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Modular Battery Management System Functional Description

The Modular Battery Management System consist of a Battery Management Control Unit (BMCU) mounted in the Switch Box, and a number of Battery Cell Modules each containing 4 or 8 cells and a Local Monitoring Unit (LMU).

Main Electrical Data

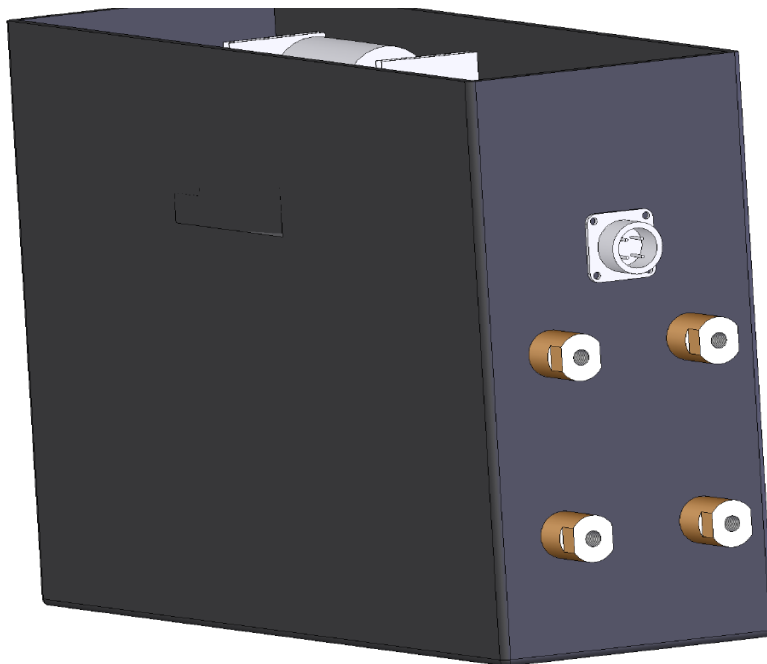
Parameter	Unit	Range	Comment
Operating Ambient Temperature	°C	-30 to +60	
Number of Cells in series		104	
Cell Type (Thunder Sky TS-LFP40AHA)	V	4.25 to 2.5	Charge / Discharge voltage limits
Charge voltage/current	V	220V – 14A	
Nominal voltage	V	332.8 V	
Discharged voltage	V	260V	
Max. Cont. Discharge Current	A	120A	
Max. Peak Discharge Current (max 5 sec duration)	A	400A	
Max. REGEN current	A	120A	

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SWITCH BOX

The Switch Box contains:

- Battery Management Control Unit PCB (BMCU)
- Main Fuses
- Main Contactors
- PreCharge Fuse and Resistor
- PreCharge Contactor
- Charge relay
- Current Measurement Shunt Resistor
- Connectors for control signals




Battery Management Control Unit:

The BMCU communicates with the vehicle computer via CAN-bus and controls the complete Battery Pack during Charge and Discharge. Current is measured with a current shunt resistor and control of an optional off-board POWER MOSFET or IGBT is available for overload and short-circuit protection.

BMCU Features:

- Controls up to 32 LMU's
- Controls Active Cell Balancing
- Local Isolated Communication with LMU's
- Automatic Addressing of LMU's
- CAN-bus Interface
- Isolated Diagnostics Interface (RS232)
- 7 General Purpose Inputs
- 8 General Purpose Outputs
- Controls Charge Process (Voltage and Current)

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- Isolation Fault Detection
- Current Measurement

Main BMCU Data

Parameter	Unit	Range	Comment
Supply Voltage	V	8 to 30	12V or 24V nominal
Current Consumption (Normal Operation)	mA	< 20	
No. of LMU's		1 to 32	Limited by Battery Pack < 600V
Battery Pack Voltage	V	< 600	Max. Charge Voltage
General Purpose Inputs	mA	< 1	Active when pulled to GND
General Purpose Outputs	A	<= 1.5	Active High Voltage = Supply Voltage
Charge Control Analog OR Digital			Isolated PWM signal CAN-bus communication
CAN Bus Communication	Baud	125k	CAN 2.0A (11 bit ID)
Cell Modules Communication	Baud	4800	Isolated 4-wire connection


