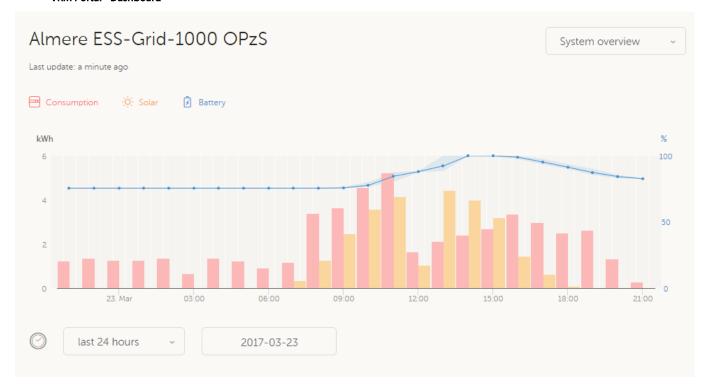


Tiles overview

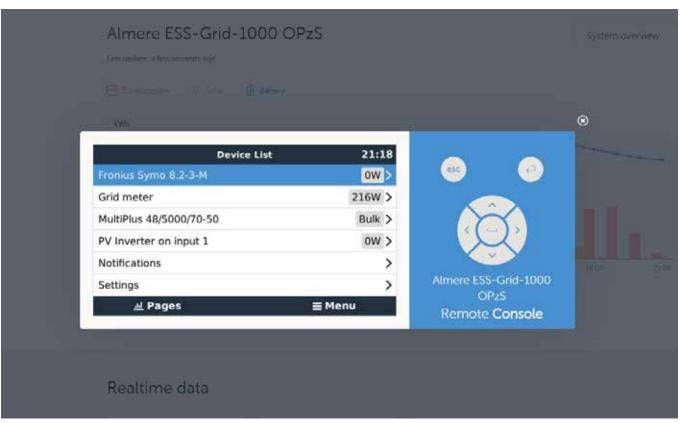


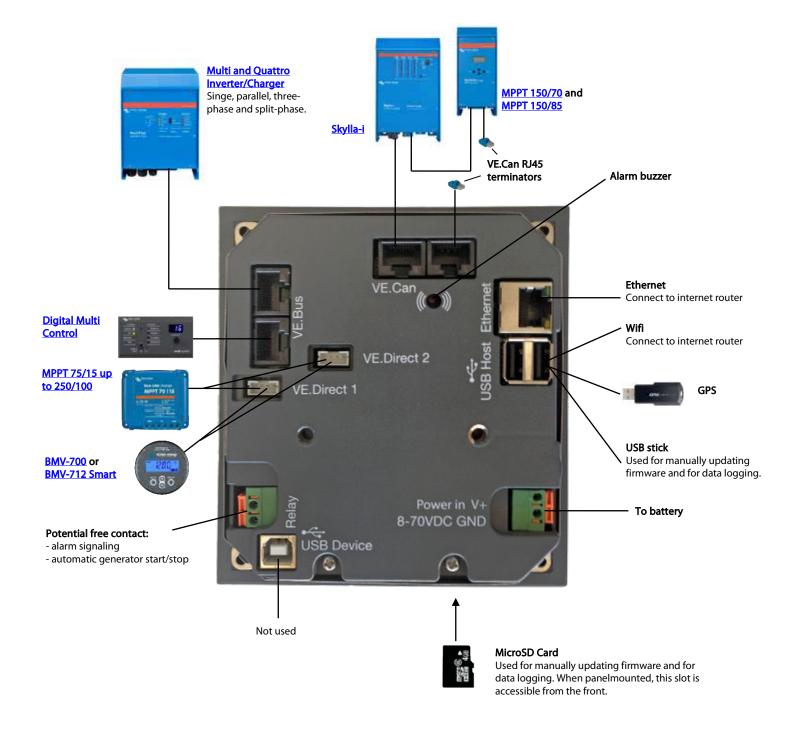


VRM Portal - Dashboard



VRM Portal - Remote Console







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. To get an impression. 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

- 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	2 nd 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					
	Ю					
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					









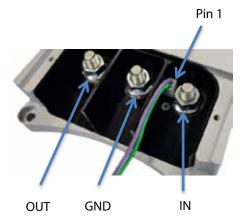
victron energy

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	100A
Input voltage range	10-30V		
Under voltage threshold		10V	
Output voltage range		10-30V	
Maximum charge current	12V:25A 24V:15A	12V:50A 24V:25A	12V:100A 24V:50A
	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	30V		
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 +60°C		
Ambient temperature	Max current: up to 60°C		
Weight	0,6kg	1,4kg	4,1kg
Dimensions	165 x 120 x 30mm	213 x 120 x 30mm	288 x 162 x 95mm

Smart BatteryProtect 65A/100A/220A



Smart BatteryProtect BP-65



Smart BatteryProtect BP-100



Smart BatteryProtect BP-220



Connector with preassembled DC minus cable (included)

Protects the battery against excessive discharge and can be used as a system on/off switch

The Smart 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.

The on/off input can be used as a system on/off switch.

12/24V auto ranging

The Smart BatteryProtect automatically detects system voltage one time only.

Bluetooth: programming made easy

When using Bluetooth to program the Smart BatteryProtect any required engage/disengage levels can be set. Alternatively, one of nine predefined engage/disengage levels can be set with the programming pin (see manual). If required, Bluetooth can be disabled.

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 16.3V respectively 32.6V.

Ignition proof

No relays but MOSFET switches, and therefore no sparks.

Delayed alarm output

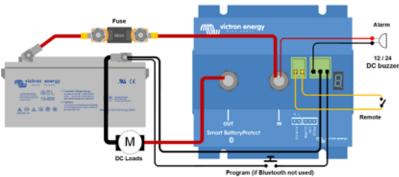
The alarm output is activated if the battery voltage drops below the preset disconnect level during more than 12 seconds. Starting the engine will therefore not activate the alarm. The alarm output is a short circuit proof open collector output to the negative (minus) rail, max. current 50 mA. The alarm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

Smart BatteryProtect		Smart BP-65	Smart BP-100	Smart BP-220
Maximum continuous load	current*	65A	100A	220A
Peak current (during 30 sec	conds)	250A	600A	600A
Operating voltage range			6 –35V	
Current consumption	BLE On	When on: 1,4 mA Whe	n off or low voltage shutdo	wn: 0,9 mA
Current consumption	BLE Off	When on: 1,2 mA When	off or low voltage shutdow	/n: 0,7 mA
Alarm output delay			12 seconds	
Maximum load on alarm ou	utput	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		2V or 24V
Operating temperature ran	ige	Full load: -40°C	to +40°C (up to 60% of nom	inal load at 50°C)
IP rating		Electroni	cs: IP67 (potted) Connect	tions: IP00
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
* The BatteryProtect is not designed for reverse currents from charging sources				



System on/off

- a. ON when the L and H terminal are interconnected (switch or relay contact)
- b. ON when the L terminal is pulled to battery minus (V< 3.5V)
- c. ON when the H terminal is high (2.9V < VH < Vbat)
- d. OFF in all other conditions







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

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 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)

12/24 V auto ranging

(multiply by two for 24 V)

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.

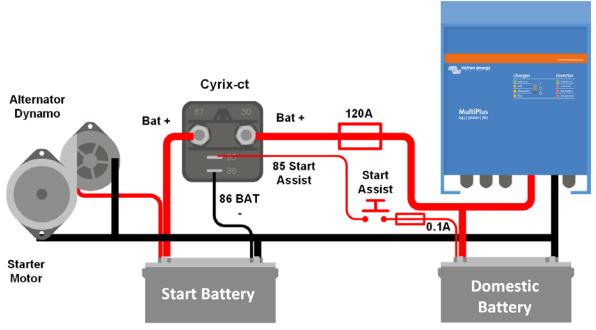
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Cyrix Battery Combiner	Cyrix-ct 1	2/24-120	Cyrix-ct 1	2/24-230
LED status indication	N	0	Ye	es
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 enga	ged during 30 seco	nds)
Control cable included (length 1 m)	N	0	Ye	es .
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)			65 x 10 (2.6 x 4.	

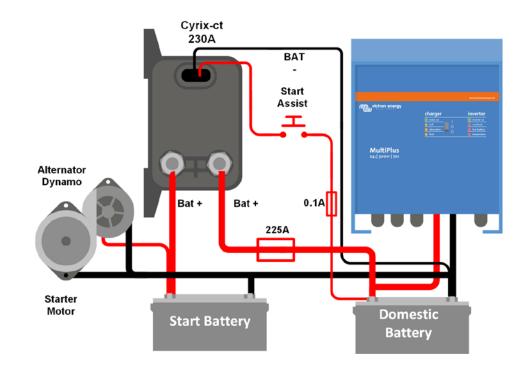
Connect (V)	Delay
V < 13 V	Remains open
13,0 V < V < 13,2 V	10 min
13,2 V < V < 13,4 V	5 min
13,4 V < V < 13,6 V	1 min
13,6 V < V < 13,8 V	4 sec

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 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	8-36 VDC
Input voltage 24/48 V model	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	78 x 102 x 110
(h x w x d in inches)	(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

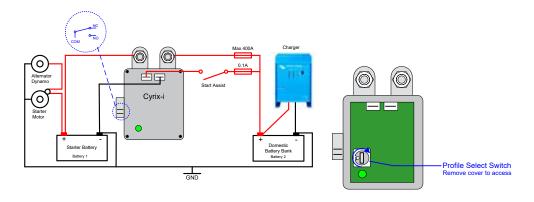
Profile 1			
Connect (V)*		Disconi	nect (V)*
Less than 13,25 V	Remains open	More than 12,75 V	Remains closed
More than 13,25 V	Closes after 30 sec	From 10,5 V to 12,75 V	Opens after 2 min
		Less than 10,5 V	Immediate

Profile 2			
Connect (V)*		Disconr	nect (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









SmartShunt 500A



SmartShunt 1000A



SmartShunt 2000A



The SmartShunt is an all in one battery monitor, only without a display. Your phone acts as the display.

The SmartShunt connects via Bluetooth to the VictronConnect App on your phone (or tablet) and you can conveniently read out all monitored battery parameters, like state of charge, time to go, historical information and much more.

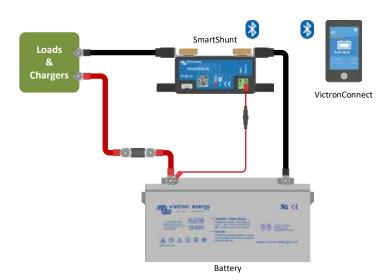
Alternatively, the SmartShunt can be connected and be read by a GX device. Connection to the SmartShunt is made via a VE.Direct cable.

The SmartShunt is a good alternative for a BMV battery monitor, especially for systems where battery monitoring is needed but less wiring and clutter is wanted.

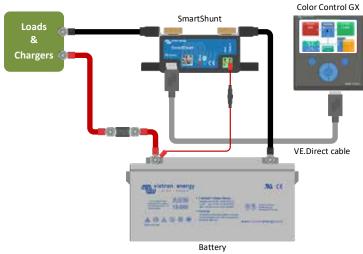
The SmartShunt is equipped with Bluetooth, a VE.Direct port and a connection that can be used to monitor a second battery, for midpoint monitoring, or to connect a temperature sensor.

Differences compared to BMV712 Battery Monitor

- No programmable visual and audible alarm.
- No programmable relay.



Basic SmartShunt wiring

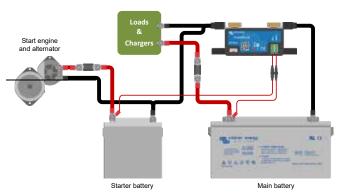


Connecting a SmartShunt to a GX device

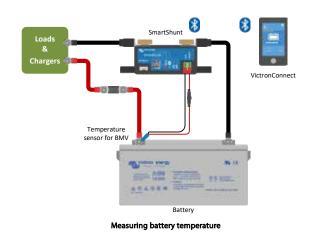
SmartShunt	500A / 1000A / 2000A	
Supply voltage range	6,5 - 70 VDC	
Current draw	< 1mA	
Input voltage range, auxiliary battery	6,5 - 70 VDC	
Battery capacity (Ah)	1 - 9999 Ah	
Operating temperature range	-40 +50°C (-40 - 120°F)	
Measures voltage of second battery, or temperature, or midpoint	Yes	
Temperature measurement range	-20 +50°C	
VE.Direct communication port	Yes	
RESOL	UTION & ACCURACY	
Current	± 0,01A	
Voltage	± 0,01V	
Amp hours	± 0,1 Ah	
State of charge (0 – 100%)	± 0,1%	
Time to go	± 1 min	
Temperature (if optional temperature sensor connected)	± 1°C/°F (0 - 50°C or 30 - 120°F)	
Accuracy of current measurement	± 0,4%	
Offset	Less than 20 / 40 / 80 mA	
Accuracy of voltage measurement	± 0,3%	
INSTALL	ATION & DIMENSIONS	
Dimensions (h x w x d)	500A: 46 x 120 x 54 mm 1000A: 68 x 120 x 54 mm 2000A: 68 x 120 x 76 mm	
Protection category	IP21	
	STANDARDS	
Safety	EN 60335-1	
Emission / Immunity	EN-IEC 61000-6-1 EN-IEC 61000-6-2 EN-IEC 61000-6-3	
Automotive	EN 50498	

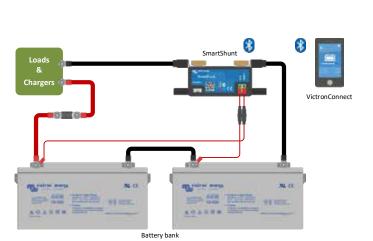
Cables (included)

Temperature sensor



Measuring voltage of the starter battery





Measuring battery bank midpoint

Two cables with 1A fuse, for '+' connection

and starter battery or midpoint connection

Optional (ASS000100000)





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: RJ12 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)

Distable relay	oov / TA 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 A BUILDING				

ricearde) or vortage measurement	= 015 /0		
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			

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

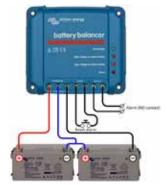




- VE.Direct cables to connect a BMV 712 to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to a Color Control GX or to a computer.



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

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

If needed, several balancers can be paralleled.

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



Safety

Color ControlThe 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.



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

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: RJ12 cable (10m) and battery cable with fuse (2m); 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.

BMV-700	BMV-702 BMV-702 BLACK	BMV-700H
6.5 - 95 VDC	6.5 - 95 VDC	60 – 385 VDC
< 4mA	< 4mA	< 4mA
n. a.	6.5 - 95 VDC	n. a.
1 - 9999 Ah		
-40 +50°C (-40 - 120°F)		
No	Yes	No
-20 +50°C n. a.		
Yes	Yes	Yes
60V / 1A normally open (function can be inverted)		
	6.5 - 95 VDC < 4mA n. a. No -20 Yes	BMV-700 BMV-702 BLACK 6.5 - 95 VDC 6.5 - 95 VDC < 4 MA

neitry	0017 17(110111	oov, minormany open (runetion 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 69 mm (2.7 x 2.7 inch)			
Body diameter and depth	52 mm (2.0 inch) and 31 mm (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	Ontional (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





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.





Also use your smartphone to adjust settings!

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

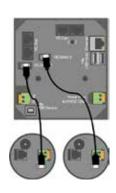


e the VictronConnect BMV app Discovery Sheet for



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. equipment and shows it of the displa 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.

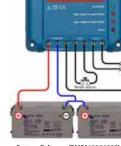




Temperature sensor



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 (to praelled connected batteries) with the highest voltage. The resulting charge current differential will ensure that all hatteries will converge to the same state of batteries will converge to the same state of

If needed, several balancers can be paralleled.

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



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.

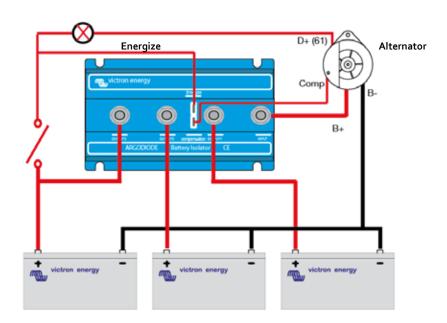
Please see our book 'Energy Unlimited' or ask for specialist advice when installing a diode isolator. Simply inserting the isolator in the cabling between the alternator and the batteries will slightly reduce charge voltage. The result can be that batteries are not charged to the full 100% and age prematurely.

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 × 120 × 115 (2.4 × 4.7 × 4.5)	60 × 120 × 115 (2.4 × 4.7 × 4.5)	60 × 120 × 150 (2.4 × 4.7 × 5.9)	60 × 120 × 150 (2.4 × 4.7 × 5.9)	60 x 120 x 200 (2.4 x 4.7 x 7.9)





Argo FET 100-3 3bat 100A



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:

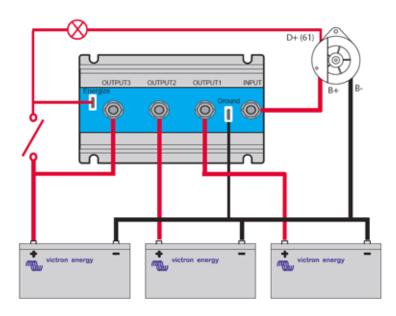
When a current of 100 A flows through a cable of 50 mm² cross section (AWG 0) and 10 m length (30 ft), the voltage drop over the cable will be 0,26 Volt. Similarly a current of 50 A through a cable of 10 mm² cross section (AWG 7) and 5 m length (15 ft) will result in a voltage drop of 0,35 Volt!

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 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.

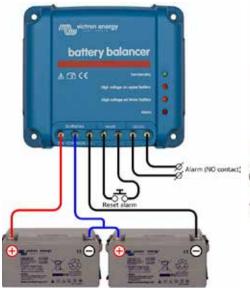
Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

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.

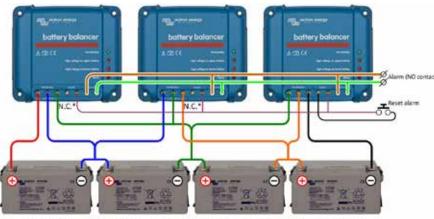
Please see the manual of the BMV-702 for more information about battery balancing.

Learn more about batteries and battery charging

e refer to our book 'Energy Unlimited' (available free of charge from Victron Energy



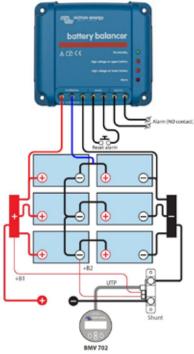
Battery Balancer connected to two series connected 12V batteries (24V system)



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

Three Battery Balancers connected to four series connected 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 mm ² / 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

- 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!)
- 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.

 If required: first wire the alarm contact and the alarm reset.
- 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).

balancer is on.

- 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
- 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

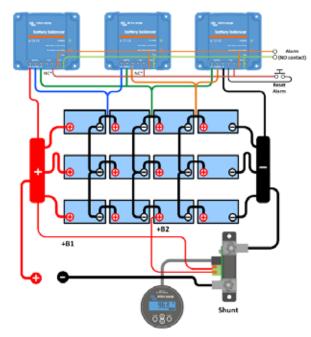
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially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

If the problem persists after several charge-discharge cycles:

- 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:
 Charge and then test all batteries or cells individually or:
- 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:

- 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 oroblem
- One or more faulty cells: replace all batteries.



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



victron energy

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.

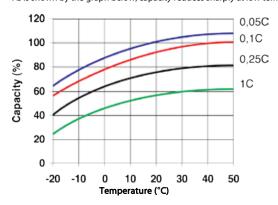


Fig. 1: Effect of temperature on capacity

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

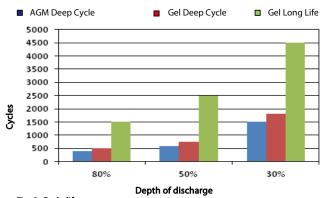


Fig. 2: Cycle life

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.

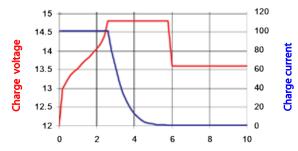


Fig. 3: Three step charge curve

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 Modu

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).

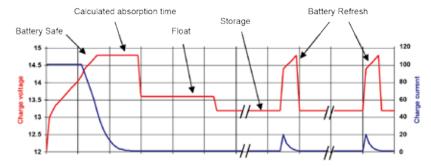


Fig. 4: Four-step adaptive charge curve

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 'Dee	p 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	lxwxh 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
BAT212070084	8	12	151 x 65 x 101	2,5			Float design life: 7-10 years at 20°C Cycle design life:
BAT212120086	14	12	151 x 98 x 101	4,4			400 cycles at 80% discharge
BAT212200084	22	12	181 x 77 x 167	5,8			600 cycles at 50% discharge
BAT412350084	38	12	197 x 165 x 170	12,5			1500 cycles at 30% discharge
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 G	iEL	General Specification									
Article number	Ah	v	lxwxh 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				
BAT412600100	66	12	258 x 166 x 235	24	270	80	Float design life: 12 years at 20°C Cycle design life: 500 cycles at 80% discharge				
BAT412800104	90	12	350 x 167 x 183	26	360	120					
BAT412101104	110	12	330 x 171 x 220	33	450	150	750 cycles at 50% discharge				
BAT412121104	130	12	410 x 176 x 227	38	500	180	1800 cycles at 30% discharge				
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	lxbxh 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
BAT702801260	800	2	210 x 191 x 688	65	Float design life: 20 years at 20°C Cycle design life:
BAT702102260	1000	2	210 x 233 x 690	80	1500 cycles at 80% discharge
BAT702122260	1200	2	210 x 275 x 690	93	2500 cycles at 50% discharge
BAT702152260	1500	2	210 x 275 x 840	115	4500 cycles at 30% discharge
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



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.



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.



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.

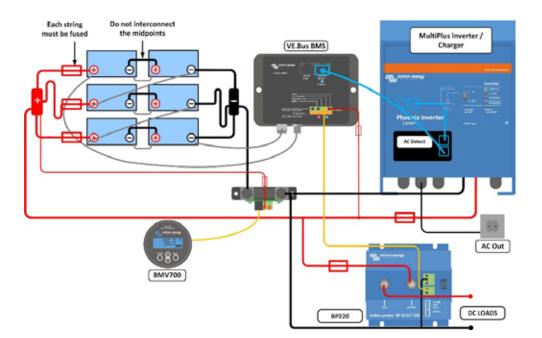
Very useful to localize a (potential) problem, such as cell imbalance.



12,8V 300Ah LiFePO4 Battery



Li-ion app



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

		E	Battery specif	ication			
VOLTAGE AND CAPACITY	LFP- Smart 12,8/50	LFP- Smart 12,8/60	LFP- Smart 12,8/100	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	25,6V
Nominal capacity @ 25°C*	50Ah	60Ah	100Ah	160Ah	200Ah	300Ah	200Ah
Nominal capacity @ 0°C*	40Ah	48Ah	80Ah	130Ah	160Ah	240Ah	160Ah
Nominal capacity @ -20°C*	25Ah	30Ah	50Ah	80Ah	100Ah	150Ah	100Ah
Nominal energy @ 25°C*	640Wh	768Wh	1280Wh	2048Wh	2560Wh	3840Wh	5120Wh
*Discharge current ≤1C							
		CYCLI	E LIFE (capacity ≥ 80	0% of nominal)			
80% DoD				2500 cycles			
70% DoD				3000 cycles			
50% DoD				5000 cycles			
			DISCHARGI	E			
Maximum continuous discharge current	100A	120A	200A	320A	400A	600A	400A
Recommended continuous discharge current	≤50A	≤60A	≤100A	≤160A	≤200A	≤300A	≤200A
End of discharge voltage	11,2V	11,2V	11,2V	11,2V	11,2V	11,2V	22,4V
			OPERATING CONE	DITIONS			
Operating temperature		Discharge: -20°C to +50°C					
Storage temperature		-45°C to +70°C					
Humidity (non-condensing)				Max. 95%			
Protection class				IP 22			
			CHARGE				
Charge voltage		В	etween 14V/28V ar	nd 14,4V/28,8V (14,	2V/28,4V recomme	nded)	
Float voltage				13,5V/27V			
Maximum charge current	100A	120A	200A	320A	400A	600A	400A
Recommended charge current	≤30A	≤30A	≤50A	≤80A	≤100A	≤150A	≤100A
			OTHER				
Max storage time @ 25°C*				1 year			
BMS connection			Male + female cab	le with M8 circular c	onnector, length 50c	m	
Power connection (threaded inserts)	M8	M8	M8	M8	M8	M10	M8
Dimensions (hxwxd) mm	199 x 188 x 147	239 x 286 x132	197 x 321 x 152	237 x 321 x 152	237 x 321 x 152	347 x 425 x 274	317 x 631 x 20
Weight	7kg	12kg	15kg	20kg	22kg	51kg	56kg
*When fully charged							



12,8V & 25,6 Lithium SuperPack batteries

Integrated BMS and safety switch

 $The \ SuperPack\ batteries\ are\ extremely\ easy\ to\ install,\ needing\ no\ additional\ components.$

The internal switch will disconnect the battery in case of over discharge, over charge, low or high temperature.

Abuse proof

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.

A Lithium-Ion 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 Li-ion compared to lead-acid.

The SuperPack batteries will cut-off the charge or discharge current when the maximum ratings are exceeded.

In several applications (especially off-grid solar), 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 Li-ion 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 are required (battery operating in 70 % to 100 % charged

In contrast, a Li-ion battery will still achieve 90 % efficiency even under shallow discharge conditions.

Can be connected in parallel

The batteries can be connected in parallel. Series connection is not allowed.

Use in upright position only.







Lithium SuperPack	12,8/20	12,8/60	12,8/100	12,8/100 High current	12,8/200	25,6/50			
Chemistry		LiFePO4							
Nominal voltage			12,8 V			25,6 V			
Nominal capacity @ 25 °C	20 Ah	60 Ah	100) Ah	200 Ah	50 Ah			
Nominal capacity @ 0 °C	16 Ah	48 Ah	80	Ah	160 Ah	40 Ah			
Nominal energy @ 25 °C	256 Wh	768 Wh	1280) Wh	2560 Wh	1280 Wh			
Cycle life @ 80 % DoD and 25 °C			2500	cycles					
CHARGE and DISCHARGE									
Max. cont. discharge current (1)	30 A	30 A	50 A	100 A	70 A	50 A			
Peak discharge current (10 sec)	80 A	80 A	100 A	150 A	100 A	100 A			
End of discharge voltage			10 V			20 V			
Charge voltage, absorption (2)		28,4 V – 28,8 V							
Charge voltage, float	13,5 V								
Max. cont. charge current	15 A	30 A	50 A	100 A	70 A	50 A			
OPERATING CONDITIONS									
Parallel configuration			Yes, un	limited					
Series configuration			N	lo					
Operating temperature		Discharge: -2	20 °C to +50 °C	Charge: +0 °C	C to +45 °C (3)				
Storage temperature			-40 °C to	o +65 ℃					
Max. storage time when fully charged		1 y	ear ≤ 25 °C	3 months ≤ 40	°C				
Humidity (non-condensing)	Max. 95 %								
Protection class	IP 43								
OTHER									
Power connection (threaded inserts)	M5	M6	N	18	M8	M8			
Dimensions (h x w x d) mm	167 x 181 x 77	213 x 229 x 138	220 x 1	x 330 72	208 x 520 x 269	220 x 330 x 172			
Weight	3,5 kg	9,5 kg	14	kg	21 kg	14 kg			
The battery may disconnect when a load with a high input capacitance is connected, such as an inverter. The battery will however retry and connect after approximately 10 seconds. The absorption period bould preferably not exceed 4 by: A longer absorption period may clightly reduce sequice life.									

2. The absorption period should preferably not exceed 4 hrs. A longer absorption period may slightly reduce service life.

3. Serial number HQ2040 and newer: charge is automatically blocked when the cell temperature decreases below 0±3 °C. It will accept charging again when increased above 3 ± 3 °C. Discharge is automatically blocked when cell temperature decreases below -20 ± 3 °C. This protection resets when temperature above -15±3 °C.





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	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	7 (@ 70°F/25°C, end of di	scharge 9,6V)			
Nominal capacity (77°F/25°C, 10,5V)	115Ah	165Ah	200Ah			
Cold Cranking Amps @ o°F/-18°C	1000	1500	1800			
DIN cold start current (A) @ o°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	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 × 4.33 × 11.53	21.57 × 4.13 × 12.44	21.49 × 4.92 × 12.71			
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	6okg/132lbs			

BlueSolar and SmartSolar charge controllers - overview

BlueSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	М
100/50	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/35	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/45	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/45-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/45-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	L
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
SmartSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	М
100/50	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	М
150/35	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	М
150/45	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	М
150/45-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/45-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	1
150/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/60-Tr	No	12/24/36/48V 12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
			MPPT ctrl & SmartSolar ctrl					
250/60-MC4	No	12/24/36/48V		Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/70-MC4 VE.Can	No No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL



Color Control GX













Venus GX

Cerbo GX

Smart Battery Sense

VE.Direct Bluetooth Smart Dongle

VE.Direct to USB interface



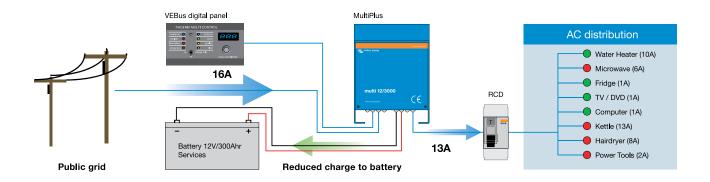
MultiPlus principle

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.

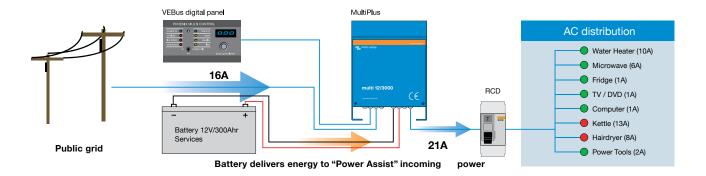


PowerAssist: Boosting the power available from mains or generator, an innovative feature of Multiplus. The feature that most distinguishes the Multiplus from other inverter/chargers is PowerAssist. This feature takes the principle of PowerControl to a further dimension by allowing a Multiplus to supplement 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.



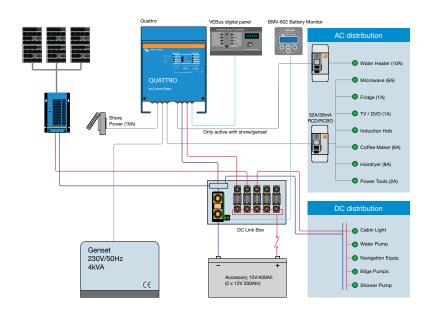
Comfort system

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

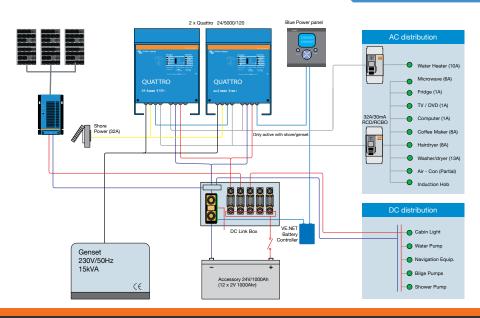
Comfort Plus system

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 46 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 46 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.

















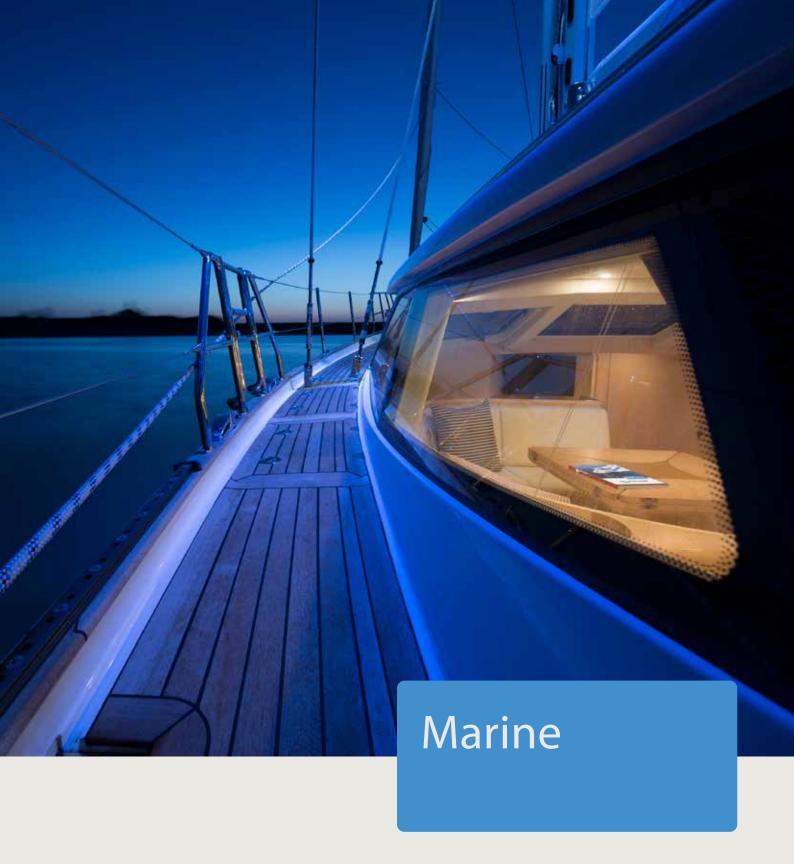


SAL064134020 REV 06 2021-02

Victron Energy B.V.

