Off-grid, backup systems & island systems

System examples & products

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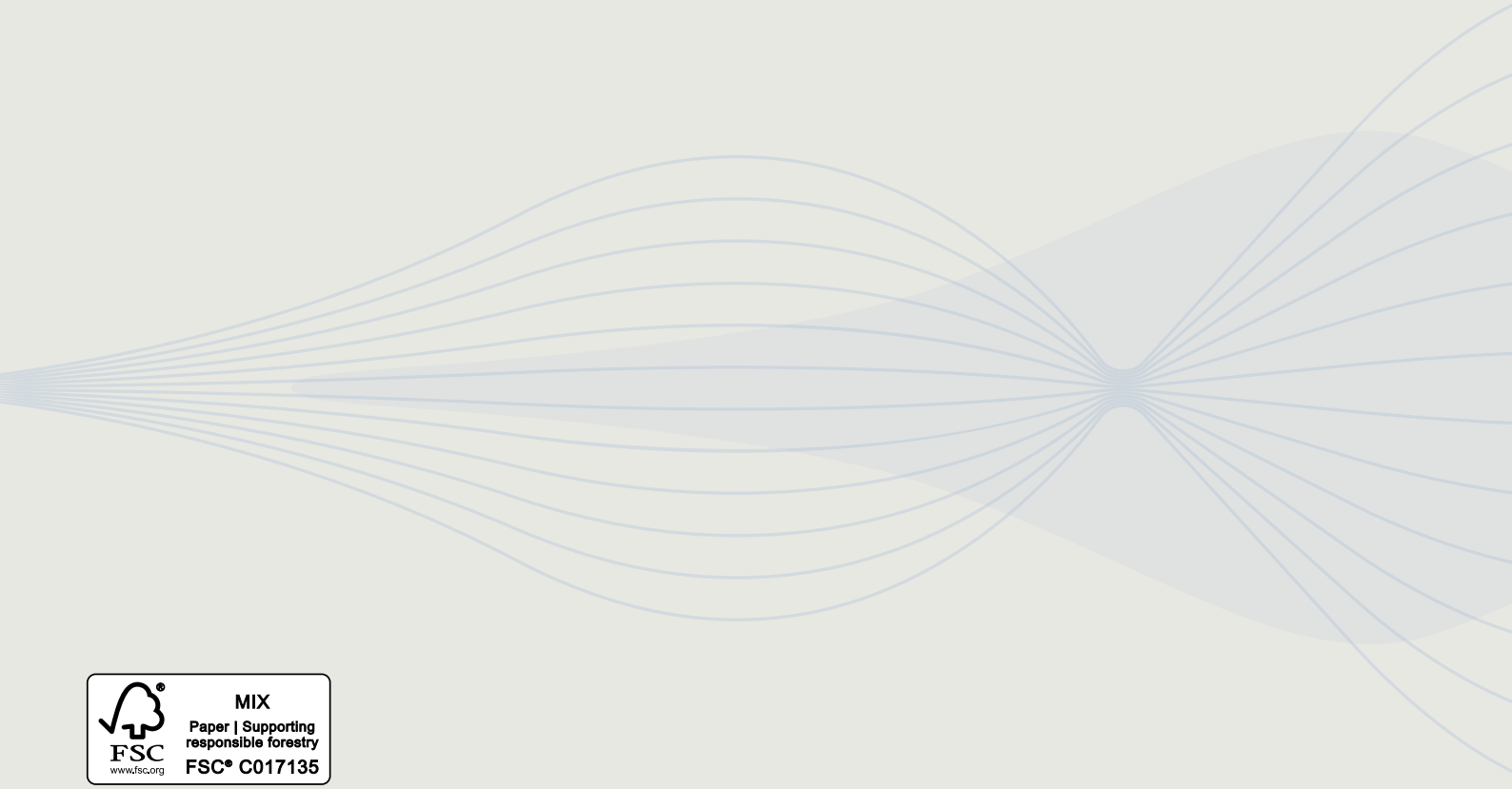


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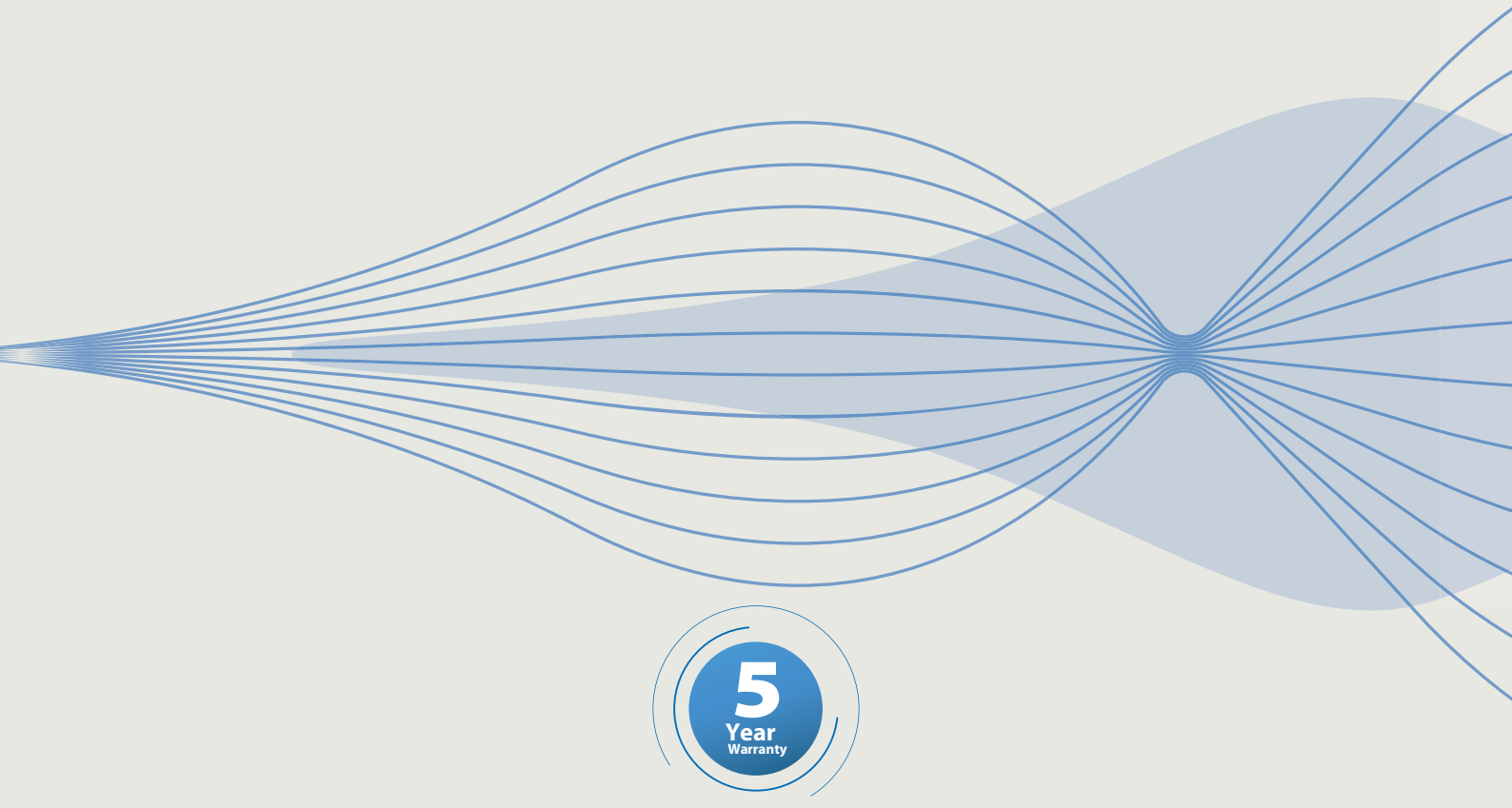
OFF-GRID & BACKUP SYSTEMS

How do you build scalable, cost-effective and robust off-grid systems that provide peace of mind?

The solution is powered by know-how. With more then 50 years of experience, we've learned what it takes to build a robust ecosystem of flexible building blocks that are powered by up-to-date features. Millions of customers value the reassurance that our power solutions deliver, knowing they have our worldwide network of authorised dealers by their side. They know our family-run business is built on a foundation of trust they can always depend on.

Energy. Anytime. Anywhere.



Index

Independence. Powered by know-how.

When you need to run your business off the grid and want to minimise your dependence on generator fuel logistics to the middle of nowhere, it's good to know the power of know-how is by your side.

Energy. Anytime. Anywhere.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OFF-GRID & BACKUP SYSTEMS

Introduction to backup and off-grid systems designs

In some regions the electricity grid is not reliable. Elsewhere there is no grid at all. Fortunately there are now affordable and scalable solutions that provide uninterrupted power. Our large range of smart and flexible products meet any power challenge and can be configured in detail to meet the needs of the most demanding customers. Here is a brief introduction to different system design types.

Backup

Backup systems power the loads during 'down times' with energy from the battery bank. They seamlessly switch over from (failing) grid power to battery power so fast, most appliances won't even notice. Solar energy can extend the up-time and if needed, a generator can be seamlessly integrated, minimising their usage automatically by prioritising solar energy.

Energy storage system

An Energy Storage System stores solar energy into the battery during the day for use after dark or when the grid fails. When the battery is full, excess solar energy is used to power the loads, to charge electric vehicles and in some areas it can be sold back to the grid automatically. When the battery has insufficient energy it automatically buys it from the grid. Analysing your on-going energy use and solar yield allows for system fine-tuning, to maximise consumption of your own energy.

Off-grid

In many remote areas where there is no power grid, generators have historically been chosen for energy provision. This means obtaining regular fuel supplies, repairing generator breakdowns and time consuming maintenance schedules. Today's solar energy harvesting - sometimes including wind - offers a reliable and sustainable alternative to remote 24 hour power, using smaller generators to offer back up power only when necessary. Fuel costs, maintenance and capital expenditure are all slashed. Designing systems which combine several energy sources is what Victron Energy does best.

What is the difference between a Backup system, an Energy Storage System and an Off-grid system?

A backup system powers the critical loads for the duration of the expected downtime. An Energy Storage System powers the base load with solar during the day and stores excess solar energy to power through the evening and night enabling self-consumption, the grid assists in powering peak consumers or on grey days. An off-grid system powers all loads 24/7 based on worst case scenarios as there is no reliance on a grid.

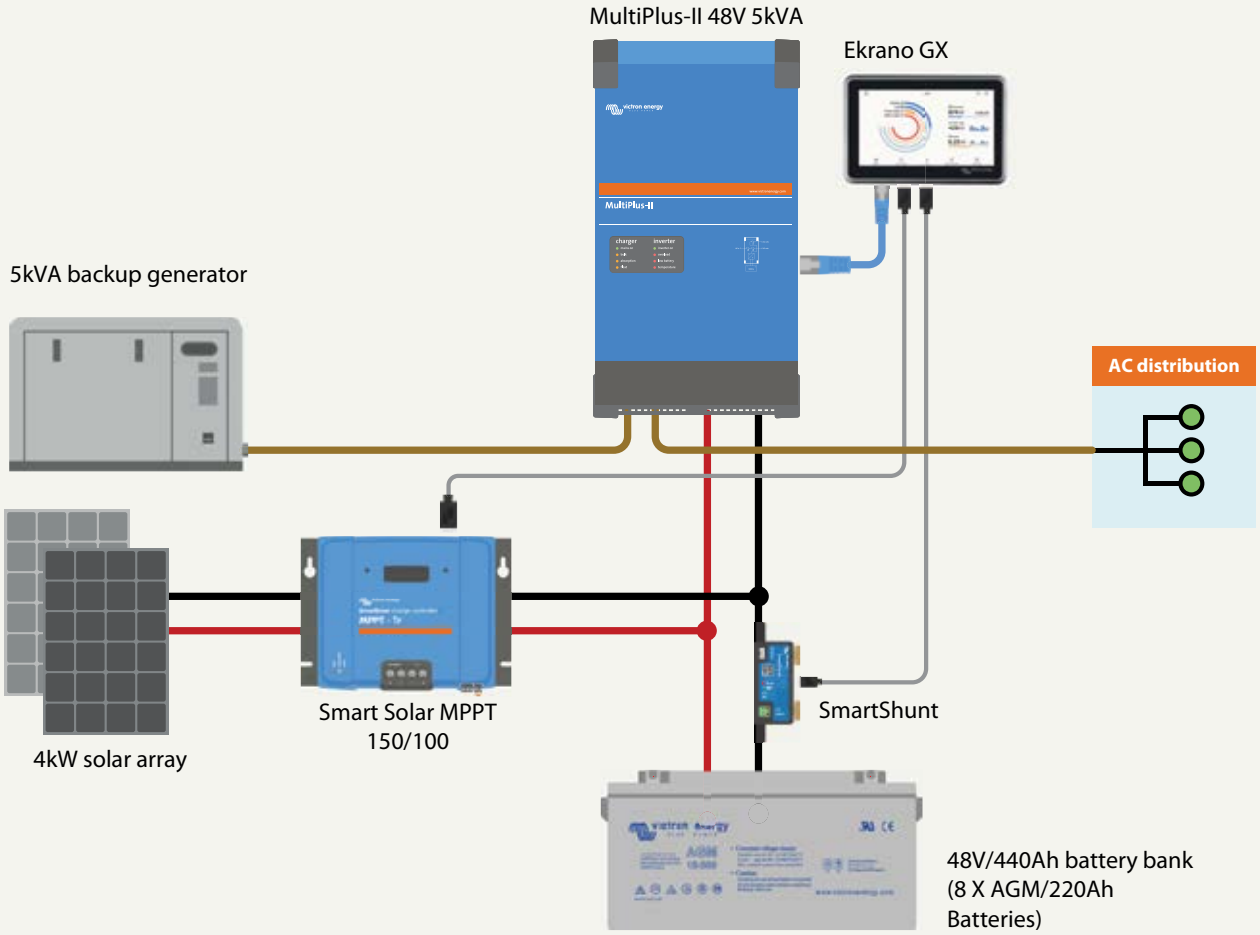
APPLICATION EXAMPLES

Off-Grid Straw Bale

The self builders of this negative-carbon straw bale house never planned to go off-grid until they got a quote for electricity grid-connection. From there it was an easy decision. Six years later with unpredictable energy prices they're really pleased with their 4kWp solar array; 5kVA inverter; and 21kWh lead acid storage. In winter, with fewer daylight hours, during foggy spells, we monitor our electricity use, and run a 5kVA standby generator to keep our batteries topped up, or to run the washing machine. Our wood fired range takes care of the cooking, heating and hot water - so we find we use the generator for less than fifty hours per year. In the summer, of course, we have more electricity than we could possibly use.

No Bills

For us being off-grid, with no bills and freedom from worry about rising prices is really a privilege. The only change we plan is to install lithium batteries because their huge charge-acceptance rate takes full advantage of those short glimpses of winter sun. Our MultiPlus 48/5000 frequently runs the Immersion heater (3kW) and Washing Machine (2.2kW) at the same time as more minor loads and has never ever had a shutdown! Although we really look after AGM batteries (8x 12V/220Ah) keeping them above 80% SOC, on two occasions we've 'taken our eye off the ball' and had a low voltage shutdown. We recharged them immediately and after six years they're still strong ...I guess they retain about 90% of their original capacity. Our MPPT BlueSolar 150/100 charge controller allows us to reduce cable losses by grouping our 15 solar panels into strings of three; and the GX communication centre allows us to monitor our system when we're travelling.



Does it work?

A lot of people are surprised that being completely off-grid 'works'. The secret is that you have to manage your lifestyle ...and your energy use. For example in the winter we turn the refrigerator off - because the whole world is a fridge, and we simply store food in an outdoor larder. If we want to run the washing machine, in the winter we check the weather forecast to see if it's going to be sunnier today or tomorrow, and then run it around midday. In the summer we could never use all the power available. And during a five-day blackout recently, only we were unaffected.

Money no object?

Managing your energy use might sound like hard work - but it's actually easy to do, makes sense, and results in zero bills! If money was no problem and we were a bit lazier, we could simply oversize our system - more panels, and bigger battery storage - and the system would still pay for itself in time. I know people who have done that and it allows them to continue with their old habits - running loads at night when they come in from work, ground source heat pump, lots of electronic domestic devices - and never worrying about how much current they're drawing. They just install and forget - it's another approach, and it still works!

APPLICATION EXAMPLES

Off-Grid Solar provides Air Source Heating

Living self-sufficient in the UK

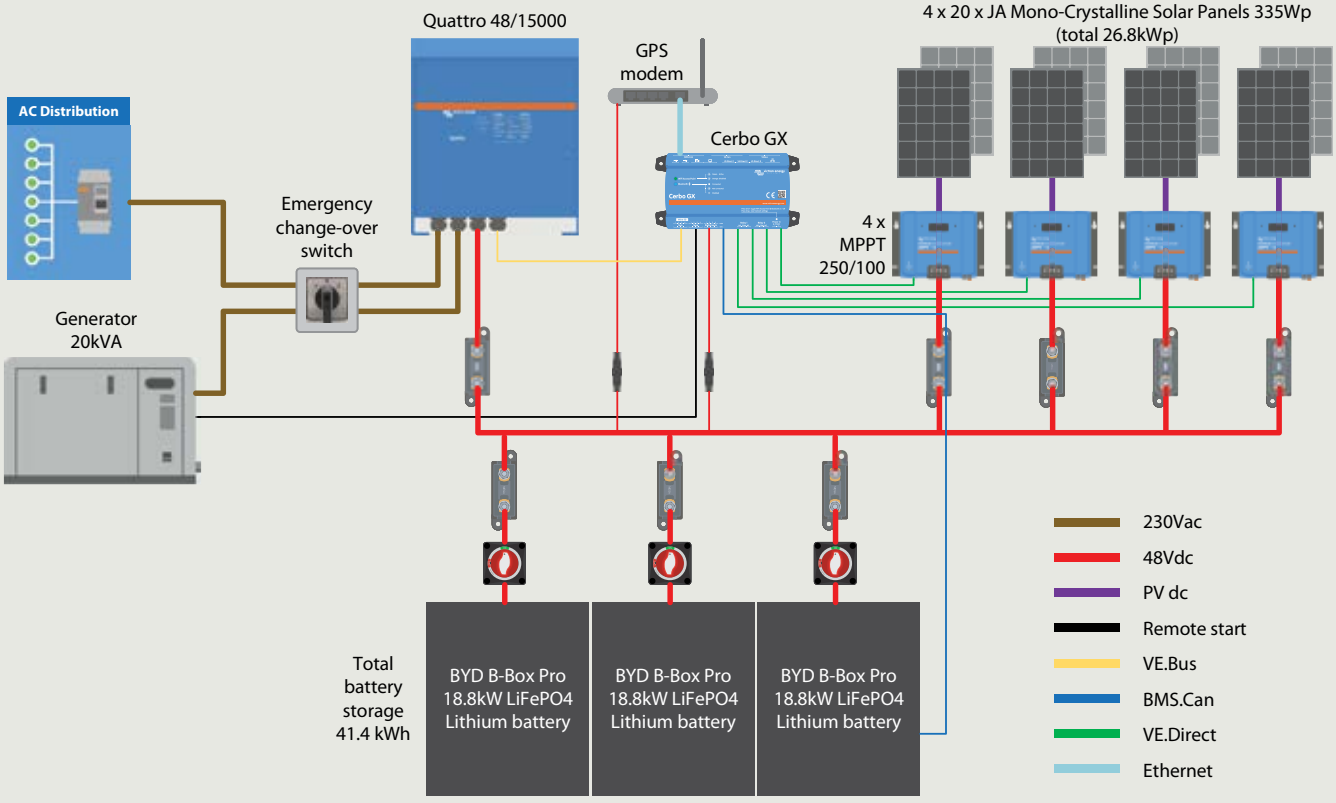
Vanessa and Bruce Jones decided to go off the grid to power their new build five-bedroomed house, after finding out that going to connect their house to the public grid was going to cost them more than £100k.

Rather than spend a large amount of money to connect their house to the grid, they contacted Ian Hewson from 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 Cerbo 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.


Quattro 48/15000
GPS modem
4 x 20 x JA Mono-Crystalline Solar Panels 335Wp (total 26.8kWp)
AC Distribution
Cerbo GX
Emergency change-over switch
4 x MPPT 250/100
Generator 20kVA
230Vac
48Vdc
PV dc
Remote start
VE.Bus
BMS.Can
VE.Direct
Ethernet
Total battery storage 41.4 kWh
BYD B-Box Pro 18.8kW LiFePO4 Lithium battery
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Freedom. Powered by know-how.

When you need power on a grid when you're off the grid, it's good to know the power of know-how is by your side.

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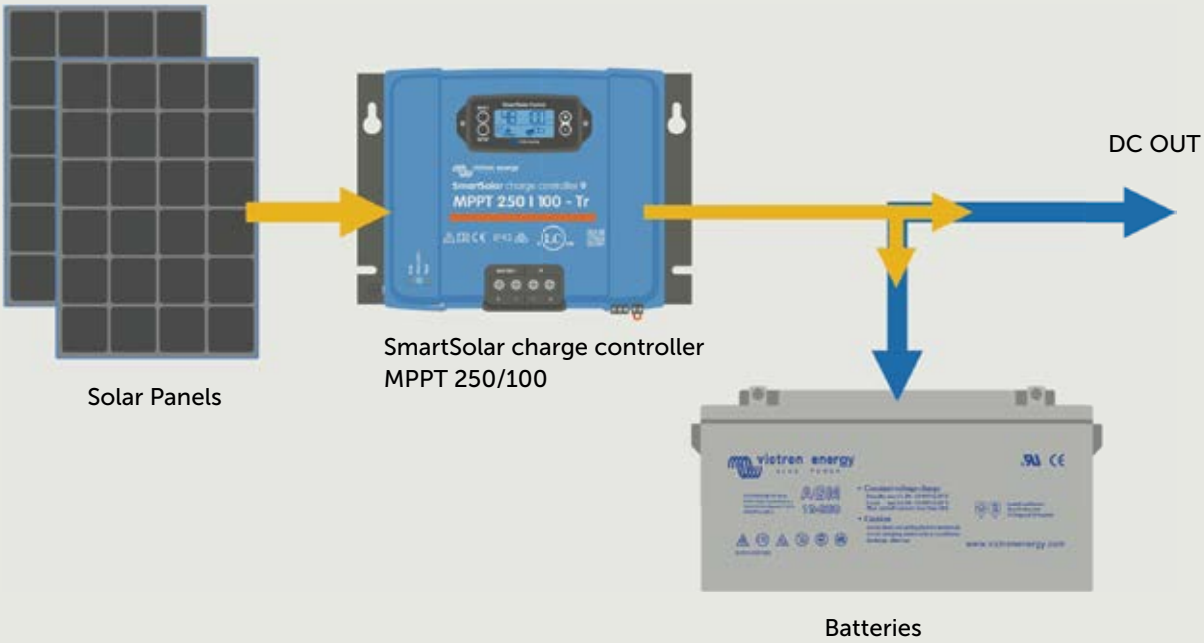
SYSTEM DESIGNS

DC and AC coupled Systems

In DC coupled PV 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-coupled PV systems.



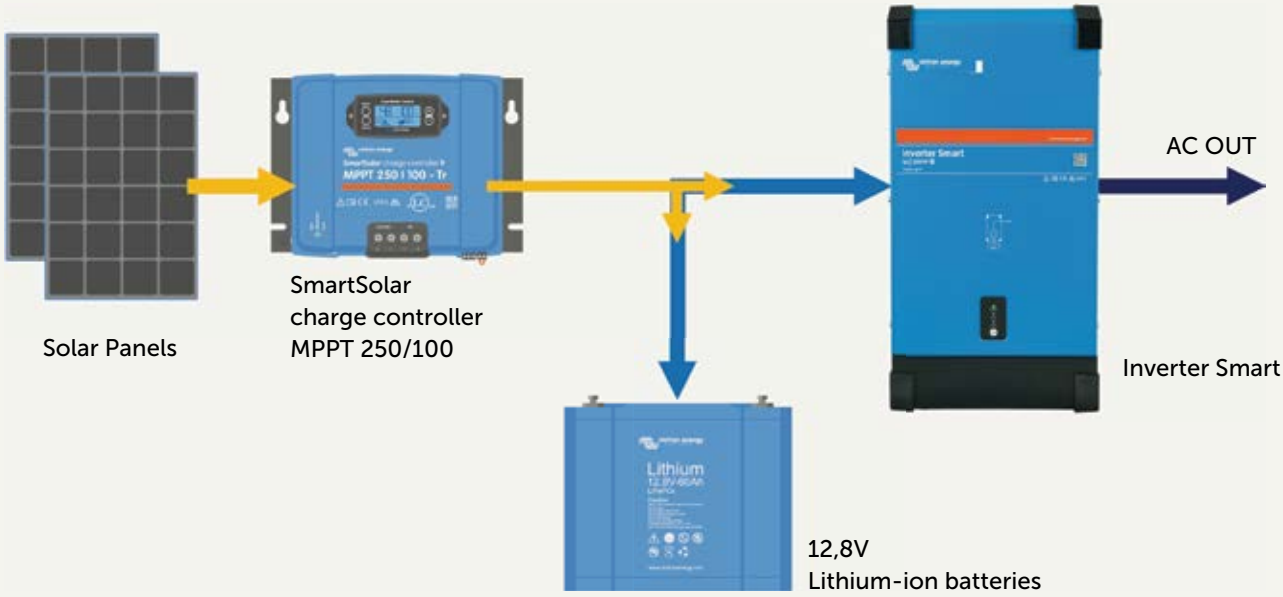
Solar Panels

SmartSolar charge controller
MPPT 250/100

Batteries

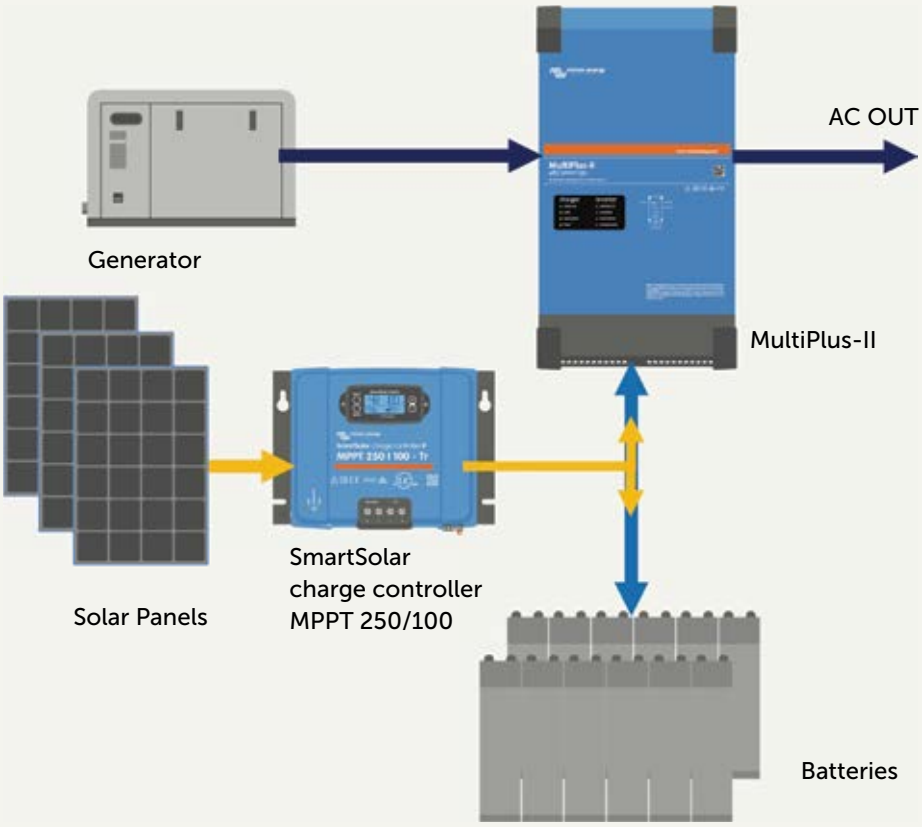
1. DC consumers

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 Smart 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.

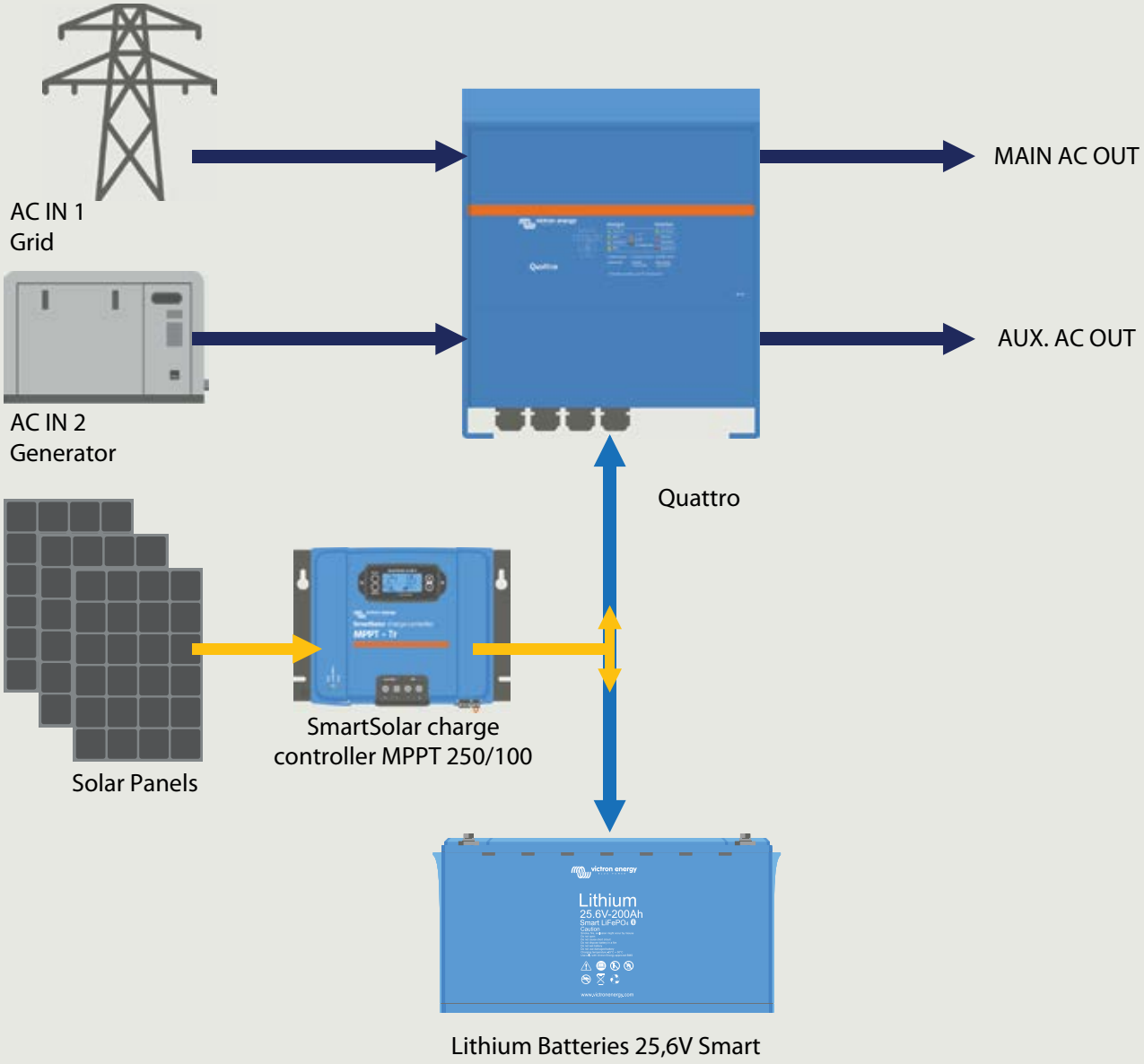
SYSTEM DESIGNS

DC coupled 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.



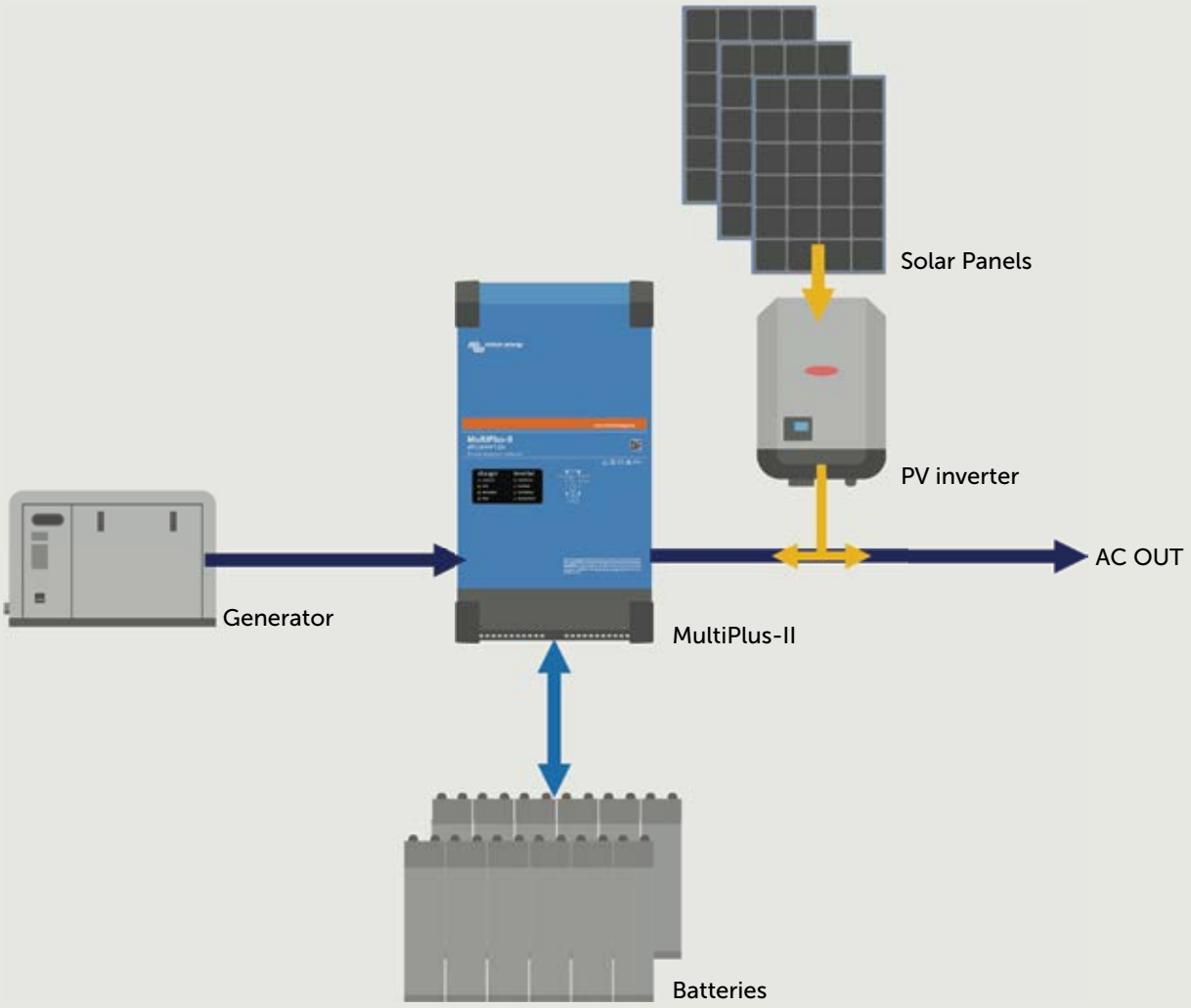
4. Backup system

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.

SYSTEM DESIGNS

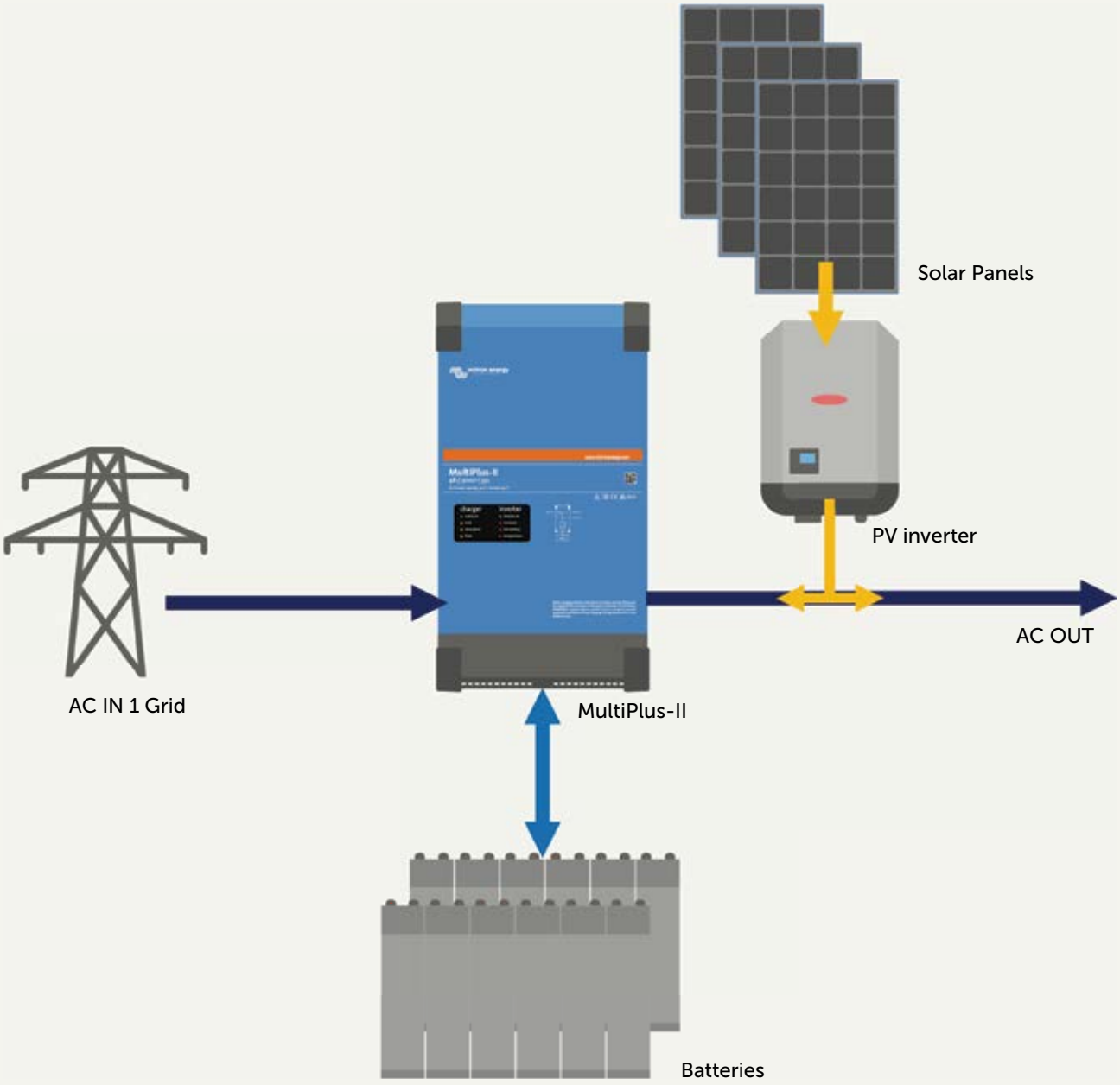
AC-coupled systems

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-coupled systems". AC-coupled 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

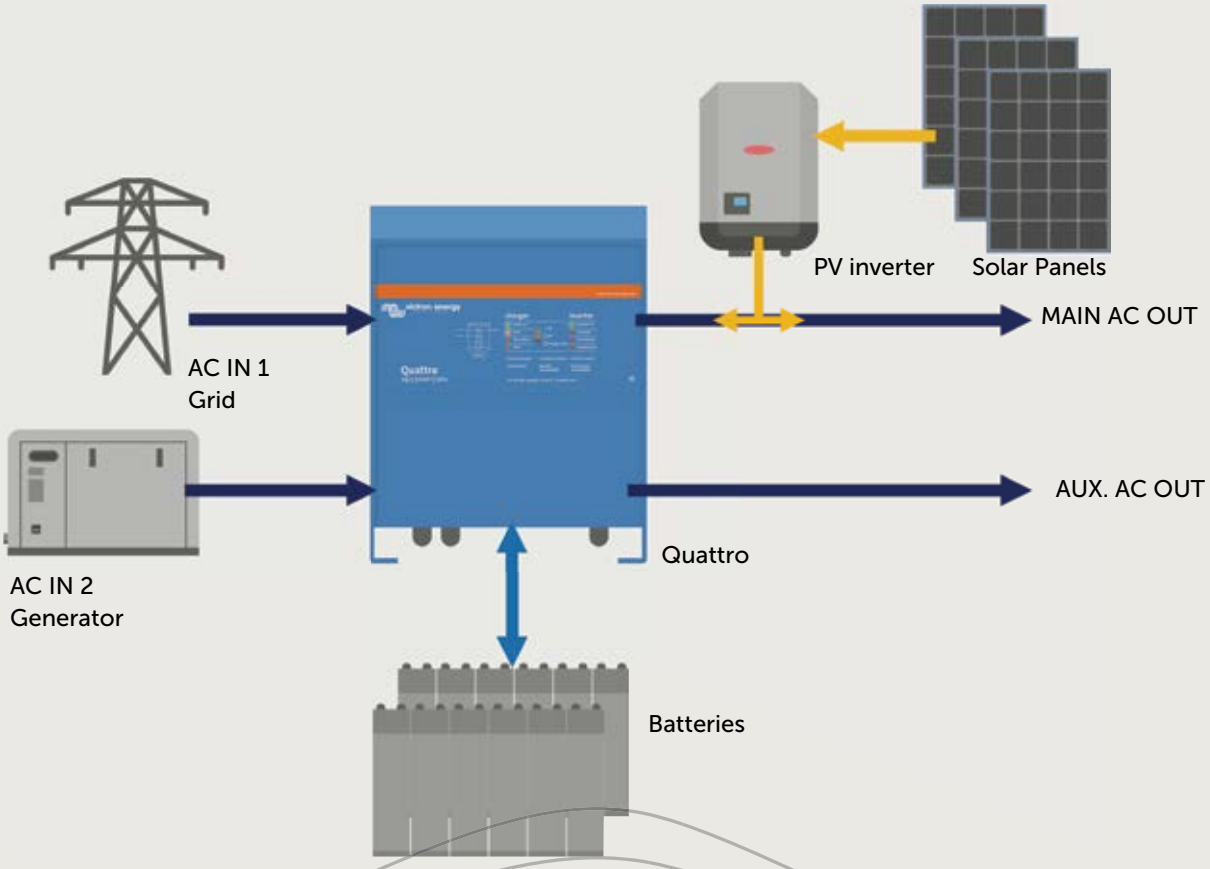
In this backup system, AC from the grid can supplement the energy supply coming from the solar panels. And vice versa, the energy from the solar panels can cover any grid failure that may occur.

