

SWE SeaSafe II 37V 28Ah 40Amp Daisy Chain Subsea Battery Module Datasheet

SWE PN 46793728.3412

February 18, 2025



Specifications

Max State of Charge-Standard – 93% SOC

Output Voltage

- 37.0 V - Nominal
- 40.9 V - Max
- 30.0 V - Min

Capacity @ 93% SOC:

- 28 Ah – Nominal @ 93% SOC
- 1036 Wh – Nominal @ 93% SOC

CC/CV Charge Voltage Setting:

- 41.0 V - Suggested
- 42.0 V - Max
- -0.3 V - Min

Communication Supply Voltage:

- 5.0 V - Nominal
- 6.0 V - Max
- -0.5 V - Min

Operating Current:

- Discharge
 - 40 A – Max (Continuous)
 - 45 A – Max (30 second pulse)
 - 52.5 A – Max (1 second pulse)
 - 90 A – Max (60 μ s pulse)
- Charge
 - 20 A – Suggested-Normal Temp
 - 40 A – Max- Normal Temp
 - 9 A – Max If $\leq 10^{\circ}\text{C}$ Low Temp
 - 0 A – Max If $\leq 0^{\circ}\text{C}$ Low Temp

Operating Temperature:

- Charge
 - $\geq 10^{\circ}\text{C}$ to $\leq 45^{\circ}\text{C}$ Normal Temp
 - $\leq 10^{\circ}\text{C}$ – Low temp $\leq 9\text{A}$ rate req.
 - $\leq 0^{\circ}\text{C}$ – NO Charge
- Discharge
 - -20°C to 60°C
- Storage
 - -40°C to 60°C

Module Dimensions:

- Height: 10.0 ± 0.1 in
- Length: 8.0 ± 0.1 in
- Width: 3.2 ± 0.1 in

Module Weight:

- ~ 17.3 lbs. (~7.9 kg) ± 0.2 lbs Max – Air

Life Cycles:

- 1000+ (Then 80% Original Capacity)

Description and Benefits

SWE SeaSafe II® Smart Battery Modules are designed to be autonomous (self-sufficient), easy to use battery system building blocks specifically developed for subsea vehicles, oceanographic systems, and deep-sea oil and gas infrastructure. Each module consists of pressure tolerant, high-performance Li-Polymer cells, a SWE Battery Management System (BMS) with patented safety protection and current paths, a thermally potted enclosure, and connectors for power and communications. The modules have a proven record of delivering longer life and longer missions than lead-acid batteries (Up to 4x more energy, 6x more available energy at colder temperatures typical of the seabed, and 8x longer cycle life) and pressure tolerance to 6000 meters ocean depth.

The SWE SeaSafe II® modules are designed as building blocks to connect in series and/or parallel, as needed, to create the desired voltage, capacity, and maximum current requirements of the desired battery system. These SeaSafe II battery modules include daisy chain connectors for Power and for RS485 Modbus Communications to enable easy module to module series interconnect into battery strings. Battery system voltage is the result of the number of battery modules connected in series in the string. These SeaSafe II battery strings can then be connected in parallel (with Diode ORing protection) to increase the battery system capacity in increments of the battery module capacity and/or increase maximum current output in increments of the module maximum current rating (with appropriate peak current shared load consideration). SWE SeaSafe II® modules are validated to an operational depth of 6000 meters. Modules inter-connect and operate within a subsea pressure balanced oil filled case instead of a more expensive subsea pressure vessel.

SeaSafe II® Battery modules are built within ISO 9001 – 2015 quality certified manufacturing and are UN38.3 certified for transportation. SeaSafe has earned certification from the American Bureau of Shipping (ABS) Type Approval – Product Design Assessment (PDA); Certificate Number 23-2400143-PDA, including UL And IEC tests passed.



National Standard	UL	UL 1642:2012
International Standard	IEC	IEC 62619:2017; IEC 61000-4-2:2008; IEC 61000-4-3:2010; IEC 61000-4-6:2013; IEC 61000-4-4:2012; CISPR 16-2:2016; UN 38.3:6th Edition
UN38.3 PASSED		

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Features

Battery Module Cells:

- High-density, long lasting, pressure-tolerant, SWE-validated and supply-controlled Lithium-Polymer cells using safe NMC chemistry, rated at 30 Ah, 3.7 V nominal.
- When charged to 93% SOC default, and discharged to ~1% SOC, each cell delivers about 28Ah and 3.7 V nominal.

Battery Module:

- Ten Series-Connected (10S x 3.7V) 30Ah (Li-Poly cells and BMS in a potted urethane case)
 - 37.0 VDC 28Ah @ 93% SOC.
- Pressure-tolerant in an oil-filled, pressure-equalized case tolerant to depth of 6000 meters.
- Patented Battery Management System built in for charge/discharge management, safety, and communications.

