victron energy
BLUE POWER

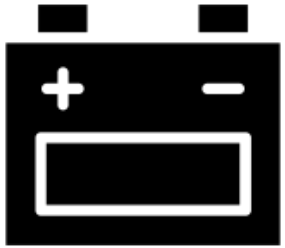
Training - DC Products

Batteries

Lead acid Batteries

Batteries store energy

- They are charged and recharged over and over again
- They are a consumable, they have a certain amount of cycle life
- They (potentially) create gas during charging
- They will get damaged when they are:
  - Discharging to deeply on a regular basis (below 50%)
  - When they are left discharged for too long (more than a week)



GEL and AGM Batteries

AGM deep cycle 12V batteries

- 8 Ah to 220 Ah
  - 400 cycles @ 80% DoD
  - 600 cycles @ 50% DoD
  - 1500 cycles @ 30% DoD

GEL deep cycle 12V batteries

- GEL 60 Ah to 220 Ah
  - 500 cycles @ 80% DoD
  - 750 cycles @ 50% DoD
  - 1800 cycles @ 30% DoD

12 Volt AGM	12 Volt GEL
90 Ah	90 Ah
110 Ah	110 Ah
130 Ah	130 Ah
165 Ah	165 Ah
220 Ah	220 Ah

Note: The smaller capacities are not generally stocked in Australia, potentially a 8 to 12 week delivery time

AGM Super Cycle batteries

- Improvements in pate paste and electrolyte
- Exceptional 100% depth of discharge (DoD) performance
- For applications with deep or occasional full discharge. But they will need a immediate recharge
- Slightly smaller size and less weight compared to our standard deep cycle

  - 300 cycles @ 100% DoD
  - 700 cycles @ 60% DoD
  - 1000 cycles @ 40% DoD

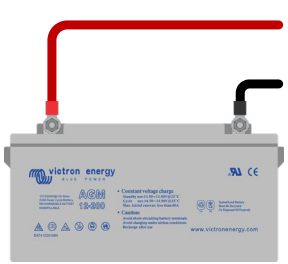
12 Volt AGM
12.5 Ah
15 Ah
25 Ah
38 Ah
60 Ah
100 Ah
125 Ah
170 Ah
230 Ah

Lead Carbon batteries

- The active material of the negative plate has been replaced by a lead carbon composite
- Better partial state of charge performance because of less sulfation
- More cycles
- Higher efficiency because of a lower charge voltage
- With threaded M8 insert terminals
  - 500 cycles @ 100% DoD
  - 1000 cycles @ 60% DoD
  - 1400 cycles @ 40% DoD

12 V
106 Ah
160 Ah

Battery bank - series

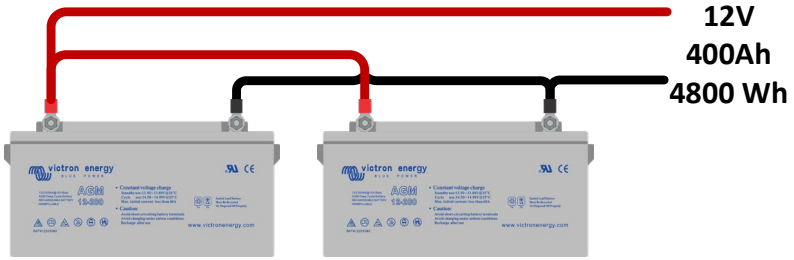


12V
200Ah
2400 Wh

24V
200Ah
4800 Wh

48V
200Ah
9600 Wh

Battery bank - parallel and series/parallel



Lithium Super Pack

- With build in BMS and safety switch
- Will disconnect on low or high voltage and high temperature
- Lighter than lead acid battery
- Can be connected in parallel, but not in series

12.8 V	25.6 V
20 Ah	
60 Ah	50 Ah
100 Ah	
200 Ah	

Smart Lithium Batteries

- LiFePo4 batteries 12.8 V and 25.6 V with Bluetooth
- Can be connected in parallel and also in series or series/parallel
- Active cell balancing
- Cell monitoring via VictronConnect App

External BMS needed

- 12/200 BMS
- VE.Bus BMS + AC detector
- Mini BMS

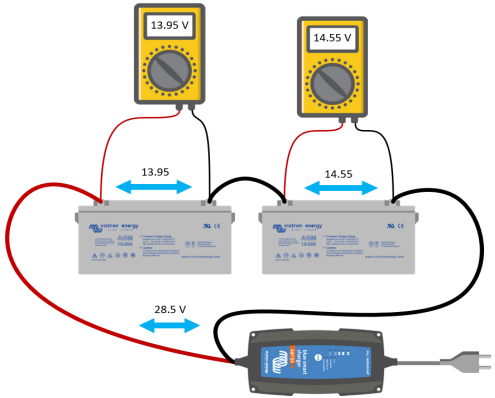
12.8V	25.6 V
60 Ah	
100 Ah	
150 Ah	
200 Ah	200 Ah
300 Ah	

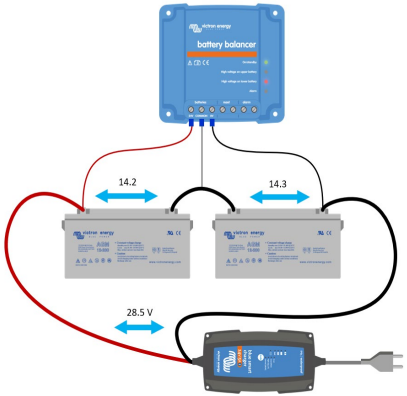
Battery Balancer

Battery Balancer

Battery balancers balance batteries that are connected in series

- When batteries are connected in series the individual battery voltages can vary and this will cause premature battery failures

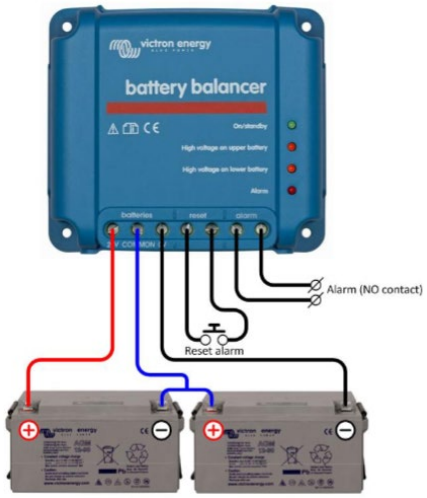


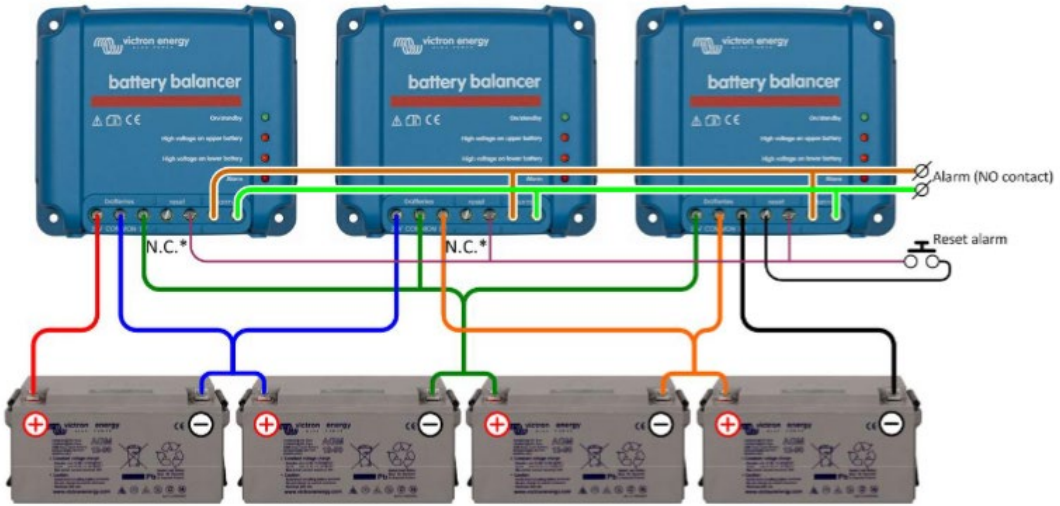


- The battery balancer compares both battery voltages during charging
- If it detects a voltage difference, it will draw a small current from the battery with the highest voltage (up to 0.7 A)

Now both batteries have the same voltage and the same state of charge

1 balancer for a 24 V system … 3 for a 48 V system



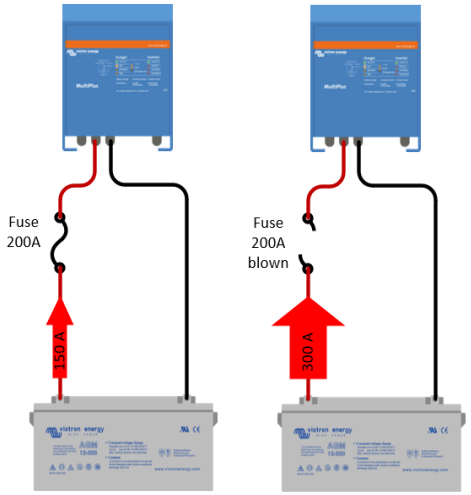


DC Fuses and fuse holders

DC fuses

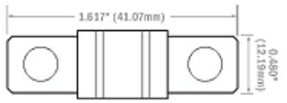
A fuse protects an electrical circuit against high currents.

- When a current flows through the fuse that is higher than its current rating, for a certain amount of time, the fuse will blow.
- Once the fuse has blown, no more current will flow into the circuit.
- Higher than expected current situations can occur when an electrical device develops a fault or when there is short-circuit in the electrical circuit.

