



CPM

THE CELL PERFORMANCE MONITOR

4 – 16 cells LiFePO₄/LTO

Technical specifications

Module description

The Cell Performance Monitor (GWL CPM) is an easy-to-use and effective solution for the protection of the LiFePO₄ 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 GWL/Modular series, i.e., it is an open-source solution that is and will be compatible with the related GWL 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

- For a battery with 4 to 16 LiFePO₄ or 5 to 16 LTO cells (any number in this range).
- 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 various display and communications modules, such as a digital voltmeter, Arduino and Raspberry microcomputers, LAN Controller by Tinycontrol, Siemens LOGO PLCs, Schneider Zelio PLC module, Eaton Easy PLC, TECO Foxtrott PLC, etc.
- For many other modules and devices which CPM can forward the necessary voltage information. Additional custom functions and algorithms can be programmed.

Functions

- 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 (Ucells) 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 LiFePO₄ cells and four upper voltage limits for LTO cells (Umax).
- Choice of four fixed predefined lower voltage limits for LiFePO₄ cells and four lower voltage limits for LTO cells (Umin).
- The upper and lower voltage limits are set by hardware, independently of each other, with the rotary switch, without the need for programming.
- Two outputs for standard single-coil relays (Umin – load disconnection and Umax – charger disconnection).
- Four outputs for two-coil bi-stable relays (Umin – load disconnection and connection and Umax – 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 (Uemergency) designed for emergency load disconnection if Umin and Umax disconnection fails.
- Emergency disconnection of the board's own consumption and safety disconnection from the battery cells after activation of the emergency output.
- 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
Operating voltage, ranges		
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. relay output voltage (1, 2, 3 Umin, Umax, Uemergency)	60V	
Current, power		
Own operating consumption	0.65 W	
Own consumption after shutdown	lim 0 (in nanoW)	
Max. permanent relay output load (No 3 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)	
Voltage protection settings		
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	By shorting terminals 8, 9 or switching off and on the board	

Technical specifications

Times	
Cell voltage measurement frequency	200 Hz
Relay switch delay U _{min} U _{max}	35 s for terminal 2, 15 s for terminal 3 If the voltage returns to the set interval after terminal 3 is switched off, terminal 2 does not switch off
Relay switch delay U _{emergency}	30 s (both terminals 2 and 3) (both terminals turn off immediately if U _{emergency} occurs within 30 s of previous U _{min} or U _{max} state reached)
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)	170 x 100 x 23
Weight	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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