work product ISO/DIS 26262-3 clause 5.5

Item Definition for Battery Management System

purpose and functionality of the Battery Management System

This BMS has been developed as an SEooC system.

Purpose
- The purpose of the designed Battery Management System (BMS) is to protect the nearby people, passengers / occupants, and other external systems from damages caused due to unsafe use or operation of Lithium-based batteries.

Scope
- This ASIL-C compliant BMS is designed for use in Lithium-based batteries, used for propulsive or non-propulsive applications in L category 2W vehicles.
- This BMS is designed for 72V.
- No exposed Metal parts comes in contact with rider.
- This BMS is designed for use in vehicles with a gross power consumption of less than or equal to 9 kW.
- The Locking and Unlocking Mechanism of swap-able battery is on the Vehicle not on the Battery.
- The BMS has interfaces with other external systems, primarily battery chargers and vehicle control units, to get the required vehicle information.

additional resources and descriptions for the Battery Management System

N°	Resource Title	Resource URL
1	README.md	Re_Work_FUSA_BMS_ASIL_C_2W_11_08/README.md
2	LICENSE.txt	Re_Work_FUSA_BMS_ASIL_C_2W_11_08/LICENSE.txt

Preliminary Architecture

Overview

Components

Name	Type	Allocated Functions/ Activities	Contained by	Connected to

Functions of the item

ID	Name	Description	Allocation
F-20	Ensure Battery is operating in SOA.	Ensures the Safe Power Delivery to the Vehicle	
F-19	Measures Battery Insulation Resistance		
F-18	Communicate with externally connected devices.	Battery state information, temperature, voltages, fault conditions, etc.	
F-16	Perform State Estimations (SOC, SOH, SOP)	(OV/UV/OC/SCP/OT/UT)	
F188	Perform HVIL Integrity Check		
F-15	Measure battery temperature		
F-14	Measure battery voltage		
F-22	Measure battery current		
F-21	Detect overtemperature condition	Prevent battery from entering and staying in overtemperature condition	
F-13	Detect undertemperature condition		
F-12	Detect overvoltage condition		
F-11	Detect undervoltage condition		
F-10	Detect open cell connection		

ID	Name	Description	Allocation
F-9	Detect overcurrent condition		
F-8	Detect thermal runaway condition		
F-6	Measure FET temperature		
F-4	Notify user about critical fault conditions	Notify the user about hazardous / life threatening conditions such as thermal runaway, fire, gassing / venting, etc.	
F-3	Communicate with charger	BMS must communicate with charger to ensure charger always provides power to battery within its safe operating region	Master Controller
F-2	Wakeup BMS on external command	Wake up BMS from sleep mode / power down mode upon external command / request.	
F-1	Estimate internal resistance	IR estimation of the battery or cells	
F117	Measure insulation resistance	Measure insulation resistance between the Pack+ and Bat-	
F-17	Balance battery	BMS must balance an imbalanced battery pack	
F-7	Control FETs	Control charge /discharge path mosfets	
F-24	Send / receive data on CAN		
F-25	Estimate battery SOC		
F-30	Detect open cell connection		
F-31	Notify user about critical faults		
F-32	Perform BMS self diagnostics		
F-33	Communicate with charger		
F-34	Wakeup BMS on external command		
F-35	Emergency disconnect		
F-39	Estimate battery SOH		
F-41	Perform precharge sequence		
F-54	Measure battery internal resistance		

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ID	Name	Description	Allocation
F-49	Measure shunt temperature		
F-55	Measure link voltage		
F111	Detect current based faults.		
F-47	Detect cell voltage based faults		
F-40	Detect temperature based faults		
F192	Estimate battery SOP		
F193	Detect Thermal Runaway		
F195	Get data from Power Distribution Section (PDU)		
F-52	Control current flow through HV lines		
F-48	Measure battery current		
F112	Detect short-circuit condition		
F-36	Control precharge switch		
F-51	Control HV power path switch		
F-56	Control balancing circuit		
F-59	Provide temperature and voltage information to master		
F-60	Provide fault information to master		
F-57	Measure cell voltages		
F-58	Measure battery temperature		
F-23	Balance battery	MCU implements algorithms to balance the battery	
F-42	Measure battery voltage		
F-43	Supply power for low voltage analog systems		
F-44	Monitor input power quality		

ID	Name	Description	Allocation
F-45	Monitor output power quality		
F-61	Provide power supply quality information to Master		
F-53	Measure insulation resistance		
F115	Collect cell voltages		