

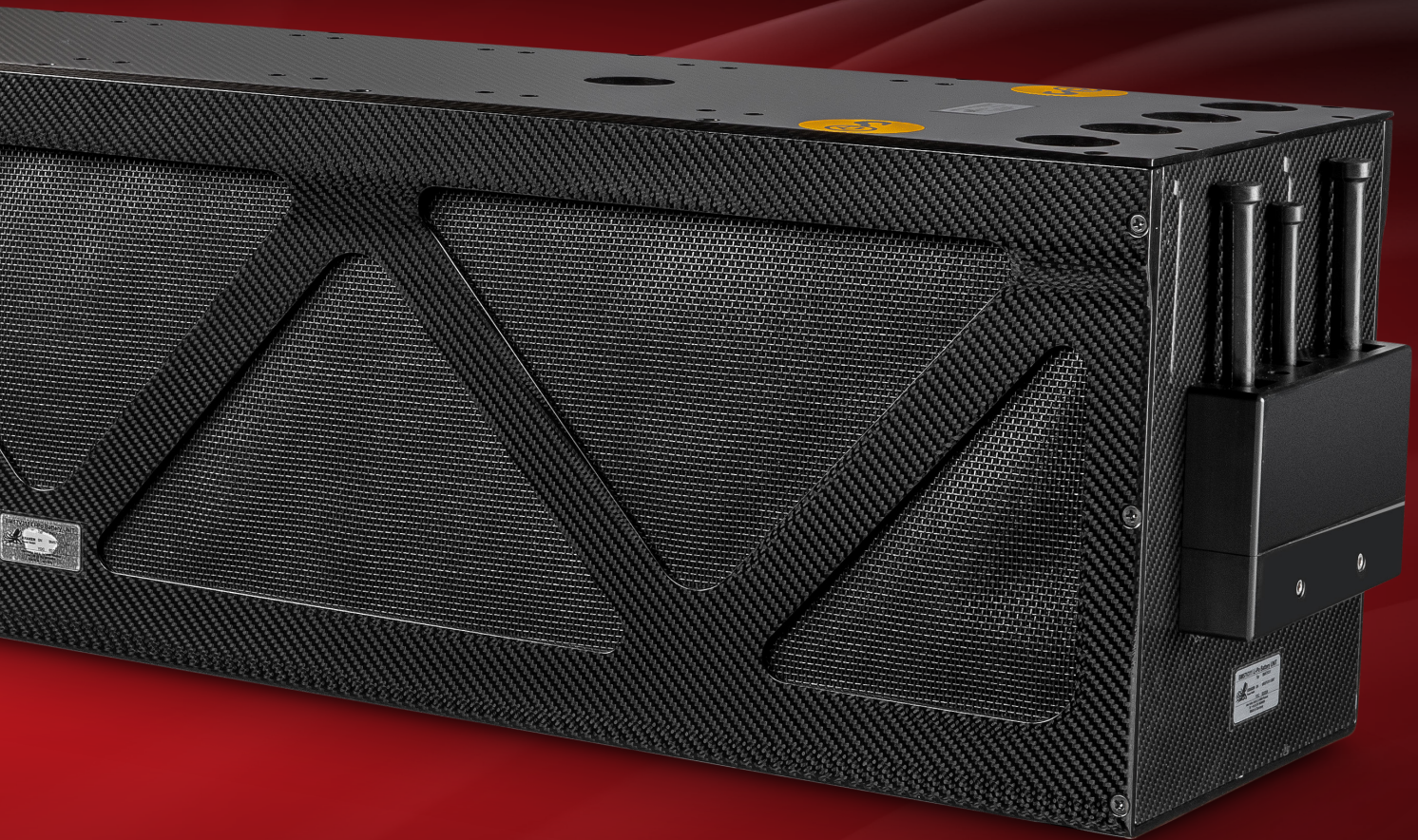
SeaPower™

BM57V311 Battery Interface Control Document



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General

Overview

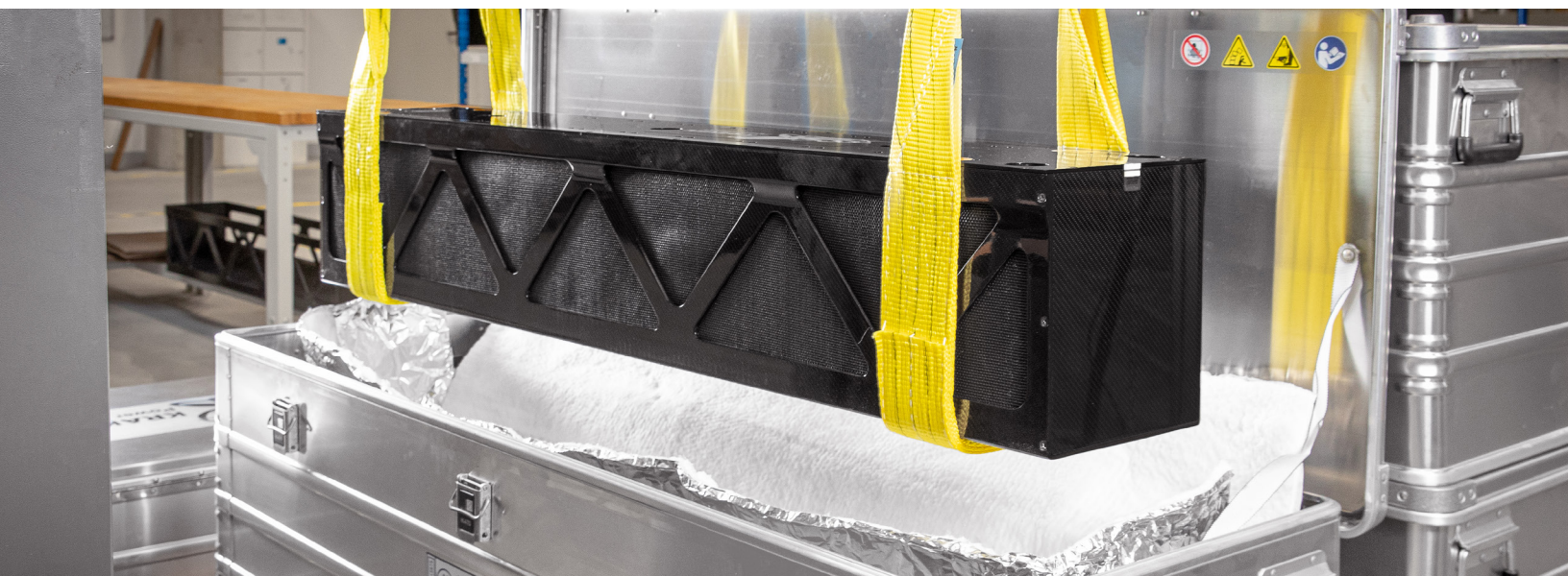
Part Number	BM57V311
Type	Subsea Potted Batteries
Nominal Energy Capacity	17.7 kWh
Nominal Voltage	311 Vdc
Depth Rating	6000 m
Certification	UN38.3
Transport	Air, Maritime, and Land
Life Cycle (Operational)	≥1000 cycles at 80%
Life Cycle (Calendar, Operational)	≥5–10 years
Life Cycle (Calendar, Storage @ SOC 50% +/- 5%)	≥5–10 years

Storage

Storage: -20–25°C (3 months)	SOC 30%
Storage: 25–40°C (1 month)	SOC 30%
Storage: 40–60°C (1 week)	SOC 30%

Features

SeaPower™ BMS	Intelligent control platform that ensures safe and efficient battery operation.
Passive Cell Balancing	Maintains voltage uniformity across all cells to optimize capacity and extend battery lifespan.
Integrated Cell Heaters	Enables cold-start and charging capability at low ambient temperatures.
Pre-Charge Circuit	Manages inrush current during connection to capacitive loads or powered systems, ensuring safe startup.
Parallel Battery Support	Enables safe connection of multiple batteries in parallel, even at differing states of charge (SOC).
State of Charge (SoC)	Calculates the battery's charge level based on voltage.
Electrical Isolation	Potting design prevents leakage currents and ensures safe operations in water under pressure.



