REGISTERED OFFICE ADDRESS:
Magnizon Power systems Ltd
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DATA SHEET

Model No.: ML48-100
for Back-up Power for Outdoor UPS

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Content

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1. Scope

This document describes the Product Specification of the Lithium-ion rechargeable battery supplied by Magnizon Power Systems Ltd., UK

2. Specifications

2.1 Battery Specification

No.	Items	Specification	Note
1	Nominal voltage	48V	
2	Open Circuit Voltage	48V~51V	
3	Nominal capacity	100Ah	Based on 0.2C discharge current
	Minimum capacity	100Ah	
4	Initial impedance	⩽150mΩ	AC 1KHz after standard Charge
5	Charge voltage	54V	
6	Discharge cut-off voltage	40.5V	
7	Standard charge current	20A	0.2C
8	Max. charge current	100A	1C
9	Current limit	10A	
10	Standard discharge current	20A	0.2C
11	Max. discharge current	100A	
12	Operating temperature	0°C ~ +55°C	Charge
		-20°C~ +55°C	Discharge
13	weight	46kg	
14	Dimension	W*H*D=486*130*480mm	Excluding mounting ear W*H*D=440*130*480mm

2.2 Common Performance

No	Items	Testing method and determinant standard
1	Charge Performance	The standard charge mode: under the temperature of 23±2℃, charge the battery with the current of 1C until the voltage reaches up to 54V, then charge with constant voltage until the charge current ≤0.02C， then stop charging.
2	Discharge Performance	When connecting with load, the battery can supply power. Charge the battery with standard charge mode, then rest for 0.5h, then discharge with 1C until the voltage is 40.5V, and the discharge time is required≥5h.

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3	High Temperature Characteristics	Standard charge the battery, then put the battery into the constant temperature and humidity oven with 55±2℃,then discharge with 1C to 40.5V. The discharge time is required ≥4.5h（90%） and the battery should no deformation and smoking.
4	Low Temperature Characteristics	Standard charge the battery, then put the battery into the constant temperature and humidity oven with -20±2℃,then discharge with 1C to 40.5V. The discharge time is required ≥2.5h（50%） and the battery should no deformation and smoking.
5	Cycle Performance	Under the temperature of 23±2℃, charge the battery with 1C, when the voltage reaches up to 54V charge with constant voltage until the charge current ≤0.02C，then stop charging, then rest for 0.5h, then discharge with 1C to 40.5V. Cycle with the above mode, the test shall be terminated when Discharging Capacity＜80% of Initial Capacity in three consecutive cycles. The cycle life is required ≥3500 times.
6	Charged Storage Characteristics	Charge the battery with 1C, then shift to charge with constant voltage until the voltage reaches up to54V, when the charge current ≤0.02C stop charging; rest under the temperature of 23±2℃for 28 days then discharge with1C to 40.5V. The discharge time is required ≥1.8h（90%）.

2.3 Safety Performance

No	Items	Testing method and determinant standard
1	Short Circuit	After charge batteries, place at 20℃±5℃ for 1h. Short the battery, the external circuit resistance should be less than 100mΩ，When the battery module temperature down to about 10 ℃ below its peak when the end of the experiment. No explosion, No fire .
2	Vibration Test	When charges fully, the fixed cell to will vibrate the table between 10Hz~50Hz, the vibration tour will be 0.8mm. The cell will vibrate in each XYZ axis 100mins. No leakage, Capacity recovery rate 90%（standby 3hours）.No explosion, No fire .
3	Over-discharge test	Charge the battery. Place at 20℃±5℃ for 1h, then discharge in 0.2C current at same temperature until some cell's voltage is 0V(if there are electronic protection circuit, remove it temporarily).No explosion, No explosion, No explosion, No fire .
4	Over-charge test	Charge at 2 times the nominal voltage, charge the battery with 2C current, and finish the experiment when the battery temperature reaches the stable state or reduces to the ambient temperature. No explosion, No fire .

