

## Sonnenschein Lithium HC (High Current)

Sonnenschein Lithium is a range of 12, 18 and 36 Volt Lithium battery modules. These Lithium modules offer significant cycling, charge time, weight and volume improvements over similar lead acid battery modules.



### Overview

Sonnenschein Lithium modules are ideal when Advanced Energy Systems are required. Excellent float and cycle life with zero maintenance offers end-users significant cost of ownership savings and complete peace of mind, through safety inherent in Sonnenschein Lithium chemistry.

The Sonnenschein Lithium Battery Management System is also designed to offer excellent control functionality (including remote monitoring) when coupled with Sonnenschein Lithium Battery Modules.

Sonnenschein Lithium monitoring and diagnostic kits are also available enabling system data recording and detailed performance status indicators.

This technology has been deployed commercially since 2006.

### Features

- > 2800 cycles at 100% DOD and 4000+ cycles at 80% DOD\*
- > Exceptional voltage stability
- > Can be connected up to 700V and 1000Ah
- > Maintenance free
- > Intra-module balancing
- > Compatible with a range of GNB Lithium chargers
- > Communication of monitored data via Battery Management System (BMS)
- > Rugged mechanical design
- > Flame retardant plastics
- > LED battery status indicator
- > Carrying Straps (SL12 110HC, SL12 138HC and SL18 69HC)
- > Manufactured in standard BCI sizes

Specifications	SL12 40HC SL12 40HC BMS**	SL12 110HC	SL12 138HC	SL18 69HC	SL36 46HC	
Nominal Module Voltage	12.8 V	12.8 V	12.8 V	19.2 V	38.4 V	
Nominal Capacity (C/5, 23°C)	40 Ah	110 Ah	138 Ah	69 Ah	46 Ah	
Weight (approximate) kg	6.5 kg	15.8 kg	19.5 kg	14.9 kg	19.6 kg	
Weight (approximate) lbs	14.3 lbs	34.8 lbs	42.9 lbs	32.8 lbs	43.1 lbs	
Dimension incl. Terminals LxWxH (mm)	197 x 131 x 182	260 x 172 x 225	306 x 172 x 225	269 x 148 x 245	306 x 172 x 225	
Dimension incl. Terminals LxWxH (inches)	7.76 x 5.12 x 7.17	10.2 x 6.77 x 8.86	12.0 x 6.77 x 8.86	10.6 x 5.83 x 9.65	12.0 x 6.77 x 8.86	
BCI Group Number	U1R	Group 24	Group 27	N/A	Group 27	
Terminals, Female-Threaded	M6 x 1.0	M8 x 1.25	M8 x 1.25	M8 x 1.25	M8 x 1.25	
Specific Energy	79 Wh/kg	89 Wh/kg	91 Wh/kg	89 Wh/kg	90 Wh/kg	
Energy Density	110 Wh/l	139 Wh/l	148 Wh/l	136 Wh/l	149 Wh/l	
Standard Discharging @ 25°C	Max. Continuous Load Current	80 A	150 A	150 A	120 A	90 A
	Peak Load Current (30 sec).	120 A	300 A	300 A	200 A	135 A
	Cut-off Voltage	10 V	10 V	10 V	15 V	30 V
Standard Charging	Max. Charge Voltage	14.6 V	14.6 V	14.6 V	21.9 V	43.8 V
	Float Voltage	13.8 V	13.8 V	13.8 V	20.7 V	41.4 V
	Recommended Current C/2	20A	70A	35A	23A	23A
Charge Time C/2 ***	2.5 hrs	2.5 hrs	2.5 hrs	2.5 hrs	2.5 hrs	
DC internal resistance (max)	15 mΩ	6 mΩ	5 mΩ	10 mΩ	25 mΩ	
Approx. equivalent Lithium Content (g)	49	128	160	121	160	

