

“Create Legacy Through Infrastructure”



Morwakoma Matji Investment Holdings (Pty) Ltd

MMIH ENERGY AFRICA : **BATTERY PACKS SPECIFICATIONS**

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TECHNICAL SETUP AND SPECIFICATIONS

The overall technical specifications of the set-up is presented below by Figure 1. The presented system is composed of:

- a) 26 battery energy storage system (BESS) connected in parallel each with installed energy of 5MWh/1.5MW. The total installed energy will be 130MWh/39MW.
- b) The BESS unit contains a control unit as well as a separate outdoor box (IP54). The control cabinet is a system control center, which is equipped with IPC, monitoring system, emergency switch, UPS, battery control board and FSS control board. The control cabinet also provides the communication interface between Equipment and EMS. In addition, it will provide the power supply and indicator lights of the system.

The overall specifications of the BESS are presented below:

The proposed BESS is composed of battery modules of 166V (52 cells in series, LFP chemistry, prismatic). The battery cells have a capacity of 280Ah. The total energy content of each module is 46.5 kWh. In order to reach 1494V, the 9 battery module's are connected in series. This is called a rack. To reach the 5.02MWh, 12 racks are connected in parallel. The operating temperature range is 20°C to 50 °C – the entire battery container is liquid cooled.



Figure 1.
BESS specifications
based on LFP Technology.

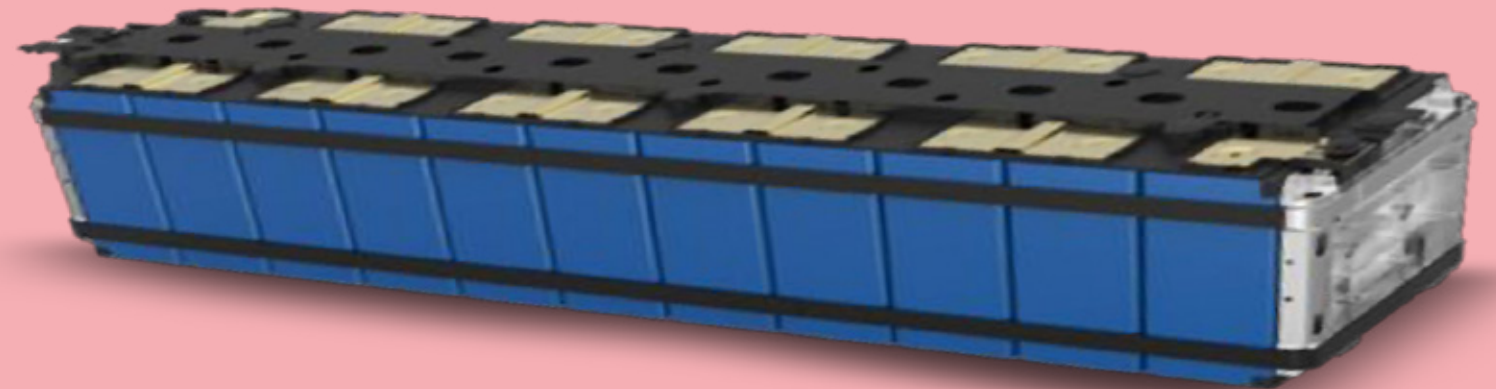


Figure 2.

BATTERY PACK / PRODUCTION LINE

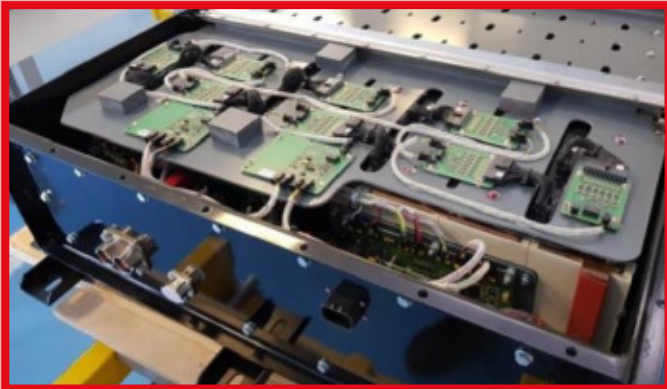
- Production of battery modules between 15 and 100kWh
- Max. production capacity: 30.000 battery modules of 100kWh.
- Air and liquid cooled
- Production of battery modules between 15 and 100kWh
- Max. production capacity: 30.000 battery modules of 100kWh.
- Air and liquid cooled
- Fully automated



