

## BMS Firmware Release Notes

| Version  | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| v2.3.256 | *Improved: current calculation and calibration for PCB2.2 Lowpower                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| v2.3.255 | *Improved: Faster current calculation and calibration.<br>*Fixed: Discharge over current cutoff occurs irrespective of charger connection status(Dual port mode).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| v2.3.254 | * New feature: Charge Restart Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| v2.3.252 | * Improved: Current measurement accuracy<br>* New feature: Low power board min and max values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| v2.3.251 | * New feature: Discharge over-current cutoff timeout.<br>* New feature: Discharge peak current cutoff.<br>* New feature: Charger startup delay.<br>* New feature: Charger disable delay.<br>* New feature: Battery maximum cycle count.<br>* New feature: Multipoint temperature sensor power control for <i>PCB v2.2</i> .<br>* New feature: State of Health calculation.<br>* New feature: High power board min and max values<br>* <i>Battery Insider v2.5.1.0</i> or later version is required.                                                                                                                                                                                                                                                                         |
| v2.3.250 | * Fixed: entry to sleep mode sequence (instant wake-up) when the SOC-BAR module is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| v2.3.249 | * Improved: option to select external current sensor type.<br>* Improved: internal charger detection procedure.<br>* Improved: fully charged state recovery procedure.<br>* <i>Battery Insider v2.5.0.9</i> or later version is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|          | Company rebranded to Enepaq                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| v2.3.248 | * New feature: option to select external current sensor type (dual range type <i>DHAB S/133</i> or cheaper single range type sensors).<br>* <i>Battery Insider v2.5.0.8</i> or later version is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| v2.3.247 | * Internal release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| v2.3.246 | * Improved: internal self-tests safety procedures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| v2.3.245 | * Improved: initialization procedure after <i>BMS</i> restart.<br>* Improved: <i>SOC-BAR</i> indication when <i>BMS</i> is in the charging state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| v2.3.244 | * Improved: current measurement.<br>* Improved: watchdog initialization.<br>* Fixed: <i>UART</i> communication <i>Read Battery Pack Voltage</i> command.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| v2.3.243 | * Improved: current measurement.<br>* Improved: over-current fault detection (rejected short current peaks).<br>* Improved: charging finish logic.<br>* Improved: <i>SOC</i> calculation in sleep mode (high battery capacity).<br>* Improved: load/charger switch diagnostics feature.<br>* Improved: <i>Ignition</i> feature (disabled unexpected load output toggling due to load measurement. Load measurement are only made in certain cases).<br>* Fixed: internal 5V power supply remains disabled after wakeup from sleep mode due to <i>UART</i> communication, when <i>Ignition</i> feature is activated (unexpected large negative current measurement value).<br>* New feature: possibility to invert external current sensor direction (available with the new |

