$LiFePO_4$ MAAX Battery Datasheet

1. Description

$LiFePO_4$ MAAX battery is equipped a BMS (Battery Management System) which utilizes a failsafe electronic control that monitors temperature, voltage and current flow at the cell level of the battery. The electronic sensing capabilities ensure optimal charging and safety, while providing the full capacity potential of this battery chemistry technology.

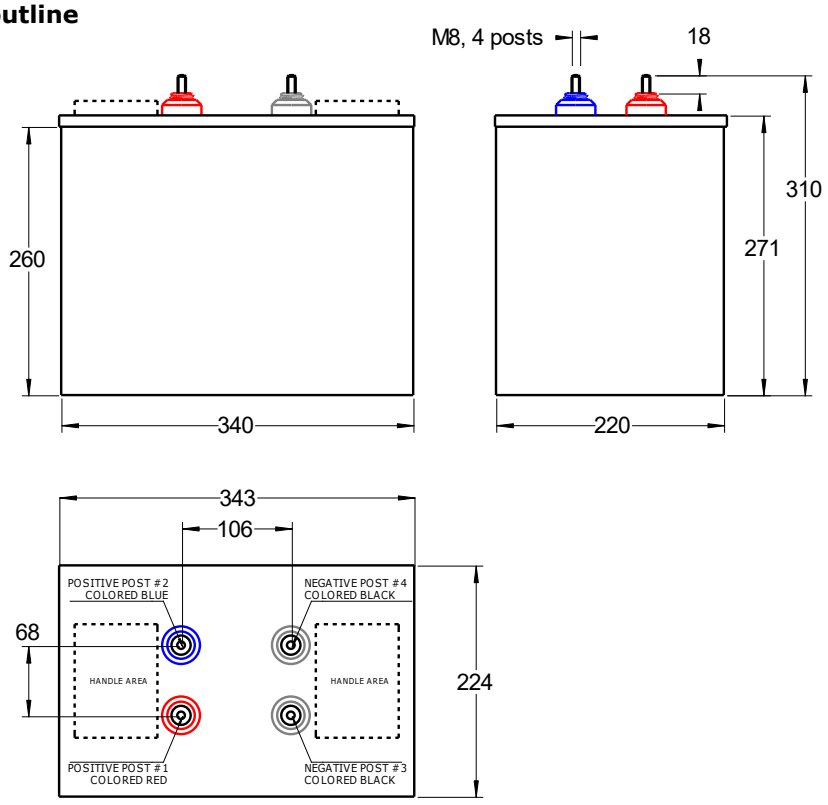
$LiFePO_4$ MAAX battery is designed to work with E-MAAX PRO and PLUS series regulators. It can be used as a standalone battery, or can be connected in-parallel with up to 14 another batteries thus forming 1500 Amp*Hours power cell. Please note that the E-MAAX CSR regulators are **NOT** compatible with the $LiFePO_4$ MAAX batteries.

Each $LiFePO_4$ MAAX battery has a digital indicator (LED) for the status display, a connection port to E-MAAX regulators, a connection port to additional $LiFePO_4$ MAAX batteries, and a connection port for optional Safety Disconnect.

2. Specifications

Parameter	Value	Units
Dimensions W x H x D	340 x 310 x 220	mm
Weight	15	kg
Housing material	steel	-
Storage Temperature range	-20 .. +65	Celsius deg
Protection	IP 56	-
Maximum allowable shock	1	G
Maximum allowable relative humidity	95	%

3. Dimensional outline



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All units are millimeters

4. Electrical specifications

Parameter	Value	Units
Nominal Battery Voltage (no load)	13.3	Volts
Maximum Battery Voltage	14.9	Volts
Minimum Battery Voltage	11.5	Volts
Charging Voltage @ 25 Celcius deg	14.4	Volts
Temperature Range for discharging	-20 .. +65	Celsius deg
Temperature Range for charging	0 .. +65	Celsius deg
Maximum Charging Current	240	Amps
Maximum Discharging Current	240	Amps
Capacity	110	Amp * Hours
Amount of charging cycles (to 80% SOC at room temperature)	3000	-

5. Electrical connections

Case 1: Battery is used as a standalone unit with a PRO or PLUS regulator

Connection	Function
Post #1 Positive RED	Connect to the alternator's output
Post #2 Positive BLUE	Connect to all the loads
Post #3 Negative BLACK	Connect to system negative
Post #4 Negative BLACK	Leave unconnected
Connection to regulator	Connect to the regulator
Communication Connection to other batteries	Leave unconnected
Connection to Safety Disconnect	Connect to the Safety Disconnect

Case 2: Battery is used as the master battery in a battery pack with a PRO or PLUS regulator

Connection	Function
Post #1 Positive RED	Connect to the alternator's output
Post #2 Positive BLUE	Connect to the Post #1 of the next battery
Post #3 Negative BLACK	Connect to system negative
Post #4 Negative BLACK	Connect to the Post #3 of the next battery
Connection to regulator	Connect to the regulator
Communication Connection to other batteries	Connect to the next battery
Connection to Safety Disconnect	Connect to the Safety Disconnect

Case 3: Battery is used as a slave battery in a battery pack with a PRO or PLUS regulator

Connection	Function
Post #1 Positive RED	Connect to the Post #2 of the previous battery
Post #2 Positive BLUE	Connect to the Post #1 of the next battery, or to all loads if this battery is the last in the bank
Post #3 Negative BLACK	Connect to the Post #4 of the previous battery
Post #4 Negative BLACK	Connect to the Post #3 of the next battery
Connection to regulator	Leave unconnected
Communication Connection to other batteries	Connect to the next battery
Connection to Safety Disconnect	Leave unconnected

Case 4: Battery is used as a standalone unit with a third party regulator

Connection	Function
Post #1 Positive RED	Connect to the alternator's output

Post #2 Positive BLUE	Connect to all the loads
Post #3 Negative BLACK	Connect to system negative
Post #4 Negative BLACK	Leave unconnected
Connection to regulator	Leave unconnected
Communication Connection to other batteries	Leave unconnected
Connection to Safety Disconnect	Can be connected

6. Indication

Each battery is equipped with a 2-character 7-segment LED display to show its current state. Depending on the operating conditions, the battery can be in three modes: Fault Mode, Warning Mode, and Normal Mode. Below are the explanations.