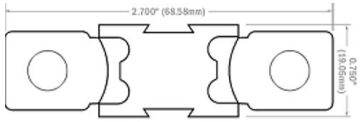


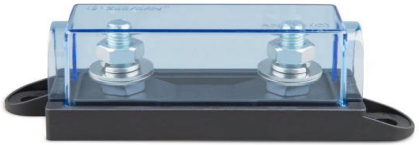
MIDI, MEGA and ANL fuses and fuse holders

MIDI	
32 V	58 V
	30 A
	40 A
	50 A
60 A	60 A
80 A	80 A
100 A	100 A
150 A	
200 A	

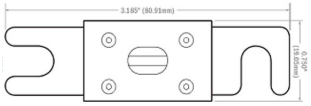


MEGA	
32 V	58 V
60 A	
80 A	
100 A	
125 A	125 A
150 A	
175 A	
200 A	200 A
225 A	
250 A	250 A
300 A	300 A
400 A	
500 A	





ANL
80 V
400 A
500 A



Modular MEGA fuse holders and busbar

- Fuse holders with dovetail
- They can connect to each other

- 500 A Busbar to connect 5 modular fuse holders, with one M10 input connection

- 1500 A Busbar to connect 6 modular fuse holders with two M10 input connections

Battery monitoring

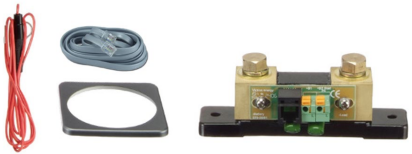
Battery monitor

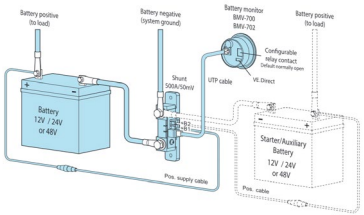
A battery monitor monitors a battery or battery bank

- It measures the energy going in and out of the battery
- It calculates remaining capacity and state of charge
- This allows you to know how full or empty the battery is.
- It displays voltage, current, state of charge, time to go, number of cycles and so on.
- It can generate an audible alarm or send an alarm signal that can be used to turn a generator on or off.

BMV Battery monitor

- Monitors voltage, current, state of charge, time to go
- Keeps track of deepest and average discharge history
- Easy to install, includes 500 A shunt and cables
- Separate front bezel for square or round appearance
- Programmable relay and VE.Direct connector
- The 712 model is equipped with Bluetooth
- Set up via front panel or via VictronConnect App

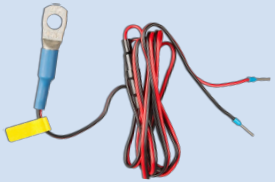




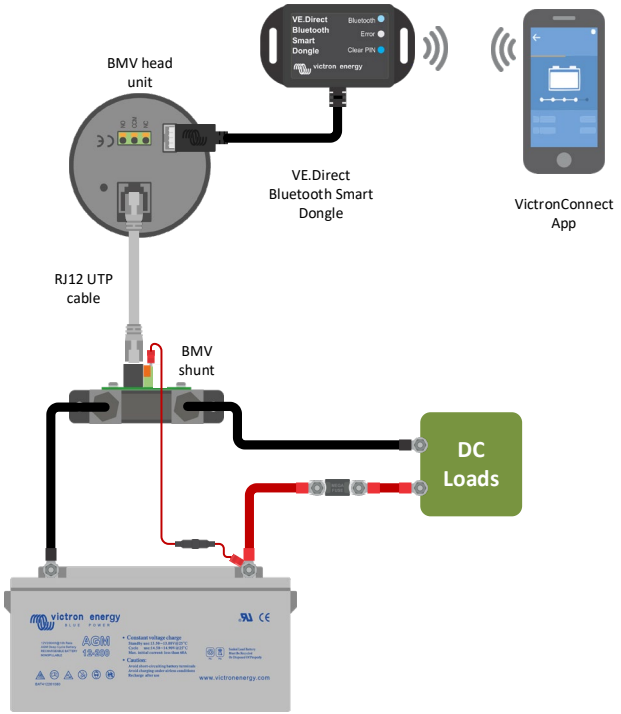
BMV range

Features	BMV-700	BMV-702	BMV- 702 black	BMV-712	BMV-700H
DC Voltage	6.5 - 95 V	6.5 - 95 V	6.5 - 95 V	6.5 - 70 V	60 - 385 V
Bluetooth	no	no	no	yes	no
Colour	grey	grey	black	grey	grey
Additional battery, temperature or midpoint	no	yes	yes	yes	no
Shunt enclosure	no	no	no	no	yes
Power consumption	4 mA	4 mA	4 mA	< 1 mA	4 mA
Relay (can be inverted)	Normally open	Normally open	Normally open	Bistable	Normally open

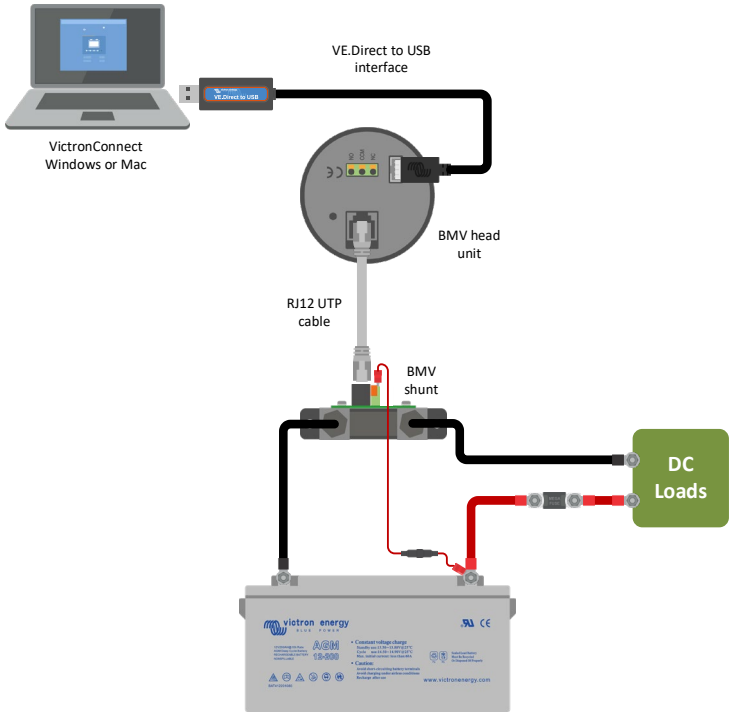
BMV Accessories

BMV temperature sensor	Mounting Enclosure	Shunts 500 - 6000 Amp	RJ12 cables 0.3 - 20 meter
			