SYSTEM DESIGNS

AC coupled systems

MultiPlus vs Quattro

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



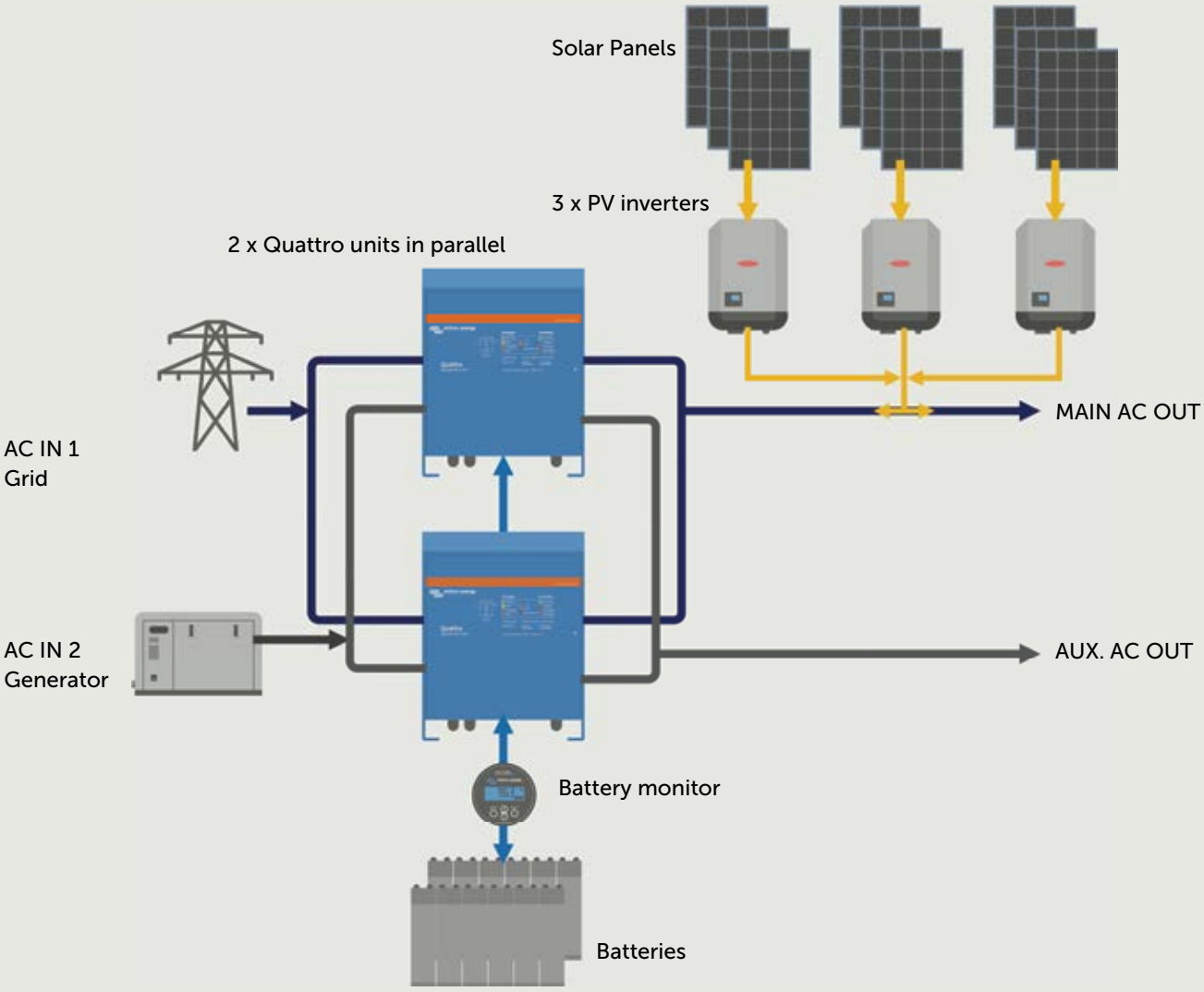
3. Solar, generator and grid

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.

SYSTEM DESIGNS

More power

The AC and DC-coupled 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.

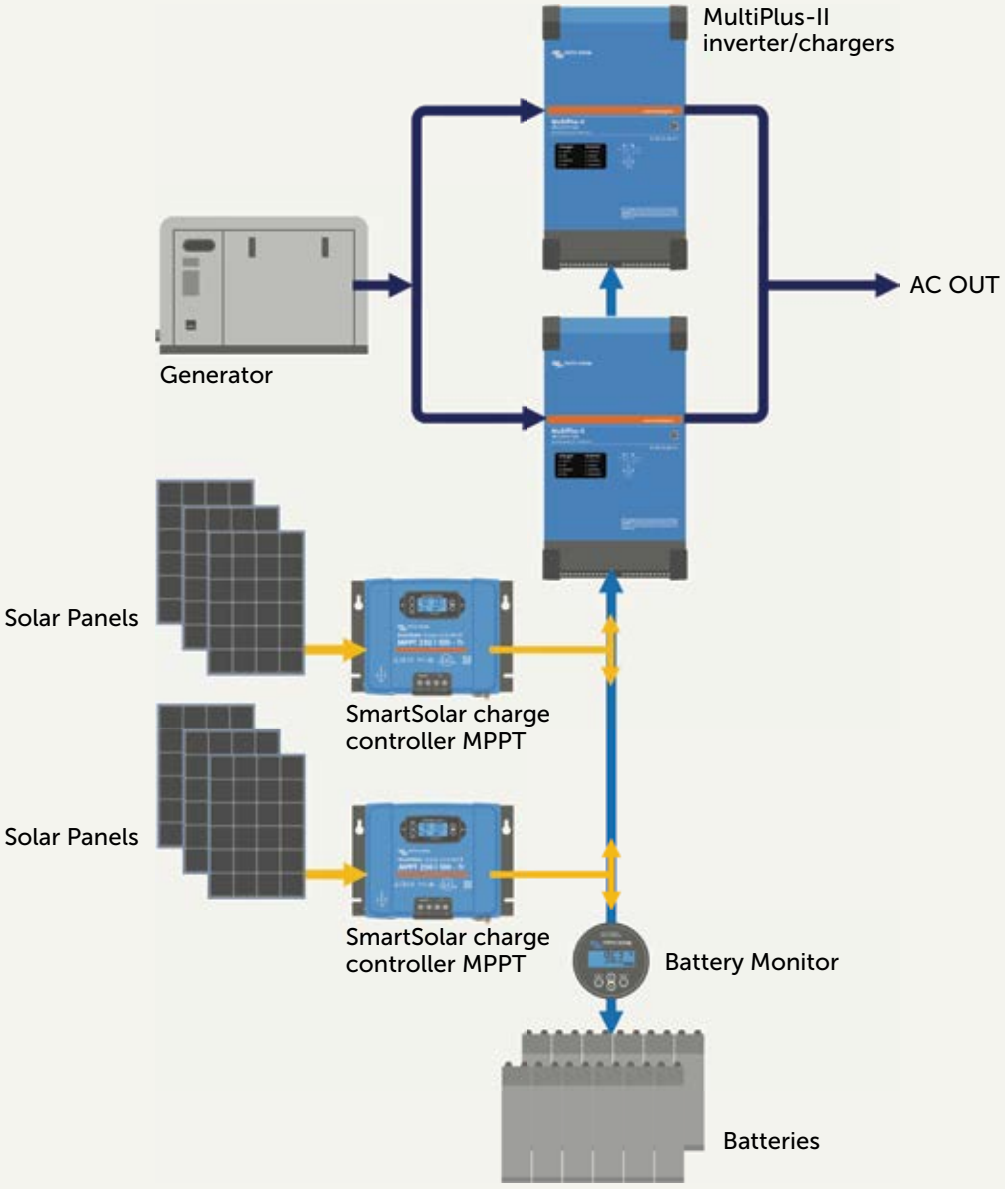


1. AC system

The illustration above shows an AC system with three PV inverters and two Quattros in parallel.

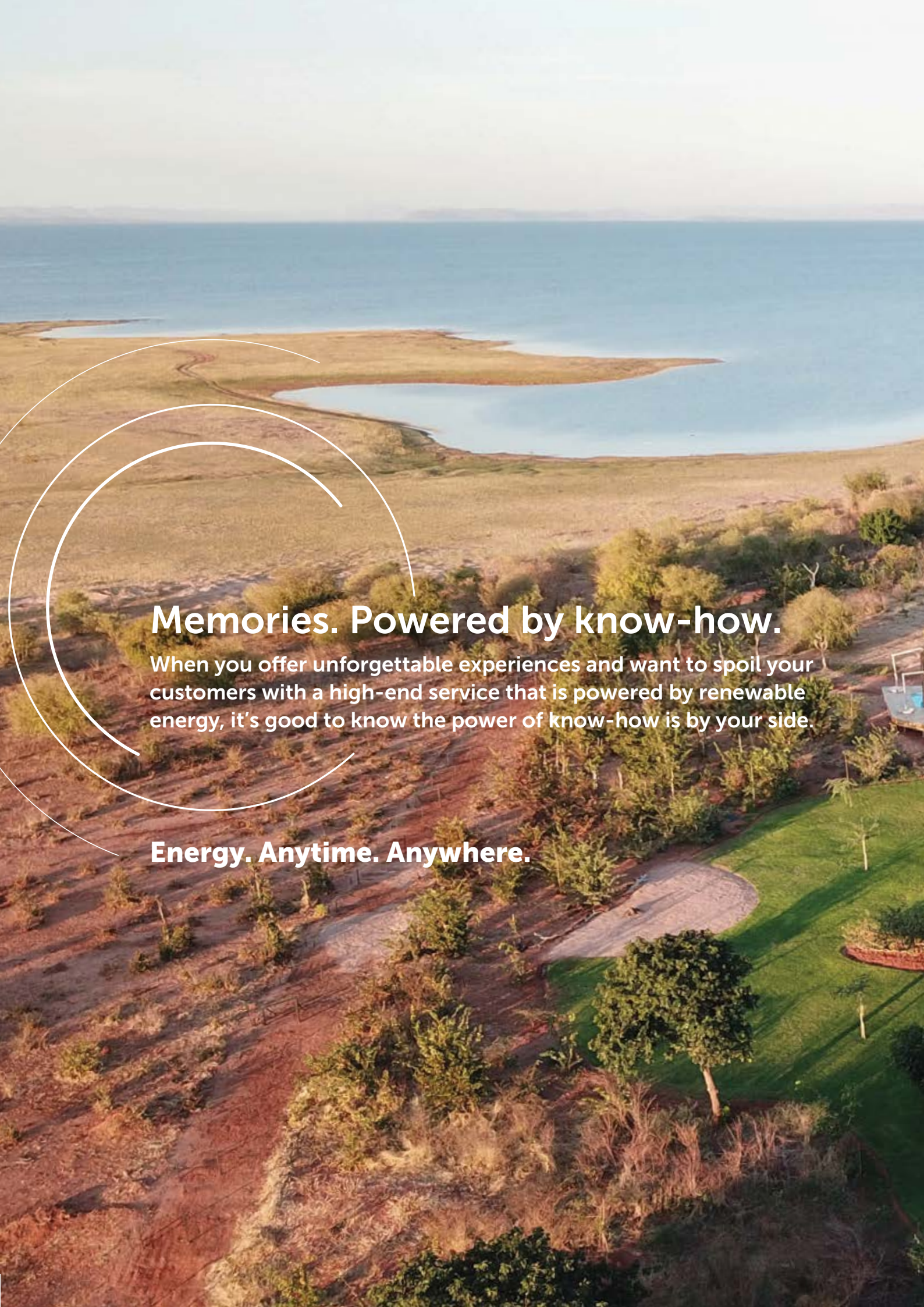
Easy to configure

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.



2. DC system

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


Memories. Powered by know-how.
When you offer unforgettable experiences and want to spoil your customers with a high-end service that is powered by renewable energy, it's good to know the power of know-how is by your side.
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Experience the power of Victron Energy monitoring

Works with

VictronConnect app

VRM - Remote Management portal

MFD & NMEA 2000 integration

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Bring the best of Victron systems together in a powerful experience that will redefine life off-grid. Thanks to the know-how that powers our connected products, you can monitor and control your systems, prevent issues and resolve challenges straight from any device. With the most up-to-date monitoring solution on the planet you can manage it all from anywhere in the world.

See our monitoring solutions in action at victronenergy.com/monitoring

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System monitoring components

Monitoring is crucial to fine-tune and optimize energy harvest and use based on ever-changing circumstances. With Victron you have complete insight in your installation, from the system's performance to their tank levels, temperatures and more. To enable remote monitoring via VRM, add a communication-centre, such as the Cerbo GX. If local monitoring is sufficient, choose a Smart product.

Know more at victronenergy.com/monitoring

Cerbo GX
This 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, a MFD or our VictronConnect app thanks to its added Bluetooth capability. Offers the highest level of control thanks to an impressive range of features and integrations.

GX Touch 50 and GX Touch 70
The GX Touch 50 and GX Touch 70 are display accessories for our Cerbo GX. The five inch and seven inch touch screen displays give an instant overview of your system and allow to adjust settings in the blink of an eye. Simply connected to the Cerbo GX with one cable. Their super slim waterproof design, top-mountable setup and simple installation bring a lot of flexibility when creating a crisp and clean dashboard.

Ekrano GX - All-in-one GX device
Combines a full featured GX device and GX Touch in one.
This practical combination of a Cerbo GX and GX Touch gives you easy access to the ports from the back of the device.

GlobalLink 520
The GlobalLink 520 allows you to connect Victron VE.Direct equipment, such as: battery monitors, MPPT solar chargers, the IP43 Charger or Inverters, to our free remote monitoring website: the VRM Portal. The GlobalLink uses the LTE-M cellular network and the first five years of cellular connectivity is included in the purchase price. The unit will come pre-configured and ready for use out of the box. No need to change any settings.

GX LTE 4G

The GX LTE 4G is a cellular modem for our GX range of monitoring products. It provides a mobile internet connection for the system and connection to the VRM Portal. It works on 2G, 3G and 4G networks.

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).

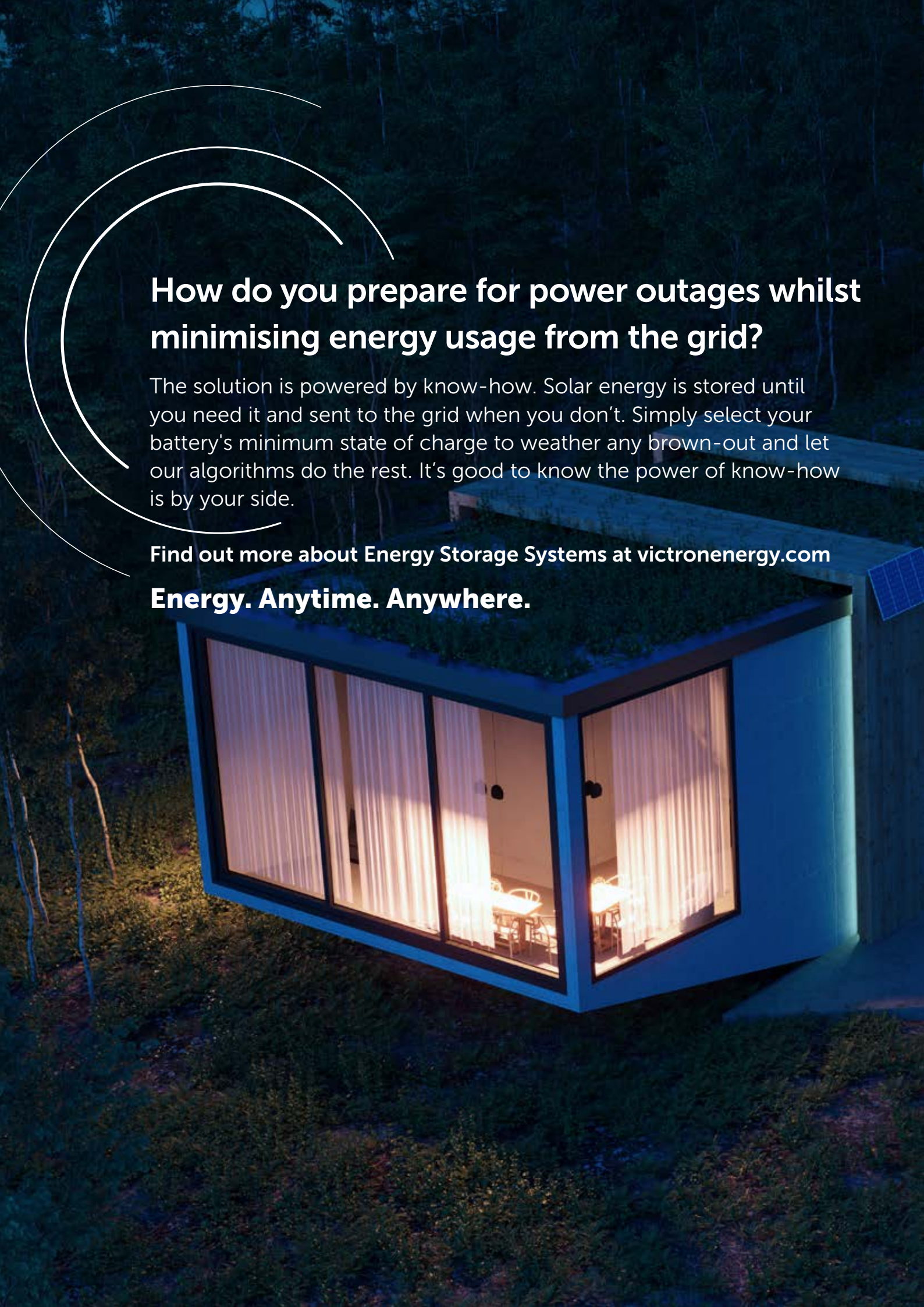
SmartSolar Control Display

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.



How do you prepare for power outages whilst minimising energy usage from the grid?

The solution is powered by know-how. Solar energy is stored until you need it and sent to the grid when you don't. Simply select your battery's minimum state of charge to weather any brown-out and let our algorithms do the rest. It's good to know the power of know-how is by your side.

Find out more about Energy Storage Systems at victronenergy.com

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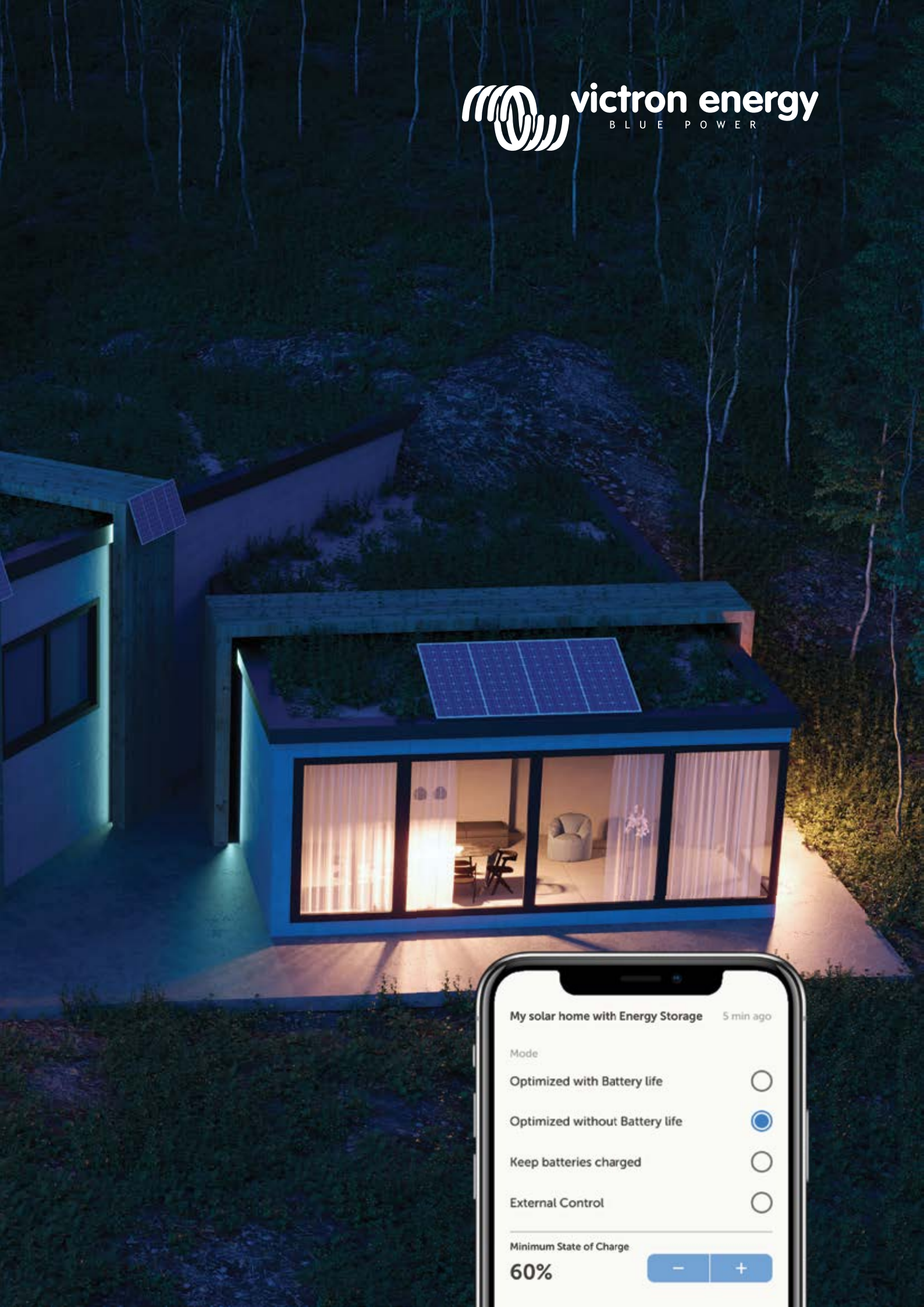


OFF-GRID & BACKUP SYSTEMS

Helpful system design resources

Victron Energy offers one of the largest product ranges in the market to cover almost every power challenge.
Admittedly, choosing the right system concept and products can be overwhelming. This brochure intends to assist with basics in systems design, covering a number of different system concepts and solutions for backup and off-grid.
Alternatively, check our helpful resources or feel free to discuss your ideas with a local Victron specialist.

Check our **Off-grid, Backup and Storage** market webpage to explore our deepdive with example calculations.

Product & design information

Our **product pages** on the website provide all necessary product information, such as product data sheets, product manuals, more system examples, enclosure drawings and certificates.

MPPT Calculator Excel sheet

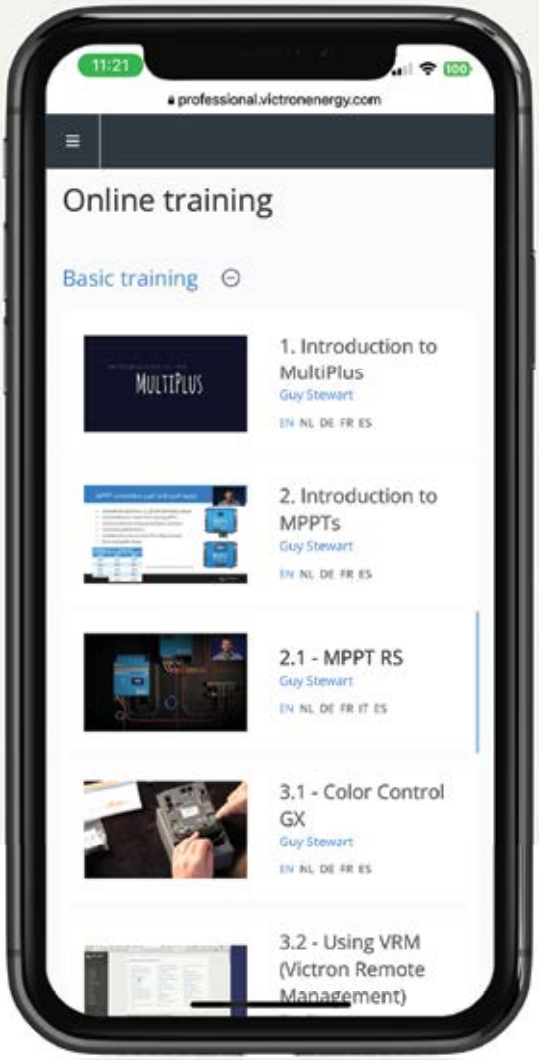
With the MPPT Calculator Excel sheet you can match solar modules to MPPT charge controllers. Download the MPPT Calculator - Victron Energy from our software page.

System examples booklet

Download our systems **examples booklet** for Off-grid, backup and storage applications with many different system design examples.

Energy Unlimited & Wiring Unlimited

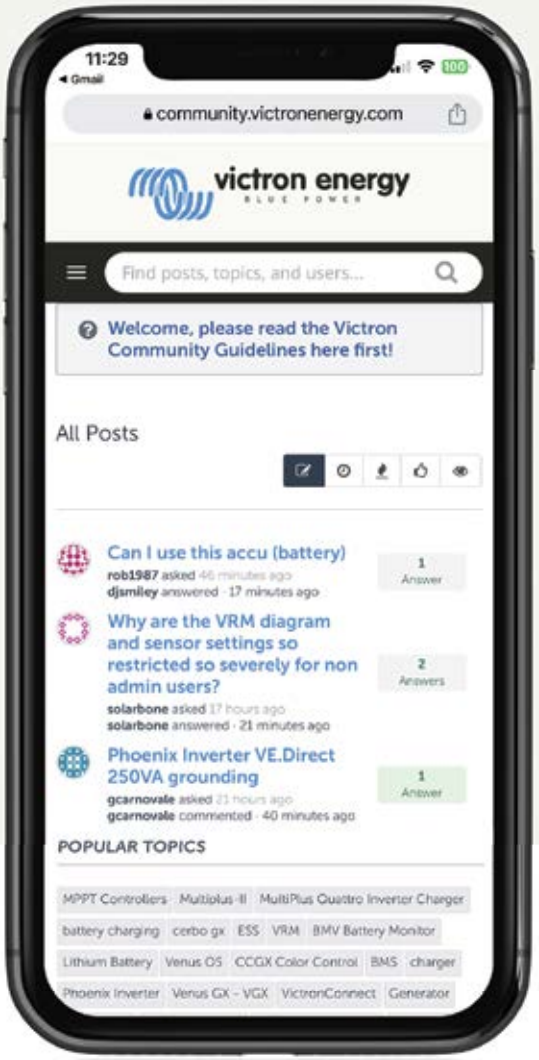
Understand the principles behind off-grid power systems and get your wiring right with Wiring Unlimited. Find a large variety of technical papers and example system schematics in the **download section**.



Victron Professional

Get updated with the latest developments and acces our large range of training courses. Succesful completion is rewarded with a certificate.

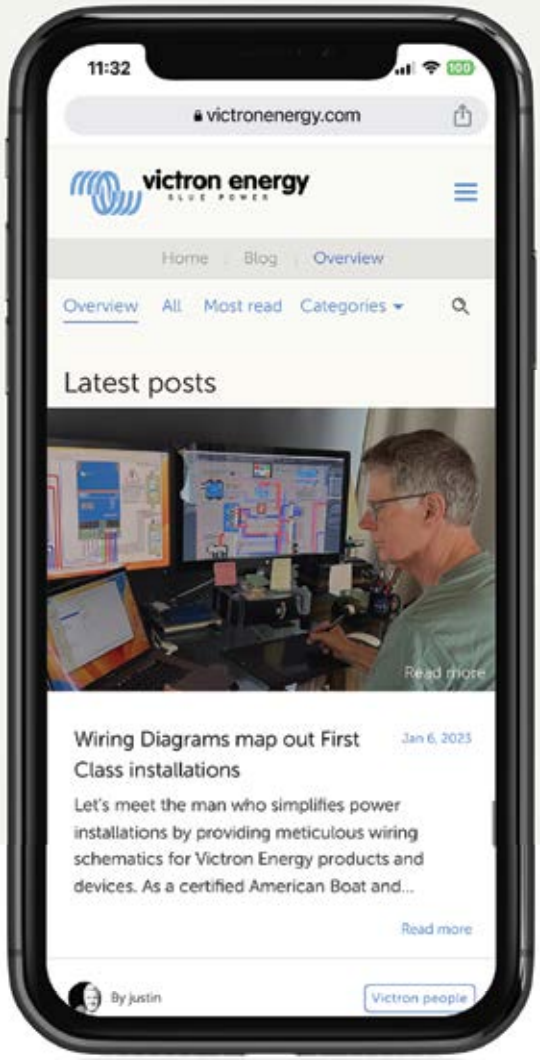
professional.victronenergy.com



Victron Community

Search in the knowledge base for questions and answers or ask our large and active community of experienced Victron users.

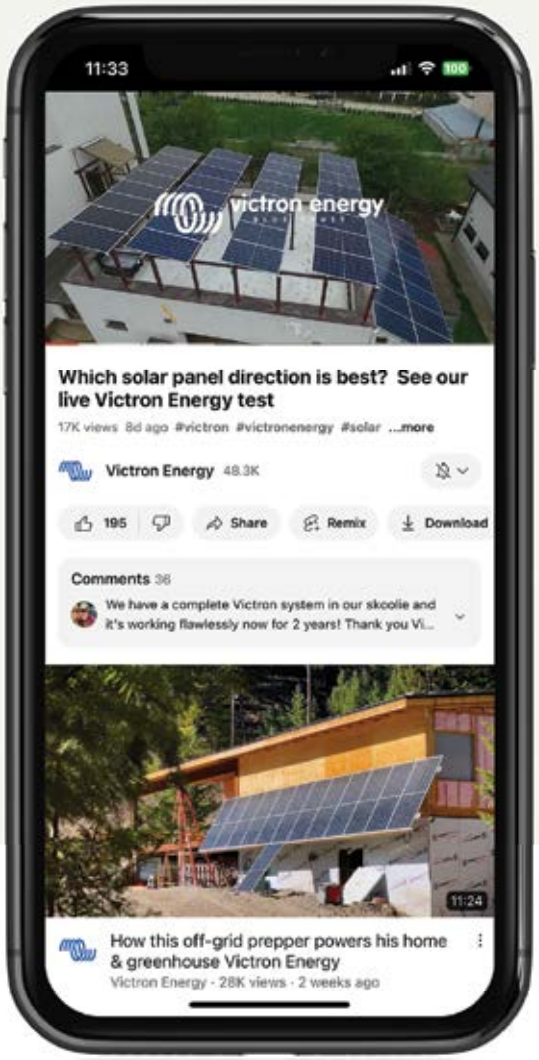
community.victronenergy.com



Victron Energy Blog

Follow interesting cases in great detail, learn about new products and new system design resources.

victronenergy.com/blog



YouTube

Follow our YouTube channel to see interesting case videos and field tests. Learn from instruction video's, Q&A sessions and new product introductions.

youtube.com/victronenergy

Note - for our latest datasheets please refer to our website: www.victronenergy.com

Technical information

EASYSOLAR 12V AND 24V, 1600VA

All-in-one solar power solution

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

The solar charge controller: Blue Solar MPPT 100/50

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

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

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

AC distribution

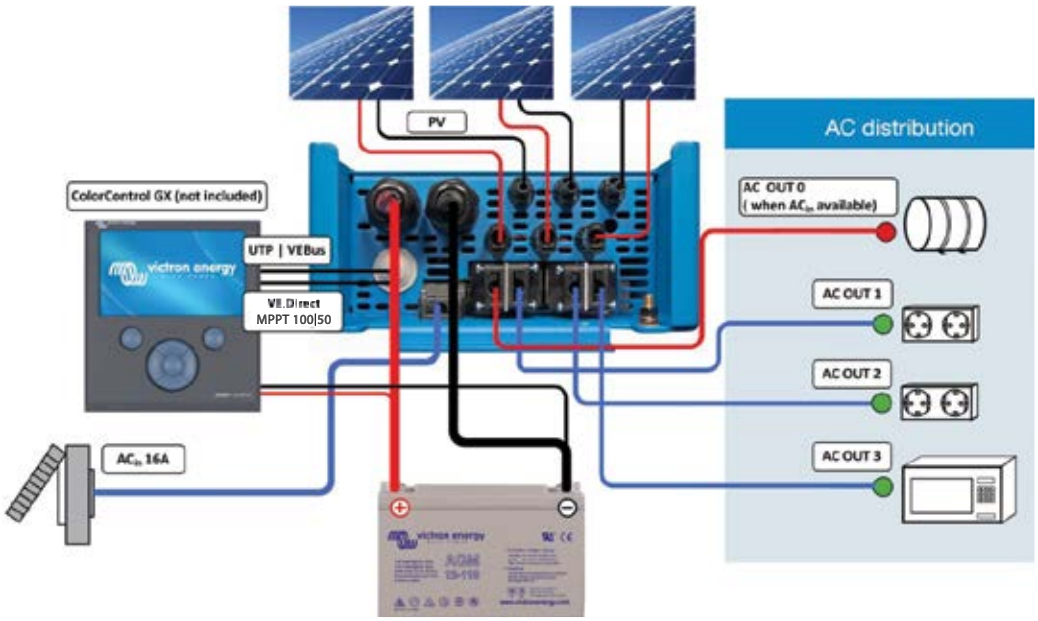
The AC distribution consists of a RCD (30 mA/16 A) and four AC outputs protected by two 10A and two 16A circuit breakers.
One 16A output is controlled by the AC input: it will switch on only when AC is available.

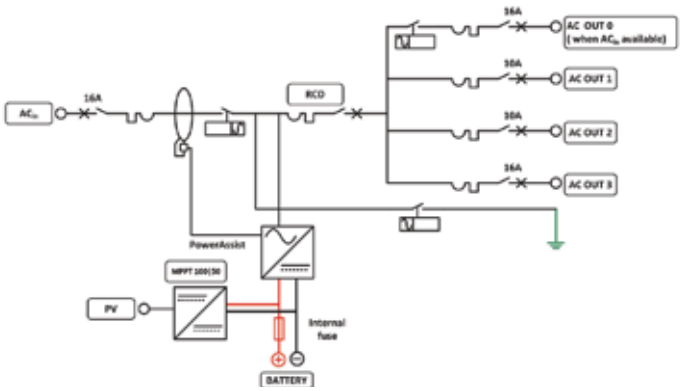
PowerAssist

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

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

3) Non-linear load, crest factor 3:1
4) At 25°C ambient
5) Programmable relay which can be set for general alarm, DC under voltage or genset start signal function
6a) If more PV power is connected, the controller will limit input power to 700W resp. 1400W
6b) PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V

EASYSOLAR-II GX

EasySolar-II GX 3 kVA

The all-in-one solar power solution

The Victron EasySolar-II GX integrates the following elements:

- A MultiPlus-II inverter/charger
- A SmartSolar MPPT -Tr solar charge controller
- A GX device with a 2 x 16-character display.

These elements come prewired together inside a single unit. This greatly simplifies most installations, saving time and money.

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.
In addition, Wi-Fi can be used to set up the system and to change settings.

Solar charge controller

The DC output of the SmartSolar MPPT is parallel wired with the DC connection of the MultiPlus-II inverter/charger.
The on/off mechanism of the MultiPlus-II also controls the SmartSolar MPPT.

GX device

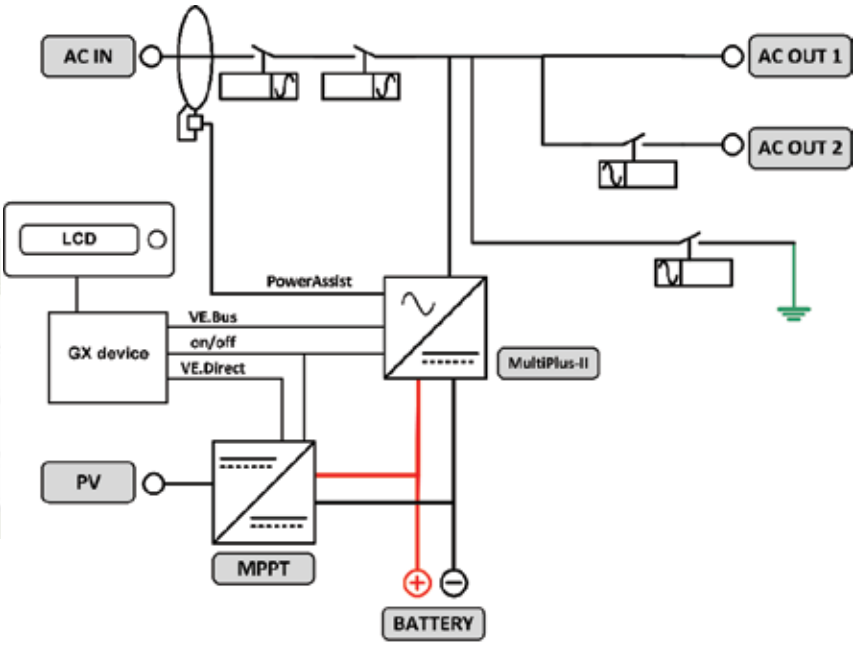
The integrated GX device includes:

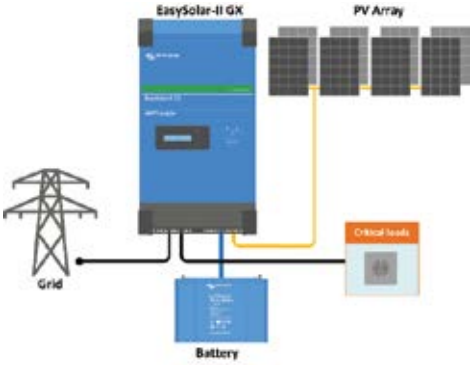
- A BMS-Can interface. This can be used to connect to a compatible CAN-bus managed battery. Note that this not a VE.Can compatible port.
- A USB port
- An Ethernet port
- A VE.Direct port

The GX device controls the MultiPlus-II and the SmartSolar MPPT with respectively a VE.Bus and a VE.Direct connection.