De Paal 35 • 1351JG Almere • The Netherlands Phone: +31 (0)36 535 97 00 • E-mail: sales@victronenergy.com

www.victronenergy.com

















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.



Application examples

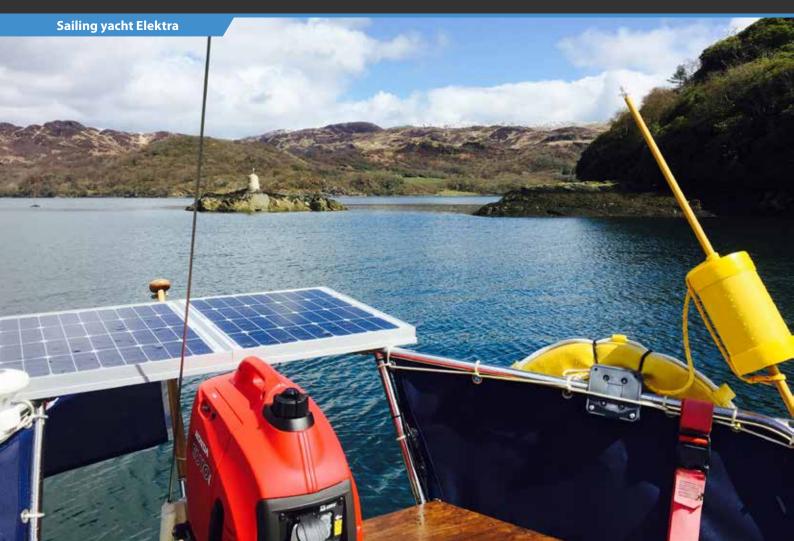
Our products are being used in many different kinds of vessels: sailing yachts, cruise ships, sloops, tugboats, motor boats and container ships. To give you an idea of the possibilities of the use of our products, we gathered a few application examples.











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.







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

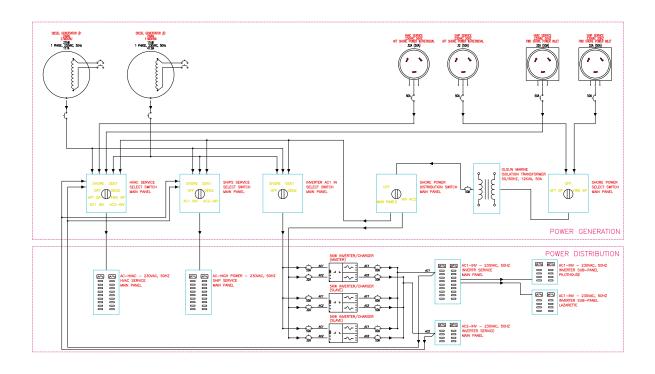
Specifications:

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













Electrical installation for optimum comfort on a roundthe-world sailing trip

Frits Boonen (61) and his wife Liza (45) will soon be setting off on a round-the-world sailing trip. For the next ten years, they will be living on a Fountaine Pajot Helia 44 catamaran that has been specially adapted for their trip, and one of those adaptations is the fact that cooking on gas is not desirable. Gas can be very dangerous and it is a considerable hassle to fill gas cylinders abroad, which is why they switched to an electric set-up. The vessel is equipped with an induction hob, an electric oven, an electric barbecue and a washing machine, which required the on-board electrical installation to be expanded significantly.

Frits and Liza want to be able to moor for two months without being dependent on the electricity and water supplies of third parties, and for this reason they had two 3kW Victron Quattros installed.

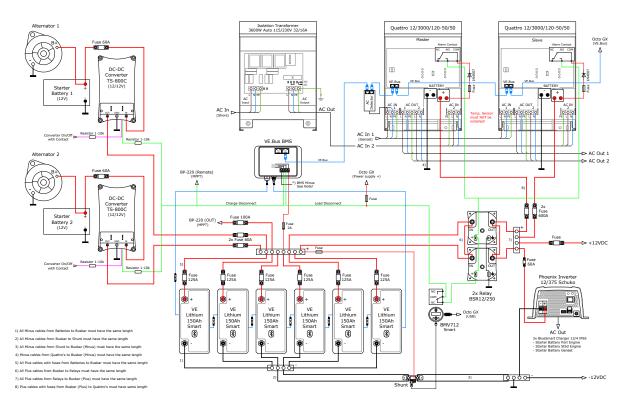


These Quattros convert the 12-volt battery voltage to the 230 volts needed for all 'domestic' electrical appliances. Thanks to the Quattros' high charging capacity, the batteries can be charged quickly, which reduces the number of generator running hours. All power is stored in six Victron lithium batteries with a total capacity of 900 Ah and the 12-volt system installed by the shipyard can continue to be used.

The energy on board can be supplemented in four ways: The solar panel installation consisting of 10 x 100Wp solar panels, each of which features its own MPPT controller for maximum efficiency.

A Buck-Boost system that enables electricity from the main engine generators to be used efficiently by creating a connection between the engines' lead-acid starter batteries and the lithium batteries.





The generator is controlled by an advanced battery monitoring system. When the lithium batteries are discharged down to 30% of their capacity, the generator automatically activates to charge the batteries. Once the batteries are charged to 90%, the generator also switches off automatically.

The vessel connects to shore power via the autotransformer and two Quattros. The shore power capacity is limited in many marinas, and the Quattros have the ability to supplement a shortfall of power when electricity demand exceeds capacity, such as when the washing machine or the hot water boiler are being used while someone is cooking. An additional benefit of the autotransformer is that it accepts both 110 volts and 230 volts, which means that the travellers can plug into a socket anywhere in the world without having to think about it first.



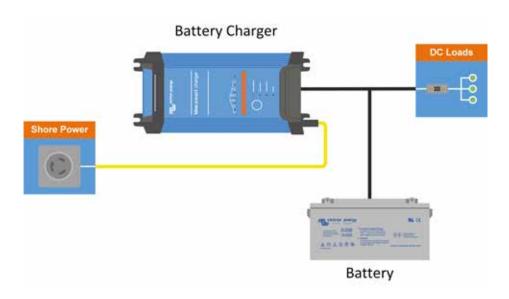


Systems

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.

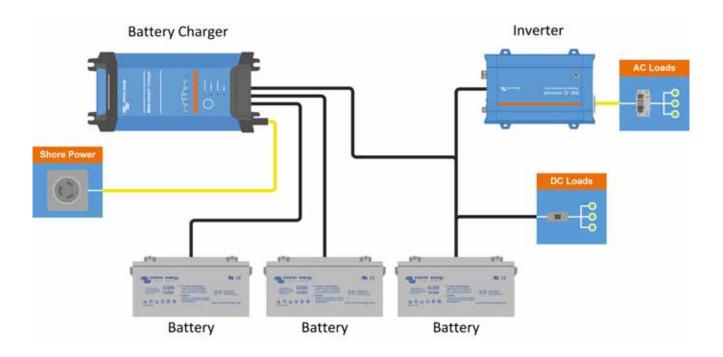
1. Simple system with only DC consumers

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



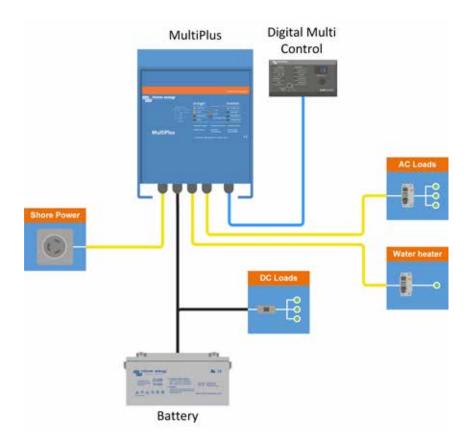
2. System with inverter

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

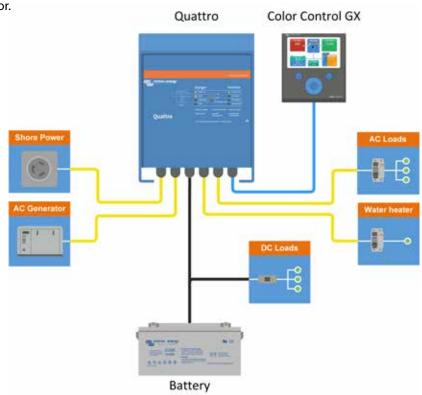
The Quattro has the same functions as the MultiPlus, but with an extra addition: a transfer system which can be directly connected to shore power and a generator.

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 transferswitch. The MultiPlus can take only one AC source.

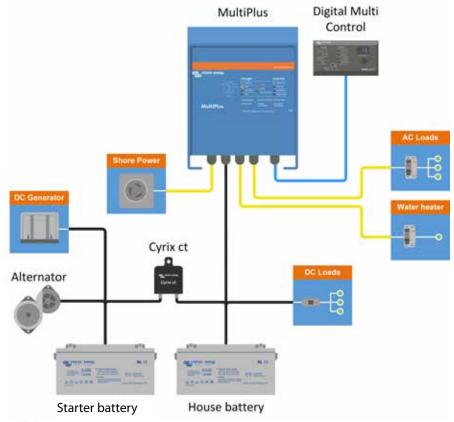




Systems

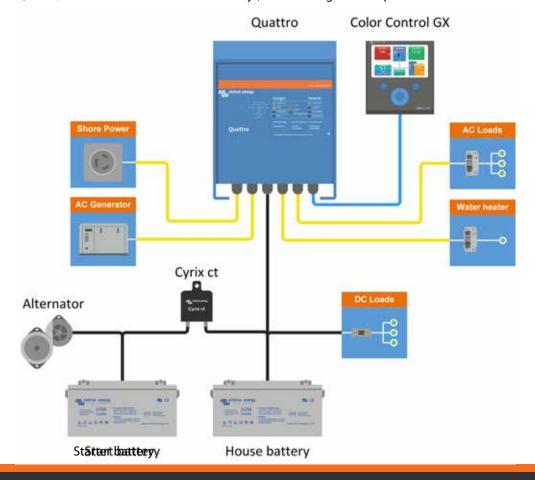
5. Using a DC Generator

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.



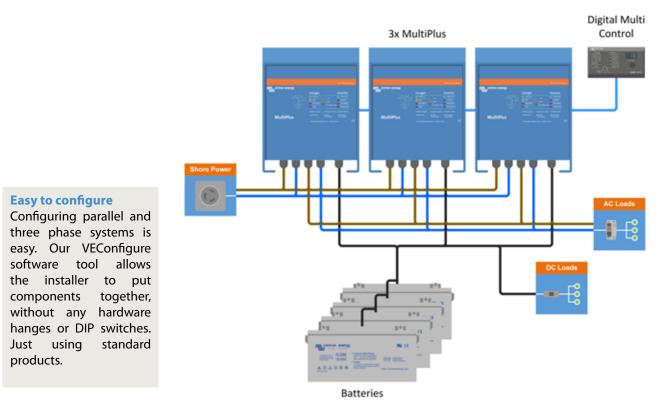
6. Using an AC Generator

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.



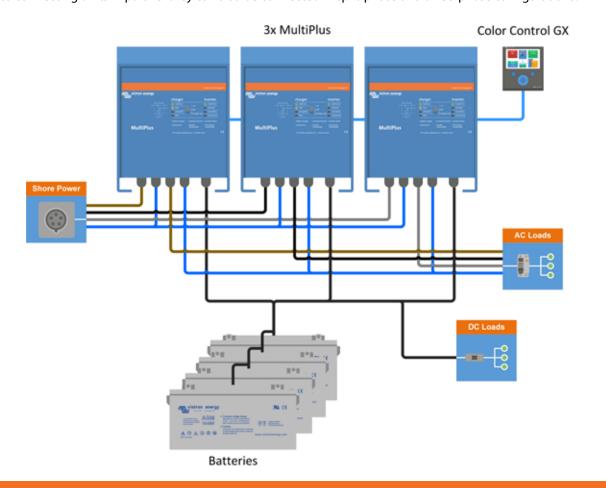
7. Parallel system

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

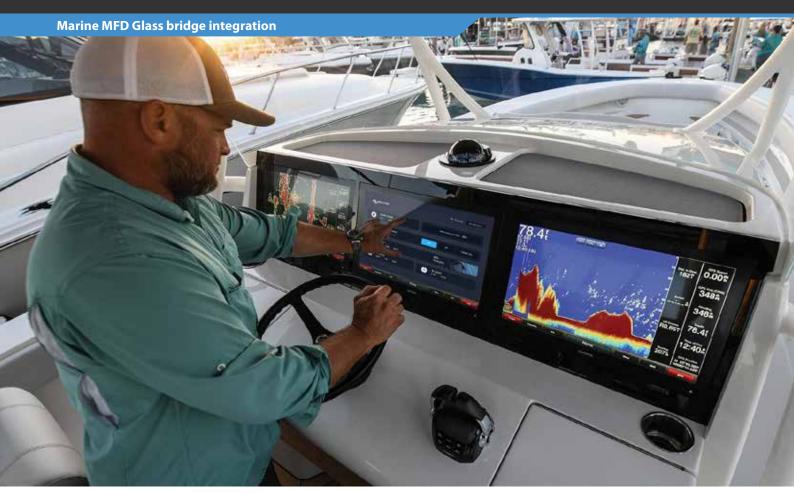


8. Three-phase system

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







Introduction & requirements

A Glass Bridge is a MFD (Multi-Functional Display) that integrates a boat's systems and navigation status into a large screen or screens at the helm of the vessel, so doing away with multiple gauges, brackets and wiring complications.

A Victron system can be easily integrated into Glass Bridge presentation by connecting the display to a Victron GX device with a network cable. Scan this QR code for more information:

Victron integrates with:



Functionalities:

- Monitor shore power and generator status.
- Monitor battery status for one or more batteries. By using the voltage of for example battery chargers, it can also visualise secondary batteries such as Generator starter batteries.
- Monitor the power conversion equipment: chargers, inverters, inverter/chargers.
- Monitor AC loads, and DC loads.
- Control shore power input current limit.
- Control the inverter/charger: switch it off, on, or set it to charger-only.
- Optionally open the Victron Remote Console panel; allowing access to further parameters.

Power equipment compatibility:

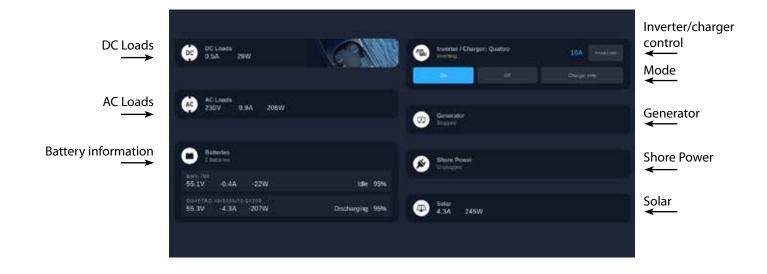
- All Victron inverter/chargers: From a 500VA single phase device up to a large 180kVA three phase-system, including Multis, Quattros, 230VAC and 120VAC models.
- Battery Monitors: BMV-700, BMV-702, BMV-712 Smart and newer, SmartShunt, Lynx Shunt VE.Can, Lynx Ion BMS.

Requirements:

- Battery system.
- Victron inverter/charger.
- Victron Battery monitor.
- Network cable connection between MFD and a GX device such as a Color Control GX, Venus GX, Cerbo GX or an Octo GX.
- UTP network cable.

All information on one screen

After connecting the MFD to the GX device, all information can be viewed on one screen:





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).



Cerbo GX

This all-new communication-centre allows you to always have perfect control over your system from wherever you are and maximises its performance. Simply connect through our Victron Remote Management (VRM) portal, or access directly, using the separate GX Touch 50, a MFD or our VictronConnect app thanks to its added Bluetooth capability. This latest addition to the GX-range combines all the best of connectivity, redefining smart power solutions in every way.



GX Touch 50

The GX Touch 50 is the display accessory for our Cerbo GX. The five inch touch screen display gives an instant overview of your system and allows to adjust settings in the blink of an eye. Simply connected to the Cerbo GX with one cable, its super slim waterproof design, top-mountable setup and its simple installation bring a lot of flexibility when creating a crisp and clean dashboard.



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.



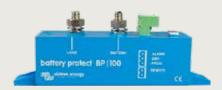
VE.Can resistive tank sender adapter

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 $\pm 1\%$. 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.



Smart BatteryProtect

The Smart BatteryProtect disconnects the battery from nonessential 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.



CANvu GX

The CANvu GX is a device similar to the Color Control GX. The CANvu GX is best for harsh environments - when its IP67 rating and touch LCD is a must.



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.

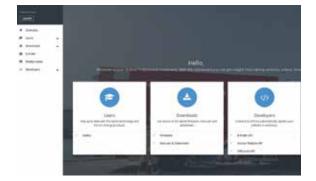
Once you have a VRM account you will be able to view live feed from your installation, such as generated solar energy, state of charge of your batteries and the consumption.

The portal is free of charge.



VictronConnect app

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

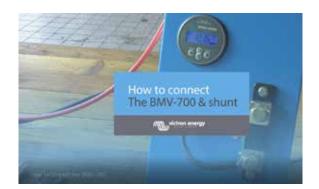
Ever wanted to show your clients, friends, colleagues how much solar energy your installation is generating or indeed any other data that you can see on your VRM site? Well now you can – using VRM World.

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.



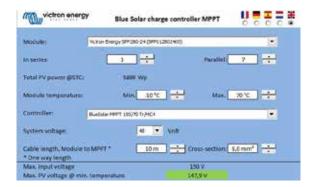
Instruction videos on Victron youtube channel

On our YouTube channel you can watch Victron Energy



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.



MPPT Calculator Excel sheet

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

Download the Excel sheet from our software page:



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.











Phoenix Inverter Smart 12/3000





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

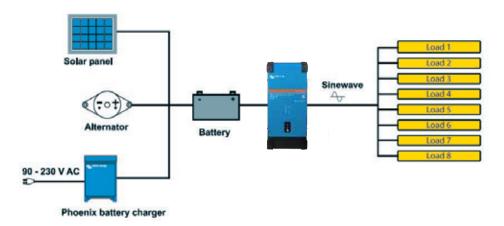
A remote on/off switch or relay contact can be connected to a two pole connector. Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

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	24/5000 48/5000		
Parallel and 3-phase operation	40/1000	40/2000 N				
Talane, and 5 phase operation		INVERTER				
Input voltage range	9.3 – 17V 18.6 – 34V 37.2 – 68V					
Output	Output voltage: 230 VAC ±2% 50 Hz or 60 Hz ± 0.1% (1)					
Cont. output power at 25°C (1)	1600 VA	2000 VA	3000 VA	5000 VA		
Cont. output power at 25°C	1300 W	1600 W	2400 W	4000 W		
Cont. output power at 40°C	1200 W	1450 W	2200 W	3700 W		
Cont. output power at 65°C	800 W	1000 W	1700 W	2800 W		
Peak power	3000 W	4000 W	6000 W	10000 W		
Dynamic (load dependent) DC low shut down (fully configurable)						
Max. efficiency 12/ 24 /48 V	92 / 94 / 94%	92 / 94 / 94%	93 / 94 / 95%	95 / 96%		
Zero load power 12 / 24 / 48 V	8/9/11 W	8/9/11 W	12 / 13 / 15 W	18 / 20 W		
Zero load power in ECO mode	0.6 / 1.3 / 2.1 W	0.6 / 1.3 / 2.1 W	1.5 / 1.9 / 2.8 W	2.2 / 3.2 W		
		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 8	Colour: steel (blue RAL 5012; and	black RAL 9017) Protection category	ory: IP21		
Battery-connection	M8 bolts	M8 bolts	12 V/24 V: 2+2 M8 bolts 48 V: M8 bolts	24 V: 2+2 M8 bolts 48 V: M8 bolts		
230 V AC-connection		Screw te		46 V. MO DOILS		
Weight	12kg	13kg	19kg	29kg / 28kg		
Dimensions (hxwxd)	485 x 219 x 125mm	485 x 219 x 125mm	533 x 285 x 150mm (12 V) 485 x 285 x 150mm (24 V/48 V)	595 x 295 x 160mm (24 V) 555 x 295 x 160mm (48 V)		
		STANDARDS				
Safety		EN 60.	335-1			
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 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.

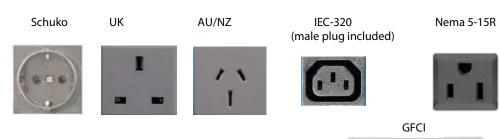
LED diagnosis

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



DC connection with screw terminals

No special tools needed for installation

	12 Volt	12/250	12/375	12/500	12/800	12/1200		
Phoenix Inverter	24 Volt 48 Volt	24/250 48/250	24/375 48/375	24/500 48/500	24/800 48/800	24/1200 48/1200		
Cont. power at 25°C (1)	48 VOIL	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 (a	adiustable)	230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0.1%						
Input voltage range	iujustable)	230VAC or 120VAC +/- 3% SUHZ or 60HZ +/- 0,1% 9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V						
DC low shut down (adjustable)								
Dynamic (load dependent) DC lo (fully configurable)	w shut down	9,3 / 18,6 / 37,2V Dynamic cut-off, see						
DC low restart and alarm (adjusta	able)			10,9 / 21,8 / 43,6V				
Battery charged detect (adjustab	ile)			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 r (default retry interval: 2,5 s, adjus		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	d cooling) Derate	1,25% per °C above 4	0°C		
Humidity (non-condensing)				max 95%				
			ENCLOSURE					
Material & Colour			Steel chassi	is and plastic cover (bl	ue Ral 5012)			
Battery-connection				Screw terminals				
Maximum cable cross-section		10mm² / AWG8	10mm² / AWG8	10mm² / AWG8	25 / 10 / 10mm ² / AWG4 / 8 / 8	35 / 25 / 25mm² / AWG2 / 4 / 4		
Standard AC outlets			UK (BS	CEE 7/4), IEC-320 (male 5 1363), AU/NZ (AS/NZ 120V: Nema 5-15R, GF0	S 3112)			
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-IE	EC 60335-1 / EN-IEC 62	109-1			
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.





Phoenix Inverter 24/5000



Phoenix Inverter Compact 24/1600

SinusMax - Superior engineering

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

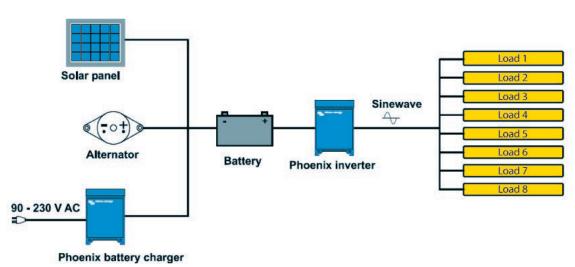
If an automatic transfer switch is required we recommend using the MultiPlus inverter/charger instead. The switch is included in these products and the charger function of the MultiPlus can be disabled. Computers and other electronic equipment will continue to operate without disruption because the MultiPlus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

Communications interface

These larger Phoenix inverter models come with a VE.Bus port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VictronConnect or VEConfigure software, which can be downloaded free of charge from our website, 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 a GX device (eg Cerbo GX) for monitoring and control.

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 – 66	V			
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 / 48V (%)	92 / 94 / 94	92 / 94 / 94	92 / 92	93 / 94 / 95	94 / 95		
Zero load power 12 / 24 / 48V (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: alu	minium (blue RAL 5012) Pro	tection category: IP21			
Battery-connection	battery cables of 1	.5 meter included	M8 bolts	2+2 M	8 bolts		
230 V AC-connection	G-ST18	8i plug	Spring-clamp	Screw to	erminals		
Weight (kg)	1	0	12	18	30		
Dimensions (hxwhd in mm)	375 x 21	14 x 110	520 x 255 x 125	362 x 258 x 218	444 x 328 x 240		
		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 outpi g) input voltage ripple too h						



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 $\underline{\sf VRM\ Portal.}$



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 - 1600VA 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

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	12/500/20 24/500/10	0	12/800/35 24/800/16	12/1200/50 24/1200/25	12/1600/70 24/1600/40
48 Volt	48/500/6		48/800/9	48/1200/13	48/1600/20
PowerControl / PowerAssist	Yes / No		.,	Yes / Yes	
Three Phase and parallel operation			Yes		
Transfer switch		INIV	16 <i>i</i>	4	
Input voltage range	INVERTER 9,5 – 17V				
Output	9,5 – 17V 19 – 33V 38– 66V Output voltage: 230VAC ± 2% Frequency: 50Hz ± 0,1% (1			- 0 10% (1)	
Cont. output power at 25°C (3)	500VA	put voi	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 45 °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
Zero roug power in search mode	2,2,511		ARGER	3737311	37 373
AC Input	Input		e range: 187-265 VAC	Input frequency	/: 45 – 65 Hz
Charge voltage 'absorption'			14.4 / 28.8		
Charge voltage 'float'			13,8 / 27,6	5 / 55,2V	
Storage mode			13,2 / 26,4		
Charge current house battery (4)	20/10/6	A	35 / 16 / 9A	50 / 25 / 13A	70 / 40 / 20A
Charge current starter battery	1A (12V and 24V models only)				
Battery temperature sensor			Ye	s	
		GE	NERAL		
Programmable relay (5)			Yes	s	
Protection (2)			a –	g	
VE.Bus communication port			ee phase operation, rer er ASS030065510 need		
Remote on-off			On/off/charger only		On/off
DIP switches			Yes (6)		Yes (7)
Internal DC fuse	125/60/30		150/80/40A 200/100/50A		200/125/60A
Common Characteristics		Operat	ing temp. range: -40 to Humidity (non-cond		ooling)
	,		LOSURE		
Common Characteristics			our: Steel/ABS (blue RAI		ategory: IP 21
Battery-connection	16/10/10 n	nm²	25 / 16 / 10 mm ²	35 / 25 / 10 mm ²	50 / 35 / 16 mm ²
230V AC-connection			G-ST18i co		
Weight	4,4 kg		6,4 kg	8,2 kg	10,2 kg
Dimensions (h x w x d)	311 x 182 x 100		360 x 240 x 100 mm	406 x 250 x 100 mm	470 x 265 x 120 mm
Cafata			NDARDS	0225 2 20 EN 62100 :	
Safety Emission / Immunity	EN-IEC 60335-1, EN-IEC 60335-2-29, EN 62109-1 EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3				
Road vehicles	EC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3 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 q. 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-II inverter/charger



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 $25 \, \text{kW} / 30 \, \text{kVA}$ output power with $420 \, \text{Amps}$ 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

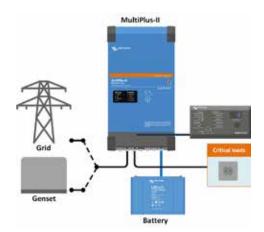
Settings can be changed in a matter of minutes with VEConfigure software (computer or laptop and MK3-USB interface needed).

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

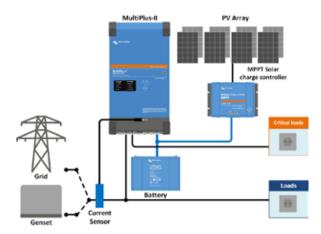
Install a Color Control GX or other GX product to connect to the internet.

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	24/3000/70-32	48/3000/35-32	48/5000/70-50				
PowerControl & PowerAssist		Yes					
Transfer switch	33	2A	50A				
Maximum AC input current	3:	50A					
INVERTER							
DC Input voltage range	19 – 33V	38 – 6	6V				
Output		ut voltage: 230 VAC ±					
		uency: 50 Hz ± 0,1%					
Cont. output power at 25°C (3)		OVA	5000VA				
Cont. output power at 25°C		00W	4000W				
Cont. output power at 40°C		00W	3700W				
Cont. output power at 65°C		00W	3000W				
Maximum apparent feed-in power		0VA	4000VA				
Peak power		00W	9000W				
Maximum efficiency	94%	95%	96%				
Zero load power	13W	11W	18W				
Zero load power in AES mode	9W	7W	12W				
Zero load power in Search mode	3W CHARGER	2W	2W				
AC Input	Input v	oltage range: 187-265					
ACTIPUL		ut frequency: 45 – 65 l	Hz				
Charge voltage 'absorption'	28,8V	57,6					
Charge voltage 'float'	27,6V	55,2					
Storage mode	26,4V	52,8					
Maximum battery charge current (4)	70A	35A	70A				
Battery temperature sensor		Yes					
	GENERAL						
Auxiliary output	_	Yes (32A)					
External AC current sensor (optional)	50	DA V	100A				
Programmable relay (5)		Yes					
Protection (2)	a – g For parallel and three phase operation,						
VE.Bus communication port		onitoring and system into					
General purpose com. port		Yes, 2x	<u> </u>				
Remote on-off		Yes					
Operating temperature range	-40 to +	-65°C (fan assisted co	oling)				
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		kg	29 kg				
Dimensions (hxwxd) mm		75 x 147	565 x 323 x 148				
	STANDARDS						
Safety		50335-1, EN-IEC 60335 C 62109-1, EN-IEC 621					
		N 55014-1, EN 55014-2					
Emission, Immunity	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	Please consult the certificates on our website.						
Anti-islanding	Please consult the certificates on our website.						
	3) Non-linear load, crest factor 3:1						
1) Can be adjusted to 60 Hz	4) At 25°C ambient						
2) Protection key:		12.1	 Programmable relay which can be set for general alarm, DC under voltage or genset start/stop 				
Protection key: a) output short circuit	5) Programmable rela		neral alarm, DC				
2) Protection key:	5) Programmable rela under voltage or gen						
2) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low	5) Programmable rela under voltage or gen	set start/stop					
2) Protection key: a) output short circuit b) overload c) battery voltage too high	5) Programmable rela under voltage or gen function. AC rating	set start/stop					



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-II GX inverter/charger



A MultiPlus-II with LCD and GX functionality

The MultiPlus-II GX integrates a MultiPlus-II inverter/charger and a GX device with a 2 x 16 character display.

Display and Wi-Fi

The display reads battery, inverter and solar charge controller parameters.

The same parameters can be accessed with a smartphone or other Wi-Fi enabled device.

GX device

The integrated GX device includes:

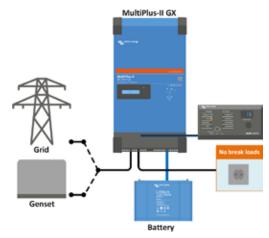
- A BMS-Can interface. This can be used to connect to a compatible CAN-bus managed battery. Note that this not a VE.Can compatible port.
- A USB port.
- A Ethernet port.
- A VE.Direct port.

Applications

The MultiPlus-II GX is intended for applications where additional interfacing with other products and/or remote monitoring is required, such as on-grid or off-grid energy storage systems and certain mobile applications.

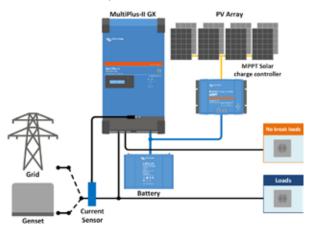
Parallel and three phase operation

Only one GX unit is needed in case of Parallel and three phase operation.



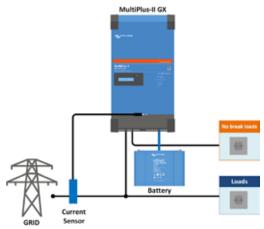
Standard marine, mobile or off-grid application

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.

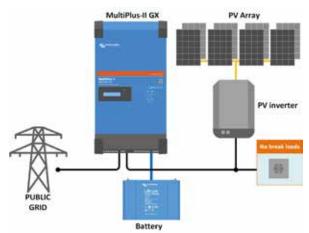


Grid parallel topology with MPPT solar charge controller

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



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



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.



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 for Wi-Fi

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



GX GSM

A cellular modem; providing a mobile internet for the system and connection to Victron Remote Management (VRM).

Optional: outdoor GSM antenna and GPS antenna.

For more detail please enter GX GSM in the search box on our website



Connection Area

MultiPlus-II GX	24/3000/70-32	48/3000/35-32	48/5000/70-5	
PowerControl & PowerAssist	Yes			
Transfer switch	3	2 A	50 A	
Maximum AC input current	3	2 A	50 A	
Auxiliary output		Yes (32 A)		
	INVERTER			
DC Input voltage range	19 – 33 V	38 – 6		
Output	Output voltage: 230 VAC \pm 2 % Frequency: 50 Hz \pm 0,1 % (1)			
Cont. output power at 25 °C (3)	3000 VA		5000 VA	
Cont. output power at 25 °C	24	00 W	4000 W	
Cont. output power at 40 °C	22	00 W	3700 W	
Cont. output power at 65 °C	17	00 W	3000 W	
Maximum apparent feed-in power	250	00 VA	4000 VA	
Peak power	55	00 W	9000 W	
Maximum efficiency	94 %	95 %	96 %	
Zero load power	13 W	11 W	18 W	
Zero load power in AES mode	9 W	7 W	12 W	
Zero load power in Search mode	3 W	2 W	2 W	
	CHARGER			
AC Input		oltage range: 187-26 ut frequency: 45 – 65		
Charge voltage 'absorption'	28,8 V	57,6	V	
Charge voltage 'float'	27,6 V	55,2	V	
Storage mode	26,4 V	52,8	V	
Maximum battery charge current (4)	70 A	35 A	70 A	
Battery temperature sensor		Yes		
	GENERAL			
Interfaces	BMS-Can,	USB, Ethernet, VE.Dir	ect, Wi-Fi	
External AC current sensor (optional)	5	0 A	100 A	
Programmable relay (5)		Yes		
Protection (2)		a – g		
VE.Bus communication port		allel and three phase ope nonitoring and system int		
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	A14/C)	
230 V AC-connection		terminals 13 mm² (6		
Weight Dimensions (hxwxd) mm		9 kg 275 x 147	30 kg 565 x 323 x 148	
Dimensions (nxwxa) mm		2/3 X 14/	303 X 323 X 148	
	STANDARDS	60335-1, EN-IEC 6033	5_2_20	
Safety	EN-IE	C 62109-1, EN-IEC 621	09-2	
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			
Anti-islanding	Please consu		our website.	
1) Can be adjusted to 60 Hz	Please consult the certificates on our website. 3) Non-linear 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	 A) At 25 °C ambient Programmable relay which can 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 and 1 A up to 60 VDC 			



g) input voltage ripple too high

Current sensor 100 A:50 mA

Length of connection cable: 1 m.