\* Actual cycle count depends on the application

\*\* Built in BMS

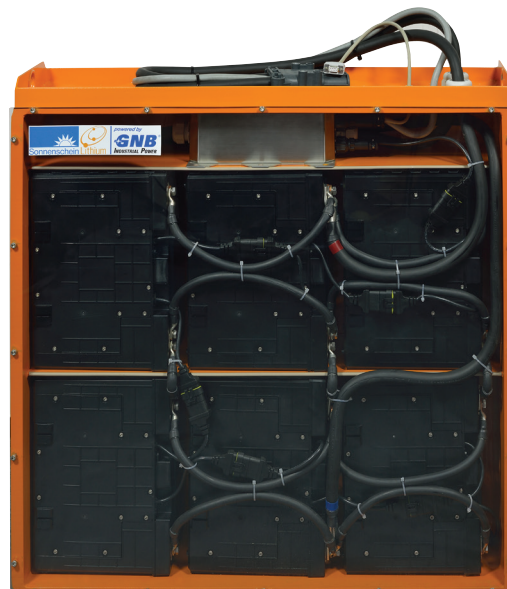
\*\*\* Faster charge is possible, this is application specific

### Common specifications

Discharge temperature	-10°C to 50°C
Charge temperature	0°C to 45°C
Storage temperature	-40°C to 50°C
Operating humidity	5% to 95%, non-condensing
Water/dust resistance	IP 56
Shock and vibration	IEC62133, DIN VG96 924
Certifications	FCC Class B, CE, UL1642
Shipping Classification	UN 3480, Class 9

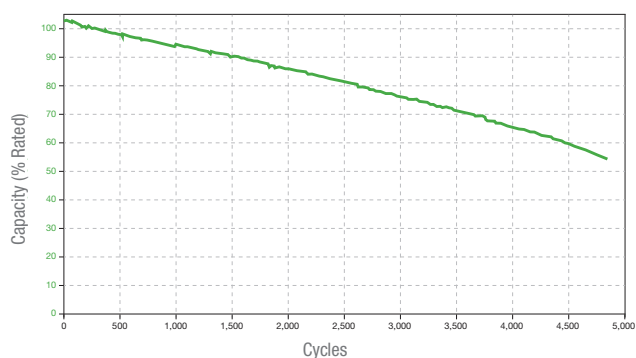
### BMS specifications (SL12 40HC BMS only)

External Communication	1x Diagnostic Interface Connector
Monitoring Parameters	RS485 bus for State of Charge (SOC), error codes, system pack balance

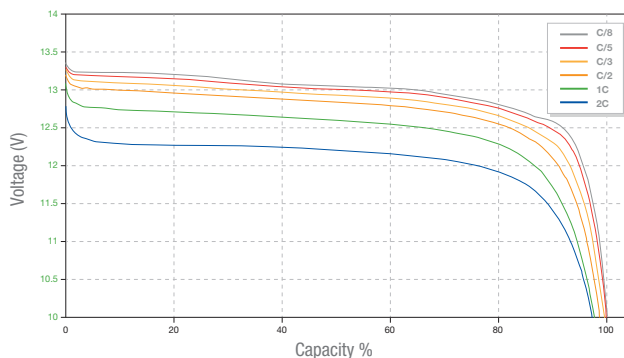


## Sonnenschein Lithium Battery Module data information:

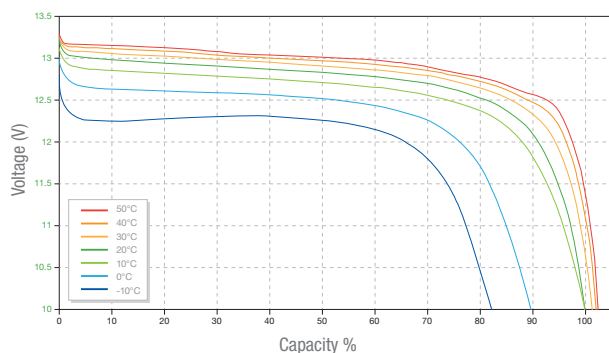
Sonnenschein Lithium Discharge Capacity Performance at 23°C  
c/2 charge and discharge, 100% DOD



