LI-ION TAMER® SENSOR MOS APPLICATION IN TELECOM DATA CENTER UPS ROOM CASE STUDY

September 2025
Doc. No. 38250_00

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Introduction

This Case Study outlines the Li-ion Tamer Sensor Multi Output Solution (MOS) installation in lithium-ion battery racks for a UPS Battery Room in a major telecom data center in Shanghai.

Project Background

A 6 MW 2N UPS system powers 2,000 racks in a major carrier facility in Shanghai. 10X38 kWh LFP battery racks sit in a 100 m² room; a single-cell failure could cascade through the entire bank.

Figure 1: Battery Racks

Lithium UPS Battery Room Challenges

Lithium-ion batteries are inherently fragile and are prone to failure which can lead to damaging fires. A lithium-ion battery failure happens in three stages:

- Abuse (thermal, electrical, mechanical)
- Initial venting of electrolyte vapours (off-gassing)
- Fire (thermal runaway)

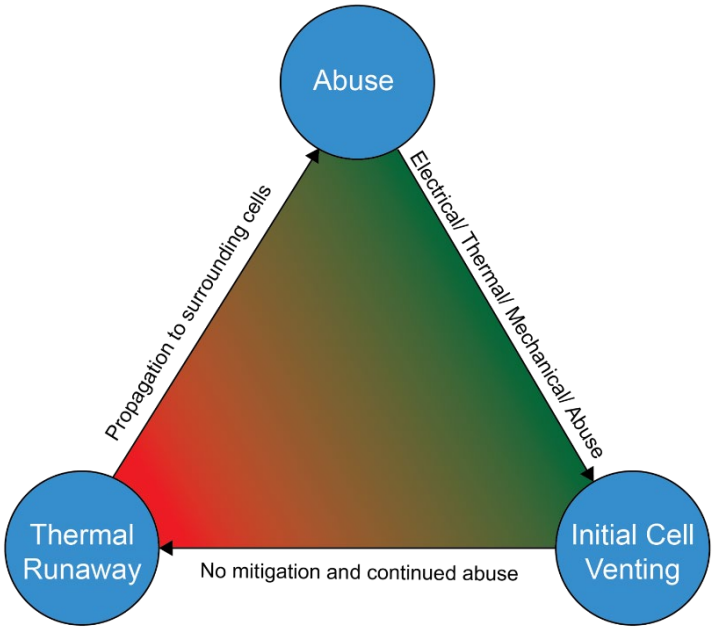


Figure 2: Lithium-ion Battery Failure Journey

Once a battery undergoes thermal runaway, the generated heat will cause thermal abuse to the surrounding batteries, causing them to also go into thermal runaway. This is why lithium-ion battery failures are often costly and catastrophic, a failure originating from a single battery can destroy the entire Data Center and significantly disrupt mission-critical operations.

The challenges in Lithium UPS Battery Room are below:

- **Early detection**: Traditional smoke/heat sensors trigger only after thermal runaway.
- **Zero false positives**: 7×24 operations cannot tolerate nuisance alarms.
- **Seamless integration**: must plug into the existing Safety and Environment Monitoring System without modifying UPS logic.

Solution

The Li-ion Tamer Sensor MOS solution was chosen to provide very early warning of lithium-ion battery failures 5-10 mins before the onset of thermal runaway.

- **Layout**: One sensor on top of each rack + One interface module on rear panel, 10 sets in total.
- **Interface**: Modbus RTU and Relay output. the interface module networked to Third Party System (Safety Environment Monitor System) through the Modbus RTU, and relay output to be connected to Audio and Visual Alarm.

In the event of Li-ion Tamer Sensor MOS activation, power is automatically removed from the batteries of the affected UPS rack to stop the overheating process and remove further escalation of the threat. Furthermore, the Li-ion Tamer Sensor MOS reports the alarm status to the Safety Environment Monitor System.