To implement PowerControl and PowerAssist and to optimize self-consumption with external current sensing.

Maximum current: 50 A resp. 100 A.



Digital Multi Control Panel

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





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 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 contro

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.

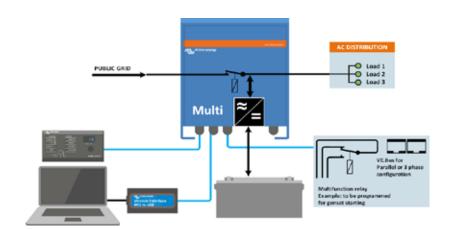
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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



12 Volt MultiPlus 24 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	24/5000/120
48 Volt					48/3000/35	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			
nput voltage range (V DC)			9,5 – 17 V	19 – 33 V 38 – 66 V		
Output		Outpu	it 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
μ			CHARGER		27 .27 .2	
AC Input		Input voltage ra	ange: 187-265 VAC	Input frequency: 45 – 65	Hz Power factor: 1	
Charge voltage 'absorption' (V DC)				1/28,8/57,6		
Charge voltage 'float' (V DC)				3 / 27,6 / 55,2		
Storage mode (V DC)				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)	33710	30 / 23		d 24 V models only)	120770733	120770
Battery temperature sensor			7 (12 V and	yes		
battery temperature sensor			GENERAL	yes		
Auxiliary output (5)	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
Programmable relay (6)		7.17 Cu		Yes	165 (1671)	. 25 (5 67 1)
Protection (2)				a - q		
VE.Bus communication port		For parallel a	nd three phase operation	on, remote monitoring ar	nd system integration	
General purpose com. port	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	11. 0.	Th. U.	11. u.	Yes	163	103
Common Characteristics		Operating temp, ran	ae: -10 to ±65°C (fan acc		(non-condensing): max 9	50%
Common Characteristics			NCLOSURE	isted cooling/ Trainlaity	(non condensing). max 2	370
Common Characteristics			olour: aluminium (blue I	RΔI 5012) Prote	ection category: IP 21	
Battery-connection		battery cables of 1.5 n		M8 bolts	Four M8 bolts (2 plus a	nd 2 minus connection
		•			Screw terminals 13	
230 V AC-connection		G-ST18i connecto	r	Spring-clamp	mm² (6 AWG)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)		375 x 214 x 110		520 x 255 x 125	362 x 258 x 218	444 x 328 x 240
		S	TANDARDS			
Safety			EN-IEC 60335-1, EN-	-IEC 60335-2-29, IEC 621	09-1	
Emission, Immunity	Ef	N 55014-1, EN 55014-2,	EN-IEC 61000-3-2, EN-II	EC 61000-3-3, IEC 61000-	6-1, IEC 61000-6-2, IEC 610	000-6-3
Road vehicles		12V and 24V models: ECE R10-4				
Anti-islanding			See	our website		
1) Can be adjusted to 60 HZ. 120 V models : 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	available on request	6) Programmable relay DC under voltage o AC rating: 230 V/4A	no external AC source availal y that can a.o. be set for gen r genset start/stop function	eral alarm,		



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 $\underline{\mbox{VRM Portal.}}$



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 <u>NMEA2000 & MFD integration guide</u>



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 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 $240\,\text{V}$ / $60\,\text{Hz}$.

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

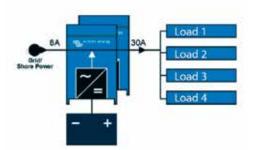
After installation, the MultiPlus is ready to go.

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!

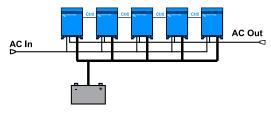
Alternatively, VE.Net can be used instead of the DIP switches.

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	24 VOIL	Yes							
PowerAssist		Yes							
Transfer switch (A))	50							
Parallel and 3-phas		Yes							
r drailer drid 5 prids	se operation	INVERTER							
Input voltage rang	ge (V DC)	9,5 – 17 V	19 – 33 V						
Output		Output voltage: 120 VAC ± 2%	Frequency: 60 Hz ± 0,1% (1)						
Cont. output power	er at 25°C / 77°F (VA) (3)	2000	3000						
Cont. output power	er at 25°C / 77°F (W)	1600	2400						
	er at 40°C / 104°F (W)	1450	2200						
	er at 65°C / 150°F (W)	1100	1700						
Peak power (W)		4000	6000						
Maximum efficiend	•	92 / 94	93 / 94						
Zero load power (V		9/11	20 / 20						
Zero load power in		7/8	15 / 15						
Zero load power in	n Search mode (W)	3/4	8 / 10						
161		CHARGER							
AC Input	·: 10/DC)		frequency: 45 – 65 Hz Power factor: 1						
Charge voltage 'ab		14,4/							
Charge voltage 'flo Storage mode (V D		13,8 / 13,2 /							
•	ouse battery (A) (4)	80 / 50	120 / 70						
Charge current sta	•	60 / 30							
Battery temperatu	•	ye							
buttery temperatu	ire serisor	GENERAL							
Auxiliary output ((5)	n.a.	Yes (32A)						
Programmable rela	ay (6)	Yes (1x)	Yes (3x)						
Protection (2)		a -	g						
VE.Bus communica		For parallel and three phase operation, re	mote monitoring and system integration						
General purpose c	om. port (7)	n. a.	Yes (2x)						
Remote on-off		Υe							
Common Characte	eristics	Operating temp. range: -40 - +65°C / -40 to 150°F (fan as:	sisted cooling) Humidity (non-condensing): max 95%						
	1.1	ENCLOSURE							
Common Characte		Material & Colour: aluminium (blue RAL M8 bolts	· · · · · · · · · · · · · · · · · · ·						
Battery-connection 120 V AC-connecti		Screw-terminal 6 AWG (13 mm²)	M8 bolts (2 plus and 2 minus connections)						
Weight	ion	13 kg 25 lbs.	Screw-terminal 6 AWG (13mm²) 19kg 40 lbs.						
,	kd in mm and inches)	520x255x125 mm 20.5x10.0x5.0 inch	362x258x218 mm 14.3x10.2x8.6 inch						
Dimensions (nxwx	tu in mini anu inches)	STANDARDS	302X238X218 HHH 14.3X10.2X8.0 HICH						
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 Imm	unity	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						
Protection key: a) output short of	<u> </u>	EN-IEC 61000-3-2/3-3/, EN-IEC 61000-6-1/6-2/6-3 2) Non-linear load, crest factor 3:1 3) At 75°F ambient							
b) overload		4) Switches off when no external AC source available							
c) battery voltag		5) Programmable relay that can a.o. be set for general							
d) battery voltag		alarm,							
e) temperature t	-	DC under voltage or genset start/stop function							
f) 230 VAC on inv g) input voltage		AC rating: 230 V/4 A DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC							
g, input voitage	TIPPLE LOOTING!!	6) 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.



Color Control GX and other GX devices

Computer controlled operation and monitoring

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



Several interfaces are available:

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



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 (see data sheet on www.victronenergy.com) 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.

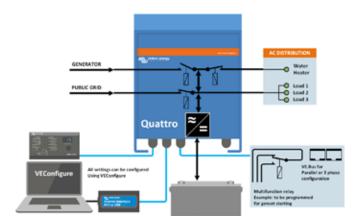
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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	e: 230 VAC ± 2% Freque	ency: 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 on	ly)					
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 pha	se operation, remote monit	oring and system integration	on				
General purpose com. port	2x	2x	2x	2x	2x				
Remote on-off			Yes						
Common Characteristics			0 to +65°C Humidity (non-	condensing): max. 95%					
		ENCLOSUR							
Common Characteristics		Material & Colour: alu	minium (blue RAL 5012) P	rotection category: IP 21					
Battery-connection		Four M8	bolts (2 plus and 2 minus c	onnections)					
230 V AC-connection	Screw terminals 13 mm ² (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

EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1 Safety 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 models available 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.



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

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.

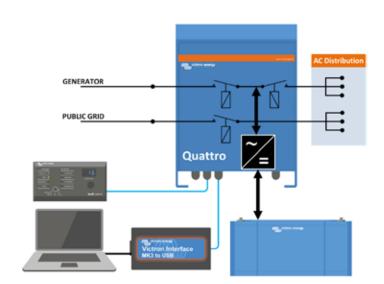
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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 48/5000/70-100/100

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			
Input voltage range		9,5 – 17 V 19 – 33V 38 – 66 V				
Output (1)	0	utput 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			
zero isaa power in search insac		CHARGER	15 11			
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)	33 K	14071				
Battery temperature sensor	4 A (12V and 24V models only) Yes					
battery temperature sensor		GENERAL				
Auxiliary output (5)	32 A	50 A	50 A			
Programmable relay (6)	3271	3x	3071			
Protection (2)		a-g				
VE.Bus communication port	For parallel split pl	nase and three phase operation, remote monitoring a	and system integration			
General purpose com. port	i or paraller, split pr	2x	and system integration			
Remote on-off		Yes				
Common Characteristics	Operating	temp.: -40 to +65°C Humidity (non-condensing	ng), may 05%			
Common Characteristics		ENCLOSURE	ig). Illax. 93%			
Common Characteristics		& Colour: aluminium (blue RAL 5012) Protection cat	tegory: IP 21			
Battery-connection		Four M8 bolts (2 plus and 2 minus connections)				
120 V AC-connection	Screw terminals 13 mm ² (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 17,5 x 13,0 x 9,6 inch 17,5 x 13,0 x 9,6 inch 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	2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1,				
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						
Protection key: a) output short circuit b) overload c) battery voltage 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 					
d) battery voltage too low	AC rating: 230 V / 4 A					



e) temperature too high

f) 120 VAC on inverter output g) input voltage ripple too high

Digital Multi Control Panel

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

DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Monitoring and control. Locally, and also remotely on the <u>VRM Portal.</u>



MK3-USB VE.Bus to USB interface

Connects to a USB port <u>(see 'A guide to VEConfigure')</u>



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.



Blue Smart IP22 Charger





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 (LiFePO₄) batteries

LiFePO₄ 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 – 2	65 VAC	180 – 265 VAC		
Charge current, normal mode	15/20	/ 30 A	8/12	2/16 A	
Charge current, NIGHT or LOW	7,5 / 10	/ 15 A	4/6	6/8A	
Efficiency	93	%	9	94%	
No load power consumption	0.5	W	0.	.5 W	
Frequency	45 – 6	55 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	h: 29,4V Li-ion: 28,4V	
Charge voltage 'float'	Normal: 13,8V High:	13,8V Li-ion: 13,5V	Normal: 27,6V High	h: 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)		Ma	x 98%		
		ENCLOSURE			
Material & Colour		Aluminium ((blue RAL 5012)		
Battery connection		Screw terminal	ls 13 mm² / AWG6		
230 V AC connection	Cable of 1,5	meter with CEE 7/7 plug, BS 1	ا 1363 plug (UK) or AS/NZS 3112	plug (AU/NZ)	
Protection category		I	P22		
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 61000-6-2, EN 61000-3-3		
Automotive	E4-1	0R	E4	I-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 (LiFePO₄) batteries

LiFePO₄ 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	5 Hz		
Efficiency	93%	93%	95%	95%	94%	96%	96%
No load power consumption				0.5W			
Charge voltage 'absorption'	Nor	mal: 14,4V Higl	n: 14,7V Li-ion: 1	14,2V	Normal: 28,8V	High: 29,4V	Li-ion: 28,4V
Charge voltage 'float'	Nor	mal: 13,8V Higl	n: 13,8V Li-ion: 1	13,5V	Normal: 27,6V	High: 27,6V	Li-ion: 27,0V
Charge voltage 'storage'	Nor	mal: 13,2V Higl	n: 13,2V Li-ion: 1	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 rever	se polarity (fuse)	Output shor	t circuit Over to	emperature	
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) (12/25 and 24/12 models only)		C		uit proof, current ax one volt lowe	limit 0,5 A r than main output		
		EN	CLOSURE				
Material & Colour			alum	inium (blue RAL	5012)		
Battery-connection			Black ar	nd red cable of 1,	5 meter		
230 V AC-connection			Cable of 1	,5 meter with CE	E 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
		STA	ANDARDS				
Safety			EN 60	335-1, EN 60335	i-2-29		
Emission Immunity		EN 55014-1, EN 61000-6-3, EN 61000-3-2					
Automotive Directive		EI	N 55014-2, EN 610	00-6-1, EN 6100	0-6-2, EN 61000-3-3		



Blue Smart IP65 Charger

Blue Smart IP65 Charger	12 V 4/5/7/10/15/25 A	24 V 5/8/13 A			
Input voltage	230	V AC			
Efficiency	94%	95%			
Standby power consumption	0,5	5 W			
Minimum battery voltage	Starts charging	from down to 0V			
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	4/5/7/10/15/25 A	5/8/13 A			
Charge current in low current mode	2/2/2/3/4/10A	2/3/4A			
Temperature compensation (lead-acid batteries only)	16 mV/°C	32 mV/°C			
Can be used as power supply	Yes				
Back current drain	0,7 Ah/month (1 mA)				
Protection		Output short circuit nperature			
Operating temp. range		ed output up to 30 °C) ty at low temperature)			
Humidity (non condensing)	Max	95%			
	ENCLOSURE				
Battery-connection	Black and red ca	able of 1,5 meter			
230 V AC-connection	•	i meter with JK) or AS/NZS 3112 plug			
Protection category	IP65 (splash a	nd dust proof)			
Weight	IP65 12 V 25 A - Other: 0,9 kg	24 V 13 A: 1,9 kg			
Dimensions (h x w x d)	IP65s 12 V 4/5 A IP65 12 V 7 A 24 V 5 A IP65 12 V 10/15 A 24 V 8 A IP65 12 V 25 A 24 V 13 A				
	STANDARDS				
Safety	EN 60335-1, E	N 60335-2-29			
Emission	EN 55014-1, EN 6100	00-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3				













MagCode Power Clip 12V



Battery indicator panel

Battery indicator eyelet M8

Blue Smart IP65 Charger The professional's choice



- 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**















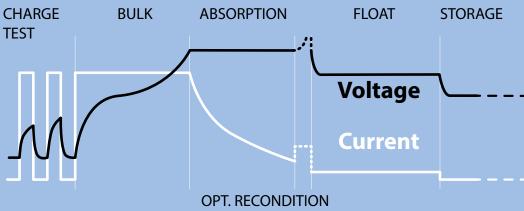






This is the best charger for this type of battery. The battery will be charged in the most efficient way.

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



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.

Reconditioning

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

Recovery function for fully discharged batteries

Most reverse polarity protected chargers will not

recognize, and therefore not recharge a battery which has been discharged to zero or nearly zero Volts. The **Blue 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.



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 STORAGE REFRESH



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 temperature during the charge process. The temperature is measured again when the charger is in low current mode during float or storage.

Special settings for a cold or hot environment are therefore not needed.

Li-ion battery mode

The Blue Smart IP65 Charger uses a specific charging algorithm for Li-ion (LiFePO₄) batteries, with automatic Li-ion under voltage protection reset.





Phoenix Smart IP43 Charger



Function comments of the comme



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

Each output can supply the full rated output current. But the total of the 3 outputs combined can never exceed the current rating of the charger.

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. 1.8.2)

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 (LiFePO₄) 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

The remote on/off consists of two terminals: Remote H and Remote L.

A remote on/off switch or relay contact can be connected between H and L.

Alternatively, terminal H can be pulled high, or terminal L can be pulled low.

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 IP43 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: 210 – 250 V)						
DC input voltage range			290 – 35	5 VDC				
Frequency			45-65	Hz				
Power factor			0,7					
Back current drain	AC dis	sconnected:	< 0,1 mA AC co	nnected and ch	arger remo	te off: < 6 mA		
No load power consumption			1 W	I				
Efficiency	12/30: 94 12/50: 92		12/30: 94% 12/50: 92%	94%		94%		
Charge voltage 'absorption'	Normal: 14,4V	High: 14,7V	Li-ion: 14,2V	Normal: 28,8V	High: 29,4	V Li-ion: 28,4V		
Charge voltage 'float'	Normal: 13,8V	High: 13,8V	Li-ion: 13,5V	Normal: 27,6V	High: 27,6	V Li-ion: 27,0V		
Storage mode	Normal: 13,2V	High: 13,2V	Li-ion: 13,5V	Normal: 26,4V	High: 26,4	V Li-ion: 27,0V		
Fully programmable			Yes, with Bluetooth	and/or VE.Direct				
Charge current house battery	30 / 50	Α	30 / 50 A	16 / 25 A		16 / 25 A		
Low current mode	15 / 25	Α	15 / 25 A	8 / 12,5 A 8 / 1		8 / 12,5 A		
Charge current starter battery			3 A (1+1 output	models only)				
Charge algorithm			5 stage ac	daptive				
Protection	Battery	reverse polar	ity (fuse, not user accessib	le) / Output short	t circuit / Ov	er temperature		
Can be used as power supply		Yes, ou	tput voltage can be set w	ith Bluetooth and	l/or VE.Dire	ct		
Operating temp. range		Rated o	-20 to 60°C (output current up to 40°C,	,	20% at 60°	°C		
Humidity (non-condensing)			max 9	5%				
Relay (programmable)			DC rating: 5 A u	ıp to 28 VDC				
		E	NCLOSURE					
Material & Colour			aluminium (blu	ie RAL 5012)				
Battery-connection			Screw terminals 1	6 mm² (AWG6)				
AC-connection	IEC 320 C14	inlet with ret	ainer clip (AC cord with co	ountry specific plu	ug 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 inc	h)			
		S	TANDARDS					
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	N 61000-6-2, EN 6	1000-3-3			
Vibration			IEC68-2-6:10-	150Hz/1.0G				



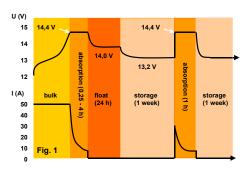
Retainer clip (included)

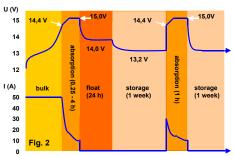


AC cord (must be ordered separately)

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

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.

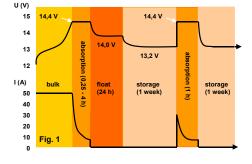
Computer interface

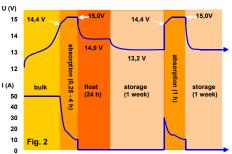
Every Phoenix Charger is ready to communicate with a computer through its RS-485 data port. Together with our VEConfigure software, which can be downloaded free of charge and the data link MK3-USB (see accessories), all parameters of the chargers can be customised.

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)		4:	5-65					
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	V	\checkmark	√	\checkmark				
Can be used as power supply	√	\checkmark	V	\checkmark				
Forced cooling	√	\checkmark	V	\checkmark				
Protection (1)		a,b,c,d						
Operating temp. range		-20 to 60°	°C (0 - 140°F)					
Humidity (non-condensing)		ma	x 95%					
		ENCLOSURE						
Material & Colour		aluminium (blue RAL 5012)					
Battery-connection		M6	studs					
AC-connection		screw-clamp	4 mm² (AWG 11)					
Protection category		IF	P 21					
Weight kg (lbs)		3,8	8 (8)					
Dimensions (hxwxd in mm and inches)		350x200x108 mm	n (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						
Protection key: Output short circuit Battery reverse polarity detection	c) Battery voltage too high d) Temperature too high							



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 (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-lon (LiFePO4) ready

Simple charger on-off control can be implemented by connecting a relay or open collector opto coupler output from a Li-lon 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)



Skylla-IP44 12/60 (1+1)

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		45-6	55 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	300-6	00 Ah	150-3	00 Ah		
Charge algorithm, Li-lon		3 stage, with on-off co	ntrol or CAN bus control			
Temperature sensor	Yes					
Can be used as power supply		Υ	es			
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, wit	h VE.Can			
Alarm relay	DPST AC rati	ng: 240VAC/4A DC ra	nting: 4A up to 35VDC, 1	A up to 60VDC		
Forced cooling		Yes (internal	air circulation)			
Protection	Battery reverse	polarity (fuse) Out	tput short circuit Ov	er temperature		
Operating temp. range		-20 to 60°C (Full outp	out current up to 40°C)			
Humidity (non-condensing)		max	95%			
	ENCLO	SURE				
Material & Colour		steel (blue	RAL 5012)			
Battery-connection		M6	bolts			
230 VAC-connection		screw-clamp 6	imm² (AWG 10)			
Protection category	IP44					
Weight	6kg (14 lbs)					
Dimensions (hxwxd)	401 x 265 x 151 mm 16 x 10,5 x 6 inch					
	STAND.	ARDS				
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 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-lon (LiFePO4) ready

Simple charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-lon 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	1	6A	20	0A			
Frequency (Hz)		45-	65Hz				
Power factor		0	,98				
Charge voltage 'absorption' (VDC) (1)		28	3,8V				
Charge voltage 'float' (VDC)		27	7,6V				
Charge voltage 'storage' (VDC)		26	5,4V				
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	500-1	000Ah			
Charge algorithm, Li-lon	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 RJ4	5 connectors, NMEA20	00 protocol, galvanically	y isolated			
Synchronised parallel operation		Yes, wit	h VE.Can				
Alarm relay	DPST AC rat	ing: 240VAC/4A DC ra	ating: 4A up to 35VDC, 1	A up to 60VDC			
Forced cooling		Υ	'es				
Protection	Battery reverse	polarity (fuse) Ou	tput short circuit Ov	er temperature			
Operating temp. range		-20 to 60°C (Full outp	out current up to 40°C)				
Humidity (non-condensing)		max	95%				
	ENCLO	SURE					
Material & Colour		aluminium (b	olue RAL 5012)				
Battery-connection		M8	bolts				
230 VAC-connection		screw-clamp 1	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)						
	STAND	ARDS					
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						



potentiometers.

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

Perfect chargers for any type of battery Charge voltage can be precisely adjusted

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

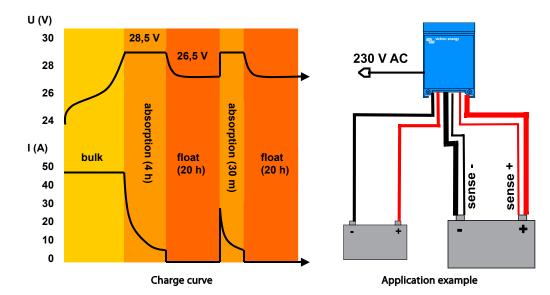
In order to compensate for voltage loss due to cable resistance, TG Chargers are provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Learn more about batteries and battery charging

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



Skylla TG 24 100



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)	120/230	3 x 400	230	230	3 x 400	230	230
Input voltage range (V AC)	95-264	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		\checkmark					
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	0 to +50°C (-40 - 122	°F)		
Humidity (non-condensing)				max 95%			
			ENCLOSURE				
Material & Colour			aluı	minium (blue RAL 50)12)		
Battery-connection				M8 studs			
230 V AC-connection			screv	v-clamp 2,5 mm² (AV	VG 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)	365 x 250 x 147 (14.4x9.9x5.8)	365 x 250 x 257 (14.4x9.9x10.1)	365 x 250 x 257 (14.4x9.9x10.1)	365 x 250 x 257 (14.4x9.9x10.1)	515 x 260 x 265 (20x10.2x10.4)	365 x 250 x 147 (14.4x9.9x5.8)	365 x 250 x 257 (14.4x9.9x10.1)
			STANDARDS				
Safety			EN	60335-1, EN 60335-2	2-29		
Emission			EN	55014-1, EN 61000-	3-2		
Immunity			EN	55014-2, EN 61000-	3-3		
1) Protection a. Output short circuit b. Battery reverse polarity detection 2) Up to 40°C (100°F) ambient		c. Battery voltage too high d. Temperature too high					



BMV-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

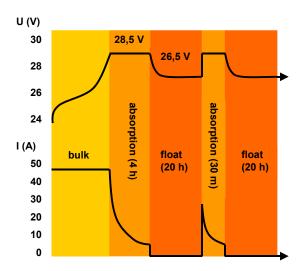
Other Skylla Chargers

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

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		\checkmark					
Can be used as power supply		√					
Remote alarm	Poten	itial free contacts 60V / 1A (1x	NO and 1x NC)				
Forced cooling		√					
Protection (1)		a, b, c, d					
Operating temp. range	-40 to +5	0°C (-40 - 122°F) (Full output c	urrent up to 40°C)				
Humidity (non-condensing)		max 95%					
	ENCLOSUR	E					
Material & Colour		aluminium (blue RAL 50	12)				
Battery-connection		M8 studs					
230 V AC-connection		screw-clamp 2,5 mm² (AW	/G 6)				
Protection category		IP 21					
Weight kg (lbs)	5,5 (12.1)	5,5 (12.1)	10 (22)				
Dimensions hxwxd in mm	365 x 250 x 147	365 x 250 x 147	365 x 250 x 257				
(hxwxd in inches)	(14.4 x 9.9 x 5.8) STANDARD	(14.4 x 9.9 x 5.8)	(14.4 x 9.9 x 10.1)				
Vibration	STAINDAIND	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					
Protection key: Output short circuit Battery reverse polarity detection	c) Battery voltage too high d) Temperature too high	2) Up to 40° C (100° F) ambient c) Battery voltage too high					



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

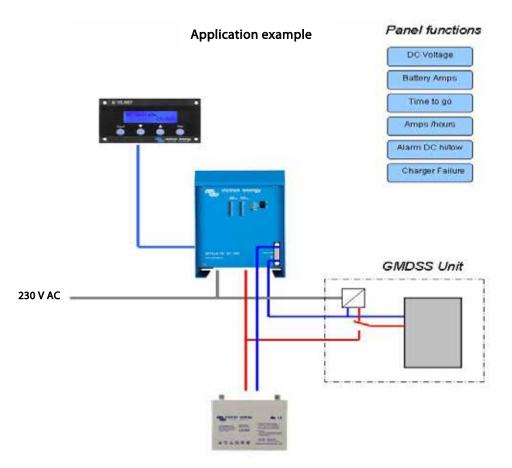
The whole system is 'click and go': the panels are pre-programmed for GMDSS functionality. A simple, intuitive menu allows changing of settings if required.

Battery time to go

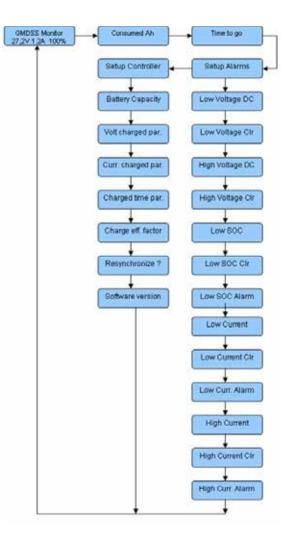
The Skylla GMDSS charger has a built-in battery controller. The capacity of the battery is fully monitored so the panel can even indicate the 'time to go' in case of a power supply black out.

Perfect charger for any type of battery

Charge voltage can be precisely adjusted to suit any VRLA or flooded battery system.



Skylla-TG	24/30 GMDSS	24/50 GMDSS				
Input voltage (V AC)	23	30				
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 (th	ree step)				
Temperature sensor	١	1				
Can be used as power supply	١	1				
Forced cooling	١					
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 r	m cables				
GMDSS connection	One 1,5					
	(+ to be taken direct Three wire 2,5 mr					
230 V AC-connection	Lengtl					
Protection category	IP:	21				
Weight kg (lbs)	6 (13)				
Dimensions hxwxd in mm (hxwxd in inches)	485x25 (19.1x9					
(HXWXU III IIICHES)	ACCESORIES	.983.0)				
VE.Net GMDSS panel	To be ordere	d separately				
UTP-cable	To be ordere					
	STANDARDS					
Safety	EN 60335-1, E	N 60335-2-29				
Emission Immunity	EN 55014-1, E					
Immunity	EN 55014-2, EN 61000-3-3					
Maritime Nav. & Radiocomm.	IEC 60945					
Protection key: Output short circuit 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.



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.

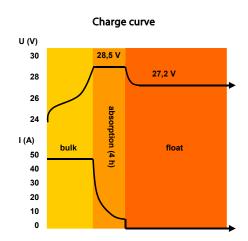
Three-stage charging, with temperature compensation

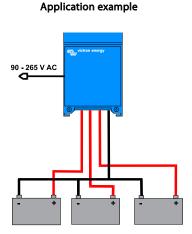
The Centaur charges at bulk rate until the output has reduced to 70% of the rated Amps, at which a 4 hour timer begins. After the timed period the charger switches to float rate.

An internal temperature sensor is used to compensate the charge voltage with $-2 \text{ mV/}^{\circ}\text{C}$ ($-1 \text{ mV/}^{\circ}\text{F}$) per cell. A DIP switch is available to select the optimum charge/float voltages for Flooded Lead-acid, Gel or AGM batteries.

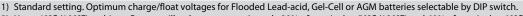
Learn more about batteries and battery charging

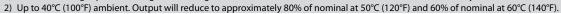
To learn more about batteries and charging batteries (including the pro's and cons of multi-bank charging and intelligent charging), please refer to our book 'Electricity on Board'





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 char	ging)				
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, - 2	2mV / °C (- 1mV / °	F) per cell				
Forced cooling		Yes, temperature and current controlled fan							
Protection			Output sho	ort circuit, over ter	mperature				
Operating temp. range			- 20	to 60°C (0 - 140°	°F)				
Ignition protected				Yes					
Humidity (non condensing)				max 95%					
			ENCLOSURE						
Material & Colour			alum	inium (blue RAL 5	012)				
Battery-connection	M6 studs	M6 studs	M8 studs	M8 studs	M8 studs	M8 studs	M8 studs		
AC-connection			screw	-clamp 4 mm² (AV	VG 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 5	5014-1, EN 61000	-3-2				
Automotive Directive			EN 5	5014-2, EN 61000	-3-3				







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

- 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.





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.

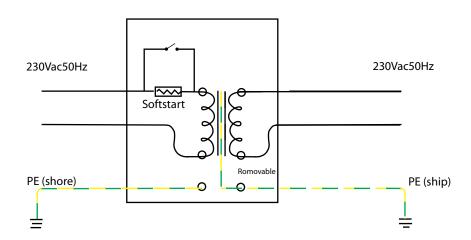
3600 Watt Auto 115/230 V

This model will automatically switch to 115 V or 230 V supply, depending on input voltage.

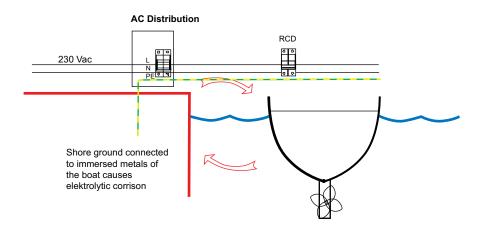
Supply 88 V – 130 V: switches to 115 V supply

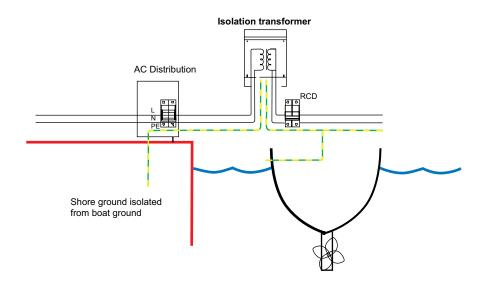
Supply 185 – 250 V: switches to 230 V supply range.

Note: The AC input voltage is raised by 1:1.05 ratio at the AC output.



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	Ma	aterial: aluminium (blue RAL 5012) Protection category: IP 2	1					
Weight	10 Kg	23 Kg	24 Kg	31 Kg					
Dimensions (h x w x d), mm	375x214x110		362 x 258 x 218						
		STANDARDS							
Safety		EN 6	0076						
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 Smart DC-DC charger isolated



Orion-Tr Smart 12/12-30



Orion-Tr Smart 12/12-30



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.

Fully programmable

- Battery charge algorithm (configurable) or fixed output.
- Smart alternator compatibility: engine running detection mechanism.

Adaptive 3-stage charge algorithm: bulk - absorption - float

- For lead acid batteries it is important that during shallow discharges 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.
- For lithium batteries absorption time is fixed, default 2 hours.
- Alternatively, a fixed output voltage can be chosen.

Suitable for use in vehicles with a smart alternator (Euro 5 and Euro 6 engines)

The built-in engine shutdown detection will stop the converter when the engine is not running. This prevents unwanted discharge of the starter battery (see manual for details).

Remote on-off

A remote on/off switch or relay contact can be connected to a two-pole connector.

