Parameter

IECEx-Compliant Battery Monitoring in Hazardous Environments

Parameter is a manufacturer of Cellwatch monitoring and detection solutions for data centers, utilities, and critical infrastructure markets where maintaining consistency is critical to operations and compliance.

DCM6-L-IECEx introduced to Cellwatch Battery Monitoring and Cellwatch Frontier

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Executive Summary

In hazardous locations, the battery monitoring question is rarely “Can we measure the battery?” The real question is whether teams can maintain continuous visibility into critical batteries without increasing ignition-source risk, adding field-engineering complexity, or increasing routine work within a classified space.

Parameter is a manufacturer of monitoring and detection solutions for data centers, utilities, and critical infrastructure markets where maintaining consistency is critical to operations and compliance. Parameter has introduced a comprehensive monitoring solution for voltage, ohmic value, current, ambient temperature, and per container temperature. The DCM6-L-IECEx is an IECEx-compliant Data Collection Module based on the 6th-generation DCM6-L platform and is used with Cellwatch Battery Monitoring or Cellwatch Frontier Monitoring Systems. It enables continuous cell-level or jar-level trending of voltage, continuous cell-level temperature, and daily cell-level ohmic value (internal resistance) while keeping the controller and integration layer in a non-hazardous area. When installed in accordance with the Conditions of Safe Use and the boundary model defined in the installation guidance, the result is a reviewable deployment approach that supports hazardous-area compliance and improves visibility into battery health over time.

This certification also expands the areas where the system can be deployed. In addition to traditional critical infrastructure battery monitoring, IECEx enables deployment in oil and gas, petrochemical, and refining operations, chemical and process manufacturing, generation-side utility environments, and hydrogen-adjacent facilities, where hazardous-area requirements mean manual checks remain the industry norm.

Cellwatch DCM hardware is now in its sixth generation, with more than 20,000 sixth-generation units installed and a published MTBF of 350 years. The IECEx DCM extends that proven monitoring foundation into hazardous environments while reducing installation burden and recurring field work compared to approaches that require additional Ex enclosures or project-specific cabling engineering.

Purpose

Hazardous locations pose a unique monitoring challenge. Access is restricted, work follows strict procedures, and even simple diagnostic tasks may require permits, gas testing, and coordination. This focuses on maintaining continuous cell-level visibility in such conditions, all from the safety of the non-hazardous area. It explains how the Parameter-IECEx solution is used with Cellwatch Battery Monitoring and Cellwatch Frontier, how the boundary between the hazardous and safe zones is maintained, and how to interpret the IECEx scope to ensure that certification claims remain accurate. It also highlights practical features that reduce installation effort and enable faster, more targeted condition-based maintenance in Zone 1, Zone 2, and even C1D2 hazardous working environments.

The Risk of Relying on Manual Checks in Zone 1 and Zone 2 Environments

Zone designations for Hazardous Environments describe the risk of flammable elements in a given environment. Zone 1 and Zone 2 battery rooms are governed by hazard controls that shape how maintenance is performed. Standards for stationary battery installations address hazards related to gas emissions, ventilation, and electrostatic discharge, and those requirements manifest as day-to-day operational constraints.

Hazardous Zone battery strings support control, protection, and continuity functions expected to perform under abnormal conditions. When degradation goes unnoticed, teams lose time and options. In hazardous areas, confirming and correcting an issue takes longer because entry is procedural, and the work is constrained by safety controls. That delay contributes to the risk. Earlier notice is what changes the maintenance posture. It gives teams time to validate the issue remotely, plan a targeted entry with the right parts and clearances, reduce downtime, and limit time spent in the hazardous area.

Access restrictions change behavior
Routine entry may require permits, PPE, gas testing, and coordination, even for basic tasks such as collecting readings or confirming status. Over time, restrictions on entry to classified rooms often further limit status checks and slow troubleshooting.

Point-in-time testing creates blind spots
Handheld testing produces snapshots rather than high-resolution trend history. Batteries rarely degrade in a clean, linear way, and early changes often appear first as shifts in resistance behavior and localized temperature patterns before voltage changes meaningfully. Connection degradation can also be presented as small deltas that are easy to miss without high-resolution data samples.