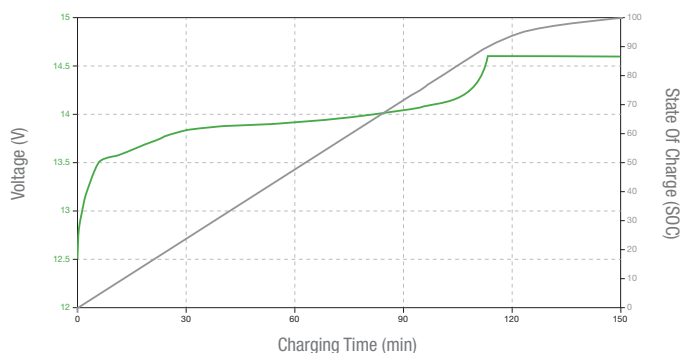
Sonnenschein Lithium Voltage Profiles at Various Rates  
23°C Ambient Temperature



Sonnenschein Lithium Discharge Voltage Profiles at C/2 Discharge Rate  
Various Ambient Temperatures



Typical Sonnenschein Lithium C/2 Charging Voltage and SOC Profiles  
23°C Ambient Temperature



Performance may vary depending on, but not limited to cell usage and application. If cell is used outside specifications, performance will diminish. All specifications are subject to change without notice. All information provided herein is believed, but not guaranteed, to be current and accurate.

## SL24 40VHC module

The SL24 40VHC module is a high-performance, 24-volt battery. Designed for high-power, short-duration discharges, this technology combines the power of lithium and the safety of phosphate, in a lightweight, versatile, building block.



### Overview

The SL24 40VHC module is ideal for mission-critical, power applications. The module's inherent reliability, long cycle life, and zero maintenance offers end-users the assurance of 24/7 system uptime, while delivering significant cost of ownership savings.

The Battery Management System (BMS) integrates seamlessly with the SL24 40VHC applications. The battery system is managed locally and real-time system information can be monitored worldwide.

### Features

- > Unparalleled Reliability for Critical Applications
- > Industry Leading Cycle Life
- > High Power Density
- > String Voltage 24 - 700 V
- > High Charge/Discharge Capability
- > Internal Battery Temperature Monitoring
- > Wide Operating Temperature Range
- > Intra-Module Balancing
- > Fully Integrates with SL BMS
- > Flame Retardant Housing
- > Extremely Small Footprint
- > Maintenance Free

Specifications		SL24 40VHC module
Nominal Voltage		25.6 V
Nominal Capacity		40 Ah
Charge Voltage	Recommended	29.2 V
Charge Voltage	Float	27.6 V
Charge Current	Recommended Continuous	40 A
Charge Current	Max Continuous	160 A*
Discharge Voltage	Minimum	18.4 V
Max. Discharge Current	10 seconds	700 A*
Max. Discharge Current	continuous	240 A*
Specific Power	(10 seconds)	> 800 W/kg
Power Density	(10 seconds)	> 1200 W/L
Weight		16.5 kg
Terminals	Female-Threaded	M8 x 1.25
Exterior Dimensions	(L x W x H)	256 x 165 x 260 mm