Alternatively, the H terminal (right) of the two-pole connector can be switched to battery plus, or the L terminal (left) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

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.

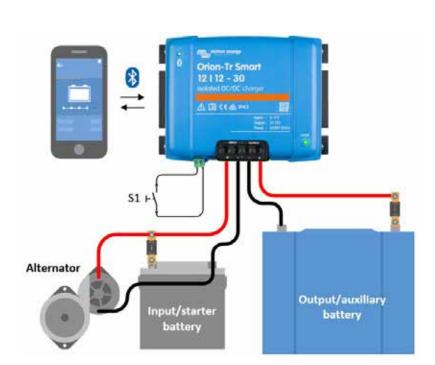
IP43 protection

When installed with the screw terminals oriented downwards.

Screw terminals

No special tools needed for installation.

Input fuse (not replaceable)



Orion-Tr Smart Chargers Isolated 220 - 280 Watt	12/12-18 (220W)	12/24-10 (240W)	24/12-20 (240W)	24/24-12 (280W)			
Input voltage range (1)	8-17V	8-17V	16-35V	16-35V			
Under voltage shut down	7V	7V	14V	14V			
Under voltage restart	7,5V	7,5V	15V	15V			
Nominal output voltage	12,2V	24,2V	12,2V	24,2V			
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V			
Output voltage tolerance	10 154	+/- 0,		20 30 0			
Output noise		2mV r					
Cont. output current at nominal output voltage and 40°C	18A	10A	20A	12A			
Maximum output current (10 s) at nominal output voltage	25A	15A	25A	15A			
Short circuit output current	40A	25A	50A	30A			
Cont. output power at 25°C	280W	280W	300W	320W			
Cont. output power at 40°C	220W	240W	240W	280W			
Efficiency	87%	88%	88%	89%			
No load input current	< 80mA	< 100mA	< 100mA	< 80mA			
Standby current		Less than	n 1mA				
Galvanic isolation		200V dc between inpu	ut, 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 ter	minals				
Maximum cable cross-section		16 mm ²	AWG6				
Weight		1,3 kg (3 lb)				
Dimensions hxwxd		130 x 186 x 70 mm (5	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 Smart Chargers Isolated 360 - 400 Watt	12/12-30 (360W)	12/24-15 (360W)	24/12-30 (360W)	24/24-17 (400W)	
Input voltage range (1)	10-17V	10-17V	20-35V	20-35V	
Under voltage shut down	7V	7V	14V	14V	
Under voltage restart	7,5V	7,5V	15V	15V	
Nominal output voltage	12,2V	24,2V	12,2V	24,2V	
Output voltage adjust range	10-15V	20-30V	10-15V	20-30V	
Output voltage tolerance		-	+/- 0,2V		
Output noise		2	mV rms		
Cont. output current at nominal output voltage and 40°C	30A	15A	30A	17A	
Maximum output current (10 s) at nominal output voltage minus 20%	40A	25A	45A	25A	
Short circuit output current	60A	40A	60A	40A	
Cont. output power at 25°C	430W	430W	430W	480W	
Cont. output power at 40°C	360W	360W	360W	400W	
Efficiency	87%	88%	88%	89%	
No load input current	< 80mA	< 100mA	< 100mA	< 80mA	
Standby current		Less	than 1mA		
Galvanic isolation		200V dc betweer	n input, output and case		
Operating temperature range		-20 to +55°C (dera	ate 3% per °C above 40°C)		
Humidity		Max. 95%	non-condensing		
DC connection		Scre	w terminals		
Maximum cable cross-section		16 m	m² (AWG6)		
Weight	12V input and/	or 12V output models: 1	,8 kg (3 lb) Other mod	dels: 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	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2				
Automotive Directive		EC	CE R10-5		

If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function). If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

Note 1) The VictronConnect App will not display current in or current out.

Note 2) The Orion-Tr Smart is not equipped with a VE.Direct port.



Orion-Tr DC-DC converters, low power, Non-isolated

High efficiency

Using synchronous rectification, full load efficiency exceeds 95%.

IP43 protection

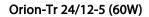
When installed with the screw terminals oriented downwards.

Screw terminals

No special tools needed for installation.











Orion-Tr 24/12-10 (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		Scre	w 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 DC-DC converters, high power, Non-isolated



Orion 24/12-25

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.

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 24/12-40





Orion 24/12-70 with binding posts

Non isolated	Orion	Orion	Orion	Orion	Orion	Orion
converters	24/12-25	24/12-40	24/12-70	12/24-8	12/24-10	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 61000-6-2 EN 61000-6-2, EN 61	0950 3, EN 55014-1 000-6-1, EN 55014-2 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 (1)	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				2m\	/ 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 in	put, output and	d case		
Operating temperature range			-20 to +5	5°C (derate	3% per °C ab	ove 40°C)		
Humidity				Max. 95% no	n-condensing)		
DC connection				Screw to	erminals			
Maximum cable cross-section				6 mm ²	AWG10			
Weight				0,42 k	g (1 lb)			
Dimensions hxwxd			100 x 1	13 x 47 mm	(4.0 x 4.5 x 1.	9 inch)		
Standards: Safety Emission Immunity				EN 61000-6-3 00-6-2, EN 61	0950 3, EN 55014-1 000-6-1, EN 5			
Automotive Directive				ECE I	R10-5			

¹⁾ If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function).

If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

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 (1)	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				2m\	/ 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 d	dc between in	put, output a	nd case		
Operating temperature range			-20 to +	55°C (derate	3% per ℃ abo	ove 40°C)		
Humidity				Max. 95% no	n-condensing	1		
DC connection				Screw t	erminals			
Maximum cable cross-section				16 mm	² AWG6			
Weight				1,3 kg	g (3 lb)			
Dimensions hxwxd			130 x	186 x 70 mm	(5.1 x 7.3 x 2.8	8 inch)		
Standards: Safety Emission Immunity Automotive Directive			EN 61	EN 61000-6- 000-6-2, EN 61	50950 3, EN 55014-1 1000-6-1, EN 5 R10-5	5014-2		

Orion-Tr	Orion-Tr	Orion-Tr	Orion-Tr	Orion-Tr	Orion-Tr	Orion-Tr	Orion-Tr
							48/48-8
	<u> </u>	<u> </u>		_ ` ′			(380W)
							40-70V
							28V
	,						30V
•		· ·		,			48,2V
10-15V	20-30V	10-15V	20-30V	40-60V	10-15V	20-30V	40-60V
			+/-	0,2V			
			2m\	/ rms			
30A	15A	30A	17A	8,5A	30A	16A	8A
40A	25A	45A	25A	15A	40A	25A	15A
60A	40A	60A	40A	25A	60A	40A	25A
430W	430W	430W	480W	480W	430W	430W	430W
360W	360W	360W	400W	400W	360W	380W	380W
87%	88%	88%	89%	89%	87%	89%	89%
< 80mA	< 100mA	< 100mA	< 80mA	< 120 mA	< 80mA	< 80mA	< 80mA
		200V d	c between in	put, output an	d case		
		-20 to +5	55°C (derate	3% per °C abo	ve 40°C)		
			Max. 95% no	n-condensing			
			Screw to	erminals			
			16 mm²	(AWG6)			
1	2V input and/	or 12V output	t models: 1,8 l	kg (3 lb)	Other models	: 1,6 kg (3.5 lb)
			•		•	x 3.2 inch)	
		EN 610	EN 61000-6-3 000-6-2, EN 61	3, EN 55014-1 000-6-1, EN 55	5014-2		
	12/12-30 (360W) 10-17V 7V 7,5V 12,2V 10-15V 30A 40A 60A 430W 360W 87% < 80mA	12/12-30 (360W) (360W) 10-17V 10-17V 7V 7V 7,5V 7,5V 12,2V 24,2V 10-15V 20-30V 30A 15A 40A 25A 60A 40A 430W 430W 360W 360W 87% 88% <80mA <100mA	12/12-30 12/24-15 24/12-30 (360W) (360W) (360W) 10-17V 10-17V 20-35V 7V 7V 14V 7,5V 7,5V 15V 12,2V 24,2V 12,2V 10-15V 20-30V 10-15V 30A 15A 30A 40A 25A 45A 60A 40A 60A 430W 430W 360W 360W 360W 360W 87% 88% 88% <80mA	12/12-30	12/12-30 (360W) (360W) (360W) (400W)	12/12-30	12/12-30

⁾ If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function).

If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.



Orion IP67 24/12 and 12/24 DC-DC converters, Non-isolated

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.

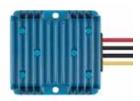
Protected against overheating

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

Orion IP67	24/12-5	24/12-10	24/12-20	24/12-100	12/24-50					
Input voltage range		15-40VDC		18-35VDC	10-15VDC					
Under voltage shutdown		13V		15V	8V					
Under voltage restart		14V		16V	9V					
No load current at 24V	1mA	20mA	85mA	45mA						
DC output voltage	12V +/- 3%	12V +/- 3%	12V +/- 3%	12V +/- 3%	24V +/- 3%					
Maximum continuous output current	5A	10A	20A	100A	50A					
Efficiency	93%	93%	95%	96%	96%					
Ripple & Noise		75mVpp		150r	mVpp					
Operating temperature range (derate 3% per °C above 40°C)		-40 to +70°	C (full rated output up to	40°C)						
Overload protection		Hiccup mode, recovers a	utomatically after fault co	ondition is removed						
Short circuit proof	Yes									
Protection against reverse polarity connection		With external for	use or circuit breaker (no	t included)	With external fuse or circuit breaker (not included)					
		ENCLOSURE								
Material & Colour			minium (blue RAL 5012)							
Material & Colour Protection category			minium (blue RAL 5012) IP67							
	Two input		IP67	Bolt	ts M6					
Protection category DC connection	Two input 0,8mm² (18 AWG)	Alui	IP67	Bolt n.a.	ts M6 n.a.					
Protection category DC connection Cable cross section, input	·	Aluı and two output cables, l	IP67 ength 1,8m							
Protection category DC connection Cable cross section, input Cable cross section, output	0,8mm² (18 AWG)	Alui and two output cables, I 1,5mm² (15 AWG)	IP67 ength 1,8m 2,6mm² (13 AWG)	n.a.	n.a.					
Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg)	0,8mm² (18 AWG) 0,8mm² (18 AWG)	Alui and two output cables, l 1,5mm² (15 AWG) 1,5mm² (15 AWG)	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG)	n.a. n.a.	n.a. n.a.					
Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg)	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, I 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g	1P67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g	n.a. n.a. 2,15 kg	n.a. n.a. 3 kg					
Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg) Dimensions (h x w x d in mm)	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, I 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32	1P67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g	n.a. n.a. 2,15 kg	n.a. n.a. 3 kg					
Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg) Dimensions (h x w x d in mm)	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, I 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32 STANDARDS	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g 74 x 74 x 32	n.a. n.a. 2,15 kg	n.a. n.a. 3 kg					
Protection category	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, I 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32 STANDARDS	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g 74 x 74 x 32 EN 60950	n.a. n.a. 2,15 kg 265 x 127 x 63	n.a. n.a. 3 kg					
Protection category DC connection Cable cross section, input Cable cross section, output Weight (kg) Dimensions (h x w x d in mm) Safety Emission	0,8mm² (18 AWG) 0,8mm² (18 AWG) 50 g	Alui and two output cables, I 1,5mm² (15 AWG) 1,5mm² (15 AWG) 300 g 74 x 74 x 32 STANDARDS	IP67 ength 1,8m 2,6mm² (13 AWG) 2,6mm² (13 AWG) 300 g 74 x 74 x 32 EN 60950 61000-6-3, EN 55014-1	n.a. n.a. 2,15 kg 265 x 127 x 63	n.a. n.a. 3 kg					



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



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



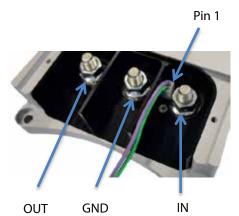
Orion IP67 24/12-100 Orion IP67 12/24-50













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	100A					
Input voltage range	10-30V							
Under voltage threshold	10V							
Output voltage range		10-30V						
Maximum charge current	12V:25A 24V:15A	12V:50A 24V:25A	12V:100A 24V:50A					
	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		30V						
	Output pin 1 and pin 2	2						
Output voltage if activated		$V_{pinout} = Vin$						
Maximum current (per pin)		$I_{pinout} = 1A$						
	GENERAL							
Operating temperature range		-25 +60°C						
Ambient temperature		Max current: up to 60°C	•					
Weight	0,6kg	1,4kg	4,1kg					
Dimensions	165 x 120 x 30mm	213 x 120 x 30mm	288 x 162 x 95mm					











Cerbo GX



Accessories included with the Cerbo GX



GX Touch 50 (optional display for Cerbo GX)



Accessories included with the GX Touch 50

Cerbo GX: communication-centre

This communication-centre allows you to always have perfect control over your system from wherever you are and to maximise its performance. Simply access your system via our Victron Remote Management (VRM) portal, or access it directly, using the optional GX Touch 50 screen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its Bluetooth capability.

GX Touch 50: display accessory

The GX Touch 50 is a display accessory for the Cerbo GX. The five inch touch screen display gives an instant overview of your system and allows you to adjust settings. Simply connect the display to the Cerbo GX with just one cable. The GX Touch 50 has a waterproof design, has a top-mountable setup and is simple to install.

Remote Console on VRM

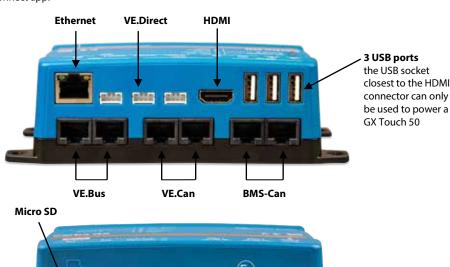
Monitor, control and configure the Cerbo GX remotely, over the internet. Just like if you were standing in front of the device, using Remote Console. The same functionality is also available on the local network LAN, or using the WiFi Access Point of the Cerbo GX.

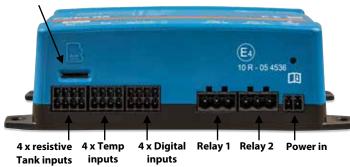
Perfect monitoring & control

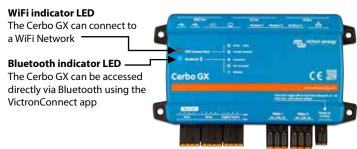
Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements. Easily control the shore power input current limit, (auto)start/stop generator(s) or change any setting to optimise the system. Follow up on alerts, perform diagnostic checks and resolve complications remotely.

Simple mounting and configuration

The Cerbo GX is easily mountable and can also be mounted on a DIN-Rail using the DIN35 adapter small, (not included). Its separate touchscreen can be bolted on a dashboard, eliminating the need to create perfect cutouts (like with the Color Control GX). Connection is easy via just one cable, taking away the hassle of having to bring many wires to the dashboard. The Bluetooth feature enables a quick connection and configuration via our VictronConnect app.







Cerbo GX			
Supply voltage	8 – 70V DC		
Mounting	Wall or DIN rail (35mm) ⁽²⁾		
	Communication ports		
VE.Direct ports (always isolated)	3 (3)		
VE.Bus (always isolated)	2 paralleled RJ45 sockets		
VE.Can	yes - non isolated		
	Other		
Outer dimensions (h x w x d)	78 x 154 x 48 mm		
Operating temperature range	-20 to +50°C		
	Standards		
Safety	tbd		
EMC tbd			
Automotive tbd			
GX Touch 50			
Mounting	With included mounting accessories		
Display Resolution	800x480		
	Other		
Outer dimensions (h x w x d)	87 x 128 x 12.4 mm		
Cable length	2 meter		
 For more detailed information about the Cerbo GX and the GX Touch 50, please visit the Victron GX product range page at Victron live: 			
 DIN rail mounting requires additional accessory - DIN35 Adapter. The listed maximum on the `Performance` section in above table is the total connected VE.Direct devices such as MPPT Solar Charge controllers. Total means all directly connected 			

devices plus the devices connected over USB. The limit is mostly bound by CPU processing power. Note that there is also a limit to the other type of devices of which often multiple are connected: PV Inverters. Up to three or four three phase inverters can typically be monitored on

a CCGX. Higher power CPU devices can monitor more.

Optional accessories





GX Touch 50 adapter for CCGX cut-out This adapter is designed to easily replace the

CCGX display with the newer GX Touch 50.
Contents of the packaging are the metal bracket, the plastic bezel, and four mounting screws.



Temperature sensor for Quattro, MultiPlus and GX Device (such as the Cerbo GX)





DIN35 adapter small

DIN-Rail adapter to easily mount a device on a DIN-Rail. Suitable for the Cerbo GX.



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. See also the screenshots below.

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 <u>blog post about 3G routers</u>.

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 <u>Modbus-TCP FAQ</u> 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/30	V DC / 250V AC (Nor	mally open)	
		Communication po	orts	
VE.Direct	2 sep	arate VE.Direct ports	– isolated	
VE.Can	2 pai	alleled RJ45 sockets	– isolated	
VE.Bus	2 pai	2 paralleled RJ45 sockets – isolated		
USB	2 ل	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 JSO	N API to retrieve dat	a from the <u>VRM Portal</u>	
		Other		
Outer dimensions (h x w x d)		130 x 120 x 28mr	m	
Operating temperature range		-20 to +50°C		
	Standards			
Safety	EN 60	950-1:2005+A1:2009	9+A2:2013	
EMC	EN 61000-6-3, EN 5	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



Mobile & boat overview



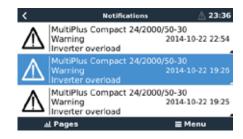
Genset control page



Main menu

Device List	₽ 17:02
Lynx Ion	>
Lynx Shunt 1000A VE.Can	>
PV Inverter on AC Out	>
Quattro 24/3000/70-2x50	>
PV Inverter on output	>
Notifications	>
<u>⊿</u> Pages ∨	≣ Menu

Alarm notifications



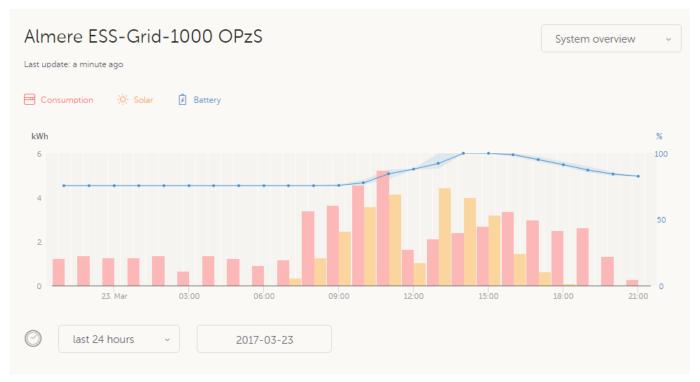
Tiles overview



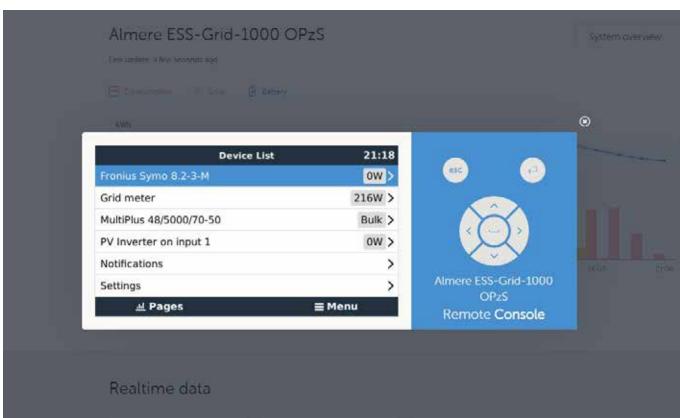


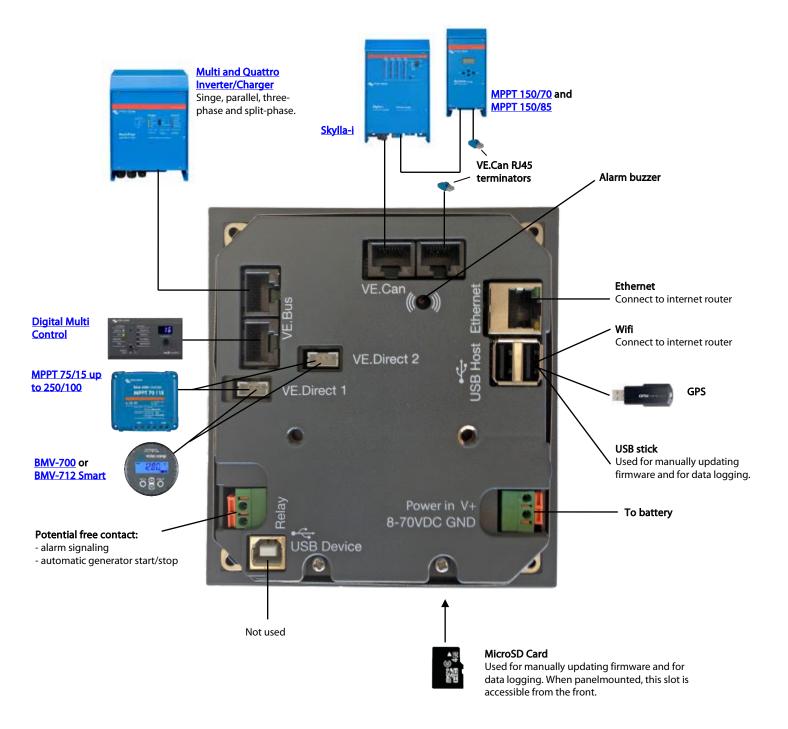
Color Control GX

VRM Portal - Dashboard



VRM Portal - Remote Console







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. 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

- 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 <u>synchronizing multiple MPPT 150/70 solar chargers</u>.
- 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 <u>blog post about 3G routers</u>.

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 <u>Modbus-TCP FAQ</u> for more information.
- Powered by the Venus OS embedded linux.

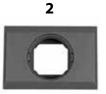
Venus GX				
Power supply voltage range	8 – 70V DC			
Current Draw	210 mA @ 12V	110 mA @ 24V	60 mA @ 48V	
	Communication por	ts		
VE.Direct	2 sep	arate VE.Direct ports – isc	olated	
VE.Can	2 par	ralleled RJ45 sockets – iso	lated	
CAN	2 nd	CAN interface – non isola	ted	
VE.Bus	2 par	ralleled RJ45 sockets – iso	lated	
USB	21	JSB Host ports – not isola	ted	
Ethernet	10/100/1000	MB RJ45 socket – isolated	except shield	
WiFi Access Point	Use	to connect to Remote Co	nsole	
WiFi Client	Connect the	Venux GX to an existing	WiFi network	
	Ю			
Potential free contact	NO/COM/NC - 6 A 250 VAC/30 VDC			
Tank level inputs	3 x Configurable for	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 m	onitor and control all pro Venus GX	ducts connected to the	
JSON	Use the VRM JSC	N API to retrieve data fro	m the <u>VRM Portal</u>	
Other				
Outer dimensions (h x w x d)		45 x 143 x 96		
Outer dimensions (h x w x d) Operating temperature range		45 x 143 x 96 -20 to +50°C		
· · · · · · · · · · · · · · · · · · ·	Standards			
· · · · · · · · · · · · · · · · · · ·			:2013	
Operating temperature range	EN 60	-20 to +50°C		



4











		Rectangular panels	Round panels	Rectangular panels	Round panels and Rectangular panels
Dimensions (h x w x	c 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		Suitak	ole for:	
BPA000100000R	Battery Alarm GX	√			
REC000200000R	Skylla-i Control GX	√			
DMC000200000R	Digital Multi Control 200/200A GX	√			
BAM010700000	Battery Monitor BMV-700		V		\checkmark
BAM010702000	Battery Monitor BMV-702		√		\checkmark
SCC900500000	MPPT Control		√		\checkmark
BPP000300100R	Color Control GX			√	√
BPP000200100R	VE.Net Blue Power Panel GX			√	\checkmark



1 Enclosure for 65 x 120 mm GX panels



3
Enclosure for Color Control GX
(also accepts a VE.Net Blue Power Panel GX)



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)



Smart BatteryProtect BP-65



Smart BatteryProtect BP-100



Smart BatteryProtect BP-220



Connector with preassembled DC minus cable (included)

Protects the battery against excessive discharge and can be used as a system on/off switch

The Smart 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.

The on/off input can be used as a system on/off switch.

12/24V auto ranging

The Smart BatteryProtect automatically detects system voltage one time only.

Bluetooth: programming made easy

When using Bluetooth to program the Smart BatteryProtect any required engage/disengage levels can be set. Alternatively, one of nine predefined engage/disengage levels can be set with the programming pin (see manual). If required, Bluetooth can be disabled.

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 16.3V respectively 32.6V.

Ignition proof

No relays but MOSFET switches, and therefore no sparks.

Delayed alarm output

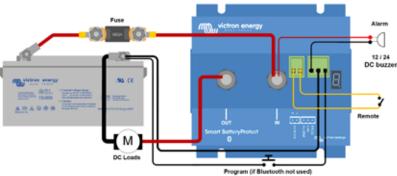
The alarm output is activated if the battery voltage drops below the preset disconnect level during more than 12 seconds. Starting the engine will therefore not activate the alarm. The alarm output is a short circuit proof open collector output to the negative (minus) rail, max. current 50 mA. The alarm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

Smart BatteryProtect		Smart BP-65	Smart BP-100	Smart BP-220	
Maximum continuous load current*		65A 100A 220A			
Peak current (during 30 sec	onds)	250A	600A	600A	
Operating voltage range			6 –35V		
Current consumption	BLE On	When on: 1,4 mA Whe	n off or low voltage shutdo	wn: 0,9 mA	
Current Consumption	BLE Off	When on: 1,2 mA When	off or low voltage shutdow	n: 0,7 mA	
Alarm output delay			12 seconds		
Maximum load on alarm ou	ıtput		50 mA (short circuit proof)		
Load disconnect delay		90 seconds (i	nmediate if triggered by th	e VE.Bus BMS)	
Load reconnect delay			30 seconds		
Default thresholds		Disenga	ge: 10,5V or 21V Engage: 12	2V or 24V	
Operating temperature ran	ge	Full load: -40°C t	o +40°C (up to 60% of nom	inal load at 50°C)	
IP rating		Electronic	cs: IP67 (potted) Connect	ions: IP00	
Connection		M6	M8	M8	
Weight		0,2 kg 0.5 lbs	0,5 kg 0.6 lbs	0,8 kg 1.8 lbs	
Dimensions (bound)		40 x 48 x 106 mm	59 x 42 x 115 mm	62 x 123 x 120 mm	
Dimensions (hxwxd)		1.6 x 1.9 x 4.2 inch	2.4 x 1.7 x 4.6 inch	2.5 x 4.9 x 4.8 inch	
* The BatteryProtect is not designed for reverse currents from charging sources					



System on/off

a. ON when the L and H terminal are interconnected (switch or relay contact)

b. ON when the L terminal is pulled to battery minus (V< 3.5V)

c. ON when the H terminal is high (2.9V < VH < Vbat)

d. OFF in all other conditions





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

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 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.

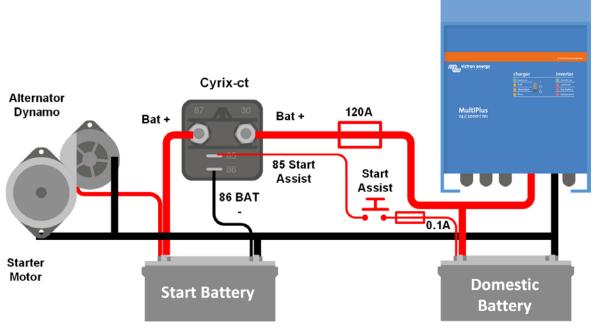
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Cyrix Battery Combiner	Cyrix-ct 1	2/24-120	Cyrix-ct 1	2/24-230
LED status indication	N	0	Ye	es .
Continuous current	120	Α	230) A
Cranking rating (5 seconds)	180	Α	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 enga	ged during 30 seco	nds)
Control cable included (length 1 m)	No Yes		es	
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 65 x 100 x 50 (1.8 x 1.8 x 3.2) (2.6 x 4.0 x 2.0)			

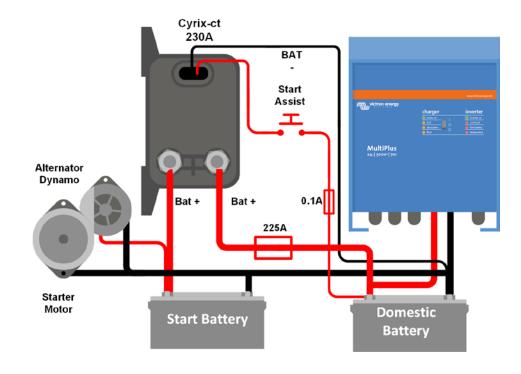
Connect (V)	Delay
V < 13 V	Remains open
13,0 V < V < 13,2 V	10 min
13,2 V < V < 13,4 V	5 min
13,4 V < V < 13,6 V	1 min
13,6 V < V < 13,8 V	4 sec

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 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	8-36 VDC	
Input voltage 24/48 V model	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	78 x 102 x 110	
(h x w x d in inches)	$(3.1 \times 4.0 \times 4.4)$	

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	

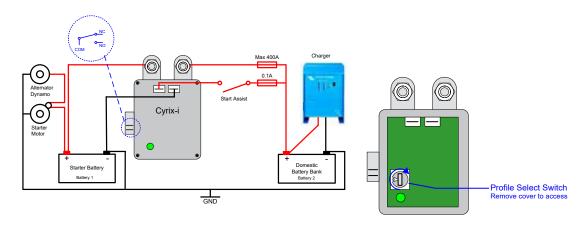
Profile 1			
Conn	ect (V)*	Disconi	nect (V)*
Less than 13,25 V	Remains open	More than 12,75 V	Remains closed
More than 13,25 V	Closes after 30 sec	From 10,5 V to 12,75 V	Opens after 2 min
		Less than 10,5 V	Immediate

Profile 2				
Connect (V)*		Disconr	nect (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)*		Disconr	nect (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-load 12/24-230



Cyrix-Li-Charge 12/24-230



Cyrix-Li-ct 12/24-230



Control cable for Cyrixct 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.

Cvrix-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 negative 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 2 s flash: connecting
LED 2 s flash: connecting
LED 2 s blink: disconnecting

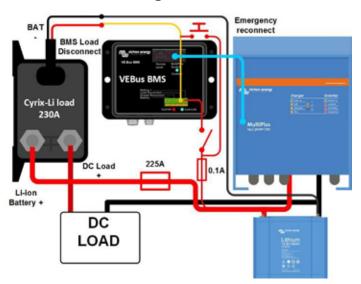
LED 0,25 s blink: alarm (over temperature; voltage > 16 V; both batteries < 10 V; one battery < 2 V)

(multiply by two for 24 V)

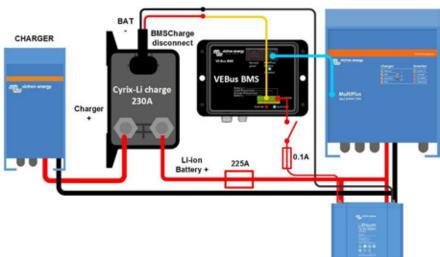
Cyrix Battery Combiner	Cyrix-Li-load 12/24-230	Cyrix-Li-Charge 12/24-230	Cyrix-Li-ct	12/24-230
Cyrix battery Combiner	Cyrix-Li-load 24/48-230	Cyrix-Li-Charge 24/48-230	12 V system	24 V system
Continuous current and breaking capacity at 12 V or 24 V	230 A 230.A 230 A		0 A	
Breaking capacity at 48 V	80 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	65 x 100 x 50			
(h x w x d in inches)	$(2.6 \times 4.0 \times 2.0)$			

Connection diagrams

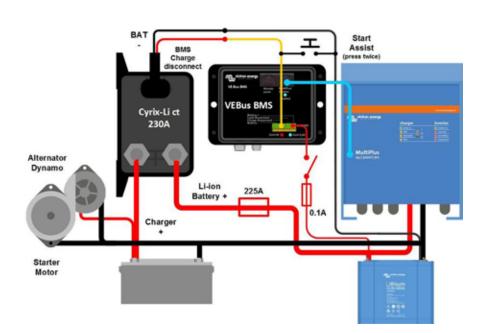
Cyrix-Li-load



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: RJ12 cable (10m) and battery cable with fuse (2m); 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 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 N		No
Temperature measurement range	-20	+50°C	n.a.
VE.Direct communication port	Yes	Yes	Yes
Relay	60V / 1A norm	nally 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	nt			

INSTALLATION & DIMENSIONS			
Installation	Flush mount		
Front	63mm diameter		
Front bezel	69 x 69 mm (2.7 x 2.7 inch)		
Body diameter and depth	52 mm (2.0 inch) and 31 mm (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.





Also use your smartphone to adjust settings!

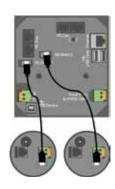
(the VE.Direct to Bluetooth Smart dongle must be ordered separately)



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 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.



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

When the charge voltage of a 24V battery system increases to more than 27V, the 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. charge.

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three





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: RJ12 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

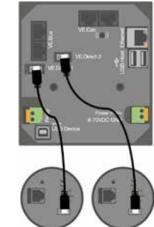
- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- 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)

Distable relay	60v / TA 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





500A / 50mV 10 meter 6 core UTP with RJ12 connectors,

and cable with fuse for '+' connection

Optional (ASS000100000)

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.



