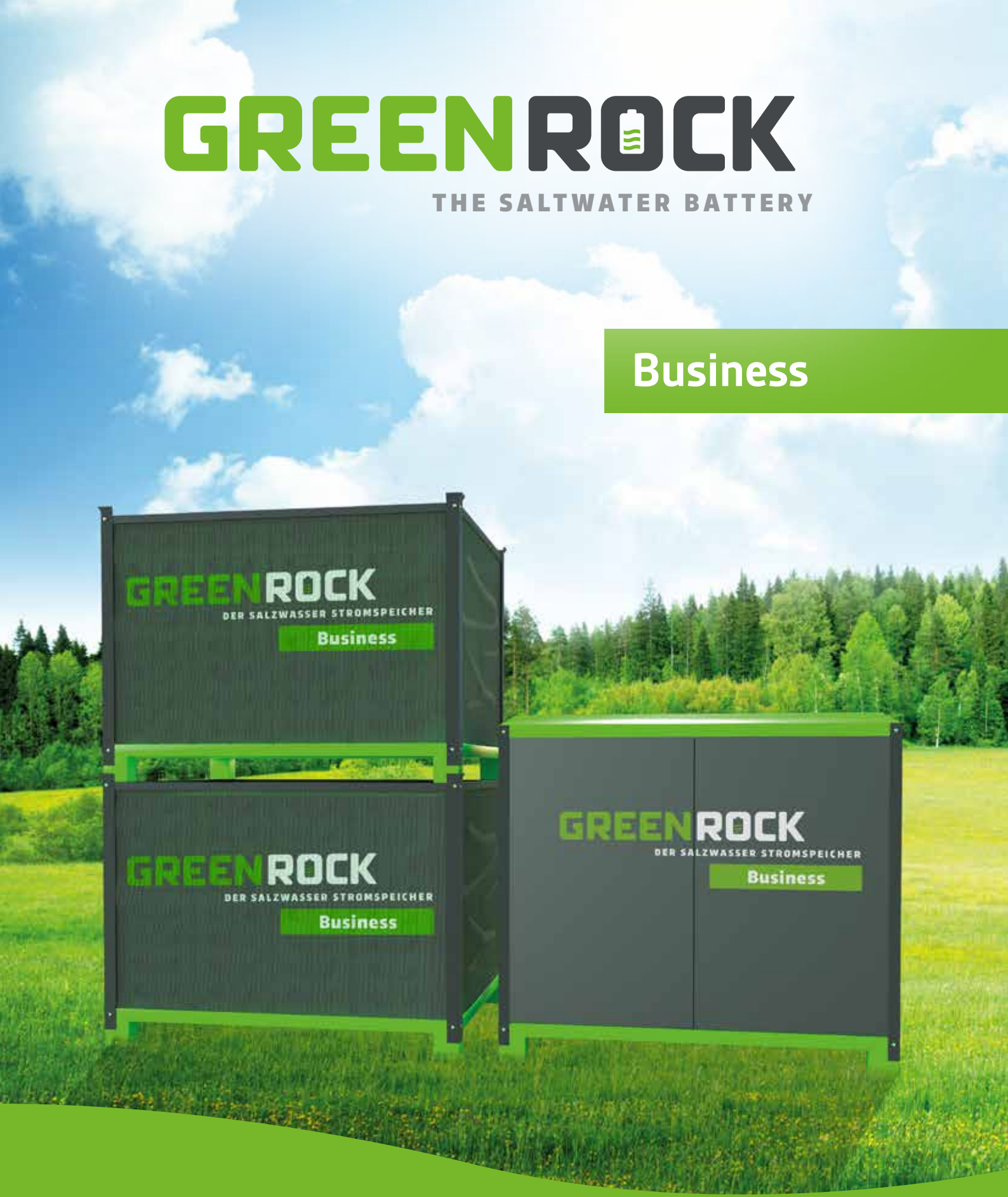
GREENROCK

THE SALTWATER BATTERY

Business



Business energy storage

The safest and most environmentally friendly energy storage for commercial use.

Energy Storage
for business and industry

Why invest in a GREENROCK business salt water storage system?
One single motivation - Your money is well spent.

Battery storage earns money in two ways.

1. By optimizing self-consumtption and lowering grid purchasing costs. Photovoltaics, wind power, biogas plants and other energy sources are well suited for this purpose. You can save on a monthly basis by reducing your kilowatt-hour purchase from your electricity supplier.

