BMS Mini 3

## ▪▪ INTRODUCTION

EMUS BMS Mini 3 is a compact, all-in-one BMS device, that autonomously executes all core and utility functions of battery management. It interacts with all other components in the system, monitors cell voltage levels, and controls charging and balancing functions, using various inputs, outputs, and interfaces.

It is designed to use for battery packs consisting of 6 up to 16 cells connected in series.
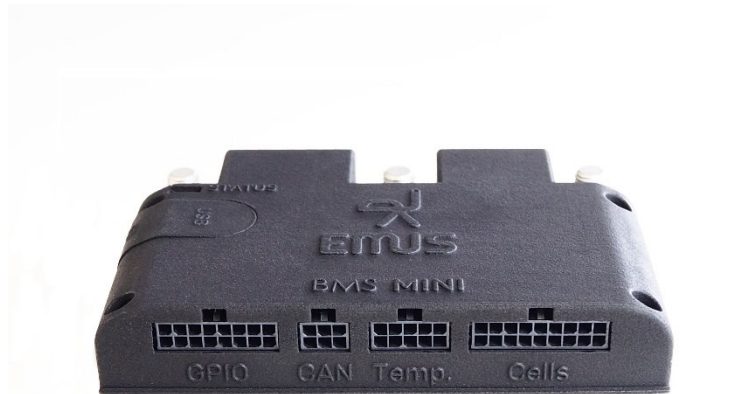
▪▪ APPLICATIONS

Any lithium chemistry, series-connected battery pack, or a pack of multiple parallel strings, from minimum 6 of up to 16 cells:

- AGV, UGV
- Scooters
- Bikes
- 2-wheelers, 3-wheelers
- Motorcycles.
- Mobile energy storages.

