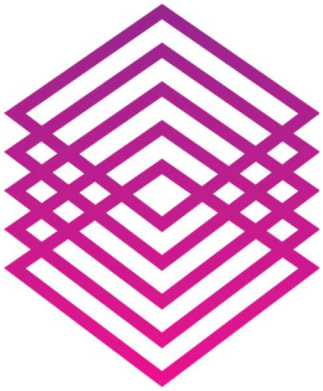

KORE POWER

Mark 1 Technical Datasheet

Document Number: KORE-M1-DAS-0002

Product Name: Mark 1 Energy Storage System

Revision History

Rev.	Description	Date	Prepared	Reviewed	Approved
A	Approved for use	9/13/2019	D.K.	M.Z.	N.W.
B	Changed document format	10/12/2019	D.K.	M.Z.	N.W.
C	Information update	6/1/2020	D.K.	M.Z.	N.W.
D	Information update / add MsBMS	1/12/2021	M.Z.	B.B.	N.W.
E	Add 9540A, fuse kAIC ratings, Updated Table 6	5/25/2021	M.Z.	B.B.	N.W.
F	Updated Table 7 & 8	6/16/2021	B.B.	M.Z.	N.W.
G	Add KP-MC	1/24/2022	J.H.	M.Z.	B.B.

Reference Documents

Number	Title/Description

KORE Power, Inc.
1875 N Lakewood Dr, Suite 200, Coeur d'Alene, ID 83814, USA

Table of Contents

List of Figures

List of Tables

1 ACRONYMS AND ABBREVIATIONS

Table 1. Acronyms and Abbreviations

Abbreviation	Meaning
BMS	Battery Management System
BOL	Beginning of Life
CAN	Controller Area Network
EMS	Energy Management System
KP-MC	KOREPoint Management Controller
MBMS	Module Battery Management System
MsBMS	Master Battery Management System
PCS	Power Conversion System
PWM	Pulse-Width Modulation
RBMS	Rack Battery Management System
RMSC	Rack Management System Controller
SOC	State of Charge
SOH	State of Health

2 CELL

KORE Power cell specifically designed for energy storage.

Figure 1. Battery Cell

Table 2. Battery Cell Specifications

Item	Specification
Chemistry	NMC/G
Dimensions (W x D x H)	313 mm x 11.6 mm x 102 mm
Weight	0.80 ± 0.015 kg
Capacity[1]	55 Ah @ 25°C, 1/3C
Nominal Voltage	3.73 V @ 25°C, 1/3C
Voltage Range	2.8 ~ 4.35 V
Energy Density	255 Wh/kg @ 25°C, 1/3C
Cycle Life	80% SOH @ 4000 Cycles est.
Housing	Aluminum-Plastic Film / Opposing tabs
Certification/Compliance	UL 1973, IEC 62619, UN 38.3, UL 9540A