2. Cover peaks with the power storage. Grid consumption and connection fee are decreased.

Emergency Power
With **GREENROCK Business** Solutions you are sure that your critical electronic devices and business processes are protected against sudden loss of power. Avoid tedious re-boots and possible damage to sensitive systems - saving you from unplanned expenses, such as:

- unprocessed orders, deliveries or services
- employees hindered in their workflow
- machines and processes shut down and unusable
- forced shut down of IT systems

Using energy storage systems as insurance against rising electricity and energy costs.
In many countries electricity prices and taxation are rising year to year. Green energy sources combined with GREENROCK salt water storage give you an edge against increasing energy costs. GREENROCK energy management combined with **GREENROCK Business** increases your economic benefits. It provides for smooth and efficient consumption from all your green renewable energy sources.

GREENROCK

The saltwater energy storage for your business

- **Ready to install and scalable from 30 kWh to 270 kWh.**
- **The safest and most environmentally friendly energy storage.**
- **Back up and optimize your business with GREENROCK Business Solutions.**

Saltwater technology is the safest and most environmentally friendly way of storing power and using your own green power production.

Advantages:

- Non-toxic
- Non-flammable
- Non-explosive
- Maintenance free
- Lifetime > 15 years
- Safe to touch
- Safe transport and storage (no dangerous goods)
- Wide temperature frame from -5°C up to +50°C
- Fast and simple installation

Usage Examples

Farmers can ensure supply and safety of life stock. Ventilation, infrared lights, feeding and milking systems are all maintained in the event of power failure. The energy management system (EMS) offers special **farming** upgrades. **Hotels and restaurants** profit from load shifting and supply E-charging stations. **Companies and manufactures** benefit in insuring to have their data secured in case of a black-out. Production and other machinery are supplied by GREENROCK energy storage with no disruption to productivity.


Farming


Hotel & Restaurants


Companies & Manufactures

Saltwater technology

To face the challenges of increasing energy consumption and increasing use of **renewable energy**, power storage systems are needed. Reliability, safety, **cost efficiency** and sustainability are most important. We offer the world's **safest & most environmentally friendly** salt water based battery. The batteries are self-contained energy storage systems based on **saltwater electrolyte**. The Power storage is made out of common, non-toxic raw materials and cost-saving production techniques. Saltwater batteries are **maintenance-free** and optimized for daily deep discharge. Frequent partial charge and discharge cycles do not influence on the battery lifetime.

Performance and operating Data

of the Battery - Tested at 25°C

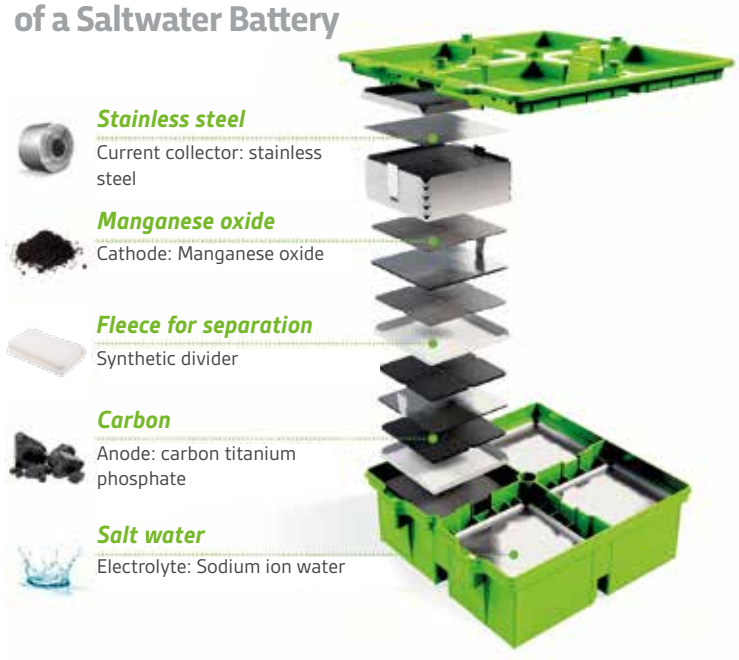
Nominal Energy	2,5 kWh
Nominal Voltage	48 V
Voltage Range	40 V – 59 V
Charging Profile	CC, CV
Usable depth of discharge (DOD)	100 %
Efficiency	88,5%
Max. charge current	10 A
Max. discharge current	10 A
Operating temperature range	-5°C – +50°C
Storage temperature range	-5°C – +50°C
Life cycle	5000 cycles @ 80% DOD