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|          | <p><i>Battery Insider v2.5.0.6</i> version).</p> <p>* New feature: possibility to disable load/charger switches diagnostics (available with the new <i>Battery Insider v2.5.0.6</i> version).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| v2.3.242 | * Improved: current and cell voltage measurement accuracy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| v2.3.241 | * Fixed: charging not starting on <i>PCB v2.1</i> hardware version when <i>Fully Discharged Warning</i> occurred, charger is connected, <i>Charger Switch Type</i> configured as <i>Charge FET</i> and <i>Load Switch Type</i> configured as <i>Discharge FET</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| v2.3.240 | * Improved: external charger detection feature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| v2.3.239 | <p>* New feature: possibility to turn off automatic <i>BMS</i> fault state recovery.</p> <p>* Improved: charging finish logic (disabled charger switch toggling when charger voltage is too high).</p> <p>* Improved: <i>Charge Finished Current</i> setting maximum value (<i>Charger Switch Type</i> dependent).</p> <p>Fixed: external current sensor inverted current flow direction.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| v2.3.238 | <p>* Fixed: unexpected random <i>AFE</i> driver crash bug.</p> <p>* Fixed: cells balancing bug, where balancing the last balanced cells is not disabled when cells disbalance becomes lower than the allowed disbalance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| v2.3.237 | <p>* Improved: <i>BMS</i> up time calculation in sleep mode.</p> <p>* Improved: <i>Battery Insider</i> events timestamp initialization after <i>BMS</i> restart.</p> <p>* Improved: <i>BMS</i> state detection.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| v2.3.236 | <p>* Support for <i>Hardware v2.3</i>, <i>v2.0</i> no longer supported.</p> <p>* Support for <i>Battery Insider v2.5.0.5</i> or later.</p> <p>* Updated: <i>BMS Register Map</i> and <i>Event Message List</i>.</p> <p>* New feature: cells voltages measurement in sleep mode when <i>Ignition</i> feature is disabled.</p> <p>* New feature: temperature faults recovery in <i>BMS</i> sleep mode when <i>Ignition</i> feature is disabled.</p> <p>* New feature: <i>BMS</i> load and charger switches self diagnostic (<i>BMS</i> generates warning sound when <i>BMS</i> detects charging/discharging current, but switches should be closed).</p> <p>* New feature: <i>BMS Single Port</i> operation mode.</p> <p>* New feature: load relay/contactor precharge.</p> <p>* Improved: <i>LED</i> functionality to lower <i>BMS</i> power consumption in active state.</p> <p>* Improved: <i>BMS</i> up time calculation in sleep mode.</p> <p>* Improved <i>BMS</i> fault detection logic: <i>BMS</i> can detect more than one fault at a time.</p> <p>* Improved: charger detection logic: charging current is not monitored for charger detection, if external <i>Charger Detection</i> pin is used.</p> <p>* Improved: external current sensor detection logic.</p> <p>* Improved: external current sensor measurement for high current ranges.</p> <p>* Improved: external inputs/outputs settings security.</p> |
| v2.3.235 | * Internal release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| v2.3.234 | * Fixed: over-current cutoff settings values changing to default values after reset <i>BMS</i> when external current sensor is used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| v2.3.233 | * Improved: added 20 sec. timeout to detect charger connected for slower chargers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| v2.3.232 | <p>* New feature: <i>DID0x</i>, <i>AIHOxAL</i>, <i>AIHOxAH Load Switch Type</i> settings.</p> <p>* New feature: activated <i>AIHOxAH Charger Switch Type</i> settings.</p> <p>* Improved: removed <i>Charger Disconnected</i> event message after reset <i>BMS</i>.</p> <p>* Improved: cell balancing algorithm.</p> <p>** Cells balancing enabled, if voltage is higher than minimum cell voltage minus allowed disbalance.</p> <p>** Reduce percentage of cells balancing, if <i>BMS</i> temperature exceeds safe limit.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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| v2.3.231 | <ul style="list-style-type: none"> <li>* New feature: multipint <i>NTC</i> sensor temperature measurement.</li> <li>* Improved: dual <i>NTC</i> sensor temperature measurement.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                |
| v2.3.230 | <ul style="list-style-type: none"> <li>* New feature: <i>UART-CAN</i> converter supported.</li> <li>* Improved: <i>BMS</i> statistics calculation.</li> <li>* Improved: fully discharge exception logic (allowed to charge).</li> <li>* Improved: <i>ASCII</i> broadcast protocol.</li> <li>* Fixed: <i>UART MODBUS</i> commands errors.</li> </ul>                                                                                                                                                                                                       |
| v2.3.229 | <ul style="list-style-type: none"> <li>* New feature: <i>SOC</i> calculation in sleep mode.</li> <li>* New feature: <i>Battery Insider SOC-BAR</i> menu settings.</li> <li>* Improved: optimized energy consumption in sleep mode.</li> <li>* Improved: turning off 5V internal power supply in sleep mode.</li> <li>* Fixed: <i>SOC-BAR</i> indicator blinking.</li> <li>* Improved: <i>Number of Series Cells</i> setting minimum value changed to 4 cells.</li> <li>* Improved: compatibility with v2.0, v2.1 and v2.2 <i>PCB</i> versions.</li> </ul> |
| v2.3.228 | <ul style="list-style-type: none"> <li>* New feature: charger external detection.</li> <li>* New feature: activated <i>Charger Switch Type DDOx</i> and <i>AIHOxAL</i> settings.</li> <li>* New feature: supported hardware version <i>PCB v2.2</i>.</li> <li>* Improved: external inputs/outputs settings security.</li> </ul>                                                                                                                                                                                                                           |
| v2.3.227 | <ul style="list-style-type: none"> <li>* Improved: low temperature cutoff logic.</li> <li>* Improved: external inputs/outputs settings security.</li> <li>* Fixed: unexpected <i>BMS</i> restart while writing new settings.</li> <li>* Fixed: unexpected <i>BMS</i> jump to bootloader while writing new settings.</li> </ul>                                                                                                                                                                                                                            |
| v2.3.226 | <ul style="list-style-type: none"> <li>* New feature: <i>Ignition</i> input to enable/disable <i>BMS</i>.</li> <li>* Improved: power management during sleep.</li> <li>* Improved: fully discharged cutoff logic (charger turned off only when <i>Charger Switch Type – Charge FET</i>).</li> <li>* Fixed: <i>Battery Insider</i> reset <i>BMS</i> feature when <i>Load Swich Type – AIDOx</i> and <i>Charger Switch Type – AIDOx</i>.</li> <li>* Fixed: unexpected charger disconnection when <i>Ignition</i> pin is selected.</li> </ul>                |
| v2.3.225 | <ul style="list-style-type: none"> <li>* Improved: under-voltage cutoff exception logic.</li> <li>* Fixed: disabled input pullup resistors.</li> <li>* Fixed external current sensor detection.</li> </ul>                                                                                                                                                                                                                                                                                                                                                |
| v2.3.224 | <ul style="list-style-type: none"> <li>* New feature: cells balancing in regeneration state.</li> <li>* Improved: power management in sleep state when <i>BMS</i> is in fault state.</li> </ul>                                                                                                                                                                                                                                                                                                                                                           |
| v2.3.223 | <ul style="list-style-type: none"> <li>* Fixed: <i>BMS</i> freeze when charging.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| v2.3.222 | <ul style="list-style-type: none"> <li>* Improved: <i>SOC-BAR</i> functionality (disable before sleep).</li> <li>* Improved: <i>UART</i> communication wakeup from sleep mode using external interrupt.</li> <li>* Improved: added 3 sec. <i>UART</i> communication timeout.</li> <li>* Fixed: temperature value in <i>CAV3</i> protocol.</li> </ul>                                                                                                                                                                                                      |
| v2.3.221 | <ul style="list-style-type: none"> <li>* Improved: current limit changes when external current sensor is connected.</li> <li>* Improved: <i>Charge Finished Current</i> and charger disconnection thresholds.</li> <li>* Improved: external temperature sensor measurement.</li> <li>* Improved: sleep management.</li> <li>* Fixed: pack voltage measurement.</li> <li>* Fixed: charger detection (connection and disconnection).</li> <li>* Fixed: charging algorithm (<i>CFET</i> toggle).</li> </ul>                                                  |
| v2.3.220 | <ul style="list-style-type: none"> <li>* Improved: cells balancing algorithm.</li> <li>* Improved: backup data saved to <i>EEPROM</i>.</li> <li>* Improved: power management in sleep state.</li> </ul>                                                                                                                                                                                                                                                                                                                                                   |

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|  | * Changed: speed value to <i>km/h</i> . |
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