User Manual

GREENROCK

User Manual

GREENROCK

1. GREENROCK

1.1. General Description

GREENROCK storage system is a module-based energy storage system consisting of AHI saltwater batteries, hereafter referred to as battery stacks, Victron Energy power inverters, Victron energy management system, hereafter referred to as ColorControl and direct current (DC) junction box with battery fuse protection.

The system is most suitable for increasing the self-consumption rate of photovoltaic systems. The PV plant can be AC or DC coupled. The GREENROCK storage system is available with Island mode functionality as for single-phase or three-phase supplies.

1.2. Single-phase Solutions

1.2.1. GREENROCK 4kWh 1ph

The smallest GREENROCK solution consists of two 24V battery stacks and one Victron Multiplus 24/1600.

Scope of delivery:

GR/4000/1P/VI	
Battery	2 pcs. 24V battery stacks
Inverter	1 pcs. Victron Multiplus C 24/1600
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

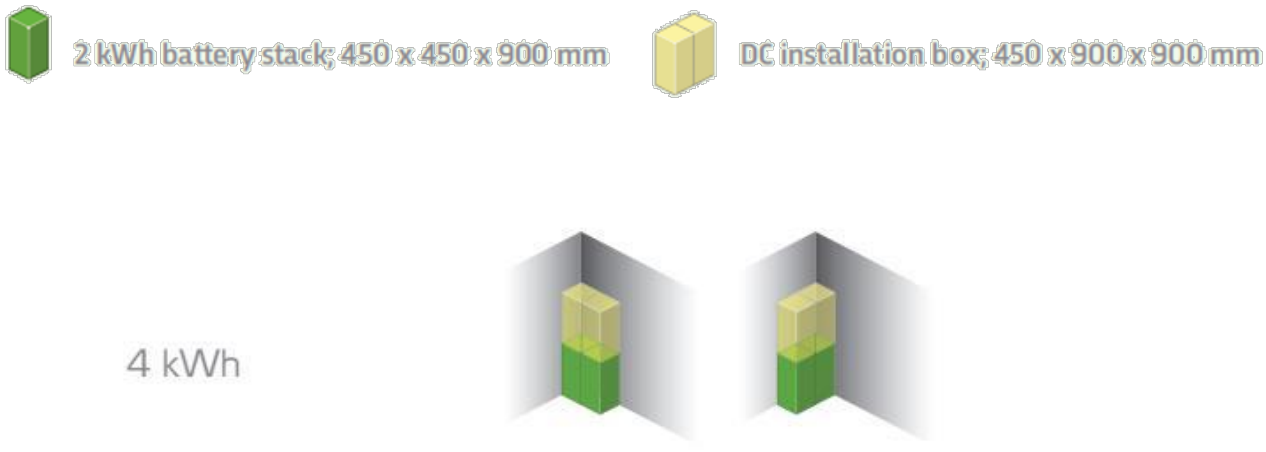
Specifications:

GR/4000/1P/VI	
Capacity	4kWh *(charging 10h and discharging 20h)*
Nominal power	1kW
Max. discharge power	1,3kW
Max. charge power	1,1kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/4000/1P/VI	
Height	See set-up options
Width	See set-up options
Depth	See set-up options
Weight	270kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.2.2. GREENROCK 6kWh 1ph

The single-phase 6kWh GREENROCK solution consists of three 24V battery stacks and one Victron Multiplus 24/1600.

Scope of delivery:

GR/6000/1P/VI	
Battery	3 pcs. 24V battery stacks
Inverter	1 pcs. Victron Multiplus C 24/1600
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

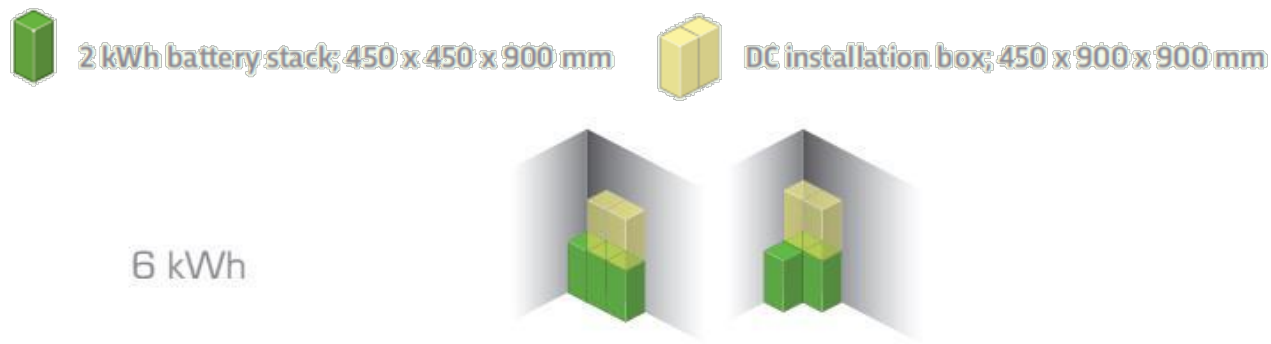
Specifications:

GR/6000/1P/VI	
Capacity	6kWh *(charging 10h and discharging 20h)*
Nominal power	1kW
Max. discharge power	1,3kW
Max. charge power	1,1kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/6000/1P/VI	
Height	See set-up options
Width	See set-up options
Depth	See set-up options
Weight	380kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.2.3. GREENROCK 8kWh 1ph

The single-phase 8kWh GREENROCK solution consists of four 48V battery stacks and one Victron Multiplus 48/3000.

Scope of delivery:

GR/8000/1P/VI	
Battery	4 pcs. 48V battery stacks
Inverter	1 pcs. Victron Multiplus 48/3000
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

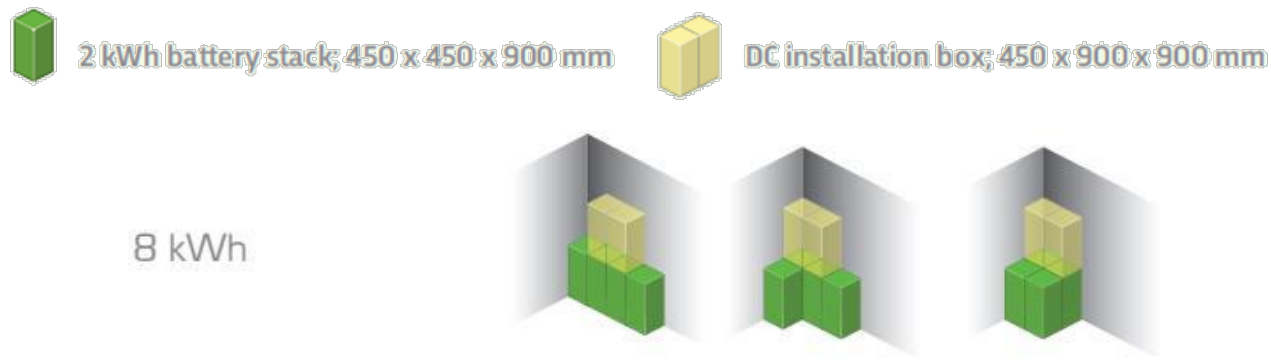
Specifications:

GR/8000/1P/VI	
Capacity	8kWh *(charging 10h and discharging 20h)*
Nominal power	2kW
Max. discharge power	2,4kW
Max. charge power	1,9kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	95%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/8000/1P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	515kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.2.4. GREENROCK 10kWh 1ph

The single-phase 10kWh GREENROCK solution consist of five 48V battery stacks and one Victron Multiplus 48/3000.

Scope of delivery:

GR/10000/1P/VI	
Battery	5 pcs. 48V battery stacks
Inverter	1 pcs. Victron Multiplus 48/3000
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

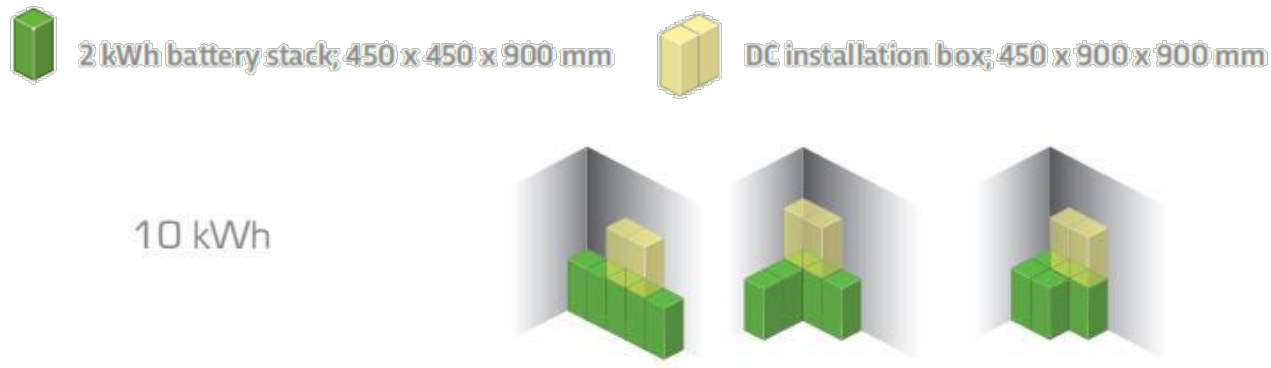
Specifications:

GR/10000/1P/VI	
Capacity	10kWh *(charging 10h and discharging 20h)*
Nominal power	2,4kW
Max. discharge power	2,4kW
Max. charge power	1,9kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	95%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/10000/1P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	ca. 650kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.2.5. GREENROCK 12kWh 1ph

The single-phase 12kWh GREENROCK solution consists of six 48V battery stacks and one Victron Multiplus 48/3000.

