

# SUPERCAPACITORS

The world's first supercapacitor-based energy storage system Meeting the energy demands of today while unlocking the potential of the world's energy future.

The evolution has begun...



## SIRIUS ENERGY STORAGE

The world's first supercapacitor-based energy storage system Safer, more efficient, more effective, longer life-cycle energy storage



Operating temperature range -30C to 85C



Charge/discharge at 2C with no effect on cycle life or capacity



No capacity degradation or cycle life reduction at 100% DOD



Safe with no risk of thermal runway or heat generation



99%+ DC-to-DC round-trip efficiency



1 million life cycles



Medium and long duration discharge capability



ATTRIBUTE LITHUM-ION FLOW SIDIUS SIRIUS ADVANTAGE BATTERY LIFE (CYCLES) 200 - 4,000 1 MILLION Lowest opex in the industry Lowest opex in the industry DC ROUND TRIP FEEICIENCY ~90% ~70% 65% - 75% 99.1% 100% Name-plate capacity is useable DEPTH-OF-DISCHARGE (DOD) TEMPERATURE EFFECT <85°C Useable in almost any location <50°C <27°C <50°C Enables fast charging. Very efficient & effective in EV, solar CHARGE CURRENT Severely Limited verely Limit Severely Limit NO LIMIT LIMITATION DISCHARGE CURRENT Single solution for short, medium and long duration discharging making it the most versatile storage in the industry 10 - 20 1 2 - 10 1 2 hours educes costs by eliminating the need for auxiliary THERMAL STARLING NO RISK High Risk Minimal Minimal ---!:--70WH/KG ENERGY DENSITY High Medium Low Effective form factor BATTERY COST Better economics than any other chemistry

\*AT SUPERCAP CELL LEVEL

#### SOLAR + STORAGE

- Plug-and-play replacement of Lead Acid or Li Ion batteries
- Compatible with existing inverters
- Safe with no risk of thermal runway
- Operating temperature range -30C to 85C eliminates need for auxiliary cooling infrastructure
- High delivered efficiency results in low opex for faster payback
- Long cycle life with 10 year warranty

#### DEMAND CHARGE REDUCTION, TIME-OF-USE SHIFTING

- Fast charge capability (30 minutes) enables optimised capacity sizing and increases response capability
- Operating temperature range -30C to 85C minimises (and even eliminates) auxiliary cooling cost
- 99% DC to DC efficiency delivers lowest opex
- High cycle life + high efficiency + low auxiliary opex = lowest cost of ownership and shortest payback

#### **CELL TOWERS**

- Compatible with existing rectifier for DC electronics infrastructure
- Operating temperature range -30C to 85C minimises (and even eliminates) auxiliary cooling infrastructure (and therefore cost)
- High cycle life + high efficiency + low auxiliary opex = lowest cost of ownership and shortest payback
- At off-grid locations, reduces generator maintenance costs and increases generator efficiency which lowers diesel consumption
- Plug-and-play replacement for Lead Acid or Li Ion batteries

#### SIRIUS ENERGY STORAGE MODULE **TECHNICAL DATA SHEET** Part Number: 3550-48-A-1.35C-M-A-G

Nominal Voltage	48VDC			
Voltage Range	44	VDC – 54VDC		
Capacity	3550Wh			
Maximum Charge Rate (0% -100% SOC)	100A (short time withstand 300A consult Arvio for times)			
Maximum Discharge Rate (100% - 0% SOC)	100A (short time withstand 300A consult Arvio for times)			
Maximum Charging Voltage	54VDC			
Internal Resistance	≤6mΩ			
DC to DC Roundtrip efficiency (@100A)	99.1% (at caps) (tested to 96% at terminals)			
Operating Temperature	-30°C to 85°C (at caps) -10°C to 55°C (recommened for design life)			
Galvanic Isolation	1500V			
Projected Cycle Life of capacitors <sup>3</sup>	1,000,000			
Projected Calendar Life <sup>1,3</sup>	Supercap cell (capacitors)	45 years		
	Module Control Electronics	10 - 15 years		
Shelf Life <sup>2</sup>	10 years			
Warehousing	Can be stored at any SOC without affecting cycle life			
Communication Port	TCP/IP RJ45 Ethernet			
Monitoring Data	Temperature, Voltage, Current, Energy, Supercap Balancing			
Remote Control Input	Battery Self-Check			
Terminal Type	F12			
Module Casing Material	Aluminium			
Dimensions (w x d x h)	600mm x 534mm x 200mm (+/-2%)			
Weight	Approx.75kg			
Self-discharge <sup>4</sup>	5% after 25 days			
Alarm	Audible alarm in the event of Over-Charge, Over-Discharge, Over- Temperature, Over-Current			
CE Certification <sup>5</sup>	EN55032:2015, EN55024:2010, EN61000-4-2:2009, EN61000-4- 2:2006+41:2008+42:2010			
Precautions				
Alarm	In case of alarm, immediately rectify / attend to the cause of the alarm			
Physical Damage	In case the module is physically damaged due to any event, do not install and energize the module under any circumstances and contact an authorized technician			
Short Circuit	Ensure precautions to prevent short-circuit under all circumstances			
Galvanic isolation	When connecting to external devices ensure that galvanic isolation does not exceed 1500V			
Charge / Discharge Current	Under no circumstances must the charge / discharge current			
Charging Voltage	Under no circumstances must the charging voltage exceed 54VDC for more than 60 seconds			
Charge Cycle	During charge cycle ensure never to exceed constant voltage of			
Series Connection	To connect modules in series, ensure all modules are at 100% SOC			
Maximum number of modules that can be	18 (do not series connect without written authorisation from Arvio)			
Maximum number of modules that can be connected in parallel	No limit			
Series – Parallel Connection	Modules cannot be connected in a series – parallel combination			
SiriusX – Monitoring Software				
Individual Cell	Monitoring of voltage			
Module	Monitoring of current, max. & min. voltage, temperature, DOD, SOC, rate of charge, rate of discharge, time to discharge, balance energy, total energy delivered over lifetime, graphs			
System	Monitoring of all modules co	nnected together		
<sup>1</sup> Projected Calendar Life is the projected life of the mod	<sup>1</sup> Projected Calendar Life is the projected life of the module (in years) from the date it is first operated.			

