# BES LITE
# BES LITE SERIES

**3014-8347**
*Issue 3*

## Battery Safety Electrolyte Detector

Compact Design | Highly Sensitive & Selective | Analog Three-State Output

## DESCRIPTION

BES LITE is a cost-effective, low-profile, light-weight battery safety detector that uses Honeywell proprietary gas sensing technology to selectively detect battery electrolyte vapor, an indicator of thermal events. This provides an advanced warning of potential thermal runaway in Lithium-Ion battery packs.

BES LITE is designed to detect gases that are typically released during the initial phase of thermal runaway as well as throughout the entire thermal runaway process. This advanced detection capability facilitates the prompt identification of imminent dangers or risks, significantly enhancing safety measures in critical situations. Therefore, the sensor allows for proactive responses that can prevent loss of assets and protection of lives.

Early detection may vary based on factors such as the nature of cell abuse and its severity, state of charge, and other variables. BES LITE allows compliance with international regulations and guidance by providing a deterministic detection of thermal runaway events.

BES LITE is compatible with all lithium-ion battery chemistries and cell types, making it versatile for use in industrial lithium-ion battery packs. Engineered to support a ten-year lifespan, it aligns with the typical operational life of industrial equipment. As concerns over lithium-ion battery safety continue to rise, BES LITE stands out as the ideal battery safety detector, ensuring the protection of both personnel and assets.

**NOTE**

Gas concentration at the sensor is affected by battery size, type, airflow path, and free volume. The BES LITE sensor was tested in a sealed 1000 mm × 742 mm × 240 mm battery pack with 30 L free volume. Further validation is recommended for different free volumes or battery pack sizes.

## DIFFERENTIATION

- **Early Thermal Runaway Detection:** BES LITE is designed to detect gases commonly released during the initial phase of lithium-ion battery cell breakdown. This early detection allows for the timely implementation of safety mitigation actions, ensuring that appropriate measures can be taken to address potential hazards before they escalate
- **Selective response to battery electrolyte vapor**: BES LITE's selective response to battery electrolyte vapor significantly reduces the risk of false alarms, making it ideal for use in environments where interference gases may be present
- **Efficient & safe design:** BES LITE employs simple electronics for easy integration and minimal power consumption. Unlike other gas sensing technologies, it operates without an internal heating element, making it ideal for explosion-proof environments and applications requiring extended battery life
- **Agnostic to Li-Ion chemistry & battery type:** Works with various Li-ion battery types including prismatic, pouch & cylindrical, as well as different chemistries such as NMC, LFP, LTO, and more.

## APPLICATIONS

Sealed and portable lithium-ion battery modules used in

- Battery Energy Storage Systems (BESS)
- UAM/UAV
- Micro-mobility
- Medical devices
- Light industrial goods

## FEATURES

- Detects initial venting events before thermal runaway
- Provides early warning of thermal runaway events
- Selectively responds to electrolyte vapor
- Intrinsically safe with no internal heating element
- Inbuilt diagnostics functionality
- Low-profile, compact design
- Three-state analog output
- Customizable to specific application needs
- Compatible with all Lithium-ion battery chemistries and cell types
- Ten-year sensor life
- Resistant to common contaminants
- Highly resistant to siloxane poisoning
- Optimized for industrial applications

## VALUE TO CUSTOMERS

- **Enhanced asset protection:** Battery electrolyte vapor detection enables early detection of thermal events, allowing enhanced asset protection
- **Selective detection:** Detects only electrolyte vapor. The selective response and high sensitivity to electrolyte vapor allows for the mitigation of false alarms
- **Reliability in critical environments:** Resistant to cross-gas interference & siloxane poisoning, ensuring reliable performance across demanding environments
- **Ease of installation:** The low-profile construction & mounting flanges enable installation even in tight spaces. The three-state output simplifies integration

Honeywell

# BATTERY SAFETY ELECTROLYTE DETECTOR
# BES LITE

| TABLE 1. GENERAL SPECIFICATIONS | | |
|---|---|---|
| **Characteristic** | **Parameter** | |
| **Detection principle** | Electrochemical sensing | |
| **Dimensions W × L × H [mm]** | 31,8 × 23,5 × 9,9 | |
| **Startup time** | 1 second to valid output | |
| **Response time**[1] | < 2 seconds (typical) | |
| **Detected media (Typical battery electrolytes)** | Ethyl methyl carbonate (EMC)<br>Dimethyl carbonate (DMC)<br>Propylene carbonate (PC) | Diethyl carbonate (DEC)<br>Ethylene carbonate (EC) |
| **Operational life**[2] | 10 years | |
| **Storage life**[3] | 3 years | |