[1]*Capacity varies with C rates*

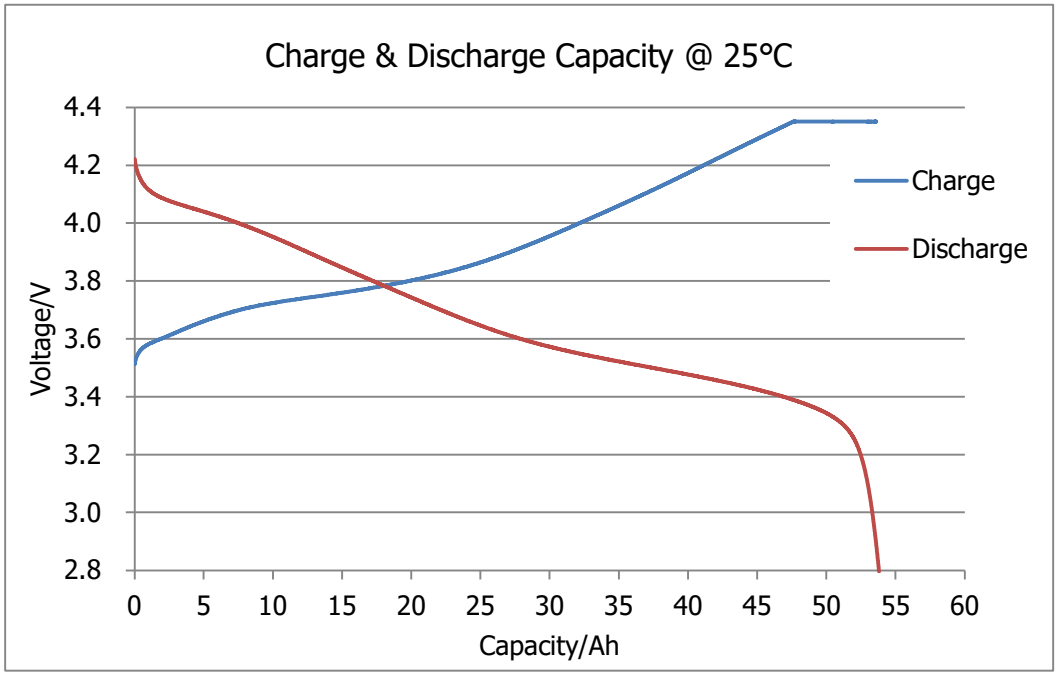

Figure 2. Charge: 1C, CC&CV Mode; Discharge: 1C, CC Mode

3 BATTERY MODULE

The battery module consists of 32 battery cells (2P16S) and a MBMS that:

- Communicates with the Rack BMS (RBMS)
- Provides operating information to the RBMS
- Maintains cell voltage through passive cell balancing
- Monitors the module temperature and controls the cooling fan using PWM.

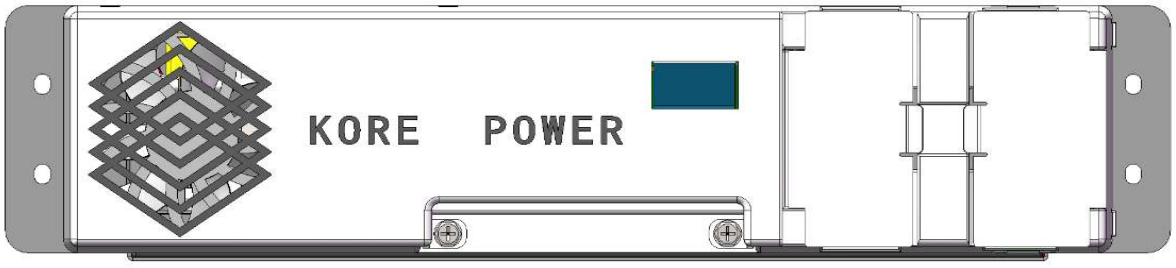

Figure 3. Battery Module

Table 3. Battery Module Specifications

Item	Specification	
Dimensions (W x D x H)	445 mm x 577 mm x 115 mm 483 mm x 577 mm x 115 mm with Mounting Bracket	
Weight	Approx. 41 kg	
Configuration	2P16S	
Capacity[1]	110 Ah @ 25°C, 1/3C	
Nominal Voltage	59.6 V @ 25°C, 1/3C	
Voltage Range	44.9 V – 69.5 V	
Energy	6.51 kWh @ 25°C, 1/3C	
Operating Ambient Temperature Range[2,3]	0 ~ 40°C	
Recommended Operating Ambient Temperature[2]	23 ± 4°C, Average 23°C	
Maximum Charge Power	6.5 kW @ 23 ± 4°C	
Maximum Discharge Power	6.5 kW @ 23 ± 4°C	
Maximum Charge Current	30A @ 0 ~ 12°C Ambient	
	100A @ 12 ~ 40°C Ambient	
Maximum Discharge Current	150A @ 0 ~ 35°C Ambient	
	100A @ 35 ~ 40°C Ambient	
Operating Humidity	5 ~ 85% RH (Non-Condensing)	
Application Altitude	≤ 2000m	
IP Rating	IP 20	
Communication	CAN 2.0B	
Cooling	Air-Cooled	
Bus Bar Connections	M8 Nut	
Storage and Transportation Temperature[3]	~7 days	-20 ~ 55℃
	~6 months	-20 ~ 45℃
Storage and Transportation Humidity	5 ~ 75% RH (Non-Condensing)	
Certification/Compliance	UL 1973, IEC 62619, UN 38.3, UL 9540A	

[1]Capacity varies with C rates

[2]Measured at fan cold air intake

[3]Low/high temperatures and long storage times will impact product life and performance

4 RACK MANAGEMENT SYSTEM CONTROLLER

The Rack Management System Controller (RMSC) provides electrical connections to a DC bus system and contains a RBMS that:

- Provides a communication interface for external controllers
- Collects battery system information and estimates battery system status
- Monitors battery system operating status
- Protects the battery system from abuse conditions