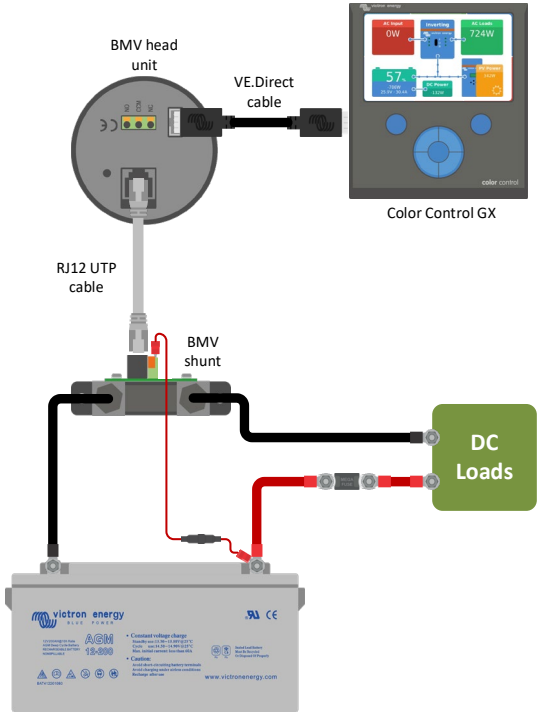
BMV and Smart Dongle



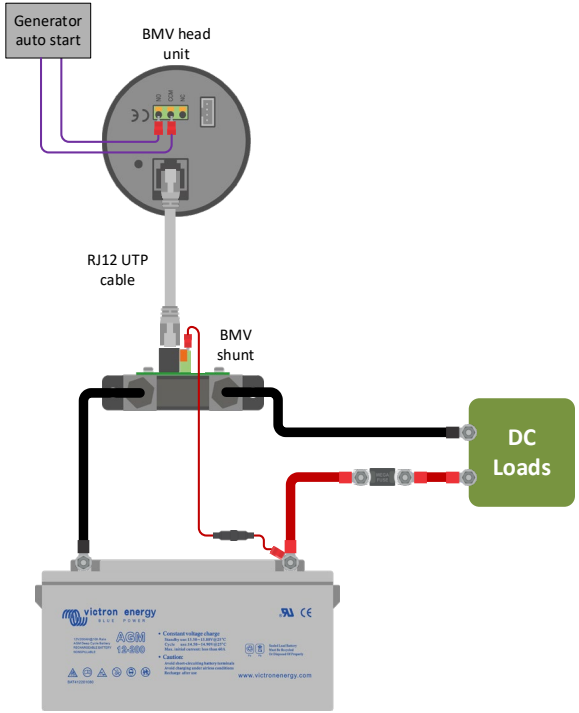
BMV and USB interface



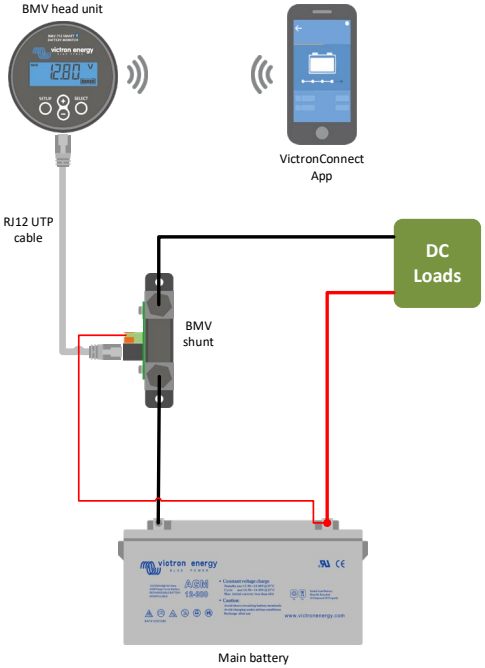
BMV Monitoring



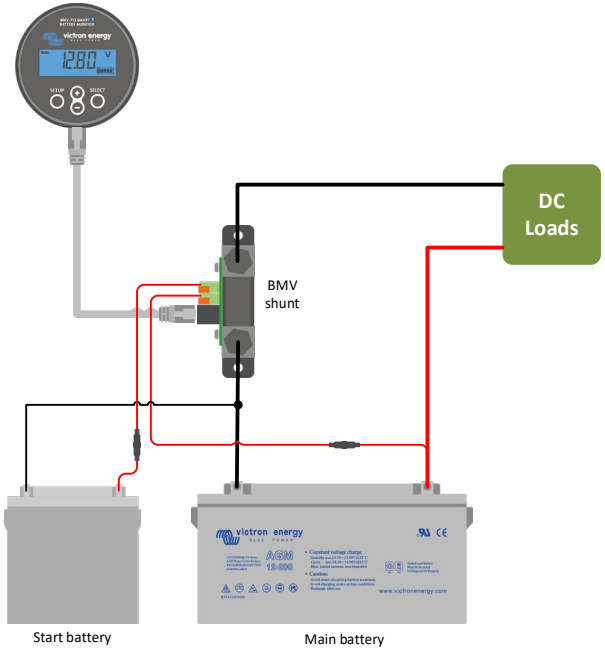
BMV generator start



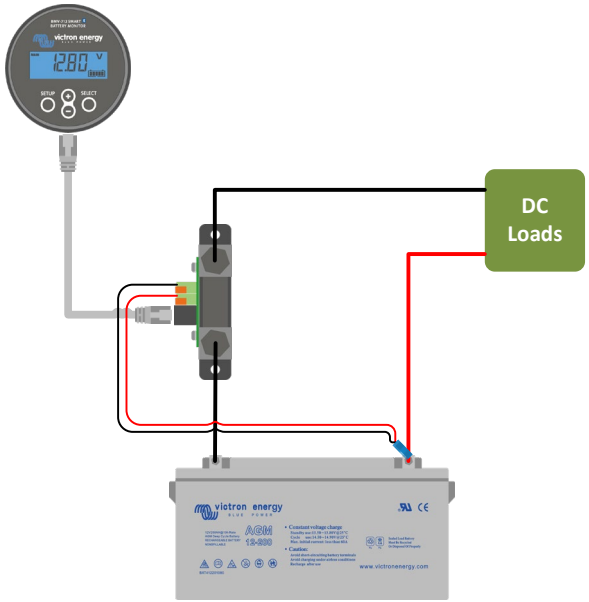
BMV single battery



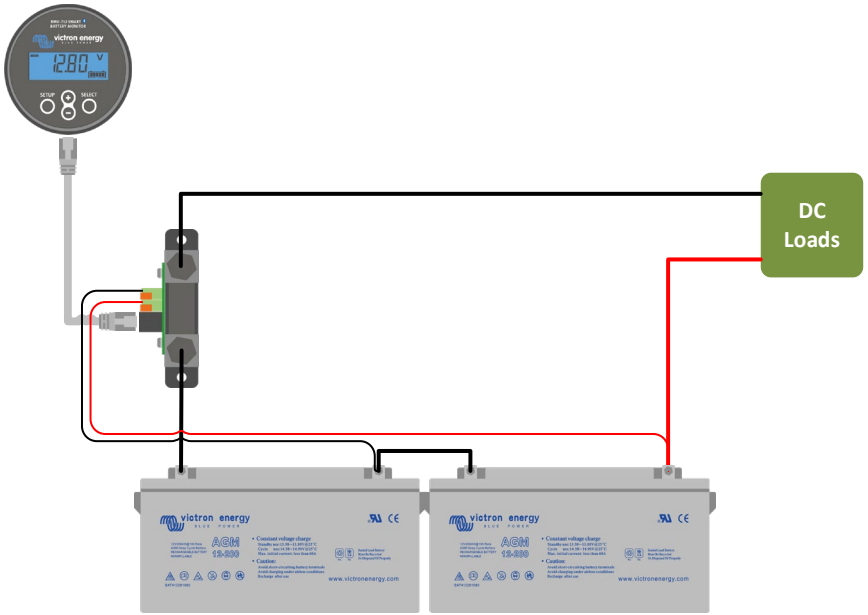
BMV dual battery



BMV temperature sensor



BMV midpoint



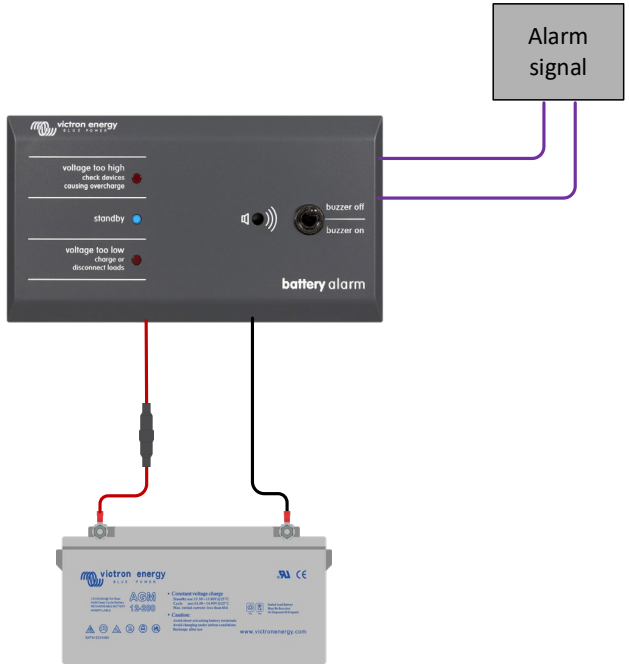
VE.Direct Accessories

VE.Direct cables 0.3 - 10 meter And Venus OD device	Smart dongle and VictronConnect App	VE.Direct - USB interface and Victron Connect App

Battery Alarm

Battery Alarm

- Alarm panel which monitors your battery bank.
- Audible and visual alarms for over and under voltage
- Potential free contact with normally open and normally closed contacts.
- Alarm thresholds and hysteresis are programmable via dipswitches



Lynx battery monitor and DC distribution system

Lynx system

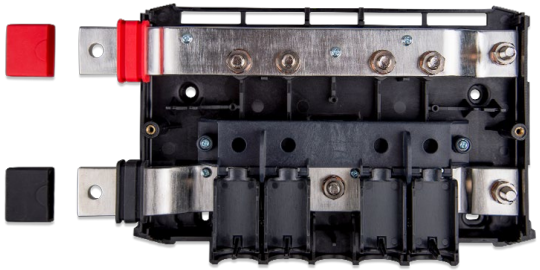
- Modular busbar system for DC distribution
- Rated to 1000 A

  - Lynx power in: to connect batteries
  - Lynx shunt: battery monitoring and main fuse
  - Lynx distributor: fuses and connections to loads

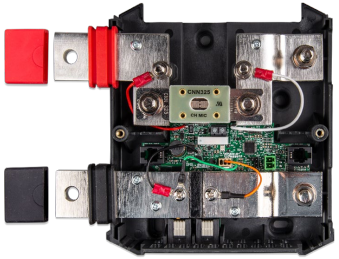
Models
Lynx Power in
Lynx Shunt VE.Can
Lynx Distributor

Modular

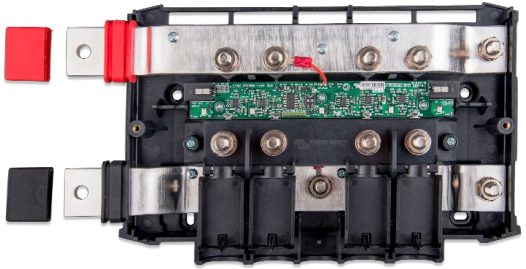
Lynx Power-in

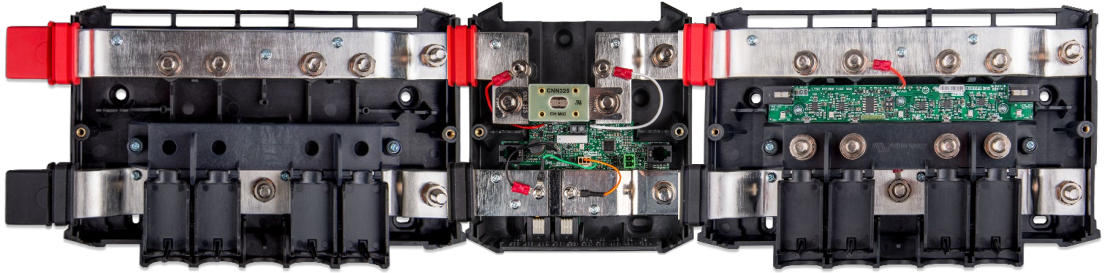


Lynx Shunt

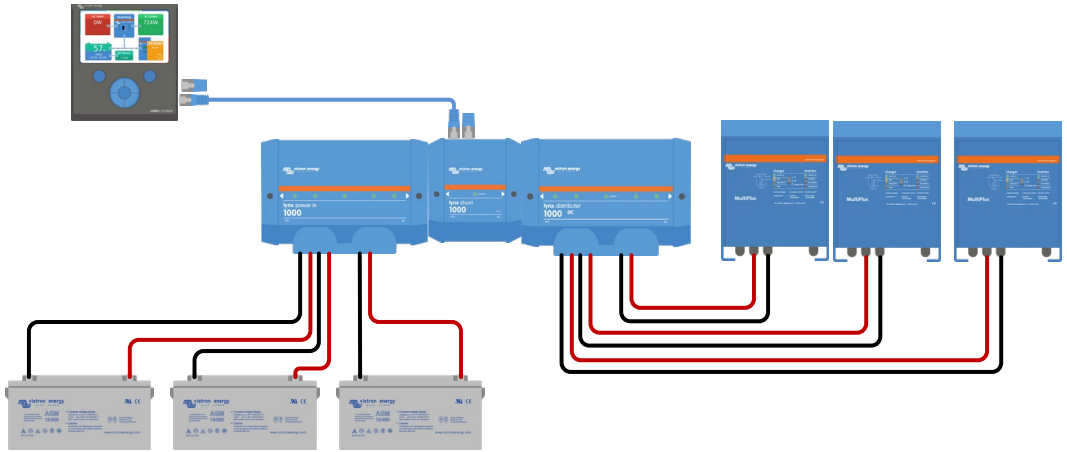


Lynx Power-out





Lynx battery monitor and DC distribution

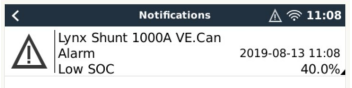


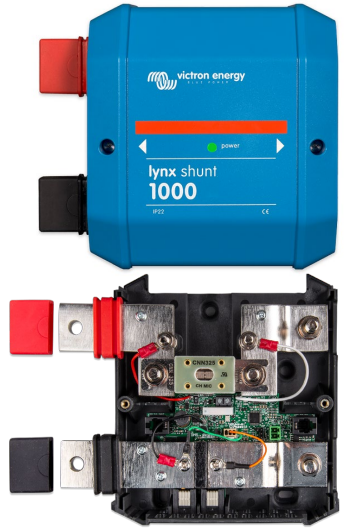
Lynx shunt

Lynx shunt contains:

- System fuse (Fuse CNN 325 A / 80 V for Lynx shunt)

- Shunt
- Battery monitoring electronics
- Alarm relay

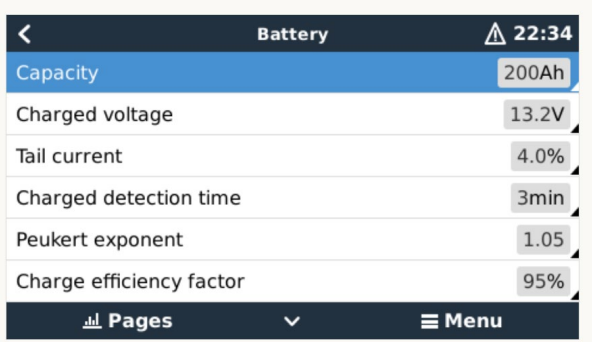


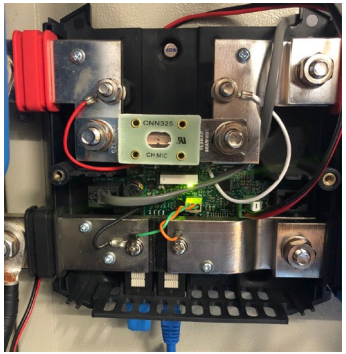


- The Lynx shunt battery monitor connects to a Venus OS device
- Setup and monitoring is via Venus OS

Battery Monitoring - Lynx shunt

- Same as BMV, only different look
- Is part of the lynx DC distribution system
- Requires a CCGX or VGX in the system
- Set up is done via CCGX

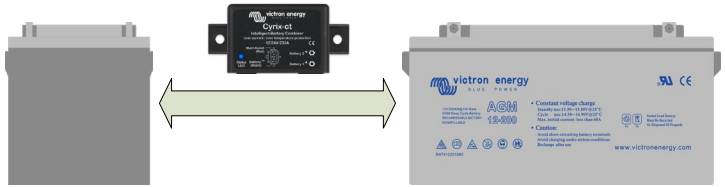




Cyrix - voltage sensitive relay

Cyrix - Voltage sensitive relay

- The Cyrix connects two different batteries to each other as soon as one of the batteries is charged
- One charge source can charge both batteries
- Situations like this occur in dual battery systems, like on boats and in vehicles
- The alternator can charge the house battery bank and the house charger can charge the start battery



Start battery

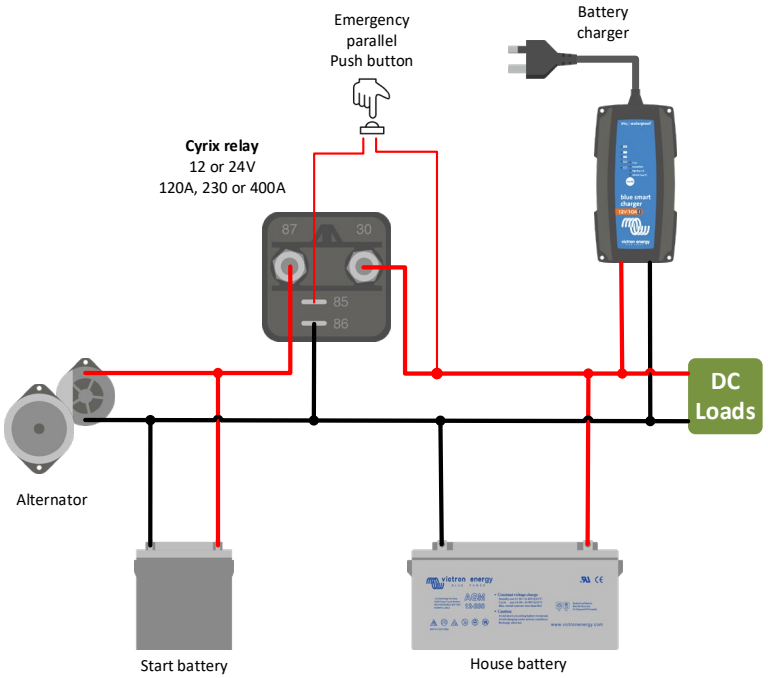
House battery

Cyrix - Voltage sensitive relays

- Voltage sensitive battery parallel switch
- Micro-processor controlled
- Prioritizes the starter battery
- Emergency parallel switch option
- Bi-directional sensing
- No voltage loss
- Also available in a kit

12 or 24 V	24 or 48 V
120 A	
230 A	
400 A	400 A

Multiple battery bank charging - Cyrix

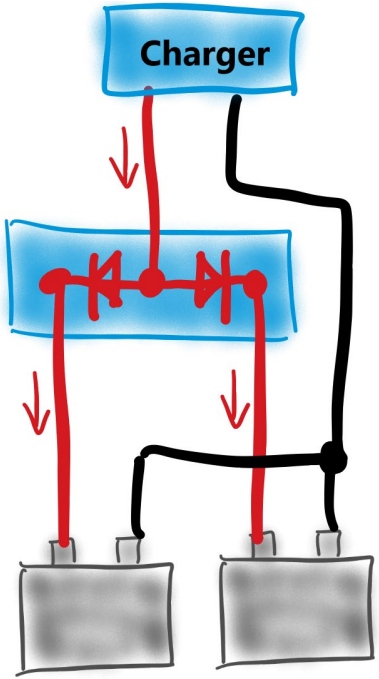


Argo battery isolators and combiners

Diode and FET splitters

Allows charging multiple battery banks from one charge source

- It turns a single output charge source into a multiple output charger
- Can be connected to alternators or to battery chargers
- Ensures one way traffic into the battery, they all get charged, but they cannot charge each other.



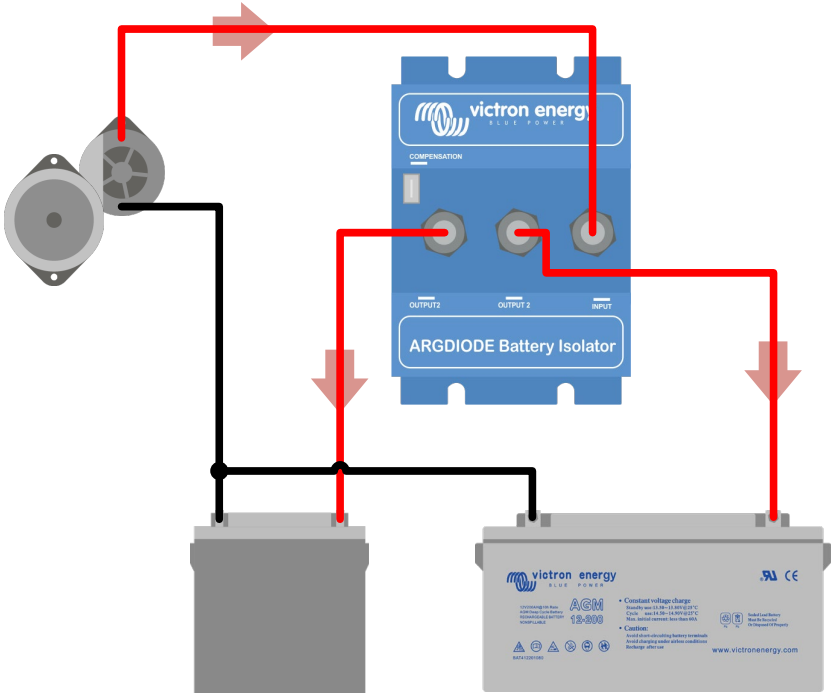
Argo - FET or Diode battery isolators

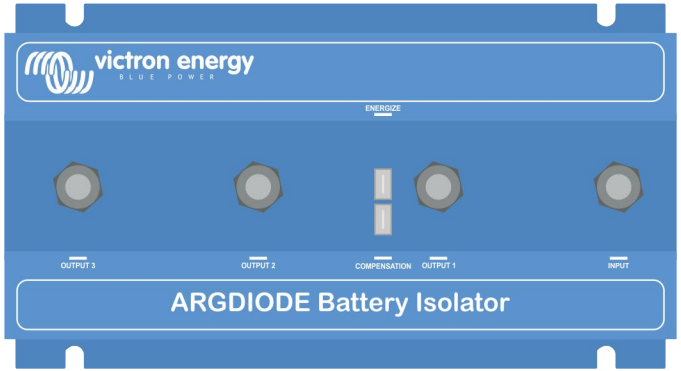
- Available in 2 or 3 battery models
- Diode model has 0.3 V voltage loss
- With alternator energize input or compensation diode
- FET model has virtually no voltage loss
- For 12 V or 24 V battery systems

2 (diode)	3 (diode)
80 A	100 A
120 A	140 A
160 A	180 A

2 (FET)	3 (FET)
100 A	100 A
200 A	200 A

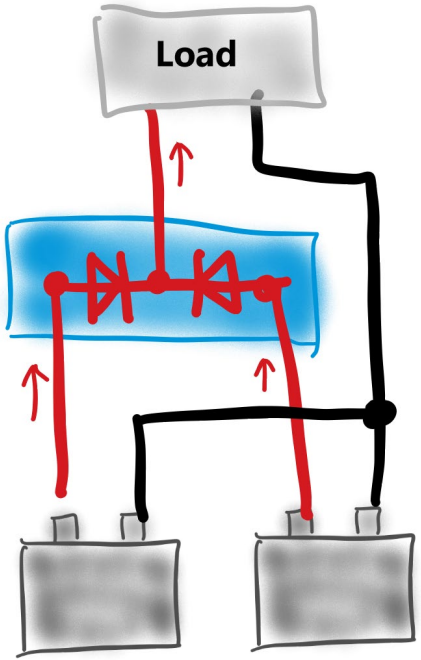
Charging multiple battery banks





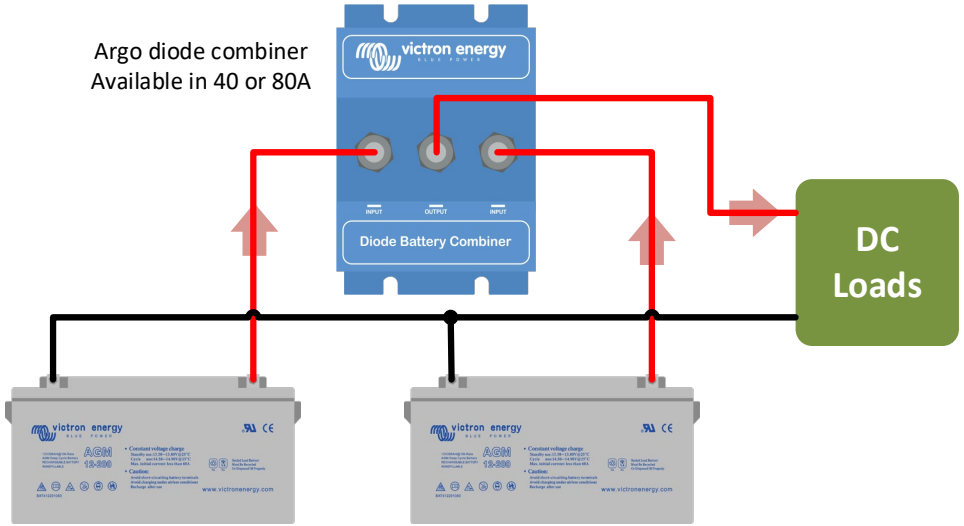
Argo - battery combiner

- Allows two DC power sources or batteries to supply the same load
- Failure of one DC source will not interrupt power to the load.
- 0.3V voltage loss
- For 12 V or 24V battery systems



2 batteries
40 A
80 A

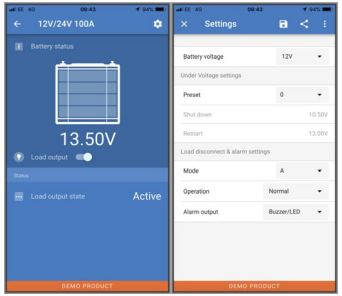
Multiple battery banks power load

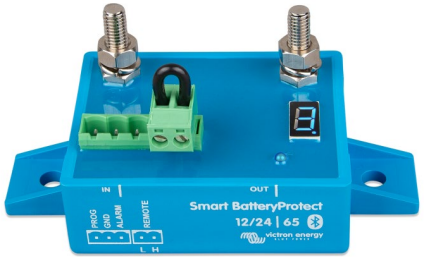


Battery Protect

Smart BatteryProtect

- Battery disconnect switch, disconnects loads before the battery is flat
- Programmable low and high voltage disconnect settings
- Very low self consumption
- Bluetooth (non smart models also still available)
- 12/24 V auto ranging
- Remote controllable
- Suitable for lithium ion
- Delayed load disconnect delayed, delayed alarm output

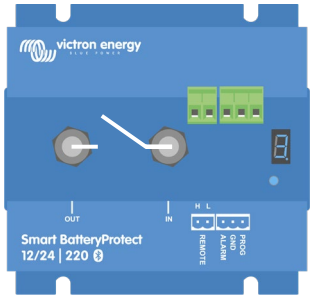


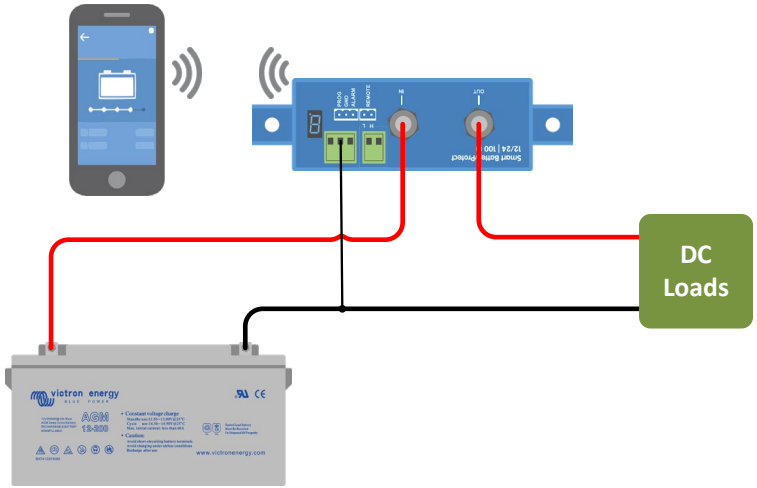


12 or 24 V	48 V
65 A (200 A peak)	
100 A (600 A peak)	100 A (250 A peak)
220 A (600 A peak)	

Battery Protect

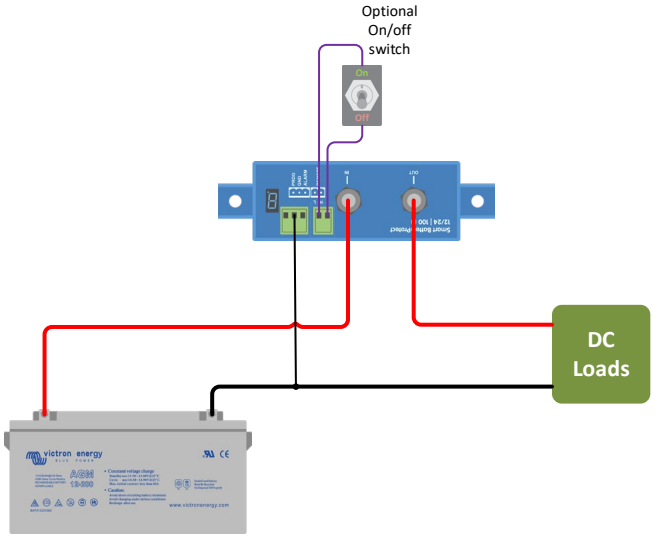
- The BatteryProtect is a low voltage switch
- It will disconnect the DC load as soon as the battery voltage is too low
- Programming manually via a wire loop or via the VictronConnect App
- It prevents battery damage due to full discharge

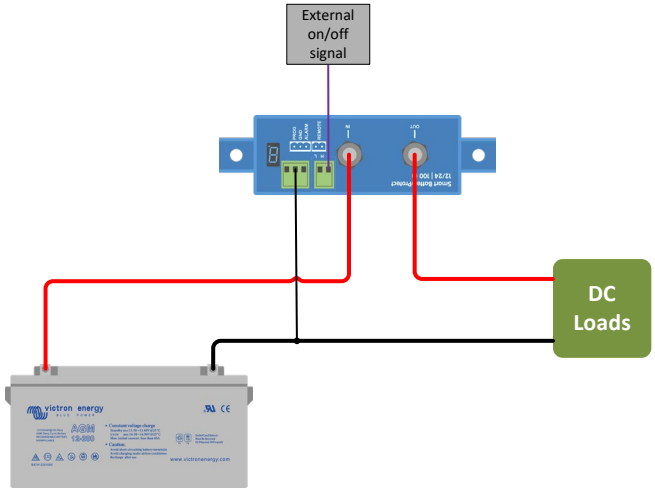




Protecting battery against deep discharge

- On/off switch can be wired to remotely turn Battery Protect off
- Or and external signal turns battery protect off (lithium BMS)

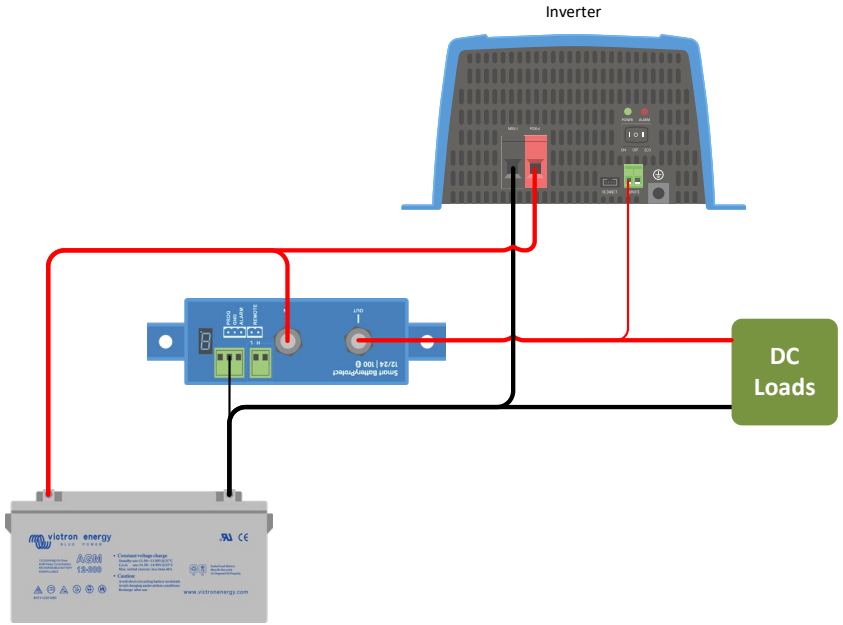




BatteryProtect together with an inverter

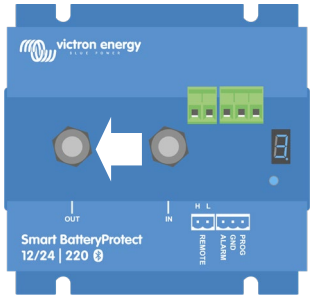
The high inrush current of an inverter might not be suitable for the peak current rating of the Battery Protect