BATTERY PACKS FOR EVS & TRACTION APPLICATIONS

ELECTRICAL DATA						
Energy	38kWh	76kWh	66.5kWh	133 kWh	76 kWh	152 kWh
Technology	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC	Li-Ion NMC
Nominal voltage	345.6V	345.6V	604.8V	604.8V	691.2V	691.2V
Voltage max.	403.2V	403.2V	705.6V	705.6V	806.4V	806.4V
Voltage min.	259.2V	259.2V	453.6V	453.6V	518.4V	518.4V
Discharging power max. (10s)*	152 kW	304 kW	266 kW	532 kW	304 kW	608 kW
Charging power max. (10s)*	76 kW	152 kW	133 kW	266 kW	152 kW	304 kW
Continuous power (RMS)	38 kW	76 kW	67 kW	133 kW	76 kW	152 kW
Internal HV-Fuse	500A	1000A	500A	1000A	450A	900A
Power consumption in standby mode	5W	5W	5W	5W	5W	5W
Cycle life (at 80% DoD, 25°C)	>3000cycles	>3000cycles	>3000cycles	>3000cycles	>3000cycles	>3000cycles

MECHANICAL DATA						
Operating temperature range during discharging	-20 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C	-20 to 60°C
Operating temperature range during charging	-10 to 45°C	-10 to 45°C	-10 to 45°C	-10 to 45°C	-10 to 45°C	-10 to 45°C
Protection classes	IP67	IP67	IP67	IP67	IP67	IP67
Weight (incl. contractor box)	274	550	481	952	550	1076
Dimension (W x L x H) in mm	503 x 1802 x 190	735 x 2395 x 190	910 x 1469 x 210	910 x 1469 x 454	735 x 2395 x 190	735 x 2395 x 426



BATTERY PACKS **FOR ESS**

Figure 4

- Battery cluster (max. 8 modules in series)
- 344 kWh/1228 V
- Charging/discharging: 0.5C
- CANBUS 2.0, RS485, Ethernet
- Dimensions: W862, D1074, H2374mm
- Weight: 2700kg