Scope of delivery:

GR/12000/1P/VI	
Battery	6 pcs. 48V battery stacks
Inverter	1 pcs. Victron Multiplus 48/3000
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

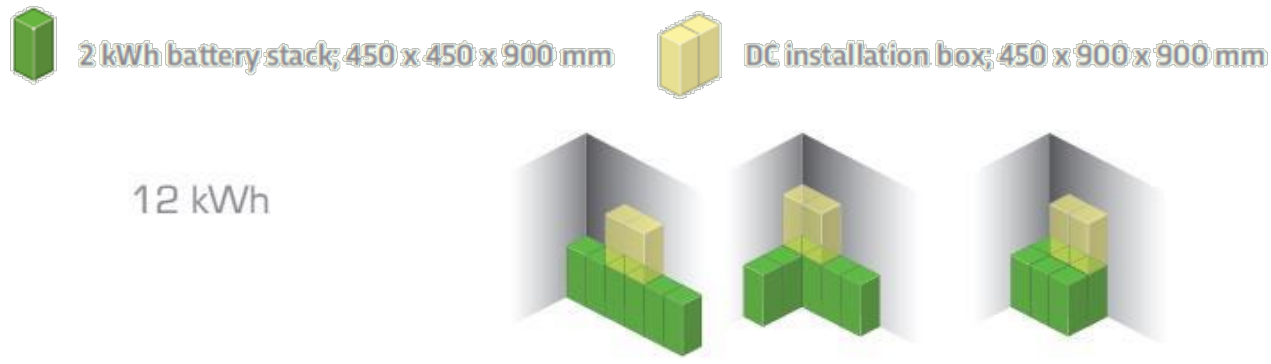
Specifications:

GR/12000/1P/VI	
Capacity	12kWh *(charging 10h and discharging 20h)*
Nominal power	2,4kW
Max. discharge power	2,4kW
Max. charge power	1,9kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	95%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/12000/1P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	750kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.2.6. GREENROCK 16kWh 1ph

The single-phase 16kWh GREENROCK solution consists of eight 48V battery stacks and one Victron Multiplus 48/3000.

Scope of delivery:

GR/16000/1P/VI	
Battery	8 pcs. 48V battery stacks
Inverter	1 pcs. Victron Multiplus 48/5000
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

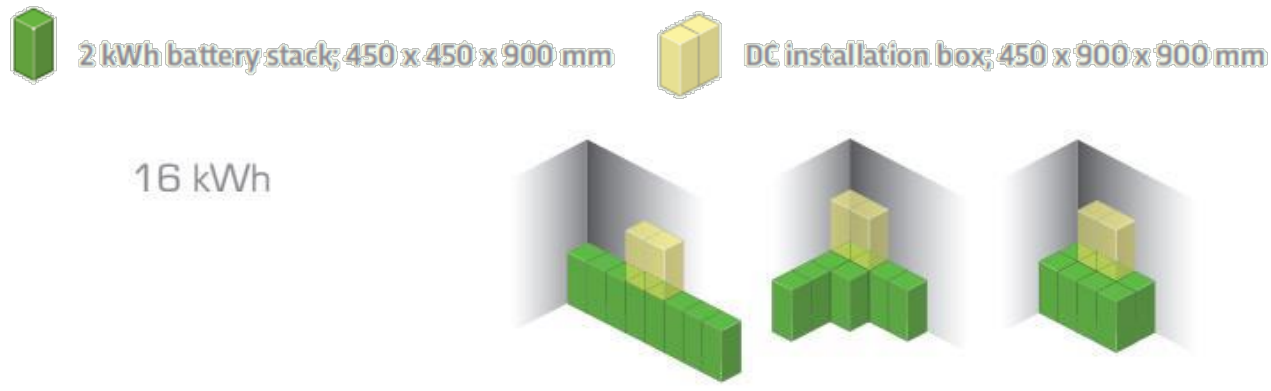
Specifications:

GR/16000/1P/VI	
Capacity	16kWh *(charging 10h and discharging 20h)*
Nominal power	4kW
Max. discharge power	4kW
Max. charge power	3,7kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	95%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/16000/1P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	1000kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3. 3-phase Solutions

1.3.1. GREENROCK 6kWh 3ph

The 3-phase 6kWH GREENROCK solution consist of three 24V battery stacks and three Victron Multiplus C24/800.

Scope of delivery:

GR/6000/3P/VI	
Battery	3 pcs. 24V battery stacks
Inverter	3 pcs. Victron Multiplus C 24/800
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

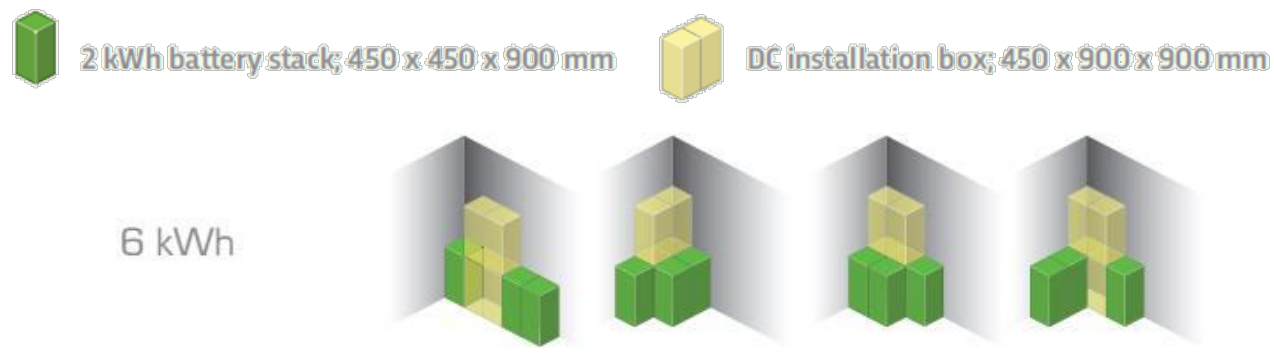
Specifications:

GR/6000/3P/VI	
Capacity	6kWh *(charging 10h and discharging 20h)*
Nominal power	1,5kW
Max. discharge power	2,1kW
Max. charge power	1,3kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/6000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	430kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3.2. GREENROCK 8kWh 3ph

The 3-phase 8kWH GREENROCK solution consists of four 24V battery stacks and Victron Multiplus C24/800.

Scope of delivery:

GR/8000/3P/VI	
Battery	4 pcs. 24V battery stacks
Inverter	3 pcs. Victron Multiplus C 24/800
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

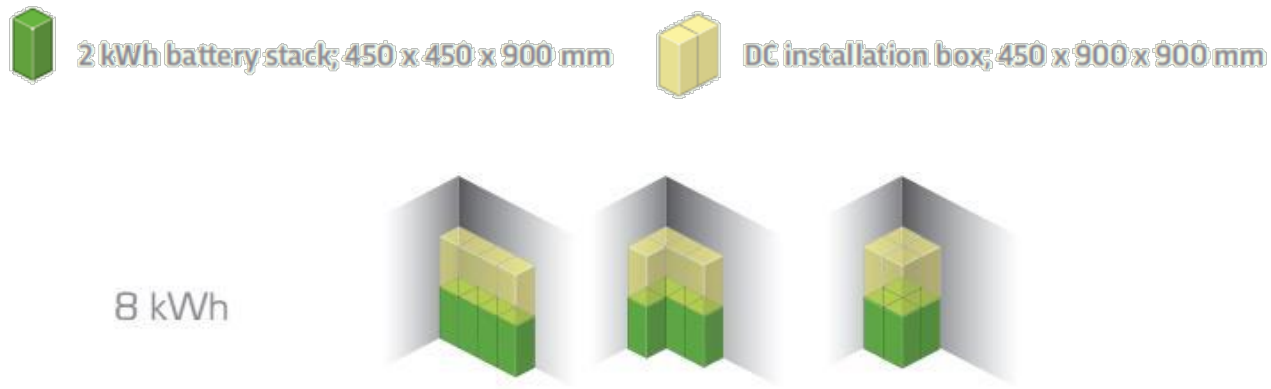
Specifications:

GR/8000/3P/VI	
Capacity	8kWh *(charging 10h and discharging 20h)*
Nominal power	2kW
Max. discharge power	2,1kW
Max. charge power	1,3kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/8000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	550kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3.3. GREENROCK 10kWh 3ph

The 3-phase 10kWh GREENROCK solution consists of five 24V battery stacks and three Victron Multiplus C24/800.

Scope of delivery:

GR/10000/3P/VI	
Battery	5 pcs. 24V battery stacks
Inverter	3 pcs. Victron Multiplus C 24/800
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

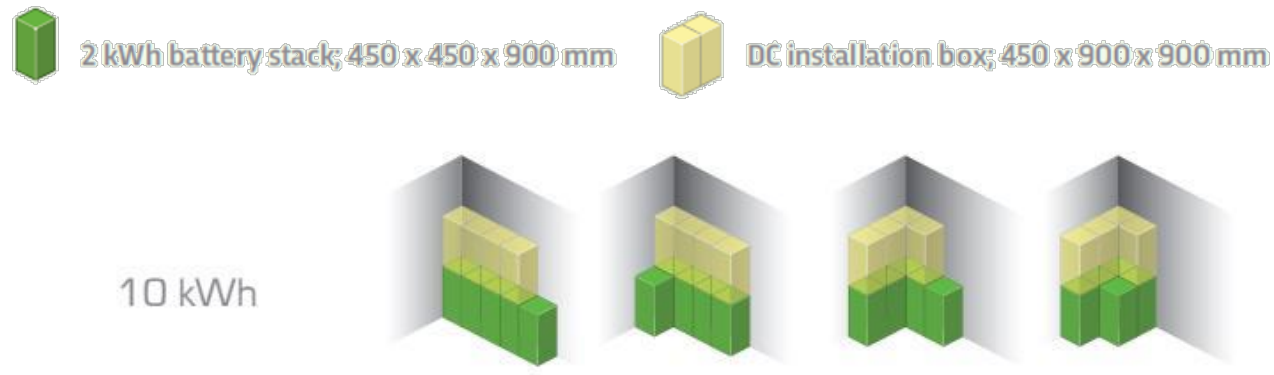
Specifications:

GR/10000/3P/VI	
Capacity	10kWh *(charging 10h and discharging 20h)*
Nominal power	2,1kW
Max. discharge power	2,1kW
Max. charge power	1,3kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/10000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	665kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3.4. GREENROCK 12kWh 3ph

The 3-phase 12kWh GREENROCK solution consisto of six 24V battery stacks and Victron Multiplus C24/1600.