Physical characteristics

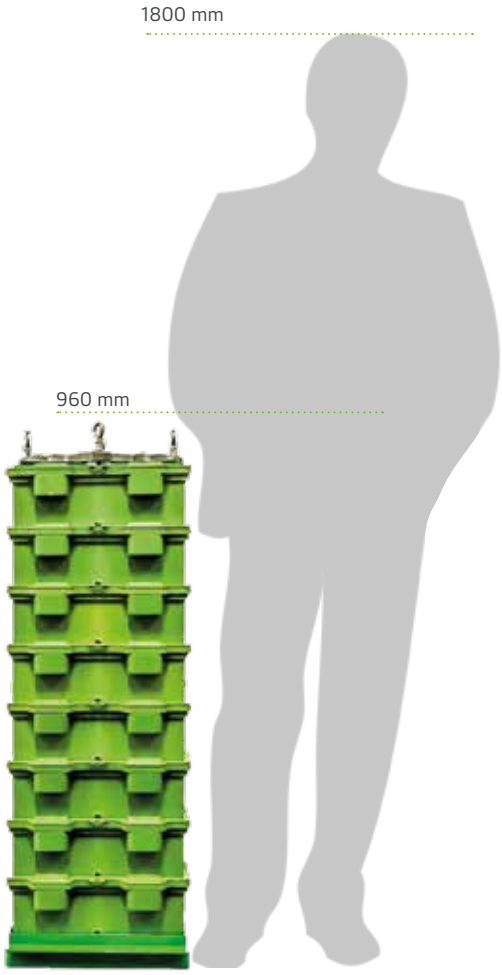
Height	960 mm
Width	313 mm
Depth	329 mm
Weight	140 Kg
Warranty	10 years acc. to warranty conditions

Construction

of a Saltwater Battery



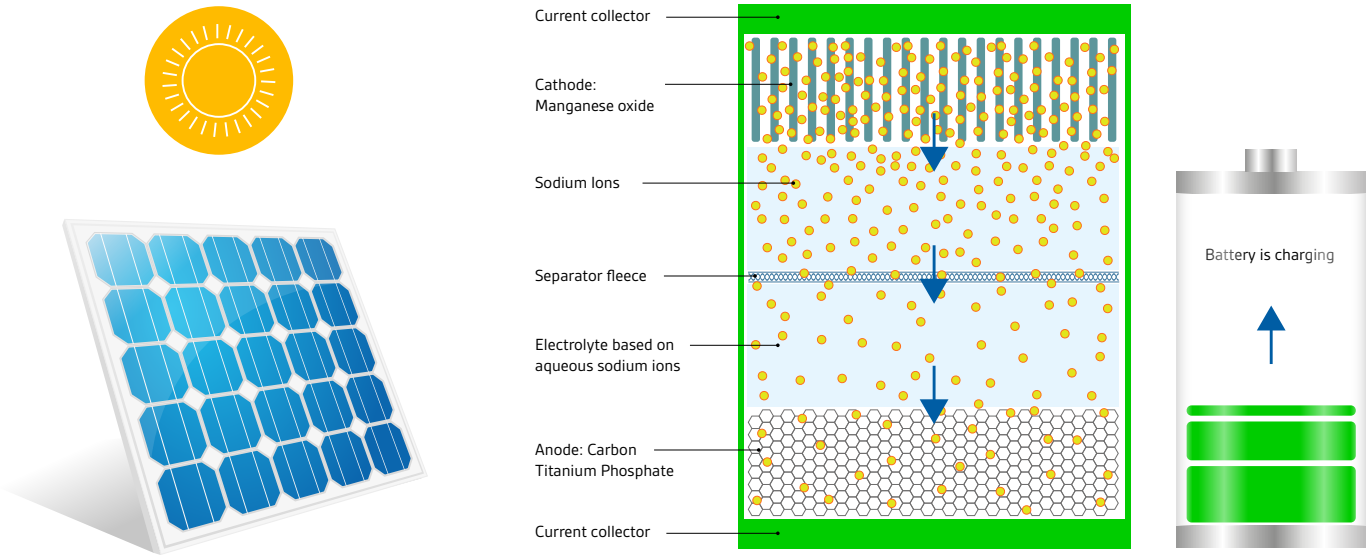
This unique technology provides sustainability for the environment & a maximum of safety.