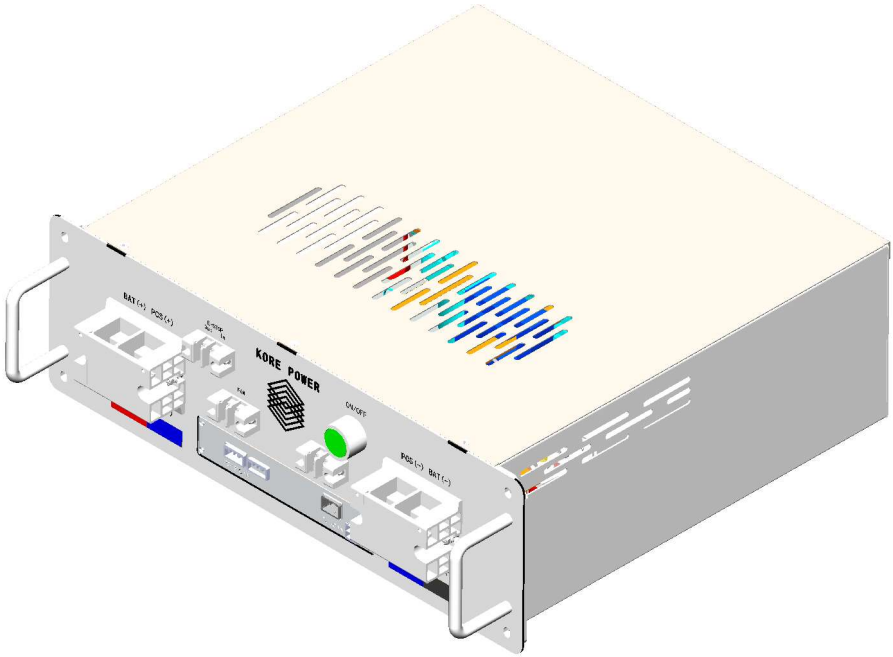

Figure 4. Rack Management System Controller

Table 4. RMSC Specifications

Item	Specification
Dimensions (W x D x H)	435 mm x 420 mm x 160 mm 483 mm x 420 mm x 160 mm with Mounting Bracket
Weight	Approx. 18 kg
Operating Voltage Range	40 ~ 1500 V
Current Rating	150 A
Auxiliary Power Voltage Source	24 VDC
Operating Temperature Range	-5 ~ 55°C
Operating Humidity	5 ~ 85 % RH (Non-Condensing)

Application Altitude	≤ 2000 m
Communications	CAN 2.0B
Cooling	Air-Cooled
Fuse Rating[1]	160 A - 50 kAIC
Main DC Terminals	M8 Bolt
Low Voltage Terminals	M3 Screw
Storage Temperature	-20 ~ 55℃
Storage and Transportation Humidity	5 ~ 75 % RH (Non-Condensing)

[1]250 kAIC option available, consult with KORE Power for availability

4.1 RMSC MAIN COMPONENTS

The RMSC consists of the following components:

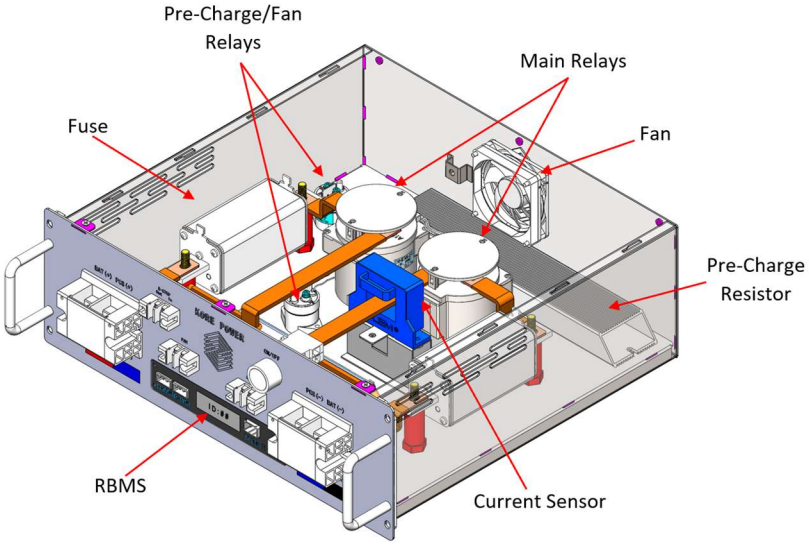

Figure 5. RMSC Main Components

4.2 RMSC PROTECTION FUNCTIONS

Table 5. RMSC Protection Functions

Function	Description
Over/Under Voltage	BMS protects the system from operating outside of cell/rack voltage rating
Over Current	BMS protects the system from operating outside of charge/discharge current rating
Over Temperature	BMS protects the system from operating outside of operating temperature range
Short Circuit	Fuse protects the system in the event of a short circuit
Inrush Current	Pre-charge circuit minimizes inrush current

5 BATTERY RACK

The Battery Rack consists of 17 battery modules and one RMSC, including all cables and connectors.