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.



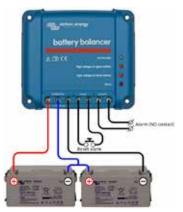


Interface cables

- 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

If needed, several balancers can be paralleled.

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



Color Control

Shunt (included)

Cables (included)

Temperature sensor

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.



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.

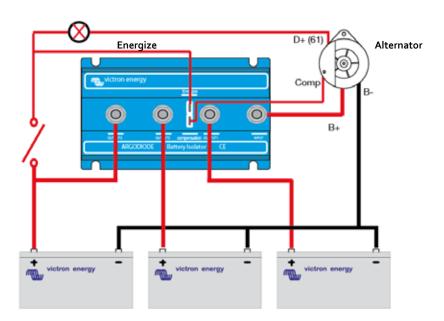
Please see our book 'Energy Unlimited' or ask for specialist advice when installing a diode isolator. Simply inserting the isolator in the cabling between the alternator and the batteries will slightly reduce charge voltage. The result can be that batteries are not charged to the full 100% and age prematurely.

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 × 120 × 115 (2.4 × 4.7 × 4.5)	60 × 120 × 115 (2.4 × 4.7 × 4.5)	60 × 120 × 150 (2.4 × 4.7 × 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



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:

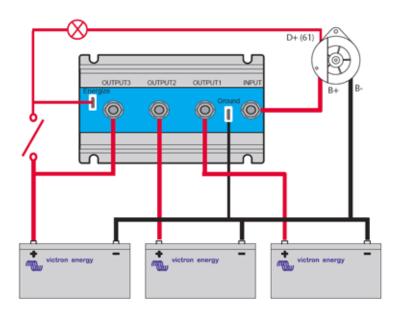
When a current of 100 A flows through a cable of 50 mm² cross section (AWG 0) and 10 m length (30 ft), the voltage drop over the cable will be 0,26 Volt. Similarly a current of 50 A through a cable of 10 mm² cross section (AWG 7) and 5 m length (15 ft) will result in a voltage drop of 0,35 Volt!

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 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.

LFD 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.

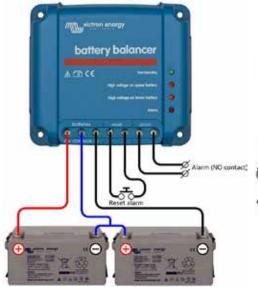
Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

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.

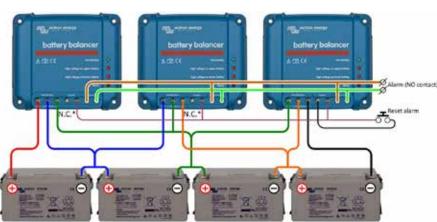
Please see the manual of the BMV-702 for more information about battery balancing.

Learn more about batteries and battery charging

fer to our book 'Energy Unlimited' (available free of charge from Victron Energy



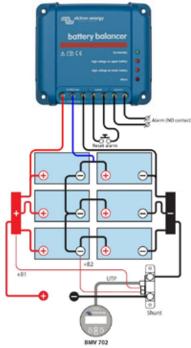
Battery Balancer connected to two series connected 12V batteries (24V system)



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

Three Battery Balancers connected to four series connected 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 mm ² / 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

- 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!)
- 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.
- If required: first wire the alarm contact and the alarm reset.
 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).
- 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

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.

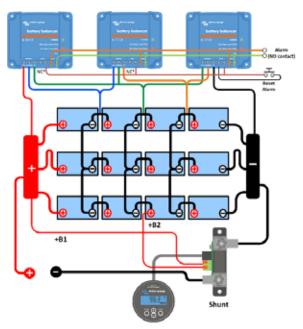
What to do in case of an alarm during charging

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:
- Charge and then test all batteries or cells individually or: 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:

- 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.
- One or more faulty cells: replace all batteries.



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



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.



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.



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

Evnensive

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.

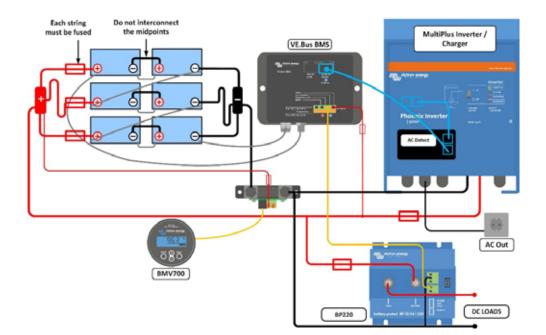
Very useful to localize a (potential) problem, such as cell imbalance.



12,8V 300Ah LiFePO4 Battery



Li-ion app



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 12,8/50	LFP- Smart 12,8/60	LFP- Smart 12,8/100	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	25,6V	
Nominal capacity @ 25°C*	50Ah	60Ah	100Ah	160Ah	200Ah	300Ah	200Ah	
Nominal capacity @ 0°C*	40Ah	48Ah	80Ah	130Ah	160Ah	240Ah	160Ah	
Nominal capacity @ -20°C*	25Ah	30Ah	50Ah	80Ah	100Ah	150Ah	100Ah	
Nominal energy @ 25°C*	640Wh	768Wh	1280Wh	2048Wh	2560Wh	3840Wh	5120Wh	
*Discharge current ≤1C								
		CYCLE	E LIFE (capacity ≥ 80	% of nominal)				
80% DoD				2500 cycles				
70% DoD				3000 cycles				
50% DoD				5000 cycles				
			DISCHARGE					
Maximum continuous discharge current	100A	120A	200A	320A	400A	600A	400A	
Recommended continuous discharge current	≤50A	≤60A	≤100A	≤160A	≤200A	≤300A	≤200A	
End of discharge voltage	11,2V	11,2V	11,2V	11,2V	11,2V	11,2V	22,4V	
			OPERATING CONE	DITIONS				
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		В	etween 14V/28V an	nd 14,4V/28,8V (14,2	2V/28,4V recommer	nded)		
Float voltage				13,5V/27V				
Maximum charge current	100A	120A	200A	320A	400A	600A	400A	
Recommended charge current	≤30A	≤30A	≤50A	≤80A	≤100A	≤150A	≤100A	
			OTHER					
Max storage time @ 25°C*				1 year				
BMS connection			Male + female cab	le with M8 circular c	onnector, length 50c	m		
Power connection (threaded inserts)	M8	M8	M8	M8	M8	M10	M8	
Dimensions (hxwxd) mm	199 x 188 x 147	239 x 286 x132	197 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	7kg	12kg	15kg	20kg	22kg	51kg	56kg	
*When fully charged								





VE.Bus BMS

Protects each individual cell of a Victron lithium iron phosphate (LiFePO₄ or LFP) battery

Each individual cell of a LiFePO₄ 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 (default 3,1V/cell, adjustable on the battery between 2,85V and 3,15V per cell).

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)

Pre-alarm

The pre-alarm output is normally free floating and becomes high in case of imminent cell under voltage (default 3,1V/cell, adjustable on the battery between 2,85V and 3,15V per cell).

Maximum current: 1A (not short circuit protected).

The minimum delay between pre-alarm and load disconnect is 30 seconds.

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.

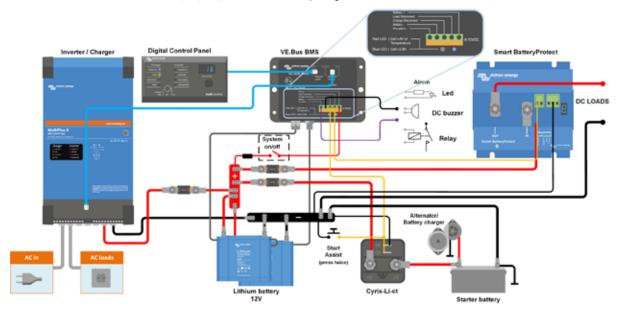


Figure 1: Application example for a vehicle or boat.

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)				
Pre-alarm output	Normally free floating High (Vbat) in case of alarm, max. 1A (not short circuit proof)				
	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				

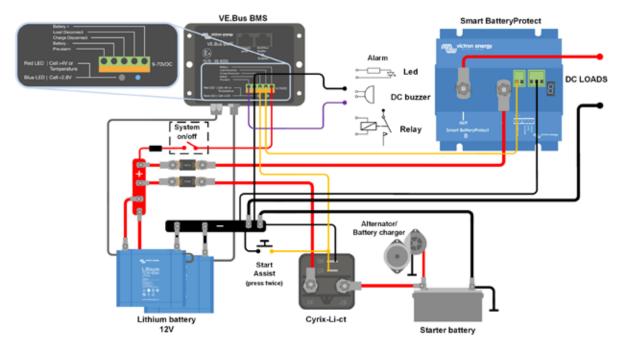


Figure 2: Application example for a vehicle or boat, without inverter/charger.



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.

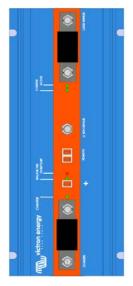




12,8V 90Ah LiFePO4 Battery



12,8V 6oAh 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)

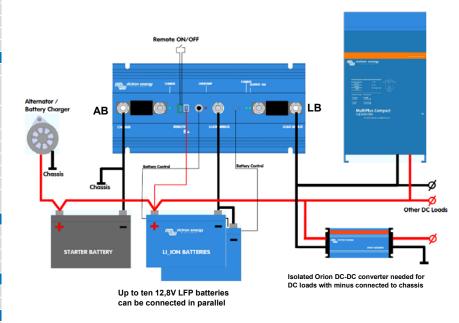
- 1. The first function of Power Port AB is to prevent the load connected to the LFP battery from discharging the starter battery. This function is similar to that of a Cyrix Battery Combiner or Argo FET Battery Isolator. Current can flow to the LFP battery only if the input voltage (= voltage on the 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 specificati	on
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 cutoff 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	Cycle service	Cycle service
	Service	Normal	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	٧	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

 \geq 300 cycles @ 100% DoD (discharge to 10,8V with I = 0,2C₂₀, followed by approximately two hours rest in discharged condition, and then a recharge with I = 0,2C₂₀)

 \geq 700 cycles @ 60% DoD (discharge during three hours with I = 0,2C₂₀, immediately followed by recharge at I = 0,2C₂₀)

≥ 1000 cycles @ 40% DoD (discharge during two hours with I = 0,2C₂₀, immediately followed by recharge at I = 0,2C₂₀)



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' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

12V AGM Telecom battery	115Ah	115Ah 165Ah				
Capacity 1/3/5/10/20 hours (% of nominal)	60/75/82/91/	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	115Ah 165Ah				
Cold Cranking Amps @ 0°F/-18°C	1000	1500	1800			
DIN cold start current (A) @ o°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 × 110 × 293mm	548 x 105 x 316mm	546 x 125 x 323mm			
Dimensions (lxwxh, inches)	15.37 × 4.33 × 11.53	21.57 × 4.13 × 12.44	21.49 X 4.92 X 12.71			
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	6okg/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.

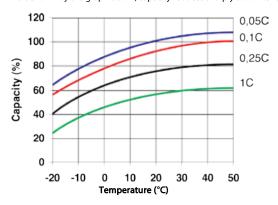


Fig. 1: Effect of temperature on capacity

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

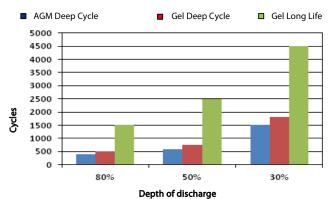


Fig. 2: Cycle life

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.

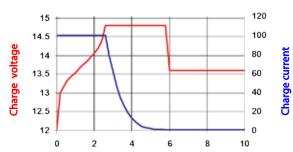


Fig. 3: Three step charge curve

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).

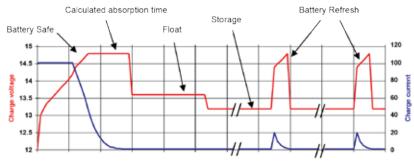


Fig. 4: Four-step adaptive charge curve

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 $10^{\circ}\text{C}/50^{\circ}\text{F}$ or more than $30^{\circ}\text{C}/85^{\circ}\text{F}$ 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 $25^{\circ}\text{C}/70^{\circ}\text{F}$.

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 'De	ep 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	lxwxh 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		
BAT212070084	8	12	151 x 65 x 101	2,5			Float design life: 7-10 years at 20°C Cycle design life:		
BAT212120086	14	12	151 x 98 x 101	4,4			400 cycles at 80% discharge		
BAT212200084	22	12	181 x 77 x 167	5,8			600 cycles at 50% discharge		
BAT412350084	38	12	197 x 165 x 170	12,5			1500 cycles at 30% discharge		
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			

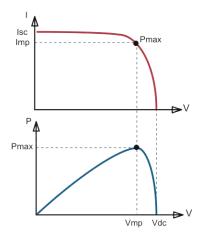
12 Volt Deep Cycle G	EL	General Specification					
Article number	Ah	v	lxwxh mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate GEL Terminals: copper
BAT412550104	60	12	229 x 138 x 227	20	250	70	Rated capacity: 20 hr. discharge at 25°C
BAT412600100	66	12	258 x 166 x 235	24	270	80	Float design life: 12 years at 20°C Cycle design life:
BAT412800104	90	12	350 x 167 x 183	26	360	120	500 cycles at 80% discharge
BAT412101104	110	12	330 x 171 x 220	33	450	150	750 cycles at 50% discharge
BAT412121104	130	12	410 x 176 x 227	38	500	180	1800 cycles at 30% discharge
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	lxbxh 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
BAT702801260	800	2	210 x 191 x 688	65	Float design life: 20 years at 20°C Cycle design life:
BAT702102260	1000	2	210 x 233 x 690	80	1500 cycles at 80% discharge
BAT702122260	1200	2	210 x 275 x 690	93	2500 cycles at 50% discharge
BAT702152260	1500	2	210 x 275 x 840	115	4500 cycles at 30% discharge
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



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

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



MPPT Control



SmartSolar Control



VictronConnect Application

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.
- Automatic battery voltage recognition.
- Flexible charge algorithm.
- Over temperature protection and power derating when temperature is high.

Sizing options:

- Suitable for a variety of battery voltages. Most models connect to 12, 24, and 48V batteries, some only
 connect to 12 and 24V batteries, or only to 48V batteries.
- Charge currents rating from 10A all the way up to 100A.
- Maximum PV array Voc voltages ranging from 75V up to 250V.
- Multiple chargers can be used in parallel, for large systems we recommend to use the models with a VE.Can communication port.

PV terminal options:

- TR one positive and one negative screw terminal.
- MC4 3 pairs of paralleled MC4 connectors.

Bluetooth options:

- SmartSolar models have Bluetooth.
- BlueSolar models do not have Bluetooth. They can be retrofitted to have Bluetooth by connecting the VE.Direct Bluetooth Smart dongle. Advantage: the product is not Bluetooth accessible when the dongle is not connected. Note that on the SmartSolar models, Bluetooth can be disabled.

Display options:

- VictronConnect Application. Connects via Bluetooth or via the VE.Direct USB interface
- MPPT Control. Connects to all models via a VE.Direct cable
- SmartSolar Control Display. Plugs directly into the housing of the larger models
- GX device
- VRM website (GX monitoring device needed)

Communication ports:

- VE.Direct all models
- VE.Direct and VE.Can limited models. VE.Can is especially suitable for systems with multiple solar chargers. All units are simply "daisy chained" to each other with a single RJ45 cable between each unit and also between the las unit in the chain and the a GX monitoring device.

Temperature sensor options:

- Internally (all models).
- Externally via the Smart Battery Sense (only SmartSolar models).

Load output options:

- Physical output On the 10, 15 and 20A models.
- Virtual output via VE.Direct TX digital output cable and the BatteryProtect or a solid-state relay.

Remotely enabling and disabling the charger:

All larger units feature the Victron standard remote on/off terminals. All models that don't feature an
onboard Remote on/off terminal can be remotely controlled by using the <u>VE.Direct non inverting
remote on/off cable – ASS030550310</u>. Note that this prohibits using the VE.Direct port for anything
else.

Firmware update options:

- Local updates via the VictronConnect Application (via Bluetooth or USB-VE.Direct interface)
- Remote updates via VRM website and a GX device

Optional accessories:

- VictronConnect Application (free download)
- Wire boxes, to cover and protect the terminals. See table on page 2 for wire box types
- Control and display panels: MPPT control or SmartSolar control)
- GX monitoring device (CCGX, Venus GX, Octo GX or Cerbo GX)
- Data cables: VE.Direct cable, RJ45 Cable (VE.Can models only), USB-VE.Direct interface
- External control cables: TX cable, non-inverting cable
- Bluetooth dongle (for non-smart models)

More information:

- To access the above-mentioned documents or information: press the search button on our website
 and enter the appropriate search word.
- For connection to a Color Control GX or other GX device see:

BlueSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	М
100/50	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/35	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/45	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/45-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/45-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	L
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
SmartSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote	Programmable	Wire Box
		j				on-off	relay	
75/10	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	М
100/50	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	М
150/35	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	М
150/45	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	М
150/45-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/45-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-H VE.Can	No	12/24/36/48V 12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
Paris Services	NO		Car a smartoour car	- Jak III	VEIDITECT OF VEICHT	9		, L















Color Control GX

Venus GX

Cerbo GX

Smart Battery Sense

VE.Direct Bluetooth Smart Dongle

VE.Direct to USB interface



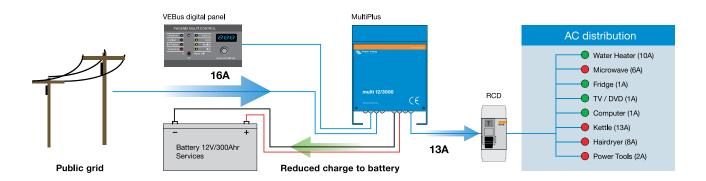
MultiPlus principle

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.

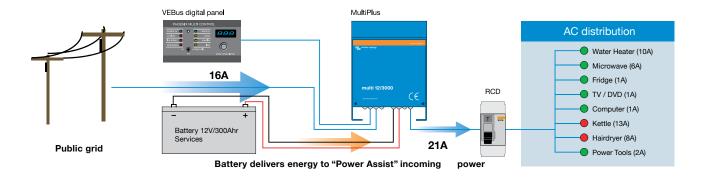


PowerAssist: Boosting the power available from mains or generator, an innovative feature of Multiplus. The feature that most distinguishes the Multiplus from other inverter/chargers is PowerAssist. This feature takes the principle of PowerControl to a further dimension by allowing a Multiplus to supplement 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 ©

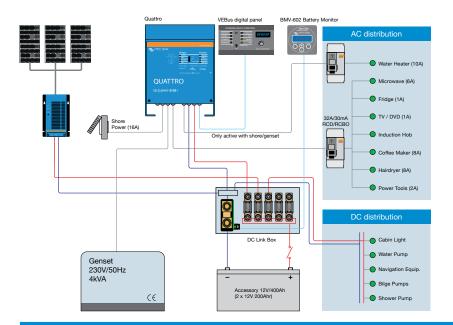
Inverter boosts incoming power, if required, to avoid overload of supply when system consumption exceeds supply.



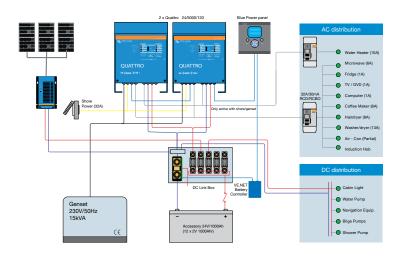
Comfort system				
Appliance	System			
Lighting	Quattro 12/3000/120			
Communication & navigation	BMV-712 battery monitor			
Water heater	2x12V/200AH and 1X80AH batteries			
Microwave oven	Digital control remote panel			
2 ring introduction hob	Alternator 12/150			
Coffee machine/Kettle	DC Link Box			
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, refrigerator, 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, shave	r etc)				
Modest air-conditioning	Solarpanel and MPPT Solar charger				

Comfort system - 7 kVA (30A) capacity



Comfort plus system - 25 kVA capacity





About Victron Energy

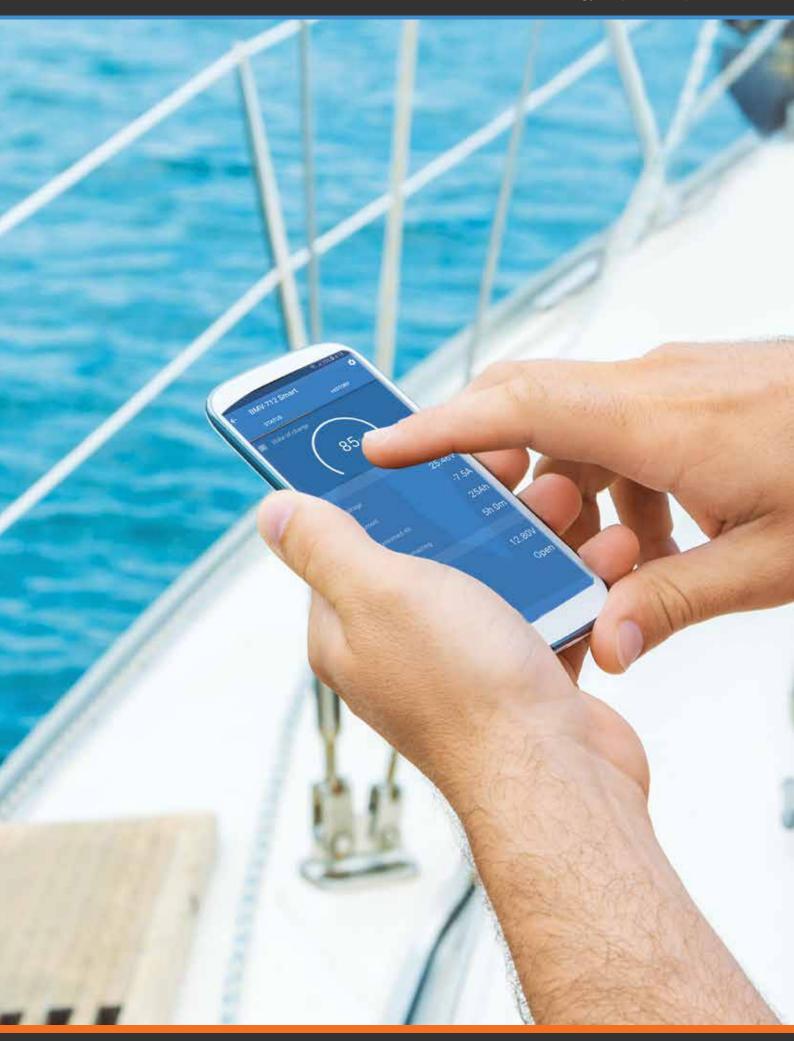
With over 46 years of experience, Victron Energy enjoys an unrivalled reputation for technical innovation, reliability and quality. Victron is a world leader in the supply of self-supporting electrical power. Our products have been designed to meet the most demanding situations faced by a diversity of 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 46 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.







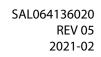




























Introduction







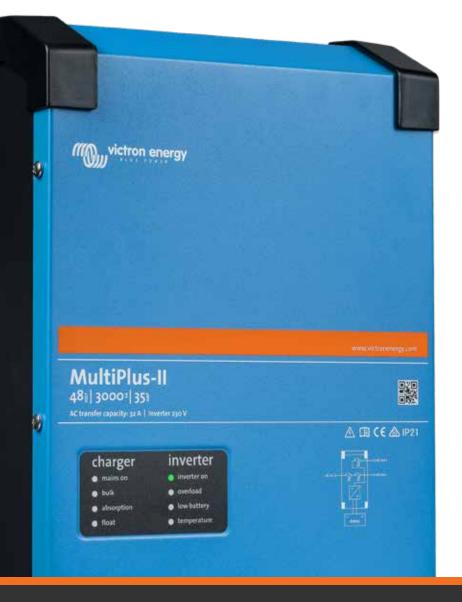
Off-grid

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

Energy, Anytime, Anywhere.

Hybrid systems

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



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











Living self-sufficient in the UK

Vanessa and Bruce Jones decided to go off the grid to power their new build five-bedroomed house, after finding out that going to connect their house to the public grid was going to cost them more than £100k.

Rather than spend a large amount of money to connect their house to the grid, they contacted lan Hewson form Off Grid Engineering. Ian worked closely with the heating engineer to design a power system with sufficient capacity to keep the domestic heating operating throughout the shorter days of winter – and provide energy for all the appliances and conveniences of a large family home.

He designed off-grid energy system for them, based on a 26kW solar array, 4x 100A MPPT solar chargers, a 41kWh LiFePO4 battery bank and a 15kVA Quattro. This system provides all their daily energy needs including the heat pump, summer, and winter alike. Excess solar energy is stored in batteries for use at night or in case of adverse weather. The 20kVA LPG backup generator will only run, after the battery bank has been depleted.

This typically will only happen in the colder months of the year. Overall, the generator provides less than 7% of their yearly energy needs.

The Octo GX allows the system's live and historical data to be monitored and managed remotely using Victron's Remote Management Portal VRM. Even when they are not at home.

The Jones' have the house of their dreams amid the rolling hills around Shaftesbury – far from the madding crowd – and can relax in the knowledge that their solar energy, too, is free ...protecting them from the spiralling costs of electricity.

Their off-grid system costs £55k. The yearly LPG cost is less than £3k and Vanessa and Bruce Jones do not have a monthly energy bill.

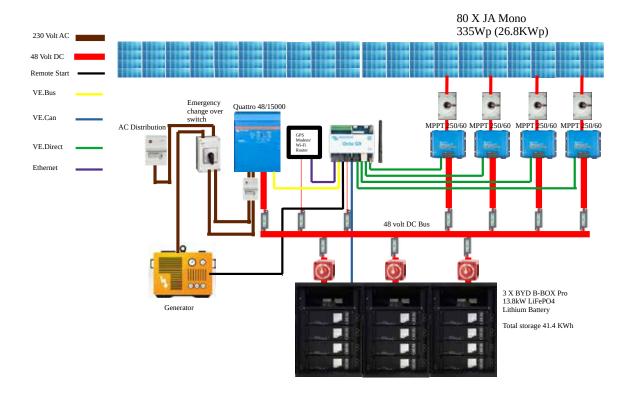






Here is the system they have installed:

- 80 x 335W JA Mono-Crystalline Solar Panels
- Victron 15 kVA Quattro
- 3 x 13.8 kWh BYD LiFePO4 battery bank
- 4 x 250V/100A SmartSolar charge controllers
- Octo GX System harmonisation and remote Communication
- 20 kVA LPG back up generator







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.

At the heart of the unit, within the tamper proof body which incorporates its own system security, is a pneumatic mast that can extend up to 15 m in height with 360 degree cameras and lighting on the masthead.

A range of surveillance fitmere fitment options exists which ca include thermal imaging, IR lighting, motion detection, access control, perimeter surveillance and alarm verification from a distance. The units can also allow verbal contact via loudspeaker along with video recording, management systems and image analysis software. The commissioning of the specific detection and evaluation techniques can exarried out remotely.

Assisting this level of sophistication and to make this all possible are Victron Energy gel batteries, a MultiPlus, BMV-702 battery monitoring along with the offoffsite remote control and monitoring made possible by a Color Control GX and the Victron Energy VRM portal.

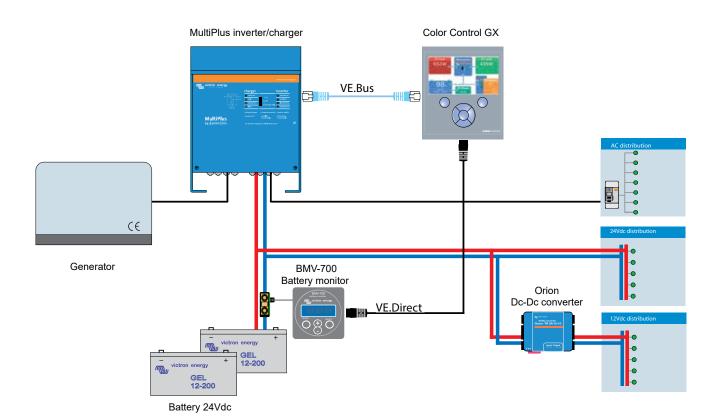




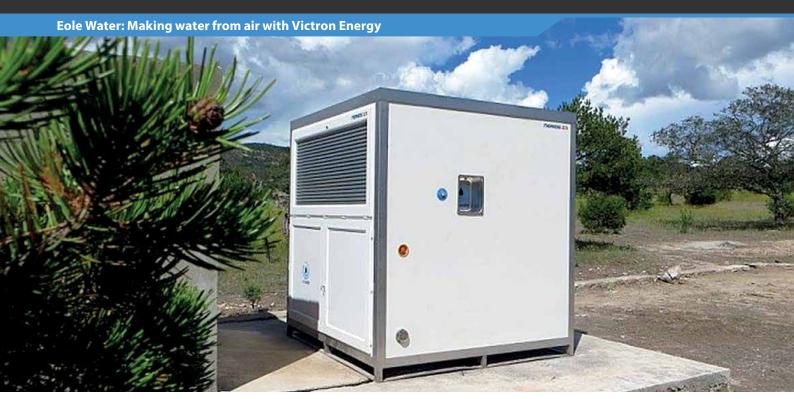












Eole Water

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.



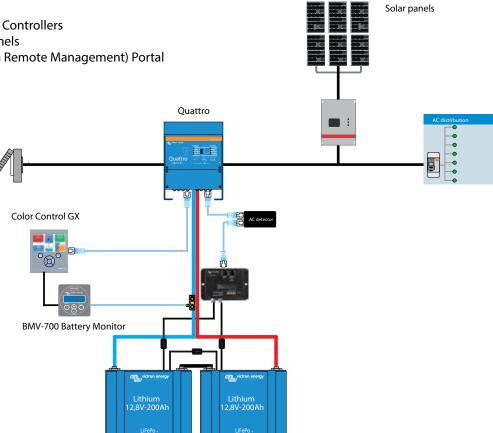


Victron inside and out

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)



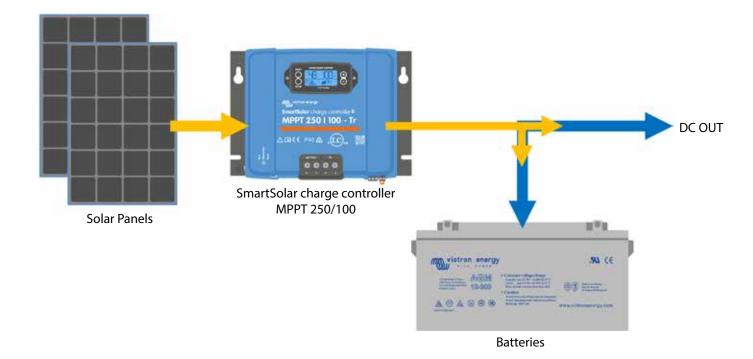






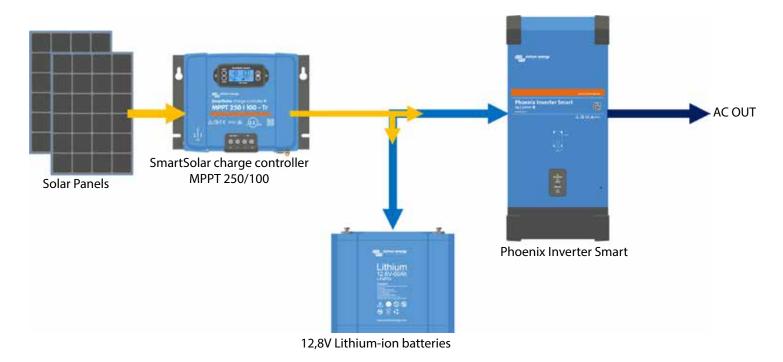
DC Systems

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.



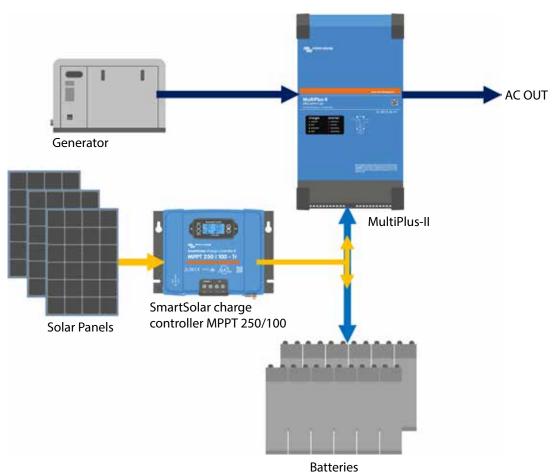
1. DC consumers

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.