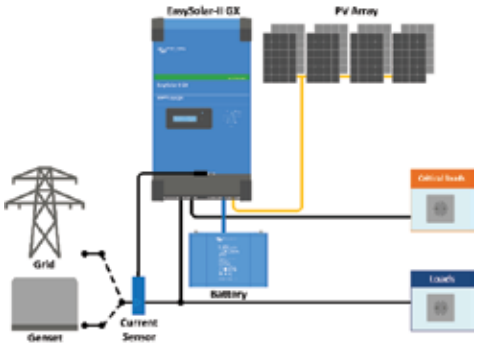
VRM app for Wi-Fi
Monitor and manage your Victron Energy system from your smart phone and tablet. Available for both iOS and Android.

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





Grid in-line topology
The EasySolar-II GX 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 EasySolar-II GX will disconnect the grid and continue to supply the loads.
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.



Grid parallel topology
The EasySolar-II GX 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 EasySolar-II GX will continue to supply the critical loads

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

Connection area

EasySolar-II	24/3000/70-32 MPPT 250/70 GX	48/3000/35-32 MPPT 250/70 GX	48/5000/70-50 MPPT 250/100 GX
INVERTER/CHARGER			
PowerControl & PowerAssist	Yes		
Transfer switch	32 A		50 A
Maximum AC input current	32 A		50 A
Auxiliary output	32 A		50 A
INVERTER			
Input voltage range	19 – 33 V	38 – 66 V	38 – 66 V
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % (1)		
Cont. output power at 25 °C (3)	3000 VA / 2400 W	3000 VA / 2400 W	5000 VA / 4000 W
Cont. output power at 40 °C / 55 °C	2200 W / 1700 W	2200 W / 1700 W	3700 W / 3000 W
Maximum apparent feed-in power	2470W / 3000 VA	2470W / 3000 VA	4400 W / 5000 VA
Peak power	5500 W	5500 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	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz		
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	70 A	35 A	70 A
Battery temperature sensor	Yes		
Programmable relay (5)	Yes		
Protection (2)	a - g		
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration		
General purpose com. port	Yes, 2x		
SMARTSOLAR CHARGE CONTROLLER			
Model	MPPT 250/70-Tr		MPPT 250/100-Tr
Maximum output current	70 A		100 A
Maximum PV power	2000 W	4000 W	5800 W
Maximum PV open circuit voltage	250 V		
Maximum efficiency	99%		
Self-consumption	20 mA		
Charge voltage 'absorption', default	57,6 V		
Charge voltage 'float', default	55,2 V		
Protection (2)	a – e		
GENERAL			
Interfaces	BMS-Can, USB, Ethernet, VE.Direct, Wi-Fi		
Remote on-off	Yes		
Operating temp. range	-20 to +45 °C (fan assisted cooling) Max. altitude 2000 m		
Humidity (non-condensing):	max 95 %		
ENCLOSURE			
Material & Colour	aluminium (blue RAL 5012)		
Protection category	IP21		
Battery-connection	M8 bolts		
PV connection	M6 bolts		
230 VAC-connection	Screw terminals 16 mm² (6 AWG)		
Weight	26 kg	26 kg	38.6 kg
Dimensions (h x w x d) mm	499 x 268 x 237		604 x 323 x 253
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2		
Emission / Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Anti-islanding	See our website		

1) Can be adjusted to 60 Hz
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

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

INVERTER SMART 1600VA - 5000VA

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 – 245 V
- 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

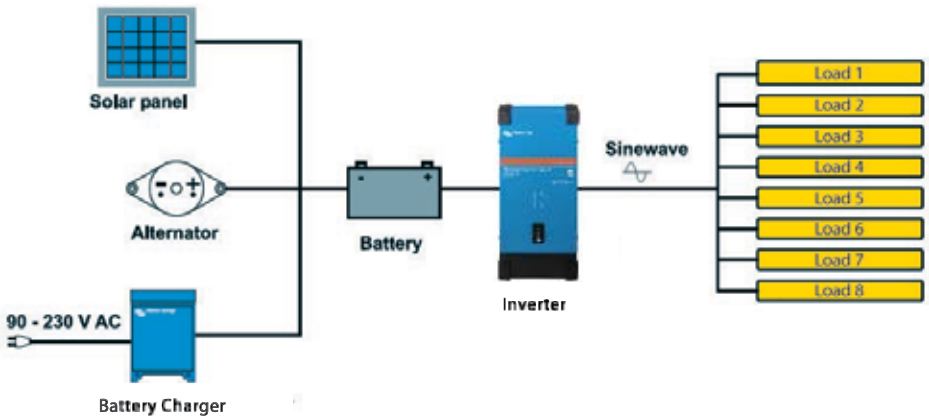
A remote on/off switch or relay contact can be connected to a two pole connector.
Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

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.



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	No			
INVERTER				
Input voltage range	9.3 – 17 V 18.6 – 34 V 37.2 – 68 V			
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)	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)	Yes			
Stop & start power ECO-mode	adjustable			
Protection (3)	a - g			
Bluetooth wireless communication	For remote monitoring and system integration			
VE.Direct communication port	For remote monitoring and system integration			
Remote on-off	Yes			
Common Characteristics	Operating temperature range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %			
ENCLOSURE				
Common Characteristics	Material & Colour: steel (blue RAL 5012; and black RAL 9017) Protection category: 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 VAC-connection	Screw terminals			
Weight	12 kg	13 kg	19 kg	29 kg / 28 kg
Dimensions (hxwxd)	485 x 219 x 125 mm	485 x 219 x 125 mm	533 x 285 x 150 mm (12 V) 485 x 285 x 150 mm (24 V/48 V)	595 x 295 x 160 mm (24 V) 555 x 295 x 160 mm (48 V)
STANDARDS				
Safety	EN 60335-1			
Emission Immunity	EN 55014-1 / EN 55014-2/ EN-IEC 61000-6-1 / EN-IEC 61000-6-2 / EN-IEC 61000-6-3			
Automotive Directive	ECE R10-5			

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

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 VAC on inverter output
g) input voltage ripple too high

Inverter Control
This panel is intended for remote on/off control of all Inverters Smart units.

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.

INVERTERS VE.DIRECT 250VA - 1200VA 230V AND 120V

Inverter 12/375 VE.Direct

Inverter 12/375 VE.Direct

VE.Direct communication port

The VE.Direct port can be connected to:

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

Fully configurable:

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

Monitoring:

- In- and output voltage, % load and alarms

Proven reliability

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

High start-up power

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

ECO mode

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

Remote on/off

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

LED diagnosis

Please see manual for a description.

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

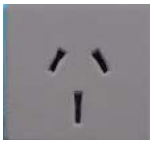
For our low power inverters, we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption.

Available with different output sockets

Schuko

UK

AU/NZS



IEC-320
(male plug included)

Nema 5-15R

GFCI

DC connection with screw terminals

No special tools needed for installation

Inverter	12 Volt 24 Volt 48 Volt	12/250 24/250 48/250	12/375 24/375 48/375	12/500 24/500 48/500	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. power at 25°C (1)		250VA	375VA	500VA	800VA	1200VA
Cont. power at 25°C / 40°C		200 / 175W	300 / 260W	400 / 350W	650 / 560W	1000 / 850W
Peak power		400W	700W	900W	1500W	2200W
Output AC voltage / frequency (adjustable)		230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0,1%				
Input voltage range		9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V				
DC low shut down (adjustable)		9,3 / 18,6 / 37,2V				
Dynamic (load dependent) DC low shut down (fully configurable)		Dynamic cut-off, see https://www.victronenergy.com/live/ve.direct:phoenix-inverters-dynamic-cutoff				
DC low restart and alarm (adjustable)		10,9 / 21,8 / 43,6V				
Battery charged detect (adjustable)		14,0 / 28,0 / 56,0V				
Max. efficiency		87 / 88 / 88%	89 / 89 / 90%	90 / 90 / 91%	90 / 90 / 91%	91 / 91 / 92%
Zero-load power		4,2 / 5,2 / 7,9W	5,6 / 6,1 / 8,5W	6 / 6,5 / 9W	6,5 / 7 / 9,5W	7 / 8 / 10W
Default zero-load power in ECO mode (default retry interval: 2,5 s, adjustable)		0,8 / 1,3 / 2,5W	0,9 / 1,4 / 2,6W	1 / 1,5 / 3,0W	1 / 1,5 / 3,0W	1 / 1,5 / 3,0W
ECO mode stop and start power setting		Adjustable				
Protection (2)		a - f				
Operating temperature range		-40 to +65°C (fan assisted cooling) Derate 1,25% per °C above 40°C				
Humidity (non-condensing)		max 95%				
ENCLOSURE						
Material & Colour		Steel chassis and plastic cover (blue Ral 5012)				
Battery-connection		Screw terminals				
Maximum cable cross-section		10mm² / AWG8	10mm² / AWG8	10mm² / AWG8	25 / 10 / 10mm² / AWG4 / 8 / 8	35 / 25 / 25mm² / AWG2 / 4 / 4
Standard AC outlets		230V: Schuko (CEE 7/4), IEC-320 (male plug included) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema 5-15R, 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 120V Nema GFCI 85 x 182 x 255 3,3 x 7.2 x 10.2	86 x 165 x 260 3.4 x 6.5 x 10.2 120V Nema GFCI 85 x 182 x 260 3.3 x 7.2 x 10.2	86 x 172 x 275 3,4 x 6,8 x 10,8 120V Nema GFCI 85 x 182 x 274 3.3 x 7.2 x 10.8	105 x 216 x 305 4.1 x 8.5 x 12.1 (12V model: 105 x 230 x 325 4.1 x 9 x 12.8)	117 x 232 x 327 4.6 x 9.1 x 12.9 (12V model: 117 x 232 x 362 4.6 x 9.1 x 14.2)
ACCESSORIES						
Remote on-off		Yes				
Automatic transfer switch		Filax				
STANDARDS						
Safety		EN-IEC 60335-1 / EN-IEC 62109-1 / UL 458 (3)				
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

3) UL 458 only for inverters with GFCI output socket

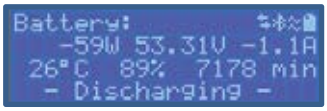
Battery Alarm
An excessively high or low battery voltage is indicated by an audible and visual alarm, and a relay for remote signalling.

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

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

INVERTER RS 48/6000 SMART

Inverter RS Smart 48/6000



Configure and monitor with VictronConnect
A built-in Smart Bluetooth connection allows for quick monitoring or settings adjustment of the Inverter RS.

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

Display and Bluetooth
The display reads battery and inverter 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
VE.Can connection to a GX device for system monitoring, data logging, and remote firmware updates. VE.Direct connection to a GlobalLink 520 for remote data monitoring.

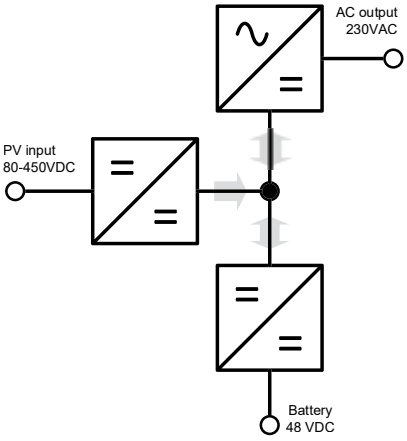
I/O Connections
Programmable Relay, temperature sensor and voltage sensor connections. The remote input can also be configured to accept the Victron smallBMS.

Inverter RS Smart	48/6000
INVERTER	
DC Input voltage range	38 – 62 V [4]
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0.1 % [1] Maximum continuous inverter current: 25 Aac
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	4500 W
Continuous output power at 65 °C	3000 W
Peak power	9 kW for 3 seconds 7 kW for 4 minutes
Short-circuit output current	50 A
Maximum efficiency	96.5 % at 1 kW load 94 % at 5 kW load
Zero load power	20 W
CHARGER	
Programmable Charger voltage range (VDC)	36 – 60 V
Charge voltage 'absorption' (VDC)	Default setting: 57,6 V (adjustable)
Charge voltage 'float' (VDC)	Default setting: 55,2 V (adjustable)
Maximum AC coupled solar charging power	5000 W [5]
Maximum charge current	88 A @ 57.6V
Battery temperature sensor	Included
Battery voltage sense	Yes
GENERAL	
Parallel and 3-phase operation	12 parallel units supported, 3 phase supports 4 units per phase
Programmable relay [3]	Yes
Protection [2]	a - g
Data Communications	VE.Direct port, VE.Can port & Bluetooth
Bluetooth frequency & power	2402 – 2480 MHz, 4dBm
General purpose analogue/digital in port	Yes, 2x
Remote on-off	Yes
Operating temperature range	-40 to +65 °C (fan assisted cooling)
Maximum altitude	2000 m
Humidity (non-condensing)	max 95 %
ENCLOSURE	
Material & Colour	steel, blue RAL 5012
Protection category	IP21
Battery-connection	M8 bolts
230 VAC-connection	Screw terminals 10 mm² (6 AWG)
Weight	11 kg
Dimensions (hxwxd)	425 x 440 x 125 mm
STANDARDS	
Safety	EN-IEC 60335-1, EN-IEC 62109-1, EN-IEC 62109-2
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3

1) Can be adjusted to 60 Hz.
2) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low e) temperature too high f) 230 VAC on inverter output g) Solar earth leakage.
3) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. DC rating: 4A up to 35 VDC and 1 A up to 70 VDC.
4) Minimum start-up voltage is 41 V. Inverter shutdown can be set as low as 32 VDC, but may shut down on low AC output voltage (due to load). Over-voltage disconnect is 65.5 V.
5) AC coupled solar charging requires an external PV inverter to be connected on a circuit at the AC output of the Inverter RS.

INVERTER RS 48/6000 SMART SOLAR

Inverter RS Smart Solar 48/6000



Inside the Inverter RS 48V 6000VA

Off-Grid solar inverter

The Inverter RS Smart Solar 48/6000 is a 48 V 6 kVA Inverter with 450 VDC 4 kWp 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

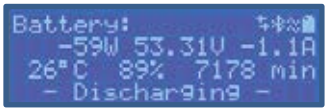
65 – 450 VDC, with a 120 VDC PV startup voltage.

Light weight, efficient and quiet

Thanks to high frequency technology and a new design this powerful inverter weighs only 11 kg. 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

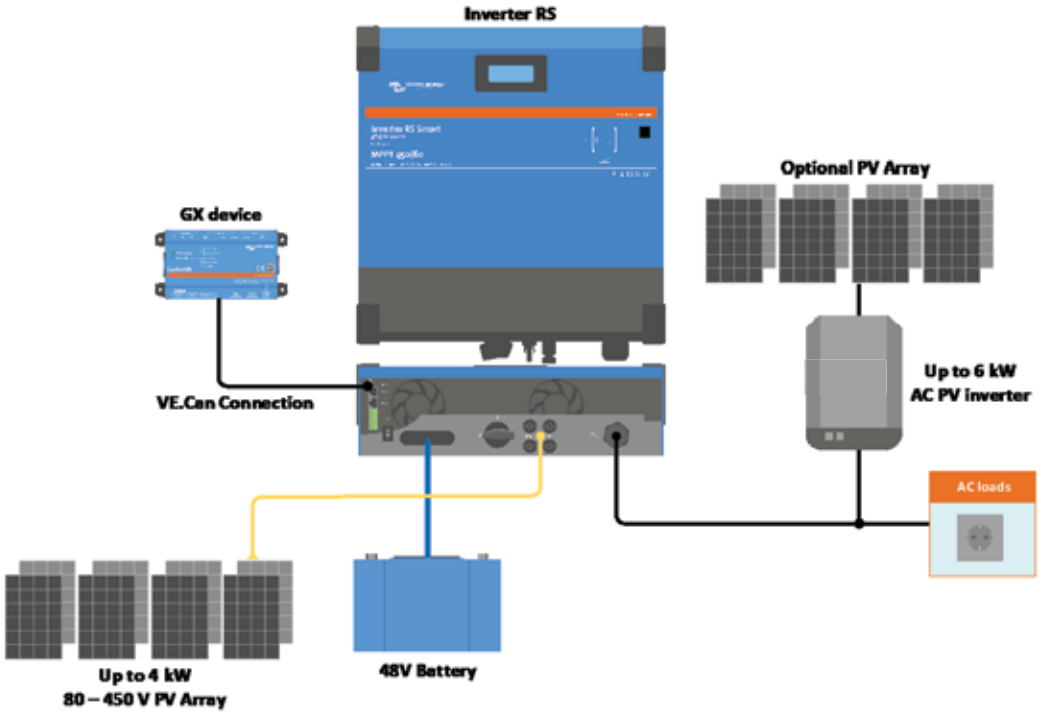
VE.Can connection to a GX device for system monitoring, data logging, and remote firmware updates.
VE.Direct connection to a GlobalLink 520 for remote data monitoring.

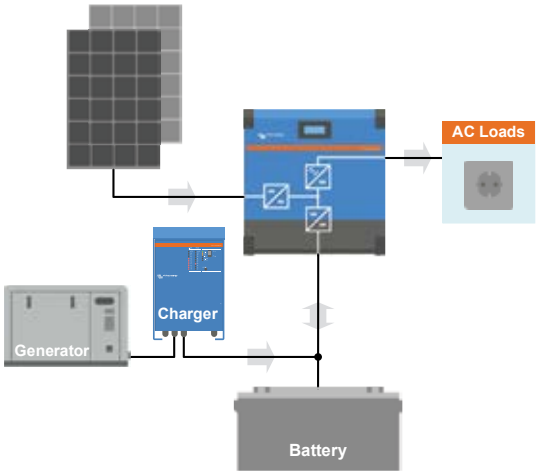
Built in PV isolator

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 smallBMS.





System example with generator
Add a generator and external battery charger if additional power is needed.

VRM Portal
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 – 62 V [6]
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0.1 % [1] Maximum continuous inverter current: 25 Aac
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	4500 W
Continuous output power at 65 °C	3000 W
Peak power	9 kW for 3 seconds 7 kW for 4 minutes
Short-circuit output current	45 A
Maximum efficiency	96.5 % at 1 kW load 94 % at 5 kW load
Zero load power	20 W
Low Battery shutdown	37.2 V (adjustable)
Low Battery restart	43.6 V (adjustable)
SOLAR	
Maximum DC voltage	450 V
Nominal DC voltage	300 V
Start-up voltage	120 V
MPPT operating voltage range	65 – 450 V [5]
Max operational PV input current	18 A [4]
Max PV Short circuit current reverse polarity protection	20 A
Maximum DC solar charging power	4000 W
Max PV short circuit current (Isc PV)	30 A
Earth leakage trip level	30 mA
Isolation fail level (detection before start-up)	100 kΩ
CHARGER	
Programmable Charger voltage range (VDC)	36 – 60 V [7]
Charge voltage 'absorption' (VDC)	Default setting: 57,6 V (adjustable)
Charge voltage 'float' (VDC)	Default setting: 55,2 V (adjustable)
Maximum AC coupled solar charging power [9]	5000 W
Maximum combined charger current	100 A [8]
Battery temperature sensor	Included
Battery voltage sense	Yes
GENERAL	
Parallel and 3-phase operation	12 parallel units supported, 3 phase supports 4 units per phase
Programmable relay [3]	Yes
Protection [2]	a - g
Data Communications Ports	VE.Direct port and VE.Can port (**)
Bluetooth frequency	2402 – 2480 MHz
Bluetooth power	4dBm
General purpose analogue/digital in port	Yes, 2x
Remote on-off	Yes
Operating temperature range	-40 to +65 °C (fan assisted cooling)
Maximum altitude	2000 m
Humidity (non-condensing)	max 95 %
ENCLOSURE	
Material & Colour	steel, blue RAL 5012
Protection category	IP21 Protective Class: I
Battery-connection	M8 bolts
230 VAC-connection	Screw terminals 10 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
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, Pollution degree 2

1) Can be adjusted to 60 Hz.
2) Protection key: a) output short circuit b) overload c) battery voltage too high d) battery voltage too low e) temperature too high f) 230 VAC on inverter output g) Solar earth leakage.
3) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. DC rating: 4 A up to 35 VDC and 1 A up to 70 VDC.
4) Normal operation is regulated to 18 A, with maximum reverse polarity protection 20 A.
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 400 V maximum PV array – see product manual for further information.
6) Minimum start-up voltage is 41 V. Inverter shutdown can be set as low as 32 VDC, but may shut down on low AC output voltage (due to load). Over-voltage disconnect is 65.5 V.
7) The Charger set-point (float and absorption) can be set to max 60 V. The output voltage at the charger terminals can be higher, due to temperature compensation as well as compensation for voltage drop over the battery cables. The maximum output current is reduced on a linear basis from full current at 60 V to 5 A at 62 V. The equalization voltage can be set to max 62 V, the equalization current percentage can be set to max 6 %.
8) Maximum charging current from AC and DC sources varies with AC and DC voltages. See product manual for more detailed limitation specifications due to these variables.
9) AC coupled solar charging requires an external PV inverter to be connected on a circuit at the AC output of the Inverter RS Solar.
** Note only the VE.Can port can be used for connection to a GX device. The VE.Direct port supports the GlobalLink 520.

MULTIPLUS INVERTER/CHARGER 500VA - 2000VA 230V

MultiPlus
500 / 800 / 1200 / 1600 VA

MultiPlus 2000 VA
(bottom cover removed)

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.

Parallel operation and three phase capability

Up to six Multis can operate in parallel to achieve higher power output.
In addition to parallel connection, three units can be configured for three-phase output.

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

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 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.

High start-up power

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

Search Mode

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

Programmable relay

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

Remote on / off / charger on

Three pole connector.

On-site system configuring, monitoring and control

After installation, the MultiPlus is ready to go.
Some settings can be changed with DIP switches.
500/800/1200 VA models: remote switch / battery charge voltage / inverter frequency / search mode.
1600/2000 VA models: battery charge voltage / search mode.
For more settings use VE-Config or the VE.Bus Smart dongle.

Remote configuring and monitoring

Install a Cerbo 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.

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and 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 or push notification.

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

12 Volt 24 Volt 48 Volt	MultiPlus 12/500/20 MultiPlus 24/500/10 MultiPlus 48/500/6	MultiPlus 12/800/35 MultiPlus 24/800/16 MultiPlus 48/800/9	MultiPlus 12/1200/50 MultiPlus 24/1200/25 MultiPlus 48/1200/13	MultiPlus 12/1600/70 MultiPlus 24/1600/40 MultiPlus 48/1600/20	MultiPlus 12/2000/80 MultiPlus 24/2000/50 MultiPlus 48/2000/25
PowerControl / PowerAssist	No	Yes	Yes	Yes	Yes
Three Phase and parallel operation	Yes	Yes	Yes	Yes	Yes
Transfer switch	16 A	16 A	16 A	16 A	35 A
INVERTER					
Input voltage range	9,5 – 17 V 19 – 33 V 38– 66 V				
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % [1]				
Cont. output power at 25 °C [3]	500 VA	800 VA	1200 VA	1600 VA	2000 VA
Cont. output power at 25 °C	430 W	700 W	1000 W	1300 W	1600 W
Cont. output power at 40 °C	400 W	650 W	900 W	1100 W	1400 W
Cont. output power at 65 °C	300 W	400 W	600 W	800 W	1000 W
Peak power	900 W	1600 W	2400 W	2800 W	3500 W
Maximum efficiency	90 / 91 / 92 %	92 / 93 / 94 %	93 / 94 / 95 %	93 / 94 / 95 %	93 / 94 / 95 %
Zero-load power	6 / 6 / 7 W	7 / 7 / 8 W	10 / 9 / 10 W	10 / 9 / 10 W	10 / 9 / 10 W
Zero-load power in search mode	2 / 2 / 3 W	2 / 2 / 3 W	3 / 3 / 3 W	3 / 3 / 3 W	3 / 3 / 3 W
CHARGER					
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz				
Charge voltage 'absorption'	14,4 / 28,8 / 57,6 V				
Charge voltage 'float'	13,8 / 27,6 / 55,2 V				
Storage mode	13,2 / 26,4 /52,8 V				
Charge current house battery [4]	20 / 10 / 6 A	35 / 16 / 9 A	50 / 25 / 13 A	70 / 40 / 20 A	80 / 50/ 25 A
Charge current starter battery	1 A (12 V and 24 V models only)				
Battery temperature sensor	Yes				
GENERAL					
Programmable relay [5]	Yes				
Protection [2]	a – g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration (RJ45-spliter ASS030065510 needed for 500 / 800 / 1200 VA models)				
Remote on-off	On/off/charger only			On/off	
DIP switches	Yes [6]	Yes [6]	Yes [6]	Yes [7]	Yes [7]
Internal DC fuse	125 / 60 /30 A	150 / 80 / 40 A	200 / 100 / 50 A	200 / 125 / 60 A	no
Common Characteristics	Operating temp. range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %				
ENCLOSURE					
Common Characteristics	Material & Colour: Steel/ABS (blue RAL 5012) Protection category: IP 21				Steel (RAL 5012), IP22
Battery-connection	16 / 10 / 10 mm²	25 / 16 / 10 mm²	35 / 25 / 10 mm²	50 / 35 / 16 mm²	M8 bolts
230 VAC-connection	G-ST18i connector				Screw
Weight	4,4 kg	6,4 kg	8,2 kg	10,2 kg	15,5 kg
Dimensions (h x w x d)	311 x 182 x 100 mm	360 x 240 x 100 mm	406 x 250 x 100 mm	470 x 265 x 120 mm	506 x 236 x 147 mm
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN 62109-1				
Emission Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Automotive Directive	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. 230 VAC on inverter output
g. Input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 25 °C ambient
5) Programmable relay which can be set for:
general alarm, DC under voltage or generator start/stop signal function
AC rating: 230 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
6) Remote / battery charge voltage / inverter frequency / search mode
7) Battery charge voltage / search mode

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

MULTIPLUS INVERTER/CHARGER 800VA - 5kVA 230V

MultiPlus Compact
12/2000/80

MultiPlus
24/3000/70

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).

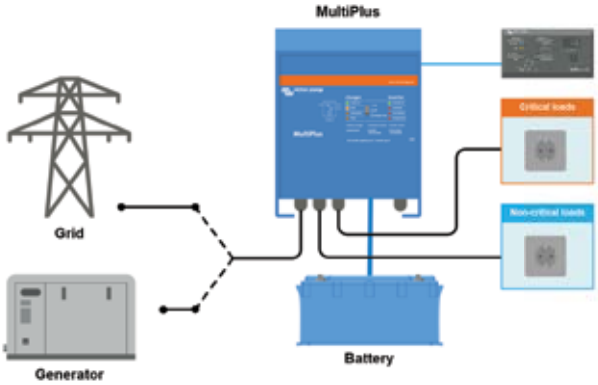
Remote Monitoring and control
Color Control GX or other GX devices.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

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.

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and 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 or push notification.

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



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 considered by the PowerControl and PowerAssist function in order to limit AC input current to a safe value when AC power is available.

MultiPlus 12 Volt 24 Volt 48 Volt	C 12/800/35 C 24/ 800/16	C 12/1200/50 C 24/1200/25	C 12/1600/70 C 24/1600/40	C 12/2000/80 C 24/2000/50	12/3000/120 24/3000/70 48/3000/35	24/5000/120 48/5000/70
Nominal Battery voltage	12 V battery 24 V battery	12 V battery 24 V battery	12 V battery 24 V battery	12 V battery 24 V battery	12 V battery 24 V battery 48 V battery	24 V battery 48 V battery
PowerControl	Yes	Yes	Yes	Yes	Yes	Yes
PowerAssist	Yes	Yes	Yes	Yes	Yes	Yes
AC input	Input voltage range: 187-250 V Input frequency: 50/60 Hz Cos Φ >0.8					
Transfer switch (A)	16	16	16	30	16 or 50	100
INVERTER						
Input voltage range (VDC)	9,5 – 17 V 19 – 33 V 38 – 66 V					
Input current (A DC)	n. a.	n. a.	n. a.	n. a.	250 / 125 / 65	238 / 118
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % [1]					
Cont. output power at 25 °C (VA) [3]	800	1200	1600	2000	3000	5000
Cont. output power at 25 °C (W)	700	1000	1300	1600	2400	4000
Cont. output power at 40 °C (W)	650	900	1200	1400	2200	3700
Cont. output power at 65 °C (W)	400	600	800	1000	1700	3000
Peak power (W)	1600	2400	3000	4000	6000	10.000
Maximum continuous Output current (A~)	n. a.	n. a.	n. a.	n. a.	11	19
Power factor range	n. a.	n. a.	n. a.	n. a.	±0.8	±0.8
Maximum output fault current	n. a.	n. a.	n. a.	n. a.	32A peak 1 sec.	53A peak 1sec
Maximum efficiency (%)	92 / 94	93 / 94	93 / 94	93 / 94	93 / 94 / 95	94 / 95
Zero load power (W)	8 / 10	8 / 10	8 / 10	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
CHARGER						
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1					
Charge voltage 'absorption' (VDC)	14,4 / 28,8 / 57,6					
Charge voltage 'float' (VDC)	13,8 / 27,6 / 55,2					
Storage mode (VDC)	13,2 / 26,4 / 52,8					
Charge current house battery (A) [4]	35 / 16	50 / 25	70 / 40	80 / 50	120 / 70 / 35	120 / 70
Charge current starter battery (A)	4 (12 V and 24 V models only)					
Battery temperature sensor	yes					
GENERAL						
Auxiliary output [5]	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
Programmable relay [6]	Yes					
Protection [2]	a - g					
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration					
General purpose com. port	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	Yes					
Common Characteristics	Operating temp. range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %					
Maximum altitude	2000 m.					
ENCLOSURE						
Common Characteristics	Material & Colour: aluminium (blue RAL 5012), Protection category: IP20, pollution degree 2, OVCIII Icw: 6kA 30mS					
Battery-connection	battery cables of 1.5 meter			M8 bolts	Four M8 bolts (2 plus and 2 minus connections)	
230 VAC-connection	G-ST18i connector			Spring-clamp	Screw terminals 13 mm² (6 AWG)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375 x 214 x 110			520 x 255 x 125	362 x 258 x 218	444 x 328 x 240
STANDARDS						
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, IEC 62109-1					
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3					
Road vehicles	12 V and 24 V 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) Up to 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
7) A.o. to communicate with a Lithium-Ion battery BMS

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

MULTIPLUS INVERTER/CHARGER 2kVA AND 3kVA 120V

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

VRM Portal and app
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 or push notification.

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 3 kVA 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 15 kW / 18 kVA 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.

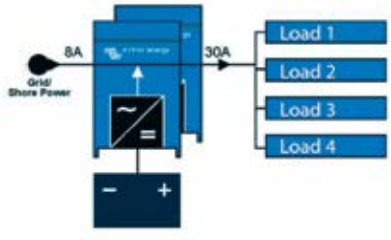
Split phase options
Two units can be stacked to provide 120-0-120 V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30 kW / 36 kVA of split phase power.
Alternatively, a split phase AC source can be obtained by connecting our autotransformer (see data sheet 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.

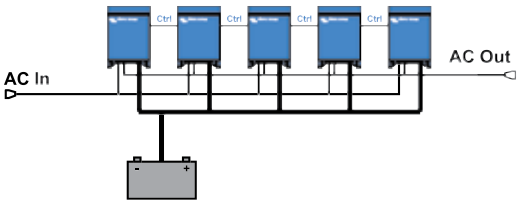
PowerAssist - Boosting the capacity of shore or generator power
This feature takes the principle of PowerControl to a further dimension. It allows the MultiPlus to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the MultiPlus will make 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 Charger datasheet and on our website, under Technical Information. In addition to this, the MultiPlus will charge a second battery using an independent trickle charge output intended for a main engine or generator starter battery.

System configuring has never been easier
After installation, the MultiPlus is ready to go.
If settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure. Even parallel and 3-phase operation can be programmed with DIP switches: no computer needed!
Alternatively, VE.Net can be used instead of the DIP switches.
And sophisticated software (VE.Bus Quick Configure and VE.Bus System Configurator) is available to configure several new, advanced, features.



PowerAssist with 2x MultiPlus in parallel



Five parallel units: output power 12,5 kW

MultiPlus	12 Volt 24 Volt	12/2000/80 24/2000/50	12/3000/120 24/3000/70
PowerControl		Yes	
PowerAssist		Yes	
Transfer switch (A)		50	
Parallel and 3-phase operation		Yes	
INVERTER			
Input voltage range (VDC)		9,5 – 17 V	19 – 33 V
Output		Output voltage: 120 VAC ± 2 %	Frequency: 60 Hz ± 0,1 % [1]
Cont. output power at 25 °C / 77 °F (VA) [3]		2000	3000
Cont. output power at 25 °C / 77 °F (W)		1600	2400
Cont. output power at 40 °C / 104 °F (W)		1450	2200
Cont. output power at 65 °C / 150 °F (W)		1100	1700
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero load power (W)		9 / 11	20 / 20
Zero load power in AES mode (W)		7 / 8	15 / 15
Zero load power in Search mode (W)		3 / 4	8 / 10
CHARGER			
AC Input		Input voltage range: 95-140 VAC	Input frequency: 45 – 65 Hz Power factor: 1
Charge voltage 'absorption' (VDC)		14,4 / 28,8	
Charge voltage 'float' (VDC)		13,8 / 27,6	
Storage mode (VDC)		13,2 / 26,4	
Charge current house battery (A) [4]		80 / 50	120 / 70
Charge current starter battery (A)		4	
Battery temperature sensor		yes	
GENERAL			
Auxiliary output [5]		n. a.	Yes (32 A)
Programmable relay [6]		Yes (1x)	Yes (3x)
Protection [2]		a - g	
VE.Bus communication port		For parallel and three phase operation, remote monitoring and system integration	
General purpose com. port [7]		n. a.	Yes (2x)
Remote on-off		Yes	
Common Characteristics		Operating temp. range: -40 - +65 °C / -40 to 150 °F (fan assisted cooling)	Humidity (non-condensing): max 95%
ENCLOSURE			
Common Characteristics		Material & Colour: aluminium (blue RAL 5012)	Protection category: IP 21
Battery-connection		M8 bolts	M8 bolts (2 plus and 2 minus connections)
120 V AC-connection		Screw-terminal 6 AWG (13 mm^2)	Screw-terminal 6 AWG (13mm^2)
Weight		13 kg 25 lbs.	19kg 40 lbs.
Dimensions (hxwxd in mm and inches)		520x255x125 mm 20.5x10.0x5.0 inch	362x258x218 mm 14.3x10.2x8.6 inch
STANDARDS			
Safety		UL 458, EN-IEC 60335-1, EN-IEC 60335-2-29	UL 1741, UL 458, EN-IEC 60335-1, EN-IEC 60335-2-29
Emission and Immunity		EN-IEC 61000-3-2/3-3/, EN-IEC 61000-6-1/6-2/6-3	EN-IEC 61000-3-2/3-3/, EN-IEC 61000-6-1/6-2/6-3

1) Can be adjusted to 50 HZ;
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 120 VAC on inverter output
g) input voltage ripple too high
3) Non-linear load, crest factor 3:1
4) Up to 75 °F ambient
5) Switches off when no external AC source available
6) Programmable relay that can a.o. be set for general alarm,
DC under voltage or genset start/stop function
AC rating: 120 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
7) A.o. to communicate with a Lithium Ion battery BMS

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

MULTIPLUS-II INVERTER/CHARGER

Connection Area
MultiPlus-II 3k

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 50 A resp. 100 A.
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

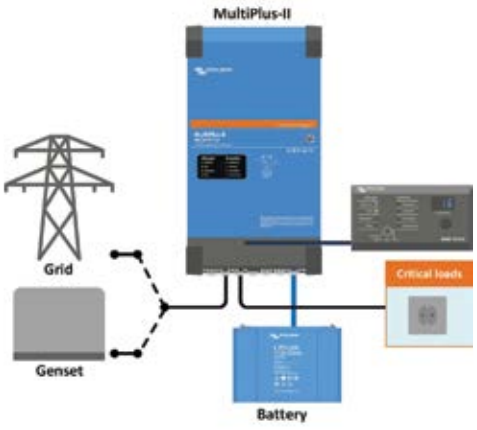
Up to 6 Multis can operate in parallel to achieve higher power output. Six 48/5000/70 units, for example, will provide 25 kW / 30 kVA output power with 420 Amps charging capacity.
In addition to parallel connection, three units of the same model can be configured for three phase output. But that's not 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.
The MultiPlus-II 8k, 10k, and 15k models can only be connected in parallel if an external AC transfer switch is used. For more information see the MultiPlus-II External Transfer Switch application manual.

On-site system configuring, monitoring and control

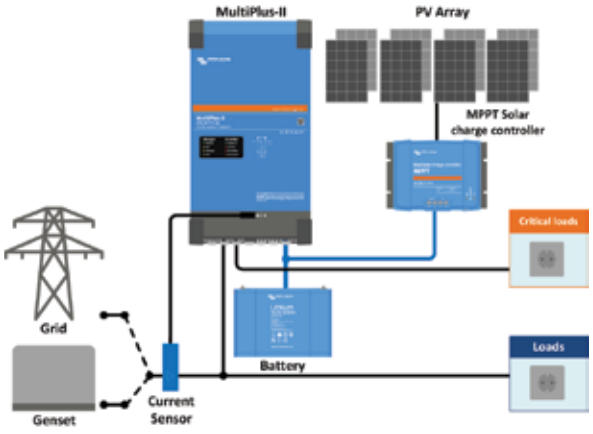
Settings can be changed in a matter of minutes with VEConfigure software (computer or laptop and MK3-USB interface needed).
Several monitoring and control options are available: Cerbo GX, Color Control GX, Venus GX, Octo GX, CANvu GX, laptop, computer, Bluetooth (with the optional VE.Bus Smart dongle), Battery Monitor, Digital Multi Control Panel.