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3. Product Circuit Diagram

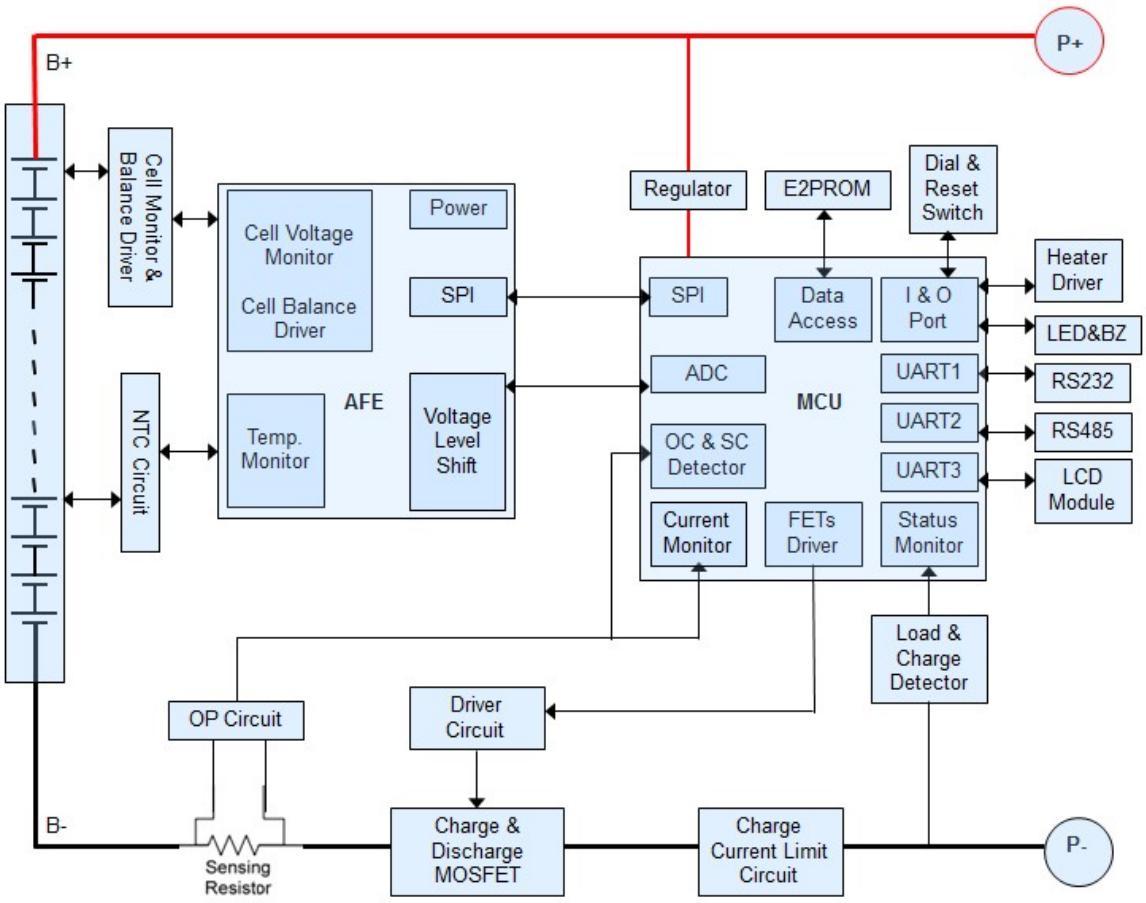

figure 1

4. BMS electrical Characteristic

No.	Item		Default Parameters	Adjustable	Remark
1	Single Over-charge Protection	Single Over-charge Alarm Voltage	3600mV	Yes	
		Single Over-charge Protection Voltage	3650mV	Yes	
		Single Over-charge Protection Delay	1.0S	Yes	
	Single Over-charge Protection Release	Single Over-charge Protection Release Voltage	3340mV	Yes	
		Capacity Release	SOC＜96%	Yes	
		Discharge Release	Discharge current > 1A		
2	Single	Single Over-discharge Alarm Voltage	2900mV	Yes	If the over-charge