Reactive maintenance is more costly in hazardous spaces
When a deviation is found late, the response becomes more extensive and more expensive. Entry is planned around hazard controls rather than the work itself, and downtime often extends because teams must return with the right tools and parts after the issue is confirmed.

The operational objective is consistent across industries
Reduce unnecessary entry, improve diagnostic coverage, and use trend evidence to plan targeted work so that entry is driven by conditions rather than routine measurement.

System Benefits That Matter in Hazardous Sites

Cellwatch Battery Monitoring is a continuous monitoring architecture designed to measure and trend battery health without taking the battery system offline. Distributed Data Collection Modules DCMs are installed at the battery to capture jar-level measurements. Data is aggregated through a controller layer and can be accessed through local interfaces and upstream integrations.

Cellwatch Frontier is used where deployments benefit from SCADA-aligned workflows and structured reporting. An enterprise software layer may be used where organizations need multi-site roll-up and fleet-level visibility.

What sets Cellwatch systems apart?

Cellwatch is designed to be easy to operate, reliable in real-world electrical conditions, and consistent enough to support long-term trend analysis. It installs permanently and runs automated diagnostics on a defined cadence, producing time-stamped trends and exception reporting that reduce the burden of manual testing.

- **Ease of use and low service friction**: Cellwatch hardware is DIN rail-mountable, installs in minutes, and is designed to be quickly disconnected and reconnected during battery replacement. The monitoring system is largely plug-and-play, reducing installation time and keeping routine service work straightforward.
- **High reliability**: Fiber-based, optically isolated communications keep measurements stable in electrically noisy UPS and DC environments. That helps operators trust the data, even at remote sites and across long service intervals.
- **High precision**: With high-resolution readings, small changes in battery condition can be detected early—before they manifest as load issues. This enables clearer trend analysis and allows for earlier intervention.
- **Repeatability:** ensures measurements are captured consistently at a set cadence, making trends reliable over time. Deterioration appears as a trackable drift rather than a single snapshot influenced by test technique.
- **Cost effectiveness:** Condition-based maintenance minimizes unnecessary site visits and prevents replacing healthy batteries according to a fixed schedule. The monitoring hardware stays installed throughout multiple battery change cycles, which reduces rework and maintains an ongoing operating history.
- **Continuous, repeatable trending:** Per-unit measurements are captured consistently over time, supporting early identification of drift rather than point-in-time snapshots.
- **Operational visibility:** Operators can access readings, trends, and exceptions without routine entry into the hazardous space.
- **Scalable deployment model:** The architecture is designed for large systems and harsh electrical environments where isolation and signal integrity matter.
- **Proven deployment base:** Sixth-generation DCM hardware has been deployed at scale, with long-life reliability metrics published for decision-makers evaluating operational risk and total cost of ownership.

Historical records are maintained at the controller layer for both Cellwatch Battery Monitoring and Frontier systems. If an enterprise layer is used, it can retrieve historical records from the controllers upon request.

DCM6-L-IECEx: Main Features for Hazardous Area Deployments

The DCM6-L-IECEx is modeled on the sixth-generation DCM6-L product, is equipped with temperature-sensing capability, and is designed for installation near batteries in hazardous zones. It operates with Cellwatch Battery Monitoring and Cellwatch Frontier.

