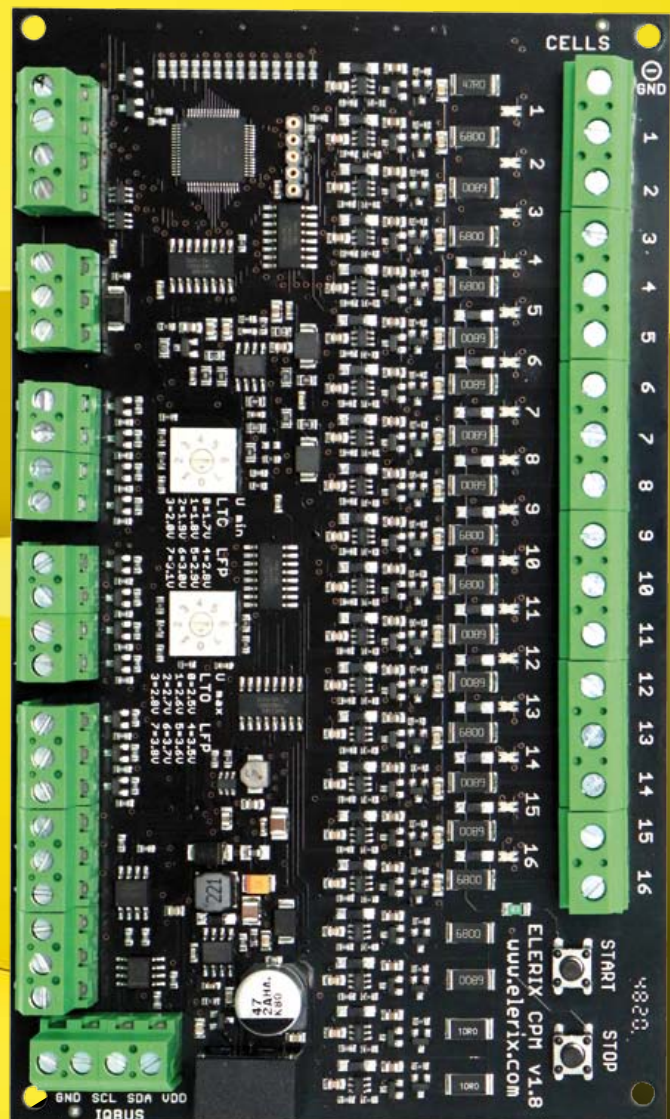




# ELERIX CPM

CELL PERFORMANCE MONITOR

4 – 16 cells LiFePO<sub>4</sub>/LTO



## Module description

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The Cell Performance Monitor (ELERIX CPM) is an easy-to-use and effective solution for the protection of the LiFePO<sub>4</sub> and LTO batteries from excessive discharge or overcharge.

The key features:

- ▶ When exceeding the user-adjustable minimum or maximum of any cell, CPM module closes or opens the output contacts for the relay coils.
- ▶ It brings the lowest and highest cell voltages of the cells in pack to separate outputs (for monitoring measurements or for connection of the LED display or the communication module).
- ▶ The multi-colour LEDs indicate the highest and lowest voltage cells and the operating status of the module.
- ▶ It has very low power consumption and a built-in function of battery emergency disconnection from the powered system, including self-disconnection and shutdown.
- ▶ It is part of the ELERIX series, i.e., it is an open-source solution that is and will be compatible with the related ELERIX products and with other commonly available components.
- ▶ The quality of the design, versatility and technical support options make it suitable for industrial applications and sophisticated home installation solutions.

## Application possibilities

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- ▶ For a battery with 4 to 16 LiFePO<sub>4</sub> or 5 to 16 LTO cells (any number in this range). For more than 16 cells the CPM boards can be chained, the protective disconnecting circuits may be realized with auxiliary relays.
- ▶ To control a bi-stable (dual coil) relay with a coil of full battery control voltage (or lower) by a pulse of 150 ms. One bi-stable relay can disconnect the charger, the second load, and the third (emergency) is a back-up in case the main relays fail to open.
- ▶ For controlling conventional single-coil NO/NC relays with a coil's voltage of full battery voltage. Two can be used to disconnect and connect the charger, load, or as an information to a additional system, such as a charger, converter or communications module. The third relay is back-up (emergency).
- ▶ For analog communication (Digital voltmeter, warning lights, PLC inputs).
- ▶ For digital communication via i2c protocol (protocol is available on demand).