Scope of delivery:

GR/12000/3P/VI	
Battery	6 pcs. 24V battery stacks
Inverter	3 pcs. Victron Multiplus C 24/1600
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

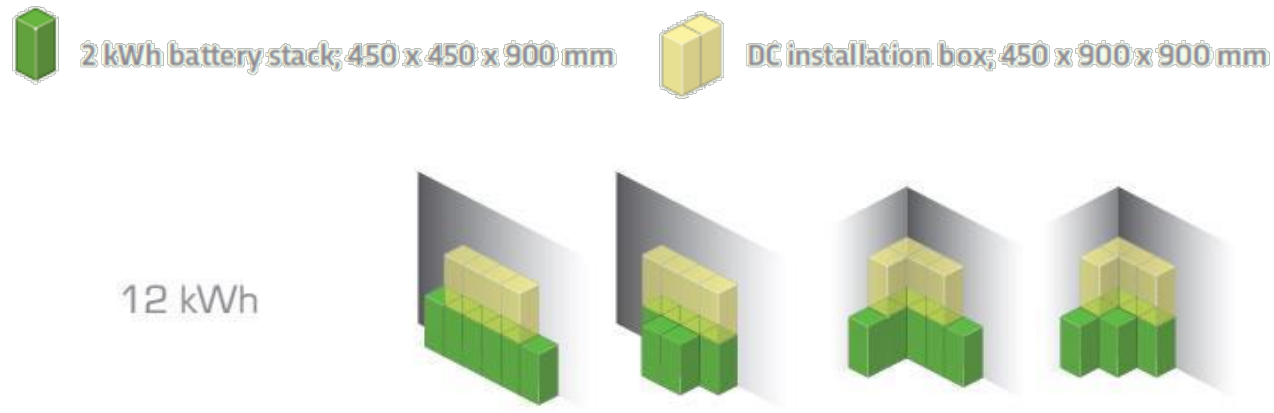
Specifications:

GR/12000/3P/VI	
Capacity	12kWh *(charging 10h and discharging 20h)*
Nominal power	3kW
Max. discharge power	3,9kW
Max. charge power	3,3kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/12000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	785kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3.5. GREENROCK 16kWh 3ph

The 3-phase 16kWh GREENROCK solution consists of eight 24V battery stacks and three Victron Multiplus C24/1600.

Scope of delivery:

GR/16000/3P/VI	
Battery	8 pcs. 24V battery stacks
Inverter	3 pcs. Victron Multiplus C 24/1600
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

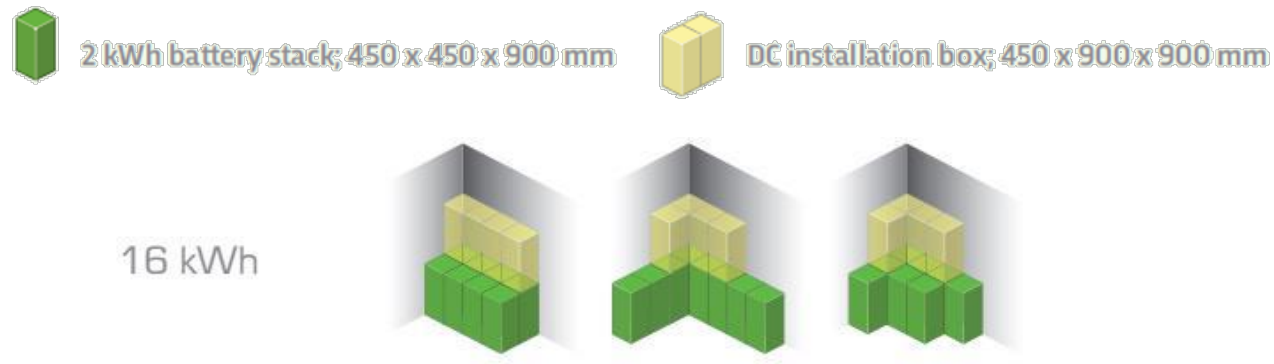
Specifications:

GR/16000/3P/VI	
Capacity	16kWh *(charging 10h and discharging 20h)*
Nominal power	3,9kW
Max. discharge power	3,9kW
Max. charge power	3,3kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/16000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	1025kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3.6. GREENROCK 20kWh 3ph

The 3-phase 20kWh GREENROCK solution consists of ten 24V battery stacks and three Victron Multiplus C24/1600.

Scope of delivery:

GR/20000/3P/VI	
Battery	10 pcs. 24V battery stacks
Inverter	3 pcs. Victron Multiplus C 24/1600
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

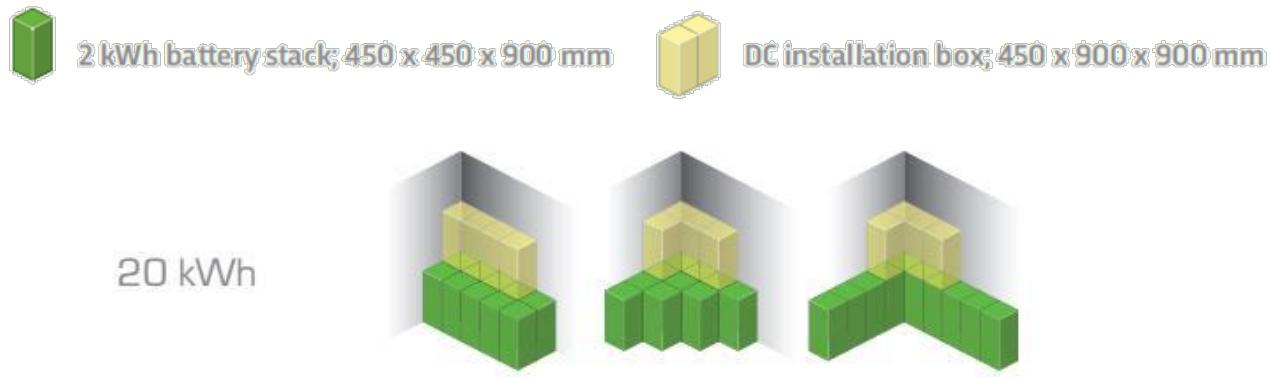
Specifications:

GR/20000/3P/VI	
Capacity	20kWh *(charging 10h and discharging 20h)*
Nominal power	3,9kW
Max. discharge power	3,9kW
Max. charge power	3,3kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	94%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/20000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	1260kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



1.3.7. GREENROCK 24kWh 3ph

The 3-phase 24kWh GREENROCK solution consists of twelve 48V battery stacks and three Victron Multiplus 48/3000.

Scope of delivery:

GR/24000/3P/VI	
Battery	12 pcs. 48V battery stacks
Inverter	3 pcs. Victron Multiplus 48/3000
EMS	1 pcs. Victron ColorControl
Case	GREENROCK battery case und DC-box
Fuse protection	Battery fuse protection
Meter	1 pcs. Energy meter 3-phase (Carlo Gavazzi)

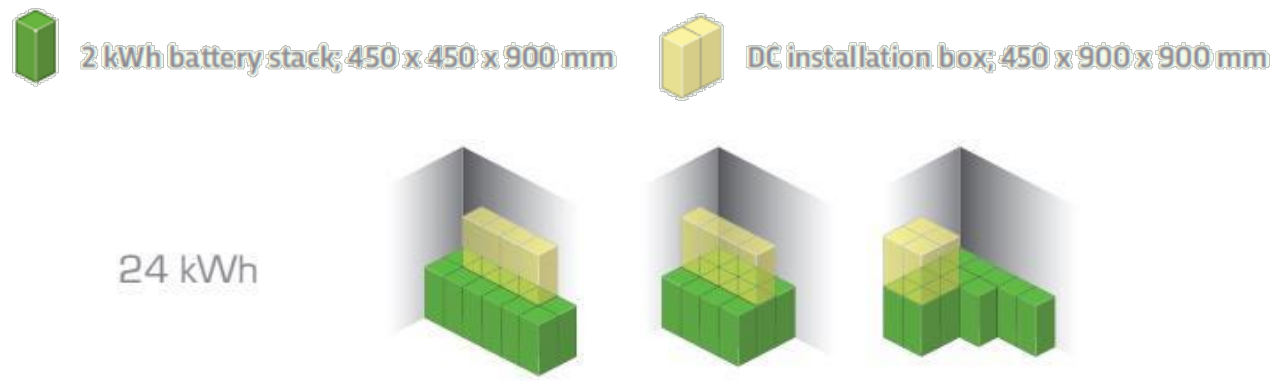
Specifications:

GR/24000/3P/VI	
Capacity	24kWh *(charging 10h and discharging 20h)*
Nominal power	6kW
Max. discharge power	7,2kW
Max. charge power	5,6kW
Max. efficiency battery	90% *(charging 10h and discharging 20h)*
Max. efficiency inverter	95%
Lifetime cycles	>3000 *(remaining capacity of 70% after 3000 cycles)*

Physical characteristics:

GR/24000/3P/VI	
Height	see set-up options
Width	see set-up options
Depth	see set-up options
Weight	1520kg
Operating temperature	-5°C to 40°C
Installation	Exclusively indoors

Set-up options:



2. Safety Instructions

Consider the following basic safety instructions for application of GREENROCK storage systems.
For safe operation of the storage system please, carefully read the safety instructions and information below.Familiarize yourself with all functionalities of the storage system. Store the manual close to the storage system and pass it – if necessary – to other operators.
Only forward GREENROCK storage systems to third parties with included manual.