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	Over-discharge Protection	Single Over-discharge Protection Voltage	2500mV	Yes	protection fails to recover after 30s, the low-power mode will be entered.
		Single Over-discharge Protection Delay	1.0S	Yes	
	Single Over-discharge Protection Release	Single Over-discharge Protection Release Voltage	2900mV	Yes	
		Release when charging	Activate by connecting charger		
3	Pack Over-charge Protection	Over-charge Alarm Voltage	52.5V	Yes	
		Over-charge Protection Voltage	54V	Yes	
		Over-charge Protection Delay	1.0S	Yes	
	Pack Over-charge Protection Release	Over-charge Protection Release Voltage	50.6V	Yes	
		Capacity Release	SOC＜96%	Yes	
		Discharge Release	Discharge current > 1A		
4	Pack Over-discharge Protection	Over-discharge Alarm Voltage	40.3V	Yes	If the over-discharge protection fails to recover after 30s, the low-power mode will be entered.
		Over-discharge Protection Voltage	37.5V	Yes	
		Over-discharge Protection Delay	1.0S	Yes	
	Pack Over-discharge Protection Release	Over-discharge Protection Release Voltage	40.3V	Yes	
		Release when charging	Activate by connecting charger		
5	Over-current Charging Protection	Over-current Charging Alarm Current	80A	Yes	Appearing 10 times in a row will lock the state and won't be automatically released
		Over-current Charging Protection Current	100A	Yes	
		Over-current Charging Protection Delay	1.0S	Yes	
	Over-current Charging Protection Release	Automatic Release	Automatic Release after 1min		
		Discharge Release	Discharge Current > 1A		
6	Over-current Discharging Protection 1	Over-current Discharging Alarm Current 1	100A	Yes	Appearing 10 times in a row will lock the state and won't be automatically released
		Over-current Discharging Protection Current 1	120A	Yes	
		Over-current Discharging Protection Delay 1	1.0S	Yes	
	Over-current Discharging Protection Release 1	Automatic Release	Automatic Release after 1min		
		Charge Release	Charge Current > 1A		
7	Over-current Discharging Protection 2	Over-current Discharging Protection Current 2	≥200A	Yes	Appearing 10 times in a row will lock the state and won't be automatically released
		Over-current Discharging Protection Delay 2	≤100mS	Yes	
	Over-current Discharging Protection Release 2	Automatic Release	Automatic Release after 1min		
		Charge Release	Charge Current > 1A		
8	Short-circuit Protection	Short-circuit Protection Delay	≤300 μ S		
		Short-circuit Protection Release	Release during charging		
			Disconnect the load will release automatically		

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9	MOS High Temperature Protection	MOS Alarm Temperature	65℃	Yes	
		MOS Protection Temperature	85℃	Yes	
		MOS Temperature Protection Release	80℃	Yes	
10	Cell Temperature Protection	Low Temperature Charging Alarm Temperature	5℃	Yes	
		Low Temperature Charging Protection Temperature	0℃	Yes	
		Low Temperature Charging Protection Release	0℃	Yes	
		High Temperature Charging Alarm Temperature	45℃	Yes	
		High Temperature Charging Protection Temperature	50℃	Yes	
		High Temperature Charging Protection Release	35℃	Yes	
		Low Temperature Discharging Alarm Temperature	-15℃	Yes	
		Low Temperature Discharging Protection Temperature	-20℃	Yes	
		Low Temperature Discharging Protection Release	-8℃	Yes	
		High Temperature Discharging Alarm Temperature	65℃	Yes	
		High Temperature Discharging Protection Temperature	70℃	Yes	
		High Temperature Discharging Protection Release	45℃	Yes	
11	Environment Temperature Alarm	Low Environment Temperature Alarm Temperature	-8℃	Yes	
		Low Environment Temperature Protection Temperature	-20℃	Yes	
		Low Environment Temperature Protection Release	0℃	Yes	
		High Environment Temperature Alarm Temperature	60℃	Yes	
		High Environment Temperature Protection Temperature	70℃	Yes	
		High Environment Temperature Protection Release	40℃	Yes	
12	Current Consumption	Self-consumption Current	≤30mA With Display Screen		
			≤20mA Without Display Screen		
		Low-power Mode Current	≤100 μ A		
13	Balancing Function	Balancing Cut-in Voltage	3400mV	Yes	
		Differential Pressure	50mV	Yes	
14	Default Capacity	Low Capacity Alarm	SOC＜30%	Yes	No alarm during Charging
		SOC	70AH	Yes	
		Full Capacity	100AH	Yes	