Remote configuring and monitoring

Install a Cerbo 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

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

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

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

MultiPlus-II 230V	12/3000/120-32 24/3000/70-32 48/3000/35-32	12/5000/220-50 24/5000/120-50 48/5000/70-50	48/8000/ 110-100	48/10000/ 140-100	48/15000/ 200-100
PowerControl & PowerAssist	Yes				
Transfer switch	32 A	50 A	100 A	100 A	100 A
Maximum AC input current	32 A	50 A	100 A	100 A	100 A
INVERTER					
DC Input voltage range	12 V - 9,5–17 V	24 V - 19–33 V	48 V – 38-66 V		
Output	Output voltage: 230 VAC ± 2 %	Frequency: 50 Hz ± 0,1 % (1)			
Cont. output power at 25 °C (3)	3000 VA	5000 VA	8000 VA	10000 VA	15000 VA
Cont. output power at 25 °C	2400 W	4000 W	6400 W	8000 W	12000 W
Cont. output power at 40 °C	2200 W	3700 W	5500 W	7000 W	10000 W
Cont. output power at 65 °C	1700 W	3000 W	4000 W	6000 W	7000 W
Max apparent feed-in power	3000 VA	5000 VA	8000 VA	10000 VA	15000 VA
Peak power	5500 W	9000 W	15000 W	18000 W	27000 W
Maximum efficiency	93%/94%/95%	95%96%/96%	95%	96%	95%
Zero load power	13 / 13 / 11 W	15/18/18 W	29 W	38 W	55 W
Zero load power in AES mode	9 / 9 / 7 W	11/12/12 W	19 W	27 W	39 W
Zero load power in Search mode	3 / 3 / 2 W	3 / 3 / 2 W	3 W	4 W	6 W
CHARGER					
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz				
Charge voltage 'absorption'	14,4 / 28,8 / 57,6 V				
Charge voltage 'float'	13,8 / 27,6 / 55,2 V				
Storage mode	13,2 / 26,4 / 52,8 V				
Max. battery charge current (4)	120 /70 / 35 A	220/120/ 70 A	110 A	140 A	200 A
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output	Yes (32 A)		Yes (50 A)		
External AC current sensor (optional)	50 A or 100 A				
Programmable relay (5)	Yes				
Protection (2)	a – g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration				
General purpose com. port	Yes, 2x				
Remote on-off	Yes				
Operating temperature range	-40 to +65 °C (fan assisted cooling)				
Humidity (non-condensing)	max 95 %				
Maximum altitude	2000 m.				
ENCLOSURE					
Material & Colour	Steel, blue RAL 5012				
Protection category	IP22				
Battery-connection	M8 bolts		Four M8 bolts (2 plus and 2 minus connections)		
230 VAC-connection	Screw terminals 13 mm² (6 AWG)		Bolts M6	Bolts M6	Bolts M6
Weight kg	19 kg	33/ 30/ 30 kg	42 kg	49 kg	80 kg
Dimensions (hxwxd) mm	546 x 275 x 147 499 x 268 x 141 499 x 268 x 141	702 x 345 x 152 607 x 330 x 149 565 x 320 x 149	642 x 363 x 206	677 x 363 x 206	810 x 405 x 217
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2				
Emission, Immunity	EN 55014-1, EN 55014-2 EN-IEC 61000-3-2, EN-IEC 61000-3-3 IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Uninterruptible power supply	Please consult the certificates on our website.				
Anti-islanding	Please consult the certificates on our website.				

1) Can be adjusted to 60 Hz
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

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

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configu MultiPlus using your pho tablet or PC.

Current sensor 100A:50mA
To implement PowerControl and PowerAssist and to optimize self-consumption with external current sensing. Maximum current: 100 A

MULTIPLUS-II 2 X 120V INVERTER/CHARGER

120/240 V input and output, or 120 V input and output (always 120 V output when in inverter mode)

The AC input can be supplied from a split phase 120/240 V source, or single phase 120 V source.
When an AC source is available, the MultiPlus will feed through the AC to its output. The output will therefore mirror the AC input.
The inverter/charger connects to the neutral and the preferred input line (L1). Power needed to charge the batteries will therefore be drawn from L1.
The MultiPlus switches to inverter operation when no AC source is available. The inverter output is 120 V single phase. In invert mode, the MultiPlus connects both output lines (L1 and L2) together to provide 120 VAC to loads on either line.
Any 240 V loads will therefore be supplied only when the MultiPlus is supplied by a split phase AC source. This prevents heavy loads such as water heaters or 240 V air conditioners from discharging the battery.

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

A maximum grid or generator current can be set. The MultiPlus 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 (available on L1 input only).

Two AC Outputs

The main output has no break functionality. The MultiPlus takes over the supply to the connected 120 V loads in the event of a grid failure or when shore/generator power is disconnected. The transfer time of the L1 output is less than 18 milliseconds so that computers and other electronic equipment will continue to operate without disruption.
The transfer time of the L2 output is longer: approximately 40 milliseconds.

The second (auxiliary) output is live only when AC is available on the input of the MultiPlus. Loads that should not discharge the battery 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.
In addition to parallel connection, three units of the same model can be configured for three phase output.
In multi-phase setups, L2 is disabled on all units.

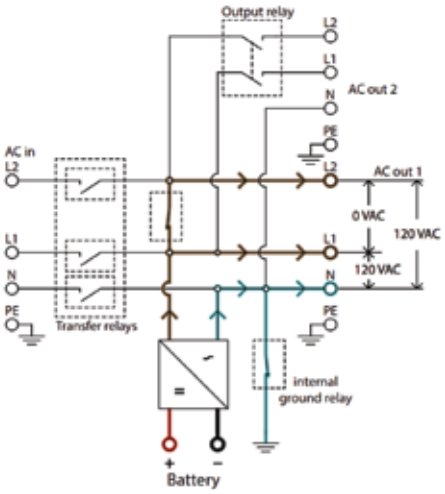
On-site system configuring, monitoring and control

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: Cerbo GX, Color Control GX, Venus GX, , CANvu GX, laptop, computer, Bluetooth (with the optional VE.Bus Smart dongle), Battery Monitor, Digital Multi Control Panel.

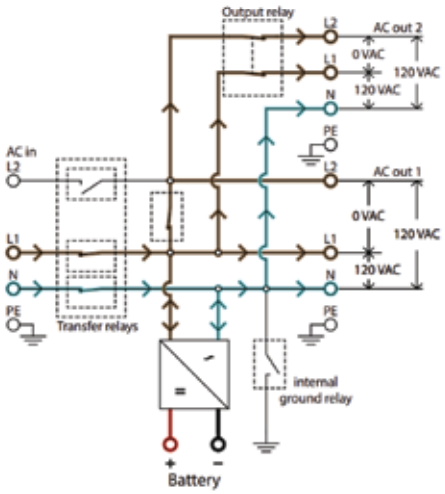
Remote configuring and monitoring

Install a Cerbo 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.

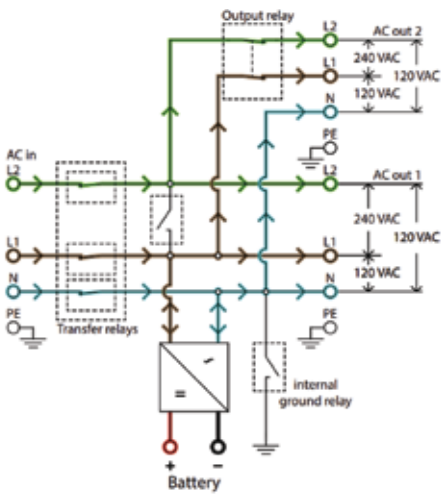
Connection Area



Power flow: Inverter mode



Power flow, 120VAC-Input



Power flow, split phase input

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

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

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

MultiPlus-II 2x120 V	12/3000/120-50	24/3000/70-50
PowerControl & PowerAssist	Yes (on L1 input)	
Transfer switch	50 A	
Maximum AC input current	50A (each leg)	
INVERTER		
DC Input voltage range	9,5 – 17 V	19-33 V
Output when in inverter mode	Output voltage: 120 VAC ± 2 % Frequency: 60 Hz ± 0,1 % (1)	
Cont. output power at 25 °C (3)	3000 VA	
Cont. output power at 25 °C	2400 W	
Cont. output power at 40 °C	2200 W	
Cont. output power at 65 °C	1700 W	
Maximum apparent feed-in power	2500 VA	
Peak power	5500 W	
Maximum efficiency	93 %	94 %
Zero load power	15W	11W
Zero load power in AES mode	10W	8W
Zero load power in Search mode	4W	4W
CHARGER		
AC Input	Split phase: 180-280 VAC 45 – 65 Hz Single phase: 90-140 VAC 45 – 65 Hz	
Charge voltage 'absorption'	14,4 V	28,8 V
Charge voltage 'float'	13,8 V	27,6 V
Storage mode	13,2 V	26,4 V
Maximum battery charge current (4)	120 A	70 A
Battery temperature sensor	Yes	
GENERAL		
Auxiliary output (5)	50 A (each leg) See note 8	
External AC current sensor (optional)	100 A	
Programmable relay (6)	Yes	
Protection (2)	a – g	
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration	
General purpose com. Port (7)	Yes, 2x	
Remote on-off	Yes	
Operating temperature range	-40 to +65 °C (-40 -150°F) Fan assisted cooling	
Humidity (non-condensing)	max 95 %	
ENCLOSURE		
Material & Colour	Steel, blue RAL 5012	
Protection category	IP22	
Battery-connection	2x2 M8 bolts	2 M8 bolts
120/240 VAC-connection	Screw terminals 21 mm² (4 AWG)	
Weight	22 kg (48 lb)	
Dimensions (hxwxd)	578 x 275 x 148 mm (23 x 11 x 6 inch)	578 x 275 x 148 mm (23 x 11 x 6 inch)
STANDARDS		
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, UL 458	
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	

1) Can be adjusted to 50 Hz
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 120 VAC on inverter output
g) input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 75 ° F / 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: 120 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
7) A. o. to communicate with a Lithium-Ion battery BMS
8) The auxiliary output of an early production batch of this product was rated at 35A instead of 50A. This batch has serial numbers starting with HQ2107. Later batches, with 50A aux. output have serial numbers starting with HQ2114 or higher.

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Current sensor 100A:50mA
To implement PowerControl and PowerAssist and to optimize self-consumption with external current sensing. Maximum current: 100A

QUATTRO INVERTER/CHARGER
3 KVA - 15 KVA 230V

Quattro
48/5000/70-100/100

Quattro
48/15000/200-100/100

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

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.

Split phase option
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.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 4 sets of three 15 kVA units can be parallel connected to provide 144 kW / 180 kVA inverter power and 2400 A 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 (16 A per 5 kVA Quattro at 230 VAC). 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).

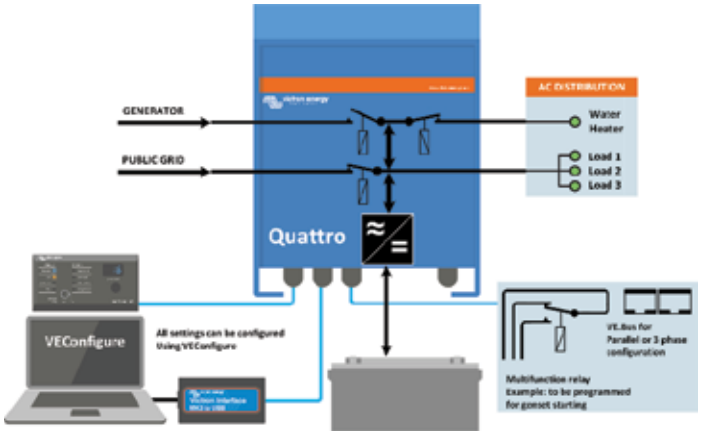
On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Color Control GX or other GX devices, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

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.

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

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



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
Nominal Battery Voltage	12/3000: 12 V battery 24/3000: 24 V battery	12/5000: 12 V battery 24/5000: 24 V battery 48/5000: 48 V Batttery	24/8000: 24 V battery 48/8000: 48 V battery	48 V battery	
PowerControl / PowerAssist	Yes				
Integrated Transfer switch	Yes				
AC inputs (2x)	Input voltage range: 187-250 VAC Input frequency: 50/60 Hz Cos Φ >0.8				
Maximum feed through current (A)	2x 50	2x100	2x100	2x100	2x100
ICw	6 kA 30 mS	10 kA 30 ms			
INVERTER					
Input voltage range (VDC)	9,5 – 17 V 19 – 33 V 38 – 66 V				
Output [1]	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 %				
Cont. output power at 25 °C (VA) [3]	3000	5000	8000	10000	15000
Cont. output power at 25 °C (W)	2400	4000	6400	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
Input current (A DC)	250 / 125	458/238/118	381/188	235	350
Maximum continuous Output current (A~)	11	19	30	37	53/50
Power factor range	±0.8	±0.8	±0.8	±0.8	±0.8
Maximum output fault current	32 A peak 1 sec.	53 A 1 sec.	100 A 1 sec	100 A 1 sec	150 A 1 sec
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' (VDC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6	57,6
Charge voltage 'float' (VDC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
Storage mode (VDC)	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 (12 V and 24 V models only)				
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output (A) [5]	25	50	50	50	50
Programmable relay [6]	3x	3x	3x	3x	3x
Protection [2]	a-g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration				
General purpose com. port	2x	2x	2x	2x	2x
Remote on-off	Yes				
Common Characteristics	Operating temp.: -20 to +60 °C Humidity (non-condensing): max. 95 %				
Maximum altitude	2000 m				
ENCLOSURE					
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP20, pollution degree 2, OVC III				
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)				
230 VAC-connection	Screw terminals 13 mm² (6 AWG)	Bolts M6	Bolts M6	Bolts M6	Bolts M6
Weight (kg)	19	34 / 30 / 30	45 / 41	51	72
Dimensions (hxwxd in mm)	362 x 258 x 218	470 x 350 x 280 444 x 328 x 240 444 x 328 x 240	470 x 350 x 280	470 x 350 x 280	572 x 488 x 344
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1				
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Road vehicles	12 V and 24 V 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) Up to 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 monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal. The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

QUATTRO INVERTER/CHARGER
3KVA - 10KVA 120V

Quattro
48/5000/70-100/100

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and 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 or push notification.

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

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.

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 4 sets of three units can be parallel connected to provide 96W / 120kVA inverter power and more than 1600A 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.

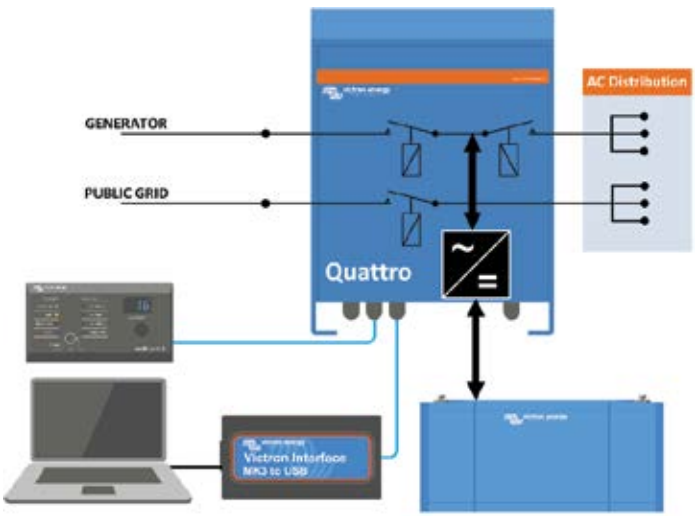
Solar energy: AC power available even during a grid failure
The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

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	48/3000/35-50/50 120V	12/5000/220-100/100 120V 24/5000/120-100/100 120V 48/5000/70-100/100 120V	48/10000/140-100/100 120V
PowerControl / PowerAssist	Yes		
Integrated Transfer switch	Yes		
AC inputs (2x)	Input voltage range: 90-140 VAC Input frequency: 45 – 65 Hz Power factor: 1		
Maximum feed through current	2x 50 A	2x 100 A	2x 100 A
INVERTER			
Input voltage range	9,5 – 17 V 19 – 33V 38 – 66 V		
Output (1)	Output voltage: 120 VAC ± 2 % Frequency: 60 Hz ± 0,1 %		
Cont. output power at 25 °C (3)	3000 VA	5000 VA	10000 VA
Cont. output power at 25 °C	2400 W	4000 W	8000 W
Cont. output power at 40 °C	2200 W	3700 W	6500 W
Cont. output power at 65 °C	1700 W	3000 W	4500 W
Peak power	6000 W	10000 W	20000 W
Maximum efficiency	94 %	94 / 94 / 95 %	96 %
Zero load power	25 W	30 / 30 / 35 W	60 W
Zero load power in AES mode	20 W	20 / 25 / 30 W	40 W
Zero load power in Search mode	12 W	10 / 10 / 15 W	15 W
CHARGER			
Charge voltage 'absorption' (V DC)	57,6 V	14,4 / 28,8 / 57,6 V	57,6 V
Charge voltage 'float' (V DC)	55,2 V	13,8 / 27,6 / 55,2 V	55,2 V
Storage mode (V DC)	52,8 V	13,2 / 26,4 / 52,8 V	52,8 V
Charge current house battery (A) (4)	35 A	200 / 120 / 70 A	140 A
Charge current starter battery (A)	4 A (12 V and 24 V models only)		
Battery temperature sensor	Yes		
GENERAL			
Auxiliary output (5)	32 A	50 A	50 A
Programmable relay (6)	3x		
Protection (2)	a-g		
VE.Bus communication port	For parallel, split phase and three phase operation, remote monitoring and system integration		
General purpose com. port	2x		
Remote on-off	Yes		
Common Characteristics	Operating temp.: -40 to +65 °C Humidity (non-condensing): max. 95 %		
ENCLOSURE			
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP 21		
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)		
120 V AC-connection	Screw terminals 13 mm² (6 AWG)	Bolts M6	Bolts M6
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch 362 x 258 x 218 mm	18,5 x 14,0 x 11,2 inch 470 x 350 x 280 mm 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch 572 x 488 x 344 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, UL 1741 (only for 48V 5kVA and 10kVA)		
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	12 V and 24 V models: ECE R10-5		
Anti-islanding	See our website		

1) Can be adjusted to 60 HZ; 120 V 60 Hz on request
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 120 VAC on inverter output
g) input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 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 monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

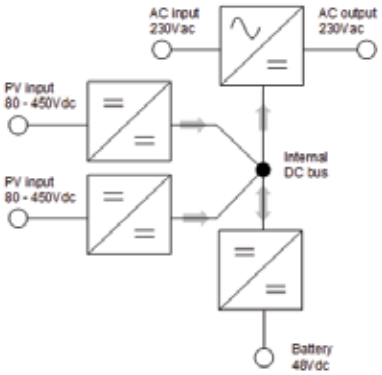
Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VEConfigure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

MULTI RS SOLAR 48/6000 DUAL TRACKER

Multi RS Solar 48/6000 dual tracker



Inside the Multi RS Solar dual tracker

Operating modes

Hybrid mode – Stores excess solar energy in a battery, to be used during the night or periods of high demand. Supplies additional power from the battery when demand exceeds grid capacity.

Backup mode – Switches to backup mode during a grid outage.

Off-grid mode – Operates without grid connection.

Generator mode – Controls the generator to minimize run-hours. Supplies additional power from the battery when demand exceeds the capacity of the generator.

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

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

Display, Bluetooth and VictronConnect app

The display reads battery, inverter and solar parameters. The same parameters can be accessed with a smartphone or other Bluetooth enabled device, using the VictronConnect app.

Extendable PV capacity, both AC-coupled and DC-coupled

The integrated 6 kWp PV capacity can be extended by adding solar chargers to the system.
Alternatively, the PV capacity can be extended by installing PV Inverters, of which the output power will be automatically controlled by the integrated frequency shift power control.

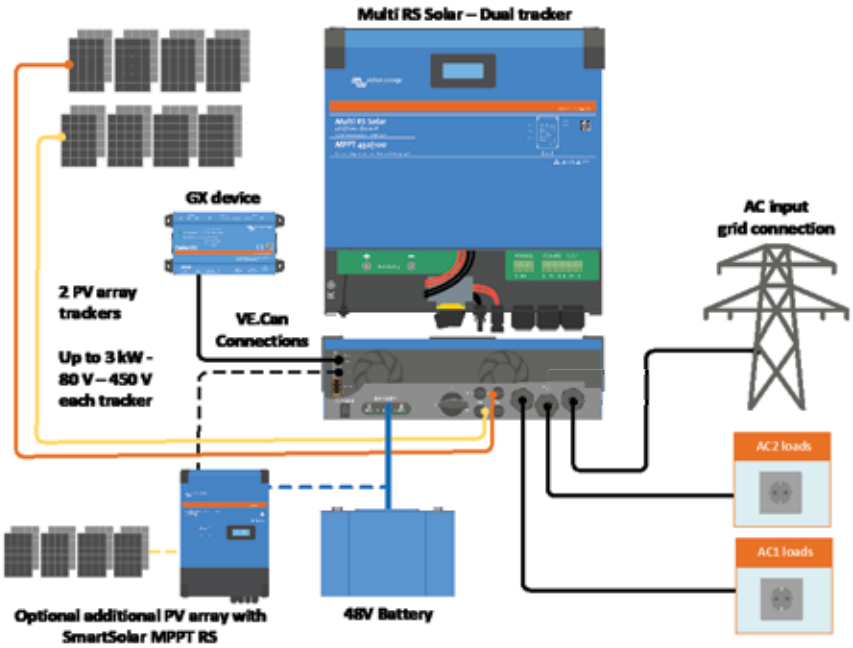
Communication ports

VE.Can connection to a GX device for system monitoring, data logging, and remote firmware updates.
VE.Direct connection to a GlobalLink 520 for remote data monitoring.

I/O Connections

Programmable relay, temperature sensor and voltage sensor connections.

Configure and monitor with VictronConnect
A built in Bluetooth Smart connection allows for quick monitoring or settings adjustment of the Multi RS.



Multi RS Solar 48/6000 Dual Tracker	
PowerControl & PowerAssist	Yes
Transfer switch	50 A
Maximum AC input and pass-through current	50 A
INVERTER	
DC Input voltage range [1]	38 – 62 V
AC Output [2]	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % Maximum continuous inverter current: 25 Aac
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	4500 W
Continuous output power at 65 °C	3000 W
Peak power [3]	9 kW for 3 seconds 7 kW for 4 minutes
Short-circuit output current	45 A
Max. AC output overcurrent protection	30 A
Efficiency	96,5 % at 1 kW load 94 % at 5 kW load
Zero load power consumption	20 W
Low Battery shutdown	37.2 V (adjustable)
Low battery restart	43.6 V (adjustable)
SOLAR	
Maximum open circuit PV array voltage [4]	450 V
Start-up voltage	120 V
MPPT operating voltage range	65 – 450 V
Maximum operational PV input current limit	13 A
Maximum PV conversion power	6 kW total – 3 kW per tracker
Maximum PV short circuit current	16 A
Earth leakage trip level	30 mA
Isolation fail level (detection before start-up)	100 kΩ
CHARGER	
AC Input	Nominal Voltage: 230 VAC, Input voltage range: 187-265 VAC Nominal frequency: 50 Hz, Input frequency: 45-65 Hz AC inrush current: NA
Programmable charge voltage range [5]	36 – 60 V
Charge voltage 'absorption'	Default setting: 57,6 V (adjustable)
Charge voltage 'float'	Default setting: 55,2 V (adjustable)
Maximum charge current from AC [6]	88 A @ 57,6 VDC
Total maximum charge current (AC + PV)	100 A DC
Battery temperature sensor	Included
Battery voltage sense	Yes
GENERAL	
Auxiliary output (AC-out-2) [7]	Yes
3-phase and parallel operation	3-phase support with one unit per phase. Parallel not supported.
Programmable relay [8]	Yes
Protections [9]	a - g
Data communications ports [10]	VE.Direct, VE.Can & Bluetooth
Bluetooth frequency & power	2402 - 2480 Mhz, 4 dBm
Programmable analog/digital input/output ports	Yes, 2x
Remote on-off	Yes
Operating temperature range	-40 to +65 °C (fan assisted cooling)
Maximum altitude	2000 m
Humidity (non-condensing)	max 95 %
ENCLOSURE	
Material & Colour	steel, blue RAL 5012
Protection category	IP21 Protective Class: I
Battery-connection	M8 bolts
PV Connection	2 strings, each with positive and negative MC4
230 VAC-connection	Screw terminals 10 mm² (6 AWG)
Weight	12,3 kg
Dimensions (hxwxd)	462 x 425 x 127 mm
STANDARDS	
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, EN-IEC 62109-2
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3, Pollution Degree 2
Overvoltage Category	Battery: OVC 1, PV port: OVC II, AC in / AC out: OVC III

1) Minimum start-up voltage is 41 VDC. Over-voltage disconnect: 65,5 V.
2) Can be adjusted to 240 VAC and 60 Hz
3) Peak power capacity and duration depends on start temperature of heatsink.
Mentioned times are with cold unit.
4) The maximum PV voltage should not exceed 8x battery float voltage.
If for example the float voltage of the battery is 50 V,
the maximum PV voltage should not exceed 8 x 50 = 400 V.
5) The Charger set points (float & absorption) can be set to max 60 V.
The output voltage at the charger terminals can be higher due to compensation
for temperature & voltage drop over the battery cables.
The maximum output current is reduced on a linear basis from full current at 60 V to
5 A at 62 V. The equalization voltage can be set to max 62 V, the equalization current
percentage can be set to max 6 %.
6) The maximum charge current from AC sources depends on input voltage and battery current. At 230V input and 57.6V battery voltage, and 25C ambient, the maximum charge current is 88 A. See manual, limitations section, for further details.
7) AC-out-2 is connected directly to the AC input and intended for non-critical loads. The AC-out-2 load is taken into account by PowerControl & PowerAssist.
8) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. DC rating: 4 A up to 35 VDC and 1 A up to 70 VDC
9) 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) solar earth leakage.
10) Not currently compatible with VE.Smart Networks. Connection to a GX device (i.e. Cerbo GX) must be made via the VE.Can interface. The VE.Direct interface is for connection to the GlobalLink 520.

SKYLLA-i BATTERY CHARGER 24V

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. Note: Two output and three output chargers cannot be paralleled with each other. 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' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

Skylla-i	24/80 (1+1)	24/80 (3)	24/100 (1+1)	24/100 (3)
Input voltage (VAC)	230V			
Input voltage range (VAC)	185-265V			
Input voltage range (VDC)	180-350V			
Maximum AC input current @ 180 VAC	16A		20A	
Frequency (Hz)	45-65Hz			
Power factor	0,98			
Charge voltage 'absorption' (VDC) (1)	28,8V			
Charge voltage 'float' (VDC)	27,6V			
Charge voltage 'storage' (VDC)	26,4V			
Charge current (A) (2)	80A	3 x 80A (max total output: 80A)	100A	3 x 100A (max total output: 100A)
Charge current starter batt. (A)	4A	n. a.	4	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity (Ah)	400-800Ah		500-1000Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
VE.Can communication port	Two RJ45 connectors, NMEA2000 protocol, galvanically isolated. Integrated 12V CAN-bus power supply, 30V DC maximum (3)			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST AC rating: 240VAC/4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Forced cooling	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	M8 bolts			
230 VAC-connection	screw-clamp 10mm² (AWG 7)			
Protection category	IP 21			
Weight kg (lbs)	7kg (16 lbs)			
Dimensions hxwxd in mm (hxwxd in inches)	405 x 250 x 150 (16.0 x 9.9 x 5.9)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			

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

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

3) When connecting the Skylla-i in a VE.Can network that also contains devices connected to a 48V battery bank, make sure to use a special RJ-45 cable, which has pins 2 and 6 (NET-S / V+) not connected.

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

Skylla TG 24 50

Skylla TG 24 50 3-phase

Skylla TG 24 100

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

Suitable for AC and DC supply (AC-DC and DC-DC operation)
Except for the 3-phase input models, the chargers also accept a DC supply.

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

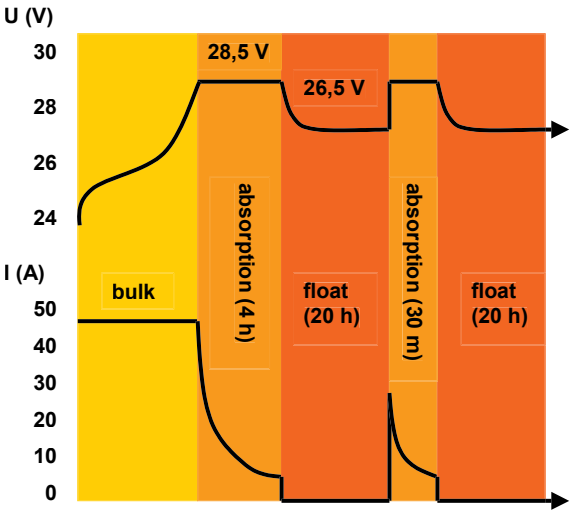
Use of TG Chargers as a power supply
As a result of the perfectly stabilized output voltage, a TG Charger can be used as a power supply if batteries or large buffer capacitors are not available.

Two outputs to charge 2 battery banks (24V models only)
The TG Chargers feature 2 isolated outputs. The second output, limited to approximately 4A and with a slightly lower output voltage, is intended to top up a starter battery.

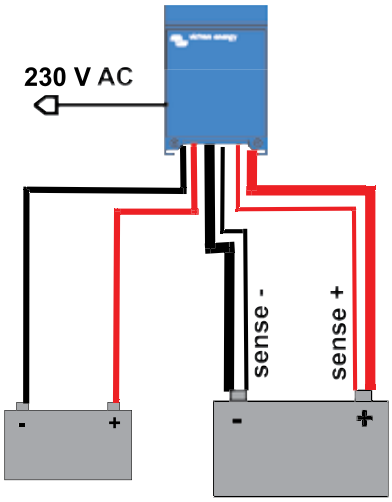
To increase battery life: temperature compensation
Every Skylla TG Charger comes with a battery temperature sensor. When connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed batteries which otherwise might be overcharged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

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

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



Charge curve



Application example

Skylla TG	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	230	3 x 400	230	230	3 x 400	230	230
Input voltage range (V AC)	95-264	185-264	320-450	185-264	185-264	320-450	185-264	185-264
Input voltage range (V DC)	120-400	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 house batt. at 110 VAC (A) (3)	30	30	n. a.	60	60	n. a.	15	30
Charge current starter batt. (A)	4		4	4	4	4	n. a.	n. a.
Charge characteristic	IUoUo (three step)							
Battery capacity (Ah)	150-500		250-500	400-800	500-1000	500-1000	125-250	250-500
Temperature sensor	√							
Can be used as power supply	√							
Remote alarm	Potential free contacts 60V / 1A (1x NO and 1x NC)							
Forced cooling	√							
Protection (1)	a,b,c,d							
Operating temp. range	-40 to +50°C (-40 - 122°F)							
Humidity (non-condensing)	max 95%							
ENCLOSURE								
Material & Colour	aluminium (blue RAL 5012)							
Battery-connection	M8 studs							
230 V AC-connection	screw-clamp 2,5 mm² (AWG 6)							
Protection category	IP 21							
Weight kg (lbs)	5,5 (12.1)		13 (28)	10 (22)	10 (22)	23 (48)	5,5 (12.1)	10 (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 257 (14.4 x 9.9 x 10.1)			515 x 260 x 265 (20 x 10.2 x 10.4)	365 x 250 x 147 (14.4 x 9.9 x 5.8)	365 x 250 x 257 (14.4 x 9.9 x 10.1)
STANDARDS								
Safety	EN 60335-1, EN 60335-2-29							
Emission	EN 55014-1, EN 61000-3-2							
Immunity	EN 55014-2, EN 61000-3-3							

1) Protection
   a. Output short circuit
   b. Battery reverse polarity detection
   c. Battery voltage too high
   d. Temperature too high
2) Up to 40°C (100°F) ambient and at the specified input voltage range
3) Up to 40°C (100°F) ambient and at 110 VAC input voltage

BMV-700 Battery Monitor

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

Skylla Control

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

Charger Switch

A remote on-off switch

Battery Alarm

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

SKYLLA CHARGER 24V UNIVERSAL INPUT AND GL APPROVAL

Skylla Charger
24 V 50 A

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

All models will operate without any adjustment needed over a 90 to 265 Volt input voltage range, whether 50 Hz or 60 Hz.
The chargers will also accept a 90-400 V DC supply.

Germanischer Lloyd approval

The Chargers have been approved by Germanischer Lloyd (GL) to environmental category C, EMC 1.
Category C applies to equipment protected from the weather.
EMC 1 applies to conducted and radiated emission limits for equipment installed on the bridge of a ship.

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

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

Other features

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

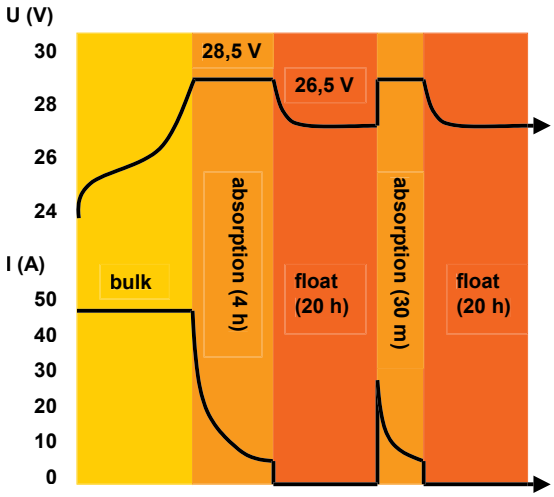
Other Skylla Chargers

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

Learn more about batteries and battery charging

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

Charge curve



Skylla-TG	24/30 90-265 VAC	24/50 90-265 VAC	24/100-G 90-265 VAC
Input voltage (V AC)	120 / 230	120 / 230	120 / 230
Input voltage range (V AC)	90-265	90-265	90-265
Input voltage range (V DC)	90-400	90-400	90-400
Frequency (Hz)	45-65 Hz or DC		
Power factor	1		
Charge voltage 'absorption' (V DC)	28,5	28,5	28,5
Charge voltage 'float' (V DC)	26,5	26,5	26,5
Charge current house batt. (A) (2)	30	50	100
Charge current starter batt. (A)	4	4	4
Charge characteristic	IUoUo (three step)		
Battery capacity (Ah)	150-300	250-500	500-1000
Temperature sensor	√		
Can be used as power supply	√		
Remote alarm	Potential free contacts 60V / 1A (1x NO and 1x NC)		
Forced cooling	√		
Protection (1)	a, b, c, d		
Operating temp. range	-40 to +50°C (-40 - 122°F) (Full output current up to 40°C)		
Humidity (non-condensing)	max 95%		
ENCLOSURE			
Material & Colour	aluminium (blue RAL 5012)		
Battery-connection	M8 studs		
230 V AC-connection	screw-clamp 2,5 mm² (AWG 6)		
Protection category	IP 21		
Weight kg (lbs)	5,5 (12.1)	5,5 (12.1)	10 (22)
Dimensions hxwxd in mm (hxwxd in inches)	365 x 250 x 147 (14.4 x 9.9 x 5.8)	365 x 250 x 147 (14.4 x 9.9 x 5.8)	365 x 250 x 257 (14.4 x 9.9 x 10.1)
STANDARDS			
Vibration	0,7g (IEC 60945)		
Safety	EN 60335-1, EN 60335-2-29, IEC 60945		
Emission	EN 55014-1, EN 61000-3-2, IEC 60945		
Immunity	EN 55014-2, EN 61000-3-3, IEC 60945		
Germanischer Lloyd	Certificate 54 758 – 08HH		

1) Protection key:
a) Output short circuit
b) Battery reverse polarity detection
c) Battery voltage too high
d) Temperature too high

2) Up to 40°C (100°F) ambient

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

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

Charger Switch
A remote on-off switch

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

EKRANO GX

Ekrano GX front and back

Accessories included with the Ekrano GX

Ekrano GX: communication-centre

The Ekrano GX represents the next generation in the GX product family. With its complete range of connections and interfaces as well as a built-in 7-inch touchscreen display, it is the most powerful GX device to date and 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 built-in touchscreen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its built-in WiFi Access Point. The Ekrano GX is also the successor to the Color Control GX.

Built-in 7-inch touchscreen display

The seven-inch touchscreen display gives an instant overview of your system and allows you to adjust settings. The touch function can be disabled (or enabled) via a recessed button on the back to prevent unauthorised use. When mounted using the supplied steel bracket, the display is watertight from the outside.

Remote Console on VRM

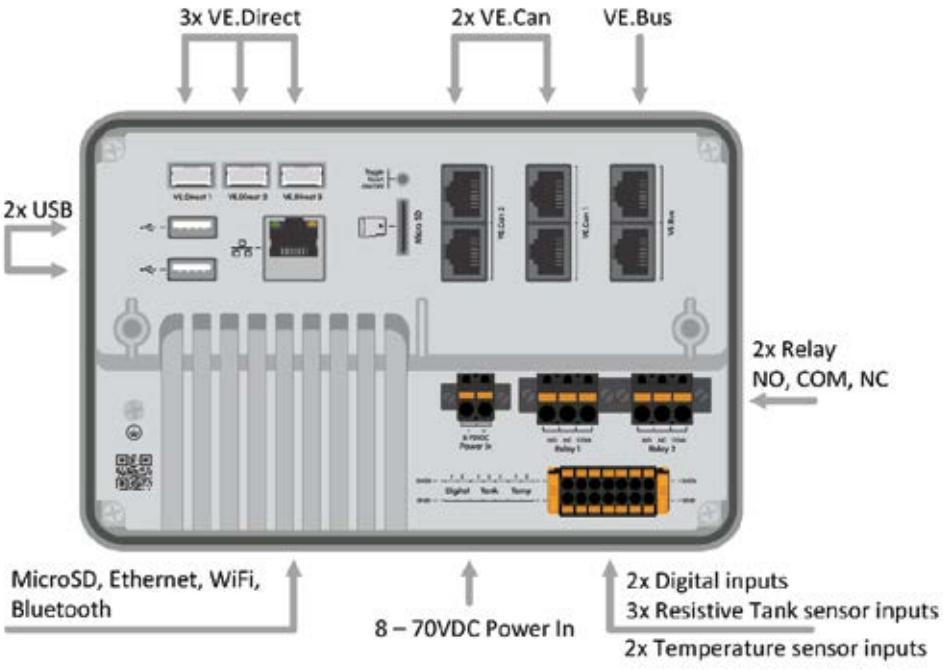
Monitor, control and configure the Ekrano GX remotely, over the internet, just like if you were standing in front of the device, using the Remote Console. The same functionality is also available via local LAN network or via the built-in WiFi access point of the Ekrano GX.

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 Ekrano GX installs easily via a cut-out for flush panel mounting and includes both a steel bracket and springs for blind hole mounting. All ports are easily accessible from the back. The power and relay terminal blocks can be screwed in place and the IO terminal block has a quick release clamp for easy access. The Bluetooth feature allows for quick connection and configuration via our VictronConnect app.



Temperature sensor for Quattro, MultiPlus and GX device (e.g. Ekrano GX) as an additional accessory.

Ekrano GX [1]	
Supply voltage	8 – 70 VDC
Power draw display on (100 % brightness)	6.2 W @ 12 V | 6.6 W @ 24 V | 7.4 W @ 48 V
Power draw display off	2.6 W 12 V | 3.0 W @ 24 V | 3.7 W @ 48 V
Relay	2 x NO/NC [2] DC up to 30 VDC: 3 A AC: 1 A, 125 VAC
Communication ports	
VE.Direct ports (always isolated)	3 (max. possible VE.Direct devices: 25) [7]
VE.Bus (always isolated)	1 bus with 2 paralleled RJ45 sockets
VE.Can 1	Yes - isolated
VE.Can 2	Yes – non-isolated
Ethernet	Yes
WiFi	Yes
Bluetooth Smart	Yes [3]
USB Host ports	Yes – 2 x USB-A (max. 1.5 A@5 V combined)
MicroSD Card Slot	Yes – SDHC cards up to max. 32 GB
IO	
Resistive tank level inputs	3 [4]
Temperature sense inputs	2 [5]
Digital Inputs	2 [6]
Display	
Display resolution	1024 x 600 pixels
Display max. backlight brightness	1000 cd/m²
Backlight dimming	Yes – dynamic via built-in ambient light sensor or manually via Remote Console With timer for auto on/off
Touch toggle on/off button	Yes – recessed button on the back (prevents unauthorised use)
Dimensions	
Outer dimensions (h x w x d)	124 x 187 x 29.8 mm | 4.88 x 7.36 x 1.17 in (without connectors and mounting accessories)
Operating temperature range	-20 to +50 °C
Other	
Mounting	Panel integrated flush mount or blind hole mount with included mounting accessories
Buzzer	Yes
Protection category	Front: IP54 (when installed with steel bracket) IP31 (when installed with springs) Back: IP21
Standards	
Safety	IEC 62368-1
EMC	EN 301489-1, EN 301489-17
Automotive	ECE R10-6

Notes

1. For more detailed information about the Ekrano GX, please visit the Victron GX product range page.
2. Currently, Relay 1 can be used for programming as an alarm relay, generator start/stop, tank pump, temperature controlled relay or manual operation. Relay 2 is available for programming as a temperature controlled relay or manual operation in the Relay menu of the GX (requires firmware 2.80 or higher).
3. Bluetooth functionality is intended to be used to assist with initial connection and networking configuration. You cannot use Bluetooth to connect to other Victron products (e.g. SmartSolar charge controllers).
4. The tank level inputs are resistive and should be connected to a resistive tank sender. Victron does not supply tank senders. The tank level ports can each be configured to work with either European (0 - 180 Ohm); or US tank senders (240 - 30 Ohm).
5. The Ekrano GX has 2 temperature inputs. They can be used to measure & monitor all kinds of temperatures. Temperature senders are not included. The required sensor is ASS000001000 - Temperature Sensor QUA/PMP/Venus GX. (Note that this is not the same as the BMV temperature accessory.). Temperature range is -20 °C to +70 °C. Actually, it can measure up to 100 °C, but the sensor is not made to withstand temperatures above 70 °C long term. Note that this is intended as a crude temperature sensor, and not calibrated. A deviation of +/- 2 °C is to be expected.
6. The digital inputs can be used for open/closed monitoring of alarms, for example doors, or fire- or bilge alarms and can also be used for pulse counting. See the product manual for electrical specifications of the digital inputs.
7. The listed maximum 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.

CERBO GX & GX TOUCH

Cerbo GX

Accessories included with the Cerbo GX

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 screen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its Bluetooth capability.

GX Touch: display accessory

The GX Touch 50 and GX Touch 70 series are display accessories for the Cerbo GX. The five inch and seven inch touch screen displays are available in two versions: top/wall (GX Touch 50 and 70) or flush mount (GX Touch 50 and 70 Flush). They give 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 displays have a waterproof design and are simple to install. The supplied (from serial number HQ2242 – not for GX Touch Flush) protection cover prevents damage from UV light during prolonged exposure to the sun.

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

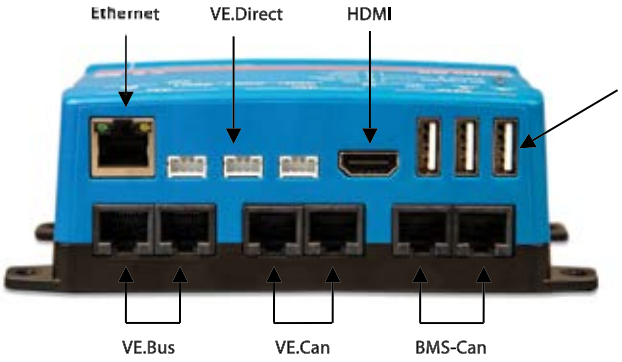
Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements. Easily control the shore power input current limit, (auto)start/stop generator(s) or change any setting to optimise the system. Follow up on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

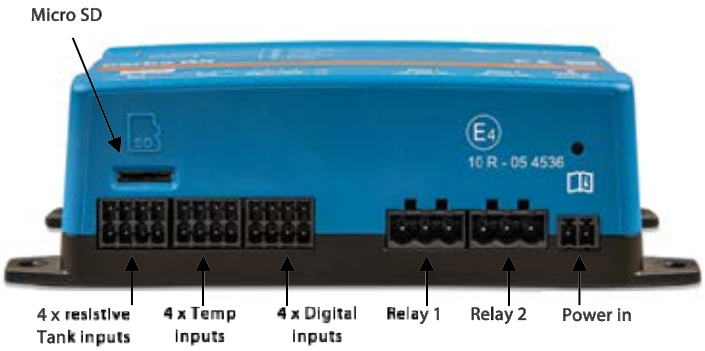
Simple mounting and configuration

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 cut-outs (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.

GX Touch (optional display for Cerbo GX and Cerbo-S GX)

GX Touch 50 & 70 protective plastic cover (not for the Flush model)





WiFi Indicator LED
The Cerbo GX can connect to a WiFi Network

Bluetooth indicator LED
The Cerbo GX can be accessed directly via Bluetooth using the VictronConnect app.

Accessories included with the GX Touch 50 / 70

Optional accessories for GX Touch 50 / 70 only

'ouch adapter for CCGX cut-out
adapter is designed to easily replace the X display with the newer GX Touch 50 or the 'ouch 70. Contents of the packaging are the ıl bracket, the plastic bezel, and four nting screws.

Accessories included with the GX Touch 50 / 70 Flush

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.

	Cerbo GX (PN BPP900450100)	Cerbo GX BPP900450110 + BPP900451100	Cerbo-S GX
Supply voltage	8 – 70 VDC		
Power draw without GX Touch	2.8 W @ 12 V		
Power draw with GX Touch	Backlight off: 3.8 W @ 12 V | Backlight at max: 4.8 W @ 12 V		
Mounting	Wall or DIN rail (35 mm) [2]		
Communication ports			
VE.Direct ports (always isolated)	3 (max. possible VE.Direct devices: 15) [3]		
VE.Bus (always isolated)	2 paralleled RJ45 sockets		
VE.Can	Yes - non isolated	Yes VE.Can 1 isolated VE.Can 2 non-isolated	Yes – non-isolated
BMS-Can port	Yes – BMS-Can only	Yes – see VE.Can	No
Bluetooth	Yes [4]		
Ethernet	10/100 RJ45 socket - isolated except shield[7]		
WiFi	Built-in		
USB	2 USB Host ports & 1 power only port	3 USB Host ports	2 USB Host ports & 1 power only port
IO			
Resistive tank level inputs	4		0
Temperature sense inputs	4		0
Digital Inputs	4[6]		4[6]
Relays[5]	2 x NO/NC | DC up to 30 VDC: 6 A | DC up to 70 VDC: 1 A | AC: 6 A, 125 VAC		
Other			
Outer dimensions (h x w x d)	78 x 154 x 48 mm		
Operating temperature range	-20 to +50 °C		
IP Rating	IP20		
Standards			
Safety	IEC 62368-1		
EMC	EN 301489-1, EN 301489-17		
Automotive	ECE R10-6		

	GX Touch 50 / GX Touch 70	GX Touch 50 Flush / GX Touch 70 Flush
Mounting	Top/wall mount with included mounting accessories	Flush mount or embossed (totally flush)
Protection cover	Included with every GX Touch from serial number HQ2242 Can also be purchased individually: Part # BPP900462050: GX Touch 50 protection cover Part # BPP900462070: GX Touch 70 protection cover	No
Display Resolution	GX Touch 50: 800 x 480GX | Touch 70: 1024 x 600	
IP Rating	IP54 (without connectors)	IP65 (when installed with the included rubber gasket)
Outer dimensions (h x w x d)	GX Touch 50: 87 x 128 x 12.4 mm | GX Touch 70: 113 x 176 x 13.5 mm GX Touch 50 Flush: 94 x 136 x 12 mm | GX Touch 70 Flush: 120 x 184 x 13 mm	
Cable length	2 meter	

Notes

1. For more detailed information about the Cerbo GX and the GX Touch, please visit the Victron GX product range page at Victron live: www.victronenergy.com/live/venus-os:start
2. DIN rail mounting requires an additional accessory - DIN35 adapter small.
3. The listed maximum 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.
4. Bluetooth functionality is intended to be used to assist with initial connection and networking configuration. You cannot use Bluetooth to connect to other Victron products (e.g. SmartSolar charge controllers).
5. In Cerbo GX hardware there are two relays. Currently, Relay 1 can be used for programming as an alarm relay, generator start/stop, tank pump, temperature-controlled relay or manual operation. Relay 2 is available for programming as a temperature-controlled relay or manual operation in the Relay menu of the GX (requires firmware 2.80 or higher).
6. The digital inputs on the Cerbo GX PN BPP900450100 and Cerbo-S GX are not able to do pulse counting.
7. On Cerbo GX PN BPP900450110 and BPP900451100, the RJ45 sockets are rotated 180 degrees to make it easier to remove the cable.

SMARTSHUNT 300A/500A/1000A/2000A

SmartShunt 300 A

SmartShunt 500 A

SmartShunt 1000 A

SmartShunt 2000 A

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.

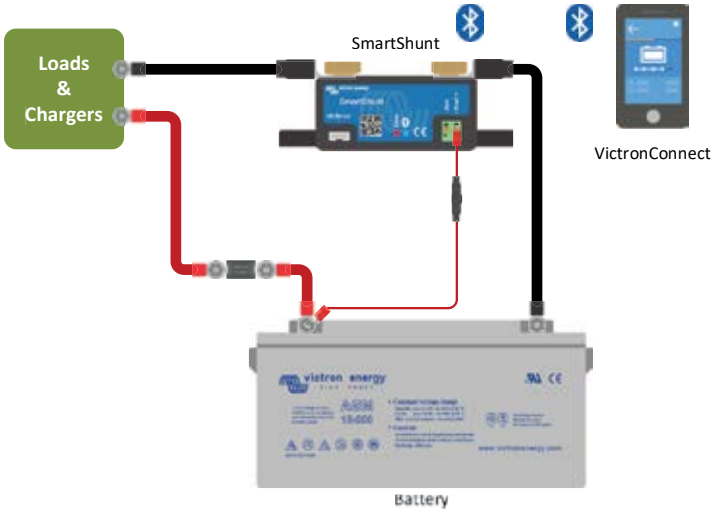
Alternatively, the SmartShunt can be connected and be read by a GX device. Connection to the SmartShunt is made via a VE.Direct cable.

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.

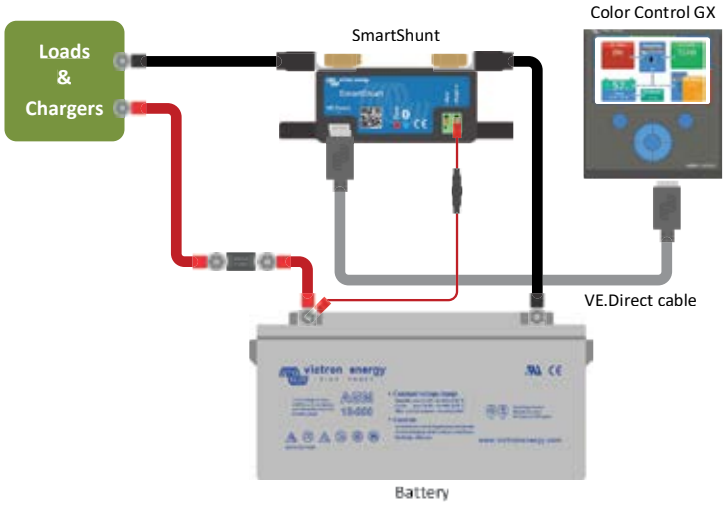
The SmartShunt is equipped with Bluetooth, a VE.Direct port and a connection that can be used to monitor a second battery, for midpoint monitoring, or to connect a temperature sensor.

Differences compared to BMV-712 Battery Monitor

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

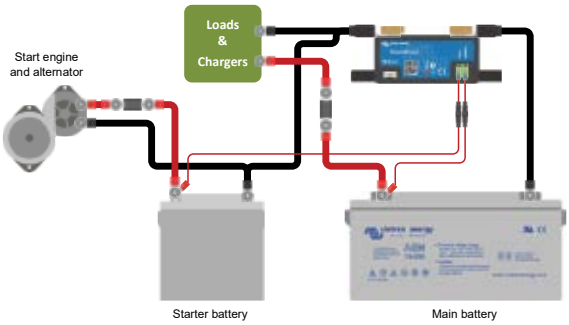


Basic SmartShunt wiring

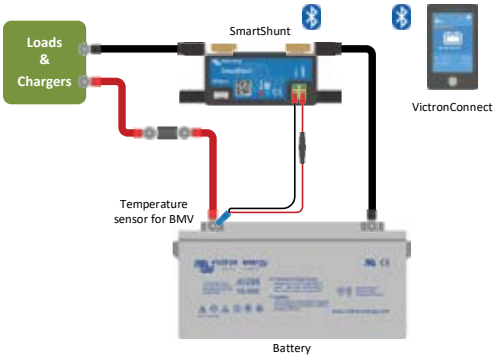


Connecting a SmartShunt to a GX device

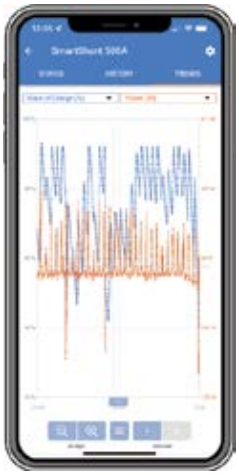
SmartShunt	300 A / 500 A / 1000 A / 2000 A
Supply voltage range	6.5 - 70 VDC
Current draw	< 1mA
Input voltage range, auxiliary battery	6.5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50°C (-40 - 120°F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50°C
VE.Direct communication port	Yes
RESOLUTION & ACCURACY	
Current	± 0.01 A
Voltage	± 0.01 V
Amp hours	± 0.1 Ah
State of charge (0 – 100 %)	± 0.1 %
Time to go	± 1 min
Temperature (if optional temperature sensor connected)	± 1 °C/°F (0 – 50 °C or 30 – 120 °F)
Accuracy of current measurement	± 0.4 %
Offset	Less than 10 / 10 / 20 / 40 mA
Accuracy of voltage measurement	± 0.3 %
INSTALLATION & DIMENSIONS	
Dimensions (h x w x d)	300 A: 44 x 120 x 44 mm 500 A: 46 x 120 x 54 mm 1000 A: 68 x 168 x 75 mm 2000 A: 68 x 168 x 100 mm
Shunt connection bolts	300 A: M8 500 A, 1000 A, 2000 A: M10 (0.3937 inch)
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
ACCESSORIES	
Cables (included)	Two cables with 1 A fuse, for '+' connection and starter battery or midpoint connection
Temperature sensor	Optional (ASS000100000)
A note regarding the range of the Bluetooth signal	The shunt and the electric cables do negatively influence the range of the Bluetooth signal. The resulting range of 10-15 meter is however satisfactory in most cases. The proximity of other electrically conducting elements, such as the metal chassis of a vehicle or seawater around the hull if a boat, may reduce the range of the Bluetooth signal to an unacceptable level. The solution in such a case is to add a VE.Direct Bluetooth Dongle (ASS030536011) to the system, and to switch off Bluetooth in the SmartShunt.
STORED TRENDS	
Data stored	Battery voltage, Current, State of Charge % as well as the Aux input (Battery temperature, or midpoint deviation, or starter battery voltage).
Number of days trends data is stored	46



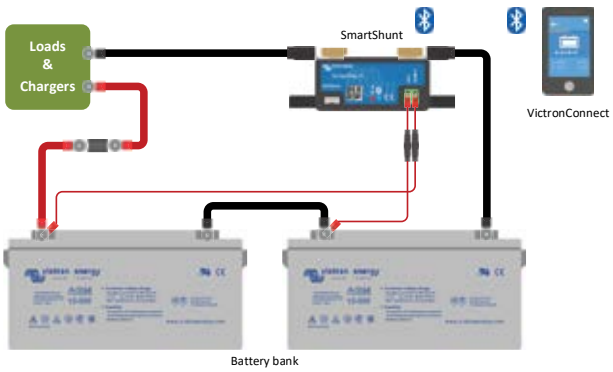
Measuring voltage of the starter battery



Measuring battery temperature



Stored trends for SmartShunt



Measuring battery bank midpoint

SMARTSHUNT IP65 300A/500A/1000A/2000A

SmartShunt IP65 300 A

SmartShunt IP65 500 A

SmartShunt IP65 1000 A

SmartShunt IP65 2000 A

The SmartShunt IP65 is an all-in-one battery monitor, only without a display. Your phone acts as the display.

The SmartShunt IP65 is water resistant and is available in a 300 A, 500 A, 1000 A or 2000 A version.

The SmartShunt IP65 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.

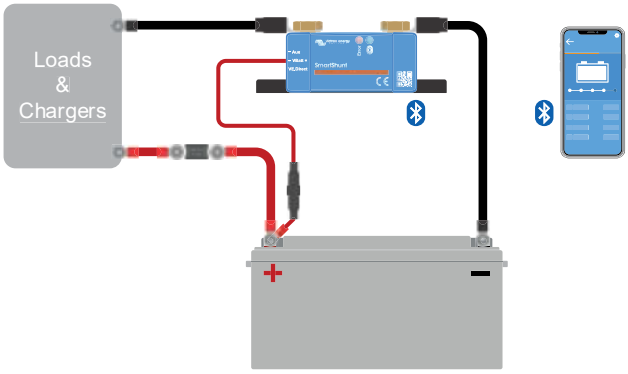
Alternatively, the SmartShunt IP65 can be connected and be read by a GX device. Connection to the SmartShunt is made via a VE.Direct cable.

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.

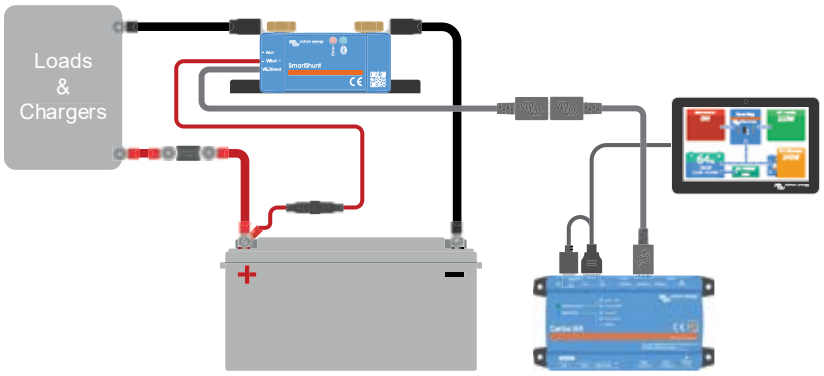
The SmartShunt is equipped with Bluetooth, has a VE.Direct port and an auxiliary connection that can be used to monitor a second battery, for midpoint monitoring, or to connect a temperature sensor.

Differences compared to BMV-712 Battery Monitor

- No visual and audible alarm (alarms are only visible via the VictronConnect app or GX device).
- No programmable relay.
- Waterproof.
- The shunt is attached to the battery monitor unit.

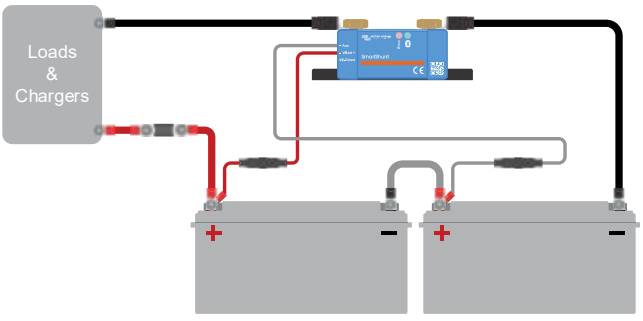


Basic SmartShunt wiring

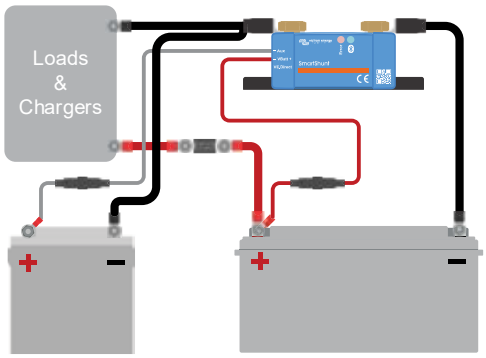


Connecting a SmartShunt to a GX device

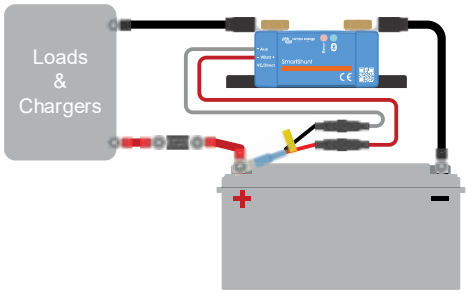
SmartShunt IP65	300 A / 500 A / 1000 A / 2000 A
Supply voltage range	6.5 - 70 VDC
Current draw	< 1 mA
Input voltage range, auxiliary battery	6.5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50 °C (-40 – 120 °F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50 °C
VE.Direct communication port	Yes
RESOLUTION & ACCURACY	
Current	± 0.01 A
Voltage	± 0.01 V
Amp hours	± 0.1 Ah
State of charge (0 – 100 %)	± 0.1 %
Time to go	± 1 min
Temperature (if optional temperature sensor connected)	± 1 °C/°F (0 – 50 °C or 30 – 120 °F)
Accuracy of current measurement	± 0.4 %
Offset	Less than 10 / 10 / 20 / 40 mA
Accuracy of voltage measurement	± 0.3 %
INSTALLATION & DIMENSIONS	
Dimensions (h x w x d)	300A: 44 x 120 x 38 mm 500A: 46 x 120 x 54 mm 1000A: 68 x 168 x 75 mm 2000A: 68 x 168 x 100 mm
Shunt connection bolts	300 A: M8 500 A, 1000 A, 2000 A: M10 (0.3937 inch)
Protection category	IP65
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	Two 1.5 m cables with 1 A fuse, for '+' connection and starter battery or midpoint connection
VE.Direct cable	1.5 m cable with a VE.Direct socket. Note that a (not included) VE.Direct cable is needed to connect a GX device.
Temperature sensor	Optional (ASS000100000)
A note regarding the range of the Bluetooth signal	The shunt and the electric cables do negatively influence the range of the Bluetooth signal. The resulting range of 10-15 meter is however satisfactory in most cases. The proximity of other electrically conducting elements, such as the metal chassis of a vehicle or seawater around the hull if a boat, may reduce the range of the Bluetooth signal to an unacceptable level. The solution in such a case is to add a VE.Direct Bluetooth Dongle (ASS030536011) to the system, and to switch off Bluetooth in the SmartShunt.
STORED TRENDS	
Data stored	Battery voltage, Current, State of Charge % as well as the Aux input (Battery temperature, or midpoint deviation, or starter battery voltage).
Number of days trends data is stored	46



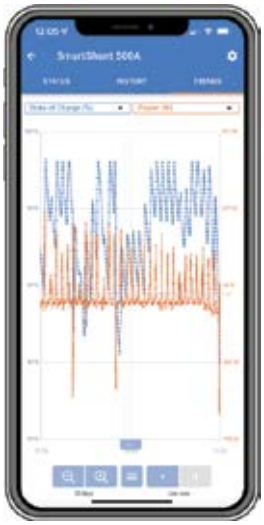
Measuring battery bank midpoint



Measuring voltage of the starter battery



Measuring battery temperature



Stored trends for SmartShunt

BMV-712 SMART: BLUETOOTH INSIDE

BMV-712 Smart

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

See the VictronConnect BMV app Discovery Sheet for more screenshots

Bluetooth inside

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

Download the Victron Bluetooth app

Use a smartphone or other Bluetooth enabled device to

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

Easy to install

All electrical connections are to the quick connect PCB on the current shunt. The shunt connects to the monitor with a standard RJ12 telephone cable. Included: 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: 0.7 Ah per month (1 mA) @12 V and 0.6 Ah per month (0.8 mA) @ 24 V
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 100 Ah battery capacity. The battery will be damaged if the remaining capacity reserve is drawn from the battery.
A residual current of 10 mA for example may damage a 200 Ah 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 – 70 V
- High current measurement resolution: 10 mA (0.01 A)
- 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	< 1 mA
Input voltage range, auxiliary battery	6.5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50 °C (-40 – 120 °F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50 °C
VE.Direct communication port	Yes
Bistable relay	60V / 1A normally open (function can be inverted)
RESOLUTION & ACCURACY (with a 500 A shunt)	
Current	± 0.01 A
Voltage	± 0.01 V
Amp hours	± 0.1 Ah
State of charge (0 – 100%)	± 0.1 %
Time to go	± 1 min
Temperature (0 - 50°C or 30 - 120°F)	± 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)
Shunt connections bolts	M10 (0.3937 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)	500 A / 50 mV
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with 1Amp slow blow fuse for '+' connectio
Temperature sensor	Optional (ASS000100000)
STORED TRENDS	
Data stored	Battery voltage, Current, State of Charge % as well as the Aux input (Battery temperature, or midpoint deviation, or starter battery voltage).
Number of days trends data is stored	46

1000A/50 mV, 2000 A/50 mV and 6000 A/50 mV shunt
The quick connect PCB on the standard 500 A/50 mV 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 24 V battery system increases to more than 27 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 batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

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

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 (NMEA 2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.

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

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

BLUESOLAR MONOCRYSTALLINE PANELS

BlueSolar Monocrystalline 305W

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

Article Number	Description	Net Weight	Electrical data under STC [1]				
			Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-Circuit Current
			P_{MPP}	V_{MPP}	I_{MPP}	Voc	Isc
		Kg	W	V	A	V	A
SPM040201200	20W-12V Mono 440 x 350 x 25mm series 4a	1.9	20	18.5	1.09	22.6	1.19
SPM040301200	30W-12V Mono 560 x 350 x 25mm series 4a	2.2	30	18.7	1.61	22.87	1.76
SPM040401200	40W-12V Mono 425 x 668 x 25mm series 4a	3.1	40	18.3	2.19	22.45	2.40
SPM040551200	55W-12V Mono 545 x 668 x 25mm series 4a	4	55	18.8	2.94	22.9	3.22
SPM040901200	90W-12V Mono 780 x 668 x 30mm series 4a	6.1	90	19.6	4.59	24.06	5.03
SPM041151202	115W-12V Mono 1030 x 668 x 30mm series 4b	8	115	19.0	6.04	23.32	6.61
SPM041301200	130W-12V Mono 1200 x 668 x 30mm series 4a	9.1	130	18.64	6.98	22.83	7.35
SPM041401200	140W-12V Mono 1250 x 668 x 30mm series 4a	9	140	19.4	7.22	23.6	8.05
SPM041501200	150W-12V Mono 1485 x 668 x 30mm series 4a	11	150	18.2	8.25	22.3	8.69
SPM041751200	175W-12V Mono 1485 x 668 x 30mm series 4a	11	175	19.4	9.03	23.7	9.89
SPM041851200	185W-12V Mono 1485 x 668 x 30mm series 4a	11	185	19.68	9.41	24.11	9.91
SPM042152402	215W-24V Mono 1580 x 705 x 35mm series 4b	11,7	215	40.1	5.36	46.01	5.65
SPM043052002	305W-20V Mono 1658 x 1002 x 35mm series 4b	19	305	32.5	9.38	39.7	10.27
SPM043602402	360W-24V Mono 1980 x 1002 x 40mm series 4b	23	360	38.4	9.38	47.4	10.24

Module	SPM 040201200	SPM 040301200	SPM 04040120	SPM 040551200	SPM 040901200	SPM 041151202	SPM 041301200	SPM 04140120	SPM 041501200	SPM 041751200	SPM 041851200	SPM 042152402	SPM 043052002	SPM 043602402
Nominal Power (±3% tolerance)	20W	30W	40W	55W	90W	115W	130W	140W	150W	175W	185W	215W	305W	360W
Cell type	Monocrystalline													
Number of cells in series	36											72	60	72
Maximum system voltage	1000V													
Temperature coefficient of MPP (%)	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C
Temperature coefficient of Voc (%)	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/° C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C
Temperature coefficient of Isc (%)	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C
Temperature Range	-40°C to +85°C													
Surface Maximum Load Capacity	200 kg/m²													
Allowable Hail Load	23 m/s, 7.53 g													
Junction Box Type	PV-LH0805		PV-LH0806		PV-LH0801	PV-LH0808	PV-LH0808-1	PV-LH0808	PV-LH0808-1	PV-LH0701	PV-LH0808	PV-LH0701	PV-JB002	
Length of Cables / Connector Type	No cable				900 mm MC4									
Output tolerance	+/-3%													
Frame	Aluminium													
Product warranty	5 years													
Warranty on electrical performance	10 years 90% + 25 years 80% of power output													
Smallest packaging unit	1 panel													
Quantity per pallet	380	260	200	140	72	72	36	48	48	42	48	42	42	37

1) STC (Standard Test Conditions): 1000 W/m², 25ºC, AM (Air Mass) 1.5

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

Article Number	Description	Net weight	Electrical data under STC (1)				
			Nominal Power	Max-Power Voltage	Max-Power Current	Open-Circuit Voltage	Short-Circuit Current
			P_{MPP}	V_{MPP}	I_{MPP}	Voc	Isc
		Kg	W	V	A	V	A
SPP040201200	20W-12V Poly 440 x 350 x 25mm series 4a	1.9	20	18.4	1.09	21.96	1.18
SPP040301200	30W-12V Poly 655 x 350 x 25mm series 4a	2.8	30	18.2	1.66	21.80	1.80
SPP040451200	45W-12V Poly 425 x 668 x 25mm series 4a	3.1	45	19.1	2.36	22.90	2.55
SPP040601200	60W-12V Poly 545 x 668 x 25mm series 4a	4	60	19.3	3.12	23.10	3.37
SPP040901200	90W-12V Poly 780 x 668 x 30mm series 4a	6.1	90	19.5	4.61	23.44	4.98
SPP041151202	115W-12V Poly 1030 x 668 x 30mm series 4b	8	115	18.9	6.08	22.73	6.56
SPP041301200	130W-12V Poly 1200 x 668 x 30mm series 4a	9.1	130	18.5	7.02	22.71	7.39
SPP041751200	175W-12V Poly 1485 x 668 x 30mm series 4a	12	175	18.3	9.56	21.9	10.24
SPP042702000	270W-20V Poly 1640 x 992 x 35mm series 4a	18.4	270	31.7	8.52	38.04	9.21
SPP042802000	280W-20V Poly 1650 x 992 x 35mm series 4a	18.4	280	31.9	8.77	39.13	9.23
SPP043302402	330W-24V Poly 1980 x 1002 x 40mm series 4b	23	330	37.3	8.86	44.72	9.57

Module	SPP 040201200	SPP 040301200	SPP 040451200	SPP 040601200	SPP 040901200	SPP 041151202	SPP 041301200	SPP 041751200	SPP 042702000	SPP 042802000	SPP 043302402
Nominal Power (± 3% tolerance)	20W	30W	45W	60W	90W	115W	130W	175W	270W	280W	330W
Cell type	Polycrystalline										
Number of cells in series	36								60		72
Maximum system voltage (V)	1000V										
Temperature coefficient of PMPP (%)	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.45/°C	-0.47/°C	-0.40/°C	-0.45/°C
Temperature coefficient of Voc (%)	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.35/°C	-0.34/°C	-0.30/°C	-0.35/°C
Temperature coefficient of Isc (%)	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.04/°C	+0.045/°C	+0.06/°C	+0.04/°C
Temperature Range	-40°C to +85°C										
Surface Maximum Load Capacity	200 kg/m²										
Allowable Hail Load	23 m/s, 7.53 g										
Junction Box Type	PV-LH0805	PV-LH0806		PV-LH0801		PV-LH0808			PV-JB002		
Length of Cable / connector	No cable				900 mm / MC4						
Output tolerance	+/-3%										
Frame	Aluminium										
Product warranty	5 years										
Warranty on electrical performance	10 years 90% + 25 years 80% of power output										
Smallest packaging unit	1 panel										
Quantity per pallet	380	240	200	140	72	72	72	48	42	42	37

1) STC (Standard Test Conditions): 1000 W/m², 25ºC, AM (Air Mass) 1.5

SMARTSOLAR CHARGE CONTROLLER
MPPT 75/10, 75/15, 100/15, 100/20-48V

SmartSolar Charge Controller
MPPT 75/15

Bluetooth sensing
Smart Battery Sense

Bluetooth sensing
BMV-712 Smart Battery Monitor

Stored trends

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

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

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

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

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

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

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

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

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 V			12/24/48 V
Rated charge current	10 A	15 A	15 A	20 A
Nominal PV power, 12 V 1a,b)	145 W	220 W	220 W	290 W
Nominal PV power, 24 V 1a,b)	290 W	440 W	440 W	580 W
Nominal PV power, 48 V 1a,b)	n. a.	n. a.	n. a.	1160 W
Max. PV short circuit current 2)	13 A	15 A	15 A	20 A
Automatic load disconnect	Yes			
Max. PV open circuit voltage	75 V		100 V	
Peak efficiency	98 %			
Self-consumption – load on	12 V: 19 mA 24 V: 16 mA			26 / 20 / 19 mA
Self-consumption – load off	12 V: 10 mA 24 V: 8 mA			10 / 8 / 7 mA
Charge voltage 'absorption'	14,4 V / 28,8 V (adjustable)			14,4 V / 28,8 V / 57,6 V (adj.)
Charge voltage 'float'	13,8 V / 27,6 V (adjustable)			13,8 V / 27,6 V / 55,2 V (adj.)
Charge algorithm	multi-stage adaptive			
Temperature compensation	-16 mV / °C resp. -32 mV / °C			
Max. continuous load current	15 A			20 A / 20 A / 1 A
Low voltage load disconnect	11,1 V / 22,2 V / 44,4 V or 11,8 V / 23,6 V / 47,2 V or Battery Life algorithm			
Low voltage load reconnect	13,1 V / 26,2 V / 52,4 V or 14 V / 28 V / 56 V or Battery Life algorithm			
Protection	Output short circuit / Over temperature			
Operating temperature	-30 to +60 °C (full rated output up to 40 °C)			
Humidity	95 %, non-condensing			
Data communication port	VE.Direct (see the data communication white paper on our website)			
ENCLOSURE				
Colour	Blue (RAL 5012)			
Power terminals	6 mm² / AWG10			
Protection category	IP43 (electronic components), IP22 (connection area)			
Weight	0,5 kg		0,6 kg	0,65 kg
Dimensions (h x w x d)	100 x 113 x 40 mm		100 x 113 x 50 mm	100 x 131 x 60 mm
STANDARDS				
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2			
STORED TRENDS				
Data stored	Battery voltage,current and temperature, as well as load output current, PV voltage and PV current.			
Number of days trends data is stored	46			

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

SMARTSOLAR CHARGE CONTROLLER
MPPT 100/30 & 100/50

SmartSolar Charge Controller
MPPT 100/50

Bluetooth sensing
Smart Battery Sense

Bluetooth sensing
BMV-712 Smart Battery Monitor

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

Ultrafast Maximum Power Point Tracking (MPPT)
Especially in case of a clouded sky, when light intensity is changing continuously, an ultra-fast MPPT controller will improve energy harvest b
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 rota
(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 Sm
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	12/24 V Auto Select	
Rated charge current	30 A	50 A
Nominal PV power, 12 V 1a,b)	440 W	700 W
Nominal PV power, 24 V 1a,b)	880 W	1400 W
Maximum PV open circuit voltage	100 V	100 V
Max. PV short circuit current 2)	35 A	60 A
Maximum efficiency	98 %	98 %
Self-consumption	12 V: 30 mA 24 V: 20 mA	
Charge voltage 'absorption'	Default setting: 14,4 V / 28,8 V (adjustable)	
Charge voltage 'float'	Default setting: 13,8 V / 27,6 V (adjustable)	
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Protection	PV reverse polarity Output short circuit Over temperature	
Operating temperature	-30 to +60 °C (full rated output up to 40 °C)	
Humidity	95 %, non-condensing	
Data communication port	VE.Direct See the data communication white paper on our website	
ENCLOSURE		
Colour	Blue (RAL 5012)	
Power terminals	16 mm² / AWG6	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	1,3 kg	
Dimensions (h x w x d)	130 x 186 x 70 mm	
STANDARDS		
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2	
STORED TRENDS		
Data stored	Battery voltage,current and temperature, as well as load output current, PV voltage and PV current.	
Number of days trends data is stored	46	

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

SMARTSOLAR CHARGE CONTROLLER
MPPT 150/35 & 150/45

SmartSolar Charge Controller
MPPT 150/35

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

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

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

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

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

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

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

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense or a BMV 712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more SmartSolar Charge Controllers.

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.

Bluetooth sensing
Smart Battery Sense

Bluetooth sensing
BMV-712 Smart Battery Monitor

SmartSolar Charge Controller	MPPT 150/35	MPPT 150/45
Battery voltage	12 / 24 / 48 V Auto Select (software tool needed to select 36 V)	
Rated charge current	35 A	45 A
Nominal PV power 1a, b)	35 A 12 V: 500 W / 24 V: 1000 W / 36 V: 1500 W / 48 V: 2000 W 45 A 12 V: 650 W / 24 V: 1300 W / 36 V: 1950 W / 48 V: 2600 W	
Max. PV short circuit current 2)	40 A	50 A
Maximum PV open circuit voltage	150 V absolute maximum coldest conditions 145 V start-up and operating maximum	
Maximum efficiency	98 %	
Self-consumption	12 V: 20 mA 24 V: 15 mA 48 V: 10 mA	
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6 V (adjustable)	
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2 V (adjustable)	
Charge algorithm	multi-stage adaptive (eight pre-programmed algorithms)	
Temperature compensation	-16 mV / -32 mV / -64 mV / °C	
Protection	PV reverse polarity / output short circuit / over-temperature	
Operating temperature	-30 to +60°C (full rated output up to 40°C)	
Humidity	95 %, non-condensing	
Data communication port	VE.Direct See the data communication white paper on our website	
ENCLOSURE		
Colour	Blue (RAL 5012)	
Power terminals	16 mm² / AWG6	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	1,25 kg	
Dimensions (h x w x d)	130 x 186 x 70 mm	
STANDARDS		
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2	
STORED TRENDS		
Data stored	Battery voltage,current and temperature, as well as load output current, PV voltage and PV current.	
Number of days trends data is stored	46	

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

SMARTSOLAR CHARGE CONTROLLER
MPPT 150/60 & 150/70

SmartSolar Charge Controller
MPPT 150/70-Tr
without optional display

SmartSolar Charge Controller
MPPT 150/70-Tr
without optional display

Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Bluetooth sensing: SmartShunt

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

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

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

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

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

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

Optional external battery voltage, temperature and current sensing via Bluetooth
A Smart Battery Sense, a BMV-712 Smart Battery Monitor or a SmartShunt can be used to communicate battery voltage and temperature (and current, in case of a BMV-712 or a SmartShunt) to one or more SmartSolar Charge Controllers.

Synchronized parallel charging with Bluetooth
Up to 10 units can be synchronized with Bluetooth.

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 150/70 UP TO 150/100 VE.CAN

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

SmartSolar Charge Controller
MPPT 150/100-Tr VE.Can
without display

Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Bluetooth sensing: SmartShunt

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, 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.

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

Internal temperature sensor and optional external battery voltage, temperature and current sensing via Bluetooth
A Smart Battery Sense, a BMV-712 Smart Battery Monitor or a SmartShunt can be used to communicate battery voltage and temperature (and current, in case of a BMV-712 or a SmartShunt) to one or more SmartSolar Charge Controllers.