\* Actual cycle count depends on the application

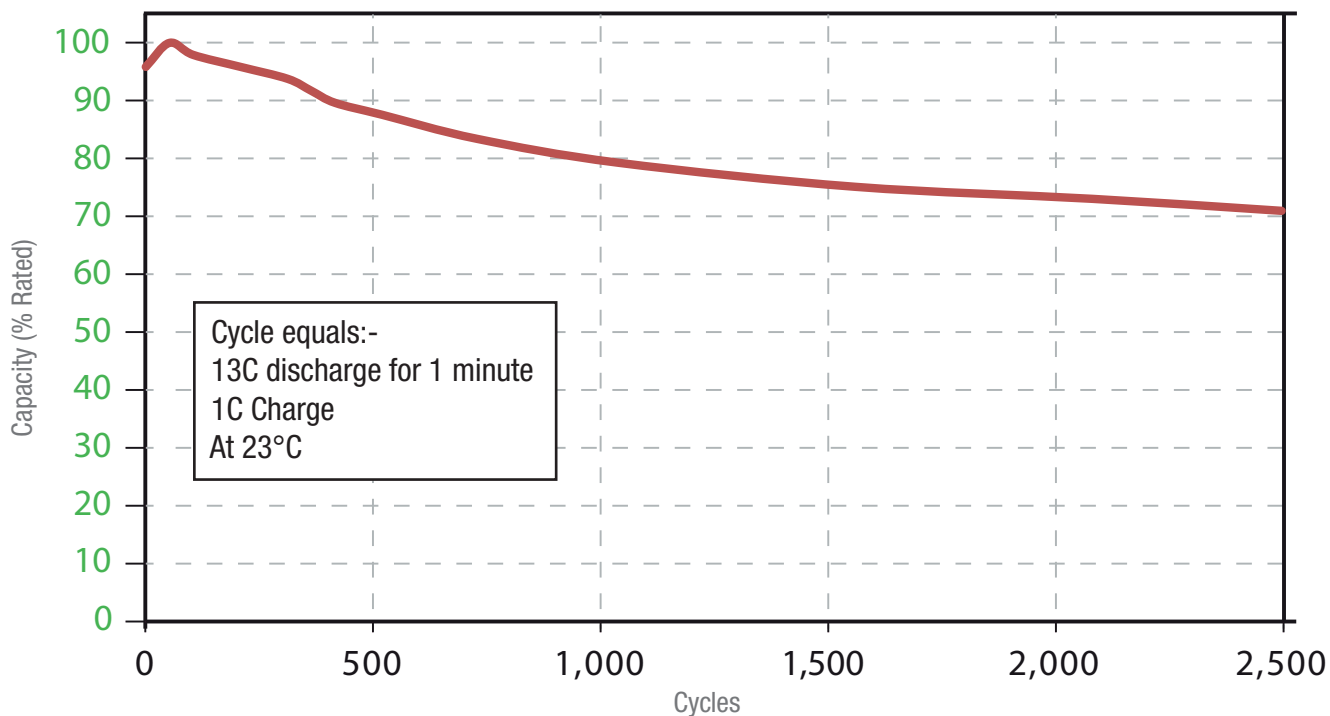
#### Common specifications

Discharge temperature	-10°C to 50°C
Charge temperature	0°C to 45°C
Storage temperature	-40°C to 50°C
Operating humidity	5% to 95%, non-condensing
Water/dust resistance	IP 56
Shock and vibration	IEC62133, DIN VG96 924
Certifications	FCC Class B, CE, UL1642, IEC 62133
Shipping Classification	UN 3480, Class 9



#### SL24 40VHC Module data information:

Cycle Data for SL24 40VHC Module



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## Sonnenschein Lithium LC (Low Current)

Sonnenschein Lithium offers a simple 'plug-and-play' replacement for typical lead-acid battery applications.

The Lithium Ion modules offer 40Ah and 20Ah with a peak load capability of 80A and 60A respectively. Sonnenschein Lithium incorporates built-in automatic protection and does not require an external battery management system for optimum usage.

### Overview

Providing extended run-time with weight and size reduction when compared to Lead Acid. Sonnenschein Lithium LC is a perfect choice when low voltage, high energy density is required.

The Sonnenschein Lithium LC modules provide excellent float and cycle life resulting in low operating costs and a high return on investment. This technology has been deployed commercially since 2006.



### Features

- > Built-in automatic protection for over-charge, overdischarge and over-temperature conditions
- > No battery management system required
- > Series connection up to four (4) batteries (48 V)
- > Intra-module balancing
- > LED battery status indicator
- > Maintenance-free
- > Flame retardant plastics
- > Thousands of cycles, under normal conditions
- > Compatible with a range of GNB Lithium chargers
- > Optional battery discharge indicator (SL-BMS LC / SOC display) for SOC display and fault indication