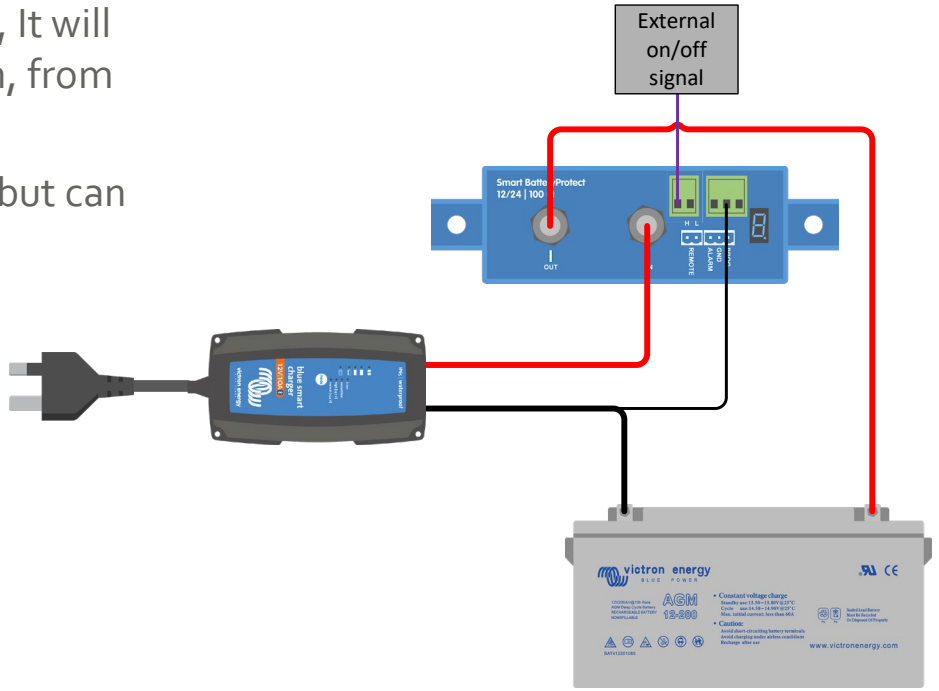
Tot get around it connect the inverter to the battery and connect the output of the Battery Protect to the remote on/off connector of the inverter



BatteryProtect can disconnect a charge source

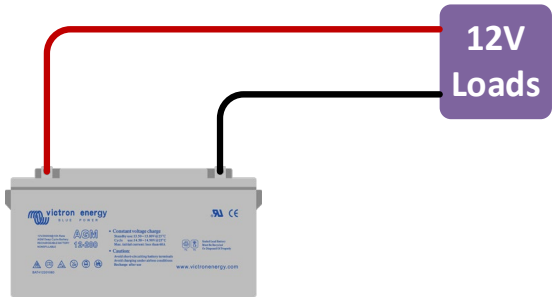
- The BatteryProtect is polarity sensitive, It will only conduct electricity in one direction, from the “in” terminal to the “out” terminal.
- It can be used to disconnect a charger, but can not be used with inverter chargers

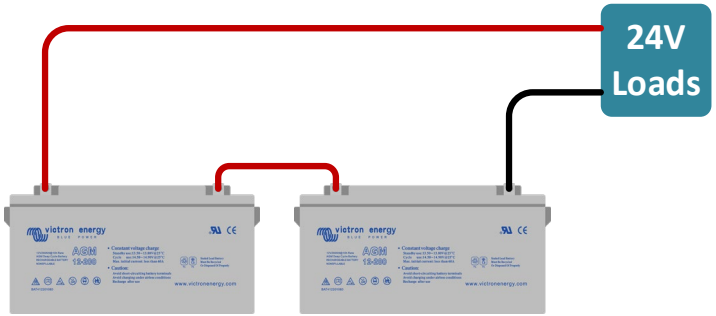




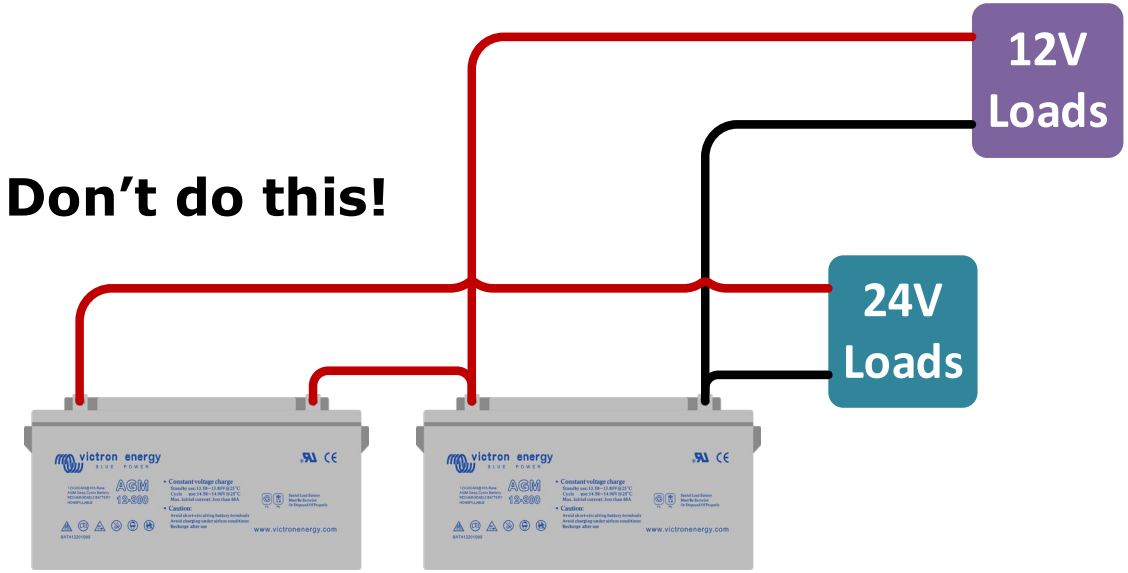
DC/DC converters

The battery supplies 12 V or 24 V





But what if both 12 V and 24 V are needed?



DC/DC converter

A DC/DC converters converts one DC voltage to another DC voltage

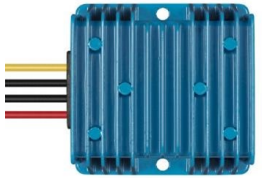
- If you have a 24 V system and need to run some 12 V loads.
- The DC/DC converter will take from the 24 V source and converts it to 12 V

Example scenarios

- RV or boat with a 24 V alternator, but house battery is 12 V
- A car with a dual battery setup and the smart alternator drops to below 12 V when the start battery is full
- A 48 V battery system that need to charge a 12 V generator start battery

Orion - DC/DC converter non isolated IP67

- 24 to 12 V and 12 to 24 V converters
- Wide input voltage range
- Full rated output up to 40°C
- IP67 rating - Waterproof



24 to 12 V	12 to 24 V
5 A (60 W)	
12 A (120 W)	
20 A (240 W)	
100 A (1200 W)	50 A (1200 W)

Orion - DC/DC converter non-isolated

- Wide range of 24 to 12 V and 12 to 24 V converters
- Two 70 A models, with bolts or with binding posts

24 to 12 V	12 to 24 V
	8 A
	10 A*
	20 A* **
25 A* **	
40 A **	
70 A* **	

* with adjustable output and parallelable

** with remote on/off connector

Orion - DC/DC converter non-isolated Tr

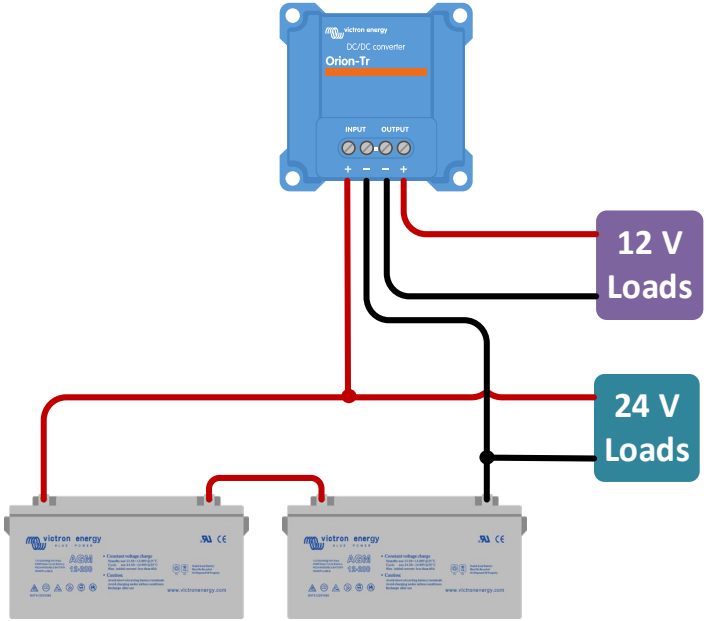
- Input voltage range 18 - 35 V
- Output voltage 12.5 V (non adjustable)
- Full rated output up to 40°C
- High efficiency, 95 % at full load
- IP43 rating (with terminals oriented downwards)

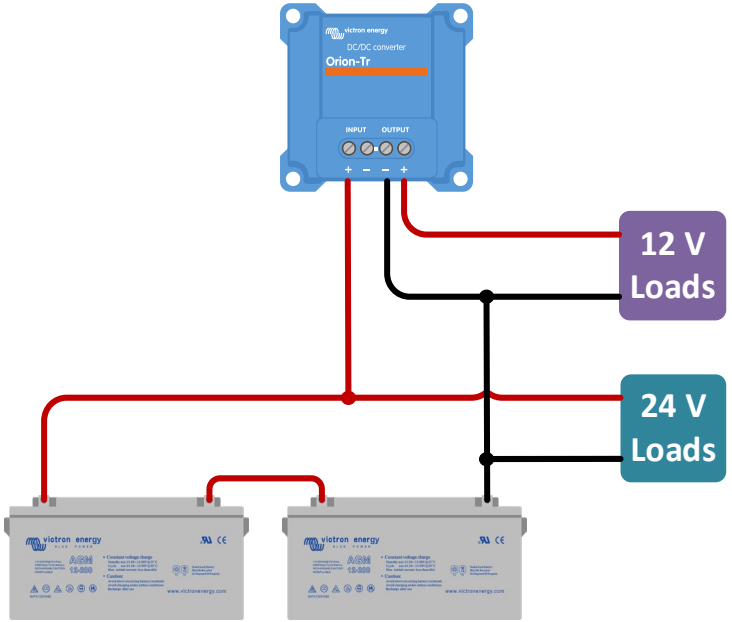
24 to 12 V
5 A (60 W)
10 A (120 W)
15 A (180 W)
20 A (240W)