▪▪ FEATURES

- USB interface that is intended for quick and straightforward connection to a host device (e.g. computer, tablet, smartphone) when configuration, diagnostics, or maintenance is needed.
- CAN data interface. Enables to communicate with CAN equipped EMUS devices and third-party devices.
- Supports 50, 125, 250, 500, 800 kbit/s and 1 Mbit/s CAN baud rates (default 250kbit/s).
- RS232, a single-ended transmission mode protocol, allows continuously monitor BMS activity using first-party or third-party devices (feature to be active in future product revisions).
- RS485 is a differential transmission mode protocol, which allows to continuously monitor BMS activity and control chargers (feature to be active in future product revisions).
- SD card enables to store all sent messages from the EMUS BMS Mini 3 and recover all unexpected situations which occurred in the past (feature to be active in future product revisions).
- Each BMS Mini 3 monitor from 6 up to 16 battery cells.
- State of Charge (SOC) and State of Health (SOH) (gen1 algorithm) allows to monitor cell's degradation factors. SOC calculations depend on real cell capacity and internal cell parameters.
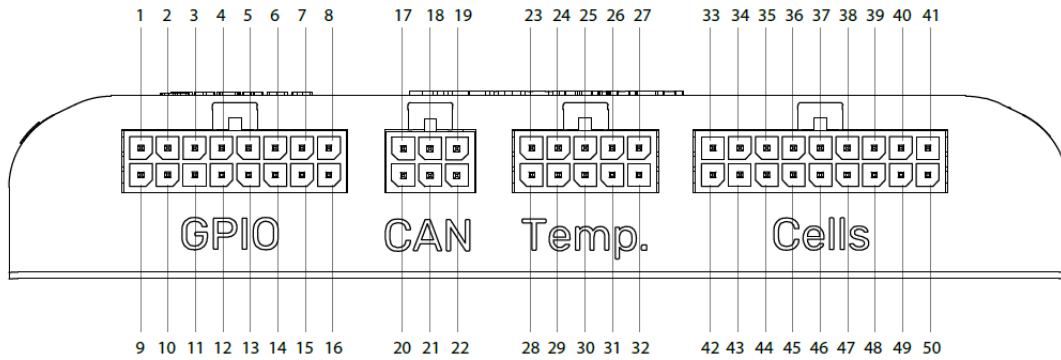
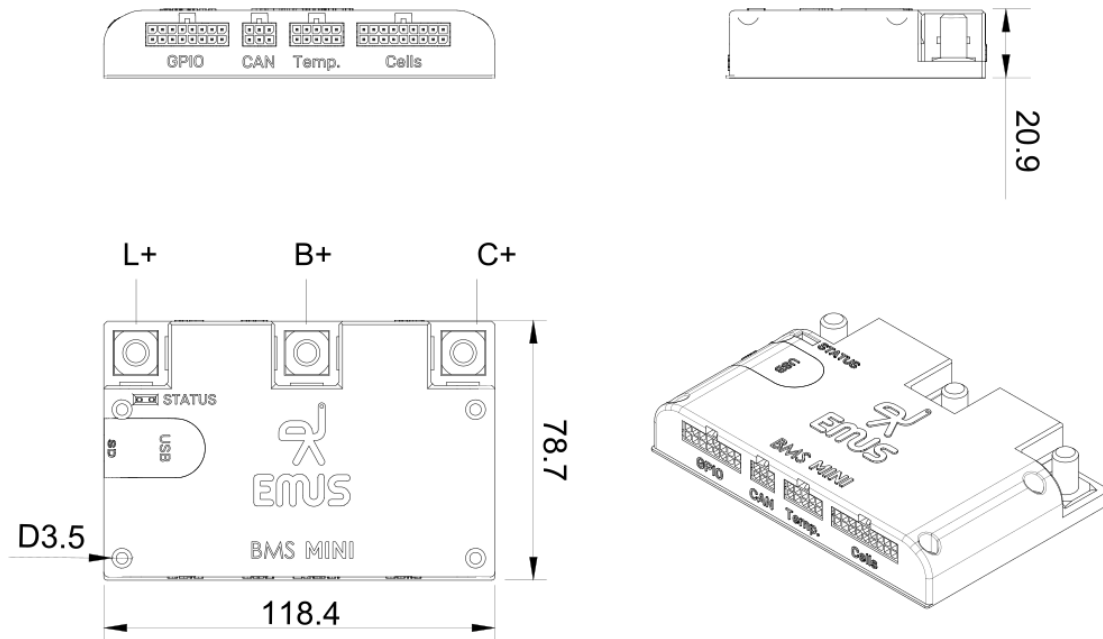## MECHANICAL INFORMATION

Figure 1 BMS MINI 3 (MNC310) pinout

Figure 2 EMUS Mini 3 (MNC034A) dimension

Pin No.	Assignment	Mating Housing	Terminal
1	5V/12V/BAT_SENS	Micro-Fit 3.0 Receptacle Housing 43025-1600	Molex MicroFit 43045-1600 (recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
2	GPAI2		
3	GPO1		
4	GPO2		
5	GPO3		
6	GPO4		
7	RS232_TX		
8	RS485_A		
9	GND		
10	GPAI1		
11	GPI1		
12	GPI2		
13	GPI3		
14	GPI4		
15	RS232_RX		
16	RS485_B		
17	5V/12V/BAT_SENS	Micro-Fit 3.0 Receptacle Housing 43025-0600	Molex MicroFit 43045-0600 (recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
18	GPO5		
19	CAN_H		
20	GND		
21	GPI5		
22	CAN_L		
23	TEMP1	Micro-Fit 3.0 Receptacle Housing 43025-1000	Molex MicroFit 43045-1000 (recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
24	TEMP2		
25	TEMP3		
26	TEMP4		
27	TEMP5		
28	GND		
29			
30			
31			
32			
33	–	Micro-Fit 3.0 Receptacle Housing 43025-1800	Molex MicroFit 43045-1800 (recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
34	CELL15+		
35	CELL13+		
36	CELL11+		
37	CELL9+		
38	CELL7+		
39	CELL5+		
40	CELL3+		