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

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.Can: the multiple controller solution
Up to 25 units can be synchronised with VE.Can, and up to 10 units with Bluetooth

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 with VE.Can interface	150/70 VE.Can	150/85 VE.Can	150/100 VE.Can (also available without Bluetooth)
Battery voltage	12/24/48 V Auto Select (36 V: manual)		
Rated charge current	70 A	85 A	100 A
Nominal PV power, 12 V 1a,b)	1000 W	1200 W	1450 W
Nominal PV power, 24 V 1a,b)	2000 W	2400 W	2900 W
Nominal PV power, 36 V 1a,b)	3000 W	3600 W	4350 W
Nominal PV power, 48 V 1a,b)	4000 W	4900 W	5800 W
Max. PV short circuit current 2)	50 A (max 30 A per MC4 conn.)	70 A (max 30 A per MC4 conn.)	
Maximum PV open circuit voltage	150 V absolute maximum coldest conditions 145 V start-up and operating maximum		
Maximum efficiency	98 %		
Self-consumption	Less than 35 mA @ 12 V / 20 mA @ 48 V		
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6 V (adjustable with: rotary switch, display, VE.Direct or Bluetooth)		
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2 V (adjustable: rotary switch, display, VE.Direct or Bluetooth)		
Charge voltage 'equalization'	Default setting: 16,2 V / 32,4 V / 48,6 V / 64,8 V (adjustable)		
Charge algorithm	multi-stage adaptive (eight preprogrammed algorithms) or user defined algorithm		
Temperature compensation	-16 mV / -32 mV / -64 mV / °C		
Protection	PV reverse polarity / Output short circuit / Over temperature		
Operating temperature	-30 to +60 °C (full rated output up to 40 °C)		
Humidity	95 %, non-condensing		
Maximum altitude	5000m (full rated output up to 2000m)		
Environmental condition	Indoor, unconditioned		
Pollution degree	PD3		
Data communication	VE.Can, VE.Direct and Bluetooth		
Remote on/off	Yes (2 pole connector)		
Programmable relay	DPST AC rating: 240 VAC / 4 A DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC		
Parallel operation	Yes, parallel synchronised operation with VE.Can (max. 25 units) or Bluetooth (max. 10 units)		
ENCLOSURE			
Colour	Blue (RAL 5012)		
PV terminals 3)	35 mm² / AWG2 (Tr models) Two pairs of MC4 connectors (MC4 models)	35 mm² / AWG2 (Tr models) Three pairs of MC4 connectors (MC4 models)	
Battery terminals	35mm² / AWG2		
Protection category	IP43 (electronic components), IP22 (connection area)		
Weight	3 kg	4,5kg	
Dimensions (h x w x d) in mm	Tr models: 185 x 250 x 95 mm MC4 models: 215x 250 x 95 mm	Tr models: 216 x 295 x 103 MC4 models: 246 x 295 x 103	
STANDARDS			
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2		
STORED TRENDS			
Data stored	Battery voltage,current and temperature, as well as load output current, PV voltage and PV current.		
Number of days trends data is stored	46		

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

With VE.Can or Bluetooth up to 25 respectively up to 10 Charge Controllers can be daisy-chained for synchronous charging and connected to a Color Control GX or other GX device.
Each Controller can be monitored individually, for example on a Color Control GX and on the VRM website (VE.Can) or on a smartphone or iPad (Bluetooth)

SMARTSOLAR CHARGE CONTROLLER
MPPT 250/60 & 250/70

SmartSolar Charge Controller
MPPT 250/70-Tr
with optional pluggable display

SmartSolar Charge Controller
MPPT 250/70-MC4
without display

Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Bluetooth sensing: SmartShunt

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

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

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

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

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

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

Internal temperature sensor and optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense, a BMV-712 Smart Battery Monitor or a SmartShunt can be used to communicate battery voltage and temperature (and current, in case of a BMV-712 or a SmartShunt) to one or more SmartSolar Charge Controllers

Synchronized parallel charging with Bluetooth
Up to 10 units can be synchronized with Bluetooth.

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.

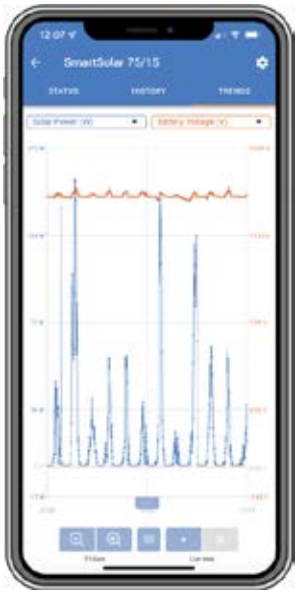
Programmable relay
Can be programmed (a.o. with a smartphone) to trip on an alarm, or other events.

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

SmartSolar Charge Controller	250/60	250/70
Battery voltage	12 / 24 / 48 V Auto Select (software tool needed to select 36 V)	
Rated charge current	60 A	70 A
Nominal PV power, 12 V 1a,b)	860 W	1000 W
Nominal PV power, 24 V 1a,b)	1720 W	2000 W
Nominal PV power, 36 V 1a,b)	2580 W	3000 W
Nominal PV power, 48 V 1a,b)	3440 W	4000 W
Max. PV short circuit current 2)	35 A (max 30 A per MC4 conn.)	
Maximum PV open circuit voltage	250 V absolute maximum coldest conditions 245 V start-up and operating maximum	
Maximum efficiency	99 %	
Self-consumption	Less than 35 mA @ 12 V / 20 mA @ 48 V	
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6 V (adjustable with: rotary switch, display, VE.Direct or Bluetooth)	
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2 V (adjustable: rotary switch, display, VE.Direct or Bluetooth)	
Charge voltage 'equalization'	Default setting: 16,2 V / 32,4 V / 48,6 V / 64,8 V (adjustable)	
Charge algorithm	multi-stage adaptive (eight pre-programmed algorithms) or user defined algorithm	
Temperature compensation	-16 mV / -32 mV / -64 mV / °C	
Protection	PV reverse polarity / Output short circuit / Over temperature	
Operating temperature	-30 to +60 °C (full rated output up to 40 °C)	
Humidity	95 %, non-condensing	
Maximum altitude	5000m (full rated output up to 2000m)	
Environmental condition	Indoor, unconditioned	
Pollution degree	PD3	
Data communication port	VE.Direct or Bluetooth	
Remote on/off	Yes (2 pole connector)	
Programmable relay	DPST AC rating: 240 VAC / 4 A DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC	
Parallel operation	Yes: up to 10 units can be synchronized with Bluetooth	
ENCLOSURE		
Colour	Blue (RAL 5012)	
PV terminals 3)	35 mm² / AWG2 (Tr models) Two pairs of MC4 connectors (MC4 models)	
Battery terminals	35 mm² / AWG2	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	3 kg	
Dimensions (h x w x d)	Tr models: 185 x 250 x 95 mm MC4 models: 215 x 250 x 95 mm	
STANDARDS		
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2	
STORED TRENDS		
Data stored	Battery voltage,current and temperature, as well as load output current, PV voltage and PV current.	
Number of days trends data is stored	46	

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



SMARTSOLAR CHARGE CONTROLLER
MPPT 250/70 UP TO 250/100 VE.CAN

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

SmartSolar Charge Controller
MPPT 250/100-Tr VE.Can
without display

Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Bluetooth sensing: SmartShunt

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 (MPP) points may be present on the power-voltage curve.
Conventional MPPTs tend to lock to a local MPP, which may not be the optimum MPP.
The innovative SmartSolar algorithm will always maximize energy harvest by locking to the optimum MPP.

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

Flexible charge algorithm
Fully programmable charge algorithm, 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.

Bluetooth Smart built-in
The wireless solution to set-up, monitor, update and synchronise SmartSolar Charge Controllers.

Internal temperature sensor and optional external battery voltage, temperature and current sensing via Bluetooth
A Smart Battery Sense, a BMV-712 Smart Battery Monitor or a SmartShunt can be used to communicate battery voltage and temperature (and current, in case of a BMV 712 or a SmartShunt) to one or more SmartSolar Charge Controllers.

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

Synchronized parallel charging with VE.Can or Bluetooth
Up to 25 units can be synchronized with VE.Can, and up to 10 units with Bluetooth.

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.Can: the multiple controller solution
Up to 25 units can be synchronised with VE.Can.

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

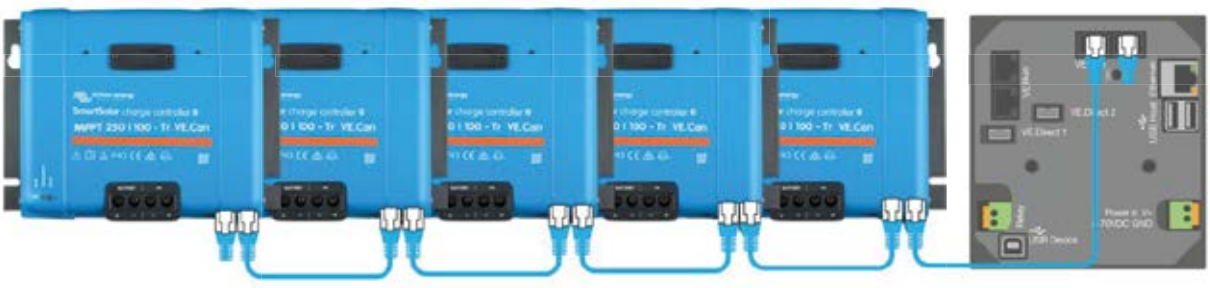
Programmable relay
Can be programmed to trip on an alarm,
or other events.

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 with VE.Can interface	250/70	250/85	250/100
Battery voltage	12/24/48 V Auto Select (36 V: manual)		
Rated charge current	70 A	85 A	100 A
Nominal PV power, 12 V 1a,b)	1000 W	1200 W	1450 W
Nominal PV power, 24 V 1a,b)	2000 W	2400 W	2900 W
Nominal PV power, 36 V 1a,b)	3000 W	3600 W	4350 W
Nominal PV power, 48 V 1a,b)	4000 W	4900 W	5800 W
Max. PV short circuit current 2)	35 A (max 30 A per MC4 conn.)	70 A (max 30 A per MC4 conn.)	
Maximum PV open circuit voltage	250 V absolute maximum coldest conditions 245 V start-up and operating maximum		
Maximum efficiency	99 %		
Self-consumption	Less than 35 mA @ 12 V / 20 mA @ 48 V		
Charge voltage 'absorption'	Default setting: 14,4 / 28,8 / 43,2 / 57,6 V (adjustable with: rotary switch, display, VE.Direct or Bluetooth)		
Charge voltage 'float'	Default setting: 13,8 / 27,6 / 41,4 / 55,2 V (adjustable: rotary switch, display, VE.Direct or Bluetooth)		
Charge voltage 'equalization'	Default setting: 16,2 V / 32,4 V / 48,6 V / 64,8 V (adjustable)		
Charge algorithm	multi-stage adaptive (eight pre-programmed algorithms) or user defined algorithm		
Temperature compensation	-16 mV / -32 mV / -64 mV / °C		
Protection	PV reverse polarity / Output short circuit / Over temperature		
Operating temperature	-30 to +60 °C (full rated output up to 40 °C)		
Humidity	95 %, non-condensing		
Maximum altitude	5000 m (full rated output up to 2000 m)		
Environmental condition	Indoor, unconditioned		
Pollution degree	PD3		
Data communication	VE.Can, VE.Direct and Bluetooth		
Remote on/off	Yes (2 pole connector)		
Programmable relay	DPST AC rating: 240 VAC / 4 A DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC		
Parallel operation	Yes, parallel synchronised operation with VE.Can (max. 25 units) or Bluetooth (max. 10 units)		
ENCLOSURE			
Colour	Blue (RAL 5012)		
PV terminals 3)	35 mm² / AWG2 (Tr models) Two pairs of MC4 connectors (MC4 models)	35 mm² / AWG2 (Tr models) Three pairs of MC4 connectors (MC4 models)	
Battery terminals	35mm² / AWG2		
Protection category	IP43 (electronic components), IP22 (connection area)		
Weight	3 kg	4,5 kg	
Dimensions (h x w x d) in mm	Tr models: 185 x 250 x 95 mm MC4 models: 215 x 250 x 95 mm	Tr models: 216 x 295 x 103 MC4 models: 246 x 295 x 103	
STANDARDS			
Safety	EN/IEC 62109-1, UL 1741, CSA C22.2		
STORED TRENDS			
Data stored	Battery voltage, current and temperature, as well as load output current, PV voltage and PV current.		
Number of days trends data is stored	46		

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



With VE.Can up to 25 Charge Controllers can be daisy-chained and connected to a Color Control GX or other GX device
Each Controller can be monitored individually, for example on a Color Control GX and on the VRM website

SMARTSOLAR MPPT RS

SmartSolar MPPT RS 450|100

Inside the SmartSolar MPPT RS 450|100

Ultra-fast Maximum Power Point Tracking (MPPT) Solar Charge Controller

The MPPT RS SmartSolar is a 48 V Solar charge controller with up to 450 VDC PV input and either 100 A, or 200 A output. It is used in on-grid and off-grid solar applications where maximum battery charging power is required.

Multiple independent MPPT tracking inputs

With multiple MPPT trackers, you can optimize your solar panel design for maximum performance for your specific location.

Isolated PV connections for additional safety

Full galvanic isolation between PV and battery connections provide additional overall system safety.

Wide MPPT voltage range

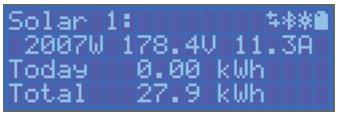
65 – 450 VDC PV operating range, with a 120 VDC PV startup voltage.

Light weight, efficient and quiet

Thanks to high frequency technology and a new design this powerful charger weighs only 7.9 kg for the 100 A model. In addition to this it has an excellent efficiency, low standby power, and a very quiet operation.

Display and Bluetooth

The display reads battery, and controller parameters. The 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.



PV Isolation resistance monitoring for peace of mind at higher voltages

The MPPT RS continuously monitors the PV array and can detect if there are faults that reduce the isolation of the panels to unsafe levels.

VE.Can and VE.Direct port

For connection to a GX device for system monitoring, data logging, and remote firmware updates. VE.Can allows for up to 25 units to be connected together in parallel and synchronize their charging.

I/O Connections

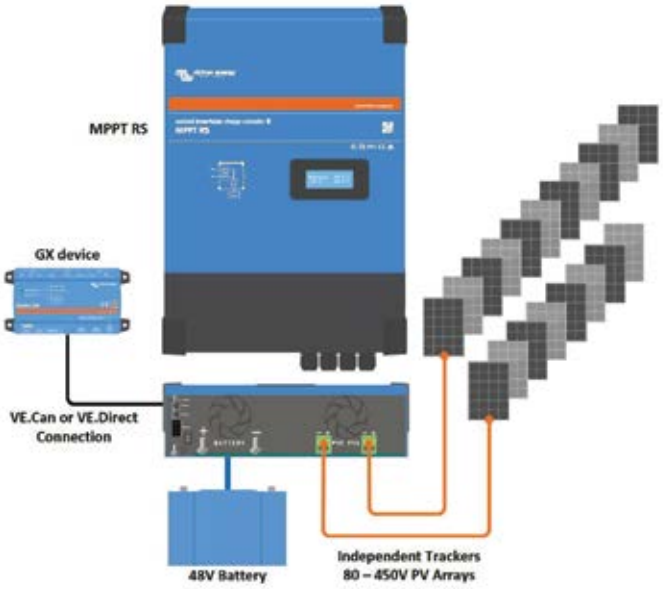
Programmable Relay, temperature sensor, auxiliary, digital input and voltage sensor connections. The remote input can accept the Victron smallBMS, and other BMS with allow-to-charge signal.

Configure and monitor with VictronConnect →

The built-in Bluetooth Smart connection allows for quick monitoring and settings adjustment.

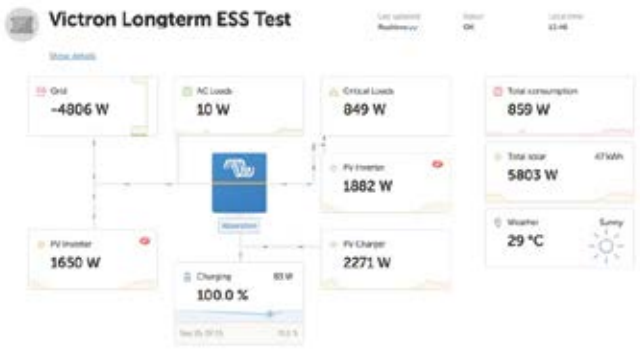
The built-in 30-day history shows individual performance of the separate MPPT trackers.

Try the VictronConnect demo to see the full range of configuration and display options with sample data.



System example diagram
The 100 A MPPT RS combined with a GX device, charging a 48 V battery with 2 separate solar PV strings.

VRM Portal
When the MPPT RS is connected to a GX device with internet connection, or the GlobalLink 520 with built in 4G connectivity, you can access our free remote monitoring website (VRM). This will display all your system data in a comprehensive graphical format. Alarms can be received by e-mail.



Isolated SmartSolar MPPT RS	450|100	450|200
CHARGER		
Battery voltage	48 V	
Rated charge current	100 A	200 A
Maximum charge power	5.8 kW at 57.6 V	11.5 kW at 57.6 V
Charge voltage 'absorption'	Default setting: 57.6 V (adjustable)	
Charge voltage 'float'	Default setting: 55.2 V (adjustable)	
Programmable voltage range	Minimum: 36 V Maximum: 60 V [7]	
Charge algorithm	Multi-stage adaptive (adjustable)	
Battery temperature sensor	Included	
Maximum efficiency	96 %	
Self-consumption	15 mA	
SOLAR		
Maximum DC PV voltage	450 V	
Start-up voltage	120 V	
MPPT operating voltage range	65 – 450 V [1]	
Number of trackers	2	4
Max. PV operational input current	16 A per tracker	
Max. PV short circuit current [2]	20 A per tracker	
Max. DC output charging power	4000 W per tracker 5760 W total	4000 W per tracker 11520 W total
Maximum PV array size per tracker [3]	7200 Wp (450 V x 20 A) [3]	
PV Isolation fail level [4]	100 kΩ	
GENERAL		
Synchronised Parallel Operation	Yes, up to 25 units with VE.Can	
Programmable relay [5]	Yes	
Protection	PV reverse polarity Output short circuit Over temperature	
Data communication	VE.Direct port, VE.Can port & Bluetooth (6)	
Bluetooth frequency	2402 – 2480 MHz	
Bluetooth power	4dBm	
General purpose analogue/digital in port	Yes, 2x	
Remote on-off	Yes	
Operating temperature range	-40 to +60 °C (fan assisted cooling)	
Humidity (non-condensing)	max 95 %	
ENCLOSURE		
Material & Colour	steel, blue RAL 5012	
Protection category	IP21	
Battery-connection	2x M8 bolts, 1x positive and 1x negative	4x M8 bolts, 2x positive and 2x negative
Power terminals PV input	1 pair of male and female MC4 connectors per tracker	
Weight	7.9 kg	13.7 kg
Dimensions (h x w x d) in mm	440 x 313 x 126	487 x 434 x 146
STANDARDS		
Safety	EN-IEC 62109-1, EN-IEC 62109-2	
Country of Origin	Designed in The Netherlands made in India	

1) MPPT operating voltage range is constrained by battery voltage - PV VOC should not exceed 8 x battery float voltage. For example, a 52.8 V float voltage results in a maximum PV VOC of 422.4 V. See product manual for further information.

2) A higher short circuit current may damage the controller if PV array is connected in reverse polarity.

3) Max. 450 VOC result in appr. 360 Vmpp, therefor the maximum PV array is appr. 360 V x 20 A = 7200 Wp.

4) The SmartSolar MPPT RS will test for sufficient resistive isolation between PV+ and GND, as well as PV- and GND. If the resistance falls below the threshold, the unit will report an error and send an error signal to the GX device (if connected) for audible and email notifications. Despite the error, the product will continue charging the battery.

5) Programmable relay which can be set for general alarm, DC under voltage or genset start/stop function. DC rating: 4 A up to 35 VDC and 1 A up to 70 VDC

6) The MPPT RS is currently not compatible with VE.Smart Networks.

7) The Charger set-point (float and absorption) can be set to max 60 V. The output voltage at the charger terminals can be higher, due to temperature compensation as well as compensation for voltage drop over the battery cables. The maximum output current is reduced on a linear basis from full current at 60 V to 5A at 62 V. The equalization voltage can be set to max 62 V, the equalization current percentage can be set to max 6%.

BLUESOLAR PWM-LIGHT CHARGE CONTROLLER 12/24V

BlueSolar PWM-Light 10A

Features

- Load output with low battery voltage disconnect function.
- Lighting control function, one timer only.
- Two digit seven segment display for quick and easy setting of the load output functionality, including timer setting.
- Three stage battery charging (bulk, absorption, float), not programmable.
- Load output protected against over load and short circuit.
- Protected against reverse polarity connection of the solar array and/or battery.

Day/night timing options

See manual for details

BlueSolar PWM-Light	12/24-5	12/24-10	12/24-20	12/24-30
Battery Voltage	12/24 V with automatic system voltage detection			
Rated charge current	5A	10A	20A	30A
Automatic load disconnect	Yes			
Maximum solar voltage	28V / 55V (1)			
Self-consumption	< 10 mA			
Load output	Manual control + low voltage disconnect			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Overload protection	Shut down after 60 s in case of 130% load			
	Shut down after 5 s in case of 160% load			
	Short circuit: immediate shut down			
Grounding	Common positive			
Operating temp. range	-20 to +50°C (full load)			
Humidity (non-condensing)	Max 95%			
BATTERY				
Charge voltage 'absorption'	14.2V / 28,4V			
Charge voltage 'float'	13.8V / 27,6V			
Low voltage load disconnect	11,2V / 22,4V			
Low voltage load reconnect	12,6V / 25,2V (manual) 13,1V / 26,2V (automatic)			
ENCLOSURE				
Protection class	IP20			
Terminal size	5 mm² / AWG10			
Weight	0,15kg			0,2kg
Dimensions (h x w x d)	70 x 133 x 33,5 mm (2.8 x 5.3 x 1.3 inch)			
STANDARDS				
Safety	IEC 62109-1			
EMC	EN 61000-6-1, EN 61000-6-3, ISO 7637-2			

1) For 12V use 36 cell solar panels
For 24V use 72 cell solar panels
or 2x 36 cell in series

2) The controller switches to the lower float voltage level 2 hours after the absorption voltage has been reached. Whenever the battery voltage becomes lower than 13V, a new charge cycle is triggered.

BLUESOLAR PWM-PRO CHARGE CONTROLLERS

BlueSolar PWM-Pro 10A

BlueSolar Pro Remote Panel

Programmable

The BlueSolar PWM-Pro series is ready for use with its default settings.
It also is fully programmable:

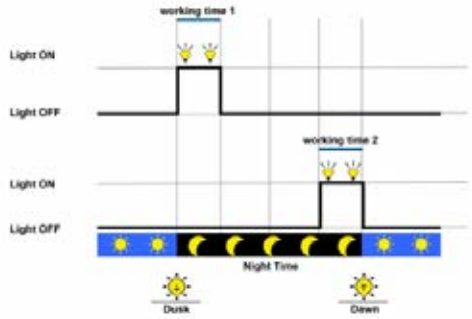
- With help of a computer and software (available free of charge from our website)
- With the dedicated BlueSolar Pro Remote Panel (see features below).

Features

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

Day/night timing options

See Remote Panel manual for details



BlueSolar PWM-Pro	12/24-5	12/24-10	12/24-20	12/24-30
Battery Voltage	12/24V with automatic system voltage detection			
Rated charge current	5A	10A	20A	30A
Automatic load disconnect	Yes			
Maximum solar voltage	28V / 55V (1)			
Self-consumption	< 10mA			
Load output	Manual control + low voltage disconnect			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Battery temperature sensor	Optional (article SCC940100100)			
Temperature compensation	-30 mV / °C resp. -60 mV / °C (if temperature sensor installed)			
Remote panel	Optional (article SCC900300000)			
Grounding	Common positive			
Operating temp. range	-20 to +50°C			
Humidity (non-condensing)	Max 98%			
DEFAULT SETTINGS				
Absorption charge (2)	14.4V / 28,8V			
Float charge (2)	13.8V / 27,6V			
Equalization charge (2)	14,6V / 29,2V			
Low voltage load disconnect	11,1V / 22,2V			
Low voltage load reconnect	12,6V / 25,2V			
ENCLOSURE				
Terminal size	4mm²	4mm²	10mm²	10mm²
Protection category	IP30			
Weight	0,13kg	0,13kg	0,3kg	0,5kg
Dimensions (h x w x d)	138x70x37 mm 5.4x2.7x1.4 inch	138x70x37 mm 5.4x2.7x1.4 inch	160x82x48 mm 6.3x3.2x1.9 inch	200x100x57 mm 7.9x4.0x2.3 inch
STANDARDS				
Safety	IEC 62109-1			
Emission	EN 61000-6-1, EN 61000-6-3, ISO 7637-2			

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

EV CHARGING STATION NS - 22 kW

EV Charging Station NS

EV Charging Station NS - Front

Black, blue (default) or white front

VictronConnect app

High power EV Charging Station

The EV Charging Station NS has three-phase and single-phase capabilities. It delivers a maximum of 22 kW AC in three-phase or 7.3 kW in single-phase mode. It comes with a blue front. A black or white front can be purchased separately.

WiFi Communication

WiFi: 802.11 b/g/n for configuration, monitoring and control. The internal WiFi module can be configured in Access Point or Station mode for both, the initial setup and monitoring.

Easy operation and control via Bluetooth and the VictronConnect App

Get full control and overview of all operating parameters and session statistics at a glance.

Light Ring for fast viewing the device state

Fully programmable RGB Light Ring around the charging port to quickly determine the device state. It can be programmed from the integrated web interface to display different light effects based on the current state (disconnected, charging, charged etc.).

Three working modes available:

1. **Manual Mode to configure output current**
   Manual mode allows configurable output current between 6-32 A. The charging power can be regulated in different ways: by using the web interface, from a GX device and VRM and via VictronConnect. It allows to manually start or stop the charging process when a vehicle is connected to the charging station.
2. **Automatic Mode to ensure maximum PV system efficiency**
   Detects when excess power is available and uses only that power to charge the vehicle.
3. **Scheduled Mode to charge the EV at certain time intervals**
   A fully programmable scheduler allows charging at different time intervals, for example at certain times during the night when grid energy is cheaper.

Integration with GX devices and VRM

Control and monitor the EV Charging Station NS from a GX device touch display and the Remote Console and the VRM Portal. The VRM Portal also offers real time and custom reports for configurable time periods.

EV Charging Station NS	EVC200300200
Input voltage range (V AC)	170 – 265 VAC
Rated charge current	32 A / phase
Nominal power	22 kW
Current output range	6 – 32 A
WiFi standards	802.11 b/g/n (2.4 Ghz only)
Self-consumption	15 mA@230 V
Configurable Max. Current	10-32 A
Configurable Min. Current	6 A up to 1 A below max. value
Connector type	IEC 62196 Type 2
GENERAL	
Means to Disconnect	External circuit breaker (40 A recommended)
Configurable price/kWh calculator(Eur)	Default setting: 0.13 (adjustable)
Control type	Web page, GX Device over Modbus TCP, VictronConnect via Bluetooth
Light Ring	55 light configurable light effects available
Protection	External RCD is required
Operating temperature	-25 °C to +50 °C
Storage temperature	-40 °C to +80 °C
Humidity	95 %, non-condensing
Data communication	Modbus TCP over WiFi, Bluetooth
ENCLOSURE	
Enclosure colour	Light Blue (RAL 5012), Traffic Black (RAL 9017), Traffic White (RAL 9016)
Power terminals	6-10 mm^2 / AWG 10-8
Protection category	IP44
Ventilation	not required
Weight	3 kg
Dimensions (h x w x d)	372 x 292 x 122mm
STANDARDS	
Safety	IEC 61851-1, IEC 61851-22 Detection for Relay Contact welded Detection for missing protective conductor Detection for missing Ground Detection for shorted CP

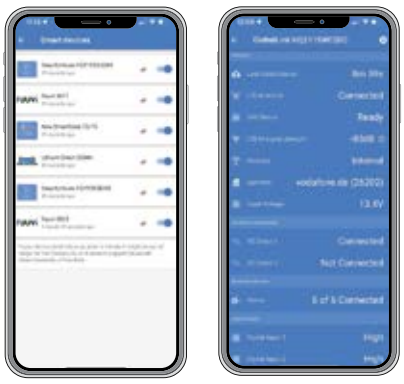
GLOBALLINK 520

GlobalLink 520

Accessories included with the GlobalLink 520

Optional Outdoor LTE-M wall-mount antenna (ANT100200100)

Outdoor LTE-M puck antenna (ANT100200200)



The GlobalLink 520 connects your remote Victron system or individual products to VRM, our online Victron Remote Management portal. Through that portal, you can monitor current and historical system operation – such as battery voltage and state of charge – from anywhere in the world. VRM is free to use.

Unique is the pre-installed and pre-paid SIM card: the GlobalLink comes with 5 years of 4G LTE-M connectivity. No need to purchase and maintain SIM-cards.

Features

- Smart device[1)] and VE.Direct support: Connect up to 10 Victron smart products using BLE and two hard wired VE.Direct devices.
- VRM-monitoring: Monitor battery state of charge, power consumption, power harvest from PV, generator and grid or check temperature measurements. Follow up on alerts and perform diagnostics checks.
- RuuviTag support: These sensors connect via BLE and are easy to setup via VictronConnect. All the data, like temperature, humidity and atmospheric pressure will be directly available in VRM.
- Support for custom SIM cards.
- Simple mounting and configuration: The GlobalLink 520 is wall mountable. The Bluetooth feature enables a quick connection and easy configuration via our VictronConnect app.

[1)] See the GlobalLink 520 manual for supported Victron products that can be connect over Bluetooth.

GlobalLink 520	ASS030543020		
Supply voltage	8 – 70 VDC		
Power draw with Bluetooth enabled (disabled)		Average with relay open	Average with relay closed
	12 V	50 mA (20 mA)	64 mA (40 mA)
	24 V	26 mA (10 mA)	34 mA (20 mA)
	48 V	14 mA (5 mA)	19 mA (10 mA)
Mounting	Wall		
Input connectivity			
VE.Direct ports (always isolated)	2		
RuuviTag support	Yes		
Instant Readout via Bluetooth	Yes (connect up to 10 additional Smart devices via BLE)		
Digital Inputs	2		
Relay	1 x NO/NC DC up to 30 VDC: 2 A AC: 0.5 A, 125 VAC		
Output connectivity			
Bluetooth	Yes		
WiFi	No		
Cellular	CAT M1 (LTE-M) 17 bands supported from 699Mhz to 2690Mhz (Total world-wide support) Bands supported are currently: 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 18, 19, 20, 25, 26, 28, 66		
Dimensions			
Outer dimensions (h x w x d)	123 x 67 x 23 mm		
Operating temperature range	-20 to +50 °C		
Other			
Antenna	Internal and SMA connector for optional external antenna		
Factory included SIM	Prepaid 1nce data SIM with 5 years of connectivity		
Support for custom SIM	Yes		
Optional external LTE-M SMA-M antenna	Outdoor wall mount antenna	3 meter	ANT100200100
	Outdoor puck antenna	3 meter	ANT100200200

Notes

1. For more detailed information about the GlobalLink 520 see the product page, the manual and check out our community pages:
   https://www.victronenergy.com/panel-systems-remote-monitoring/globallink-520
   https://www.victronenergy.com/media/pg/GlobalLink_520/en/index-en.html
   https://community.victronenergy.com/topics/65904/globallink.html

BATTERY BALANCER

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

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

The Solution: battery balancing

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

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

LED indicators

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

Alarm relay

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

Alarm reset

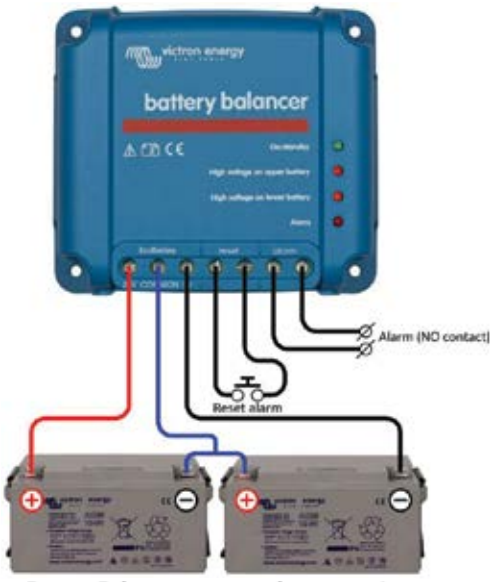
Two terminals are available to connect a push button. Interconnecting the two terminals resets the relay.
The reset condition will remain active until the alarm is over. Thereafter the relay will close again when a new alarm occurs.

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

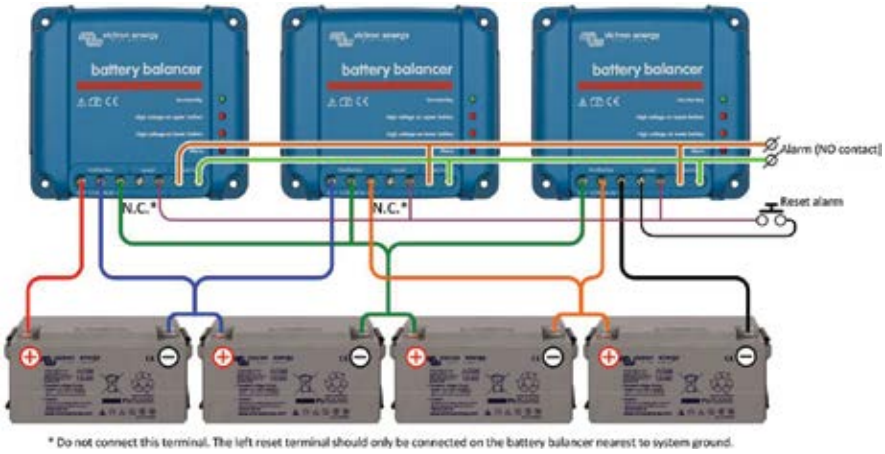
The BMV-702 measures the midpoint of a string of cells or batteries. It displays the deviation from the ideal midpoint in volts or percent. Separate deviation percentages can be set to trigger a visual/audible alarm and to close a potential free relay contact for remote alarm purposes.
Please see the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

Learn more about batteries and battery charging

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

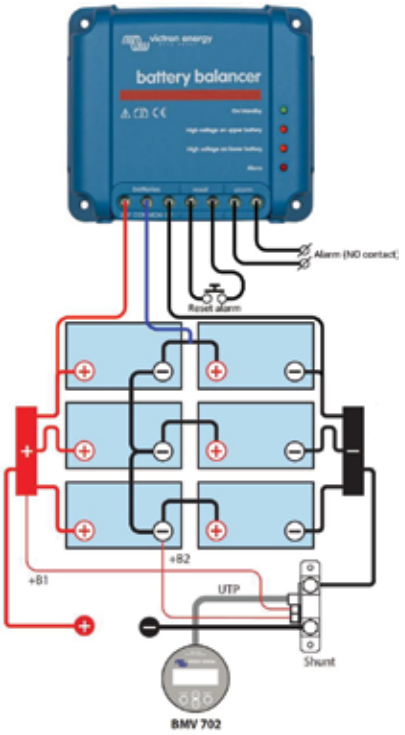


Battery Balancer connected to two series connected 12V batteries (24V system)



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

Victron Battery Balancer	
Input voltage range	Up to 18V per battery, 36V total
Turn on level	27,3V +/- 1%
Turn off level	26,6V +/- 1%
Current draw when off	0,7 mA
Midpoint deviation to start balancing	50 mV
Maximum balancing current	0,7A (when deviation > 100 mV)
Alarm trigger level	200 mV
Alarm reset level	140 mV
Alarm relay	60V / 1A normally open
Alarm relay reset	Two terminals to connect a push button
Over temperature protection	yes
Operating temperature	-30 to +50°C
Humidity (non-condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm² / AWG10
Protection category	IP22
Weight	0,4 kg
Dimensions (h x w x d)	100 x 113 x 47 mm
STANDARDS	
Safety	EN 60950, CSA/UL 62368-1
Emission	EN 61000-6-3, EN 55014-1
Immunity	EN 61000-6-2, EN 61000-6-1, EN 55014-2
Automotive Directive	EN 50498



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

Installation

1) The Battery Balancer(s) must be installed on a well-ventilated vertical surface close to the batteries (but, due to possible corrosive gasses, not above the batteries!)
2) **In case of series-parallel connection, the midpoint interconnecting cables must be sized to at least carry the current that arises when one battery becomes open-circuited.**
   - In case of 2 parallel strings: cross section 50% of the series interconnecting cables.
   - In case of 3 parallel strings: cross section 33% of the series interconnecting cables, etc.
3) If required: first wire the alarm contact and the alarm reset.
4) Use at least 0,75 mm² to wire the negative, positive and midpoint connections (in this order). Additionally, if in your application it is needed to comply with UL, also fuse these wires near the batteries with a 10A fuse suitable for DC current (e.g. Littelfuse ATOF series automotive blade fuse in combination with an inline fuse holder).
5) The balancer is operational.
   When the voltage over a string of two batteries is less than 26,6V the balancer switches to standby and all LEDs will be off.
   When the voltage over a string of two batteries increases to more than 27,3V (during charging) the green LED will turn on, indicating that the balancer is on.
   When on, a voltage deviation of more than 50 mV will start the balancing process and at 100 mV one of the two orange LEDs will turn on. A deviation of more than 200 mV will trigger the alarm relay.

What to do in case of an alarm during charging

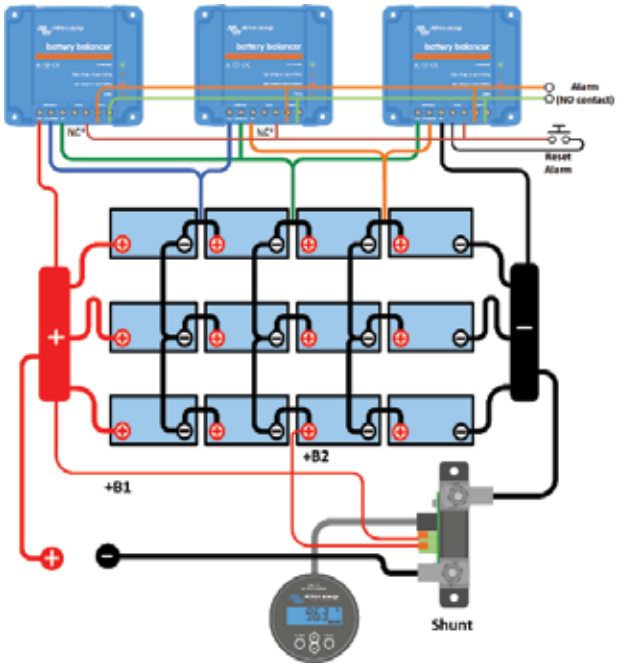
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially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

If the problem persists after several charge-discharge cycles:

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

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

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



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

TELECOM BATTERIES

Telecom Battery
Battery AGM 12V 200Ah

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

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

AGM technology

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

Low self-discharge

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

Low internal resistance

Accepts very high charge and discharge rates.

High cyclic life capability

More than 500 cycles at 50% depth of discharge.

Telecom Battery
Battery AGM 12V 200Ah

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

AGM SUPER CYCLE BATTERY

A truly innovative battery

The AGM Super Cycle batteries are the result of recent battery electrochemistry developments.
The paste of the positive plates is less sensitive to softening, even in case of repeated 100% discharge of the battery, and new additives to the electrolyte reduce sulfation in case of deep discharge.

Exceptional 100% depth of discharge (DoD) performance

Tests have shown that the Super Cycle battery does withstand at least three hundred 100% DoD cycles.
The tests consist of a daily discharge to 10,8V with $I = 0,2C_{20}$, followed by approximately two hours rest in discharged condition, and then a recharge with $I = 0,2C_{20}$.
The two hours rest period in discharged condition will damage most batteries within 100 cycles, but not the Super Cycle battery.

We recommend the Super Cycle battery for applications where an occasional discharge to 100% DoD, or frequent discharge to 60-80% DoD is expected.

Smaller and lighter

An additional advantage of the new chemistry is a slightly smaller size and less weight compared to our standard deep cycle AGM batteries.

