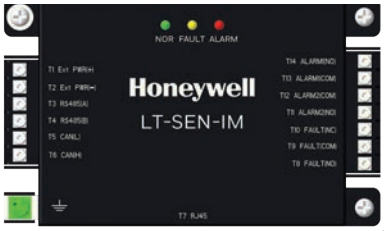
LI-ION TAMER SENSOR MULTI OUTPUT SOLUTION LITHIUM ION BATTERY MONITORING SYSTEM





The Li-ion Tamer Sensor Multi Output Solution (MOS) is a device that detects hydrogen and carbon monoxide gases, which are generated during thermal runaway of lithium-ion batteries. The detection of these gases allows proper management of flammable gas accumulation to avoid explosive conditions. It is also capable of detecting the initial venting of battery electrolyte solvent vapours (off-gassing phase) that occurs early in the failure mode of lithium-ion batteries. The early detection of such events allows proper mitigation steps to be taken to avoid a catastrophic thermal runaway failure.

The Li-ion Tamer Sensor MOS is designed to be plug-and-play, easy to install and consists of two primary components, (i) off-gas sensor, (ii) interface module.

- Off-gas sensor comprises on-board detection algorithms making it acutely sensitive to lithium-ion battery electrolyte solvent vapours, does not require calibration, is compatible with all forms of lithium-ion battery form factors and chemistries and has a lifetime comparable to a typical lithium-ion battery system.
- Off-gas sensor connects to the interface module providing 3 relay outputs and Modbus/ CANBus serial outputs that can be used to electrically isolate the battery system and activate the ventilation system.

FEATURES & BENEFITS

- 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 (only requires bump test)
- Highly reliable output signal
- Low power consumption
- Cost Effective solution for modular Battery Energy Storage Systems (BESS)
- Compatible with all lithium-ion battery form factors and chemistries
- Easy installation
- Independent and redundant perspective on battery health
- Reduction/removal of false positive signals
- Support 2 alarm relay outputs and 1 fault relay output
- Configurable communication protocols including Relay outputs and Modbus/Canbus selection communication

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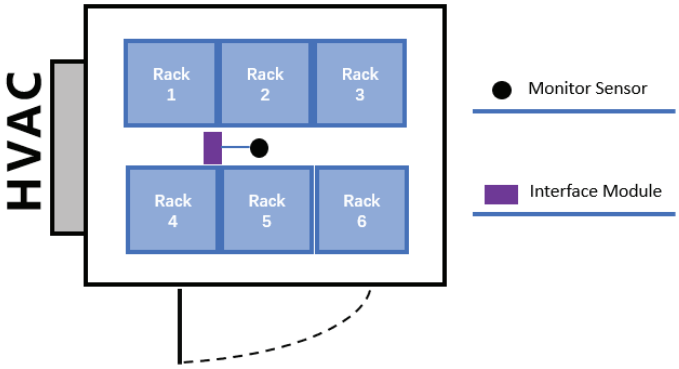
SYSTEM CONFIGURATION

The Li-ion Tamer Sensor MOS provides cost effective protection for small battery cabinets/ enclosures or where localized battery protection is required.
In a typical setup, system configuration will consist of the following:

- Off-gas sensors installed at the battery racks or cabin – downstream convective airstreams – to detect the venting of battery electrolyte vapours
- Interface Module to monitor sensor and output signal integration.

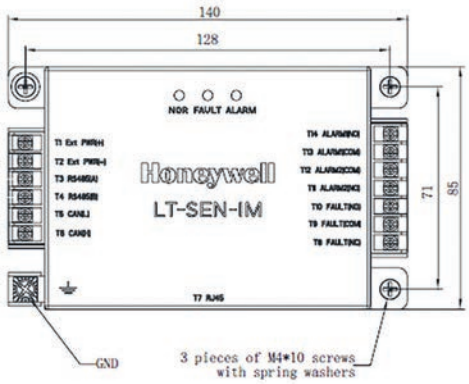
The Li-ion Tamer Sensor MOS requires minimal operation and maintenance procedures as the sensor is designed to be calibration free and has comparable lifetime to that of the ESS battery system. The sensor response can be easily verified with a bump test.

Important Note: This Li-ion Tamer Sensor MOS detects the venting of electrolyte solvent vapours from lithium-ion batteries during the initial cell venting. It also detects hydrogen and carbon monoxide gases generated during cell thermal runaway. 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.