Early Visibility

- **Hazardous-ready without bulky Ex enclosures:** The IECEx DCM meets explosion protection requirements for hydrogen and other IIC gas groups without requiring the DCM to be housed inside a separate bulky Ex enclosure. This eliminates the separate engineering effort for enclosure and gland decisions, which adds time and delays installations.
- **Integrated leads and temperature probes:** Leads and temperature probes are integrated and certified with the unit, reducing custom cabling and connection engineering in the field.
- **Installed or removed quickly without opening battery connections:** For some configurations the battery monitoring system can be installed or removed without breaking battery connections, supporting battery replacement workflows without turning each maintenance cycle into a re-engineering exercise.
- **Simplified installation via fiber optic loop:** DCMs connect via a fiber optic loop. Fiber provides optical isolation and supports performance in electrically noisy environments. Fiber is a communications and isolation method, not the basis of Ex protection or certification.
- **Maintainability and stability:** Published collateral emphasizes no critical maintenance or calibration following installation, and secure mounting supports consistent measurement over time.
- **Scale advantage:** Each DCM can monitor up to four battery cells units, typically 2V lead-acid cells, within the supported voltage range, reducing device count in higher-unit configurations.
- **High-resolution measurements:** IECEx measures with 1 µΩ resolution for low-ohmic cells and ties this to ohmic accuracy and inter-cell strap connection resistance. Inter-cell connection resistances can be measured separately, if specified, with additional
    - Broad temperature operating range
    - Small size allows the system to be installed in limited space applications

- You've mentioned engineering time and installation time. A good reference would be how much faster you can install or how many engineering hours you can save.
- High reliability is a critical differentiator since it is extremely costly and burdensome to perform maintenance. You touch on this but maybe emphasize how this could impact the customer in hours or downtime if they used a competitive product.

Installation and mounting summary

- Mounting: DCM base plate mounting holes, optional DIN rail mount.
- Cabling options: 36-inch standard leads, 72-inch lead option.
- Small Size
- Adapter options
- Materials needed for installation provided as part of the solution
- Compatible with wide range of batteries

How to Evaluate Solutions

What separates solutions in practice

- **Installation burden:** Does the approach require additional Ex enclosures around the monitoring device, or is the monitoring device certified for direct deployment at the battery within defined conditions?
- **Field engineering load:** How much project-specific design work is needed for cabling, connectivity, and acceptable installation boundaries.
- **Maintainability:** Whether the system supports battery replacement and module replacement without adding engineering work each service cycle.
- **Scale:** Device count and complexity as battery configurations grow, including how many battery units each module can support.
- **Workflow readiness:** Whether teams can rely on real-time access and trending to plan targeted entry and reduce downtime.

IECEx Marking and Certification Boundary

IECEx is an international third-party certification scheme for equipment used in explosive atmospheres, based on IEC standards, especially the IEC 60079 series. It differentiates between equipment certification and proper installation and lifecycle management on-site. (IECEx Certified Equipment Scheme overview, IEC 60079 family)

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Markings and rated ambient range

- **IECEx marking:** Ex mb IIC T4 Gb
- **ATEX marking:** II 2G Ex mb IIC T4 Gb
- **UKEX marking:** II 2G Ex mb IIC T4 Gb
- **Rated ambient range (equipment-specific):** 0°C ≤ Tamb ≤ +60°C

- **Ex mb:** Encapsulation protection concept "m" with protection level "b," commonly associated with EPL Gb when installed within certified conditions.
- **IIC:** Most stringent gas group for Group II gas atmospheres, including reference gases such as hydrogen and acetylene.
- **T4:** Temperature class limiting maximum surface temperature to 135°C under defined conditions.
- **Gb:** Equipment Protection Level for gas atmospheres, commonly mapped to Zone 1 use when installed correctly.

Measurements and Trending Matters

In stationary battery programs, the value of monitoring comes from baselining and trending, not from a single reading. IEEE guidance treats monitored parameters as observable operational inputs whose values vary by application. (IEEE 1491). Industry reliability guidance also cautions that different ohmic methods and instruments can produce different values. Consistency of method, baseline, and trending cadence matters. (NERC PRC-005 supplementary reference)

Voltage as a lagging indicator
Voltage can remain nominal while degradation begins. It often does not show early-stage change until a problem is already well underway.

Ohmic value and trending
Internal resistance trends are commonly used as an early indicator, particularly when evaluated against a baseline. Trend direction and rate of change carry more operational value than any single measurement.

Temperature context
Temperature behavior provides important context for interpreting battery condition and risk, especially when paired with resistance and voltage trends.