<sup>2</sup> Shelf Life is the life of the module (in years) from the date it is manufactured to the time it is first operated.

<sup>3</sup> Additional terms and conditions, including a limited warranty, will apply at the time of purchase.

<sup>4</sup>Self-discharge: (1) 30% after 30 days; (2) 80% after 60 days; Self-discharge only when not charging or discharging; No memory effect; .Module can be recharged to 100% at any time. <sup>5</sup>CE certification is completed for supercap cells

Product dimensions are for reference only unless otherwise identified and may change without notice.

For critical applications, please contact Kilowatt Labs, Inc., or its authorized representative.

#### SIRIUS ENERGY STORAGE MODULE TECHNICAL DATA SHEET Part Number: 7100-48-A-1.35C-M-A-G

Nominal Voltage	48VDC		
Voltage Range	44VDC – 54VDC		
Capacity	7100Wh		
Maximum Charge Rate (0% -100% SOC)	200A (short time withstand 300A consult Arvio for times)		
Maximum Discharge Rate (100% - 0% SOC)	200A (short time withstand 300A consult Arvio for times)		
Maximum Charging Voltage	54VDC		
Internal Resistance	≤3mΩ		
DC to DC Roundtrip efficiency (@100A)	99.1% (at caps) (tested to 96% at terminals)		
Operating Temperature	-30°C to 85°C (at caps) -10°C to 55°C (recommened for design life)		
Galvanic Isolation	1500V		
Projected Cycle Life of capacitors <sup>3</sup>	1,000,000		
Projected Calendar Life <sup>1,3</sup>	Supercap cell (capacitors)	45 years	
	Module Control Electronics	10 - 15 years	
Shelf Life <sup>2</sup>	10 years		
Warehousing	Can be stored at any SOC without affecting cycle life		
Communication Port	TCP/IP RJ45 Ethernet		
Monitoring Data	Temperature, Voltage, Current, Energy, Supercap Balancing		
Remote Control Input	Battery Self-Check		
Terminal Type	F12		
Module Casing Material	Aluminium		
Dimensions (w x d x h)	600mm x 490mm x 330mm (+/-2%)		
Weight	Approx.127kg		
Self-discharge <sup>4</sup>	5% after 25 days		
Alarm	Audible alarm in the event of Over-Charge, Over-Discharge, Over-		
	Temperature, Over-Current		
CE Certification <sup>5</sup>	EN55032:2015, EN55024:2010, EN61000-4-2:2009, EN61000-4-		
S:2000+A1:2008+A2:2010			
	In case of alarm, immediately rectify / attend to the cause of the		
Alarm	alarm		
	In case the module is physically damaged due to any event, do not		
Physical Damage	install and energize the module under any circumstances and		
Short Circuit	contact an authorized technician		
	When connecting to external devices ensure that galvanic isolation		
Galvanic isolation	does not exceed 1500V		
Charge / Discharge Current	Under no circumstances must the charge / discharge current		
	exceed 200A for an extended period of time		
Charging Voltage	Under no circumstances must the charging voltage exceed 54VDC		
	During charge cycle ensure never to exceed constant voltage of		
Charge Cycle	54VDC and constant current of 200A		
Series Connection	To connect modules in series, ensure all modules are at 100% SOC		
	before connecting. Do not co	nnect otherwise.	
Maximum number of modules that can be connected in series	18 (do not series connect wit	hout written authorisation from Arvio)	
Maximum number of modules that can be			
connected in parallel	No limit		
Series – Parallel Connection	Modules cannot be connected	ed in a series – parallel combination	
under any circumstances			
SiriusX – Monitoring Software			
	Monitoring of current may & min voltage temperature DOD		
Module	SOC, rate of charge, rate of discharge, time to discharge, balance		
	energy, total energy delivere	d over lifetime, graphs	
System	Monitoring of all modules connected together		

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