2.1. Used Signal Words and Warning Icons

Symbol	Signal word	meaning
	**Danger**	Failure to observe the regulation could lead to mortal danger.
	**Alert**	Failure to observe the regulation could result in serious or fatal injuries and risk of life.
	**Caution**	Failure to observe the regulation could lead to minor injuries or damage of property.
	Depending on degree of danger	Refers to dangers of electrical hazards.
	**Important**	Important information regarding operation
	**Information**	General information or special advice

2.2. Electrical Hazards

	**Danger**	**Risk of injury or loss of life due to electric current** GREENROCK storage systems are working with voltages up to 400V corresponding to high amperage. Amperage up from 250mA can be fatal. Take precautions.
	Action	• In case of danger immediately cut the storage from power grid. • Only trained specialists are allowed to remove the coverage of GREENROCK storage systems. • Do not touch voltage parts.

	**Alert**	**Risk of injury due to electric current.** Copper rails of GREENROCK storage system are carrying electricity. When working on or with the storage take preacautions.
	Action	• Cut the storage from power grid. • Open fused circuit breaker and cut batteries from copper rails. • Use isolated tools.

	**Caution**	**Risk of injury due to electric current** Poles of GREENROCK battery stack are under voltage. Take precautions.
	Action	• Do not place tools or other material on battery stacks. • Use isolated tools when working at the storage.

2.3. Chemical Hazards

Information	**All materials used in GREENROCK storage systems are safe and non-poisonous.** The electrolyte is based on sodium sulfate. It is ph-neutral salt water.
Action	• In case of contact with the electrolyte rinse the affected parts thoroughly with water. • Remains of electrolyte at the storage or surroundings can be wiped off with a cloth. • No collection tray under the battery stacks needed.

Alert	**Operating GREENROCK storage systems can release traces of gases:** H_2, O_2, CO_2, CO, take precautions to avoid gathering gases.
Action	• Per installed kWh a natural ventilation of 0,5 m³/h is recommended. • Arrange for appropriate technical ventilation if natural ventilation is insufficient.

2.4. Thermal Hazards

Alert	**Danger of injuries due to hot copper rails!** Copper rails in the inner parts of the storage can heat up. Take precautions.
Action	• Do not touch copper rails!

Alert	**Risk of fire due to covering openings and slits!** Operating GREENROCK storage systems can warm up. Openings and slits are deliberately planned!
Action	• Do not use as storage area or shelf! • Do not cover openings and slits of GREENROCK storage systems!

2.5. Physikal Risks

Alert	**Risk of injuries or damages of property due to heavy battery stacks** Each battery stack of GREENROCK storage system weights 118kg. Take precautions.
Action	• Use technical aids for transport and installation (crane, hand pallet truck, sack truck). • Batteries are allowed to tilt at maximum 45°.

Alert	**Risk of injury or loss of life and/or damages of property due to battery stacks tipping over.** GREENROCK storage systems are heavy and high. Take precautions to avoid tipping over.
Action	• Fix the storage system at the wall. Use material appropriate for brickwork.

3. Standard Conditions at Site

Install the storage system indoors or sheltered from weather conditions.
An entire closed-off area for installation is not necessary.
Do not install and operate the storage system in direct sunlight.

3.1. Size and weight

Check exact specifications in data sheets of chapter 1. The Installation site must be appropriate for size and weight of the storage system.

3.2. Ventilation

During normal operation GREENROCK storage systems can emitting traces of gases. A natural, constant ventilation of 0,5m³/h per installed kWh is recommended. If natural ventilation is not available an appropriate technical ventilation must be installed. Ventilation following the regional guidelines for battery rooms are recommended alternatively. Europe and other areas recommend EN 50272 guidelines. Batteries have to be installed in well ventilated rooms. Install ventilation in accordance to the batteries storage capacity and lead exhaust air outside the building.

3.3. Humidity

Install the storage system in a clean and tidy surrounding, sheltered from water penetration.
Bringing water to the storage system leads to short-circuit hazards. Set-up options of installing the connection box above the battery box ensures safety of circuit-hazard up to a water level of 1m.

3.4. Ambient temperature

Based on a 24 hour average the storage system must run between -5°C and +40°C of ambient temperature. Operating beyond these limits may shorten the life cycle of the storage system or either cause damages beyond repair.
Regarding storage temperature a range between -10°C to +40°C is accepted. Storage of GREENROCK batteries beyond these permitted limits can lead to permanent damage.

4. GREENROCK Installation

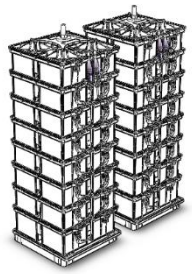
4.1. Unpack

After receipt of delivery check tilt and shock indicators. They must not be triggered. Packaging and transport cases must be in good order.
Carefully unpack the components and check completeness of scope of delivery. Further check for leakage of electrolyte and electrical connections are available and in good order. If damages or missing components are noticed please contact your sales partner. Take pictures and arrange for documentation of the damages.

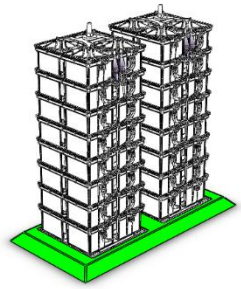
4.2. Transport

Only use appropriate devices for moving the battery stacks. Stacks can be transported with pallet trucks.
Position the battery storage system in a way to remain wiring safe while transported.
Pay attention to not tilting the stacks over 45° during transportation.

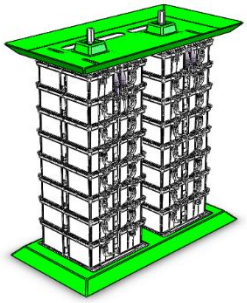
4.3. Build up Single-phase Systems



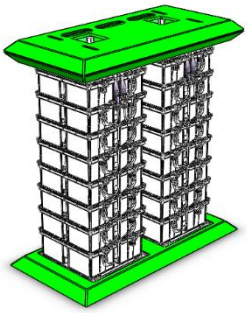
- Put battery stacks at their place of destination and align them.
- Battery wiring must be at the front side.
- Use appropriate lifting aids.



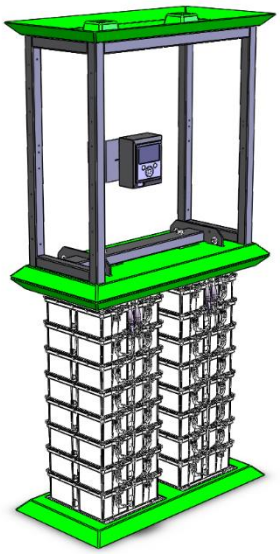
- Put over opened ground plate and use it as pattern for positioning
- Pay attention to wiring and do not damage wires.



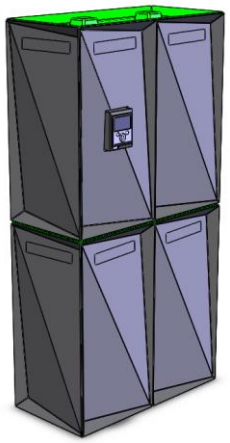
- Apply cover to battery stacks.
- Openings for wires have to be on back side.



- Place and center ground plate of connection box.
- Openings for wires have to be on back side.

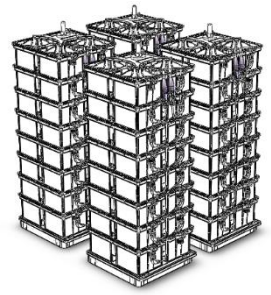


- Put connection box on top of ground plate
- Center connection box. Distant bolts have to fit into the openings and snap with cross strut.
- Check if the connections are mechanically secured.
- Fasten connecting box with M16 screws and maximum torque at 170 Nm.

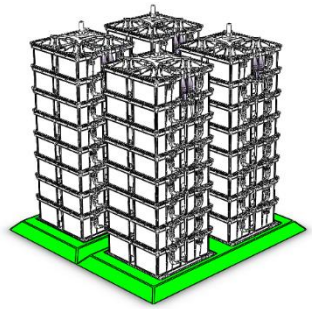


- Housing elements are fixed with pre-assembled velcro spots.

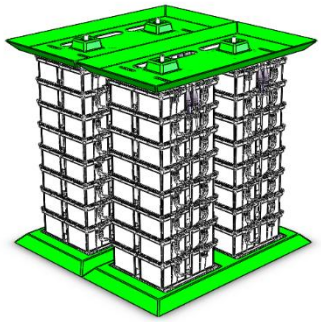
4.4. Build up 3-phase Systems



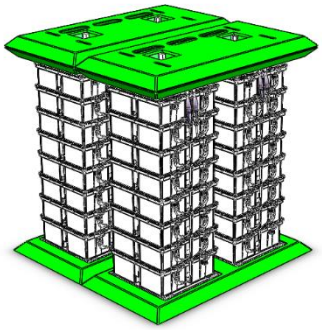
- Put battery stacks at their place of destination and align them.
- Battery wiring must be at the front side.
- Use appropriate lifting aids.