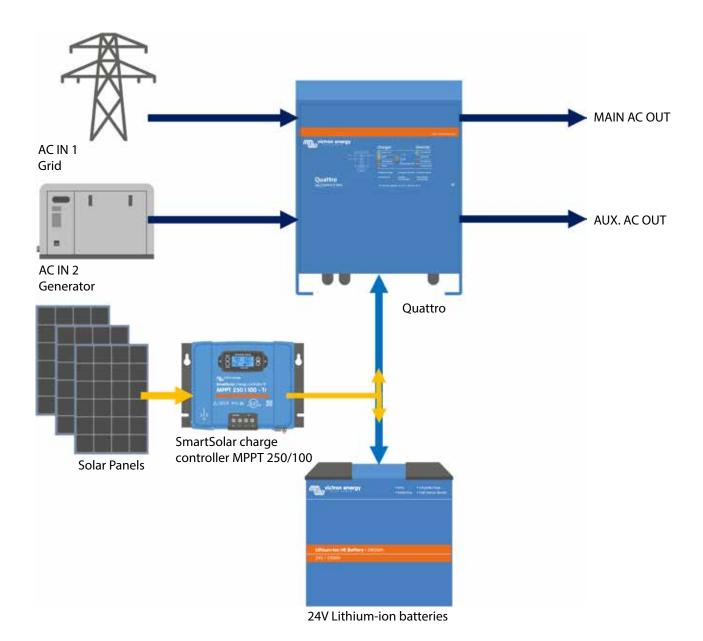
DC systems

PowerAssist – boosting the capacity of grid or generator power

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

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

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

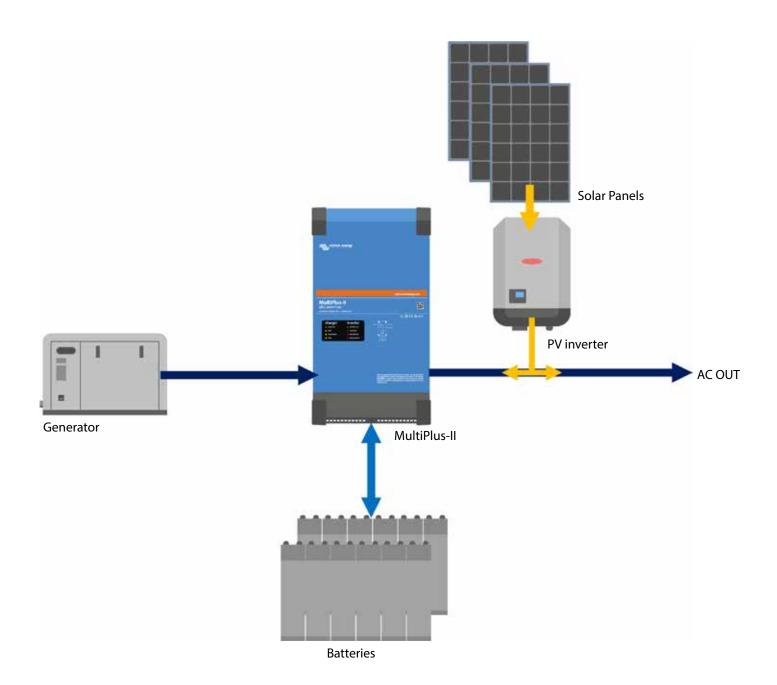


4. Backup system

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

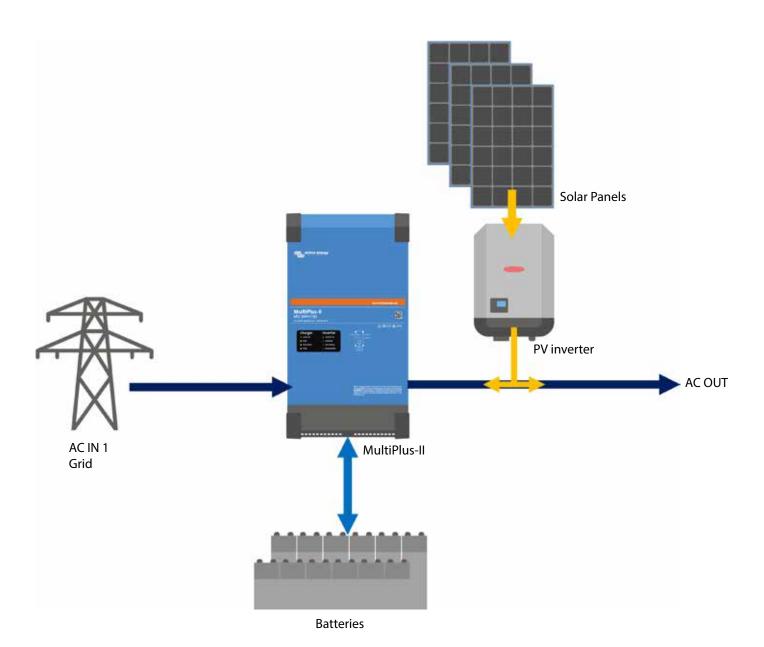
For larger solar systems that generally supply to AC consumers, it is more efficient to immediately invert the solar power into AC. Therefore we call these systems "AC systems". AC systems have a higher energy efficiency in comparison to DC systems. The PV inverter directly converts the solar energy 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

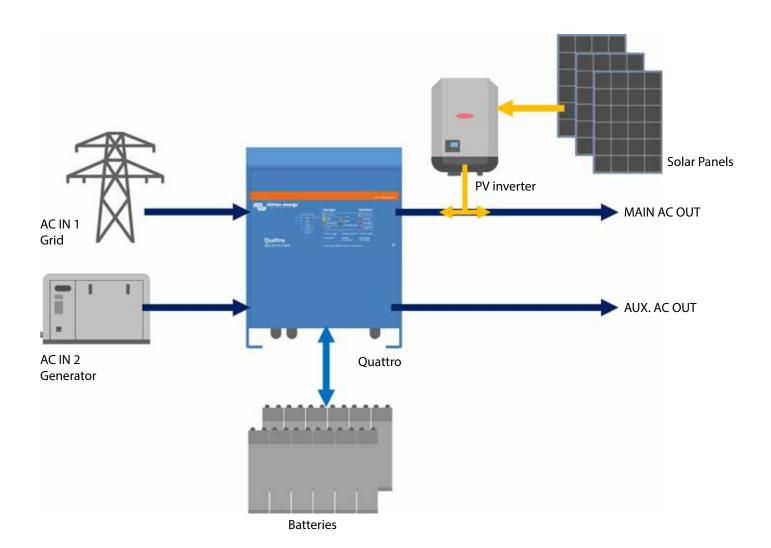
In this backup system, AC from the grid can supplement the energy supply coming from the solar panels. And vice versa, the energy from the solar panels can cover any grid failure that may occur.

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.

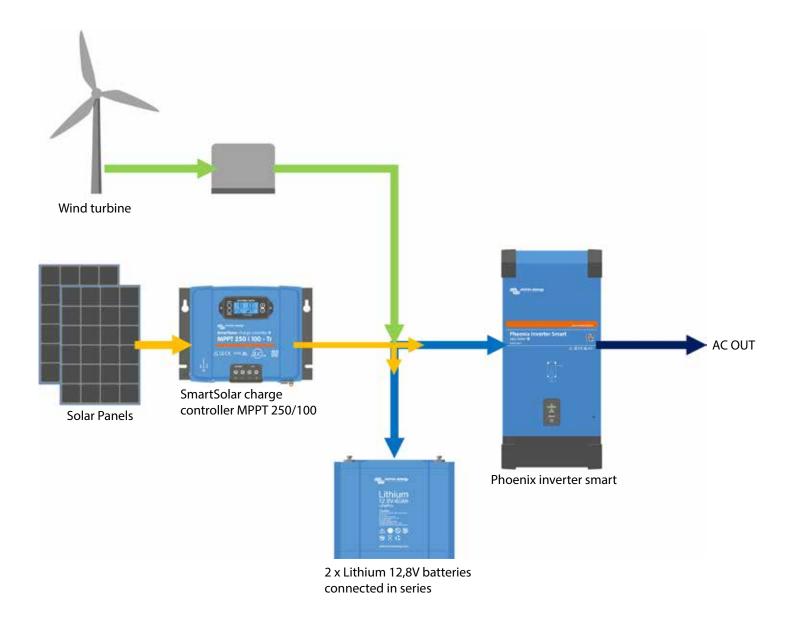
The big difference is that a Quattro can take two AC sources, and switch between them based on intelligent rules. It has a built-in transfer switch. The MultiPlus can take only one AC source.



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.



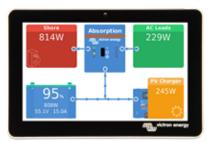


Accessories

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.

Cerbo GX

This all-new communication-centre allows you to always have perfect control over your system from wherever you are and maximises its performance. Simply connect through our Victron Remote Management (VRM) portal, or access directly, using the separate GX Touch 50, a MFD or our VictronConnect app thanks to its added Bluetooth capability. This latest addition to the GX-range combines all the best of connectivity, redefining smart power solutions in every way.

GX Touch 50

The GX Touch 50 is the display accessory for our Cerbo GX. The five inch touch screen display gives an instant overview of your system and allows to adjust settings in the blink of an eye. Simply connected to the Cerbo GX with one cable, its super slim waterproof design, top-mountable setup and its simple installation bring a lot of flexibility when creating a crisp and clean dashboard.

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.



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.

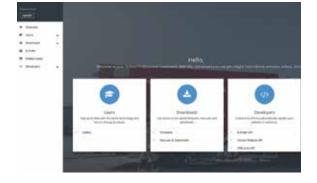
The portal is free of charge.



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.

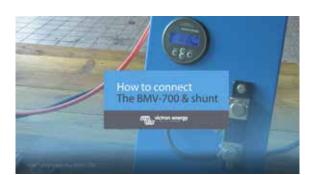


VRM World: View shared VRM sites around the world

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.



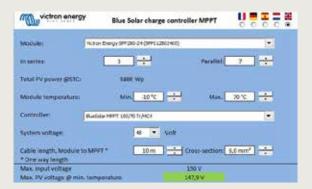


Victron Community

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.



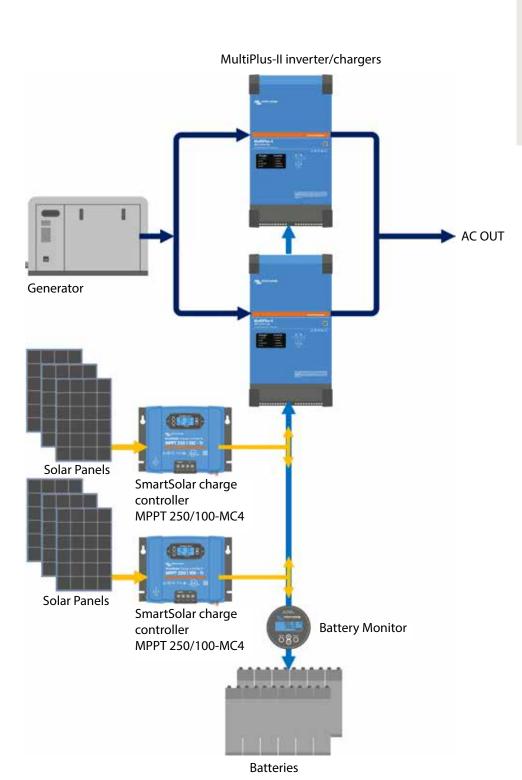
Victron Live

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.



More power

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

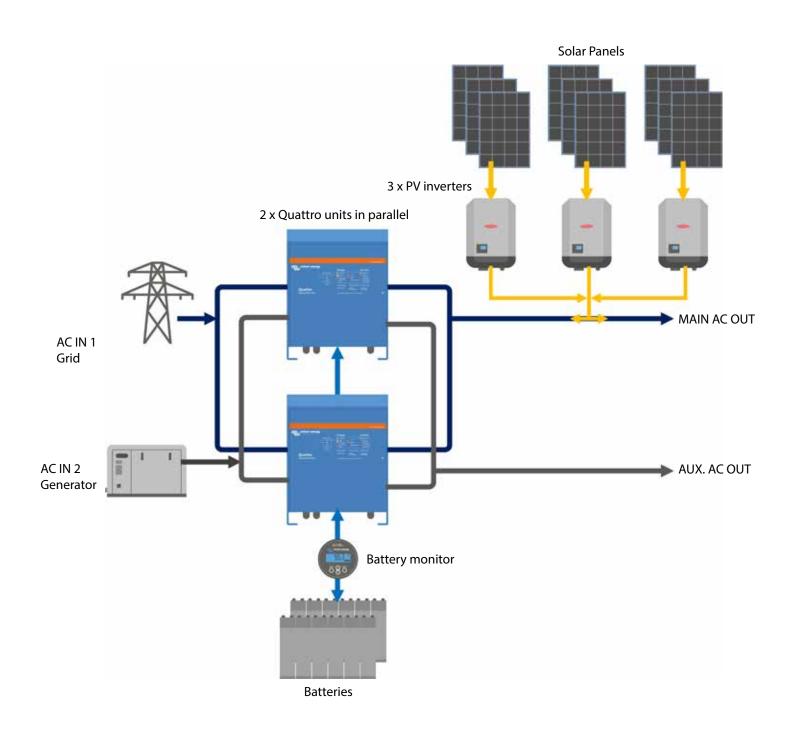


Easy to configure

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











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.

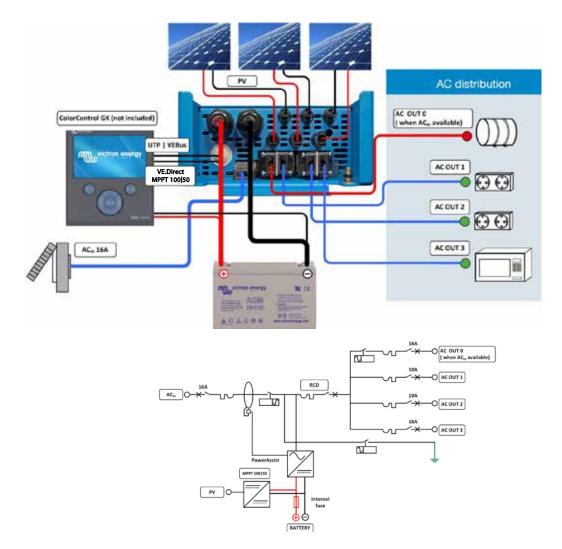
PowerAssist

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. Please see

http://www.victronenergy.nl/support-and-downloads/software/



EasySolar	EasySolar 12/1600/70	EasySolar 24/1600/40			
	Inverter/charger				
Transfer switch	16	A .			
to a second seco	INVERTER	10 221/			
Input voltage range 'Heavy duty' output AC 0	9,5 – 17V 16	19 – 33V			
neavy duty output AC 0	Output voltage				
Output AC1, 2, 3	Frequency: 50 Hz \pm 0,1% (1)				
Cont. output power at 25°C (3)	1600VA / 1300W				
Cont. output power at 40°C	120	ow			
Peak power	300	ow			
Maximum efficiency	92%	94%			
Zero load power	8W	10W			
Zero load power in search mode	2W	3W			
	CHARGER				
AC Input	Input voltage rar				
<u> </u>	Input frequency: 45 – 65				
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			
Sola	ar Charge Controller				
Model	MPPT 1	100/50			
Maximum output current	50	A			
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-stag	•			
Temperature compensation	-16mV/°C	-32mV/°C			
Protection	a -	g			
	MON CHARACTERISTICS				
Operating temp. range	-20 to +50°C (fan				
Humidity (non-condensing):	max max	95%			
Material & Colour	ENCLOSURE	uo DAL FO12)			
	aluminium (b				
Protection category Battery-connection	Battery cable:				
PV connection	Three sets of MC4 (PV				
230 V AC-connection	G-ST18i c				
Weight	15				
Dimensions (hxwxd)	745 x 214	<u> </u>			
	STANDARDS				
Safety	EN 60335-1, EN 603	335-2-29. EN 62109			
Emission / Immunity		14-2, EN 61000-3-3			
Automotive Directive	2004/1				
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	 Non-linear load, crest factor 3:1 At 25°C ambient Programmable relay which can b voltage or genset start signal fun If more PV power is connected, the 700W resp. 1400W 	e set for general alarm, DC under ction			
e. Temperature too high f. 230 VAC on inverter output g. Input voltage ripple too high	6b) PV voltage must exceed Vbat + 5 Thereafter minimum PV voltage is Vb				





EasySolar 5 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.

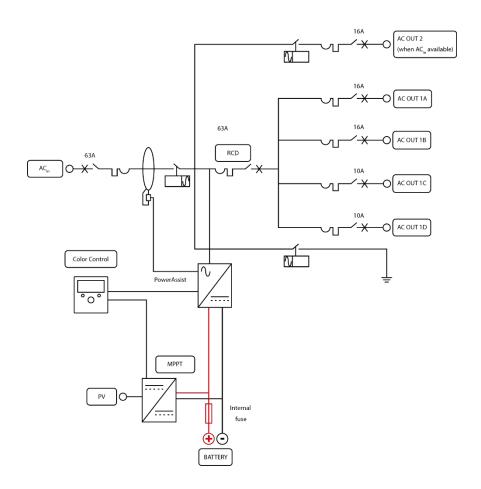
An additional 16A output is controlled by the AC input: it will switch on only when AC is available.

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	EasySolar 24/3000/70-50	EasySolar 48/5000/70-100			
	MPPT150/70	MPPT150/100			
_	INVERTER/CHARGER				
Transfer switch	50A	100A			
land to the second	INVERTER	20 (())			
Input voltage range	19 – 33V	38 – 66V			
'Heavy duty' output AC 2 Output AC 1a, 1b, 1c, 1d	16 A Output voltage: 230VAC ± 2%				
•	Frequency: 50				
Cont. output power at 25°C (3)	3000VA / 2400W	5000VA / 4000W			
Cont. output power at 40°C	2200W	3700W			
Cont. output power at 65°C	1700W	3000W			
Peak power	6000W	10000W			
Maximum efficiency	94%	95%			
Zero load power	20W	35W			
Zero load power in search mode	10W	15W			
	CHARGER	107.265.146			
AC Input	Input voltage ran Input frequency: 45 – 65				
Charge voltage 'absorption'	28,8V	57,6V			
Charge voltage 'float'	27,6V	55,2V			
Storage mode	26,4V	52,8V			
Charge current	70A	70A			
Battery temperature sensor	ye				
Programmable relay (5)	yε				
Protection (2)	a -				
Protection (2)	SOLAR CHARGE CONTROLLER	9			
Model	MPPT 150/70-MC4	MPPT 150/100-MC4			
Maximum output current (4)	70A	100A			
Maximum PV power	2000W	5800W			
Maximum PV open circuit voltage	150	0V			
Maximum efficiency	98%				
Self-consumption	10mA				
Charge voltage 'absorption', default setting	28,8V	57,6V			
Charge voltage 'float', default setting	27,6V	55,2V			
Charge algorithm	multi-stage	e adaptive			
Temperature compensation	-16 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 (bl				
Protection category	IP:				
Battery-connection	Four M8 bolts (2 plus an	d 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	48kg			
Dimensions (hxwxd)	810 x 258 x 218	877 x 328 x 241			
	STANDARDS				
Safety	EN 60335-1, EN 6033	35-2-29, EN 62109-1			
Emission / Immunity	EN 55014-1, EN 55014-2, EN 61000-3-3, EN	N 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:	3) Non-linear load, crest factor 3:14) At 25°C ambient				
a. Output short circuit	5) Programmable relay which can be set for general	alarm, DC under			
b. Overload c. Battery voltage too high	voltage or genset start signal function				
C. Battery voltage too light d. Battery voltage too low e. Temperature too high f. 230 VAC on inverter output g. Input voltage ripple too high					







Inverter RS Smart Solar 48/6000

PV input 80-450VDC Battery 48 VDC

Off-Grid solar inverter

The Inverter RS Smart Solar 48/6000 is a 48V 6kVA Inverter with 450VDC 4kWp PV input. It is used in off-grid solar applications where AC power is required.

Combination of an inverter, bi-directional DC-DC converter and MPPT

The inverter produces a perfect sine wave, able to supply high powered appliances. It is supplied by a bi-directional DC-DC converter, that can either charge the battery when excess solar power is available or convert from the battery when it is needed.

Wide MPPT voltage range

80 - 450VDC, with a 120VDC PV startup voltage.

Light weight, efficient and quiet

Thanks to high frequency technology and a new design this powerful inverter weighs only 11kg. In addition to this it has an excellent efficiency, low standby power, and a very quiet operation.

Display and Bluetooth

The display reads battery, inverter and solar charge controller parameters.

The same parameters can be accessed with a smartphone or other Bluetooth enabled device. In addition, Bluetooth can be used to set up the system and to change settings with VictronConnect.



VE.Can and VE.Direct port

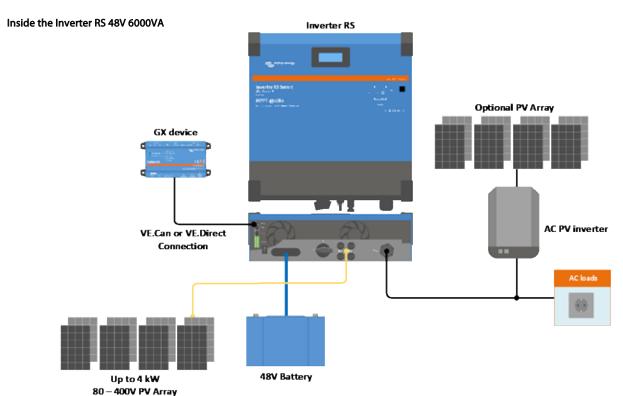
For connection to a GX device for system monitoring, data logging, and remote firmware updates.

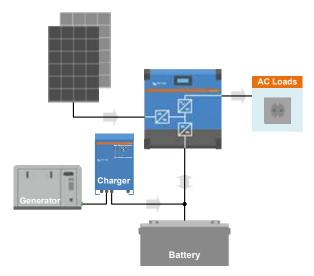
Built in PV isolator

Both parallel PV strings connected to the MC4 plugs can be safely isolated with the large built-in switch on the bottom of the unit.

I/O Connections

Programmable Relay, temperature sensor and voltage sensor connections. The remote input can also be configured to accept the Victron miniBMS.





System example with generator

Add a generator and battery charging if additional power is needed.





Configure and monitor with VictronConnect

A built-in Smart Bluetooth connection allows for quick monitoring or settings adjustment of the Inverter RS.



When the Inverter RS is connected to a GX device with internet connection, you can access our free remote monitoring website (VRM). This 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 email.

Inverter RS Smart Solar	48/6000
	INVERTER
DC Input voltage range	38 – 64 V (6)
Output	Output voltage: 230 VAC ± 2% Frequency: 50 Hz ± 0.1% (1)
Continuous output power at 25°C	Increases linearly from 4800 W at 46 VDC to 5300 W at 52 VDC
Continuous output power at 40°C	4500W
Continuous output power at 65°C	3000W
Peak power	9 kW for 3 seconds
Short-circuit output current	50A
	96.5% at 1 kW load
Maximum efficiency	94% at 5 kW load
Zero load power	20W
	SOLAR
Maximum DC voltage	450V
Nominal DC voltage	300V
Start-up voltage	120V
MPPT operating voltage range	80 – 450V (5)
DC input current limit	18A (4)
Maximum DC input current	20A
Maximum PV input power	4000W
Maximum DC charging power	4000W
Earth leakage trip level	30 mA
	CHARGER
Charge voltage 'absorption' (V DC)	57.6V
Charge voltage 'float' (V DC)	55.2V
Maximum charge current	100A
Battery temperature sensor	Yes
	GENERAL
Parallel and 3-phase operation	No
Programmable relay (3)	Yes
Protection (2)	a - f
Data Communications Ports	VE.Direct port and VE.Can port
General purpose analogue/digital in 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	IP21
Battery-connection	M8 bolts
230 V AC-connection	Screw terminals 13 mm² (6 AWG)
Weight	11 kg
Dimensions (hxwxd)	425 x 440 x 125 mm
	STANDARDS
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2
	EN 55014-1, EN 55014-2
Emission, Immunity	EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3

- 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
- 3) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. DC rating: 4A up to 35VDC and 1A up to 70VDC
- 4) Normal operation is regulated to 18A, with maximum reverse polarity protection 20A.
- 5) MPPT operating range is also constrained by battery voltage PV VOC should not exceed 8x battery float voltage, e.g. a 50V battery voltage maximum should have 400V maximum PV array.

 – see product manual for further information.
- 6) Minimum start-up voltage is 41V. Inverter shutdown can be set as low as 32V DC, but may shut down on low AC output voltage (due to load). Over-voltage disconnect is 65.5V. Charger setpoint can be set to max 62V. The charge current derates above 57V.





Phoenix Inverter Smart 12/3000





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

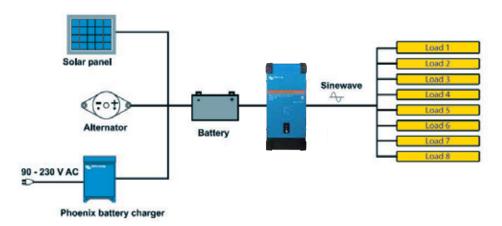
A remote on/off switch or relay contact can be connected to a two pole connector. Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

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	24/5000 48/5000		
Parallel and 3-phase operation	10/1000	N				
The second secon		INVERTER				
Input voltage range		9.3 – 17V 18.6 –	· 34V 37.2 – 68V			
Output		Output voltage: 230 VAC ±29	% 50 Hz or 60 Hz ± 0.1% (1)			
Cont. output power at 25°C (1)	1600 VA	2000 VA	3000 VA	5000 VA		
Cont. output power at 25°C	1300 W	1600 W	2400 W	4000 W		
Cont. output power at 40°C	1200 W	1450 W	2200 W	3700 W		
Cont. output power at 65°C	800 W	1000 W	1700 W	2800 W		
Peak power	3000 W	4000 W	6000 W	10000 W		
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off, see https://www.victronenergy.com/live/ve.direct:phoenix-inverters-dynamic-cutoff					
Max. efficiency 12/ 24 /48 V	92 / 94 / 94%	92 / 94 / 94%	93 / 94 / 95%	95 / 96%		
Zero load power 12 / 24 / 48 V	8/9/11 W	8/9/11 W	12 / 13 / 15 W	18 / 20 W		
Zero load power in ECO mode	0.6 / 1.3 / 2.1 W	0.6 / 1.3 / 2.1 W	1.5 / 1.9 / 2.8 W	2.2 / 3.2 W		
		GENERAL				
Programmable relay (2)		Ye	es			
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 8	& Colour: steel (blue RAL 5012; and	black RAL 9017) Protection categ	ory: IP21		
Battery-connection	M8 bolts	M8 bolts	12 V/24 V: 2+2 M8 bolts 48 V: M8 bolts	24 V: 2+2 M8 bolts 48 V: M8 bolts		
230 V AC-connection		Screw te		40 V. MO DOILS		
Weight	12kg	13kg	19kg	29kg / 28kg		
Dimensions (hxwxd)	485 x 219 x 125mm	485 x 219 x 125mm	533 x 285 x 150mm (12 V) 485 x 285 x 150mm (24 V/48 V)	595 x 295 x 160mm (24 V 555 x 295 x 160mm (48 V		
		STANDARDS				
Safety		EN 60	335-1			
Emission Immunity	EN 550	014-1 / EN 55014-2/ EN-IEC 61000-6	5-1 / EN-IEC 61000-6-2 / EN-IEC 6100	0-6-3		
Automotive Directive		ECE F	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 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.

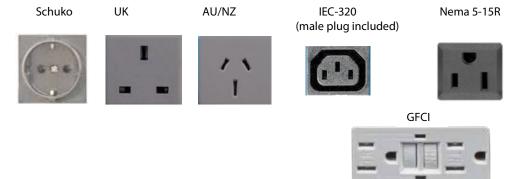
LED diagnosis

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



DC connection with screw terminals

No special tools needed for installation

	12 Volt	12/250	12/375	12/500	12/800	12/1200
Phoenix Inverter	24 Volt 48 Volt	24/250 48/250	24/375 48/375	24/500 48/500	24/800 48/800	24/1200 48/1200
Cont. power at 25°C (1)	40 VOIC	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)	10011		0VAC +/- 3% 50Hz o		220011
Input voltage range	(aajastaste)			17 / 18,4 - 34,0 / 36,8 -		
DC low shut down (adjustable)			7,2	9,3 / 18,6 / 37,2V	02,01	
Dynamic (load dependent) DC (fully configurable)		https://	www.victronenergy.c	Dynamic cut-off, see	enix-inverters-dynami	c-cutoff
DC low restart and alarm (adju-	stable)	·		10,9 / 21,8 / 43,6V	ĺ	
Battery charged detect (adjusta	able)			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 ECC (default retry interval: 2,5 s, adj		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	er 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, GFCI				
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				EC 60335-1 / EN-IEC 62	109-1	
EMC		EN	55014-1 / EN 55014-2	2 / IEC 61000-6-1 / IEC	61000-6-2 / IEC 61000-	6-3
Automotive Directive				ECE R10-4		
1) Nonlinear load, crest factor 3 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	3:1					



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.





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	12/500/20	12/800/35	12/1200/50	12/1600/70		
24 Volt	24/500/10	24/800/16	24/1200/25	24/1600/40		
48 Volt	48/500/6	48/800/9	48/1200/13	48/1600/20		
PowerControl / PowerAssist	Yes / No Yes / Yes					
Three Phase and parallel operation		Ye				
Transfer switch		16.	A			
	IN	/ERTER				
Input voltage range		9,5 – 17V 19 –				
Output		ltage: 230VAC ± 2%	Frequency: 50Hz ±			
Cont. output power at 25°C (3)	500VA	800VA	1200VA	1600VA 1300W		
Cont. output power at 25°C	430W	700W	1000W			
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		
		IARGER				
AC Input	Input voltag	ge 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,				
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	C.	Ye ENERAL	S			
Programmable relay (5)	GE	Ye	s			
Protection (2)						
FIOLECTION (Z)		a –	g			
VE.Bus communication port		a – ree phase operation, rei ter ASS030065510 need	note monitoring and s			
, , , , , , , , , , , , , , , , , , ,		ree phase operation, rei	note monitoring and s			
VE.Bus communication port		ree phase operation, rei ter ASS030065510 need	note monitoring and s	A models)		
VE.Bus communication port Remote on-off		ree phase operation, rei ter ASS030065510 need On/off/charger only	note monitoring and s	A models) On/off		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse	(RJ45-spli	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6)	mote monitoring and s led for 500/800/1200V 200/100/50A	A models) On/off Yes (7) 200/125/60A		
VE.Bus communication port Remote on-off DIP switches	(RJ45-spli 125/60/30A Opera	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond	note monitoring and s led for 500/800/1200V 200/100/50A +65°C (fan assisted co	A models) On/off Yes (7) 200/125/60A		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics	125/60/30A Opera	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond LOSURE	note monitoring and sled for 500/800/1200V 200/100/50A +65°C (fan assisted codensing): max 95%	A models) On/off Yes (7) 200/125/60A coling)		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics	(RJ45-spli 125/60/30A Opera ENC Material & Col	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond LOSURE our: Steel/ABS (blue RA	note monitoring and sled for 500/800/1200V 200/100/50A +65°C (fan assisted codensing): max 95%	A models) On/off Yes (7) 200/125/60A coling) ategory: IP 21		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection	125/60/30A Opera	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond ILOSURE our: Steel/ABS (blue RA 25 / 16 / 10 mm²	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection codensing: max 95%	A models) On/off Yes (7) 200/125/60A coling)		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection	125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm ²	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond CLOSURE our: Steel/ABS (blue RA 25 / 16 / 10 mm² G-ST18i cd	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection codensing: max 95%	A models) On/off Yes (7) 200/125/60A soling) ategory: IP 21 50 / 35 / 16 mm ²		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection Weight	125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm ²	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond CLOSURE our: Steel/ABS (blue RA 25 / 16 / 10 mm² G-ST18i co	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² connector	A models) On/off Yes (7) 200/125/60A soling) ategory: IP 21 50 / 35 / 16 mm ²		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection	125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm² 4,4 kg 311 x 182 x 100 mm	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond CLOSURE our: Steel/ABS (blue RA 25 / 16 / 10 mm² G-ST18i cd 6,4 kg 360 x 240 x 100 mm	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection codensing: max 95%	A models) On/off Yes (7) 200/125/60A soling) ategory: IP 21 50 / 35 / 16 mm ²		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection Weight Dimensions (h x w x d)	125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm² 4,4 kg 311 x 182 x 100 mm STA	ree phase operation, rei ter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-cond CLOSURE our: Steel/ABS (blue RA 25 / 16 / 10 mm ² G-ST18i cd 6,4 kg 360 x 240 x 100 mm	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² connector 8,2 kg 406 x 250 x 100 mm	A models) On/off Yes (7) 200/125/60A coling) ategory: IP 21 50 / 35 / 16 mm ² 10,2 kg 470 x 265 x 120 mm		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection Weight	(RJ45-spli 125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm ² 4,4 kg 311 x 182 x 100 mm	ree phase operation, reiter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-conditions) title (100 mm² G-ST18i cd 6,4 kg 360 x 240 x 100 mm NDARDS	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² connector 8,2 kg 406 x 250 x 100 mm	A models) On/off Yes (7) 200/125/60A coling) ategory: IP 21 50 / 35 / 16 mm ² 10,2 kg 470 x 265 x 120 mm		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection Weight Dimensions (h x w x d) Safety Emission / Immunity	(RJ45-spli 125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm ² 4,4 kg 311 x 182 x 100 mm	ree phase operation, reiter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-conditional to the conditional to the con	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² 200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² 200/100/100/100/100/100/100/100/100/100/	A models) On/off Yes (7) 200/125/60A coling) ategory: IP 21 50 / 35 / 16 mm ² 10,2 kg 470 x 265 x 120 mm		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection Weight Dimensions (h x w x d)	(RJ45-spli 125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm ² 4,4 kg 311 x 182 x 100 mm	ree phase operation, reiter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-conditional conditional co	200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² 200/100/50A +65°C (fan assisted codensing): max 95% L 5012) Protection of 35 / 25 / 10 mm ² 200/100/100/100/100/100/100/100/100/100/	A models) On/off Yes (7) 200/125/60A coling) ategory: IP 21 50 / 35 / 16 mm ² 10,2 kg 470 x 265 x 120 mm		
VE.Bus communication port Remote on-off DIP switches Internal DC fuse Common Characteristics Common Characteristics Battery-connection 230V AC-connection Weight Dimensions (h x w x d) Safety Emission / Immunity	(RJ45-spli 125/60/30A Opera ENC Material & Col 16 / 10 / 10 mm ² 4,4 kg 311 x 182 x 100 mm STA EN 550: 3) Nor 4) At 2 5) Proguented of the color of	ree phase operation, reiter ASS030065510 need On/off/charger only Yes (6) 150/80/40A ting temp. range: -40 to Humidity (non-conditional to the conditional to the con	200/100/50A 200/100/50A 465°C (fan assisted codensing): max 95% 2512) Protection of 35 / 25 / 10 mm ² 2512 onnector 252	A models) On/off Yes (7) 200/125/60A coling) attegory: IP 21 50 / 35 / 16 mm ² 10,2 kg 470 x 265 x 120 mm 1 000-3-3		





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 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.