What automated monitoring changes operationally
Ohmic value is measured in both Cellwatch Battery Monitoring and Frontier deployments. The difference is operational. A permanently installed controller provides real-time access and trended history. In hazardous spaces, this enables a disciplined workflow. Teams can confirm conditions remotely, plan parts and clearances, and prepare the maintenance event before

arriving on-site and securing the space. Entry becomes targeted and purposeful rather than routine.

Frontier deployments also support structured reporting workflows. IECEx collateral distinguishes real-time access and trending from report generation, with daily, weekly, and monthly automated reports.

Data, Integration, and Visibility

Integration boundary
In hazardous deployments, integration occurs from the controller layer located in the non-hazardous area. This preserves the hazardous-area boundary and is the practical point to interface with upstream systems.

Integration pathways

Integration outputs and protocol support are controller-dependent and configuration-dependent.

- **Cellwatch Battery Monitoring deployments:** Provide outputs such as Modbus and SNMP for upstream monitoring, depending on configuration.
- **Cellwatch Frontier deployments:** Support SCADA-aligned workflows and can publish alarms and selected values via DNP3 where required, depending on configuration. SNMP and Modbus TCP/IP are also supported.

Visibility across sites

Historical records are maintained at the controller layer. If an enterprise layer is used, it can retrieve historical records from those controllers for analysis, reporting, and fleet-level context.

Best-Fit Environments and Practical Applications and Industries Applications and Industries

Cellwatch Frontier is used anywhere battery-backed DC power supports continuity, control, communications, and safety, and where teams need visibility before a maintenance window, an outage event, or a site visit forces the issue. Frontier remains a strong fit for utility and telecom networks, and it now extends the same monitoring model into industrial, oil and gas, chemical and process, generation-side, hazardous environments and others where access is controlled and operational consequences are higher.

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Utility
Frontier supports station batteries that provide backup protection, switching, and critical communications. It provides daily monitoring and reporting that reduces manual effort in compliance-driven programs and helps utilities identify weak cells, connection deterioration, ripple conditions, and temperature shifts before readiness is questioned during switching or outage response.

Telecom
Frontier supports battery plants across distributed cabinets, shelters, and remote enclosures where battery failure can disrupt service. Automated diagnostics and exception-based alerts help teams focus dispatches on the sites that need attention, rather than relying on sweeps to discover issues after performance has already degraded.

Industrial and Manufacturing
Manufacturing environments often depend on DC-backed systems for automation, controls, and operational continuity. Frontier supports earlier detection and condition-based decisions in settings where even a brief interruption can delay restart, disrupt output, or create cascading operational costs.

Power Generation and Hydrogen-Related Applications
Generation-side environments may include controlled-access battery spaces and hydrogen-classified areas where monitoring must be deployed with the right hazardous-area architecture. Frontier supports battery visibility in these settings using the same monitoring workflow used across other deployments, with IECEx-rated field components available for Zone 1 applications where classified constraints apply.

Hazardous Battery Environments
Hazardous environments require a monitoring approach that respects the installation conditions of the space. Frontier supports this through a safe-zone and hazard-zone deployment model, using compatible IECEx-rated field components in the classified area, so operators can maintain visibility without treating hazardous sites as disconnected specialty programs.

Oil and Gas
Oil and gas environments often combine distributed assets, limited service windows, and classified operating conditions. Frontier supports battery monitoring at sites where DC systems back up controls, communications, and safety-related functions, and where battery visibility is needed before entry can be scheduled or work can be coordinated with broader operating conditions.

Chemical and Process Facilities
Process sites rely on stable DC-backed systems to support operating continuity and controlled response. In these environments, the consequences of battery issues can extend into process stability and safe operations, not just maintenance inconvenience. Frontier provides earlier visibility so operators can plan service and coordinate access around operational constraints.

Maritime and Offshore
Maritime and offshore environments often feature numerous distributed UPS and battery

systems that support onboard operations, with service windows that can be limited. Frontier supports earlier identification of issues, so maintenance can be planned for the next service opportunity, rather than discovered when a system is already at risk.