Battery module

- 43 kWh
- 153V
- IP 54
- Liquid cooling

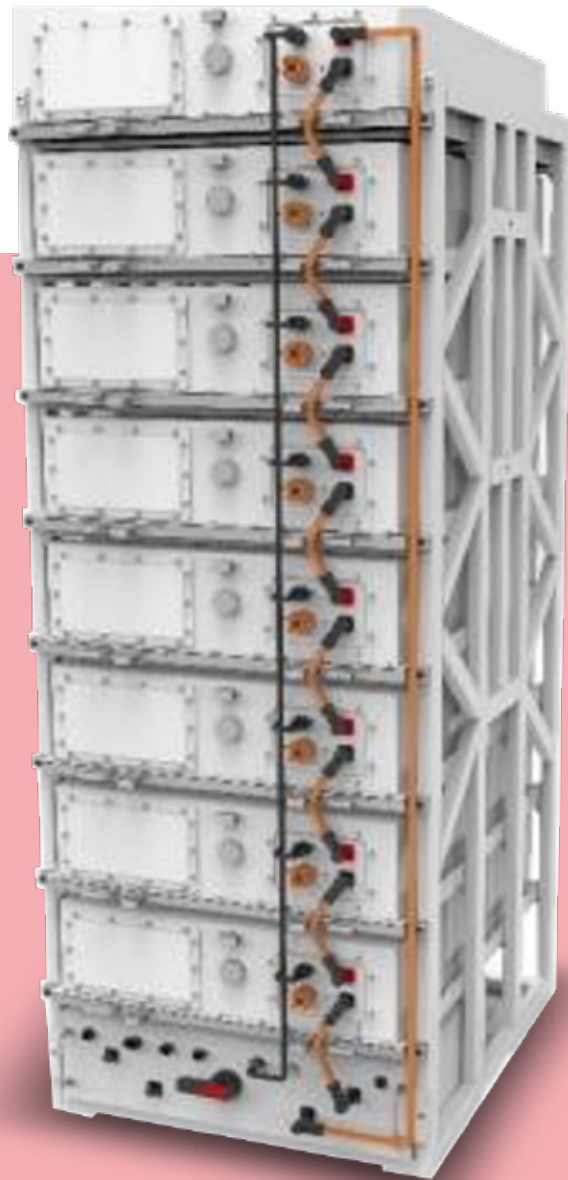
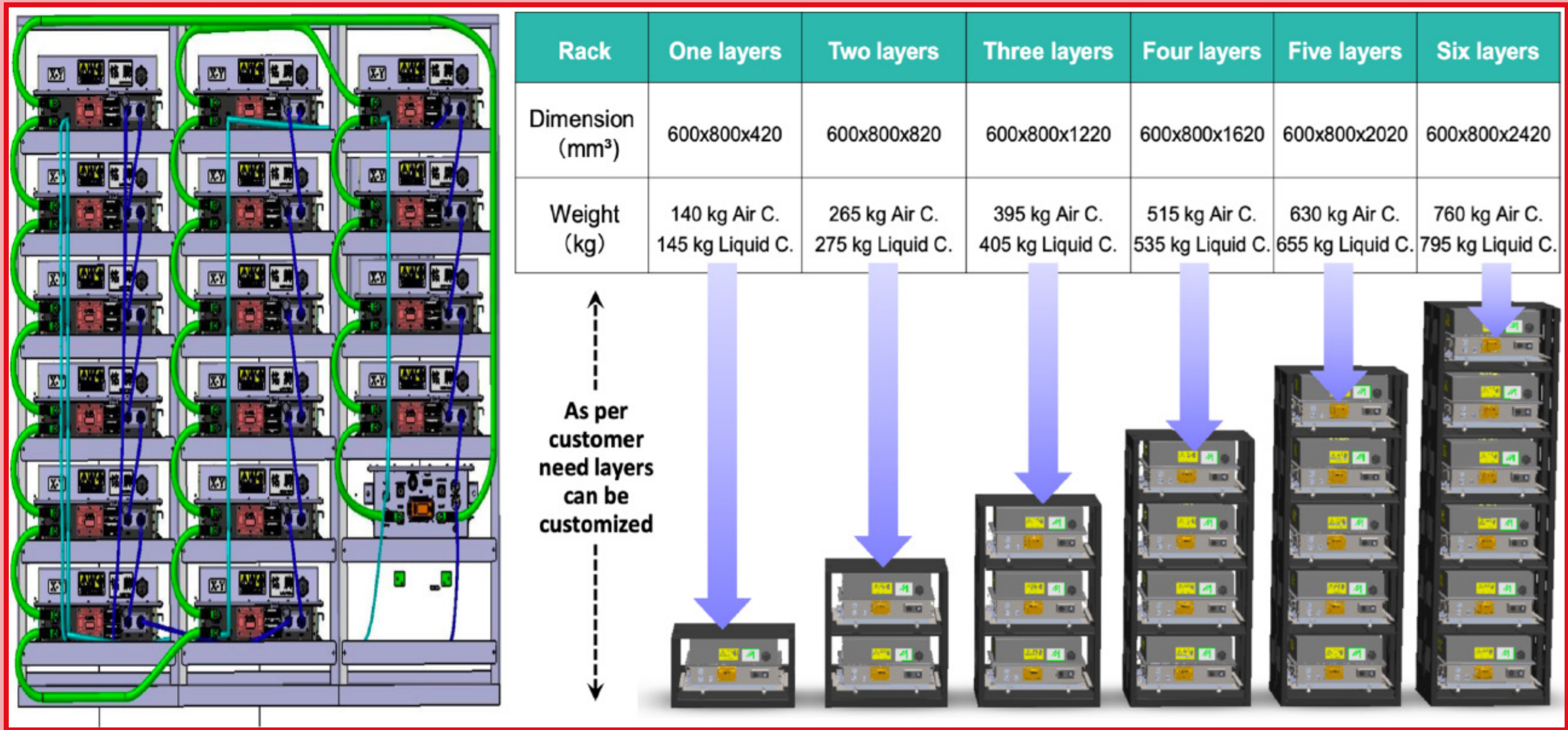