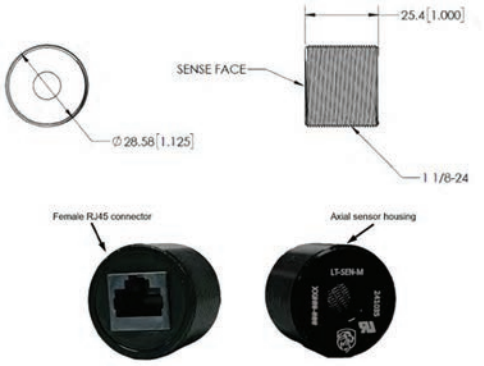


HARDWARE DETAILS

INTERFACE MODULE



OFF-GAS SENSOR



LI-ION TAMER SENSOR MULTI OUTPUT SOLUTION Technical Specifications

SPECIFICATIONS

INTERFACE MODULE SPECIFICATIONS	
Dimensions [mm]	140 (L) x 85 (W) x 34 (H)
Input Power Range	15 - 32VDC Typical 24VDC
Max. Sensors per Module	1
System Outputs	3 Relay outputs/MODBUS/CANBUS
POWER CONSUMPTION SPECIFICATIONS	
Interface Module (with Sensors)	65mA, Max 1.56W (@ 24VDC)
Off-Gas Sensor	Max. 15 mA (200mW @ 13.2 VDC)
Relay Load	Max. 30 VDC 2A Max. 125 VAC 0.5 A
Output – RJ45	0.25W (5VDC/ 0.5mA) power supply for sensor
COMMUNICATION SPECIFICATIONS	
Baud Rate	MODBUS: 9600 CANBUS: 500K
Hardware	MODBUS: RS485, 2-wire (TX, RX) CANBUS: 2-wire (CANH, CANL)
PRODUCT LIFE SPECIFICATIONS	
Target Lifetime	> 10 years
GAS DETECTION SPECIFICATIONS	
Target Gases	• **LT-SEN-M:** - Hydrogen gas (H_2) - Battery electrolyte solvent vapours • **LT-SEN-M-C49:** - Hydrogen gas (H_2) - Battery electrolyte solvent vapours - Carbon monoxide (CO)
Min. Detection Threshold	• 10 ppm/second (hydrogen gas) • 10 ppm/second (electrolyte solvents)
Response Time	5 seconds
Fault Detection	Single cell failure
OFF-GAS SENSOR ENVIRONMENTAL SPECIFICATIONS	
Temperature	-40 °C to 50 °C
Humidity	5 % to 90 % RH (non-condensing)
Max. Temperature Change	8.6°C/min
RELAY OUTPUT/ LED INDICATOR SPECIFICATIONS	
Relays Numbers	3 (alarm1, alarm2, fault)
Alarm Latch	Alarm output latch, reset or send command to release.
LED Indicator	Initialization: Green LED Blink Normal: Green LED Steady Alarm: Red LED steady Fault: Yellow LED steady (sensor fault)

ORDERING INFORMATION

ORDERING CODE	DESCRIPTION
LT-SEN-MOS	Li-ion Tamer Sensor MOS (Comprises LT-SEN-M and LT-SEN-IM-UL)
LT-SEN-MOS-C49	Li-ion Tamer Sensor MOS-C49 (Comprises LT-SEN-M-C49 and LT-SEN-IM-UL)

SPARE PARTS

ORDERING CODE	DESCRIPTION
LT-SEN-IM-UL	Li-ion Tamer Interface Module UL
LT-SEN-M	Li-ion Tamer Gen 2+ Sensor
LT-SEN-M-C49	Li-ion Tamer Gen 2+ Sensor-C49

PRODUCT CERTIFICATIONS

CERTIFICATION OF OFF-GAS SENSOR:

- UL 2075 and ULC 588 Recognized for Hydrogen (H_2) detection
- UL 2075 and ULC 588 Recognized for Carbon Monoxide (CO) detection*
- UL 2075 and ULC 588 Recognized for Battery Electrolyte Solvent Vapour detection
  Includes Diethyl Carbonate (DEC), Dimethyl Carbonate (DMC), and Ethyl Methyl Carbonate (EMC)
- FM 6540 Approved for Battery Electrolyte Solvent Vapours (ex. DEC, DMC, EMC)**
- 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)
- CE
- UKCA
- FCC
- CSFM (according to UL 2075 for H_2)

** Available on selected models.*
*** Model (LT-SEN-M) only.*

CERTIFICATION OF INTERFACE MODULE:

- Certification of fire alarm system module UL864 10th
- ULC S527
- FM 6540
- Safety UL61010-1
- RoHS EN50581-2002
- EMI EN55011-2010
- EMC EN61326-1-2021

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