5. Configuration

figure3/3

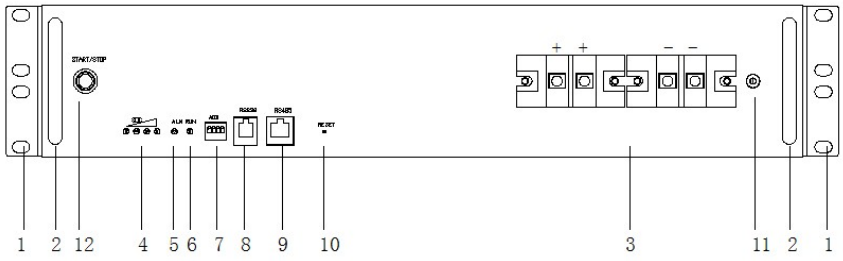

Figure4

1—Lug: it is recommended to be installed in the 19-inch standard cabinet for product installation and fixation.

2—Handle: easy to handle, move and install.

3—Wiring row: 4P (2P positive 2P negative) power supply interface, using pole type wiring, the terminals are insulated by thermoplastic polyester (PBT) insulation sheets, and the front is protected by transparent

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polycarbonate (PC) insulation protective cover.

4—Power light: four green LED lights display the current power of the lithium battery pack

5—Alarm light: red LED light, off under normal circumstances, on under failure.

6—Operation light: green light, it is often bright when product runs.

7—Address switch: 4 bit binary dial code switch is used to set address allocation in extended application,

8—RS485: Uplink communication port. When uploading data, RS485 communication mode, data content including system parameters, system status and warning information, generally adopt the rate of 9600bps.

9—RS485: Cascade communication port. RS485 communication mode is adopted in product cascade.

10—Power (On/off): the specific definition requirements of the three functions of on/off buttons are shown in the table below

(1)On/Activate button: When BMS is in sleep mode, press this button for 3s, the BMS will be activated, and the LED indicator will be lit successively, and then the BMS will go into the normal working state

(2) Off/Sleep button (optional): When BMS is in standby or working state, after pressing this button for 3s, BMS stops work, and the LED indicator will be lit successively and then into sleep mode.

11—Grounding hole

12—Switch: long press On/long press Off

6. Battery Pack Function

<table>
<tr><td></td><td>Item</td><td colspan="2">Control Operation</td></tr>
<tr><td>1</td><td>Monitoring Information</td><td colspan="2">Pack Voltage, Single Voltage, Charging Current, Discharging Current, Temperature, Working Mode, Alarm Information</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">Protect Function</td><td>Protection</td><td>Protection Release</td></tr>
<tr><td>Pack/Single Over-voltage Protection</td><td>Release when achieve protection voltage</td></tr>
<tr><td>Pack/Single Under-voltage Protection</td><td>If the over-discharge protection fails to recover after 30s, the low-power mode will be entered.</td></tr>
<tr><td>Over-current Protection during Charging/Discharging</td><td>Automatic Release after 1min; Appearing 10 times in a row will lock the state and won’t be automatically released</td></tr>
<tr><td>Temperature Protection</td><td>The temperature reaches the recovery</td></tr>
</table>