| TABLE 2. ENVIRONMENTAL SPECIFICATIONS | |
|---|---|
| **Characteristic** | **Parameter** |
| **Operating temperature range** | -20°C to 70°C [-4°F to 158°F] |
| **Storage temperature range** | -40°C to 85°C [-40°F to 185°F] |
| **Humidity**[4] | 10 %RH to 90 %RH (non-condensing) |
| **Ingress protection** | IP30 |
| **Vibration** | Sine wave (logarithmic) sweep, 7 Hz to 200 Hz, 1 g to 8 g, 3 h per axis |
| **Shock** | 50 g, 11ms (all axes) |
| **EMC** | As per AIS 004 Part 3 |
| **ESD (unpowered)** | ±8 kV contact discharge (ISO 10605 - 2022)<br>±8 kV air discharge (ISO 10605 - 2022) |

| TABLE 3. ELECTRICAL SPECIFICATIONS | | | | |
|---|---|---|---|---|
| **Characteristic** | **Minimum** | **Nominal** | **Maximum** | **Unit** |
| **Supply voltage** | 4.5 | 5.0 | 5.5 | Vdc |
| **Current consumption** | – | – | 3.0 | mA |
| **Output type** | Three-state output[5] | | | |
| **Output (nominal)** | 2.00 | 2.50 | 3.00 | Vdc |
| **Device fault (diagnostics) or no power condition** | – | 0.0 | <0.5 | Vdc |
| **Output for first vent event** | 4.25 | – | 5.00 | Vdc |

| TABLE 4. INSTALLATION | |
|---|---|
| **Characteristic** | **Parameter** |
| **Device enclosure material** | Acetal (POM) |
| **Connector** | Amphenol® connector P/N:10114830-11103LF (on device) |
| | Mating connector: Amphenol® P/N 10114826-X0X03LF |
| | Crimp terminal P/N:10114827 (28 AWG) |
| **Weight** | 4.5 g |
| **Mounting** | Two M3 screws with flat washers (recommended); installation torque[6] 0.45 Nm ±0.05 Nm |
| **Interface circuit recommendation** | Recommended filter capacitor at output: 0.001 µF to 0.22 µF |
| | Minimum input impedance of load: 850 Kohms |
| | Use of a buffer circuit to isolate the sensor output from input devices/circuits with low input impedance (less than 1 MΩ) is recommended |

[1] Response time – the time required for the device to detect a change in an input physical parameter or stimulus and provide a commensurate or pre-determined change in output. .

[2] At ambient operating conditions ranging from 25°C to 40°C.

[3] At storage conditions ranging from -10°C to 50°C.

[4] Refer to Table 5 for the temperature-relative humidity combinations within the application boundary.

[5] Three-State Output – The device provides a constant analog voltage output signal of 2.50 Vdc during normal operating condition. When a first vent event is detected, the output rails to high (5 Vdc). If the internal diagnostics detects a fault in the device, it produces a constant low (0 Vdc) output. Output is ratiometric to supply voltage; 10 % variation is applicable in all output conditions.

[6] WARNING – Do not over-torque. Tightening beyond the recommended torque value will damage the mounting flange.

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**Figure 1. Product Dimensions (for reference only), mm**