Configurable Maximum State of Charge % (SOC%):

- The Maximum State of Charge is the maximum percent of charge capacity to which the battery is charged.
 - Max SOC is managed by the BMS, which allows charging to occur until the Battery Module Voltage represented by the estimated Max SOC is achieved. Once this happens, the BMS automatically disconnects the charge until the SOC drops below the Max SOC.
- The Max SOC has a **DEfacto Factory Setting: 93% MAX SOC%**
 - The Max SOC can be custom set to a different SOC% at the factory if requested and aligned with SWE Sales contact prior to manufacturing of the battery modules.
 - Lower Max SOC% provides more charging cycles over the life of the battery, but less capacity-per-cycle. Higher Max SOC% provides more capacity-per-cycle, but fewer cycles over the life of the battery.

Potting:

- Thermally conductive, flexible urethane allows for shock and vibration isolation and large area heat dissipation.

Communications Connectors:

- | | | |
|-------------------|------------------------------|-------------------|
| • RS485 COMM IN: | TE CONNECTIVITY(CPC SERIES): | 206153-1 (MALE) |
| • RS485 COMM OUT: | TE CONNECTIVITY(CPC SERIES): | 206060-1 (FEMALE) |

Power Connectors:

- | | | |
|--------------|-------------------------------|--------|
| • PACK + RED | ANDERSON POWER (PP75 SERIES): | 5916G7 |
| • PACK - BLK | ANDERSON POWER (PP75 SERIES): | 5916G4 |

Hardware Reset Connector:

- | | | |
|------------------|-----------------------------|---------------------|
| • RESET, ISO GND | MOLEX MICROFIT 3.0 SERIES): | 43645-0200 (MALE) |
| ○ Mate: Socket | MOLEX MICROFIT 3.0 SERIES): | 43030-0002 (FEMALE) |

Battery Protection Functions:

- The module's Battery Management system (BMS) provides protection against the following conditions:
 - Short circuit in charge
 - Short circuit in discharge
 - Charging outside of allowed temperature range
 - Discharging outside of allowed temperature range
 - Excessive charge
 - Excessive discharge
 - Excessive continuous current
- The module also possesses back-up over-current safety fuses that are not user-serviceable.

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Cell Balancing within the Module:

- The module's BMS automatically accomplishes continuous balancing of the cells within the module using a discharge balancing method. Balancing current is about 80 TO 100 mA.

Module Balancing within the String:

- The module's BMS automatically accomplishes balancing of a series-connected string of modules during charging as each module reaches its end of charge.

Module Charge Control:

- Each module's BMS contains a charge control circuit that allows a simple, current-limited, Constant-Current/Constant Voltage (CC/CV) DC power source, such as an appropriately set voltage and current CC/CV power supply or an appropriate voltage solar panel to be connected to the battery module or serially connected string of modules to charge the battery system unattended. Autonomous charge control completely interrupts charge current when full State of Charge (SOC) is achieved or safety thresholds are triggered to assure that no cell within the module can be over-charged even when charge power is connected and unattended.
- **TO MAINTAIN BATTERY LIFE, BATTERY MODULE SHOULD BE RE-CHARGED TO $\geq 80\%$ SOC WHEN INITIALLY RECEIVED, OR WHEN APPROACHING 2% SOC, OR EVERY 6 MONTHS.**

Battery Module's BMS Communication method:

- Half Duplex RS-485 on BMS's communication port.
- Communication is via Modbus ASCII (default) or RTU (software selectable) protocol.

Other example BMS Functions via Modbus:

- Relative and Absolute gas gauging
- Module voltage
- Individual cell voltages
- Bootable software update, etc.
- Module current
- Module temperature
- Module/cell's internal short circuit warning

Communication Port Isolation:

- The communication port on the battery module's BMS is electrically isolated from the battery module by galvanic isolation with a peak isolation working voltage of ± 560 V.

Communication Port Power:

- External +5 V power and ground must be supplied to the battery module's BMS communication port in order to support communications. The maximum current is 4 mA with outputs unloaded.

Self-Discharge:

- Active Mode:
 - 1.5 mA from BMS plus $< 1\%$ cell self-discharge per month (at room temperature)
- Storage/Ship Mode:
 - < 0.15 mA from BMS plus $< 1\%$ cell self-discharge per month (at room temperature)

Energy Density:

- Volumetric:
 - ~ 247 Wh/l @ **93% SOC** ~ 265 Wh/l @ **100% SOC**
- Gravimetric
 - ~ 131 Wh/kg @ **93% SOC** ~ 141 Wh/kg @ **100% SOC**

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Battery Module Drawing:

