

Appendix

TYPE

RS-Series, Battery Management Controllers: MGMHV800300, MGHV800500.
 Software version: 1.20, Hardware version: 1.4.

RS-Series, Battery modules: MGRS12S4P176, MGRS14S3P132, MGRS16S3P132, MGRS24S2P088.
 Software version: 1.9, Hardware version: 1.0.

DESCRIPTION

The Lithium-Ion battery system consists of battery management controller per string and battery modules (maximum 48).

Features include:

- Battery module integrated slave BMS, and redundant BMS.
- Automatic thermal runaway suppression valve for gas venting to gastight exhaust.
- Cell level desalinated water flooding thermal runaway propagation protection system per string.
- Passive cell balancing.
- Interlock circuit in HV and CAN-bus connectors.
- CAN-bus communication.
- liquid cooling

Modules are arranged in series and parallel to obtain system voltage and stored energy capacity. Each string is provided with a battery management controller.

The MG Master HV is the safety and control unit of the battery system. It protects the connected battery modules against over-charging, over-discharging, over-temperature, under-temperature and controls the balancing of the battery cells. Besides a safety function, the MG Master HV monitors and tracks other important parameters to give insight in the battery status and energy consumption (for example SOH, SOC.) The CAN-bus communication to ship provides data when boundary limits are exceeded, SOC, SOH, charge voltage and current limits, discharge voltage and current limits, charging allowed, discharging allowed.

Each battery module has an integrated BMS measuring cell voltages, temperatures and controls balancing. This BMS communicates with a battery management controller MG Master HV. If the measured parameters exceed the limits, the battery management controller will automatically take action. Besides this software protection, a redundant BMS is added to each battery module having an independent hardwired protection mechanism to achieve maximum safety.

RATINGS

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RATINGS	<p>Battery controllers Battery Management Controllers: MGMHV800300, MGHV800500. MGMHV800300; 900Vdc, 300 Amps, 30mF, 24V aux supply. MGMHV800500; 900Vdc, 500 Amps, 30mF, 24V aux supply. With pre-charge circuit.</p> <p>Battery modules: Modules consist of various configurations of cells (IEC designation: INP13/155/250/M/-10+40/90). 80-90% Ethylene glycol Cooling system flow rate 1litre / minute minimum, at 0.5barG. Module propagation prevention system per module. Thermal runaway is limited to single cell under test conditions carried out.</p> <p>MGRS12S4P176 (a) Module capacity; 192 Ah (b) Maximum ambient operating temperature 50oC; (c) Automatic shutdown cell temperature limit 55 degrees Celsius and above; (d) Module operating voltage range; 36–50.4V (4.2V per cell) (e) Cell shutdown voltage limits; Overvoltage shutdown limit 4250mV. Undervoltage shutdown limit 2700mV. (f) Continuous charge and discharge rate; 384 Amp & 500 Amp (with liquid cooling.) (g) Peak bolted short circuit current 19.8kA at 4.2V cell voltage; (h) Equipment ingress protection rating IP65; (i) Gas volume generated (calculated per module); 8160 litres per module (j) Gas Temperature Classification and Division/Zone Group IIC T4.</p> <p>MGRS14S3P132 (a) Module capacity; 144 Ah (b) Maximum ambient operating temperature 50oC; (c) Automatic shutdown cell temperature limit 55 degrees Celsius and above; (d) Module operating voltage range; 42–58.8V (4.2V per cell) (e) Cell shutdown voltage limits; Overvoltage shutdown limit 4250mV. Undervoltage shutdown limit 2700mV. (f) Continuous charge and discharge rate; 288 Amp & 396 Amp (with liquid cooling.) (g) Peak bolted short circuit current 14.8kA at 4.2V cell voltage; (h) Equipment ingress protection rating IP65; (i) Gas volume generated (calculated per module); 7140 litres per module (j) Gas Temperature Classification and Division/Zone Group IIC T4.</p> <p>MGRS16S3P132 (a) Module capacity; 144 Ah (b) Maximum ambient operating temperature 50oC;</p>
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	<p>(c) Automatic shutdown cell temperature limit 55 degrees Celsius and above; (d) Module operating voltage range; 48-67.2 V (4.2V per cell) (e) Cell shutdown voltage limits; Overvoltage shutdown limit 4250mV. Undervoltage shutdown limit 2700mV. (f) Continuous charge and discharge rate;288 Amps & 396Amps (with liquid cooling.) (g) Peak bolted short circuit current 14.8 kA at 4.2V cell voltage; (h) Equipment ingress protection rating IP65; (i) Gas volume generated (calculated per module); 8160 litres per module (j) Gas Temperature Classification and Division/Zone Group IIC T4.</p> <p>MGRS24S2P088</p> <p>(a) Module capacity; 96 Ah (b) Maximum ambient operating temperature 50oC; (c) Automatic shutdown cell temperature limit 55 degrees Celsius and above; (d) Module operating voltage range; 72-100.8 V (4.2V per cell) (e) Module and cell shutdown voltage limits; Overvoltage shutdown limit 4250mV. Undervoltage shutdown limit 2700mV. (f) Continuous charge and discharge rate; 192Amps & 264Amps (with liquid cooling.) (g) Module Peak bolted short circuit current 9.9kA at 4.2V cell voltage; (h) Equipment ingress protection rating IP65; (i) Gas volume generated (calculated per module) 8160 litres per module; (j) Gas Temperature Classification and Division/Zone Group IIC T4.</p>
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