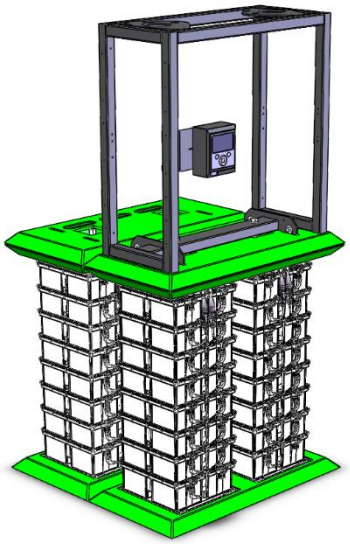
- Put over opened ground plate and use it as pattern for positioning.
- Pay attention to wiring and do not damage wires.



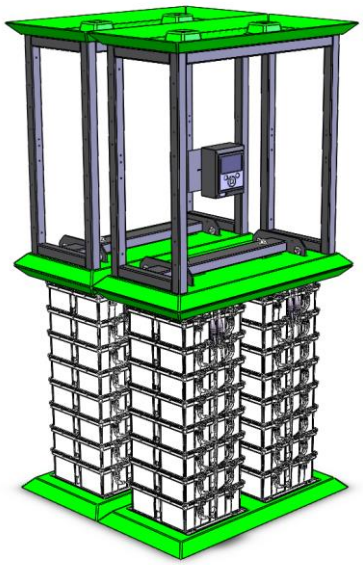
- Apply cover to battery stacks.
- Openings for wires have to be on back side.



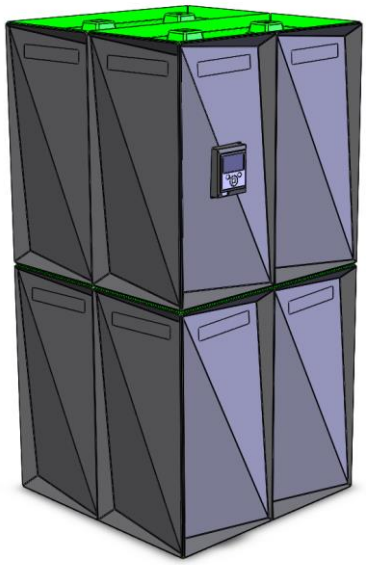
- Place and center ground plate of connection box.
- Openings for wires have to be on back side.



- Put connection box with ColorControl on top of front ground plate.
- Center connection box. Distant bolts have to fit into the openings and snap with cross strut.
- Check if the connections are mechanically secured.
- Fasten connecting box with M16 screws (included in scope of delivery) and maximum torque of 170 Nm.



- Put second connection box on top of ground plate behind.
- Center connection box. Distant bolts have to fit into the openings and snap with cross strut.
- Check if the connections are mechanically secured.
- Fasten connecting box with M16 screws (included in scope of delivery) and maximum torque of 170 Nm.



- Housing elements are fixed with pre-assembled velcro spots.

4.5. Electric Installation

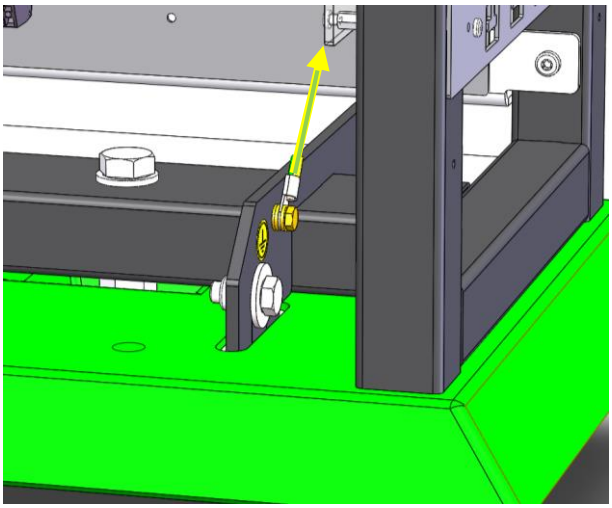
Alert	Only qualified electricians are allowed to install GREENROCK storage systems. **Before connecting observe safety rules**
Action	1. Activate 2. Secure against being switched on again. 3. Ensure that there is no voltage. 4. Earth and short circuit. 5. Provide protection by covers or barriers for any neighbouring live parts.

Caution	**Electric Installation must correspond to regional standards and guidelines.**
Action	• Pay attention to local and regional regulations, guidelines and norms! • Before installing contact responsible energy provider!

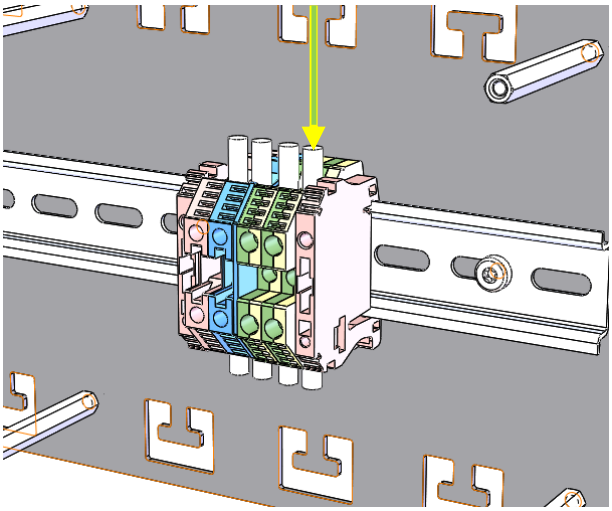
Caution	**Risk of injury or loss of life due to electric current!** Poles of GREENROCK battery stack are under voltage. Take precautions.
Action	• Do not place tools or other material on battery stacks. • Use isolated tools when working at the storage.

GREENROCK storage systems include all wiring and fuse protection on DC side. It is a safety extra-low voltage system with 24V or 48V. Each battery stack is protected with circuit breakers. (20A gG fuse with 48V and 30A gG with 24V). (20A gG Sicherung bei 48V Systemen, 30A gG Sicherung bei 24V Systemen) abgesichert.
Before starting installation check that all circuit breakers between battery stack and copper rail are opened.

4.5.1. Grounding



- Connect all metal parts of GREENROCK storage system with PE-line (included in scope of delivery).

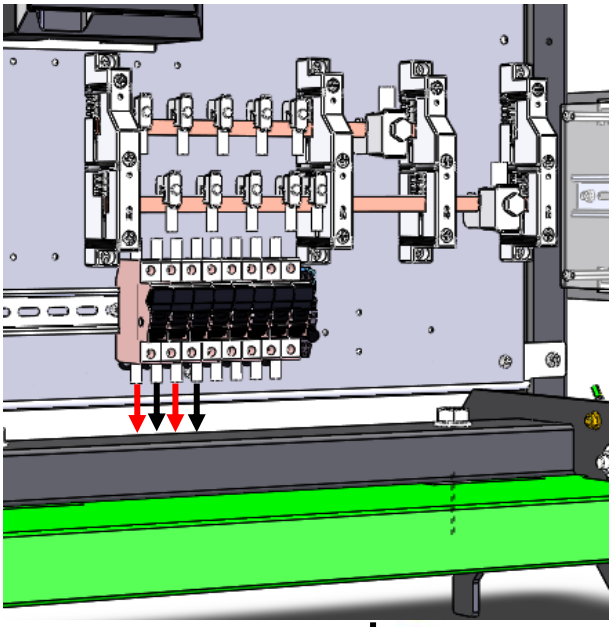


- … connect with ground terminal of GREENROCK storage system.

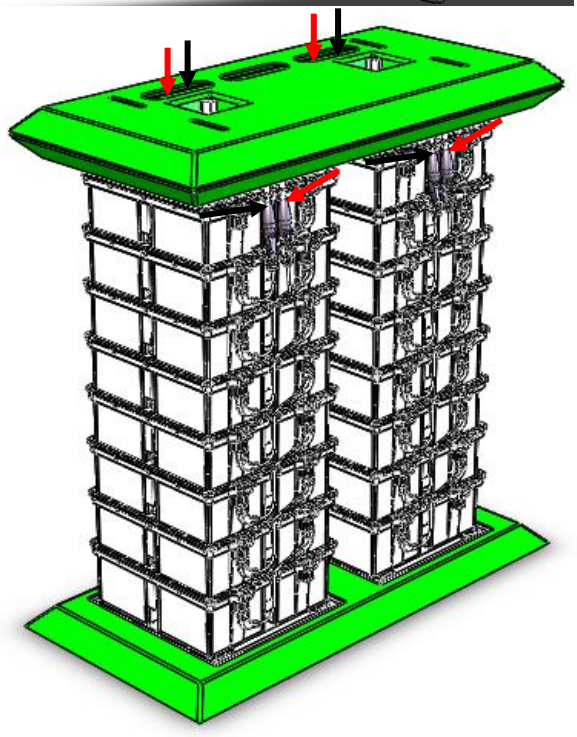
4.5.2. Connecting battery stacks

⚠	**Caution**	**Before connecting battery stacks to connecting box check voltage of battery stacks. Meter and compare voltage!** If the voltage of each battery stack is differing more than 5V (with 48V systems) and more than 3V (with 24V systems) take following measures :
	Action	• Use battery charger and bring each stack to appropriate voltage. • Contact BlueSky Energy.

If the battery is within above mentioned voltage the stacks can be connected with connection box, as described below:

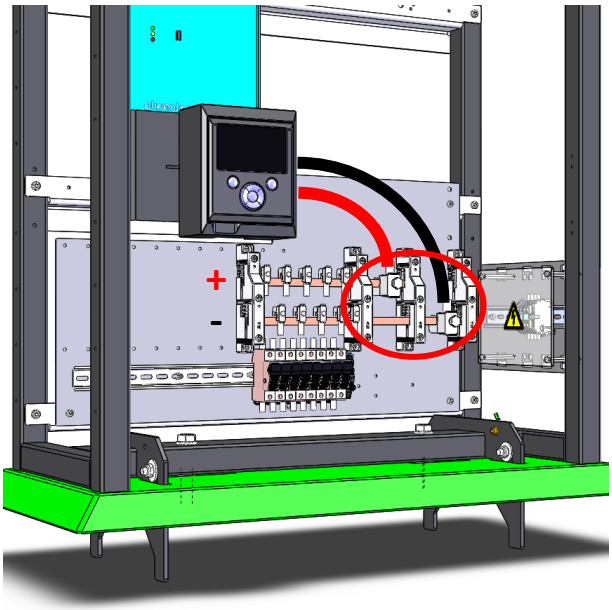


- Battery wires are already connected with fuse holder (within scope of delivery).
- Before connecting the battery make sure that fuse holders are open!