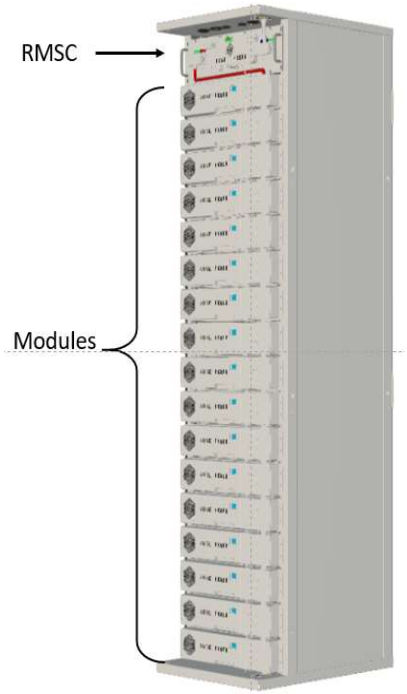

Figure 6. Battery Rack

Table 6. Battery Rack Specifications[1]

Item	Specification	
Dimensions (W x D x H)	520 mm x 655 mm x 2260 mm	
Operating Ambient Temperature Range[2]	0 ~ 40°C	
Recommended Operating Ambient Temperature[2]	23 ± 4°C, Average 23°C	
Operating Humidity	5 ~ 85 % RH (Non-Condensing)	
Application Altitude	≤ 2000m	
Pollution Degree	2	
Communications	CAN 2.0B	
Certification/Compliance	IEEE 693[3], UL 9540A[3], UL 1973	
Configuration	*17 modules + 1 RMSC*	*n modules + 1 RMSC*
Nominal Voltage	1014 Vdc @ 23 ± 4°C	59.6*n Vdc @ 23 ± 4°C
Voltage Range	763 ~ 1181 Vdc	44.9*n ~ 69.5*n Vdc
Energy	110.7 kWh @ 23 ± 4°C	6.51*n kWh @ 23 ± 4°C
Maximum Charge Power	110 kW @ 23 ± 4°C	6.5*n kW @ 23 ± 4°C
Maximum Discharge Power	110 kW	6.5*n kW
Weight	Approx. 900 kg	Approx. 203 + (41*n) kg

[1]Performance may vary based on use conditions and application.

[2]Measured at fan cold air intake

[3]Only valid with 17 modules

5.1 AUXILIARY POWER SUPPLY

Table 7. Auxiliary Power Consumption

Input Voltage		24 VDC
Battery Module Power Consumption (Max)	Fan	17W
	MBMS	2W
RMSC Power Consumption (Max)	Fan	4W
	RBMS	18W (40W inrush@100ms)

5.2 HEAT RELEASE ESTIMATES

Table 8. Thermal Management Estimates[1]

C Rate	Watts Per Module[2]	Watts for 17 Modules[2]
1	151.17	2569.81
0.75	85.03	1445.59
0.5	37.79	642.51
0.25	9.45	160.69
0.1	1.52	25.76

[1]Recommendations based on 23°C at fan cold air intake and BOL, may vary based on project, please contact KORE for more information.

[2]Values are based on DC I^2R and battery nominal rating.

6 KOREPOINT MANAGEMENT CONTROLLER

The KOREPoint Management Controller (KP-MC) is a Bank Level Controller for monitoring and controlling multiple battery racks that:

- Provides a SunSpec Modbus TCP interface for external communications and control
- Provides a CAN interface for internal communication with the battery racks
- Provides a web-based interface for troubleshooting and configuration
- Capable of storing up to 30 days of data from the battery racks
- 35mm DIN Rail mount on back of enclosure
- 4 status LEDs indicate Power, Run, Alarm and Fault