Low internal resistance

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

Recommended charge voltage:

	Float Service	Cycle service Normal	Cycle service Fast recharge
Absorption		14,2 - 14,6 V	14,6 - 14,9 V
Float	13,5 - 13,8 V	13,5 - 13,8 V	13,5 - 13,8 V
Storage	13,2 - 13,5 V	13,2 - 13,5 V	13,2 - 13,5 V

Specifications

Article number	V	Ah C5 (10,8V)	Ah C10 (10,8V)	Ah C20 (10,8V)	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Terminals
BAT412015081	12	13	14	15	151 x 100 x 103	4,1			M5 insert
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
BAT412060082	12	52	56	60	224 x 135 x 178	14	300	90	M6 insert
BAT412110081	12	82	90	100	260 x 168 x 215	26	500	170	M6 insert
BAT412112081	12	105	114	125	330 x 171 x 214	33	550	220	M8 insert
BAT412117081	12	145	153	170	336 x 172 x 280	45	600	290	M8 insert
BAT412123081	12	200	210	230	532 x 207 x 226	57	700	400	M8 insert

Cycle life

≥ 300 cycles @ 100% DoD (discharge to 10,8V with $I = 0,2C_{20}$, followed by approximately two hours rest in discharged condition, and then a recharge with $I = 0,2C_{20}$)
≥ 700 cycles @ 60% DoD (discharge during three hours with $I = 0,2C_{20}$, immediately followed by recharge at $I = 0,2C_{20}$)
≥ 1000 cycles @ 40% DoD (discharge during two hours with $I = 0,2C_{20}$, immediately followed by recharge at $I = 0,2C_{20}$)

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.

Super Cycle Battery 12V 230Ah

GEL & AGM BATTERIES

AGM Battery
12V 90Ah

1. VRLA technology

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

2. Sealed (VRLA) AGM Batteries

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

3. Sealed (VRLA) Gel Batteries

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

4. Low Self-Discharge

Because of the use of lead calcium grids and high purity materials, Victron VRLA batteries can be stored during long periods of time without recharge. The rate of self-discharge is less than 2% per month at 20°C. The self-discharge doubles for every increase in temperature by 10°C.
Victron VRLA batteries can therefore be stored for up to a year without recharging, if kept under cool conditions.

5. Exceptional Deep Discharge Recovery

Victron VRLA batteries have exceptional discharge recovery, even after deep or prolonged discharge.
Nevertheless repeatedly deep and prolonged discharge has a very negative effect on the service life of all lead acid batteries, Victron batteries are no exception.

6. Battery Discharging Characteristics

The rated capacity of Victron AGM and Gel Deep Cycle batteries refers to 20 hour discharge, in other words: a discharge current of 0,05 C.
The rated capacity of Victron Tubular Plate Long Life batteries refers to 10 hours discharge.
The effective capacity decreases with increasing discharge current (see table 1). Please note that the capacity reduction will be even faster in case of a constant power load, such as an inverter.

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

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

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

7. Effect of temperature on service life

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

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

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

8. Effect of temperature on capacity

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

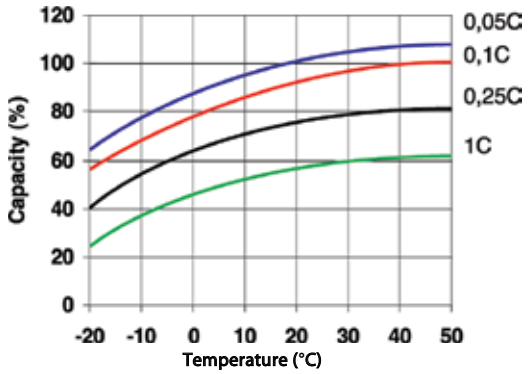


Fig. 1: Effect of temperature on capacity

9. Cycle life of Victron batteries

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

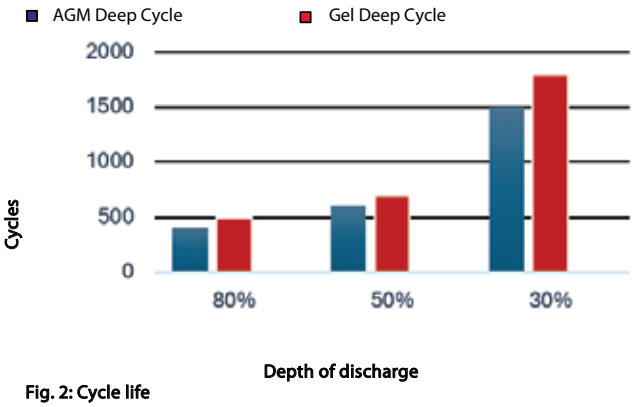


Fig. 2: Cycle life

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

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

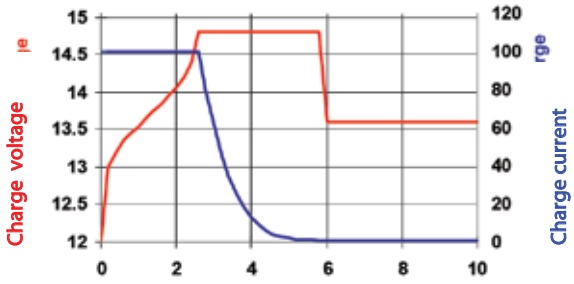


Fig. 3: Three step charge curve

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

Disadvantages of the traditional 3-step charge curve:

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

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

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

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

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

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

When a battery is not frequently deeply discharged, a 2-step charge curve can be used. During the first phase the battery is charged with a limited current (the bulk phase). Once a pre-set voltage has been reached the battery is kept at that voltage (the float phase).
This charge method is used for starter batteries in vehicles and in uninterruptible power supplies (UPS).

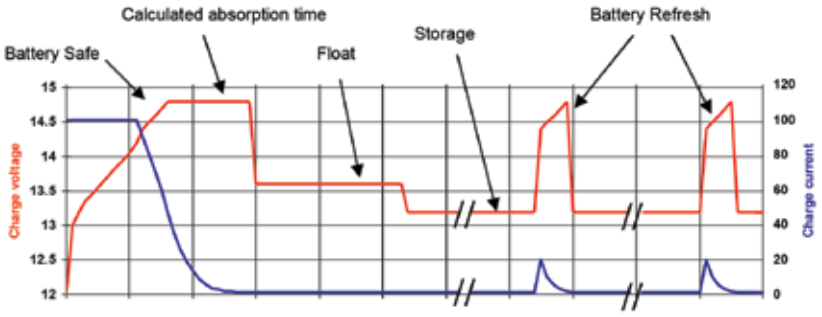


Fig. 4: Four-step adaptive charge curve

13. Optimum charge voltage of Victron VRLA batteries

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

14. Effect of temperature on charging voltage

The charge voltage should be reduced with increased temperature. Temperature compensation is required when the temperature of the battery is expected to be less than 10°C / 50°F or more than 30°C / 85°F during long periods of time.
The recommended temperature compensation for Victron VRLA batteries is -4 mV / Cell (-24 mV /°C for a 12V battery).
The centre point for temperature compensation is 25°C / 70°F.

15. Charge current

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

	Float Service (V)	Cycle service Normal (V)	Cycle service Fastest recharge (V)
Victron AGM 'Deep Cycle'			
Absorption		14,2 - 14,6	14,6 - 14,9
Float	13,5 - 13,8	13,5 - 13,8	13,5 - 13,8
Storage	13,2 - 13,5	13,2 - 13,5	13,2 - 13,5
Victron Gel 'Deep Cycle'			
Absorption		14,1 - 14,4	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	

Table 3: Recommended charge voltage

12 Volt Deep Cycle AGM							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate AGM Terminals: copper
BAT406225084	**240**	6	320 x 176 x 247	31	700	270	Rated capacity: 20 hr. discharge at 25°C Float design life: 7-10 years at 20°C Cycle design life: 400 cycles at 80% discharge 600 cycles at 50% discharge 1500 cycles at 30% discharge
BAT212070084	**8**	12	151 x 65 x 101	2,5			
BAT212120086	**14**	12	151 x 98 x 101	4,4			
BAT212200084	**22**	12	181 x 77 x 167	5,8			
BAT412350084	**38**	12	197 x 165 x 170	12,5			
BAT412550084	**60**	12	229 x 138 x 227	20	280	80	
BAT412800084	**90**	12	350 x 167 x 183	27	400	130	
BAT412101084	**110**	12	330 x 171 x 220	32	500	170	
BAT412121084	**130**	12	410 x 176 x 227	38	550	200	
BAT412151084	**165**	12	485 x 172 x 240	47	600	220	
BAT412201084	**220**	12	522 x 238 x 240	65	650	250	
BAT412124081	**240**	12	522 x 240 x 224	67	650	250	

12 Volt Deep Cycle GEL							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate GEL Terminals: copper
BAT412550104	**60**	12	229 x 138 x 227	20	250	70	Rated capacity: 20 hr. discharge at 25°C Float design life: 12 years at 20°C Cycle design life: 500 cycles at 80% discharge 750 cycles at 50% discharge 1800 cycles at 30% discharge
BAT412800104	**90**	12	350 x 167 x 183	26	360	120	
BAT412101104	**110**	12	330 x 171 x 220	33	450	150	
BAT412121104	**130**	12	410 x 176 x 227	38	500	180	
BAT412151104	**165**	12	485 x 172 x 240	48	550	200	
BAT412201104	**220**	12	522 x 238 x 240	66	600	220	
BAT412126101	**265**	12	520 x 268 x 223	75	650	250	

Other capacities and terminal types: at request

12,8V & 25,6 VOLT LITHIUM-ION PHOSPATE BATTERIES SMART

12,8 V 330 Ah LiFePO4 Battery

VictronConnect App

Victron Energy Lithium Battery Smart batteries are Lithium Iron Phosphate (LiFePO4) batteries and are available in 12.8 V or 25.6 V in various capacities. They can be connected in series, parallel and series/parallel so that a battery bank can be built for system voltages of 12 V, 24 V or 48 V. The maximum number of batteries in one system is 20, which results in a maximum energy storage of 84 kWh in a 12 V system and up to 102 kWh in a 24 V[1] and 48 V[1] system.

A single LFP cell has a nominal voltage of 3.2 V. A 12.8 V battery consists of 4 cells connected in series and a 25.6 V battery consists of 8 cells connected in series.

Why lithium-iron-phosphate?

Rugged

A lead acid battery will fail prematurely due to sulfation:

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

A LFP battery:

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

LFP is therefore the chemistry of choice for demanding applications.

Efficient

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

Size and weight

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

Expensive?

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

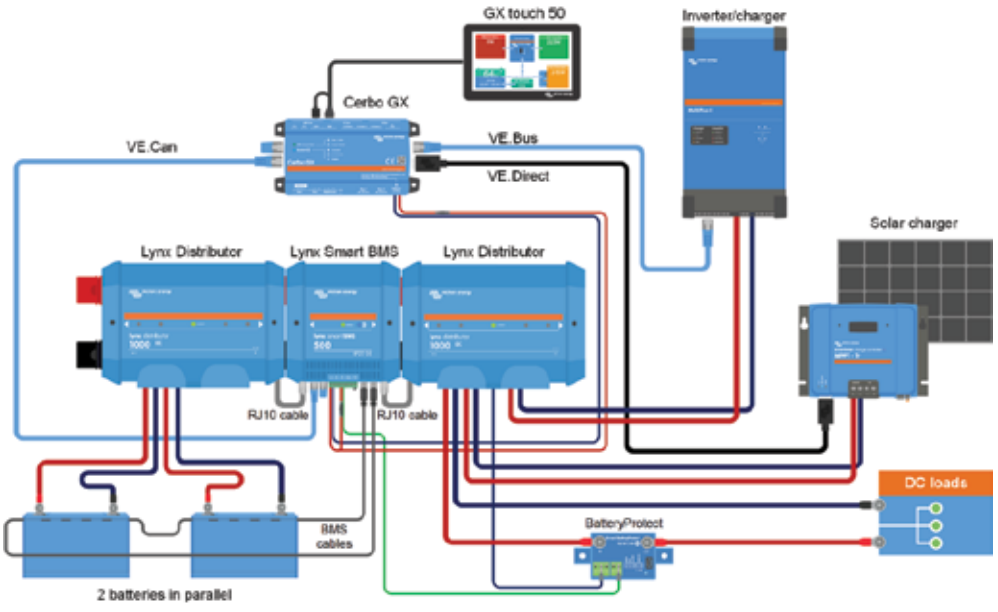
Bluetooth

- With Bluetooth cell voltages, temperature and alarm status can be monitored.
- Instant readout: The VictronConnect App can display the most important data on the Device list page without the need to connect to the product.
- Very useful to localize a (potential) problem, such as cell imbalance.

Six tailored BMS solutions

- There are 6 different BMS models tailored for various applications available for use with the Lithium Battery Smart. The system design and BMS selection guide in the battery manual provides an overview and explains the differences between them and their typical use.

[1] To reduce required balancing time, we recommend using a little different batteries in series as possible for the application. 24 V systems are best built using 24 V batteries. And 48 V systems are best built using two 24 V batteries in series. While the alternative, four 12 V batteries in series, will work, it will require more periodic balancing time.



Our LFP batteries have integrated cell balancing and cell monitoring. 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 3.1 V (adjustable 2.85 V – 3.15 V).
2. Disconnect or shut down the load whenever the voltage of a battery cell decreases to less than 2.8 V (adjustable 2.6 V – 2.8 V).
3. Stop the charging process whenever the voltage of a battery cell increases to more than 3.75 V or when the temperature becomes too high or too low.

See the BMS datasheets for more features.

Battery specification

VOLTAGE AND CAPACITY	LFP-Smart 12,8/50	LFP-Smart 12,8/100	LFP-Smart 12,8/160	LFP-Smart 12,8/180	LFP-Smart 12,8/200	LFP- Smart 12,8/330	LFP- Smart 25,6/100	LFP-Smart 25,6/200-a
Nominal voltage	12,8 V	12,8 V	12,8 V	12,8 V	12,8 V	12,8 V	25,6 V	25,6 V
Nominal capacity @ 25 °C*	50 Ah	100 Ah	160 Ah	180 Ah	200 Ah	330 Ah	100 Ah	200 Ah
Nominal capacity @ 0 °C*	40 Ah	80 Ah	130 Ah	150 Ah	160 Ah	260 Ah	80 Ah	160 Ah
Nominal capacity @ -20 °C*	25 Ah	50 Ah	80 Ah	90 Ah	100 Ah	160 Ah	50 Ah	100 Ah
Nominal energy @ 25 °C*	640 Wh	1280 Wh	2048 Wh	2304 Wh	2560 Wh	4220 Wh	2560 Wh	5120 Wh
Capacity loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Energy loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Round trip efficiency	92 %							
*Discharge current ≤1C								
CYCLE LIFE (capacity ≥ 80 % of nominal)								
80 % DoD	2500 cycles							
70 % DoD	3000 cycles							
50 % DoD	5000 cycles							
DISCHARGE								
Maximum continuous discharge current	100 A	200 A	320 A	360 A	400 A	400 A	200 A	400 A
Recommended continuous discharge current	≤50 A	≤100 A	≤160 A	≤180 A	≤200 A	≤300 A	≤100 A	≤200 A
End of discharge voltage	11.2 V	11.2 V	11.2 V	11.2 V	11.2 V	11.2 V	22.4 V	22.4 V
Internal resistance	2 mΩ	0.8 mΩ	0.9 mΩ	0.9 mΩ	0.8 mΩ	0.8 mΩ	1.6 mΩ	1.5 mΩ
OPERATING CONDITIONS								
Operating temperature	Discharge: -20 °C to +50 °C Charge: +5 °C to +50 °C							
Storage temperature	-45 °C to +70 °C							
Humidity (non-condensing)	Max. 95 %							
Protection class	IP 22							
CHARGE								
Charge voltage	Between 14 V/28 V and 14,4 V/28,8 V (14,2 V/28,4 V recommended)							
Float voltage	13,5 V/27 V							
Maximum charge current	100 A	200 A	320 A	360 A	400 A	400 A	200 A	400 A
Recommended charge current	≤30 A	≤50 A	≤80 A	≤90 A	≤100 A	≤150 A	≤50 A	≤100 A
MOUNTING								
Can be placed on their sides	Yes[2]	Yes[2]	Yes[2]	Yes[2]	Yes[2]	No[3]	Yes[2]	Yes[2]
OTHER								
Max storage time @ 25°C[1]	1 year							
BMS connection	Male + female cable with M8 circular connector, length 50 cm							
Max batteries per BMS	20 (102 kWh per BMS[4])							
Power connection (threaded inserts)	M8	M8	M8	M8	M8	M10	M8	M8
Dimensions (hxwxd) mm	199 x 188 x 147	197 x 321 x 152	237 x 321 x 152	237 x 321 x 152	237 x 321 x 152	265 x 359 x 206	197 x 650 x 163	237 x 650 x 163
Weight	7 kg	14 kg	18 kg	18 kg	20 kg	29 kg	28 kg	39 kg
STANDARDS								
Safety	Cells: UL1973 + IEC62619:2017 + UL9540A		Cells: IEC62133:2012		Cells: UL1973 + IEC62619:2017 + UL9540A Battery: IEC62619:2017 + IEC62620:2014	Cells: UL1642	Cells: UL1973 + UL9540A	Cells: UL1973 + IEC62619:2017 + UL9540A Battery: IEC62620:2014
EMC	EN 60335-1:2012/AC:2014, EN-IEC 62368-1: 2020, IEC 61427-1:2013 EN-IEC 61000-6-3:2007/A1:2011/AC:2012 - EN 55014-1:2017/A11:2020							
Automotive	ECE R10-6							

[1] When fully charged
[2] The lithium battery can be mounted upright and on its side, but not with the battery terminals facing down
[3] The 12,8V/330Ah lithium battery may only be mounted in an upright position
[4] Up to 5 BMS-es can be paralleled. For more info, please see the official release notes

12,8V, 25,6V & 51,6 VOLT LITHIUM NG BATTERIES

25,6 V 200 Ah Lithium NG battery

Secured with mounting brackets

Lynx Smart BMS NG 500 A & 1000 A

Complete overview of all battery data via VictronConnect (or a GX device and VRM)

Victron Energy Lithium NG batteries are Lithium Iron Phosphate ($LiFePO_4$ or LFP) batteries available in various capacities with nominal voltages of 12.8 V, 25.6 V and 51.2 V. They can be connected in series, parallel, or a combination of both to create battery banks for system voltages of 12V, 24V, or 48V. A maximum of 50 batteries can be used when configuring a bank with 12V or 24V batteries, while up to 25 batteries can be used with 48V batteries. This allows for a maximum energy storage capacity of 192 kWh with 12V batteries, up to 384 kWh with 24V batteries, and 128 kWh with 48V batteries.

Key features:

Integrated shunt

The battery data (battery voltage, current and temperature) are transmitted to the BMS and evaluated there, i.e. to calculate the state of charge, which can then be read out via VictronConnect or a GX communication centre, or to create and issue specific warnings and alarms.

Automatic setup, monitoring and control via VictronConnect App or a GX device and the VRM Portal

All battery parameters are managed by the BMS automatically. The BMS automatically detects the system voltage and the number of batteries in parallel, series and series/parallel connection. The BMS (from now on Lynx Smart BMS NG 500 A/1000 A, further models to follow) is mandatory and must be purchased separately.

Monitoring and control take place via VictronConnect (every BMS model has Bluetooth), a GX communication centre or the VRM Portal. You can view battery parameters such as cell status, cell voltages, battery current and temperatures in real-time. The battery firmware is automatically updated by the BMS.

Easy bracket mounting

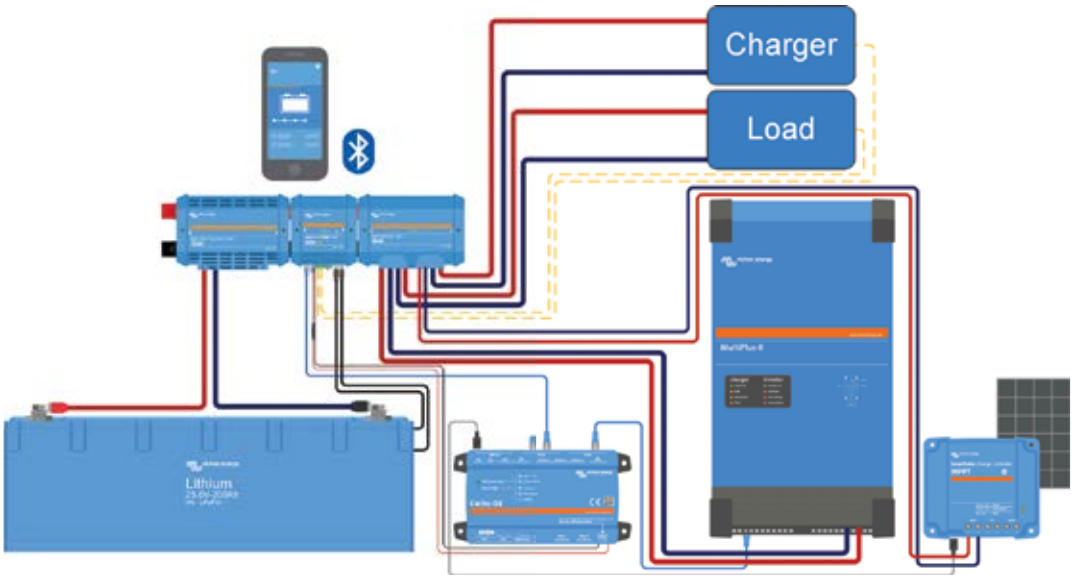
Mounting brackets make the installation easier and ensure that the battery is optimally secured against slipping and tipping over.

Increased ingress protection (IP-rating)

The Lithium NG batteries are effectively sealed against dust and can withstand low-pressure water jets, making them suitable for environments where exposure to dust and water is a concern.

Low self-discharge rate

The self-discharge rate has been significantly improved and is now a maximum of 2 % of the battery capacity per month. A low self-discharge rate contributes to the overall performance, longevity, and reliability of the NG batteries.



Typical system example with Lithium NG battery and Lynx Smart BMS NG

Our Lithium NG batteries have integrated cell balancing and cell monitoring. 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 3.0 V.
2. Disconnect or shut down the load whenever the voltage of a battery cell decreases to less than 2.8 V.
3. Stop the charging process whenever the voltage of a battery cell increases to more than 3.6 V or when the temperature becomes too high or too low.

See the BMS datasheets for more features.

Battery specification

VOLTAGE AND CAPACITY	LFP-12,8/100	LFP-12,8/150	LFP-12,8/200	LFP-12,8/300	LFP-25,6/100	LFP-25,6/200	LFP-25,6/300	LFP-51,2/100
Nominal voltage	12,8 V	12,8 V	12,8 V	12,8 V	25,6 V	25,6 V	25,6 V	51,2 V
Nominal capacity @ 25 °C*	100 Ah	150 Ah	200 Ah	300 Ah	100 Ah	200 Ah	300 Ah	100 Ah
Nominal energy @ 25 °C*	1280 Wh	1920 Wh	2560 Wh	3840 Wh	2560 Wh	5120 Wh	7680 Wh	5120 Wh
Capacity loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Energy loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Round trip efficiency	92 %							
* Discharge current ≤1C								
CYCLE LIFE (capacity ≥ 80 % of nominal)								
80 % DoD	2500 cycles							
70 % DoD	3000 cycles							
50 % DoD	5000 cycles							
DISCHARGE								
Max continuous discharge current (C-rate)	100 A (1C)	150 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)
Max pulse discharge current 10s (C-rate)	200 A (2C)	300 A (2C)	400 A (2C)	600 A (2C)	200 A (2C)	400 A (2C)	600 A (2C)	200 A (2C)
End of discharge voltage	11,2 V				22,4 V			44,8 V
Internal resistance	2 mΩ		1 mΩ		4 mΩ	2 mΩ	1 mΩ	8 mΩ
CHARGE								
Charge voltage	Between 14 V / 28 V / 56 V and 14,4 V / 28,8 V / 56,8 V							
Float voltage	13,5 V / 27 V 54 V							
Max continuous charge current (C-rate)	100 A (1C)	150 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)
Max pulse charge current 10s (C-rate)	200 A (2C)	225 A (1.5C)	400 A (2C)	450 A (1.5C)	200 A (2C)	400 A (2C)	450 A (1.5C)	200 A (2C)
GENERAL								
BMS-es	Lynx Smart BMS NG 500 A / 1000 A (M10 busbars), must be purchased separately							
Cell measurements	Cell voltages and temperatures, battery current							
Battery BMS interface	Male + female cable with M8 circular connector with high-speed digital communication, length 50 cm M8 extension cables are available separately for purchase in various lengths between 1 and 5 meters							
Alarm feature	Pre-alarm contact on BMS							
Bluetooth	In the BMS							
Max batteries per BMS	50 (up to 384 kWh per BMS [3])							25 (128 kWh per BMS [3])
Battery firmware updates	Battery firmware automatically updated by BMS							
Repairable	Yes (cover can be removed with screws)							
OPERATING CONDITIONS								
Operating temperature	Discharge: -20 °C to +50 °C | Charge: +5 °C to +50 °C							
Storage temperature	-45 °C to +70 °C							
Humidity (non-condensing)	Max. 95 %							
Protection class	IP65							
MOUNTING								
Mounting options	Strap or mounting brackets (brackets included)							
Can be placed on their sides	Yes[2]							
OTHER								
Self-discharge rate	≤ 3 % per month @ 25 °C							
Power connection	M8 (threaded inserts and bolts)							
Dimensions (h x w x d) mm	235 x 197 x 160	205 x 250 x 205	235 x 341 x 160	206 x 447 x 205	235 x 341 x 160	235 x 648 x 162	206 x 841 x 205	235 x 648 x 162
Weight (est.)	9 kg	14 kg	19 kg	29 kg	19 kg	37 kg	52 kg	37 kg
STANDARDS								
Safety	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619 (all three pending)	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619 (all three pending)	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619(all three pending)	Cells: UL1973 UL9540A IEC62619 (all three pending)
	Battery: IEC 62619 (pending)							
EMC	EN 61000-6-3, EN 61000-6-2							
Automotive	ECE R10-6 (pending)							
Performance	IEC 62620 (pending)							

[1] When fully charged
[2] The lithium battery can be mounted upright and on its side, but not with the battery terminals facing down
[3] Up to 5 BMS-es can be paralleled. For more info, please see this announcement.

VE.BUS BMS V2

VE.Bus BMS V2

The next generation VE.Bus BMS V2

The VE.Bus BMS V2 is the next generation of the VE.Bus Battery Management System (BMS) for Victron Energy Lithium Battery Smart batteries. These batteries are Lithium Iron Phosphate (LiFePO4) batteries and are available in 12.8 V or 25.6 V in various capacities. They can be connected in series, parallel and series/parallel so that a battery bank can be built for system voltages of 12 V, 24 V or 48 V. The maximum number of batteries in one system is 20, which results in a maximum energy storage of 84 kWh in a 12 V system and up to 102 kWh in a 24 V[1] and 48 V[1] system.

It is designed to interface with and protect the lithium batteries in systems that have Victron inverters or inverter/chargers that have VE.Bus communication[2].

Protects each individual cell of a Victron Lithium Battery Smart

For reliable and safe operation, a $LiFePO_4$ battery must be monitored and protected against over voltage and under voltage of any individual cell, and also over temperature or under temperature conditions. The Victron Lithium Battery Smart range includes integrated cell voltage monitoring, cell voltage balancing, and temperature monitoring.

If the cell voltage or battery temperature is outside of the allowable range, this is communicated to the BMS via two BMS cables with M8 circular connectors. In systems with multiple batteries, the BMS cables of each battery are connected in series (daisy chained), with the first and the last BMS cables connected to the BMS.

Based on the status of the Victron Lithium Battery Smart or batteries, the BMS will:

- Generate a pre-alarm signal to alert of an imminent cell under voltage condition.
- Disable inverting in VE.Bus inverters or inverter/chargers via VE.Bus, and disable other loads via the "Load Disconnect" terminal in the event of a cell under voltage condition.
- Disable charging in VE.Bus inverters or inverter/chargers via VE.Bus, disable VE.Direct and VE.Can solar chargers via a GX device and disable other chargers via the 'Charge Disconnect' terminal in the event of a cell overvoltage, under temperature or over temperature condition.

Communication with VE.Bus products

MultiPlus, Quattro or Inverters connect to the 'MultiPlus/Quattro' port with a standard RJ45 UTP cable.
The BMS disables inverting in the case of a cell under voltage condition and disables charging in the case of a cell over voltage or temperature condition.

Communication with remote devices

A GX device (such as a Cerbo GX), Digital Multi Control (DMC) panel or a VE.Bus Smart dongle (including any combination) can be connected to the BMS via the 'Remote panel' port. These accessories can all be used in combination with the BMS to remotely control the VE.Bus Inverter or inverter/charger switch state (on/off/charger-only).

Auxiliary power input and output terminals

The BMS has a dedicated power output terminal (GX-Power) for a GX device and an auxiliary power input terminal (Aux-In) for an external DC power source, such as an AC/DC adaptor. In the event of a system shutdown, the GX device will remain powered via the auxiliary power input or be disconnected to prevent further battery discharge.

VE.Bus BMS V2
left side

Remote terminals

These terminals can be used to switch the BMS on or off. When the BMS is off, both outputs will be free floating so that loads and chargers are turned off. There are two remote terminals, namely, "Remote L" and "Remote H". A remote on/off switch or relay contact can be connected between L and H to switch the BMS on or off. Alternatively, terminal H can be switched to battery plus, or terminal L can be switched to battery Minus.

LED indicators

The BMS has the following LED indications:

- Status (blue): Lights shortly once every 10 seconds to indicate normal operation.
- Temp or Cell>4 V (red): Lights when the charge disconnect output is low because of cell overvoltage or overtemperature.
- Cell>2.8 V (blue): Lights when the load disconnect output is high and the battery cell voltages are above 2.8 V.

[1] To reduce required balancing time, we recommend to use a little different batteries in series as possible for the application. 24 V systems are best built using 24 V batteries. And 48 V systems are best built using two 24 V batteries in series. While the alternative, four 12 V batteries in series, will work, it will require more periodic balancing time. For more information on these batteries, visit the Lithium Battery Smart product page.
[2] Inverter/chargers or inverters with the small processors labeled 19XXXXX or 20XXXXX are not supported. These can be identified by the first two digits on the microprocessor label. For such devices, use the VE.Bus BMS instead of VE.Bus BMS V2.

VE.Bus BMS V2
right side

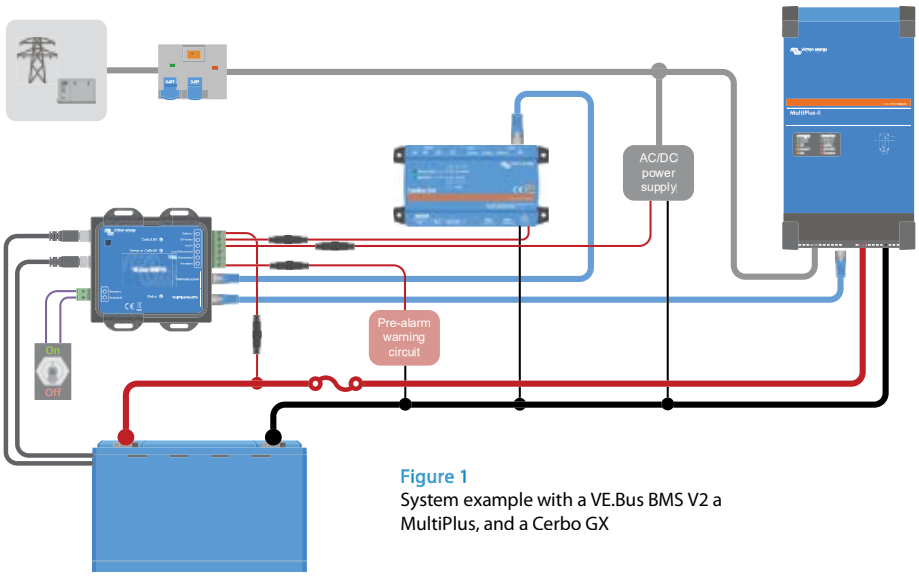


Figure 1
System example with a VE.Bus BMS V2 a MultiPlus, and a Cerbo GX

VE.Bus BMS V2	BMS300200200
Input voltage range	9 – 70 VDC
Current draw - regular operation	10 mA (excluding Load disconnect current)
Current draw - low cell voltage	2 mA
Current draw - switched off via remote on/off terminal	1.50 mA
GX-pow output	1 A
Aux-in input	1 A
Load disconnect output	Normally high (output voltage ≈ supply voltage – 1 V) Floating when the load needs to be disconnected Source current limit: 1 A Sink current: 0 A
Charge disconnect output	Normally high, (output voltage ≈ supply voltage – 1 V) Floating when charger should be disconnected Source current limit: 10 mA Sink current: 0 A
Pre-alarm output current rating	1 A, not short circuit protected
Remote terminals	Usage modes to turn the system on or 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<3.5 V) c) ON when the H terminal is high (2.9 V < VH < Vbat) d) OFF in all other conditions
VE.Bus communication port	2 x RJ45 sockets to connect to all VE.Bus products
GENERAL	
Operating temperature	-20 to +50 °C 0 – 120 °F
Humidity	Max. 95 % (non-condensing)
Protection grade	IP20
ENCLOSURE	
Material	ABS
Colour	Matt black with a blue sticker
Weight	120 gr
Dimensions (h x w x d)	23.8 mm x 94.5 mm x 105.5 mm
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 EN 50498
EXTERNAL AC-DC ADAPTER	
Min. power rating	1 A@12 V - If the nominal output voltage is > battery voltage, the AC-DC adapter takes over the power supply of the GX device.

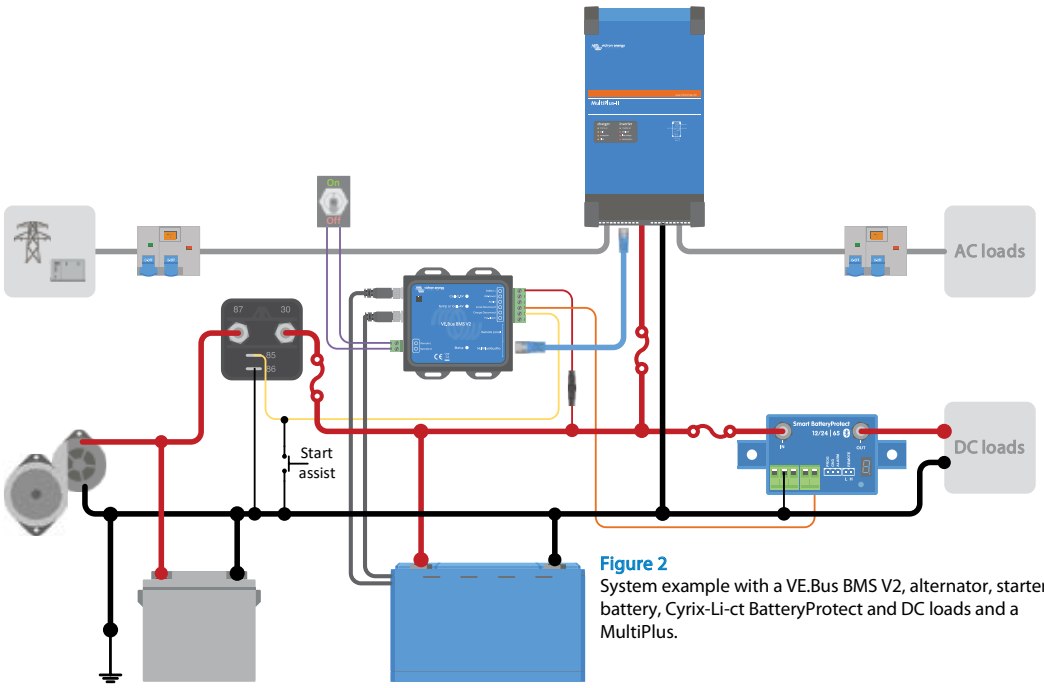


Figure 2
System example with a VE.Bus BMS V2, alternator, starter battery, Cyrix-Li-ct BatteryProtect and DC loads and a MultiPlus.

SmallBMS WITH PRE-ALARM

smallBMS

The smallBMS with pre-alarm is an all-in-one Battery Management System (BMS) for Victron Energy Lithium Battery Smart batteries. These batteries are Lithium Iron Phosphate (LiFePO4) batteries and are available in 12.8 V or 25.6 V in various capacities. They can be connected in series, parallel and series/parallel so that a battery bank can be built for system voltages of 12 V, 24 V or 48 V. The maximum number of batteries in one system is 20, which results in a maximum energy storage of 84 kWh in a 12 V system and up to 102 kWh in a 24 V[1] and 48 V[1] system.

The smallBMS is a simple and inexpensive alternative to the VE.Bus BMS, but does not have a VE.Bus interface and is therefore not suitable for use with VE.Bus MultiPlus and Quattro inverter/chargers.

Features

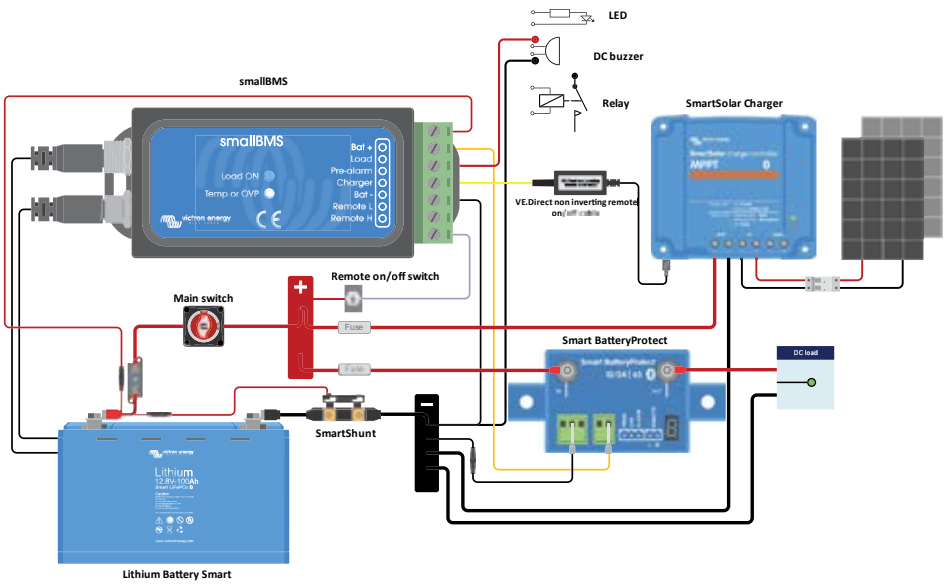
- Load disconnect output: Can be used to control the remote on/off input of a BatteryProtect, Inverters, DC-DC converter or other loads that have remote on/off port functionality. Due to its maximum output current of 1A, it can even control a high-current relay or a contactor. Note that a non inverting or inverting on/off cable may be required, please consult the manual.
- Pre-alarm output: The pre-alarm output can be used to issue a visible or audible warning when the battery voltage is low and will trip with a minimum delay of 30 seconds before the Load disconnect output is disabled due to cell undervoltage.
- Charge disconnect output: Can be used to control the remote on/off port of a charger, such as the Smart Charger IP43, a Cyrix-Li-Charge relay, a Cyrix-Li-ct Battery Combiner or a BatteryProtect. The output is normally high and becomes free floating in case of imminent low cell voltage or high/low temperature. Note that the Charge disconnect output is not suitable to power an inductive load such as a relay coil.
- Remote on/off terminal: Both the Load and Charge disconnect output can be controlled remotely via the remote on/off terminal. When off, both outputs will be free floating so that loads and chargers are turned off.
- LED indicators: The smallBMS has two LED indicators, a blue LED indicating that the Load disconnect output is still high and the cell voltage is above the threshold set in the battery, and a red LED indicating that the Charge disconnect output is low due to high/low cell temperature or high cell voltage.

[1] To reduce required balancing time, we recommend to use a little different batteries in series as possible for the application. 24 V systems are best built using 24 V batteries. And 48 V systems are best built using two 24 V batteries in series. While the alternative, four 12 V batteries in series, will work, it will require more periodic balancing time. For more information on these batteries, visit the Lithium Smart Battery product page.