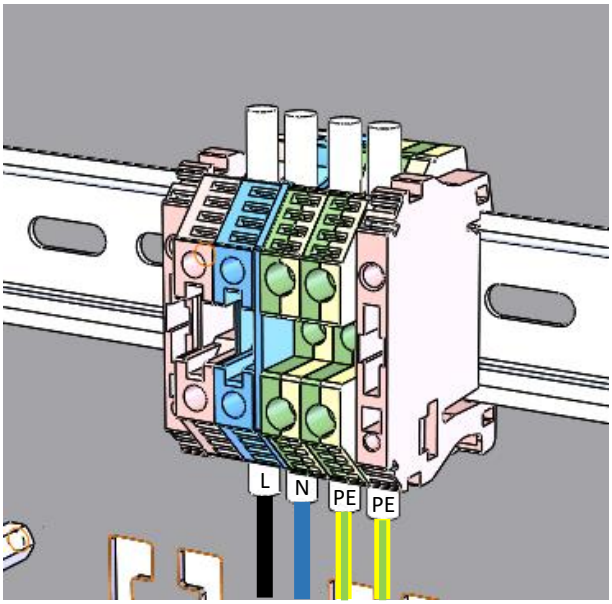


- Lead battery cables through cable entries and connect with battery.
- Pay attention to correct polarity!

4.5.3. Connect Inverter Single-phase

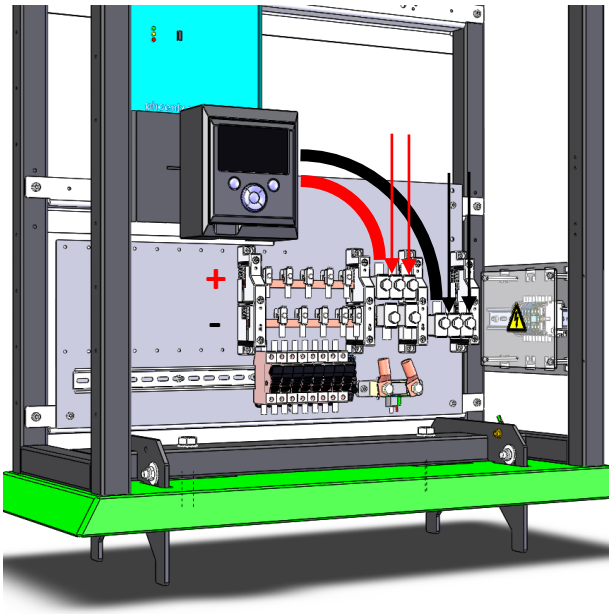


- With single-phase systems the inverter is already connected on DC side with copper rail of storage system.
- Before starting up check on correct polarity!

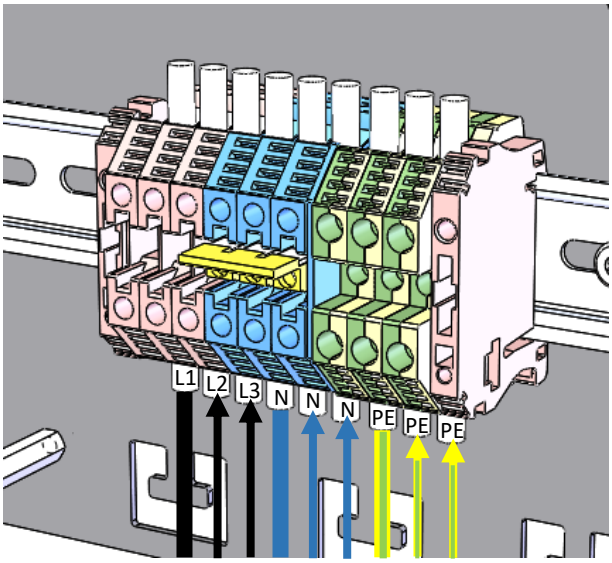


- With single-phase systems the inverter is already connected on AC side to the terminal block of the battery.

4.5.4. Connect Inverter 3-phase

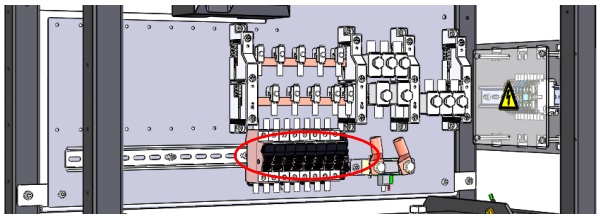


- Connect Inverters placed in the second connecting box on DC side with copper rail.
- Lead cables of Inverter to copper rail and connect to clamps of conductor connection. Torque 6Nm.
- Pay attention to correct polarity!
- Outcome are neatly laid cables, fixed with cable straps (as with inverter 1) .

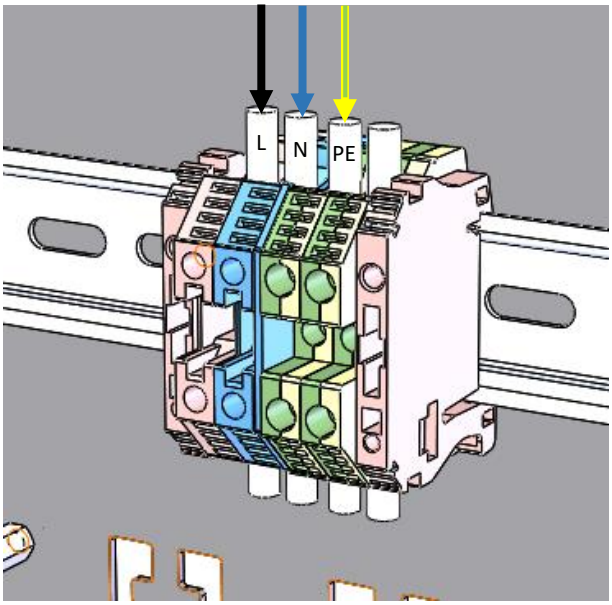


- AC- side of inverter L1 is already connected.
- AC-side of the two inverters located in the second connecting box (L2 and L3) must be connected to the terminal block of the battery.
- Lead the 2 three-pole cables to terminal block and connect. Torque 1Nm.

4.5.5. AC-Connection Single-phase



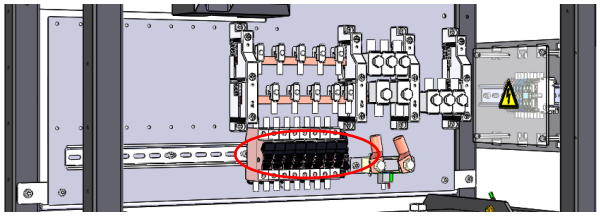
- Make sure all circuit breakers in the GREENROCK system are opened.



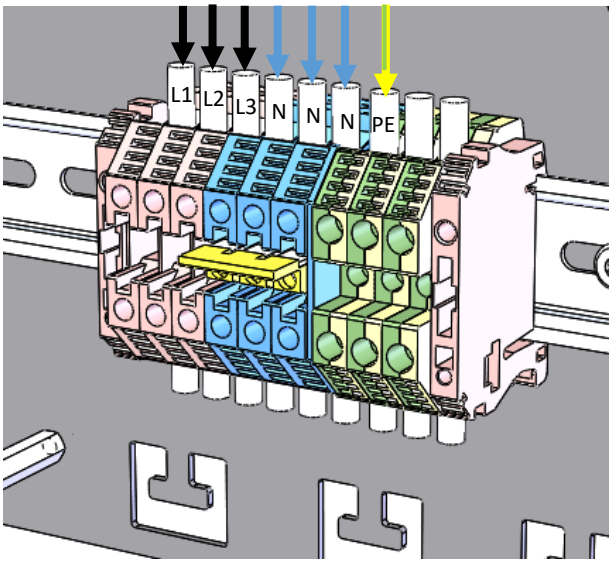
- AC-connecting cable has to be dimensioned according to the installed inverter (check user manual Victron inverter).
- Make sure AC-connecting cable is not carrying voltage.
- Connect AC connecting cable with terminal block. Torque 1Nm.

4.5.6. AC-connection Three-phase

For AC connection pay attention to local and regional regulations, guidelines and norms.



- Make sure all circuit breakers in the GREENROCK system are opened.



- AC-connecting cable has to be dimensioned according to the installed inverter (check user manual Victron inverter).
- Check correct direction of rotation when connecting AC-cable (clockwise rotating field.
- Make sure AC-connecting cable is not carrying voltage.
- Connect AC connecting cable with terminal block. Torque 1Nm.

4.5.7. AC-Installation

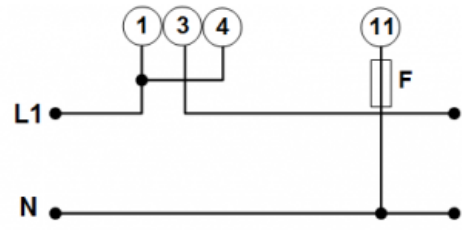
For AC connection pay attention to local and regional regulations, guidelines and norms.

GREENROCK storage system has to be secured with appropriate circuit breakers which are corresponding to the used electrical power of the inverters. Check enclosed user manual for Victron inverter. Inverters potentially create residual currents. Therefore installation of an extra ground fault circuit interrupter type B is recommended.
Furthermore meet requirements of energy supply companies and install appropriate protection for grid and installation. Please get in touch with your responsible energy provider.