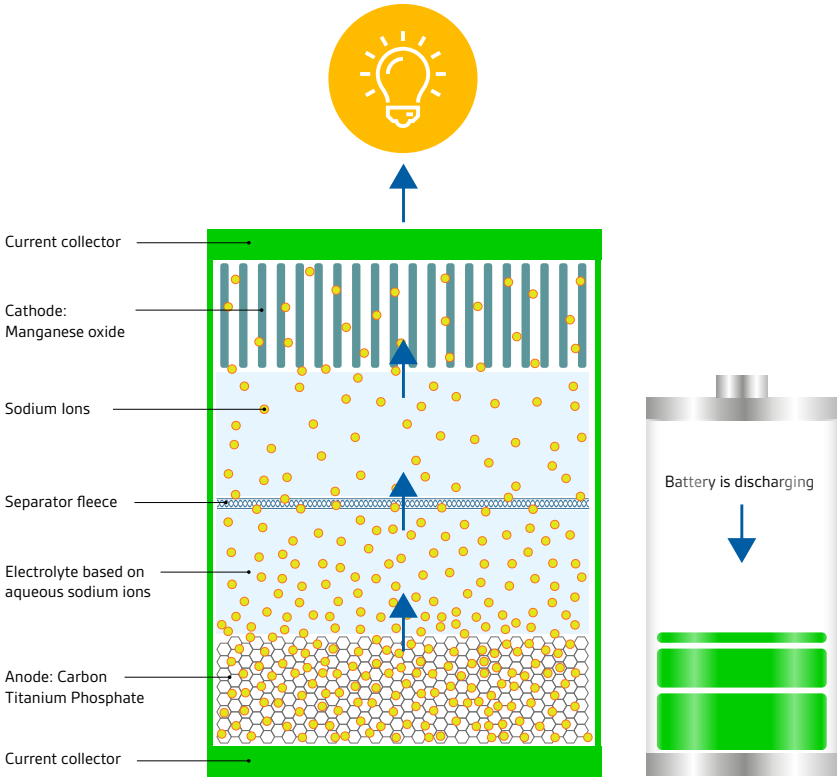
Size comparison: saltwater battery stack with 2.5 kWh

Charging and Discharging Process

In the course of **charging**, the electrical energy reaches the battery chemistry via a current collector, thus the sodium ions migrate to the anode and settle in the anode grid.



While **discharging**, the process is reversed. The sodium ions migrate to the cathode, the electrical energy flows from the battery via the current collector to the desired consumer.



Smart Energy Management

Smart **GREENROCK Energy Management** further optimizes your GREENROCK Business installation. It increases self-consumption and provides load management. A mobile App makes it easy to access and analyze the data. GREENROCK Energy Management is an **important tool** for on-grid and off-grid installations.

GREENROCK Energy Management (EMS) assists to:

+ Achieve independence from rising electricity prices.
+ Increase self-consumption, ie. less electricity purchase.
+ Achieve up to 98% self-sufficiency.
+ Use the electric power directly where it is produced.

GREENROCK Energy Management System monitors:

+ Energy flow of solar panels
+ Energy flow of the battery
+ Temperature
+ Energy flow of inverter
+ Overview of the energy balance and consumption
  (how many kWh were produced by the PV, how many kWh were purchased)

Additional upgrade possible at any time:

- Integration with heating element for water heater
- Integration with heat pump
- Integration with electric charging stations
- Integration of peak shaving / load shedding (load management)

Self-sufficient off-grid installations:
Operate your own micro-grid without a connection to the main grid.

On-Grid

Optimizing self-consumption

Use the electricity produced by your solar panels during the day in the evening hours and consume your own green energy. The GREENROCK Energy Management further helps to optimize self-consumption by including heat pump, e-charging station, heating element and wireless sockets into the system. Furthermore, the GREENROCK Business solution offers the option of integrating additional energy sources such as wind turbines and fuel cells. This gives you even more flexibility. You can bring up self-consumption to over 95% and purchase less power from the grid.