Switch Box Component Data

Components	Unit	Range	Comment
Main Fuses	A	400	Bussmann FHW-400A
	V	500	
Main Contactors Power Contacts	A	500	Tyco KILOVAC EV200
	V	900	
Main Contactors Aux Contacts	A	2	
	V	30	
Main Contactors Coil	V	9V – 36V	12V nom.
	A	1	
PreCharge Fuse	A	20	Bussmann 20CT
	V	690	
PreCharge Contactor Contacts	A	100	Tyco KILOVAC LEV100
	V	900	
PreCharge Contactor Coil	V	9V – 16V	12V nom.
	A	0.36	
PreCharge Resistor (2*100 Ohm in parallel)	Ohm	50	Welwyn WDBR2 (2kW)
Charger Relay Contacts	A	30	Potter & Brumfield
	V	600	
Charger Relay Coil	Vac	240	
Current Measurement Shunt	A	150	Continuous current Peak current (10 sec)
	A	300	

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Switch Box Connections

Power Connections	Pin	Brass Studs with M8 thread
+HV input from Battery Pack -HV input from Battery Pack	+ -	To fuses and HV contacts
+HV output to vehicle -HV output to vehicle	+ -	From HV contacts
Charger Connector	Pin	5-way chassis plug Amphenol 62GB-12E14-22PN
+Charge voltage	A	PowerFinn Charger (B+)
-Charge voltage	B	PowerFinn Charger (B-)
Charger coil (L)	C	PowerFinn Charger (L1 out) 230Vac
Charger coil (N)	D	PowerFinn Charger (N1 out) 230Vac
Spare	E	
Contactors Connector (Connected to Vehicle Control System)	Pin	12 way panel socket ITT CANNON NEPTUNE 192900-0308
+HV Contactor Pilot 1	A	Pilot contact: 1+2 closes when main contact closes
+HV Contactor Pilot 2	B	Pilot contact: 1+2 closes when main contact closes
+HV Contactor Coil+	C	Supply with 12V to operate
+HV Contactor Coil-	D	Connect to GND
PreCharge Relay Coil+	E	Supply with 12V to operate
PreCharge Relay Coil-	F	Connect to GND
-HV Contactor Pilot 1	G	Pilot contact: 1+2 closes when main contact closes
-HV Contactor Pilot 2	H	Pilot contact: 1+2 closes when main contact closes
-HV Contactor Coil+	J	Supply with 12V to operate
-HV Contactor Coil-	K	Connect to GND
Spare	L	
Spare	M	
Spare	N	

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BMCU PCB	BMCU Connector (Connected to Vehicle Control System)	Pin	19 way panel socket ITT CANNON NEPTUNE 192900-0039
+12V supply	Ignition (14V-in)	A	BMS Supply from vehicle (Operation)
+12V supply	+14V Charger Aux	B	BMS Supply from BRUSA Charger (Charging)
GND	Vehicle GND	C	GND
IN 1	Enable Discharge Input	D	Pull low when ignition is on
IN 2	Spare Digital input 1	E	Active low
IN 3	Spare Digital input 2	F	Active low
PWM1	Spare Isolated Digital Output 1	G	Open Collector
PWM2	Spare Isolated Digital Output 2	H	Open Collector
OUT 1	Run Output	J	Active high (14V) when run is OK
OUT 2	Pack Cooling Fan On	K	Active high (14V) to turn fans on
CAN-HI	CAN HI	L	CAN bus communication
CAN-LO	CAN LO	M	CAN bus communication
RS-Tx	RS232 Tx	N	Diagnose/configuration (Isolated)
RS-Rx	RS232 Rx	P	Diagnose/configuration (Isolated)
RS-GND	RS232 GND	R	Diagnose/configuration (Isolated)
OUT 3	Spare Digital Output	S	
OUT 4	Charging Status: Charging	T	RED LED
OUT 5	Charging Status: Balancing	U	YELLOW LED
OUT 6	Charging Status: Charging Complete	V	GREEN LED