



Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

Manufacturer	MG Energy Systems B.V.
Address	Foeke Sjoerdswei 3, Leeuwarden, 8914 BH, Netherlands
Type	Lithium-Ion Battery System
Description	<p>RS-Series, Battery Management Controllers: MGMHV800300, MGHV800500, and Battery modules: MGRS12S4P176, MGRS14S3P132, MGRS16S3P132, MGRS24S2P088.</p> <p>The Lithium-Ion battery system consists of battery management controller and battery modules. Battery modules have integrated slave BMS and redundant BMS. Module automatic thermal runaway gas venting to gastight exhaust. Thermal runaway propagation protection system per string.</p>
Trade Name	MG Lithium-Ion RS Battery System
Application	Marine
Specified Standard	<p>Marine according environmental categories Test specification 1, December 2020, ENV2. for battery management controller and battery management system</p> <p>Test specification 5, March 2019 for the battery module</p> <p>ES-TRIN 2021 Article 10.11.</p> <p>Type approval procedure TA14, version 04, September 2020</p>

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Ratings

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

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.

Please see appendix of this certificate for the battery module ratings

Other Conditions

- Per project plan approval required as per Ship Rules part 6, chapter 2, section 12, and part 5
- vent off arrangement to be gas tight steel/stainless steel, vented off to open air safe location
- Module propagation prevention system per module: 12 litre 0-50% Ethylene glycol, compressed by air to 2.5bar. PPS system required per string. With failure leakage alarm.
- earth fault detection to be provided
- Isolating heat exchanger to be placed between battery modules and ship cooling system
- use for emergency source requires alarm and shutdown to comply with LR table
- Preferred cooling system leakage detection implemented
- Diagnostic tool availability on vessel
- When multiple string configuration the BMS will limit output current when too many strings are lost (BMS C-Rating limit activates) and ship PMS should take into account

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This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

The Design Appraisal Document PRJ11100304071 and its supplementary Type Approval Terms and Conditions form part of this Certificate.

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