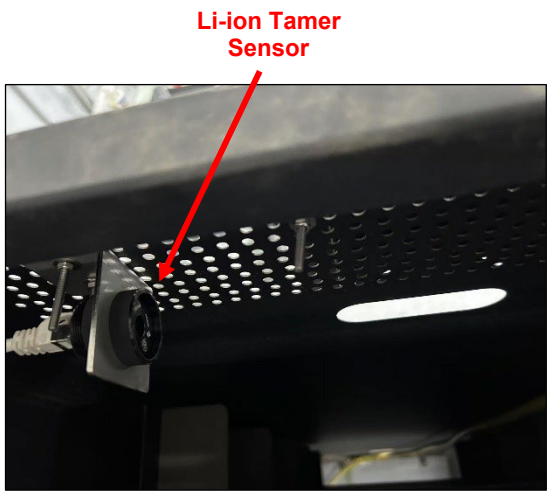


Figure 3: Li-ion Tamer Sensor Installation Position (on the top of rack)

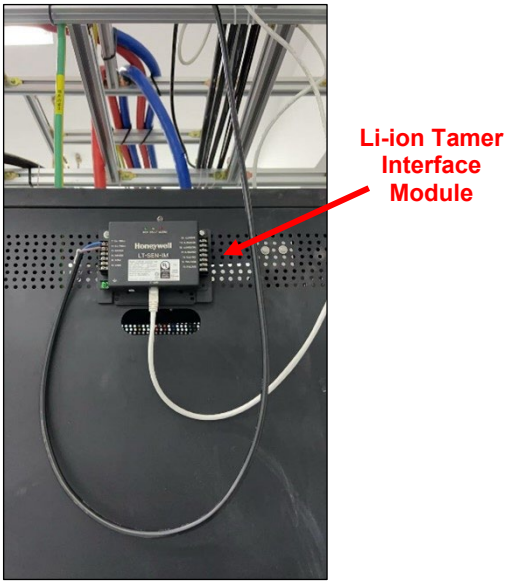
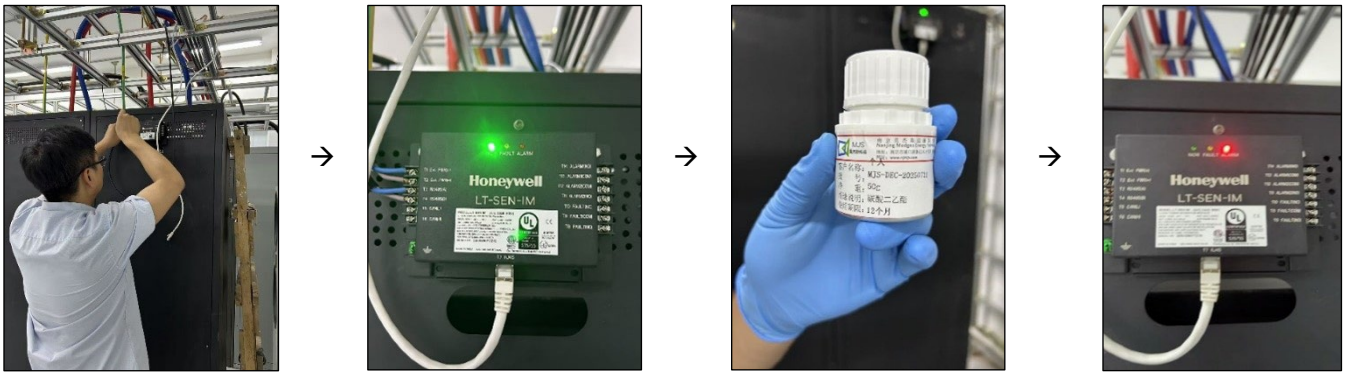


Figure 4: Interface module Installation Position (on the back of rack)

Validation Tests

- DEC simulation (0.5 ml DEC):
  - MOS alarms in 0.5 s
  - UPS disconnects in 2.1 s
- False-alarm test (cleaners, cigarette, dust): 0 triggers

Install the MOS → Power up initialization → DEC Testing → Alarm Activated



Third Party System UI Display

LT-SEN-MOS reports the status of Sensor (normal, alarm, fault, initialization).