Figure 4.
BESS specifications
based on LFP Technology.



Battery module

BATTERY PACKS **FOR ESS**



BATTERY PACKS **FOR ESS** (*CLUSTER*)

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9	Cluster 10	Cluster 11	Cluster 12	Cluster 13	Cluster 14
Module 1 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 2 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 3 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 4 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 5 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 6 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 7 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Module 8 (kWh)	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Total ESS capacity (kWh)	344	688	1,032	1,376	1,720	2,064	2,408	2,752	3,096	3,440	3,784	4,128	4,472	4,816
Power (kW)	100	300	500	500	500	1000	1000	1000	1000	1000	1000	2000	2000	2000

BATTERY PACKS **FOR ESS**

The overall specifications of the PCS (1.5MW) unit are summarized below. Each container will contain 1 inverter of 1.5MW.

Part Number	EPCS-1000IEC	EPCS-1200IEC	EPCS-1500IEC	EPCS-1725IEC
DC Connection				
Full Power DC Voltage Range ⁽¹⁾	623 to 1500 V	762 to 1500 V	952 to 1500 V	1052 to 1500 V
Max. DC Charge Continuous Current	1617 A			1617 A / 808.5 A x 2
Max. DC Discharge Continuous Current	1666 A			1666 A / 883 A x 2
AC Connection				
AC Output Power	1000 kW / kVA	1200 kW / kVA	1500 kW / kVA	1725 kW / kVA
Max. AC Output Continuous Current	1672 A			1448 A
Nominal AC Voltage Vrms ⁽²⁾	400 V	480 V	600 V	690 V
Nominal AC Frequency	50 / 60 Hz			
Current Harmonic Distortion (THDi) ⁽³⁾	< 3% IEEE519			
Power Factor	Four quadrants			
Efficiency				
Max. Efficiency	98.30%	98.35%	98.50%	98.52%
Euro Efficiency	97.53%	97.87%	98.40%	98.30%
CEC Efficiency	98.00%	98.14%	98.37%	98.38%
Protection				
DC Side	DC load break switch with DC fuses			
AC Side	AC circuit breaker			
DC Overvoltage	Surge arrester, class II as standard			
AC Overvoltage	Surge arrester, class II as standard			
Ingress Protection	IP55 / IP34 / IP34 (electronics / air duct / connection area)			
General				
Dimensions (W x H x D)	2200 x 2280 x 1100 mm (without protection shed) 2420 x 2280 x 1436 mm (with protection shed)			
Approximate Weight	2600 kg			
Environment				
Operating Temperature ⁽⁴⁾	-30 °C to +60 °C			
Storage Temperature	-30 °C to +70 °C			
Relative Humidity	0% to 95% RH, non-condensing			
Altitude ⁽⁵⁾	< 4000 m			
Acoustic Noise (1 m)	< 79 dB(A) @ 25 °C, full power			
Cooling	Forced air cooling			
Compliance				
Safety / EMC	IEC 62477, IEC 61000-6-2, IEC 61000-6-4			
Grid Connection	VDE-AR-N 4110:2018, G99, EN50549-2			G99, EN50549-2