Practical Next Steps and Non-Claims

Practical next steps
For teams evaluating deployment, the next step is to confirm site classification, align the boundary model and routing plan to installation guidance, and validate integration requirements at the controller layer. For installation and compliance, engineers and installers should rely on the installation guide, IECEx documentation, and site-specific hazardous-area engineering review.

Limitations and non-claims
IECEx certification does not automatically certify the batteries or their connection method; additional evaluation is required for explosion protection at the battery-connection boundary.

Installations must follow the manufacturer's guidance and applicable standards to preserve certified protection. Installation of any component in a manner not specified or approved may impair the equipment's protection. Use in an unapproved manner may limit or void the warranty.

1. of electrostatic discharge using methods listed in the manufacturer's instructions as per EN IEC 60079-0:2018 / IEC 60079-0:2017 Ed. 7 clause 7.4.2. Additionally, the surface shall only be cleaned with a damp cloth.
2. Only to be used with Parameter approved controllers that do not use any source of optical energy other than non-array divergent LEDs which are excluded from the requirements of IEC 60079-28.

Appendix - Reference Architecture Figures

Appendix - Specification Snapshot Matrix and Controlled Table

Quick-Scan Specification Snapshot (Datasheet-Aligned)

- Approved hazardous area: Zone 1, gas group IIC, temperature class T4
- Rated ambient range: 0°C to +60°C

- Power supply (full functionality): 4 V to 12 V DC
- Enhanced voltage measurement: 2 mV resolution, 0.1% ± 15 mV accuracy
- Enhanced ohmic measurement: 1 μΩ resolution, 2% ± 4 μΩ accuracy (0 to 6 mΩ range)
- Temperature measurement point: Negative post (with temperature probe installed)
- Temperature measurement: 0.01°C resolution, ± 1°C accuracy
- Standard lead lengths: 36-inch standard, 72-inch option
- Mounting options: Base plate mounting holes, optional DIN rail mount
- Planning cable limits: TP 75 ft max, CT 75 ft max, FO 100 ft max

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Appendix E. Glossary and Abbreviations

- **ATEX:** European directive and certification framework for equipment used in explosive atmospheres.
- **UKEX:** UK certification framework for equipment used in explosive atmospheres.
- **IECEx:** International certification system for equipment used in explosive atmospheres.
- **Hazardous Area / Zone:** A location where explosive gas atmospheres may be present; zones classify likelihood and duration of that atmosphere.
- **Zone 0 / Zone 1 / Zone 2:** Zone definitions used to describe how often an explosive atmosphere is present.
- **EPL (Equipment Protection Level):** Classification describing the level of protection for equipment used in explosive atmospheres.
- **Ex mb:** Encapsulation protection concept using protection method “m” with protection level “b.”
- **Gas group (IIA, IIB, IIC):** Classification of gases by ignition characteristics; IIC includes high-risk gases such as hydrogen.
- **Temperature class (T1–T6):** Classification limiting maximum surface temperature under defined conditions; T4 corresponds to 135°C.
- **DCM (Data Collection Module):** A field module that measures battery parameters and reports them back to a controller.
- **DCM6-L-IECEx:** Certified hazardous-area variant of the DCM used in classified environments.
- **Cellwatch Battery Monitoring:** Continuous battery monitoring platform architecture and system components.

- **Cellwatch Frontier:** A monitoring system used where SCADA-aligned workflows and structured reporting are required, depending on configuration.
- **SCADA:** Supervisory Control and Data Acquisition systems used to monitor and control industrial operations.
- **DNP3:** Utility and industrial communications protocol commonly used in SCADA environments.
- **SNMP:** Network monitoring protocol commonly used for alarms and status reporting.
- **Modbus:** Common industrial communications protocol used for monitoring and control.

External Standards and Industry References

- IECEx Certified Equipment Scheme overview and the IEC 60079 standards family (explosive atmospheres equipment framework).
- IEC 62485-2 (stationary battery installation of hazards, including gas emission, ventilation, and explosion of hazard provisions).
- IEEE 1491 (stationary battery monitoring parameters and the role of monitoring).
NERC PRC-005 supplementary reference (ohmic baseline and trending considerations, measurement method consistency).