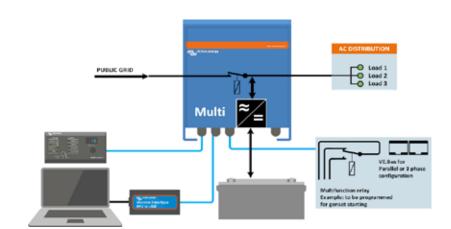
 ${\tt Data\ can\ be\ stored\ and\ displayed\ on\ our\ VRM\ (Victron\ Remote\ Management)\ website, free\ of\ charge.}$

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



Yes Yes Yes 30 19 - 33 V 38 - 66 V ± 2% Frequency: 50 2000 1600 1400 1000 4000 93 / 94 9 / 11 7 / 9 3 / 4 Input frequency: 45 - 65	Yes Yes Yes 16 or 50 Hz ± 0,1% (1) 3000 2400 2200 1700 6000 93 / 94 / 95 20 / 20 / 25 15 / 15 / 20 8 / 10 / 12 Hz Power factor: 1	Yes Yes Yes 100 5000 4000 3700 3000 10.000 94/95 30/35 25/30 10/15				
30 19 - 33 V 38 - 66 V ± 296 Frequency: 50 2000 1600 1400 1000 4000 93 / 94 9 / 11 7 / 9 3 / 4	16 or 50 Hz ± 0,1% (1) 3000 2400 2200 1700 6000 93 / 94 / 95 20 / 20 / 25 15 / 15 / 20 8 / 10 / 12	5000 4000 3700 3000 10.000 94 / 95 30 / 35 25 / 30				
19 – 33 V 38 – 66 V ± 2% Frequency: 50 2000 1600 1400 1000 4000 93 / 94 9 / 11 7 / 9 3 / 4	Hz±0,1% (1) 3000 2400 2200 1700 6000 93/94/95 20/20/25 15/15/20 8/10/12	5000 4000 3700 3000 10.000 94 / 95 30 / 35 25 / 30				
± 2% Frequency: 50 2000 1600 1400 1000 4000 93 / 94 9 / 11 7 / 9 3 / 4	3000 2400 2200 1700 6000 93/94/95 20/20/25 15/15/20 8/10/12	4000 3700 3000 10.000 94/95 30/35 25/30				
± 2% Frequency: 50 2000 1600 1400 1000 4000 93 / 94 9 / 11 7 / 9 3 / 4	3000 2400 2200 1700 6000 93/94/95 20/20/25 15/15/20 8/10/12	4000 3700 3000 10.000 94 / 95 30 / 35 25 / 30				
2000 1600 1400 1000 4000 93/94 9/11 7/9 3/4	3000 2400 2200 1700 6000 93/94/95 20/20/25 15/15/20 8/10/12	4000 3700 3000 10.000 94/95 30/35 25/30				
1600 1400 1000 4000 93/94 9/11 7/9 3/4	2400 2200 1700 6000 93 / 94 / 95 20 / 20 / 25 15 / 15 / 20 8 / 10 / 12	4000 3700 3000 10.000 94/95 30/35 25/30				
1400 1000 4000 93/94 9/11 7/9 3/4	2200 1700 6000 93/94/95 20/20/25 15/15/20 8/10/12	3700 3000 10.000 94/95 30/35 25/30				
1000 4000 93/94 9/11 7/9 3/4	1700 6000 93/94/95 20/20/25 15/15/20 8/10/12	3000 10.000 94/95 30/35 25/30				
4000 93/94 9/11 7/9 3/4	6000 93/94/95 20/20/25 15/15/20 8/10/12	10.000 94 / 95 30 / 35 25 / 30				
93/94 9/11 7/9 3/4	93/94/95 20/20/25 15/15/20 8/10/12	94 / 95 30 / 35 25 / 30				
9/11 7/9 3/4	20/20/25 15/15/20 8/10/12	30 / 35 25 / 30				
7/9 3/4	15 / 15 / 20 8 / 10 / 12	25 / 30				
3/4	8/10/12					
		.07.13				
Input frequency: 45 – 65	Hz Power factor: 1					
14,4 / 28,8 / 57,6						
13,8 / 27,6 / 55,2						
13,2 / 26,4 / 52,8						
80 / 50	120 / 70 / 35	120 / 70				
/ and 24 V models only)						
yes						
n. a.	Yes (16A)	Yes (50A)				
Yes						
a - g						
ration, remote monitoring ar	, ,					
n.a.	Yes	Yes				
Yes						
n assisted cooling) Humidity	(non-condensing): max 95	%				
	ction category: IP 21					
M8 bolts	Four M8 bolts (2 plus an	d 2 minus connections)				
	Screw terminals 13 mm² (6 AWG)	M6 bolts				
Spring-clamp	18	30				
12	362 x 258 x 218	444 x 328 x 240				
12 520 x 255 x 125		20.6.2				
12 520 x 255 x 125 , EN-IEC 60335-2-29, IEC 6210)0-6-3				
12 520 x 255 x 125 , EN-IEC 60335-2-29, IEC 6211 EN-IEC 61000-3-3, IEC 61000-		12V and 24V models: ECE R10-4				
12 520 x 255 x 125 , EN-IEC 60335-2-29, IEC 6210 EN-IEC 61000-3-3, IEC 61000- d 24V models: ECE R10-4						
12 520 x 255 x 125 , EN-IEC 60335-2-29, IEC 6211 EN-IEC 61000-3-3, IEC 61000-						
		2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 6100				



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

VEConfigure')

Several interfaces are available:



Color Control GX and other GX devices

Monitoring and control. Locally, and also remotely on the $\underline{\mbox{VRM Portal.}}$



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

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



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 (see data sheet on www.victronenergy.com) 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.

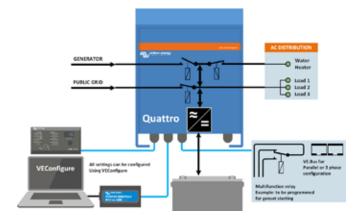
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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



2x 50 3000 2400 2200 1700 6000 93 / 94	2x100 INVERTER 9	Yes Yes Yes 265 VAC Input frequency: 2x100 ,5 – 17V 19 – 33V 38 – 2: 230 VAC ± 2% Freque 8000 6500 5500	2x100	2x100
3000 2400 2200 1700 6000	2x100 INVERTER 9 Output voltage 5000 4000 3700 3000	Yes 265 VAC Input frequency: 2x100 ,5 – 17V 19 – 33V 38 – 2: 230 VAC ± 2% Freque 8000 6500	2x100 66V ncy: 50 Hz ± 0,1% 10000	2x100
3000 2400 2200 1700 6000	2x100 INVERTER 9 Output voltage 5000 4000 3700 3000	2x100 ,5 – 17V 19 – 33V 38 – e: 230 VAC ± 2% Freque 8000 6500	2x100 66V ncy: 50 Hz ± 0,1% 10000	2x100
3000 2400 2200 1700 6000	2x100 INVERTER 9 Output voltage 5000 4000 3700 3000	2x100 ,5 – 17V 19 – 33V 38 – e: 230 VAC ± 2% Freque 8000 6500	2x100 66V ncy: 50 Hz ± 0,1% 10000	2x100
2400 2200 1700 6000	9 Output voltage 5000 4000 3700 3000	230 VAC ± 2% Freque 8000 6500	ncy: 50 Hz ± 0,1% 10000	
2400 2200 1700 6000	Output voltage 5000 4000 3700 3000	230 VAC ± 2% Freque 8000 6500	ncy: 50 Hz ± 0,1% 10000	
2400 2200 1700 6000	5000 4000 3700 3000	8000 6500	10000	
2400 2200 1700 6000	4000 3700 3000	6500		
2200 1700 6000	3700 3000		8000	15000
1700 6000	3000	5500		12000
6000			6500	10000
	10000	3600	4500	7000
93 / 94	. 5500	16000	20000	25000
	94 / 94 / 95	94 / 96	96	96
20 / 20	30/30/35	60 / 60	60	110
15 / 15	20 / 25 / 30	40 / 40	40	75
8/10	10 / 10 / 15	15 / 15	15	20
	CHARGER			
14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6		57,6
13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8	52,8
120 / 70	220 / 120 / 70	200 / 110	140	200
4 (12V and 24V models only)				
		Yes		
	GENERAL			
25	50	50	50	50
3x	3x	3x	3x	3x
		a-g		
	For parallel and three phas	se operation, remote monit	oring and system integration	on
2x	2x	2x	2x	2x
		Yes		
			condensing): max. 95%	
	Four M8	bolts (2 plus and 2 minus co	onnections)	
rew terminals 13 mm² (6 AWG)	Bolts M6	Bolts M6	Bolts M6	Bolts M6
19	34/30/30	45 / 41	51	72
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
EN 5501	4-1, EN 55014-2, EN-IEC 610	000-3-2, EN-IEC 61000-3-3, I	EC 61000-6-1, IEC 61000-6-2	2, IEC 61000-6-3
		12V and 24V models: ECE	R10-4	
		See our website		
le on request	4) At 25°C ambient 5) Switches off when r 6) Programmable rela DC under voltage of AC rating: 230 V / 4	no external AC source available y that can a.o. be set for general r genset start/stop function A	alarm,	
	20 / 20 15 / 15 8 / 10 14,4 / 28,8 13,8 / 27,6 13,2 / 26,4 120 / 70 25 3x 2x 2x rew terminals 13 mm ² (6 AWG) 19 362 x 258 x 218	20 / 20	20 / 20	20 / 20



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 <u>VRM Portal</u>.



MK3-USB (VE.Bus to USB interface)

Connects to a USB port <u>(see 'A guide to VEConfigure')</u>



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.





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

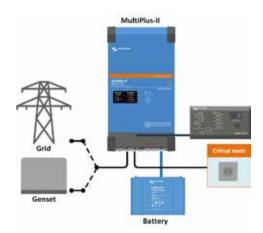
Settings can be changed in a matter of minutes with VEConfigure software (computer or laptop and MK3-USB interface needed).

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

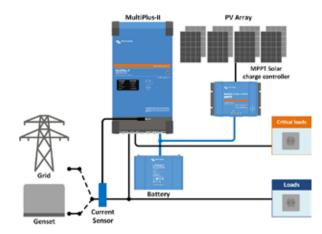
Install a Color Control GX or other GX product to connect to the internet.

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



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	24/3000/70-32	48/3000/35-32	48/5000/70-50		
PowerControl & PowerAssist		Yes			
Transfer switch	32A 50A				
Maximum AC input current		2A	50A		
maximum //e input current	INVERTER	-, ,	3071		
DC Input voltage range	19 – 33V	38 – 6	56V		
· · · · · · · · · · · · · · · · · · ·		ut voltage: 230 VAC ±			
Output	· ·	uency: 50 Hz ± 0,1%			
Cont. output power at 25°C (3)		0VA	5000VA		
Cont. output power at 25°C	240	00W	4000W		
Cont. output power at 40°C	2200W 3700W				
Cont. output power at 65°C	1700W 3000				
Maximum apparent feed-in power	2500VA 4000V				
Peak power		00W	9000W		
Maximum efficiency	94%	95%	96%		
Zero load power	13W	11W	18W		
Zero load power in AES mode	9W 7W		12W		
Zero load power in Search mode	3W CHARGER	2W	2W		
AC Input Charge voltage 'absorption'	Input v	oltage range: 187-26 ut frequency: 45 – 65 57,6	Hz		
Charge voltage 'float'	27,6V 55,				
Storage mode	26,4V	52,8			
Maximum battery charge current (4)	70A	35A	70A		
Battery temperature sensor	Yes				
	GENERAL				
Auxiliary output		Yes (32A)			
External AC current sensor (optional)	50A 100A				
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	Temote in	Yes, 2x	tegration		
Remote on-off		Yes			
Operating temperature range	-40 to ±	-65°C (fan assisted co	ooling)		
Humidity (non-condensing)	-40 10 1	max 95%	Joinig)		
Trainlarty (non-condensing)	ENCLOSURE	IIIdX 9370			
Material & Colour		Steel, blue RAL 5012			
Protection category		IP22			
Battery-connection		M8 bolts			
230 V AC-connection	Screwi	terminals 13 mm² (6	AWG)		
Weight		kg	29 kg		
Dimensions (hxwxd) mm		75 x 147	565 x 323 x 148		
Dimensions (nxwxu) mm	STANDARDS	73 X 1 4 7	303 X 323 X 146		
Safety	EN-IEC 6 EN-IEC EN	0335-1, EN-IEC 6033 62109-1, EN-IEC 62 I 55014-1, EN 55014-	109-2 2		
Emission, Immunity	IEC 61000-6	1000-3-2, EN-IEC 610 -1, IEC 61000-6-2, IEC	61000-6-3		
Uninterruptible power supply					
Anti-islanding 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 a) input voltage ripple too high	Please consult the certificates on our website. Please consult the certificates on our website. 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



g) input voltage ripple too high

Current sensor 100A:50mA

To implement PowerControl and PowerAssist and to optimize selfconsumption with external current

Maximum current: 50A resp. 100A. Length of connection cable: 1 m.



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





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 $240\,\text{V}$ / $60\,\text{Hz}$.

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

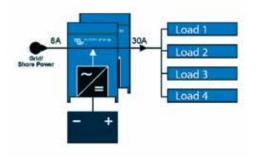
After installation, the MultiPlus is ready to go.

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!

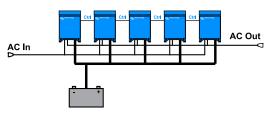
Alternatively, VE.Net can be used instead of the DIP switches.

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



AA JUDI	12 Volt	12/2000/80	12/3000/120	
MultiPlus	24 Volt	24/2000/50	24/3000/70	
PowerControl	211010	2-1/2000/30 Ye		
PowerAssist		Ye		
Transfer switch (A)	1	5		
Parallel and 3-pha		Ye		
r drainer dria 5 prid	se operation	INVERTER		
Input voltage rang	ie (V DC)	9,5 – 17 V	19 – 33 V	
Output		Output voltage: 120 VAC ± 2%	Frequency: 60 Hz ± 0,1% (1)	
Cont. output power	er at 25°C / 77°F (VA) (3)	2000	3000	
Cont. output power	er at 25°C / 77°F (W)	1600	2400	
Cont. output power	er at 40°C / 104°F (W)	1450	2200	
Cont. output power	rat 65°C / 150°F (W) 1100		1700	
Peak power (W)	r (W) 4000		6000	
Maximum efficien	cy (%)	92 / 94	93 / 94	
Zero load power (\	W)	9/11	20 / 20	
Zero load power ir	n AES mode (W)	7/8	15 / 15	
Zero load power ir	n Search mode (W)	3/4	8 / 10	
		CHARGER		
AC Input			frequency: 45 – 65 Hz Power factor: 1	
Charge voltage 'ab		14,4 /	•	
Charge voltage 'flo		13,8 /	•	
Storage mode (V DC)		13,2 /		
-	use battery (A) (4)	80 / 50	120 / 70	
Charge current sta	•			
Battery temperatu	re sensor	ує	PS	
	(=)	GENERAL	V (994)	
Auxiliary output (n. a.	Yes (32A)	
Programmable rel	ay (6)	Yes (1x)	Yes (3x)	
Protection (2) VE.Bus communica	-4:	a -		
	•	For parallel and three phase operation, re n. a.	- · · · · · · · · · · · · · · · · · · ·	
General purpose c Remote on-off	om. port (/)	n. a. Ye	Yes (2x)	
Common Characte	avieties	Operating temp. range: -40 - +65°C / -40 to 150°F (fan as:	-	
Common Characte	ensucs	ENCLOSURE	sisted cooling) — Humidity (non-condensing): max 95%	
Common Characte	prietics	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-connecti		Screw-terminal 6 AWG (13 mm²)	Screw-terminal 6 AWG (13mm²)	
Weight	ion	13 kg 25 lbs.	19kg 40 lbs.	
-	d 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 Imm	unity	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) Protection key:		2) Non-linear load, crest factor 3:1		
a) output short of	circuit	3) At 75°F ambient		
b) overload		4) Switches off when no external AC source available		
c) battery voltag		5) Programmable relay that can a.o. be set for general		
d) battery voltag		alarm,		
e) temperature t		DC under voltage or genset start/stop function		
f) 230 VAC on in		AC rating: 230 V/4 A		
g) input voltage	rippie too nign	DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC 6) A.o. to communicate with a Lithium Ion battery BMS		
		o, A.o. to communicate with a Lithium foll battery bivis		



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.







Several interfaces are available:

Computer controlled operation and monitoring



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

Color Control GX and other GX devices Provides monitor and control. Locally, and also

remotely on the **VRM Portal**.



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.



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

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.

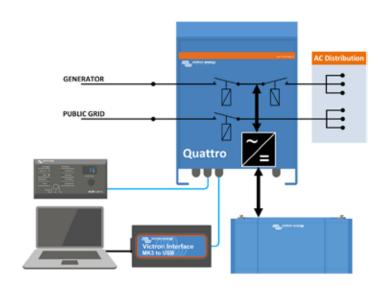
Remote configuring

When connected to the Ethernet, systems with a Color Control GX or other GX device can be accessed and settings can be changed remotely.



Quattro 48/5000/70-100/100

Color Control GX, 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					
Integrated Transfer switch		Yes Yes			
AC inputs (2x)	Input voltage	range: 90-140 VAC Input frequency: 45 – 65 Hz Po	ower factor: 1		
Maximum feed through current	2x 50 A	2x 100 A	2x 100 A		
	II	NVERTER			
Input voltage range		9,5 – 17 V 19 – 33V 38 – 66 V			
Output (1)	Out	out voltage: 120 VAC \pm 2% Frequency: 60 Hz \pm 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	10/10/15W	15 W		
		HARGER			
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			
, in production		SENERAL			
Auxiliary output (5)	32 A	50 A	50 A		
Programmable relay (6)		3x			
Protection (2)		a-g			
VE.Bus communication port	For parallel, split phas	e and three phase operation, remote monitoring an	d system integration		
General purpose com. port	2x				
Remote on-off	Yes				
Common Characteristics	Operating temp.: -40 to +65°C Humidity (non-condensing): max. 95%				
	, ,	ICLOSURE	,		
Common Characteristics	Material & 0	Colour: aluminium (blue RAL 5012) Protection cate	gory: IP 21		
Battery-connection		Four M8 bolts (2 plus and 2 minus connections)	J. ,.		
120 V AC-connection	Screw terminals 13 mm ² (6 AWG)	Bolts M6	Bolts M6		
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg		
	•	18,5 x 14,0 x 11,2 inch 470 x 350 x 280 mm			
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch	17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch		
	362 x 258 x 218 mm	17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	572 x 488 x 344 mm		
	ST	ANDARDS			
Safety		EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1			
Emission, Immunity	EN 55014-1, EN 55014-2, E	N-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IE	EC 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	4) At 25°C i 5) Switche 6) Program DC unde AC rating	ear load, crest factor 3:1 ambient s off when no external AC source available mable relay that can a.o. be set for general alarm, r voltage or genset start/stop function g: 230 V / 4 A g: 4 A up to 35 VDC, 1 A up to 60 VDC			
f) 120 VAC on inverter output g) input voltage ripple too high		•			



Digital Multi Control Panel

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



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 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	1	6A	20	DA	
Frequency (Hz)		45-	65Hz		
Power factor		0	,98		
Charge voltage 'absorption' (VDC) (1)		28	3,8V		
Charge voltage 'float' (VDC)		27	7,6V		
Charge voltage 'storage' (VDC)		26	5,4V		
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-lon	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-lon 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 outp	out current up to 40°C)		
Humidity (non-condensing)		max	¢ 95%		
	ENCLO	SURE			
Material & Colour		aluminium (Ł	olue RAL 5012)		
Battery-connection		M8	bolts		
230 VAC-connection		screw-clamp	10mm² (AWG 7)		
Protection category		IF	21		
Weight kg (lbs)		7kg	(16 lbs)		
Dimensions hxwxd in mm (hxwxd in inches)			250 x 150 9.9 x 5.9)		
	STAND				
Safety		EN 60335-1,	EN 60335-2-29		
Emission		EN 55014-1, EN 610	00-6-3, EN 61000-3-2		
Immunity	EN:	55014-2, EN 61000-6-1,	EN 61000-6-2, EN 61000)-3-3	



potentiometers.

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

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

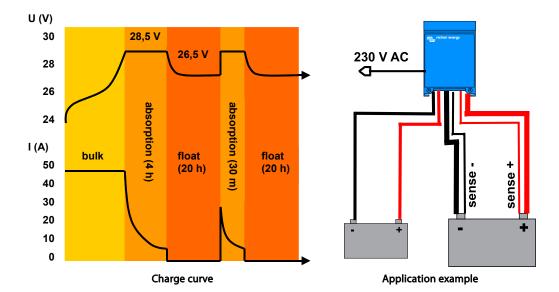
In order to compensate for voltage loss due to cable resistance, TG Chargers are provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Learn more about batteries and battery charging

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



Skylla TG 24 100



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)	120/230	3 x 400	230	230	3 x 400	230	230
Input voltage range (V AC)	95-264	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	V						
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 mm ² (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)	365 x 250 x 147 (14.4x9.9x5.8)	365 x 250 x 257 (14.4x9.9x10.1)	365 x 250 x 257 (14.4x9.9x10.1)	365 x 250 x 257 (14.4x9.9x10.1)	515 x 260 x 265 (20x10.2x10.4)	365 x 250 x 147 (14.4x9.9x5.8)	365 x 250 x 257 (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 2) Up to 40°C (100°F) ambient	c. Battery voltage too high d. Temperature too high						



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

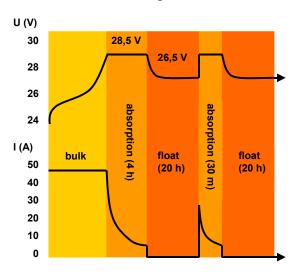
Other Skylla Chargers

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

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	Pote	Potential free contacts 60V / 1A (1x NO and 1x NC)			
Forced cooling		√			
Protection (1)		a, b, c, d			
Operating temp. range	-40 to +5	-40 to +50°C (-40 - 122°F) (Full output current up to 40°C)			
Humidity (non-condensing)		max 95%			
	ENCLOSUF	RE			
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)	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)		
	STANDARE	os e e e e e e e e e e e e e e e e e e e			
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			
Protection key: Output short circuit Battery reverse polarity detection	2) Up to 40°C (100°F) ambient c) Battery voltage too high d) Temperature too high				



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.





Cerbo GX



Accessories included with the Cerbo GX



GX Touch 50 (optional display for Cerbo GX)



Accessories included with the GX Touch 50

Cerbo GX: communication-centre

This communication-centre allows you to always have perfect control over your system from wherever you are and to maximise its performance. Simply access your system via our Victron Remote Management (VRM) portal, or access it directly, using the optional GX Touch 50 screen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its Bluetooth capability.

GX Touch 50: display accessory

The GX Touch 50 is a display accessory for the Cerbo GX. The five inch touch screen display gives an instant overview of your system and allows you to adjust settings. Simply connect the display to the Cerbo GX with just one cable. The GX Touch 50 has a waterproof design, has a top-mountable setup and is simple to install.

Remote Console on VRM

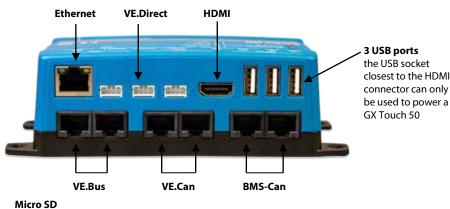
Monitor, control and configure the Cerbo GX remotely, over the internet. Just like if you were standing in front of the device, using Remote Console. The same functionality is also available on the local network LAN, or using the WiFi Access Point of the Cerbo GX.

Perfect monitoring & control

Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements. Easily control the shore power input current limit, (auto)start/stop generator(s) or change any setting to optimise the system. Follow up on alerts, perform diagnostic checks and resolve complications remotely.

Simple mounting and configuration

The Cerbo GX is easily mountable and can also be mounted on a DIN-Rail using the DIN35 adapter small, (not included). Its separate touchscreen can be bolted on a dashboard, eliminating the need to create perfect cutouts (like with the Color Control GX). Connection is easy via just one cable, taking away the hassle of having to bring many wires to the dashboard. The Bluetooth feature enables a quick connection and configuration via our VictronConnect app.







Cerbo GX					
Supply voltage	8 – 70V DC				
Mounting	Wall or DIN rail (35mm) ⁽²⁾				
Communication ports					
VE.Direct ports (always isolated)	3 (3)				
VE.Bus (always isolated)	2 paralleled RJ45 sockets				
VE.Can	yes - non isolated				
	Other				
Outer dimensions (h x w x d)	78 x 154 x 48 mm				
Operating temperature range	-20 to +50°C				
	Standards				
Safety	tbd				
EMC	tbd				
Automotive	tbd				
GX Touch 50					
Mounting	With included mounting accessories				
Display Resolution	800x480				
	Other				
Outer dimensions (h x w x d)	87 x 128 x 12.4 mm				
Cable length	2 meter				
 For more detailed information about the Cerbo GX and the GX Touch 50, please visit the Victron GX product range page at Victron live: DIN rail mounting requires additional accessory - DIN35 Adapter. The listed maximum on the 'Performance' section in above table is the total connected VE.Direct devices such as MPPT Solar Charge controllers. Total means all directly connected devices plus the devices connected over USB. The limit is mostly bound by CPU processing power. Note that there is also a limit to the other type of devices of which often multiple are connected: PV Inverters. Up to three or four three phase inverters can typically be monitored on 					

Optional accessories

a CCGX. Higher power CPU devices can monitor more.





GX Touch 50 adapter for CCGX cut-outThis adapter is designed to easily replace the CCGX display with the newer GX Touch 50.
Contents of the packaging are the metal bracket, the plastic bezel, and four mounting screws.



Temperature sensor for Quattro, MultiPlus and GX Device (such as the Cerbo GX)





DIN35 adapter small

DIN-Rail adapter to easily mount a device on a DIN-Rail. Suitable for the Cerbo GX.



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. See also the screenshots below.

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 <u>blog post about 3G routers</u>.

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 / 30	3A / 30V DC / 250V AC (Normally open)			
		Communication ports			
VE.Direct	2 sep	2 separate VE.Direct ports – isolated			
VE.Can	2 par	2 paralleled RJ45 sockets – isolated			
VE.Bus	2 par	2 paralleled RJ45 sockets – isolated			
USB	21	2 USB Host ports – not isolated			
Ethernet	10/100/1000	10/100/1000MB RJ45 socket – isolated except shield			
		3rd party interfaci	ng		
Modbus-TCP		Use Modbus-TCP to monitor and control all products connected to the Color Control GX			
JSON	Use the VRM JSO	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 60	EN 60950-1:2005+A1:2009+A2:2013			
EMC	EN 61000-6-3, EN 5	EN 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2			
Automotive		E4-10R-053535			

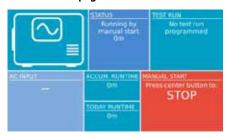
Overview - Multi with PV Inverter on output



Mobile & boat overview



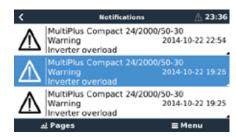
Genset control page



Main menu



Alarm notifications

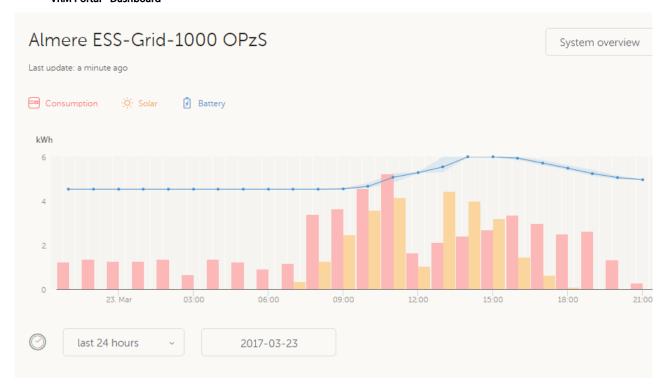


Tiles overview

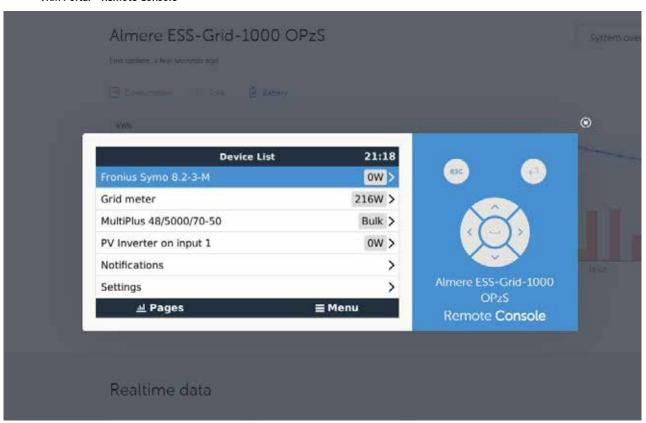


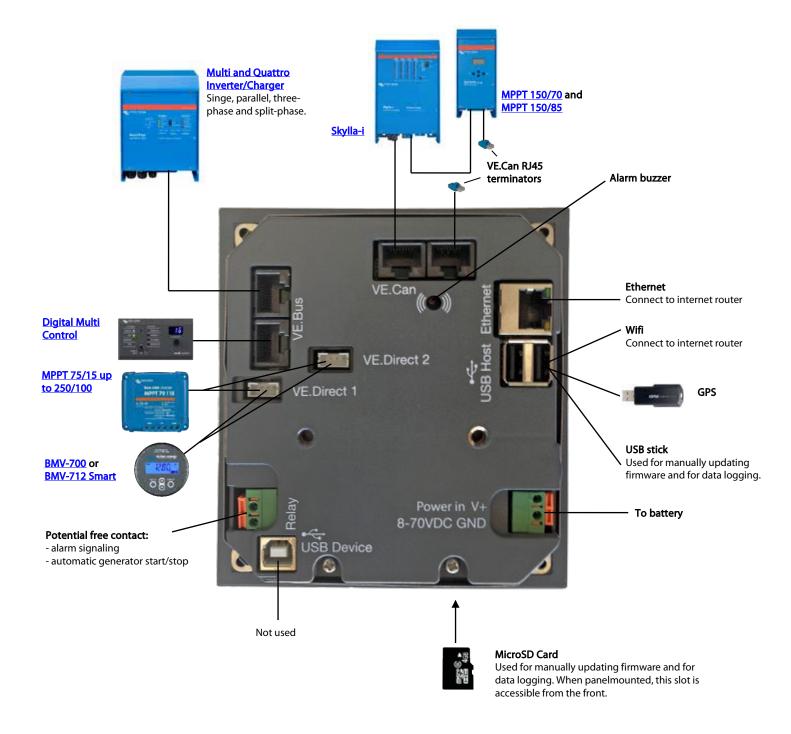


VRM Portal - Dashboard



VRM Portal – Remote Console











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. 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

- 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 <u>synchronizing multiple MPPT 150/70 solar chargers</u>.
- 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	2 nd 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				
	Ю				
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	9			
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 60	950-1:2005+A1:2009+A2	:2013		
EMC	EN 61000-6-3, EN 5	N 61000-6-3, EN 55014-1, EN 61000-6-2, EN 61000-6-1, EN 55014-2			
Automotive	In progress				





SmartShunt 500A



SmartShunt 1000A



SmartShunt 2000A



The SmartShunt is an all in one battery monitor, only without a display. Your phone acts as the display.

The SmartShunt connects via Bluetooth to the VictronConnect App on your phone (or tablet) and you can conveniently read out all monitored battery parameters, like state of charge, time to go, historical information and much more.

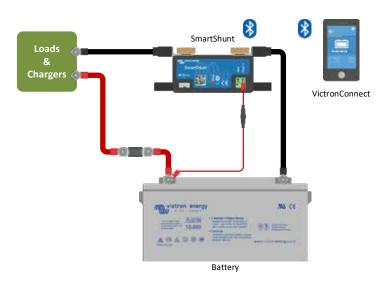
Alternatively, the SmartShunt can be connected and be read by a GX device. Connection to the SmartShunt is made via a VE.Direct cable.