Here is an example of the use of radio-controlled sockets: The system starts a pool pump when sufficient PV power is available. Dishwasher, washing machine or even feed processing plants can be controlled by PV-supplied wireless sockets

Load management

Optimize your load points and better balance your energy usage. Allowing you to choose a cheaper network contract and reduce costs.

Covering peaks

With a smaller power supply you can permanently reduce costs. Take advantage of the available capacity and shift your needs to less intense times. For example operating the loads in a Hotel between e-charging stations, pool pump, kitchen, sauna, ...

Power back-up

GREENROCK Business Solutions ensure your energy supply and provide power back-up for critical devices such as computer networks.

Off-Grid

Control of hybrid power plants

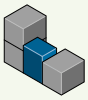
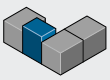
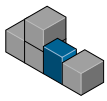
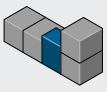
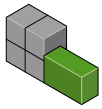
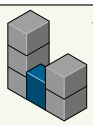
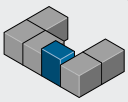
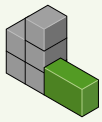
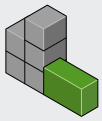
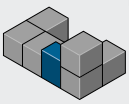
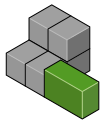
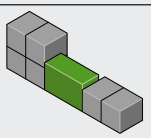
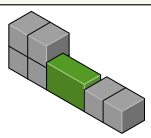
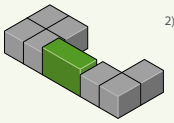
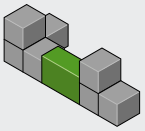
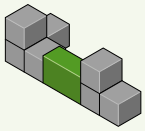
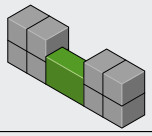
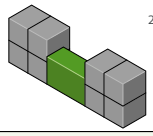
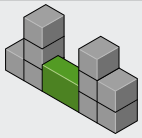
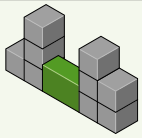
Supplimental energy sources, such as diesel generator and wind turbine, ... can be easily integrated with your PV plant to form a hybrid power system.

Container solutions

For outdoor energy systems: **GREENROCK container solutions** provide protection for your saltwater energy storage.

Example of set-up solutions

Place, plug in, save energy. Simple and fast.

	connection box small	connection box small	connection box small	connection box large	connection box large	connection box large
30 kWh						
60 kWh						
90 kWh						
120 kWh		 1)	 1)			
150 kWh		 1)	 1)			
180 kWh			 1)			
210 kWh				 2)	 2)	 2)
240 kWh					 2)	 2)
270 kWh					 2)	 2)

Flexible options for on-site installation

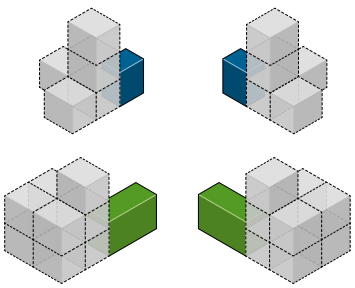
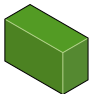


Fig. Shows maximum alignment of battery modules in depth, width and height. Set-up of the battery modules is possible left and right hand-side of the connection box.

1) Maximum 3 battery modules per side.

Fig. Shows maximum alignment of battery modules in depth, width and height. Set-up of the battery modules is possible left and right hand-side of the connection box.

2) Maximum 6 battery modules per side.

 connection box large
2200 x 950 x 1500 mm

 connection box small
1400x 800 x 1500 mm

 battery module
1442 x 1172 x 1060 mm

Variants

Connection box small – technical data
1400 x 800 x 1500 mm

Max. inverter power kW	Number of battery modules – capacity 30 kWh each (measures width/depth/height in mm 1442 x 1172 x 1060) stackable up to 3 levels max.					
	1 / 30 kWh	2 / 60 kWh	3 / 90 kWh	4 / 120 kWh	5 / 150 kWh	6 / 180 kWh
7,2	◉	◉	◉			
12		◉	◉	◉	◉	
19			◉	◉	◉	◉
24			◉	◉	◉	◉