BMS

System Architecture

Microcontroller	Firmware-based state machine with autonomous and host-controlled operation.
Host Communication	RS485 serial interface with multi-drop bus support.
Firmware Update Interface	USB port for in-field upgrades.
Control Signal Lines	BMU_ON and LOAD_ON signals triggered via shorted pin logic (safety interlock).
Internal Power Supply	Isolated DC/DC converter powers BMS independently from external load.

Monitoring and Telemetry

Sensors	Integrated voltage, current, and temperature sensing across system.
Telemetry Output	Real-time data at cell module and system level.
Self-Check	Automatic diagnostics at startup (< 1 s).
Fault Response	Real-time fault detection and response (< 100 ms).

Power Control

Solid-State Relays (SSR)	High-speed electronic switching for load and charger.
Hard Fuses	Permanent fault protection for catastrophic overcurrent.
Directional Diodes	Prevents reverse current during system interconnection or parallel operation.

Safety

Electrical Protection

Deep Discharge Protection	BMS automatic shutdown to prevent irreversible cell damage.
Undervoltage Protection	Firmware-controlled discharge cutoff to prevent undervoltage damage.
Overvoltage Protection	Firmware-controlled cutoff to prevent overvoltage during charging.
Overcurrent Protection	Firmware cutoff at 20 A and hardware cutoff at 23 A during excessive load or charging current.
Short Circuit Protection	Rapid isolation of output paths via hardware fuse.
Thermal Protection	Firmware-controlled cutoff in response to temperatures outside the safe operating range.
Pressure Relief	Dedicated vent path through the silicone encapsulation layer.
Propagation Prevention	Potted design with high-temperature flame-resistant spacers between cells.

Electrical

Battery Pack

Cell Chemistry	Lithium Cobalt Manganese Nickel Oxide
Cell Module	7S1P
Battery Pack Configuration	84S1P
Cell Voltage (Min/Nom/Max)	2.7 V / 3.7 V / 4.2 Vdc
Cell (0 to 100 % SoC)	3.0 V to 4.16 Vdc
Battery Voltage (0 to 100% SoC)	276 to 349.4 Vdc
Battery Capacity	57 Ah
Battery Fuse	23 A
ELC (Equivalent Lithium Content)	1512 g

Electrical Interface

J1X1 & J1X2 Power Connectors	LPBH9F (SubConn)
J1X3 COM Connector	MCLPBH9F (SubConn)
Communication Protocol	RS485
Serial Settings	115200 baud, 8-N-1

Charge

Max Charge Current in Water	15 A @ 25°C
Max Charge Current in Air	3 A @ 20°C
Max Charge Power	5241 W
Charging Temperature	10 – 45°C

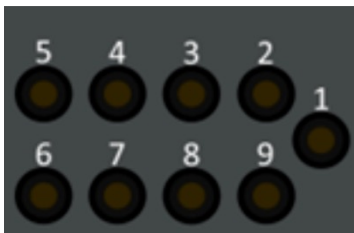
Discharge

Current (Nom/Peak)	15 A / 20A
Peak Current	30 s
Max Discharge Power	4660 W @ nominal voltage
Hotel Load	<6 W
Discharging Temperature	-10 – 45°C

Endurance @ 20 °C

@ 100% Load (15 A)	3 h 45 min
@ 75% Load	5 h
@ 50% Load	7 h 30 min
@ 25% Load	15 h

LPBH9F



Pin Signal

1	V+
2	V+
3	V+
4	V+
5	V-
6	V-
7	V-
8	V-
9	Reserved

MCLPBH9F



Pin Signal

1	RS485-
2	RS485+
3	BMU ON
4	BMU RETURN
5	COM_GND
6	Reserved
7	Reserved
8	Reserved
9	Reserved

Mechanical

Overview

Weight in Air	150 +/- 5 kg
Weight in Water	63 +/- 2.5 kg
Length	1425 +/- 6 mm
Width	249 +/- 2.5 mm
Height	265 +/- 2.5 mm

Displacement	86 L
External Housing	Carbon fiber
Internal Housing	Silicone
Compensating Fluid	Silicone
Structural Hardware	Titanium