4.5.8. Installation Meter single-phase

	Information	**Meter enclosed to the scope of delivery can be used for maxim 65A per phase.** If you need a meter for more than 65A, please get in contact with your sales partner!

The meter is needed as control unit for GREENROCK storage systems and monitors charging and discharging.



- Install meter at main distributor between grid connection and battery.

- Connect enclosed USB to RS485 cable with blue USB connection to ColorControl.

- Connect USB to RS485 cable with energy meter.

- Change switching position of front selector's energy meter. It must be unlocked (closing position). Next CCGX ColorControl is allowed to configure automatically.

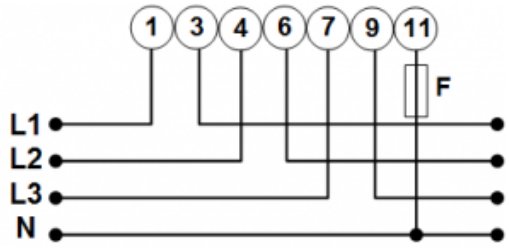
Quelle: https://www.victronenergy.com/live/energy-meters:start

For further information please check user manual of meter (included in scope of delivery).

4.5.9. Installation Meter 3-phase

Information	**Meter enclosed to the scope of delivery can be used for maxim 65A per phase.** If you need a meter for more than 65A, please get in contact with your sales partner!

The meter is needed as control unit for GREENROCK storage systems and controls charging and discharging.



- Install meter at main distributor between grid connection and battery.

- Connect enclosed USB to RS485 cable with blue USB connection to ColorControl.

- Connect USB to RS485 cable with energy meter.

- Change switching position of front selector's energy meter. It must be unlocked (closing position). Next CCGX ColorControl is allowed to configure automatically.

Quelle: https://www.victronenergy.com/live/energy-meters:start

For further information please check User Manual of meter (included in scope of delivery).

4.5.10. Put into Service

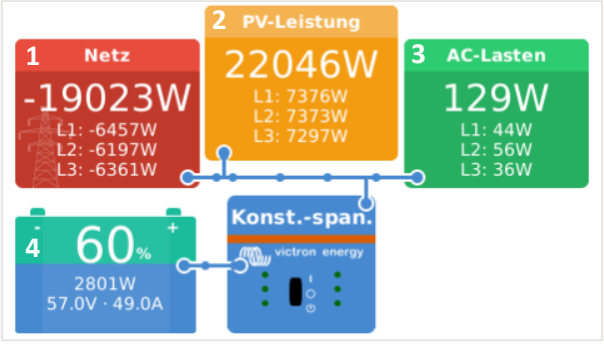
After installation the system can be put into service. A GREENROCK storage system is preconfigured and adjusted to your demands.
Insert the supplied fuses into circuit breaker and shut one after the other. Now the supplied fine wire fuse for ColorConrol can be applied. ColorControl is starting up. As soon as the ColorControl is started up you can switch on the inverters. State of charge of batteries is shown on the display.

Now the AC-supply line can be connected. Depending on consumption and generated PV power (if installed) the battery is charging and discharging on its own.

4.5.11. ColorControl

Overview ColorControl

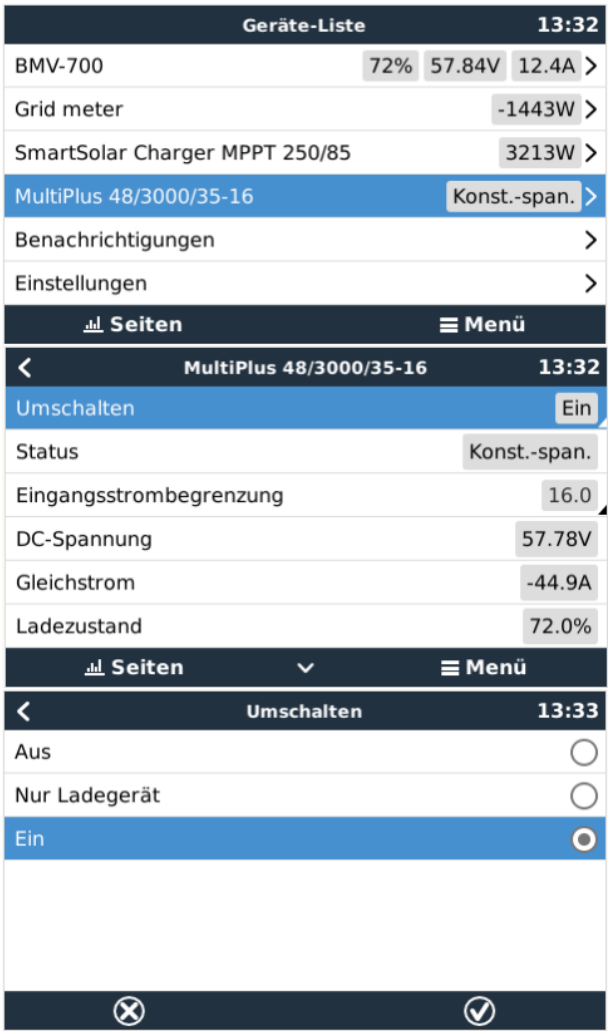
- Button 1 is the escape button. It leads back to the general overview.
- Button 2 leads to the menu or back from a submenu to the main menu.
- Button 3 helps to navigate in through the menu. Confirm with the button in the middle.



1. Informs about purchase or feed to the grid.
2. Informs about PV power (only possible with Fronius PV-inverter or extra meter)
3. Shows present consumption.
4. States to SOC the present charging or discharging capacity and battery voltage.

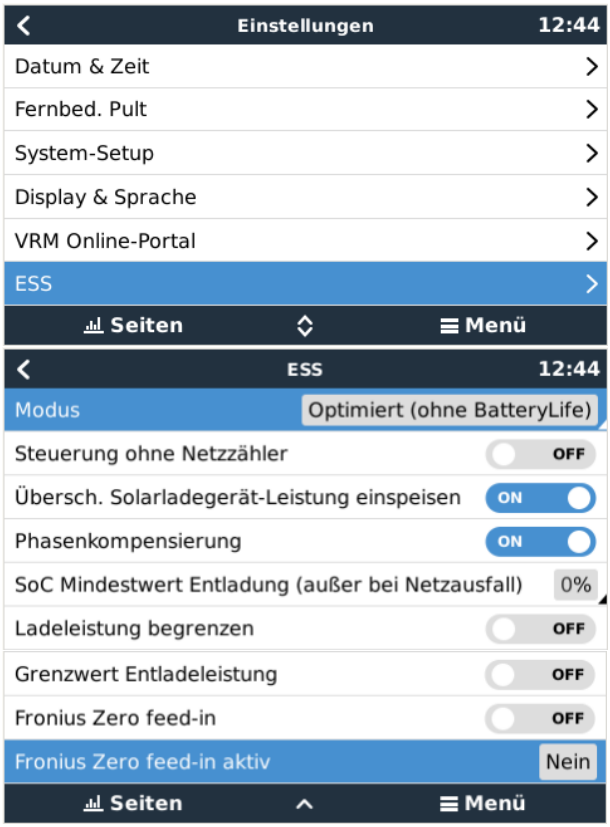
Attention: SOC is an approximate value. During first commissioning the SOC shows 100% nevertheless the battery is not completely charged. After charging end voltage for the first time the SOC value will be adapted!

Disconnecting the Battery with ColorControl



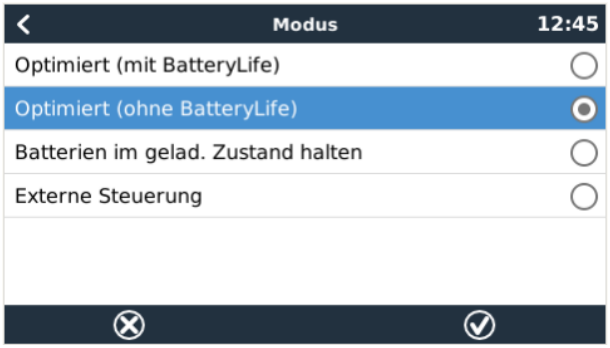
- Using ColorControl for switching of the system please, choose Multiplus XY in your menu.
- Follow menu item SWITCH.
- Choose OFF. Inverter or inverters (for 3-phase systems) are switched off.

configuration ESS



- Follow the menu point SETTINGS and move to ESS.
- Here general settings of the storage system can be changed.

- ESS Menu



<u>Mode</u>

- Optimized
  PV power > consumption → charge
  PV power < consumption → discharge
- Keep battery in charged condition. Battery will only be discharged in the event of mains failure.
- External control:
  charging and discharging takes place via external management system

Battery life: ensures complete charging of battery in times of fewer PV energy. Raise low SOC (not needed for GREENROCK storage systems!)

- Necessary if GREENROCK storage system is running without meter (meter is enclosed in scope of delivery).

- Needed in combination with DC charge controllers.

- Ensures that power at the grid meter is L1 + L2 + L3 0

- Minimum SOC, to which level the battery is allowed to discharge.

Saltwater batteries can be 100% discharged. The level can be entered with 0%.)

- Limits charging capacity of inverters (AC to DC)

- Limits charging capacity of inverters (DC to AC)

- Configuration needed only with Fronius solar inverters.

- Configuration needed only with Fronius solar inverters.

For further information concerning ESS configurations please check:
https://www.victronenergy.com/live/ess:design-installation-manual

4.5.12. Internet Connection

In order to use the advantages of the VRM online portal (https://vrm.victronenergy.com/) integrate CCGX to a grid with internet connection. In regular intervals CCGX will transfer information about energy flow and connected data to the VRM portal. The portal offers access to energy flow, current status and connected products. E-Mail alerts can be installed as well as download of CSV or Excel files is possible.