41	CELL1+		
42	CELL16+		
43	CELL14+		
44	CELL12+		
45	CELL10+		
46	CELL8+		
47	CELL6+		
48	CELL4+		
49	CELL2+		
50	CELL1-		

◼◼ ELECTRICAL CHARACTERISTICS

Item	Conditions	Value	
Operating voltage		12 to 72.8 VDC	
Current consumption	At typical supply voltage, with nothing else connected	12 VDC typical 28 mA	72.8 VDC typical 10 mA
General purpose output GPO1–GPO5 max sinking current (resettable fuse trip current)		1.25A	
General purpose output max voltage		32 VDC	
General purpose input ON voltage		5 to 72.8 VDC	
General purpose input OFF voltage		0 VDC	
USB interface controller		F232R	
USB power supply data line transient/overvoltage protection	VS protection (Pd – 85W)	6V	
RS232 interface voltage	TVS protection (Pd –200W)	–15V to 15V	
USB/RS232 interface galvanic isolation		None	
CAN intarface	TVS protection (Pd – 350W)	–24V to 24V	
RS485 interface voltage	TVS protection (Pd – 600W)	–7V to 12V	
USB interface duplexity	USB not connected	Full duplex (send and receive)	
RS232 interface duplexity	USB connected	Full duplex (send and receive)	
		Half duplex (send only)	
USB/RS232 interface baud rate		57.6kbps	
USB/RS232 interface data bits		8 bits	

USB/RS232 interface parity		None
USB/RS232 interface stop bits		1 bit
External temp sensors		5
Individual cell voltage limits	Firmware v2.x	2V to 4.55V
	Firmware v3.x and above	1V to 4.95V[1]
Individual cell voltage measurement accuracy	Firmware v2.x	12mV
	Firmware v3.x and above	2mV
Individual cell voltage measurement resolution	Firmware v2.x	10mV
	Firmware v3.x and above	1mV
CAN speeds		50, 125, 250, 500, 800 kbit/s and 1 Mbit/s
Load current	Continuous — without heatsink	100A
	Continuous — with heatsink[2]	200A
	Peak — without heatsink, 10s	250A
	Peak — with heatsink, 60s	300A
Charge current	Continuous — without heatsink	50A
	Continuous — with heatsink	100A
	Peak — without heatsink, 10s	100A
	Peak — with heatsink, 60s	150A
Balancing	Resistor	8.2 Ohm
	Current @4.2V	500mA
Pre-Charge Resistor		250 Ohm
5V/12V	Hold current	1A

OTHER SPECIFICATIONS

Item	Condition	Value
Number of cells limits		6 to 16 cells[3]
Operating temperature		–40°C to +85°C
Maximum number of external temperature sensors		5
External temperature sensor measurement accuracy		±5°C
External temperature sensors measurement resolution		1°C
IP rating		IP40
Weight		0.154kg
Terminal tightening torque on M8 L+, C+, B+ terminals	Maximum	15Nm
	Destruction	18Nm

[1] Maximum voltage per cell is limited by full pack voltage depending on number of cells used.
[2] Used Heatsink with at least 0.7 K/W thermal resistance.
[3] Minimum cells count depends on full battery pack voltage. Minimum full battery pack voltage must be above 12V.

COMPATIBLE CHARGERS AND INVERTERS

Charger Name	Communication Protocol
Elcon	CAN J1939-based
Zivan RE	CAN Zivan proprietary
Powerfinn	CAN
Delta-Q	CANOpen - based
Non-CAN	I/O Controlled

⚠ **NOTE**: More chargers, inverters integrations are planned for the next product revision.

⚠ **NOTE**: For all chargers recently supported please refer to https://emusbms.com.

⚠ **NOTE**: For more information on each charger's communication protocol, please contact the charger manufacturer.