Specifications		SL12 40LC	SL24 20LC
Nominal Module Voltage		12.8 V	25.6 V
Nominal Capacity (C/5, 23°C)		40 Ah	20 Ah
Weight (approximate) kg		6.5 kg	6.4 kg
Weight (approximate) lbs		14.3 lbs	14.1 lbs
Dimension incl. Terminals LxWxH (mm)		197 x 131 x 182	197 x 131 x 183
Dimension incl. Terminals LxWxH (inches)		7.76 x 5.12 x 7.17	7.76 x 5.12 x 7.20
BCI Group Number		U1	U1
Terminals, Female-Threaded		1/4-20	M6x1.0
Specific Energy		79 Wh/kg	80 Wh/kg
Energy Density		110 Wh/l	110 Wh/l
Standard Discharging @ 25°C	Max. Continuous Load Current	30 A	30 A
	Peak Load Current (30 sec).	80 A	60 A
	Cut-off Voltage	10 V	20 V
Standard Charging	Max. Charge Voltage	14.6 V	29.2 V
	Float Voltage	13.8 V	27.6 V
	Recommended Current C/2	20A	10 A
	Charge Time C/2 *	2.5 hrs	2.5 hrs
DC internal resistance (max)		15 mΩ	43 mΩ

\* Faster charge is possible, this is application specific.

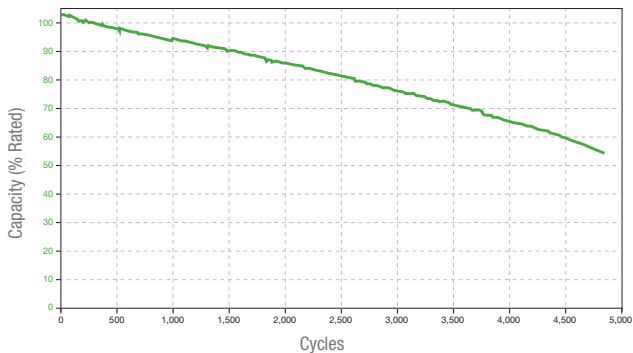
### Common specifications

Discharge temperature	-10°C to 50°C
Charge temperature	0°C to 45°C
Storage temperature	-40°C to 50°C
Operating humidity	5% to 95%, non-condensing
Water/dust resistance	IP 56
Shock and vibration	IEC62133, DIN VG96 924
Certifications	FCC Class B, CE, IEC 62133 UL1642 (cells only)
Shipping Classification	UN 3480, Class 9

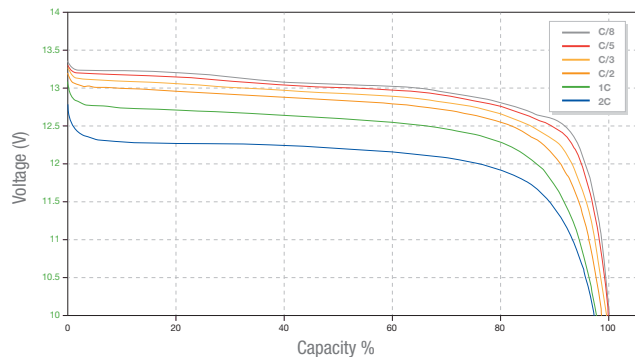


## Sonnenschein Lithium Battery Module data information:

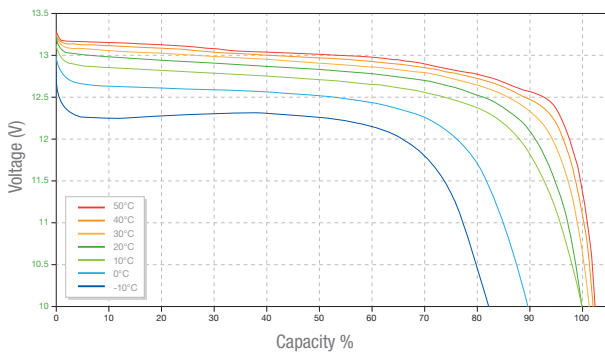
Sonnenschein Lithium Discharge Capacity Performance at 23°C  
c/2 charge and discharge, 100% DOD