Specifications are subject to change without prior notice
Subject to change based on customer's requirements
(1) Minimum DC voltage at nominal AC voltage and unit PF=1. The minimum DC voltage depends on AC voltage and power factor.
(2) An isolation transformer is required between the PCS and loads.
(3) THDi at nominal power
(4) Power de-rating above 50 °C
(5) Power de-rating above 2000 m



Figure 5.
PCS specifications

BATTERY PACKS **FOR ESS**

- a) Current measurements
- b) Voltage measurements
- c) Temperature measurements
- d) State functions calculations such as SoC and SoH. Additional state functions can be
- e) Thermal Management
- d) System monitoring
- e) Charge & discharge control
- f) Communications
- g) Safety protection
- h) Fault diagnosis

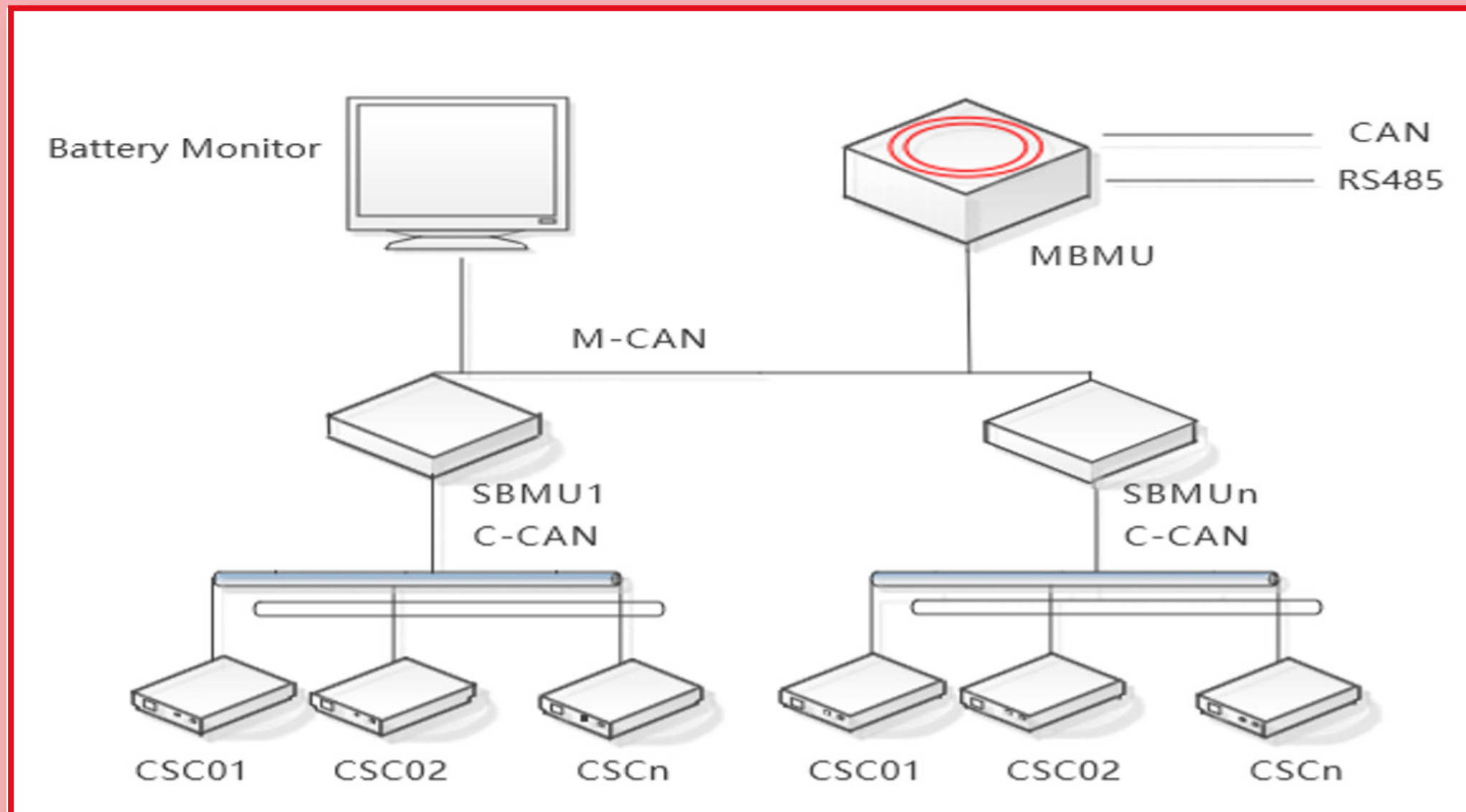
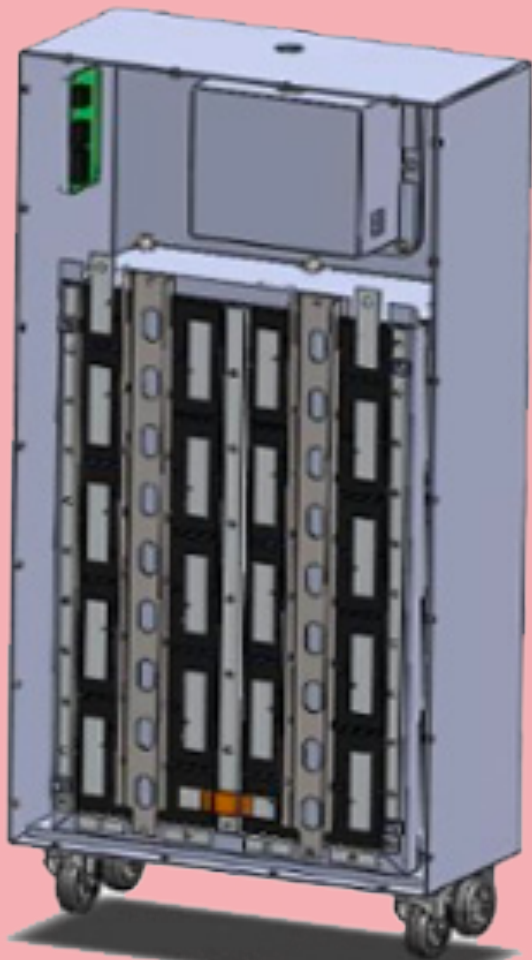