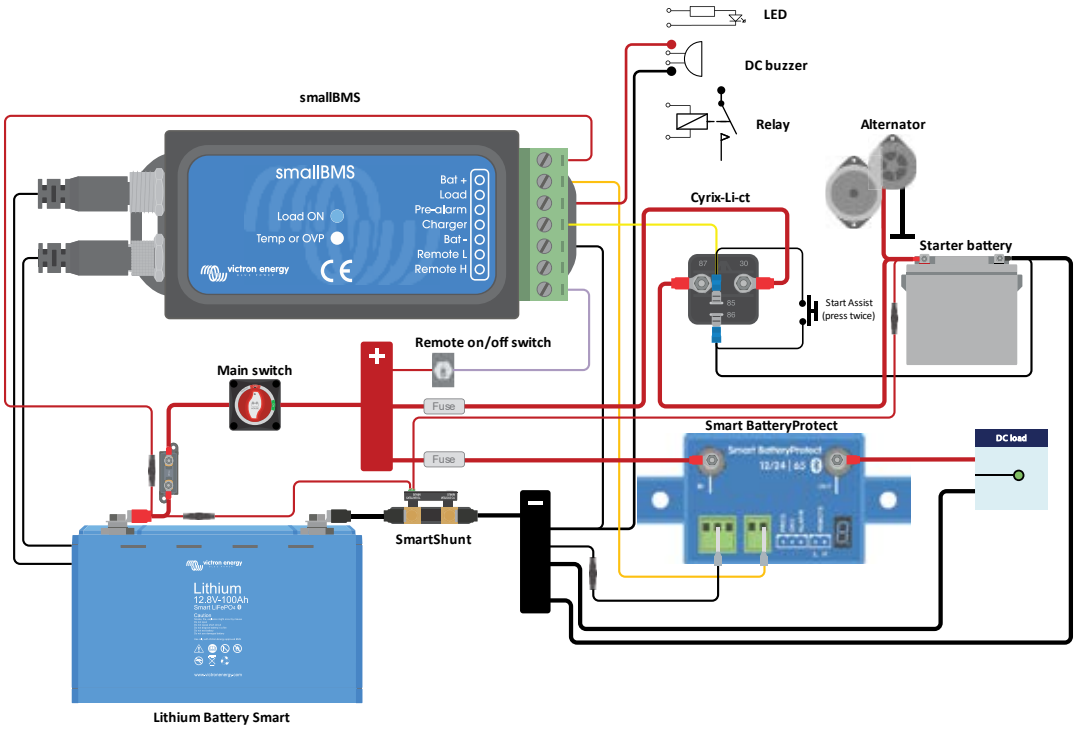
Cyrix Combiners designed for use with the smallBMS and the VE.Bus BMS:

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.

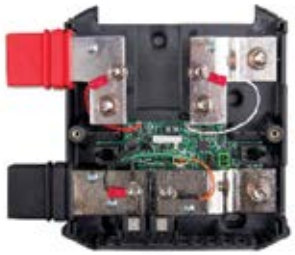


smallBMS with pre-alarm	BMS400100000
Operating voltage (Vbat)	8 – 70 VDC
Power supply cable and fuse (not supplied)	Recommended fuse size 0.3 A - 2.5 A, dependent on devices connected to Load disconnect and pre-alarm output
Current consumption, remote on	2.2 mA (excluding Load and Charge disconnect output current)
Current consumption, low cell voltage	1.2 mA
Current consumption, remote off	1,2 mA
Load disconnect output	Normally high (Vbat – 0.1 V) Source current limit: 1A (not short circuit protected) Sink current: 0A (output free floating)
Charge disconnect output	Normally high (Vbat –0.6 V) Source current limit: 10mA (short circuit protected) Sink current: 0A (output free floating)
Pre-alarm output	Normally free floating In case of alarm: output voltage Vbat -0.1 V Maximum output current: 1A (not short circuit protected)
Remote on/off: Remote L and Remote H	Use modes: 1. ON when the L and H terminal are interconnected 2. ON when the L terminal is pulled to battery minus (V <3.5 V) 3. ON when the H terminal is high (2.9 V <V_H <Vbat) 4. OFF in all other conditions
GENERAL	
Operating temperature range	-20 to +50 °C (0 – 120 °F)
Humidity	Max. 95 % (non-condensing)
Protection grade	IP20
ENCLOSURE	
Material and colour	ABS, matt black
Weight	0.1 kg
Dimensions (h x w x d)	106 x 42 x 23 mm
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



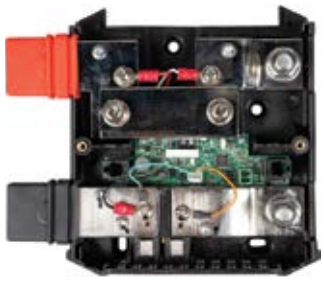
LYNX SHUNT VE.CAN

Lynx Shunt VE.Can (M8) model



Lynx Shunt VE.Can (M8) without cover

Lynx Shunt VE.Can (M10) model



Lynx Shunt VE.Can (M10) with fuse dummy busbar installed

VE.Can RJ45 terminator

Busbar integrated battery monitoring

The Lynx Shunt VE.Can is an integral part of the Lynx Distribution system, featuring a positive and negative busbar, a battery monitor, and a fuse holder for the main system fuse. It is available in two versions: M8 and M10. The shunt can communicate with GX devices via VE.Can. Additionally, it is equipped with a power LED for status indication.

The M10 model includes an additional piece of busbar that can replace the fuse inside the shunt, providing the flexibility to place the main fuse outside the shunt in a different location. This is particularly useful in larger systems where higher-rated fuses are required.
The Lynx Shunt VE.Can ships with two RJ45 VE.Can terminators, which are used when connecting to a GX device.

The Lynx Shunt VE.Can M8 is specifically designed to accommodate a CNN fuse. The M10 model can handle CNN, ANL or Mega fuses. The fuse needs to be purchased separately. For more information, see the Fusing section in the Lynx Shunt VE.Can manual.

The Lynx Distribution System

The Lynx Distribution System is a modular busbar system that incorporates DC connections, distribution, fusing, battery monitoring and/or Lithium battery management. For more information also see the
DC Distribution Systems product page.

The Lynx Distribution System consist of the following parts:

- **Lynx Power In (M8, M10)** - A positive and negative busbar with 4 connections for batteries or DC equipment.
- **Lynx Class-T Power In (M10)** - A positive and negative busbar that connects and fuses up to two strings of lithium batteries using Class-T fuses (available in 225 A, 250 A, 350 A, and 400 A; must be purchased separately).
- **Lynx Distributor (M8, M10)** - A positive and negative busbar with 4 fused connections for batteries or DC equipment together with fuse monitoring.
- **Lynx Shunt VE.Can (M8, M10)** - A positive busbar with a space for a main system fuse and a negative busbar with a shunt for battery monitoring. It has VE.Can communication for monitoring and setup with a GX device.
- **Lynx Smart BMS 500 and 1000 (M8 – 1000A model only in M10)** - For use together with Victron Energy Smart Lithium batteries. It contains a positive busbar with a contactor that is driven by a battery management system (BMS) and a negative busbar with a shunt for battery monitoring. It has Bluetooth communication for monitoring and setup via the VictronConnect App and VE.Can communication for monitoring with a GX device and the VRM portal.
- **Lynx Smart BMS 500 and 1000 NG (M10)*** - For use together with Victron Energy Lithium NG batteries. It contains a positive busbar with a contactor that is driven by a battery management system (BMS) and a negative busbar with a shunt for battery monitoring. It has Bluetooth communication for monitoring and setup via the VictronConnect App and VE.Can communication for monitoring with a GX device and the VRM portal.

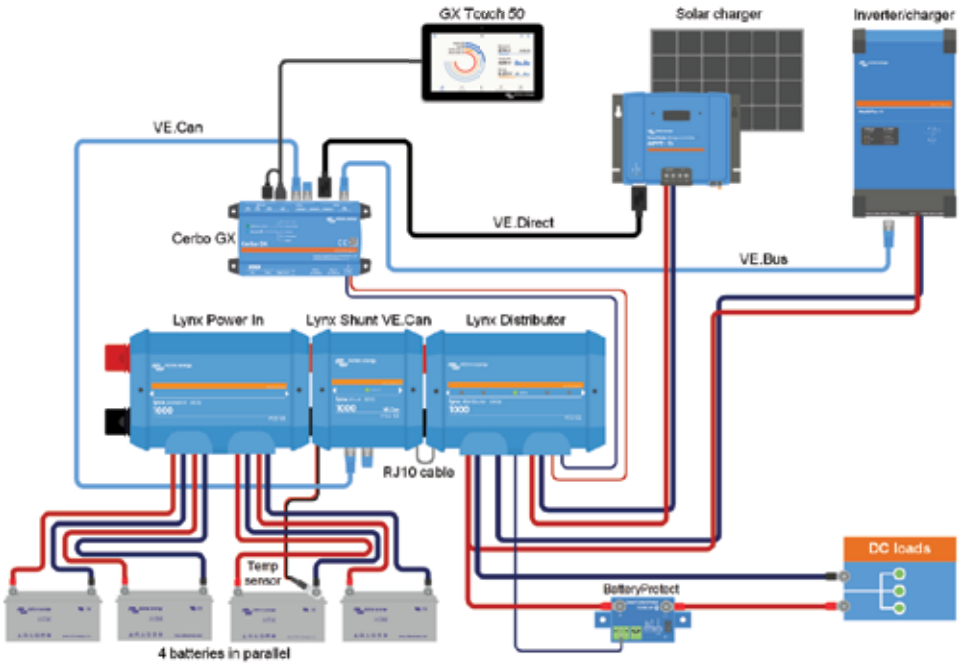
The Lynx modules: Lynx Power In, Lynx Class-T Power In, Lynx Distributor, Lynx Shunt VE.Can and Lynx Smart BMS

Lynx Shunt VE.Can	M8 model	M10 model
POWER		
Supply voltage range	9 - 70 Vdc	
Supported system voltages	12, 24 or 48 V	
Reverse polarity protection	No	
Current rating	1000 Adc continuous	
Power consumption	60 mA @ 1 2V 33 mA @ 24 V 20 mA @ 48 V	
Potential free alarm contact	3 A, 30 Vdc, 250 Vac	
CONNECTIONS		
Busbar	M8	M10
Fuse	M8	
Fuse Dummy Busbar	No	Yes, included
VE.Can	RJ45 (Two RJ45 terminators included)	
Power supply connection to Lynx Distributor	RJ10 (RJ10 cables ship with each Lynx Distributor)	
Temperature sensor	Screw terminal (Sensor included)	
Relay	Screw terminal	
PHYSICAL		
Enclosure material	ABS	
Enclosure dimensions (h x w x d)	190 x 180 x 80 mm	
Unit weight	1.4 kg	
Busbar material	Tinned copper	
Busbar dimensions (hxw)	8 x 30 mm	
ENVIRONMENTAL		
Operating temperature range	-40 °C to +60 °C	
Storage temperature range	-40 °C to +60 °C	
Humidity	Max. 95 % (non-condensing)	
Protection class	IP22	

System example – Lynx Shunt VE.Can, Lynx Power In, Lynx Distributor and lead acid batteries

This system contains the following components:

- Lynx Power In with 4 paralleled 12V lead acid batteries.
- Identical cable lengths for each battery.
- Lynx Shunt VE.Can with main system fuse and battery monitor.
- Lynx Distributor with fused connections for inverter/charger(s), loads and chargers. Note that additional modules can be added if more connections are needed.
- Cerbo GX (or other GX device) to read out the battery monitor data.



System with Lynx Shunt VE.Can, lead acid batteries, a Lynx Shunt VE.Can and a Lynx Distributor

LYNX SMART BMS

Lynx Smart BMS 500 A

Lynx Smart BMS 1000 A

VictronConnect

The Lynx Smart BMS is a dedicated Battery Management System (BMS) for the Victron Lithium Battery Smart batteries. These batteries are Lithium Iron Phosphate (LiFePO4) batteries and are available in 12.8 V or 25.6 V in various capacities. They can be connected in series, parallel and series/parallel so that a battery bank can be built for system voltages of 12V, 24 V or 48 V. The maximum number of batteries in one system is 20, which results in a maximum energy storage of 84 kWh in a 12 V and up to 102 kWh in a 24 V[1] and 48 V[1] system. The maximum energy storage capacity can be multiplied by paralleling multiple Lynx Smart BMSs, which also ensures redundancy should one battery bank fail.
For more information on these batteries, visit the Victron Lithium Battery Smart product page.

Out of the various available BMSes, the Lynx Smart BMS is the most feature rich and complete option and integrates seamlessly into the Lynx Distributor system. It is available in 500 A and 1000 A (both M10) versions.

Built-in 500 A or 1000 A contactor

The contactor acts as a secondary safety system to protect the battery in case the primary controls (ATC, ATD and/or DVCC) fail to disable loads and/or chargers when required and is also suitable as a remote controllable main system switch.

Pre-charge circuit

In addition to the contactor, a built-in pre-charge circuit prevents high inrush currents when connecting a capacitive load such as a MultiPlus/Quattro or other inverter, eliminating the need for external pre-charging.

Monitoring and control

Monitor and control the BMS via Bluetooth using the VictronConnect App or a GX device such as a Cerbo GX and the VRM Portal. A built in battery monitor that operates in a similar fashion as the other Victron Energy battery monitors, provides data such as state of charge, voltage, current, historical data, status info and more in real time, and with Instant Readout even without the need to connect to the BMS, allowing diagnostic at a glance.

DVCC closed loop control as well as ATC/ATD contacts

Compatible Victron inverter/chargers and solar chargers are automatically controlled via a connected GX device and DVCC. The ATC/ATD contacts can be used to control other chargers and loads that have a remote on/off port.

Programmable relay

The relay can be used either as an alarm relay (combined with the pre-alarm) or to control an alternator via its external regulator (ignition cable). In Alternator ATC mode, the relay will only activate when the contactor is closed. Alternator ATC contact of the alternator opens first and then with a delay of 2 seconds the contactor. These 2 seconds ensure that the alternator is switched off before the battery is disconnected from the system.

AUX terminal

The advantage of the onboard auxiliary power supply (1.1 A @ system voltage) is to provide power to specific loads (i.e. a GX device) after the BMS has shut down the loads in the event of a low cell voltage event. If no charge voltage is detected within 5 minutes, the BMS including the AUX connection switches off.

VE.Can and NMEA 2000 data communication

VE.Can allows for easy connection (standard RJ45 network cable) and communication with a GX device. Since the CAN-bus protocol is based on NMEA 2000 (and J1939), it is easy to integrate into a marine network and feed your marine MFD with data (requires a VE.Can to NMEA 2000 micro-C male cable).

Lynx Distributor fuse monitoring

Read out fuse status and receive an alarm in case a fuse is blown. The Lynx Smart BMS monitors up to 4 connected Lynx Distributors and their fuses via VictronConnect or a GX device.

Parallel redundant Lynx Smart BMS

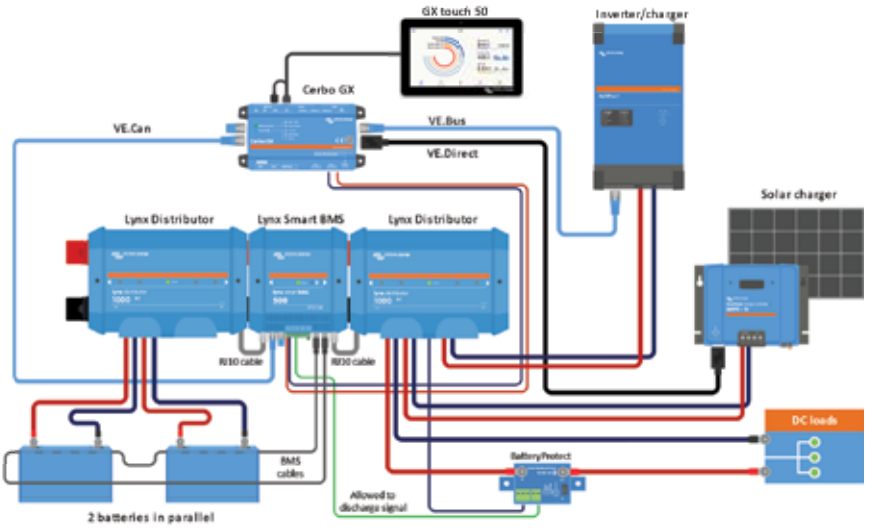
The new parallel redundancy feature for the Lynx Smart BMS and Lynx Smart BMS NG series allows multiple Lynx BMSes in one installation. Each has its own battery bank, and together they form a single redundant battery system. Up to 5 BMS-es can be paralleled.

[1] To reduce required balancing time, we recommend to use a little different batteries in series as possible for the application. 24 V systems are best built using 24 V batteries. And 48 V systems are best built using two 24 V batteries in series. While the alternative, four 12 V batteries in series, will work, it will require more periodic balancing time.

System example – Lynx Smart BMS, 2x Lynx Distributor and lithium batteries

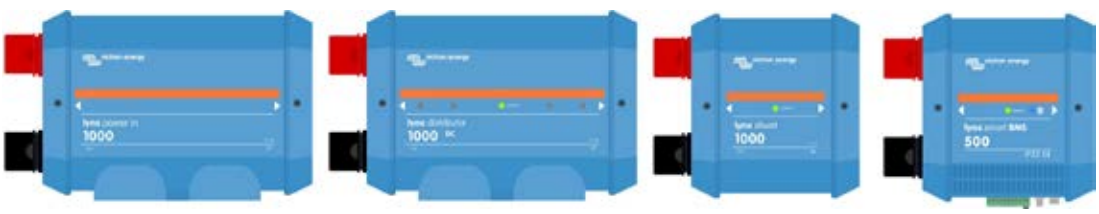
This system contains the following components:

- Lynx Distributor with 2 fused paralleled Lithium Smart batteries.
- Lynx Smart BMS with BMS, contactor and battery monitor.
- A second Lynx Distributor provides fused connections for inverter/charger(s), loads and chargers. Additional modules can be added if more connections are needed.
- A Cerbo GX (or other GX device) to read out the Lynx Smart BMS and Lynx Distributor data.



Lynx Smart BMS	500 A	1000 A
POWER		
Battery voltage range	9 – 60 VDC	
Maximum input voltage	75 VDC	
Supported system voltages	12, 24 or 48 V	
Reverse polarity protection	No	
Main safety contactor continuous current rating	500 A continuous	1000 A continuous
Main safety contactor peak current rating	600 A for 5 minutes	1200 A for 5 minutes
Power consumption OFF mode	0.3 mA for all system voltages	
Power consumption in Standby mode	Approximately 0.6 W (50 mA at 12 V)	
Power consumption in ON mode	Approx. 2.6 W (217 mA at 12 V) depending on the state of the relays	Approximately 4.2 W (350 mA at 12 V) depending on the state of the relays
Minimum load resistance for pre-charging	10 Ω and above for 12 V systems 20 Ω and above for 24 V and 48 V systems	
AUX output maximum current rating	1.1 A continuous, protected by resettable fuse	
Allow-to-charge port Maximum current rating	0.5 A at 60 VDC, protected by resettable fuse	
Allow-to-discharge port Maximum current rating	0.5 A at 60VDC, protected by resettable fuse	
Alarm relay (SPDT) Maximum current rating	2 A at 60 VDC	
CONNECTIONS		
Busbar	M10 (Torque: 33 Nm) [1]	M10 (Torque: 33 Nm) (17 Nm for units with a serial number before HQ2340XXXX)
VE.Can	RJ45	
I/O	Removable multi-connector with screw terminals	
Battery BTV cables	Male and female circular 3-pole connector with M8 screw ring Up to 20 batteries can be connected in one system	
Lynx Distributor fuse monitoring (up to 4 modules)	RJ10 (cable ships with each Lynx Distributor)	
PHYSICAL		
Enclosure material	ABS	
Enclosure dimensions (h x w x d)	190 x 180 x 80 mm	230 x 180 x 100 mm
Unit weight	1.9 kg	2.7 kg
Busbar material	Tinned copper	
Busbar dimensions (h x w)	8 x 30 mm	
ENVIRONMENTAL		
Operating temperature range	-40 °C to +60 °C	
Storage temperature range	-40 °C to +60 °C	
Humidity	Max. 95 % (non-condensing)	
Protection class	IP22	
STANDARDS		
Safety	EN-IEC 63000:2018	
EMC	EN-IEC 61000-6-3:2007/A1:2011/AC:2012	
QMS	NEN-EN-ISO 9001:2015	

1) In the previous version the Lynx Smart BMS 500 had an M8 busbar connection



OFF-GRID & BACKUP SYSTEMS

System schematic drawing & requirements

Always feel free to contact your local Victron dealer, they are happy to help and trained with the highest of know-how to translate your needs into a robust system. Find your local dealer at **'Where to buy'** on our website.

Cost savings. Powered by know-how.

When you need reliable 24/7 power on your construction site, without 80% fuel waste, it's good to know the power of know-how is by your side.

Energy. Anytime. Anywhere.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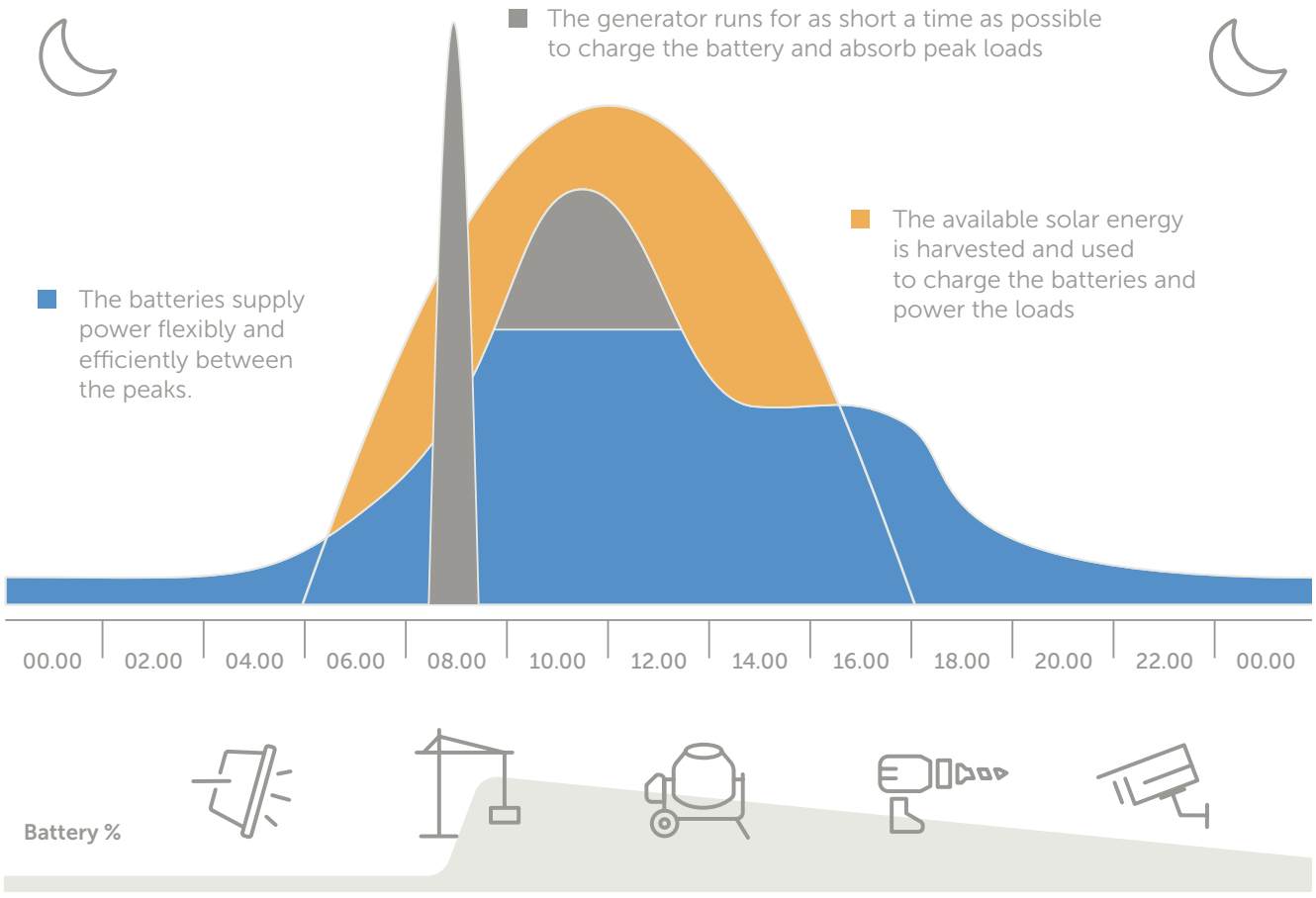
BLUE POWER

HYBRID GENERATORS

How can an already-efficient generator save up to 80% on fuel?

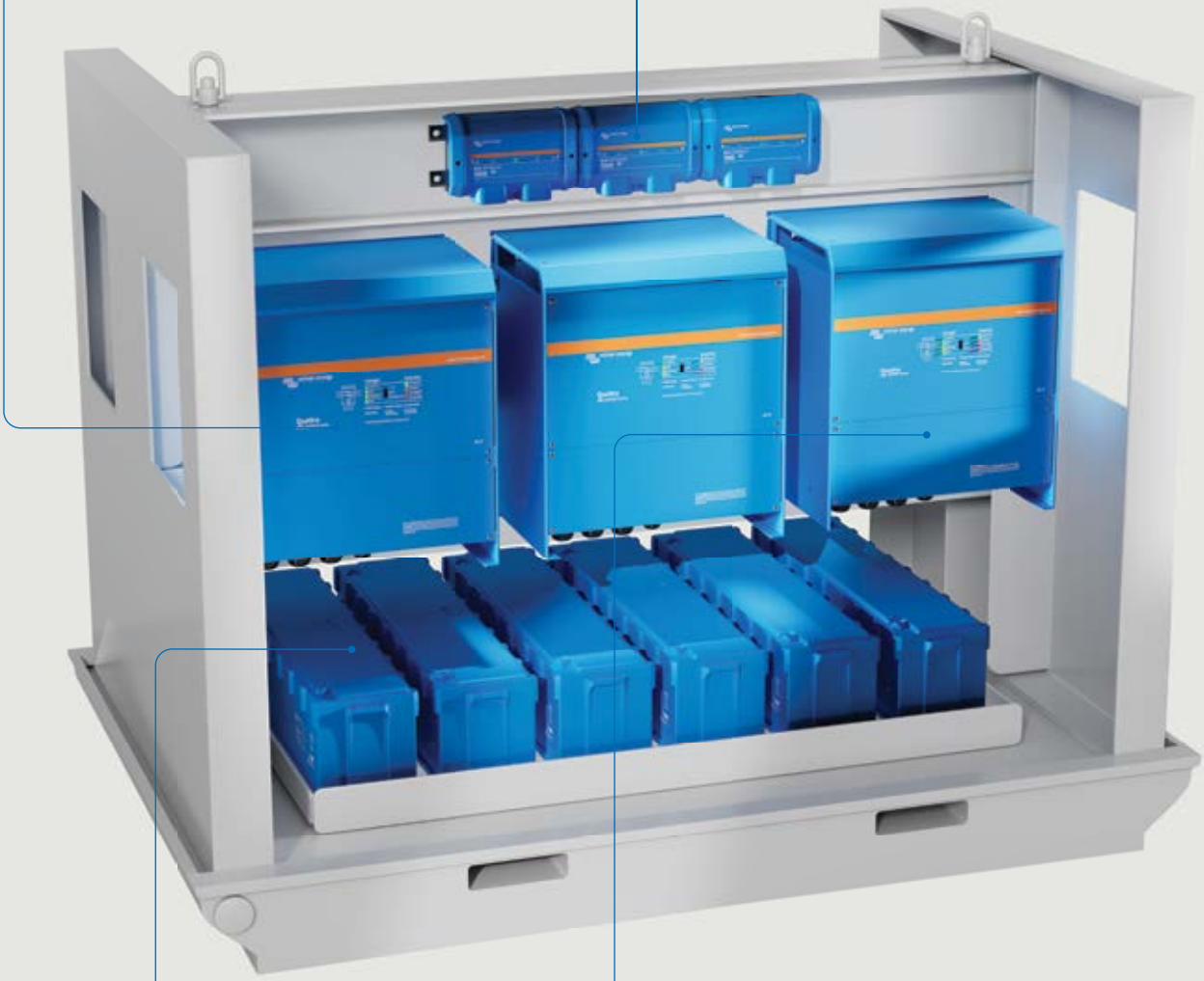
The solution is powered by know-how. From our reliable heavy-duty inverter/chargers to our industry-leading VRM remote management portal and digital generator controller integration, incredible cost savings can be achieved with our hybrid generator concept. At the same time, energy security is increased and emissions, maintenance and capital expenditure are significantly reduced.

Learn more at victronenergy.com/hybrid-generators



Inverter/Chargers take the lead
Power sensitive loads and meet high surge-currents perfectly, using our robust Quattro inverter/chargers

Lynx DC distribution system
Protects the batteries, monitors battery state-of-charge, health and fuse-status remotely.



Ultra-fast 1C (dis)charging
Improve generator fuel-economy with Lithium NG Smart batteries that can be fully charged in one hour.

Extreme performance
Low standby consumption.
From peak loads to zero loads: engineered for maximum performance & efficiency.

NEW

Digital generator controller integration

Improved fleet management

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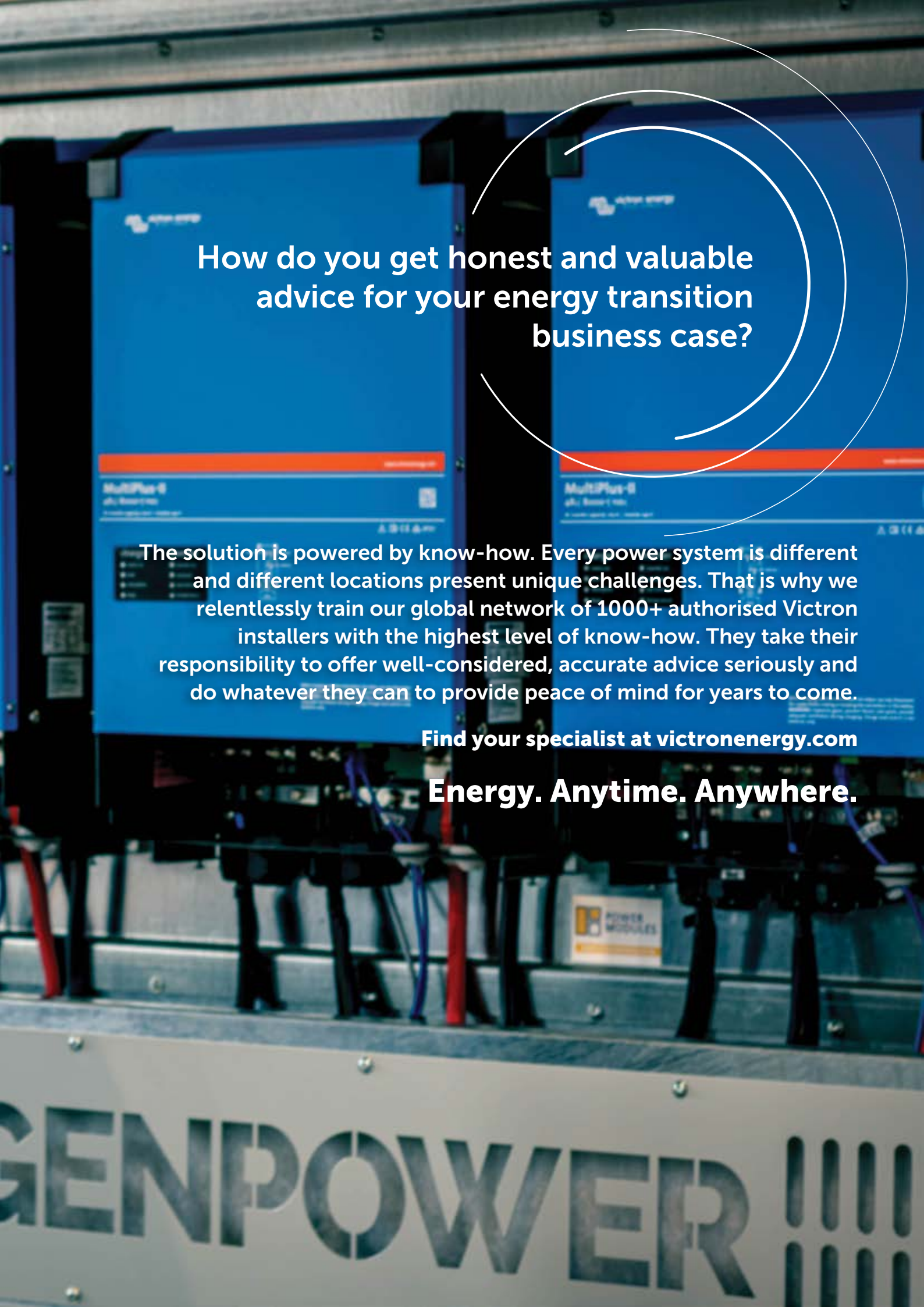
BLUE POWER



How do you get honest and valuable advice for your energy transition business case?

The solution is powered by know-how. Every power system is different and different locations present unique challenges. That is why we relentlessly train our global network of 1000+ authorised Victron installers with the highest level of know-how. They take their responsibility to offer well-considered, accurate advice seriously and do whatever they can to provide peace of mind for years to come.

Find your specialist at victronenergy.com

Energy. Anytime. Anywhere.

OFF-GRID & BACKUP SYSTEMS

Flexible building blocks to solve any kind of power challenge

With Victron Energy you have one of the widest ranges of robust connected power products that keep performing, even in the harshest of climates. Our up-to-date solutions counter most off-grid issues and can be fine-tuned to the most demanding and specific needs.

Feel free to ask your local Victron dealer for advice.

www.victronenergy.com

Inverter/chargers — Inverter/charger/MPPT — Inverters

Solar chargers from small — ...to large

Battery chargers — EV Charging Station — DC distribution systems

Battery Monitoring — System monitoring

And more

Battery protection - DC-DC converters and chargers - Lithium batteries - AGM and GEL batteries - Battery Management Systems - Voltage sensitive relays - Fuses and fuse holders - Busbars - Battery switches

OFF-GRID & BACKUP SYSTEMS

Why Victron?

At Victron Energy we're as dedicated and driven to making and improving power solutions today as we were when we started in 1975. Thanks to our customer feedback, data and knowledge sharing, we innovate 24/7. We are powered by know-how, it keeps us going and our users going, ensuring peace of mind in off-grid for years to come.

01

It's not one thing that makes it all work.

Our modular, robust and connected power systems have been proven to deliver unequalled reliability time and time again, even in the harshest of climates. But it's our unique combination of up-to-date hard- and software, intelligent monitoring apps, the network of highly trained authorised professionals and widespread repair centers that turns a Victron Energy system into an unbeatable system, that is powered by know-how.

02

Reliability powers long service life cycles.

When making power supply investment decisions, calculations purely based on price can be deceptive. Their true performance and expected service life cycle are equally important. Good thing Victron Energy lives up to our specifications, both in terms of performance and expected life cycle (when used as designed). Our 5 or 10 year warranty and fair and fast repair policies mean your investments are protected and won't let you down.

Endless energy
since 1975

03

How efficiency translates into cost-effectiveness.

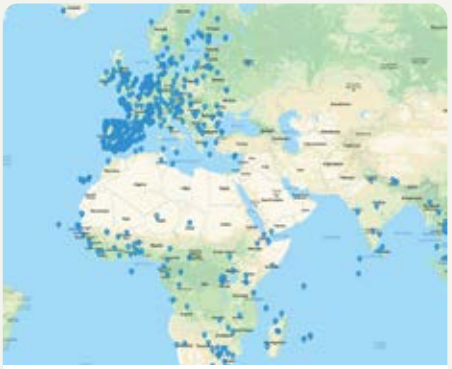
With battery-based systems, efficiency is always key to providing great levels of cost-effectiveness. From our incredibly efficient SmartSolar Charge Controllers to the way our inverter/chargers can intelligently control and minimise generator use, with a Blue Power system you can be sure that all the details are thought-through. This, combined with our reputation for extreme resilience and long life cycles, translates into cost-effective solutions, especially when compared to 'cheaper' options.

04

Intelligent monitoring means optimized systems.

Monitoring is crucial to fine-tune and optimize energy harvest and use based on ever-changing circumstances. With Victron you have the power of know-how at your fingertips. Through our industry leading and free VictronConnect app, you always have perfect control over your system from wherever you are. With our app and VRM portal you can monitor the complete system, change settings and catch potential issues early by programming alerts and alarms.

05



Our worldwide network of authorised dealers is by your side.

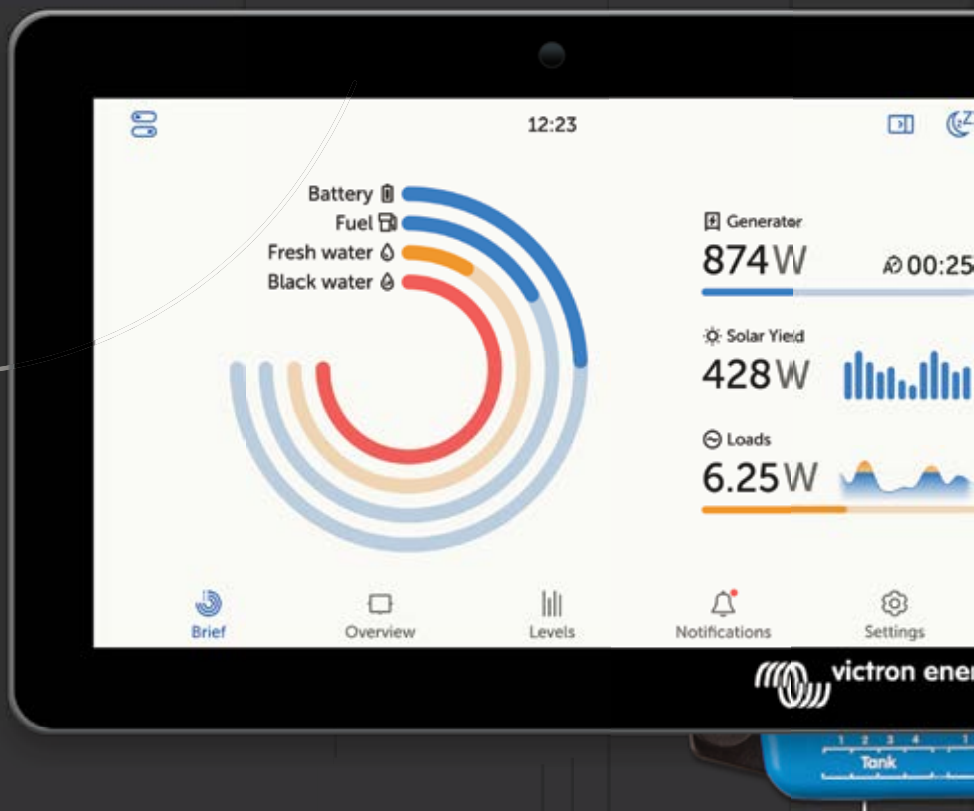
Our global network of ±1000 highly trained distributors, installers and service partners are always on hand to help. From stock advice, installation recommendations, after-care and technical support.

With the Victron Energy team, our partners and lively community you can always be sure the power of know-how is by your side.

CERBO GX

Connect it all. Control it all.

Unlock the full power of Victron Remote Management with the Cerbo GX



GX Touch

Works with

VictronConnect app

VRM - Remote Management portal

MFD & NMEA 2000 integration

Tank levels

victron energy
BLUE POWER

Managed Batteries

Victron Connected Products

MFD

Marine MFD's

Wireless temperature sensors

Switch Relays

Solar irradiance & wind meters

Auto start/stop the generator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