Figure 7. KOREPoint Management Controller

Table 9. KP-MC Specifications

Item	Specification
Dimensions (W x D x H)	51 mm x 154 mm x 125 mm
Weight	<1kg
Operating Ambient Temperature Range	-40 ~ 85°C
Operating Humidity	5~75% RH (Non-condensing)
Communications	Modbus TCP and CAN 2.0B
SunSpec Models	1, 64320, 802, 803, and 804
Auxiliary Power Voltage Source	9-30VDC
Maximum Power Consumption	15 W
Storage and Transportation Temperature	-40 ~ 85°C
Storage and Transportation Humidity	5~85% RH (Non-Condensing)
Certification/Compliance	CE class A[1], FCC part 15 class A

[1] *See KORE Power's Declaration of Conformity for more information*

Note: The KP-MC has replaced the MsBMS

7 SYSTEM TOPOLOGY

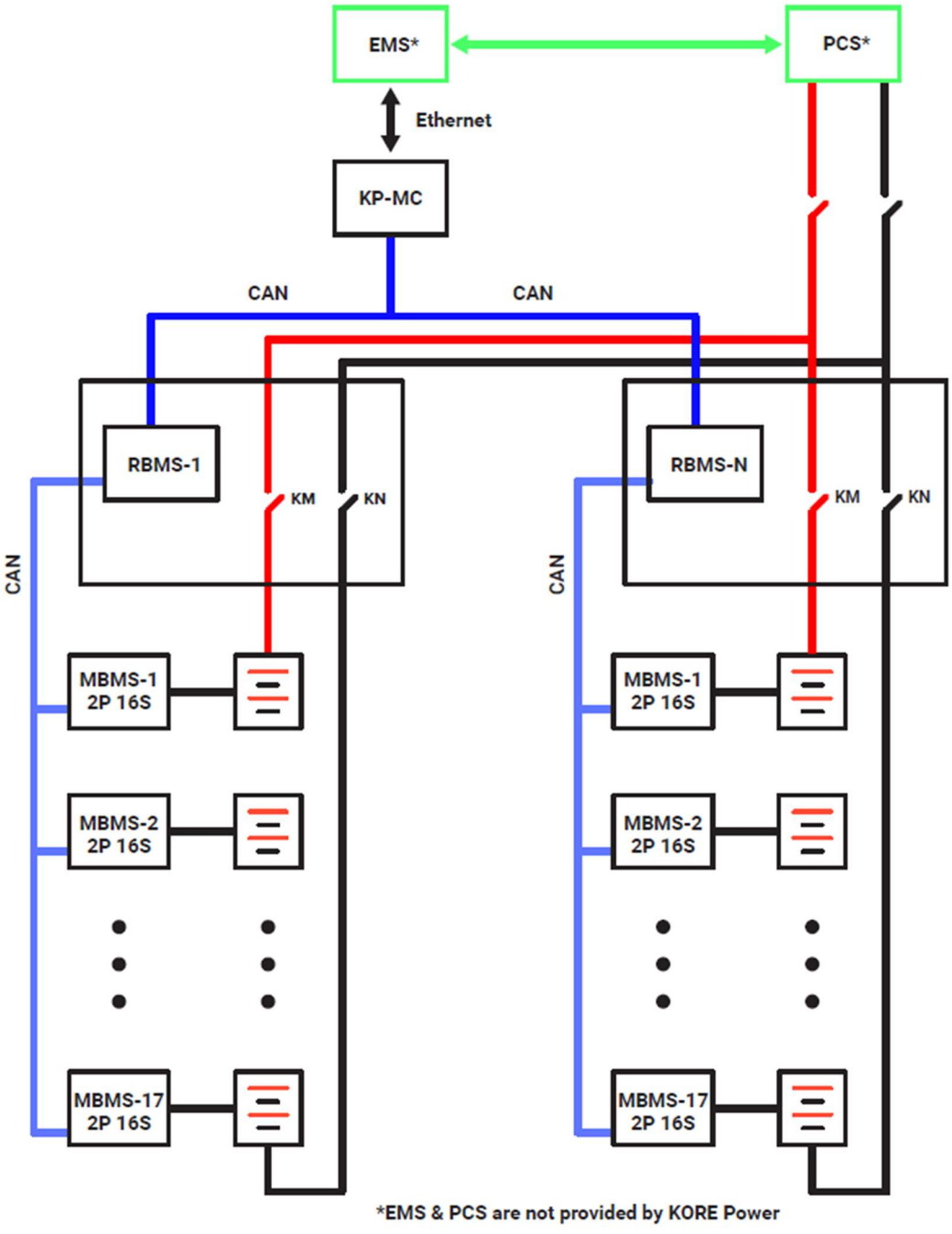

Figure 8. Mark 1 System Topology

End of Document