Non-isolated Orion overview

	5 A	8 A	10 A	12 A	15 A	20 A	25 A	40 A	50 A	70 A	100 A
12 V to 24 V		IP21	IP21			IP21			IP67		
24 V to 12 V	IP67			IP67		IP67	IP21	IP21		IP21	IP67
	IP43		IP43		IP43	IP43					

DC/DC non-isolated - The negative is common





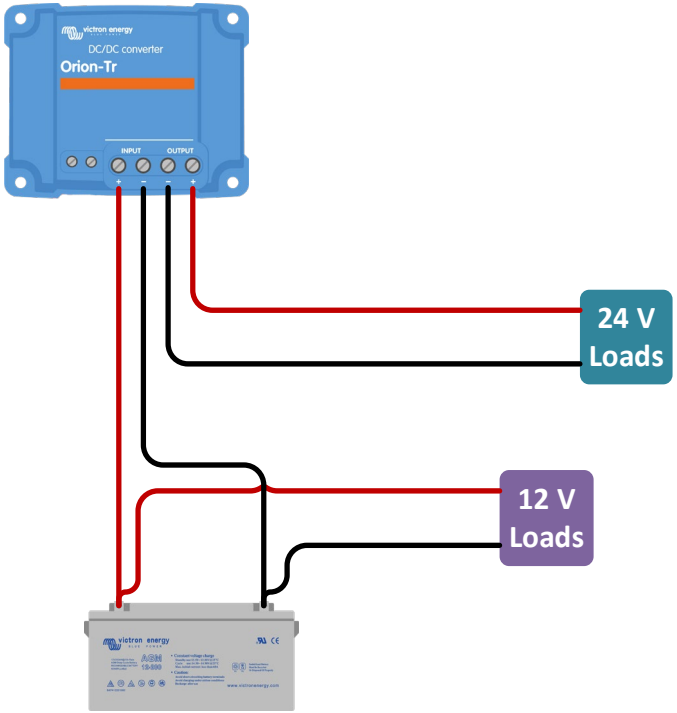
Orion - DC/DC converter isolated Tr

- Full rated output up to 40°C
- High efficiency, 95% at full load
- Output voltage is adjustable
- Short circuit proof
- Parallelable
- Remote on/off
- IP22 rating (IP43)

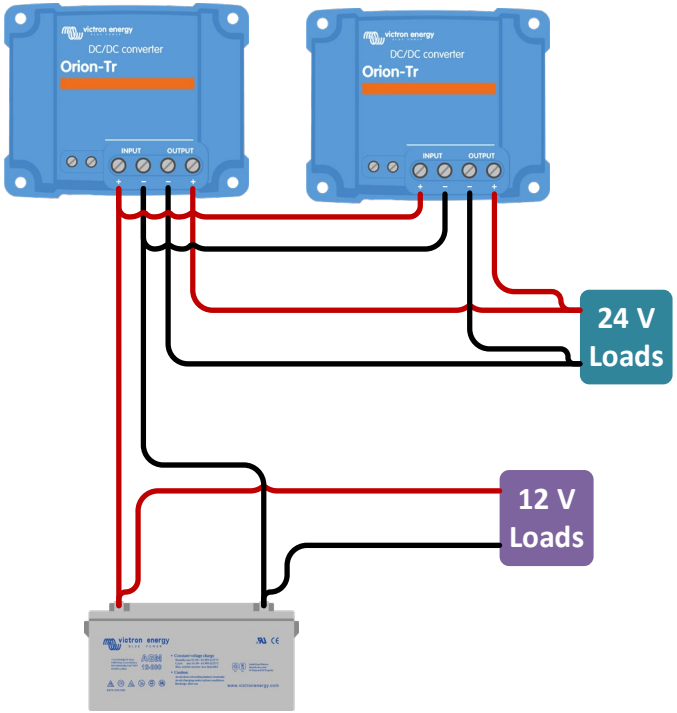
DC/DC converters - TR isolated

TR isolated	12V output	24 V output	48V output
12V input	9 A (110W)	5 A (120W)	
	18 A (220W)	10 A (240W)	
	30 A (360W)	15 A (360W)	
24V input	9 A (110W)	5 A (120W)	2.5 A (120W)
	18 A (220W)	12 A (280W)	6 A (280W)
	30 A (360W)	17 A (400W)	8 A (400W)
48 V input	9 A (110W)	5 A (120W)	2.5 A (120W)
	18 A (220W)	12 A (280W)	6 A (280W)
	30 A (360W)	16 A (380W)	8 A (400W)

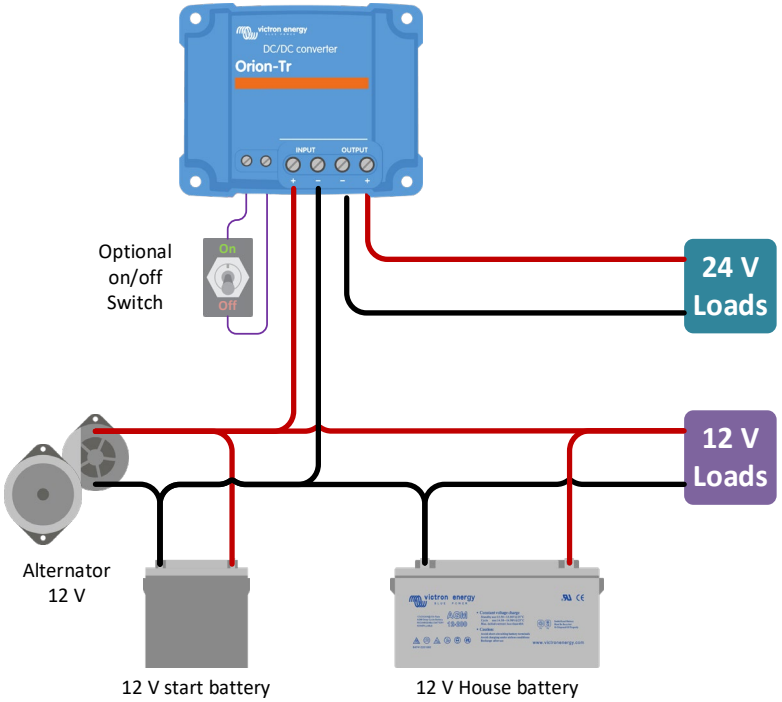
DC/DC galvanic isolation - negative is not common



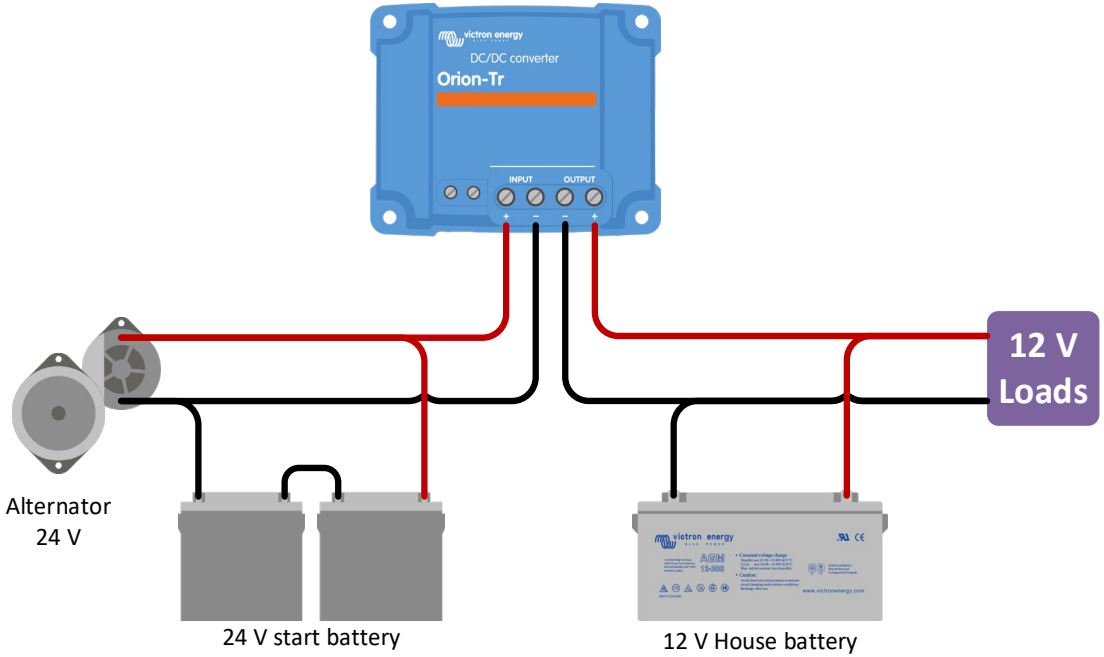
Can be paralleled - unlimited units



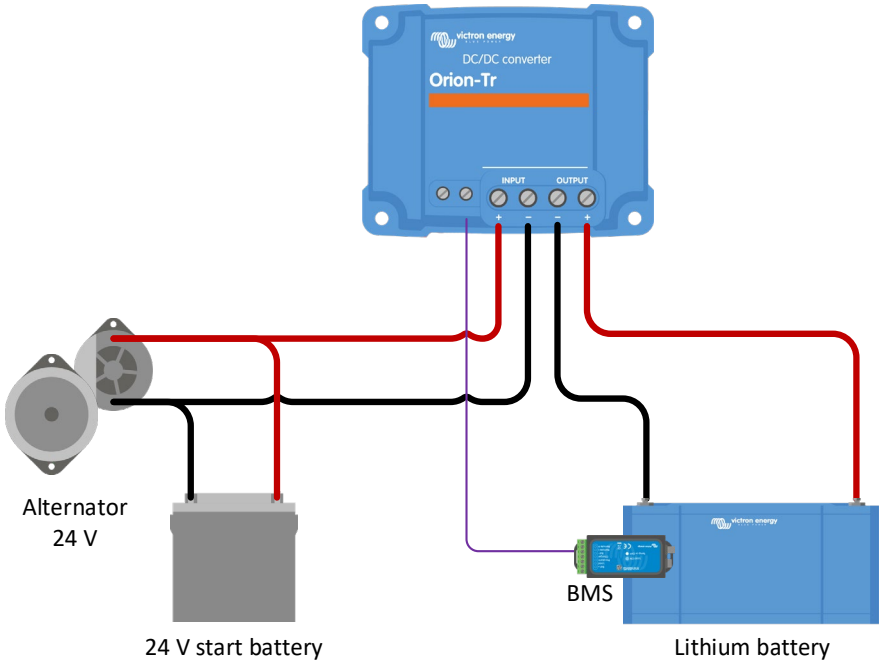
Remote on/off switch



DC/DC basic charging (1-stage)