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			value
		Short-circuit Protection	Release during charging; Disconnect the load will release automatically
3	Fault Detection	With fault warning function, the upper computer can view the corresponding fault display. Detecting faults including heating film fault, analog sampling fault, temperature NTC failure, cell fault etc..	
4	Communication	The battery pack communicates with the upper computer through RS485, and RS485 is cascaded and connected for communication	
5	Sleep Mode	In order to reduce the power consumption of the whole system, the system has sleep function. When the following situation occurs, the system will enter sleep mode. 1) Over-discharge protection is not restored to the over-discharge release voltage for 10S. 2) The duration of standby state without charge and discharge reaches 24 hours. 3) Operate the compound key switch according to the operation rules.	
6	Wake-up	For convenient use, the system provides a variety of different ways to wake up. The system only can be awakened by the charging signal if it enters sleep mode due to over-discharge protection. 1) Charge to wake up 2) Wake up by communication 3) Press the button to wake up 4) It will automatically wake up. If sleeping by over-discharge protection, it will automatically wake up every 4 hours and start discharging MOS for 3 seconds. If the external power can charge the battery pack, then exit the sleep mode and enter the charging mode. Otherwise, continue into sleep mode	
7	Balancing	Charging equalization function	
8	Intermittent charge	Start charging when the battery pack capacity is below 95%.	
9	Charging Current Limiting	With charging current limiting function. The charging current limiting maximum	
10	Intelligent Communication	The upper computer software can check battery parameters, set protection parameters, and support multi-machines cascade communication. The main PACK uniformly uploads the collected data from PACK to the upper computer for display. When setting protection parameters, the operation is only valid for the host.	
11	History Data Store	The protection board has the function of historical storage. When the protection board appears or clears the alarm, protection and failure, the protection board will automatically save the current battery parameters.It can store more than 300 pieces of information. When the information is full, it will cover the information with the longest date one by one.The upper computer can read the corresponding historical records and convert them into Excel to protect data	

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7. Test Requirement

7.1 Standard test condition

Battery Pack to be tested should be new battery pack within one month after shipment from our factory and the battery pack should not be cycled more than five times before the test. Unless otherwise specified, test and measurement should be done under these conditions:

Temperature ： 15℃~25℃

Relative Humidity ： 45%~85%RH

Atmospheric Pressure ： 86kPa~106kPa

7.2 measuring equipment implementation requirements

1.Dimension Measurement Instrument:

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

2.Battery test system should have current accuracy within ± 0.1%, voltage accuracy within ± 0.5% & time accuracy within ± 0.1%.

3.Temperature measurement accuracy of instruments should be within ± 0.5 ℃.

4.Standard class specified in national standard or more sensitive class, with internal impedance not less than 10 KΩ.

5.Standard class specified in national standard or more sensitive class. Total resistance including ammeter and wire is less than 0.01Ω.

6.Impedance shall be measured by a sinusoidal alternating current method (AC 1kHz LCR). Resistance is not a constant value according to the change of temperature and state of charge, and related to lead length and capacity.

7.All test equipment and measuring instruments should be passed inspection of calibration organization.

7.3 Appearance Test Standard

There shall be no such defect as scratch, flaw, crack, rust, leakage, or which may adversely affect commercial value of battery.

8. Storage and Shipment Requirement

Item		Criteria
Storage temperature	Short period(less than 1 month)	-10℃~45℃
	Medium period (less than 3 month）	-10℃~35℃
	Long period (more than 3 month)	0℃~30℃
Relative Humidity		≤75% RH
State of Charge		40%~60%

Battery pack must be charged every three months when long term storage, please charge the battery pack

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with standard charging current for 0.5h~1h to keep 40%~60% state of charge.

9. Warning and Caution

1)Do not connect the battery pack's positive (+) and negative (-) poles reversed to charger or load, Do not connect the battery pack to charger's input power source (AC power supply).
2) Do not let the battery pack's terminals (+ and -) contact with unnecessary wire or any metal or stored them together, that may cause the battery pack short-circuit.
3) Do not drive a nail in battery pack, hit the battery pack with a hammer, stamp on or throw the battery pack.
4) Do not disassemble or alter the batteries' outside structure.
5) Do not use the battery pack under blazing sun, otherwise may cause battery pack overheating then catch fire or disable.
6) Do not put the battery pack into fire or heat the battery pack; do not store the battery pack in high temperature environment
7) Do not submerge the battery pack in water or get wet in the rain, keep the battery in shady and cool place when stored.
8) Do not charge the battery continuously over 24 hour.
9) When charging or discharging the battery pack, if you find any abnormal smell or noise, you must stop the charging or discharging at once, and contact the factory.
10) When using the battery pack out of range of 0~50℃, the capacity may decrease, that doesn't mean the battery pack was failure.