Furthermore you can install the VRM APP (available for iOS and Android) on your smart phone or tablet. Being connected with the internet offers automatic checks and updates of the firmware.

There are different possibilities to connect CCGX to the network:

- Via network cable and ethernet port
- Via additional WiFi Donge (USB port)
- Connection with 3G or 4G router
- USB-tethering with cell phone

5. Battery Stacks

5.1. General Description

Batteries used for GREENROCK-storage systems are Aqueous Hybrid Ion (AHI) batteries or saltwater batteries. They do not contain heavy metals or toxic chemicals. This makes them worldwide the one and only sustainable electrochemical storage solution.

5.1.1. 48V Battery Stack

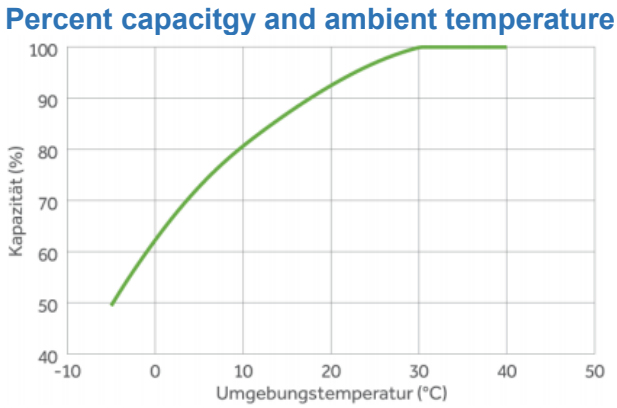
The 48V battery stack is the basic element for a scalable energy solution of BlueSky Energy. Eight AHI batteries connected in series are building up to a 48V product. For technical data concerning the battery stacks please consult the enclosed data sheet of GREENROCK 48V battery stacks.

5.1.2. 24V Battery Stack

The 24V battery stack consists of two parallel cords with each four AHI battery cells connected in series. For technical data concerning the battery stacks please consult the enclosed data sheet of GREENROCK 24V battery stacks

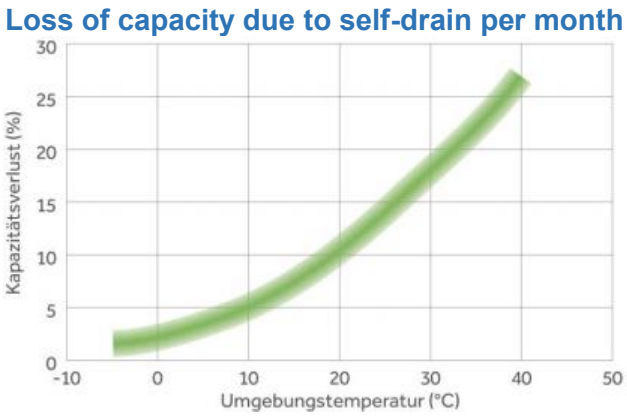
5.1.3. Capacity and Ambient Temperature

Capacity of AHI batteries is linked with ambient temperature captured on a 24h average of the running system.



5.1.4. Capacity and Ambient Temperature

Self-drain of AHI batteries is depending on ambient temperature. A graph below shows an approximate loss of capacity due to self-drain during one month.
The loss of capacity due to self-drain is not irreversible. Recharging the battery to 100% balances the loss.



6. Inverter

Built-in inverters in GREENROCK storage systems are Victron Energy inverters. Options for 24V und 48V with power of 800VA to 5000VA are available. Inverters can interconnect with single-phase or three-phase systems.
For further technical information please read enclosed data sheet and user manual of the inverter.
In case of failure or fault please check user manual and meaning of LED error code.

7. Storing

If GREENROCK storage systems are stored or not used for longer periods, cut all connections to the grid. Open all circuit breakers between battery stack and copper rail and remove fine wire fuse between ColorControl and copper rail. Otherwise the ColorControl will meanwhile discharge the battery.
Store the GREENROCK system indoors and protected of sun and water at a temperature between -10° and +40°C. After longer storage periods it is might be that the battery level is discharged low and ColorControl cannot be supplied any more. In that case charge the batteries with an appropriate battery charger and put the system into operation.

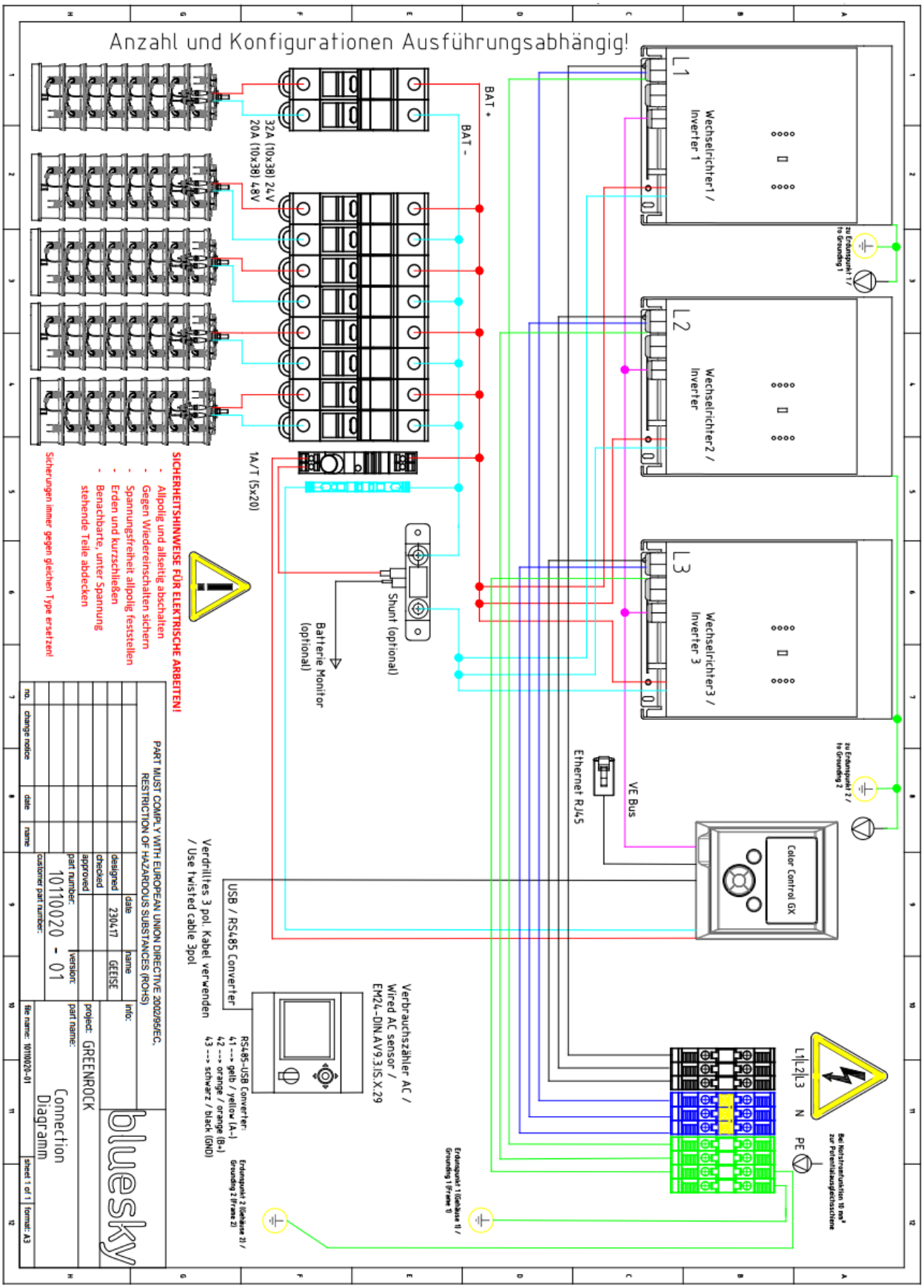
8. Maintenance

GREENROCK saltwater storage systems are maintenance-free. For cleaning off pollution on the outside of the battery use a damp cloth.

9. Disposal

AHI batteries are not toxic or corrosive. Do not dispose in sewer system or environmental water systems!
For disposal follow local, national and state requirements!
Dispose inverters in accordance with of local guidelines. Please check disposal information on each component!

10. Appendix


Anzahl und Konfigurationen Ausführungsabhängig!
L1
Wechselrichter1 / Inverter 1
L2
Wechselrichter2 / Inverter
L3
Wechselrichter3 / Inverter 3
32A (10x38) 24V
20A (10x38) 48V
BAT +
BAT -
1A/T (5x20)
Shunt (optional)
Batterie Monitor (optional)
Ethernet RJ45
VE Bus
Color Control GX
USB / RS485 Converter
Verdrilltes 3 pol. Kabel verwenden / Use twisted cable 3pol
Verbrauchszähler AC / Wired AC sensor / EM24-DIN.AV9.3.IS.X.29
L1 L2 L3 N PE
SICHERHEITSHINWEISE FÜR ELEKTRISCHE ARBEITEN!
- Allpolig und allseitig abschalten
- Gegen Wiedereinschalten sichern
- Spannungsfreiheit allpolig feststellen
- Erden und kurzschließen
- Benachbarte, unter Spannung stehende Teile abdecken
Sicherungen immer gegen gleichen Type ersetzen!
PART MUST COMPLY WITH EUROPEAN UNION DIRECTIVE 2002/95/EC. RESTRICTION OF HAZARDOUS SUBSTANCES (ROHS)
designed
checked
approved
date
name
GEEISE
230417
part number:
10110020 - 01
version:
customer part number:
project: GREENROCK
part name:
Connection Diagramm
bluesky
file name: 10110020-01
sheet 1 of 1
format: A3