Fault Mode: This mode is invoked when some of the battery parameters exceed their maximum allowable values. This mode requires immediate attention to avoid fires, explosions, and other damage to the equipment. While in the Fault Mode, the indicator is permanently active until the fault conditions are removed.

Display Characters	Explanation	Meaning
F1	Low State-Of-Charge	Below 10%
F2	Over temperature	Over 50 degrees C
F3	Over Voltage	Over 14.9 Volts
F4	Over charge current	Over 240 Amps
F5	Over drain current	Over 240 Amps

Warning Mode: This mode is invoked when some of the battery parameters are approaching their maximum allowable values. This mode requires attention to stop problems from developing any further. While in the Warning Mode, the indicator is permanently active until the warning conditions are removed.

Display Characters	Explanation	
A1	Low State-Of-Charge	Below 30%
A2	Over temperature	Over 40 degrees C
A3	Over Voltage	Over 14.7 Volts
A4	Over charge current	Over 200 Amps
A5	Over drain current	Over 200 Amps

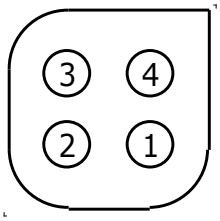
Normal Mode: The indicator becomes active only when the diagnostic button is pressed.
For the first 2 seconds, the indicator shows the Battery Index. This is a value between 1 and 15, and it is used to enumerate the batteries when they are connected in parallel. The parameter is important only when three or more batteries are connected together. In this case, the Battery Indexes must be different for each battery. For the next 2 seconds, the indicator shows the battery status as explained below.

Display Characters	Explanation
C0	Battery is in the stand-by state.
C1	No more attempts to re-connect the load. This is a special condition
C2	Safety Disconnect Status: load is connected to the battery
C3	Another battery is connected to this battery via battery-to-battery digital communication link
C4	This battery is connected to the regulator via digital communication link
C5	The battery is balancing itself. This is used to equalize the charge between the battery's cells while battery is not being charged or discharged. Balancing is active until the cell voltages differ no more than 0.1 Volts.

7. Electrical specifications for the regulator-to-battery digital link

Parameter	Value	Units
DC voltage supply range	6 .. 20	Volts
Cable ratings	Gauge: 20 AWG Material: tinned copper strands Strand size: Ø 0.16 mm Insulator Material: PVC Jacket Color: black Diameter: 5.5 mm	-
Communications format	RS-485	-
Wire colors designations	black – battery negative (isolated from the housing) red – DC supply (isolated from the housing) white – communication lead "A" yellow – communication lead "B"	-
Connector pin-out	1 - black – battery negative 2 - red – DC supply 3 - white – communication lead "A" 4 - yellow – communication lead "B"	-

4-pin connector pins, view from the cable side (insertion)



8. Electrical specifications for the Safety Disconnect connections

A remotely controlled safety disconnect is used in between a battery and its loads to protect the battery from over-discharge, over-voltage, or over-charging. The LiFePO$_4$ MAAX batteries have a dedicated connection to remotely control safety disconnects, and it must be used when the battery is a standalone unit, or it is the master battery in a battery pack. For the LiFePO$_4$ MAAX batteries, ElectroMaax recommends to use the solenoid-driven ML-RBS Safety Disconnects. An ML-RBS Safety Disconnect is a solenoid-driven latching relay with manual override. Below is the description of the signals and its functions:

Wire Color	Function
Red	Battery Positive
Black	Battery Negative
Brown	Signal to connect the load
Orange	Signal to disconnect the load
Yellow	Status input from the Safety Disconnect

In case a safety disconnect is not used, a jumper must be placed in between the Black and Yellow wires.

9. Electrical specifications for the battery-to-battery digital link

Parameter	Value	Units
DC voltage supply range	6 .. 20	Volts
Cable ratings	Gauge: 20 AWG Material: tinned copper strands Strand size: Ø 0.16 mm Insulator Material: PVC Jacket Color: black Diameter: 5.5 mm	-
Communications format	RS-485	-
Wire colors designations	black – battery negative (isolated from the housing) red – DC supply (isolated from the housing) white – communication lead "A" yellow – communication lead "B"	-
Connector pin-out	1 - black – battery negative 2 - red – DC supply 3 - white – communication lead "A" 4 - yellow – communication lead "B"	-

10. Storage Swtich:
Located on the connection face of the battery case is a two-position rocker switch (0=off / 1=on) which disables the BMS when the battery is not being used for extended periods (> 1 month).

This feature prevents the battery from self-discharging due to cell balancing which may consume up to 30 milli-amps, thereby reducing discharge rates to approximately 2% / month.

Caution: The Storage switch should only be used when the system master switch has disconnected the battery banks. The Storage Switch is also set to "0" (off) for shipping of the battery.

Notice

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