Figure 6. BMS topology layer

BATTERY PACKS FOR ESS

Technical specifications for household battery packs (2024)b) Voltage measurements

NOMINAL VOLTAGE	54,4V dc
MAXIUMUM VOLTAGE	61,2V dc
NOMINAL CHARGE CURRENT	66 A
NOMINAL DISCHARGE CURRENT	66 A
NOMINAL ENERGY CAPACITY	16,6 kWh
NOMINAL POWER	3.6kW/5 kW
PEAK OUTPUT POWER	3.6kW/5 kW
BATTERY CHEMISTRY	LFP
CYCLE LIFE 90% DOD	≥10000 Cycles
BATTERY MANAGEMENT SYSTEM	
CELL BALANCING	Up to 300 mA
COMMUNICATION	CAN FD up to 5 Mbit/s SPI UART (RS485, RS232)
MEASURMENTS	18 volt. measurements, 8 temp. measurements, plus 6 auxiliary measurements.
SAFETY	Up to Automotive Safety Integrity Level D
PROTECTION	abnormal voltage, current, temperature protections, low soc protection, etc
DIMENTION	165 mm x 65 mm x 15 mm
Operating Temperature (battery should be kept in door)	-20 to 50 °C
BATTERY MECHANICAL SPESIFICATIONS	
DIMENSIONS	520 X 1100 X 235 MM
WEIGHT	190 kg
DISCHARGE TEMPERATURE RANGE	(-20 to 50°C)
CHARGE TEMPERATURE RANGE	(0 to 50°C)
ENCLOSURE PROTECTION	IP20 INDOOR
COOLING	NEUTRAL CONVECTION
NOISE AT 1 M DISTANCE	< 30 Dba
MAX ALTITUDE	5000 M
MOVING AND STABILISATION	WHEELS WITH BRAKE





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