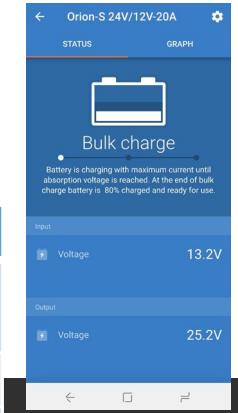
Current limiting between alternator and lithium

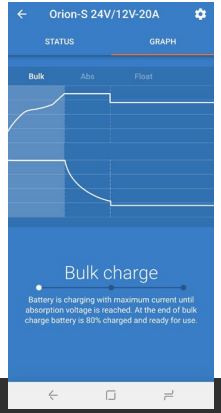


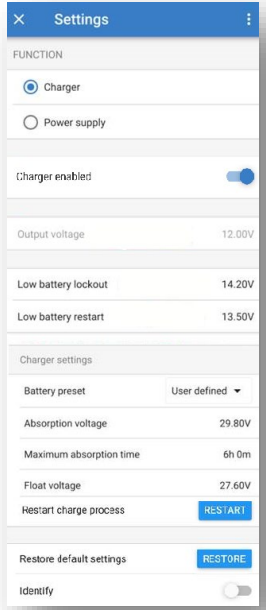
Orion Smart

New

- Bluetooth, programmable via Victron connect
- Choose operation mode: Charger or DC/DC Converter, Same charge algorithm already used in other chargers
- Parallelable
- Can act as a buck boost charger
- On/off switch in VictronConnect or via remote connector
- Engine shutdown detection







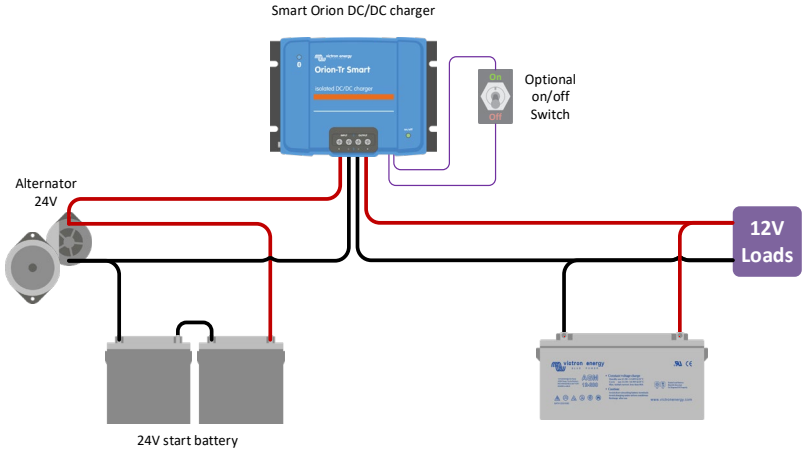
	12 to 12 V	12 to 24 V	24 to 12 V	24 to 24 V
Non Isolated	30 A (360 W)	15 A (360 W)	30 A (360W)	17 A (400W)
Isolated	18 A (220 W)	10 A (240 W)	20 A (240 W)	12 A (280 W)
	30A (360 W)	15 A (360 W)	30 A (360 W)	17 A (400 W)

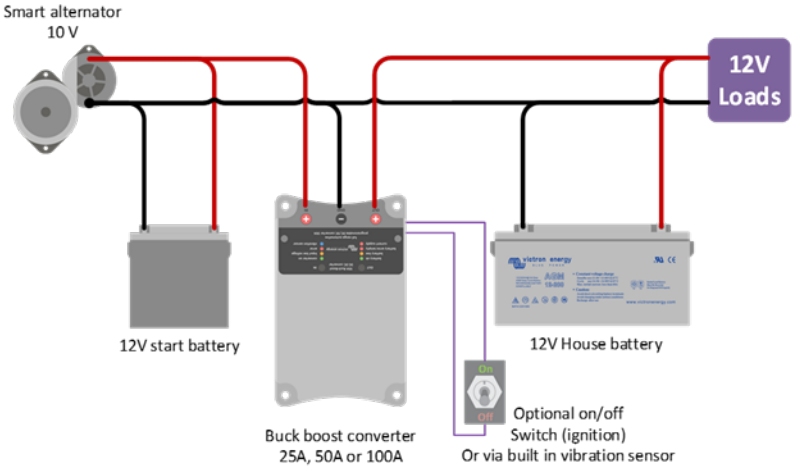
Buck boost DC/DC converter

- For charging a 12/24 V service battery in vehicles with an intelligent alternator
- Non-isolated
- Input voltage 10-30 V (12 or 24 V)
- Output voltage 2-30 V (12 or 24 V)
- 1 stage charger
- Adjustable automatic current limiter
- Programmable

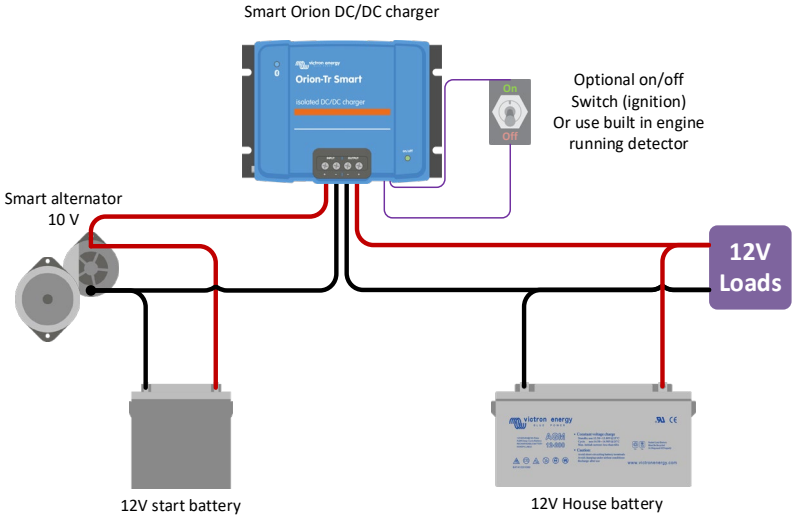
Buck boost
25 A (300 W)
50 A (600W)
100 A (1200W)

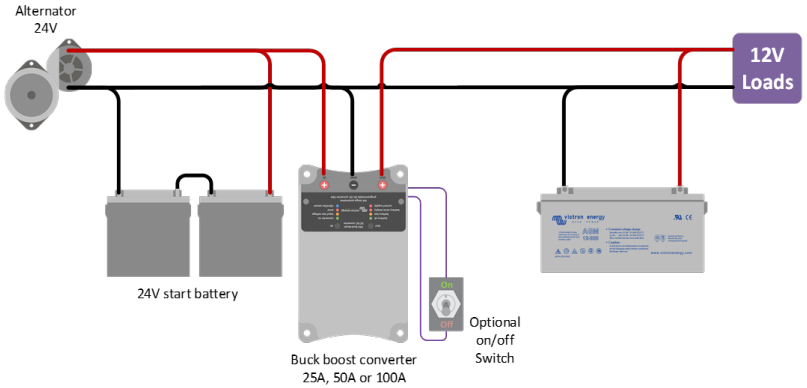
Boosting voltage in case of a smart alternator



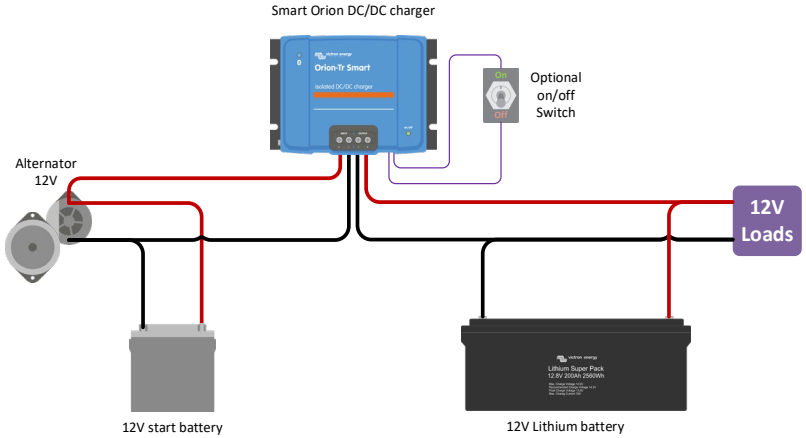


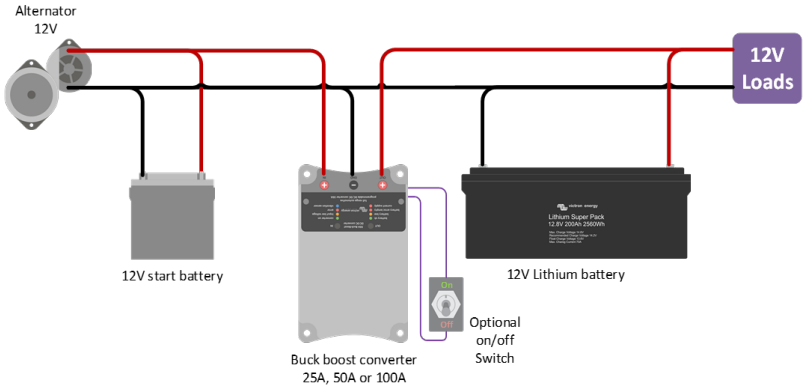
Converting of voltages, example from 24V to 12V





Current limiting in case of a lithium battery





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