## Functions

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- ▶ Powered directly from a protected battery (always from all cells, total voltage 9 V min., 60 V max.).
- ▶ Continuous measurement (200 Hz) of all cell voltages and the lowest and highest voltages output to two separate high impedance outputs (U<sub>cells</sub>) for further processing.
- ▶ Labelling of the lowest and highest voltage cells using a two-colour LED; see the specifications.
- ▶ Choice of four fixed predefined upper voltage limits for LiFePO<sub>4</sub> cells and four upper voltage limits for LTO cells (U<sub>max</sub>).
- ▶ Choice of four fixed predefined lower voltage limits for LiFePO<sub>4</sub> cells and four lower voltage limits for LTO cells (U<sub>min</sub>).
- ▶ The upper and lower voltage limits are set by hardware, independently of each other, with the rotary switch, without the need for programming.
- ▶ Four outputs for single-coil relays (U<sub>min</sub> and U<sub>max</sub>, two without hysteresis and two with voltage hysteresis).
- ▶ Four outputs for two-coil bi-stable relays (U<sub>min</sub> – load disconnection and connection and U<sub>max</sub> – charger disconnection and connection).
- ▶ The single-coil relay always opens 20 seconds earlier than the two-coil relay, which can be used to relieve the load or charge before completely disconnecting the battery.
- ▶ Emergency outputs for single-coil and two-coil bi-stable relays (U<sub>emergency</sub>) designed for emergency load disconnection if U<sub>min</sub> and U<sub>max</sub> disconnection fails.
- ▶ Emergency disconnection of the board's own consumption and safety disconnection from the battery cells after activation of the emergency output U<sub>min</sub>. Else after the voltage reach 4.5V on any cell.
- ▶ Optimization of CPM consumption by divided even power from all connected cells.
- ▶ Switching the module on and off using the hardware buttons on the board.
- ▶ Switching on, off and reset by potential-free shorting of specified outputs (see the specifications).

## Technical specifications

Model	4 – 16 cells	LFP/LTO
<b>Operating voltage, ranges</b>		
Total operating voltage of the pack min. / max.	9V / 60V	
Number of monitored cells	4 – 16 (any number in this range)	
Cell voltage indication range	1.7 – 4.09V	
Max. operating voltage at cell input	5.5V	
Max. voltage of relays outputs (1,2,3,4 Umin, Umax, Uemergency)	60V	
<b>Current, power</b>		
Own operating consumption	0.65 W	
Own consumption after shutdown	lim 0 (in nanoW)	
Max. continuous load of relays outputs (No. 3, 4 Umin, Umax, Uemergency)	1.5 W	
Highest short-time load of relay outputs No. 1 and 2 Umin Umax Uemergency) (150ms)	10 W	
Maximum output current Umin Umax (terminals No. 1, 2 and 3, 4 Ucells)	5 mA (only for high-impedance digital input)	
<b>Voltage protection settings</b>		
Relay switch options for Umin	1.7V 1.8V 1.9V 2.0V (LTO) 2.8V 2.9V 3.0V 3.1V (LFP)	
Relay switch options for Umax	2.5V 2.6V 2.7V 2.8V (LTO) 3.5V 3.6V 3.7V 3.8V (LFP)	
Emergency relay switch of Uemergency, incl. power off of own consumption	0.3V below set Umin	
Emergency relay switch of Uemergency, excl. power off of own consumption	0.3V above set Umax	
Return to operating state	U_min #4 has additional voltage hysteresis - returns to ON after reaching U_max minus 0.1V U_max #4 has additional voltage hysteresis - returns to ON after reaching U_min plus 0.1V	

## Technical specifications

Times	
Cell voltage measurement frequency	200 Hz
Relay switch delay U <sub>min</sub> U <sub>max</sub>	Outputs #3 and #4 disconnect 15s after voltage limit (U <sub>max</sub> or U <sub>min</sub> ) is reached. Output #2 disconnect 35s after voltage limit (U <sub>max</sub> or U <sub>min</sub> ) is reached. If the voltages return to set interval after #3/#4 disconnection, the outputs #2 remain up (the impulse is not sent).
Relay switch delay U <sub>emergency</sub>	Output #3 disconnects <2s after voltage U <sub>emergency</sub> is reached. The impulse on #2 flash ~2s after #3 disconnection. In case of reaching U <sub>min</sub> minus 0.3V (lower U <sub>emergency</sub> ), U <sub>max</sub> outputs #2, #3 and #4 are also disconnected and CPM is switched OFF. If the voltages return above/below U <sub>emergency</sub> voltage after #3 disconnection, the output #2 remain up (the impulse is not sent).
Pulse length for bi-stable relay	150 ms
Switch-on delay	With button on board > 2 s; Terminals 4, 5 > 2 s
Switch-off delay	With button on board > 1 s Terminals 6, 7 > 1 s
Reset delay	Terminals 8,9 > 1 s
Dimensions, weight	
Dimensions (L x W x H)	optovstup > 300ms (vývody 6,7)
Weight	170 x 100 x 23
	150 g
Operating environment	
Operating temperature	-40°C +80°C
IP code in application	At least IP 20
Certification	
EMC	Interference and radiation resistance, protocols according to EN 61 000

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