

TECHNICAL DATA

GREENROCK STACKS



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GREENROCK PRODUCT DESCRIPTION

The GREENROCK product line includes all products and accessories related to GREENROCK saltwater batteries.

An electrolyte of sodium ions forms the basis of saltwater batteries. They are modular building blocks for clean energy storage systems. Saltwater technology is the safest and most environmentally friendly way to store electric power. It is particularly suitable for long-lasting stationary applications such as in residential buildings, commercial storage facilities or off-grid solutions.

Some of the advantages of sodium ion batteries are:

- Safe to touch
- Non-toxic
- Non-flammable
- Non-explosive
- Safe transport and logistics (non-hazardous goods)
- Wide operating temperature range -5°C to +50°C
- Maintenance free

BASICS TO THE TECHNICAL DATA

General: Please note the currently valid operating instructions (the latest version can be found on our partner portal). Take into account local standards and guidelines.

Guarantee: Details can be found in our warranty conditions (the latest version can be found on our partner portal)

Validity: from 1 February 2019 until further notice

Subject to technical alterations, errors, misprint and typographical failures.

48V AND 24V BATTERY

Order Number	9013 0005 01	9013 0004 01
Type Number	GREENROCK BA-S1-48	GREENROCK BA-S1-24
Nominal Energy	2,7 kWh (4A charge/discharge)	2,7 kWh (8A charge/discharge)
Nominal Voltage	48 VDC	24 VDC
Voltage Range	35 V – 59 V	17,5 V – 29,5 V
Charging methode		CC/CV
Depth of Discharge		100%
Efficiency		88,5%
Max. charge current > 1 sek	20A	40A
Max. discharge current > 1 sek	20A	40A
Operating temperature		-5°C – +50°C
Storage temperature		-5°C – +50°C
Interconnection		Only in parallel
Connection terminals		MC-4 connectors
Installation guidelines		Indoor / IP21
Certifications		CE

Testing performed at 25°C



Physical Characteristics

Height	929mm
Width	313mm
Depth	329mm
Weight	140kg

Data 48V Battery

Capacity (Ah)		Charge Current		
		5A	10A	15A
Discharge Current	5A	53,1	42,8	35,8
	10A	46,7	39,0	32,5
	15A	42,9	35,8	31,3

Energy (Wh)		Charge Current		
		5A	5A	5A
Discharge Current	5A	2565	2004	1619
	10A	2258	1827	1467
	15A	2071	1676	1414

Energy efficiency (%)		Charge Current		
		5A	10A	15A
Discharge Current	5A	88,5	87,6	86,2
	10A	85,0	84,2	82,0
	15A	83,8	82,0	80,0

Data 24V Battery

Capacity (Ah)		Charge Current		
		10A	20A	30A
Discharge Current	10A	106,2	85,6	71,6
	20A	93,4	78,0	65,0
	30A	85,8	71,6	62,6

Energy (Wh)		Charge Current		
		10A	20A	30A
Discharge Current	10A	2565	2004	1619
	20A	2258	1827	1467
	30A	2071	1676	1414

Energy efficiency (%)		Charge Current		
		10A	20A	30A
Discharge Current	5A	88,5	87,6	86,2
	10A	85,0	84,2	82,0
	15A	83,8	82,0	80,0

12V BATTERY

The 12V saltwater battery is designed for smaller power storage and power supply applications. Areas of application are e.g. camping, boats or energy self-sufficient micro consumers.

Order Number	9013 0003 01
Type Number	GREENROCK BA-S1-12
Nominal Energy	675 Wh (4A charge/discharge)
Nominal Voltage	12 VDC
Voltage Range	8,8 V – 14,7 V
Charging methode	CC/CV
Depth of Discharge	100%
Efficiency	88,5%
Max. charge current > 1 sek	20A
Max. discharge current > 1 sek	20A
Operating temperature	-5°C – +50°C
Storage temperature	-5°C – +50°C
Interconnection	Parallel
	Serial max. 4 pcs. to 48V
Connection terminals	MC-4 connectors
Installation guidelines	Indoor / IP21
Certifications	CE
Testing performed at 25°C	

Physical Characteristics

Height	235mm
Width	313mm
Depth	329mm
Weight	35 kg



Data 12V Battery

Capacity (Ah)		Charge Current		
		5A	10A	15A
Discharge Current	5A	53,1	42,8	35,8
	10A	46,7	39,0	32,5
	15A	42,9	35,8	31,3

Energy (Wh)		Charge Current		
		5A	10A	15A
Discharge Current	5A	641,3	501,0	404,8
	10A	564,5	456,8	366,8
	15A	517,8	419,0	353,5

Energy efficiency (%)		Charge Current		
		5A	10A	15A
Discharge Current	5A	88,5	87,6	86,2
	10A	85,0	84,2	82,0
	15A	83,8	82,0	80,0

PRODUCT TESTS

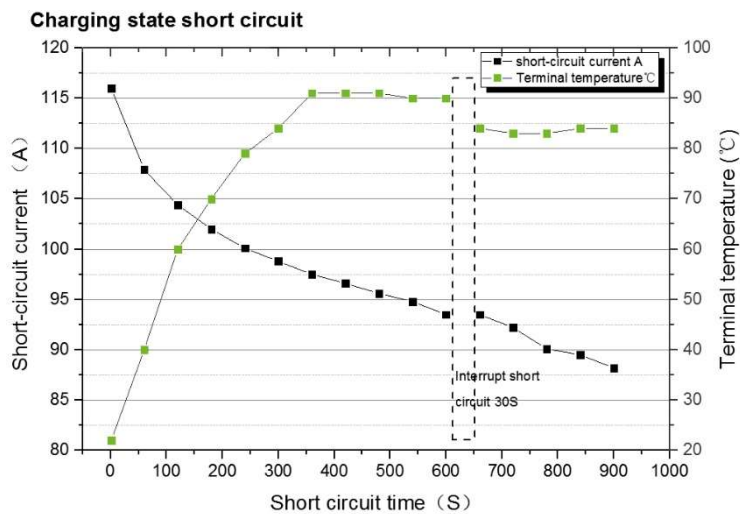
Below please find some testing results which outline the behaviour of the product under certain, specific test environments.

Overcharge Test

During and after the overcharge test of 500 hours constant charging at 8.0V and an average current of 0.35A the battery met all test parameters.

Short Circuit Test

Resistance of the wire was 2 mΩ in the short circuit. Neither fire nor explosion, or any battery deformation occurred during short circuit test.



Operation in high temperature ranges

At higher temperatures between 40°C and 50°C the battery's efficiency improves and the capacity increases. Exceeding 50°C, the high temperatures cause evaporation of the electrolyte and leads to increased gas evolution. In consequence the battery's lifetime may shorten.

Imbalanced Charging

Tested at 25°C with 5A charge/discharge current and charging and discharging voltage: 35.2V – 60V

Outcome	No explosion	No fire
	No release of toxic gases	No voltage out of control
	No accumulation of combustible gases	

Energy throughput

Under constant conditions of 5A charging/discharging current, constant temperature according to performance data and 2.5 kWh loading / unloading per unit, there are 9,957 cycles and an energy throughput of 22,030 kWh.

Current charge/discharge	Discharging per battery stack kWh	cycles	Roundtrip efficiency	Throughput in kWh
5A	2.50	9,957	88.5%	22,030