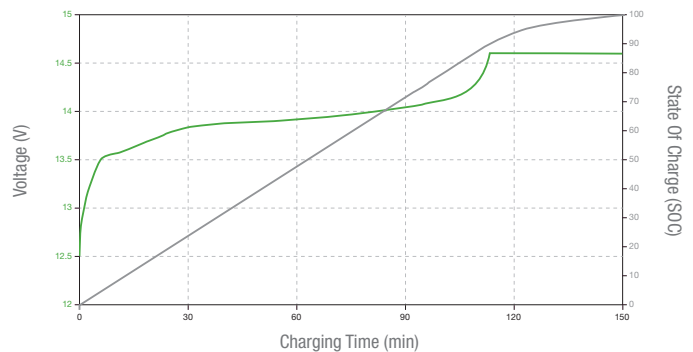
Sonnenschein Lithium Voltage Profiles at Various Rates  
23°C Ambient Temperature



Sonnenschein Lithium Discharge Voltage Profiles at C/2 Discharge Rate  
Various Ambient Temperatures



Typical Sonnenschein Lithium C/2 Charging Voltage and SOC Profiles  
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## Sonnenschein Lithium

### Battery Management System (SL BMS)

The Sonnenschein Lithium BMS is designed to manage system safety, optimise system performance and control communication with the application and the outside world. The SLBMS is compatible with all HC and VHC Sonnenschein Lithium Ion modules.



#### Overview

Sonnenschein Lithium Battery Management Systems (SL BMS) are designed for use with Sonnenschein Lithium battery modules. The BMS provides numerous system integration options facilitating temperature, voltage, current and state-of-charge monitoring for use with Sonnenschein Lithium HC and VHC battery modules. One single SL BMS is capable of managing up to 48 Sonnenschein Lithium battery modules. This technology has been deployed commercially since 2006.

#### Features

- > Monitoring, temperature, voltage, current, SOC status
- > One SL BMS can manage multiple battery modules
- > CANbus communications for control and management
- > Digital and analog I/O
- > Battery-to-battery balance control
- > Drive train pre-charge control
- > Control of up to 4 contactors
- > System ground isolation verification
- > Sleep mode when key signal 'OFF'

Specifications	SL BMS LV	SL BMS HV	SL BMS SHV
Dimension incl. mounting tabs and protrusion of connectors (LxWxH)		188mm x 157mm x 42mm	
Weight (kg)		0,55	
External Communication		CAN 2.0b, 125, 250, 500 Kbit/s, standard frames	
Communications to Battery Modules		RS-485	
External Control Signals		Control signal for line, pre-charge & charger contactors	
Monitoring Parameters		State-of-charge, error codes, system pack balance	
Isolation		Chassis to battery insulation measurement	
Operating Humidity		5% - 95%, non-condensing	
Mechanical Enclosure		IP56, UL 94V-0 (4x) 5 mm mounting holes	
Certifications		FCC Class B, CE	
Mechanical Enclosure		IP56, UL 94V-0 (4x) 5 mm mounting holes	
Operates at	10V - 150V	100V - 450V	350V - 700V

## SL-BMS LC / SOC Display

The SL-BMS LC / SOC Display provides a simple and elegant solution for the Sonnenschein Lithium LC battery modules.



### Overview

The SL-BMS LC / SOC Display can be used with up to 4 Sonnenschein Lithium LC 12V battery modules connected in series for fault and SOC indication. This technology has been deployed commercially since 2006.

### Features

- > 10-segment LED state of charge indication
- > Fault-indicator LED
- > Aids battery system balancing
- > 1.4m connection cable
- > Automatic sleep mode
- > Simple mounting

Specifications	
Max Batteries in Series	4 (60 V max)
Dimensions LxWxH	60 x 45 x 14 mm
Weight (kg)	0,12
Battery Discharge Indicator	10-segments blue LED State of Charge/status LED indicator
Communications to Battery Pack	RS-485
Monitoring Patterns	State of charge, error codes, module to module balancing
Mechanical Enclosure	IP56, UL 94V-0 (2x) M 4 threaded holes in bottom
Certifications	FCC Class B, CE