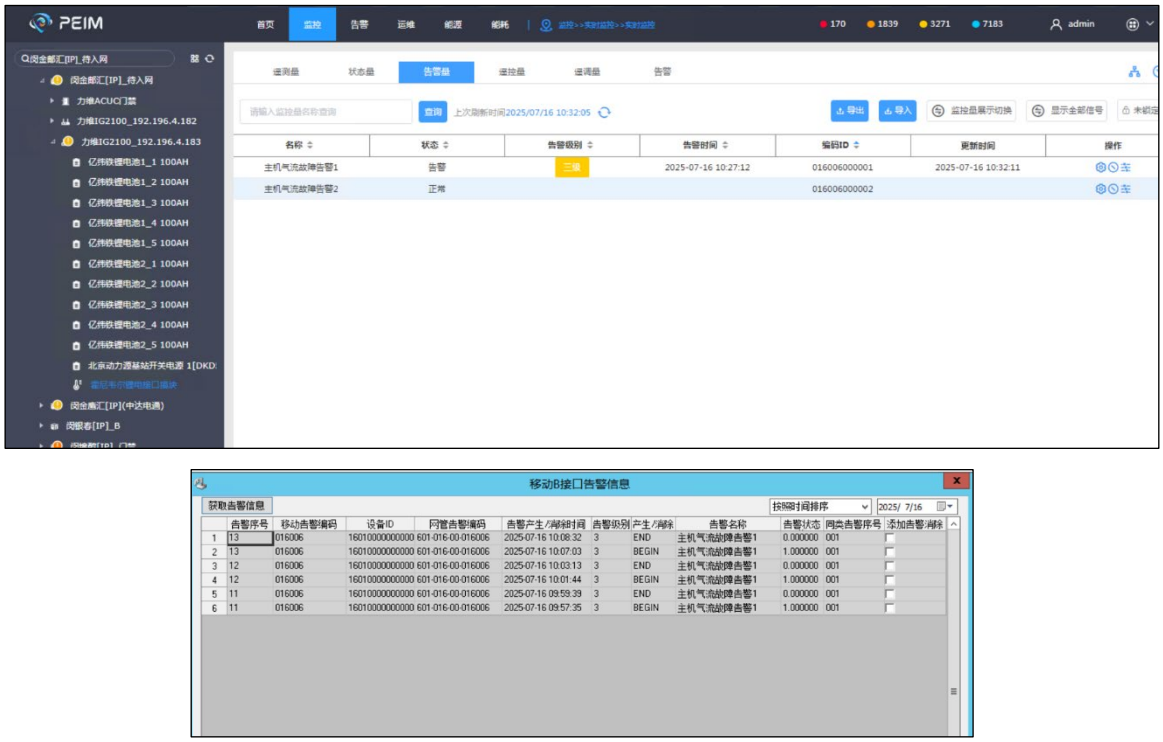


Figure 5: Third Party System UI Display

Conclusion and Value

The Li-ion Tamer Sensor MOS built on the recognized Li-ion Tamer detection technology is the ultimate safety solution for the protection of lithium-ion UPS applications.

The Li-ion Tamer Sensor MOS system provides the earliest possible warning of imminent battery failures by detecting the off-gas phase (FM 6540 approved) that occurs early in the failure mode of lithium-ion batteries. An alert to a battery off-gas event enables investigation and proper mitigation steps to be taken at an early stage to avoid progression to the most catastrophic phase (thermal runaway) which can pose serious threat to occupants' safety, damage assets/ property and result in loss of battery-backup availability for mission-critical infrastructure. It is noteworthy, the detection of the off-gas phase of a failing lithium-ion battery is recognized as a reliable means of pre-thermal-runaway warning by (NFPA72) standards and insurers.

The Li-ion Tamer Sensor MOS with its advanced detection capabilities, calibration-free and 10-year sensors' lifespan, multiple integration capabilities including relays, Modbus, and CANbus communication makes it an indispensable solution for the safe and efficient operation of data center UPS battery systems.

Client Quote *(anonymized)*

"We used to rely on 'seeing smoke'—now we rely on 'smelling danger'. Li-ion Tamer MOS turns invisible risks into controllable data."

— Director of Operations, Data Hall, Major Telecom Facility in Shanghai

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