LI-ION TAMER RACK MONITOR
LITHIUM ION BATTERY RACK MONITORING SYSTEM

Product Description
The Li-ion Tamer Rack Monitoring system is a device that detects the venting of battery electrolyte solvent vapours (off-gassing phase) that occurs early in the failure mode of lithium-ion batteries. The early detection of this event allows proper mitigation steps to be taken to avoid a catastrophic thermal runaway failure.

The Li-ion Tamer Rack Monitoring system is designed to be plug-and-play, easy to install and consists of two primary components, (1) off-gas sensors, (2) controller.

1. Off-gas sensors comprise on-board detection algorithms making them acutely sensitive to lithium-ion battery electrolyte solvent vapours, do not require calibration, are compatible with all forms of lithium-ion battery form factors and chemistries and have a lifetime comparable to a typical lithium-ion battery system.
2. Off-gas sensors are connected to the controller that contains proprietary logic to diagnose when and where battery electrolyte vapours venting has occurred. It has digital and Modbus serial outputs that can be used to electrically isolate the battery system and activate the ventilation system.

System Configuration
The Li-ion Tamer Rack Monitoring system is a versatile solution that accommodates the vast range of lithium-ion battery systems. In a typical setup, system configuration will consist of the following:

- Monitoring sensors installed at the battery racks – downstream convective airstreams – to monitor the venting of battery electrolyte vapours
- Reference sensors installed to monitor the ambient environment and air inlets to cancel common mode signals
- Controllers for aggregating sensor signals

The Li-ion Tamer Rack Monitor system requires minimal operation and maintenance procedures as the sensors are designed to be calibration-free and have comparable lifetime to that of the ESS battery system. The gas sensors response can be easily verified with a bump test. To confirm operation, sensors can be activated with a bottle of battery off-gassing compounds (diethyl carbonate) which is supplied by Xtralis.

Important Note: This device detects the venting of electrolyte vapours from lithium-ion batteries. It does not prevent fires or thermal runaway. This device is not a stand alone safety device and should be incorporated into a proper safety system. If device responds, there is a risk of battery fault which could lead to thermal runaway. To avoid injury, leave area immediately.

Hardware Details

Controller

Off-gas Sensor

Key Features
- Early warning of lithium-ion battery failures
- Enable thermal runaway prevention with proper mitigation actions
- Single cell failure detection without electrical or mechanical contact of cells
- Extended product lifetime
- Calibration-free product
- Highly reliable output signal
- Low power consumption
- Compatible with all lithium-ion battery form factors and chemistries
- Easy installation
- Independent and redundant perspective on battery health
- Auto diagnostic capabilities
- Reduction/removal of false positive signals
- Configurable communication protocols including digital outputs and Modbus serial communication
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Specifications

**Controller Specifications**
- **Dimensions (mm)**: 210 (W) x 113 (L) x 63 (H)
- **Input power range**: 12 - 28 VDC
- **Max sensors per controller**: 15
- **System outputs**: Digital outputs/MODBUS

**Power Consumption Specifications**
- **Controller (no sensors)**:
  - 2.4 W (@ 24 VDC)
  - 1.4 W (@ 12 VDC)
- **Sensor**:
  - 275 mW (@ 5 VDC)
- **Controller (fully populated, 15 sensors)**:
  - 6.6 W (@ 24 VDC)
  - 5.6 W (@ 12 VDC)
- **Fuse Rating**: 3.5 A

**MODBUS Communication Specifications**
- **Baud rate**: 9600
- **Parity**: None
- **Stop bit**: One
- **Hardware**: RS232 3-wire (TX, RX, ground)

**Product Life Specifications**
- **Target lifetime**: > 10 years
- **Warranty**: 1 year

**Gas Detection Specifications**
- **Target gases**: Lithium ion battery off-gassing compounds
- **Min. detection threshold**: < 1 ppm/sec
- **Response time**: 5 seconds
- **Fault detection**: Single cell failure

**Environmental Specifications**
- **Temperature**: -10 to +60°C
- **Humidity**: 5 to 95% RH
- **Max temperature change**: 8.6°C/min

**Digital Output Specifications**
- **Connector type**: 2x 10-pin Molex
- **Signal type**: Digital
- **Signal level, normal**: HIGH 12 – 28 VDC (Input voltage) 100mA max per channel
- **Signal level, alarm**: LOW, ~0 VDC

**Ordering Information**

<table>
<thead>
<tr>
<th>Ordering Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT-SEN-M</td>
<td>Monitoring sensor</td>
</tr>
<tr>
<td>LT-SEN-R</td>
<td>Reference sensor</td>
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<tr>
<td>LT-CTR-C</td>
<td>Combined controller</td>
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<tr>
<td>LT-ACC-PCL</td>
<td>10' Power Cable</td>
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<tr>
<td>LT-ACC-DCL</td>
<td>10' Digital Output Cable</td>
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<td>LT-ACC-MCL-25</td>
<td>25' Monitoring Sensor Cable (RJ45 Black)</td>
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<td>LT-ACC-MCL-50</td>
<td>50' Monitoring Sensor Cable (RJ45 Black)</td>
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<td>LT-ACC-MCL-100</td>
<td>100' Monitoring Sensor Cable (RJ45 Black)</td>
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<td>LT-ACC-RCL-25</td>
<td>25' Reference Sensor Cable (RJ45 Blue)</td>
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<td>50' Reference Sensor Cable (RJ45 Blue)</td>
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<tr>
<td>LT-ACC-RCL-100</td>
<td>100' Reference Sensor Cable (RJ45 Blue)</td>
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<tr>
<td>LT-ACC-CCL-1</td>
<td>1' Controller Daisy Chain Cable (RJ45 Grey)</td>
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<td>LT-ACC-CCL-3</td>
<td>3' Controller Daisy Chain Cable (RJ45 Grey)</td>
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<td>LT-ACC-CCL-50</td>
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<td>100' Controller Daisy Chain Cable (RJ45 Grey)</td>
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<tr>
<td>LT-ACC-IPA</td>
<td>MODBUS TCP/IP Adapter</td>
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<tr>
<td>LT-ACC-RLY</td>
<td>Form C Relay</td>
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<tr>
<td>LT-ACC-TST</td>
<td>DEC Bump Test Bottle</td>
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<tr>
<td>LT-ACC-BKT-PK5</td>
<td>Sensor Mount Kit Spare – 5x brackets 10x nuts</td>
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<tr>
<td>LT-ACC-SCL-MF</td>
<td>6’ MODBUS Serial Cable Male to Female</td>
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<tr>
<td>LT-ACC-OEM</td>
<td>OEM Board</td>
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</table>

**Product Certifications**
- ETL listed to UL 61010 and CSA 22.2 NO. 61010 for product safety
- EN 61326 for EU Directive (2014/30/EU)
- RoHS 3 EU 2015/863

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