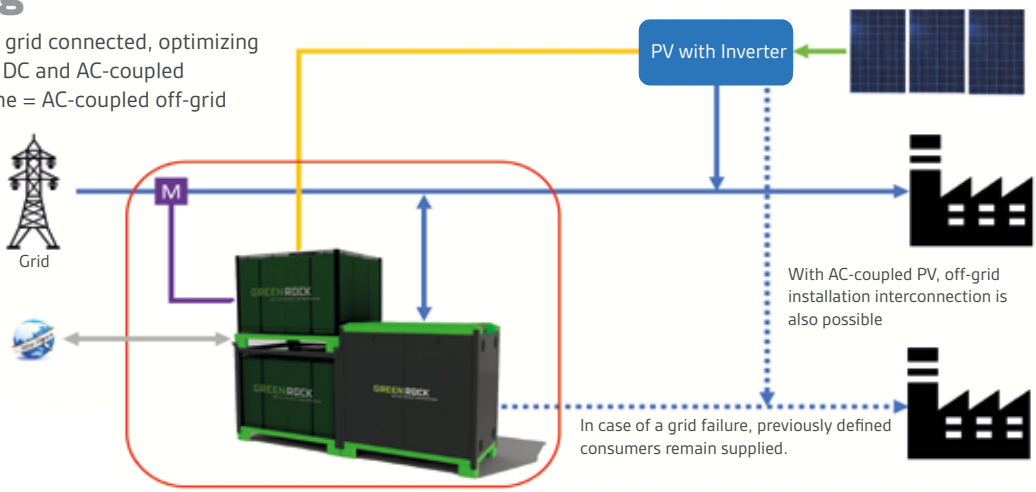
Connection box large – technical data
2200 x 950 x 1500 mm

Max. inverter power kW	Number of battery modules – capacity 30 kWh each (measures width/depth/height in mm 1442 x 1172 x 1060) stackable up to 3 levels max					
	4 / 120 kWh	5 / 150 kWh	6 / 180 kWh	7 / 210 kWh	8 / 240 kWh	9 / 270 kWh
36	◉	◉	◉	◉		
48		◉	◉	◉	◉	◉
72			◉	◉	◉	◉

System Diagrams

AC coupling

GREENROCK Business grid connected, optimizing self-consumption with DC and AC-coupled photovoltaic (dotted line = AC-coupled off-grid installation)

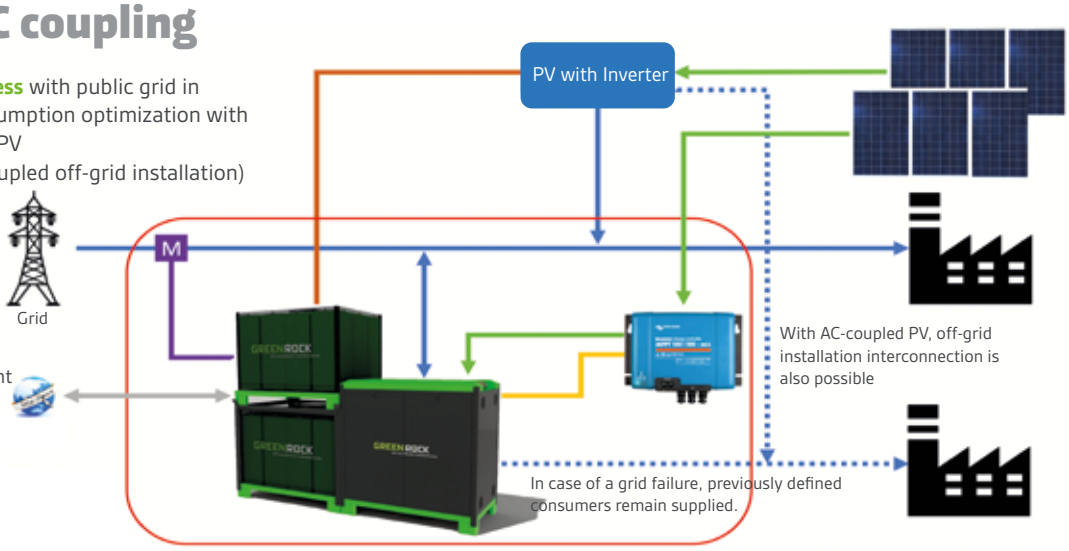


M = Measurement
Purple = RS485
Blue = AC
Green = DC
Yellow = RS485
Grey = www
= Delivery scope GREENROCK

Regional electro-technical connection conditions and legal regulations are to be considered separately!