The SmartShunt is a good alternative for a BMV battery monitor, especially for systems where battery monitoring is needed but less wiring and clutter is wanted.

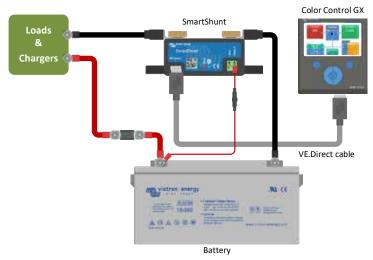
The SmartShunt is equipped with Bluetooth, a VE.Direct port and a connection that can be used to monitor a second battery, for midpoint monitoring, or to connect a temperature sensor.

Differences compared to BMV712 Battery Monitor

- No programmable visual and audible alarm.
- No programmable relay.

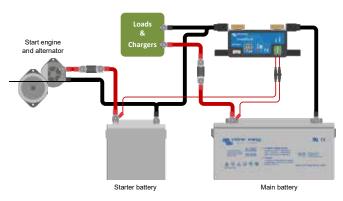


Basic SmartShunt wiring

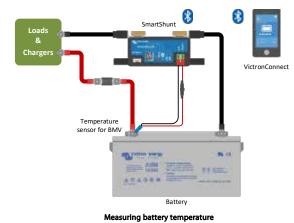


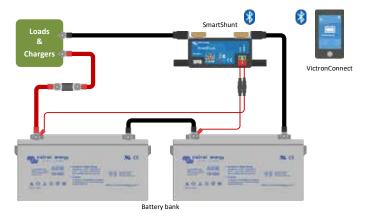
Connecting a SmartShunt to a GX device

SmartShunt	500A / 1000A / 2000A		
Supply voltage range	6,5 - 70 VDC		
Current draw	< 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		
RESOL	UTION & ACCURACY		
Current	± 0,01A		
Voltage	± 0,01V		
Amp hours	± 0,1 Ah		
State of charge (0 – 100%)	± 0,1%		
Time to go	± 1 min		
Temperature (if optional temperature sensor connected)	± 1°C/°F (0 - 50°C or 30 - 120°F)		
Accuracy of current measurement	± 0,4%		
Offset	Less than 20 / 40 / 80 mA		
Accuracy of voltage measurement	± 0,3%		
INSTALL	ATION & DIMENSIONS		
Dimensions (h x w x d)	500A: 46 x 120 x 54 mm 1000A: 68 x 120 x 54 mm 2000A: 68 x 120 x 76 mm		
Protection category	IP21		
	STANDARDS		
Safety	EN 60335-1		
Emission / Immunity	EN-IEC 61000-6-1 EN-IEC 61000-6-2 EN-IEC 61000-6-3		
Automotive	EN 50498		
Cables (included)	Two cables with 1A fuse, for '+' connection and starter battery or midpoint connection		
Temperature sensor	Optional (ASS000100000)		



Measuring voltage of the starter battery





Measuring battery bank midpoint







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 instal

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: RJ12 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)
DECOLUTION O A	CCLIDACY (with a FOO A about)

bistable relay	oov / TA 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

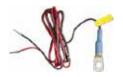
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.



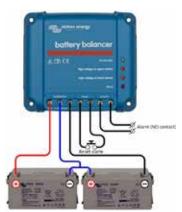


Interface cables

- 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.

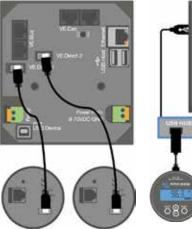
If needed, several balancers can be paralleled.

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.



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.



								El	ectrical data unde	er STC (1)		
Article Number		Description		Net Weight		Net Weight Nom Pow		Max-Power Voltage	Max-Power Current	Open-Cii Voltag		Short-Circuit Current
						Рм	.PP	Vмрр	Імрр	Voc		lsc
				Kg		٧	V	V	А	V		А
SPM040201200	20W-12V Mo	ono 440 x 350 x 25n	nm series 4a	1.9		2	0	18.5	1.09	22.6		1.19
SPM040301200	30W-12V Mo	ono 560 x 350 x 25n	nm series 4a	2.2		3	0	18.7	1.61	22.87		1.76
SPM040401200	40W-12V Mo	ono 425 x 668 x 25n	nm series 4a	3.1		4	0	18.3	2.19	22.45	i	2.40
SPM040551200	55W-12V Mo	ono 545 x 668 x 25n	nm series 4a	4		5.	5	18.8	2.94	22.9		3.22
SPM040901200	90W-12V Mo	ono 780 x 668 x 30n	nm series 4a	6.1		9	0	19.6	4.59	24.06	i	5.03
SPM041151200	115W-12V Mo	ono 1015 x 668 x 30	mm series 4a	8		11	5	19.0	6.04	23.32	2	6.61
SPM041751200	175W-12V Mo	ono 1485 x 668 x 30	mm series 4a	11		17	' 5	19.4	9.03	23.7		9.89
SPM042152400	215W-24V Mo	ono 1580 x 808 x 35	mm series 4a	15		21	5	37.4	5.75	45.82	!	6.30
SPM043052000	305W-20V Mo	ono 1640 x 992 x 35	mm series 4a	18		30)5	32.5	9.38	39.7		10.27
SPM043602400	360W-24V Mo	ono 1956 x 992 x 40	mm series 4a	22		36	50	38.4	9.38	47.4		10.24
Module		SPM 040201200	SPM 040301200	SPM 04040120		SPM 0551200	SPM 040901200	SPM 0 4115120	SPM 0 041751200	SPM 042152400	SPM 043052000	SPM 043602400
Nominal Power (±3%	tolerance)	20W	30W	40W		55W	90W	115W	175W	215W	305W	360W
Cell type							Mo	onocrystalline				
Number of cells in seri	ies					36				72	60	72
Maximum system volt	tage							1000V				
Temperature coefficie	ent 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 coefficie	ent of Voc (%)	-0.35/°C	-0.35/°C	-0.35/°C	-0	0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C
Temperature coefficie	ent of Isc (%)	+0.04/°C	+0.04/°C	+0.04/°C	+0	0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C
Temperature Range							-4	0°C to +85°C				
Surface Maximum Loa	ad Capacity							200 kg/m ²				
Allowable Hail Load							2	3 m/s, 7.53 g				
Junction Box Type		PV-LH0805		PV-LH0	806		PV-LH0801		PV-LH0808	PV-LH0701		PV-JB002
Length of Cables / Cor	nnector Type		1	No cable					900	mm MC4		
Output tolerance								+/-3%				
Frame								Aluminium				
Product warranty								5 years				
Troduct Warranty		10 years 90% + 25 years 80% of power output										
Warranty on electrical	l performance				1 panel							
•								1 panel				

BlueSolar polycrystalline panels



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
IVICT	COILLECTORS

						Electrical data under STC (1)					
Article Number		Description		Net	weight	Nominal Power	Max-Power Voltage	Max-Power Current	Open-Cir Voltag		Short-Circuit Current
						Рмрр	VMPP	Імрр	Voc		lsc
					Kg	W	V	А	V		Α
SPP040201200	20W-12V P	oly 440 x 350 x 2	25mm series 4a		1.9	20	18.4	1.09	21.96		1.18
SPP040301200	30W-12V P	Poly 655 x 350 x 2	25mm series 4a		2.8	30	18.2	1.66	21.80		1.80
SPP040451200	45W-12V P	oly 425 x 668 x 2	25mm series 4a		3.1	45	19.1	2.36	22.90		2.55
SPP040601200	60W-12V P	oly 545 x 668 x 2	25mm series 4a		4	60	19.3	3.12	23.10		3.37
SPP040901200	90W-12V P	oly 780 x 668 x 3	30mm series 4a		6.1	90	19.5	4.61	23.44		4.98
SPP041151200	115W-12V P	oly 1015 x 668 x	30mm series 4a		8	115	18.94	6.08	22.73		6.56
SPP041751200	175W-12V P	oly 1485 x 668 x	30mm series 4a		12	175	18,3	9.56	21.9		10.24
SPP032602000	260W-20V P	oly 1640 x 992 x	40mm series 3a		17	260	30	8.66	36.75		9.30
SPP042702000	270W-20V P	oly 1640 x 992 x	35mm series 4a		18.4	270	31.7	8.52	38.04		9.21
SPP043302400	330W-24V P	oly 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 0 041151200	SPP 041751200	SPP 032601200	SPP 042702000	SPP 043302400
Nominal Power (± 3% to	lerance)	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	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 o	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 o	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						-4	0°C to +85°C				
Surface Maximum Load C	apacity						200 kg/m²				
Allowable Hail Load						2:	3 m/s, 7.53 g				
Junction Box Type		PV-LH0805		PV-LH0806		PV-LH0801		PV-LH0808	PV-JB002		
Length of Cable / connect	tor		No cable			900 mm / MC4					
Output tolerance							+/-3%				
Frame							Aluminium				
Product warranty							5 years				
Warranty on electrical per	formance				10	years 90% + 25	years 80% of powe	routput			
Smallest packaging unit							1 panel				
Quantity per pallet		380	240	180	140	90	80	36	20	32	37
1) STC (Standard	d Test Conditions): 100	00 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	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	М
100/50	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/35	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/45	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	М
150/45-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/45-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	L
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
SmartSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	М
100/50	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	М
150/35	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	М
150/45	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	М
150/45-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/45-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	
								VI
150/85-Tr VE.Can	No No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl MPPT ctrl & SmartSolar ctrl	Built-in Built-in	VE.Direct & VE.Can VE.Direct & VE.Can	Yes	Yes	XL XL
150/85-MC4 VE.Can	No	12/24/36/48V				Yes	Yes	
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL















Color Control GX

Venus GX

Cerbo GX

Smart Battery Sense

VE.Direct Bluetooth Smart Dongle

VE.Direct to USB interface

With load output





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.

VF.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.

2) A PV array with a higher short circuit current may damage the controller.

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.

Fully discharged battery recovery function

Will initiate charging even if the battery has been discharged to zero volts.

Will reconnect to a fully discharged Li-ion battery with integrated disconnect function.

SmartSolar Charge Controller	MPPT 75/10	MPPT 75/15	MPPT 100/15	MPPT 100/20-48V		
Battery voltage (auto select)		12/24/48V				
Rated charge current	10A	15A	15A	20A		
Nominal PV power, 12V 1a,b)	145W	220W	220W	290W		
Nominal PV power, 24V 1a,b)	290W	440W	440W	580W		
Nominal PV power, 48V 1a,b)	n. a.	n.a.	n.a.	1160W		
Max. PV short circuit current 2)	13A	15A	15A	20A		
Automatic load disconnect		Yes				
Max. PV open circuit voltage	7.	5V	10	VO		
Peak efficiency		98	%			
Self-consumption – load on		12V: 19 mA 24V: 16 mA		26 / 20 / 19 mA		
Self-consumption – load off		12V: 10 mA 24V: 8 mA		10/8/7 mA		
Charge voltage 'absorption'		14,4V / 28,8V (adjustable)		14,4V / 28,8V / 57,6V (adj.)		
Charge voltage 'float'		13,8V / 27,6V / 55,2V (adj.)				
Charge algorithm	multi-stage adaptive					
Temperature compensation	-16 mV / °C resp32 mV / °C					
Max. continuous load current	15A 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 / 28	V / 56V or Battery Life alo	gorithm		
Protection		Output short circuit	/ Over temperature			
Operating temperature		-30 to +60°C (full rate	ed output up to 40°C)			
Humidity		95%, non-c	ondensing			
Data communication port	VE.Direc	t (see the data communic	ation white paper on our	website)		
		ENCLOSURE				
Colour		Blue (RA	L 5012)			
Power terminals		6 mm ² /	AWG10			
Protection category	IP	43 (electronic compone	nts), IP22 (connection are	ea)		
Weight	0,5	i kg	0,6 kg	0,65 kg		
Dimensions (h x w x d)	100 x 113	3 x 40 mm	100 x 113 x 50 mm	100 x 113 x 60 mm		
		STANDARDS				
Safety		EN/IEC 62109-1, U	L 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						



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.

Fully discharged battery recovery function

Will initiate charging even if the battery has been discharged to zero volts.

Will reconnect to a fully discharged Li-ion battery with integrated disconnect function.

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-sta	ge adaptive			
Temperature compensation	-16 mV / °C resp32 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	•	Direct on white paper on our website			
	ENCLOSURE				
Colour	Blue (F	RAL 5012)			
Power terminals	16 mm	n² / AWG6			
Protection category	IP43 (electronic compone	ents), 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.					

72

SmartSolar charge controller MPPT 150/35 & 150/45





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.

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

 $The innovative \ Blue Solar \ algorithm \ will \ always \ maximize \ energy \ harvest \ by \ locking \ to \ the \ optimum \ MPP.$

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.

Fully discharged battery recovery function

Will initiate charging even if the battery has been discharged to zero volts.

Will reconnect to a fully discharged Li-ion battery with integrated disconnect function.

SmartSolar Charge Controller	MPPT 150/35	MPPT 150/45			
Battery voltage	12 / 24 / 48V Auto Select				
, 3	(software tool nee	,			
Rated charge current	35A	45A			
Nominal PV power 1a, b)	35A 12V: 500W / 24V: 1000V 45A 12V: 650W / 24V: 1300V				
Max. PV short circuit current 2)	40A	50A			
Maximum PV open circuit voltage	150V absolute maximu 145V start-up and o				
Maximum efficiency	98	%			
Self-consumption	12V: 20mA 24V: 1	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 p	re-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 rate	d output up to 40°C)			
Humidity	95%, non-c	ondensing			
Data communication port	VE.D See the data communication				
	ENCLOSURE				
Colour	Blue (RA	L 5012)			
Power terminals	16 mm ²	/ AWG6			
Protection category	IP43 (electronic componer	its), IP22 (connection area)			
Weight	1,25	i kg			
Dimensions (h x w x d)	130 x 186	x 70 mm			
	STANDARDS				
Safety	EN/IEC 62109-1, U	L 1741, CSA C22.2			
1a) If more PV power is connected, the controlle 1b) The PV voltage must exceed Vbat + 5V for the					

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 150/100-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 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.

Fully discharged battery recovery function

Will initiate charging even if the battery has been discharged to zero volts. Will reconnect to a fully discharged Li-ion battery with integrated disconnect function.

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 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.

Fully discharged battery recovery function

Will initiate charging even if the battery has been discharged to zero volts. Will reconnect to a fully discharged Li-ion battery with integrated disconnect function.

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		28	V / 55V (1)					
Self-consumption			< 10 mA					
Load output		Manual control +	low voltage disconnect					
Protection	Battery rever	se polarity (fuse)	Output short circuit (Over temperature				
		Shut down after	60 s in case of 130% load					
Overload protection		Shut down after	5 s in case of 160% load					
		Short circuit: i	mmediate shut down					
Grounding		Com	mon 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			25,2V (manual)					
3		13,1V / 26 ENCLOSURE	5,2V (automatic)					
Protection class		LINCLOSORE	IP20					
Terminal size		F mr	m² / AWG10					
Weight		0,15kg	II-/AWGIO	o,2kg				
Dimensions (h x w x d)			mm (2.8 x 5.3 x 1.3 inch)	0,210				
		STANDARDS	(2.0 / 3.3 / 2.3(11)					
Safety			C 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 ne 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:

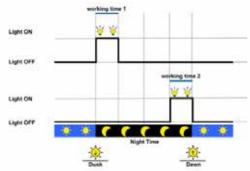
- With help of a computer and software (available free of charge from our website)
- With the dedicated BlueSolar Pro Remote Panel (see features below).

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		2	BV / 55V (1)					
Self-consumption			< 10mA					
Load output		Manual control	+ low voltage disconnec	t				
Protection	Battery reverse	polarity (fuse)	Output short circuit	Over temperature				
Battery temperature sensor		Optional (ar	ticle SCC940100100)					
Temperature compensation			C resp60 mV / °C cure sensor installed)					
Remote panel		Optional (ar	ticle SCC900300000)					
Grounding		Com	nmon positive					
Operating temp. range		-2	0 to +50°C					
Humidity (non-condensing)	Max 98%							
	D	EFAULT SETTING	iS					
Absorption charge (2)		14	I.4V / 28,8V					
Float charge (2)		13	3.8V / 27,6V					
Equalization charge (2)		14	I,6V / 29,2V					
Low voltage load disconnect		11	,1V / 22,2V					
Low voltage load reconnect		12	2,6V / 25,2V					
		ENCLOSURE						
Terminal size	4mm²	4mm²	10mm ²	10mm ²				
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 mn 5.4x2.7x1.4 inc		200x100x57 mn 7.9x4.0x2.3 inch				
		STANDARDS						
Safety	IEC 62109-1							
Emission	EN 61000-6-1, EN 61000-6-3, ISO 7637-2							

For 12V use 36 cell Solar panels
 For 24V use 72 cell Solar panels



Battery Balancer

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

One battery with a slightly higher internal leakage current in a 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.

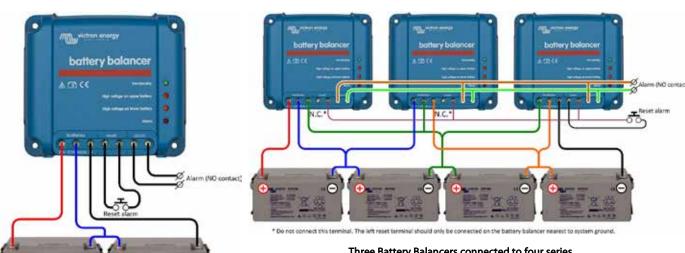
Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

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

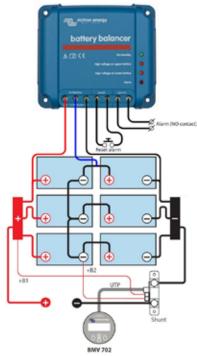
efer to our book 'Energy Unlimited' (available free of charge from Victron Energy



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 buttor
Over temperature protection	yes
Operating temperature	-30 to +50°C
Humidity (non-condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm ² / 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

- 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!)
- 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.
- If required: first wire the alarm contact and the alarm reset.

 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).
- 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
 - 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

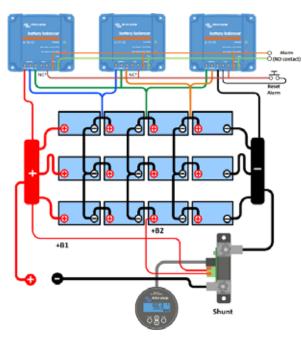
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially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

- 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.
- 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



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	115Ah 165Ah							
Capacity 1/3/5/10/20 hours (% of nominal)	60/75/82/91/1	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	7 (@ 70°F/25°C, end of di	scharge 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) @ o°F/-18°C	600	900	1000						
Short Circuit Current (A)	3500	5000	6000						
Reserve Capacity (minutes)	200	200 320							
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 × 4.33 × 11.53	21.57 × 4.13 × 12.44	21.49 X 4.92 X 12.71						
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	6okg/132lbs						



OPzS Solar Batteries 910

Long life flooded tubular plate batteries

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

Low maintenance

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

Dry-charged or ready for use electrolyte filled

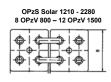
The batteries are available filled with electrolyte or dry-charged (for long term stocking, container transport or air transport). Dry charged batteries have to be filled with diluted sulfuric acid (density 1,24kg/l @ 20°C). The electrolyte may be stronger for cold- or weaker for hot climates.

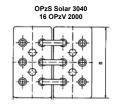
Learn more about batteries and battery charging

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

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 / 20°C)	910Ah	1210Ah	1520Ah	1830Ah	2280Ah	3040Ah	3800Ah	4560Ah		
Capacity (10 hr / 20°C)	640Ah	853Ah	1065Ah	1278Ah	1613Ah	2143Ah	2675Ah	3208Ah		
Capacity 2/5/10 hours (% of 10hr capacity)			60 / 85 / 100	(@ 68°F/20°C, enc	d of discharge 1,8	Volt per cell)				
Capacity 20 / 24 / 48 / 72 hours (% of 120hr capacity)			77 / 80 / 89 / 95	5 (@ 68ºF/20ºC, en	d of discharge 1,8	35 Volt per cell)				
Capacity 100 / 120 / 240 hours (% of 120hr capacity)			99 / 100 / 104	(@ 68°F/20°C, enc	d of discharge 1,8	5 Volt per cell)				
Self-discharge @ 70°F/20°C				3% per	month					
Absorption voltage (V) @ 70°F/20°C		2,35 to 2,50V/cell (28,2 to 30,0V for a 24 Volt battery)								
Float voltage (V) @ 70°F/20°C			2,23 to 2,	30V/cell (26,8 to	27,6V for a 24 Vo	lt battery)				
Storage voltage (V) @ 70°F/20°C			2,18 to 2,	22V/cell (26,2 to	26,6V for a 24 Vo	lt battery)				
Float design life @ 70°F/20°C				20 y	ears					
Cycle design life @ 80% discharge				15	00					
Cycle design life @ 50% discharge				28	00					
Cycle design life @ 30% discharge				52	00					
Dimensions (Ixwxh, 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		







OP2S Solar 3800 - 4560 20 OP2V 2500 - 24 OP2V 3000

length

Cell interconnection



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 hatteries

Low internal resistance

The internal resistance is also slightly lower compared to our standard deep cycle AGM batteries.

Recommended charge voltage:

	Float	Cycle service	Cycle service
	Service	Normal	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	٧	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

 \geq 300 cycles @ 100% DoD (discharge to 10,8V with I = 0,2C₂₀, followed by approximately two hours rest in discharged condition, and then a recharge with I = 0,2C₂₀)

 \geq 700 cycles @ 60% DoD (discharge during three hours with $I = 0.2C_{20}$, immediately followed by recharge at $I = 0.2C_{20}$)

 \geq 1000 cycles @ 40% DoD (discharge during two hours with I = 0,2C₂₀, immediately followed by recharge at I = 0,2C₂₀)



Super Cycle Battery 12V 230Ah









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

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.

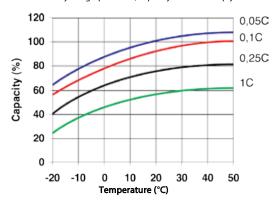


Fig. 1: Effect of temperature on capacity

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

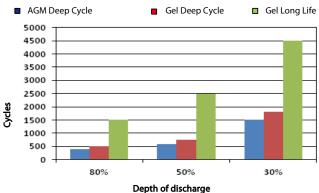


Fig. 2: Cycle life

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.

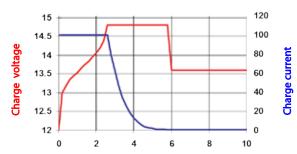


Fig. 3: Three step charge curve

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 selfdischarge (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).

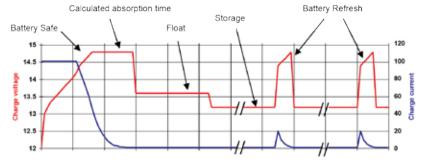


Fig. 4: Four-step adaptive charge curve

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 voltageThe 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 'D	eep 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 'De	ep 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 'Lor	ng 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 A	\GM	General Specification					
Article number	Ah	v	lxwxh 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
BAT212070084	8	12	151 x 65 x 101	2,5			Float design life: 7-10 years at 20°C Cycle design life:
BAT212120086	14	12	151 x 98 x 101	4,4			400 cycles at 80% discharge
BAT212200084	22	12	181 x 77 x 167	5,8			600 cycles at 50% discharge
BAT412350084	38	12	197 x 165 x 170	12,5			1500 cycles at 30% discharge
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 G	EL	General Specification					
Article number	Ah	v	lxwxh 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
BAT412600100	66	12	258 x 166 x 235	24	270	80	Float design life: 12 years at 20°C Cycle design life:
BAT412800104	90	12	350 x 167 x 183	26	360	120	500 cycles at 80% discharge
BAT412101104	110	12	330 x 171 x 220	33	450	150	750 cycles at 50% discharge
BAT412121104	130	12	410 x 176 x 227	38	500	180	1800 cycles at 30% discharge
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	lxbxh 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			
BAT702801260	800	2	210 x 191 x 688	65	Float design life: 20 years at 20°C Cycle design life:			
BAT702102260	1000	2	210 x 233 x 690	80	1500 cycles at 80% discharge			
BAT702122260	1200	2	210 x 275 x 690	93	2500 cycles at 50% discharge			
BAT702152260	1500	2	210 x 275 x 840	115	4500 cycles at 30% discharge			
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



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.



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.



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.

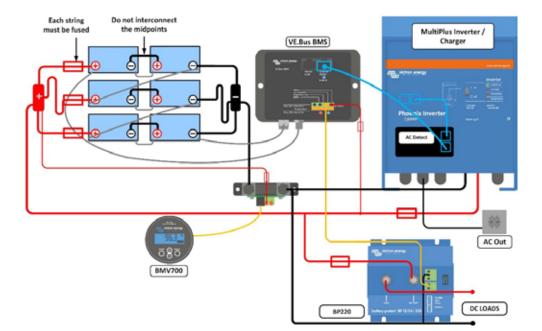
Very useful to localize a (potential) problem, such as cell imbalance.



12,8V 300Ah LiFePO4 Battery



Li-ion app



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

		E	Battery specif	ication			
VOLTAGE AND CAPACITY	LFP- Smart 12,8/50	LFP- Smart 12,8/60	LFP- Smart 12,8/100	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	25,6V
Nominal capacity @ 25°C*	50Ah	60Ah	100Ah	160Ah	200Ah	300Ah	200Ah
Nominal capacity @ 0°C*	40Ah	48Ah	80Ah	130Ah	160Ah	240Ah	160Ah
Nominal capacity @ -20°C*	25Ah	30Ah	50Ah	80Ah	100Ah	150Ah	100Ah
Nominal energy @ 25°C*	640Wh	768Wh	1280Wh	2048Wh	2560Wh	3840Wh	5120Wh
*Discharge current ≤1C							
		CYCL	E LIFE (capacity ≥ 80	0% of nominal)			
80% DoD	2500 cycles						
70% DoD	3000 cycles						
50% DoD	5000 cycles						
			DISCHARG	E			
Maximum continuous discharge current	100A	120A	200A	320A	400A	600A	400A
Recommended continuous discharge current	≤50A	≤60A	≤100A	≤160A	≤200A	≤300A	≤200A
End of discharge voltage	11,2V	11,2V	11,2V	11,2V	11,2V	11,2V	22,4V
			OPERATING CONE	DITIONS			
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	100A	120A	200A	320A	400A	600A	400A
Recommended charge current	≤30A	≤30A	≤50A	≤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	M8	M10	M8
Dimensions (hxwxd) mm	199 x 188 x 147	239 x 286 x132	197 x 321 x 152	237 x 321 x 152	237 x 321 x 152	347 x 425 x 274	317 x 631 x 20
Weight	7kg	12kg	15kg	20kg	22kg	51kg	56kg
*When fully charged							





VE.Bus BMS

Protects each individual cell of a Victron lithium iron phosphate (LiFePO₄ or LFP) battery

Each individual cell of a LiFePO $_4$ battery must be protected against over voltage, under voltage and over temperature. Victron LiFePO $_4$ 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 (default 3,1V/cell, adjustable on the battery between 2,85V and 3,15V per cell).

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)

Pre-alarm

The pre-alarm output is normally free floating and becomes high in case of imminent cell under voltage (default 3,1V/cell, adjustable on the battery between 2,85V and 3,15V per cell).

Maximum current: 1A (not short circuit protected).

The minimum delay between pre-alarm and load disconnect is 30 seconds.

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.

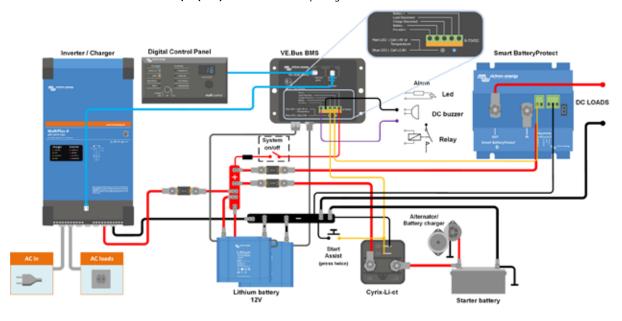


Figure 1: Application example for a vehicle or boat.

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					
12.545.511.5					
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)				
Pre-alarm output	Normally free floating High (Vbat) in case of alarm, max. 1A (not short circuit proof)				
	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				

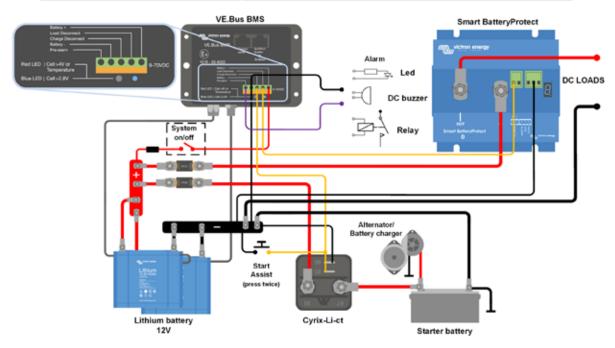


Figure 2: Application example for a vehicle or boat, without inverter/charger.



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.



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.





smallBMS

A simple and low cost alternative to the VE.Bus BMS

The smallBMS can replace the VE.Bus BMS in several applications. It is however not suitable for use with VE.Bus MultiPlus and Quattro inverter/chargers: it has no VE.Bus interface.

The smallBMS is intended for use with Victron Smart LiFePo4 batteries with M8 circular connectors. The smallBMS has three outputs, similar to the VE.Bus BMS.

Load Disconnect output

The Load output is normally high and becomes free floating in case of cell under voltage (default 2,8V/cell, adjustable on the battery between 2,6V and 2,8V per cell). Maximum current: 1A. The Load output is not short-circuit protected.

The Load output can be used to control:

- A high current relay or contactor.
- The remote on/off input of a Battery Protect, inverter or DC-DC converter or other loads. (a non-inverting or inverting on/off cable may be required, please consult the detailed manual on our website)

Pre-alarm output

The pre-alarm output is normally free floating and becomes high in case of imminent cell under voltage (default 3,1V/cell, adjustable on the battery between 2,85V and 3,15V per cell). Maximum current: 1A (not short circuit protected).

The minimum delay between pre-alarm and load disconnect is 30 seconds.

Charge disconnect output

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

The Charger output is not suitable to power an inductive load such as a relay coil.

The Charger output can be used to control:

- The remote on/off of a charger
- A Cyrix-Li-Charge relay
- A Cyrix-Li-ct Battery Combiner

System on/off input

The system on/off input controls both outputs. When off, both outputs will be free floating so that loads and chargers are turned off.

The System on/off consists of two terminals: Remote L and Remote H.

A remote on/off switch or relay contact can be connected between L and H.

Alternatively, terminal H can be switched to battery plus, or terminal L can be switched to battery minus.

Protects 12V, 24V and 48V systems

Operating voltage range: 8 to 70V DC.

LED indicators

- Load ON (blue): Load output high (cell voltage >2.8V, adjustable on the battery).
- **Temp or OVP (red)**: Charger output free floating (due to cell over temperature (>50°C), cell under temperature (<5°C) or cell over voltage).

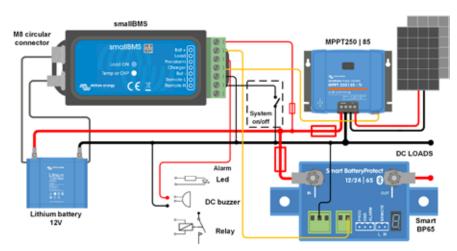


Figure 1: Application example for a DC off-grid system, with system on/off switch between L and battery negative

smallBMS						
Normal operating Input voltage range (Vbat)	8 – 70V DC					
Current draw, normal operation	2.2 mA (excluding Load output and Charger output current)					
Current draw, low cell voltage	1.2mA					
Current draw, remote off	1,2 mA					
Load output	Normally high (Vbat – 0.1V) Source current limit: 1A (not short circuit protected) Sink current: 0A (output free floating)					
Charger output	Normally high (Vbat – 0.6V) Source current limit: 10mA (short circuit protected) Sink current: 0A (output free floating)					
Pre-alarm	Normally free floating In case of alarm: output voltage Vbat -0.1V Maximum output current: 1A (not short circuit protected)					
System on/off: Remote L and Remote H	Use modes of the system on-off: a. ON when the L and H terminal are interconnected (switch or relay contact) b. ON when the L terminal is pulled to battery minus (V < 3.5V) c. ON when the H terminal is high (2.9V < VH < Vbat) d. OFF in all other conditions					
	GENERAL					
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)	106 x 42 x 23mm					
	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					

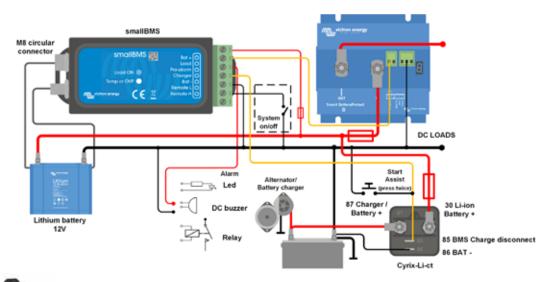


Figure 2: Application example for a vehicle or boat, with system on/off switch between L and battery negative





the Charge Disconnect of the BMS.

Cyrix Combiners designed for use with the smallBMS and the VE.Bus 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.





About Victron Energy

With over 46 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 46 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.













