

Amendment 3 to AIS- 038 (09/2022)

Specific Requirements for M, N Category Electric Power Train Vehicles

1.0 Annexure IX-K

Substitute following Annexure IX-K for existing Annexure IX-K:

Note: Earlier Annexure IX-K was inserted through Amendment 2 published on 29th August 2022.

Annexure IX-K

Technical Requirements for Traction Battery (REESS) of M, N Category Electric Power Train Vehicles

0. The Traction Battery Pack (REESS) design and manufacture guidelines as specified in this Annexure, to be followed by REESS manufacturer. Same shall be verified by test agency at the time of type approval and CoP of REESS
1. The manufacturing date of battery cells shall be clearly visible on the cells used to build REESS, with clear month and year of manufacture (format mm-yyyy). REESS manufacturer shall print clearly visible manufacturing date on the battery pack. If manufacturing date is in the form of code on the cells, then REESS manufacturer shall print manufacturing date on the REESS pack and shall maintain record of manufacturing date(s) of cells used in the assembly of pack
2. Cells used to make REESS, shall be certified as per as per IS 16893-Part 2 and Part 3 by NABL accredited lab or by test agency notified under CMV Rule 126.
3. Cells used to make REESS, shall undergo minimum 1 cycle of charge-discharge at C/3 current rate. Data of this cycling shall be maintained by REESS pack manufacturer.
4. REESS shall have pressure release vent provided, to avoid building up of internal pressure and release of gases in case internal single cell short circuit. Joints, in the coolant lines which pass inside the battery, shall be leak proof.
5. REESS shall have Active paralleling circuits for the parallel connection of strings to eliminate circulating currents. These power semiconductor devices used for interconnecting strings will also act as protection/safety switches which will detect any faulty strings and isolate them. They will allow bidirectional flow of currents to charge and discharge the pack. The parallel strings will get isolated if it is detected to be faulty. Therefore, active paralleling circuits shall be mandatory in the battery packs or circulating

current mitigation techniques shall be adopted.

Alternatively, fuses / bond wires can also be used to prevent circulating currents flowing through the cells connected in parallel. Such precautionary devices will help in isolation of faulty cells connected in parallel.

6. Sufficient cell-to-cell spacing distance shall be maintained for effective heat transfer from the cell and also to isolate the cells in case of thermal run away in REESS. The inter cell gap in REESS shall be decided based on the type of cell geometry used viz., cylindrical, prismatic or pouch and capacity of cells.
7. REESS shall have additional safety fuse or circuit breaker in addition to the features available in Battery Management System (BMS).
8. REESS with 100% SoC shall be tested for water ingress protection IP X7 as per IEC 60529. There shall be no fire or explosion during IP X7 testing of REESS. Alternatively, immersion into water test can be performed as per ISO 6469-1:2019.
9. BMS shall be microprocessor/microcontroller-based circuit.
10. BMS shall comply EMC requirements as per AIS 004 Part 3 or AIS 004 Part 3 Rev 1 as applicable at ESA level.
11. BMS of REESS shall be verified for following safety features during REESS testing as per Annex IX of this standard.
 - a) Over-charge protection
 - b) Over-discharge protection
 - c) Over-temperature protection:
 - d) Overcurrent protection
 - e) Short circuit protection
12. Onboard/portable charger
 - a) Charger shall have Charge voltage cut-off to avoid over charging of REESS (Traction Battery)
 - b) Charger shall have soft-start function every time REESS is connected for charging.
 - c) Charger shall have Pre-charge Function to detect deep discharge condition of battery.
 - d) Charger shall have input supply variation (230 VAC +/- 10%) protection, output voltage and current regulation.

- e) Charger shall have earth leakage detection as per Class 1 of IS 12640 Part I:2016.
 - f) On-board/portable charger shall have communication with battery (BMS).
13. Each REESS manufactured shall have a traceability document in which the details of cells, BMS, charger used along with serial/batch number, charge discharge data values etc shall be maintained with the REESS manufacturer.
 14. Adequate protection of cells in case of regenerative braking shall be considered in REESS design.
 15. Data of critical parameters of battery pack shall be logged by BMS and latest data for at least one month shall be maintained. Alternatively, latest data also can be stored on cloud (remote server) at least for one month.