AC and DC coupling

GREENROCK Business with public grid in self-generated consumption optimization with DC and AC-coupled PV
(dotted line = AC-coupled off-grid installation)



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Yellow = USB
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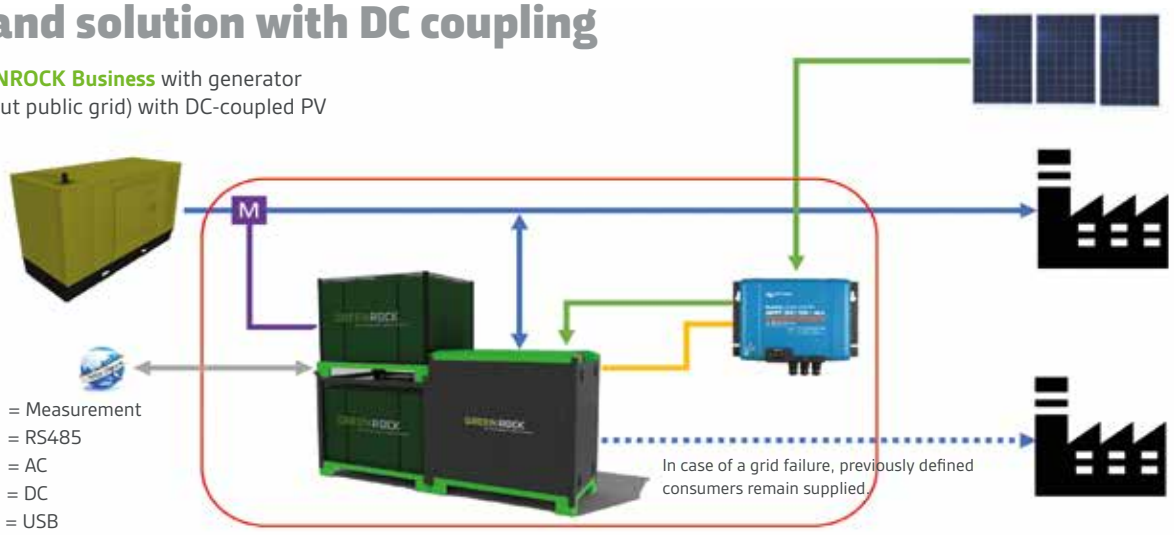
Island solution with DC coupling

GREENROCK Business with generator (without public grid) with DC-coupled PV



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Regional electro-technical connection conditions and legal regulations are to be considered separately!

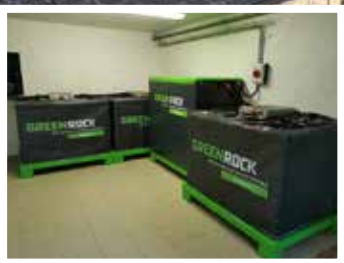
References

Farm in Austria

72 kWh grid-connected system for increased solar self-consumption and **self-sufficiency**.
Farmer Jürgen Hutsteiner can self-sufficiently provide his farm with 10,000 chickens and cultivated areas in the summer months. With his **electric car** he delivers eggs to local restaurants and markets. The electric vehicle is charged with the produced solar energy.

"Our GREENROCK power storage system in combination with PV is nearly 100% self-sufficient in summer time. Thanks to island mode function, ventilation, lighting and operating features are working properly in the event of a power outage. Our animals are never in danger."

Jürgen Hutsteiner, farmer, Steyr, Austria



Nursing home in Belgium

After extensive energetic restoration the Flemish Minister of Energy, officially opened the nursing home Sint Lambertus Buuren in Halen. A 90 kWh GREENROCK Business saltwater battery stores photovoltaic power for using during the night. The storage system optimizes self-consumption and offers residents and caregivers a safe living and working environment.

School in Switzerland

100 kWh GREENROCK Business storage for a school in Switzerland.

"We do not want to make any compromises in terms of safety and environmental compatibility for our school and kindergarten. Therefore, we decided to install GREENROCK saltwater batteries with its smart energy management system." Says client Mr. Jörg Müller. „We are proud to have commissioned the first major installation in Switzerland."

GREENROCK

THE SALTWATER BATTERY

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design: dreiwerken.de | Errors and omissions excepted

Your contact:

Stamp / Business card

BLUESKY ENERGY

Neukirchner Straße 15
4873 Frankenburg, Austria
Tel.: +43 720 01 01 88 99
greenrock@bluesky-energy.eu
bluesky-energy.eu/greenrock

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