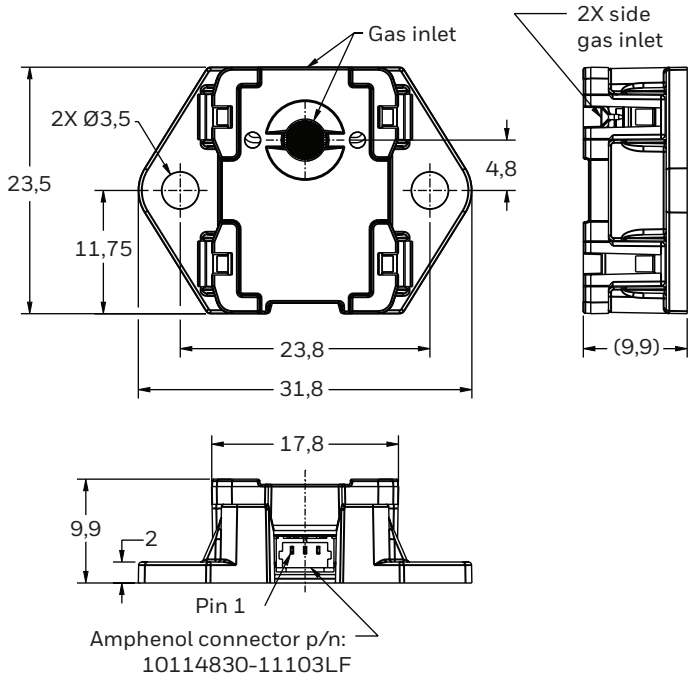


**Figure 2. Electrical Connection**

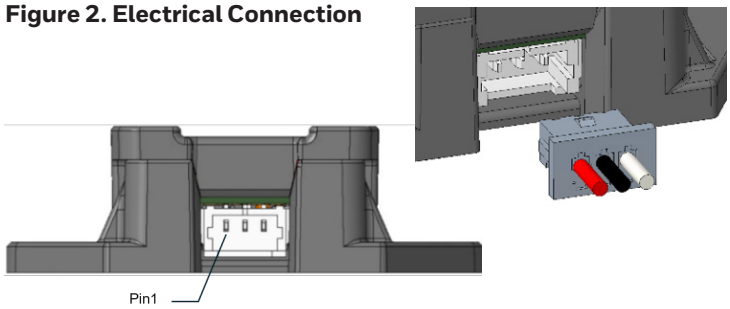


**TABLE 5. TEMPERATURE – RELATIVE HUMIDITY MATRIX**

| Temperature → Humidity ↓ | 25°C | 40°C | 65°C | 70°C |
|---|---|---|---|---|
| 10 %RH | | | | |
| 15 %RH | | | | |
| 65 %RH | | | | |
| 85 %RH | | | | |
| 90 %RH | | | | |

**TABLE 6. PIN OUT**

| Pin | Designation | Function |
|---|---|---|
| 1 | $V_{CC}$ | Supply voltage |
| 2 | GND | Ground |
| 3 | $V_{OUT}$ | Output |

**TABLE 7. ORDER GUIDE**

| Catalog Listing | Description |
|---|---|
| BESL-10100-000 | Battery Safety Electrolyte Detector - flange mount version, Op. temp range -20°C to 70°C, 5 V supply voltage, three-state analog output |
| BESL-20200-000 | Battery Safety Electrolyte Detector - board mount version, Op. temp range -20°C to 70°C, 5 V supply voltage, three-state analog output |

**Figure 3. Illustration of the Three-State Output**

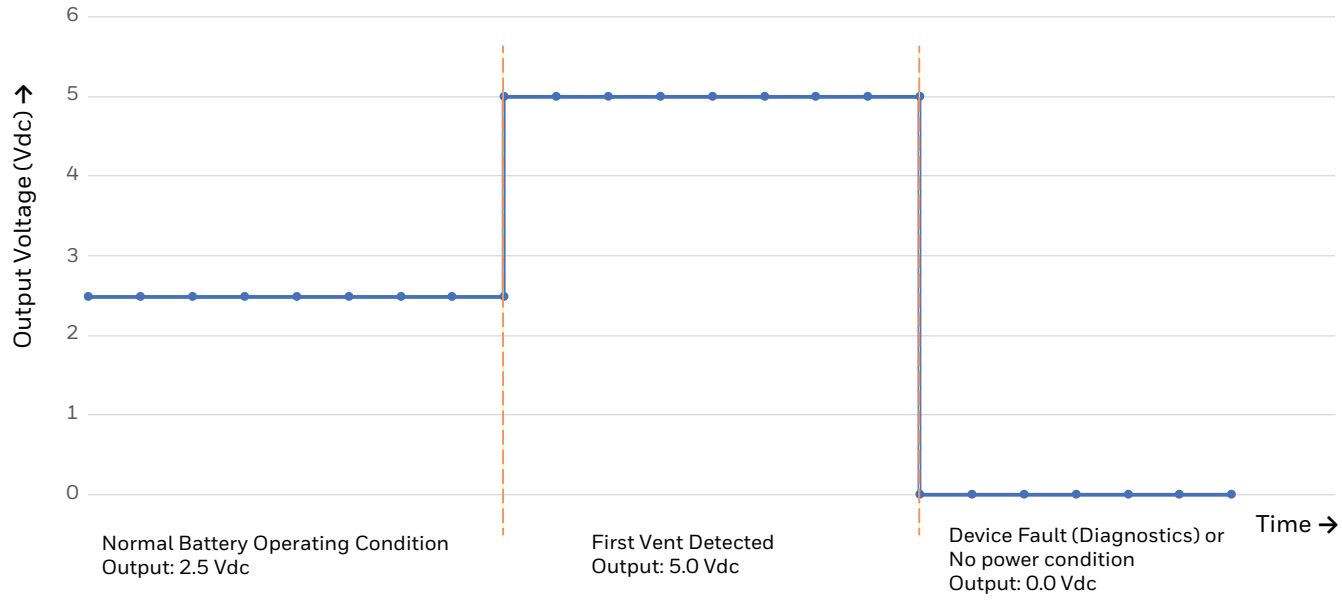

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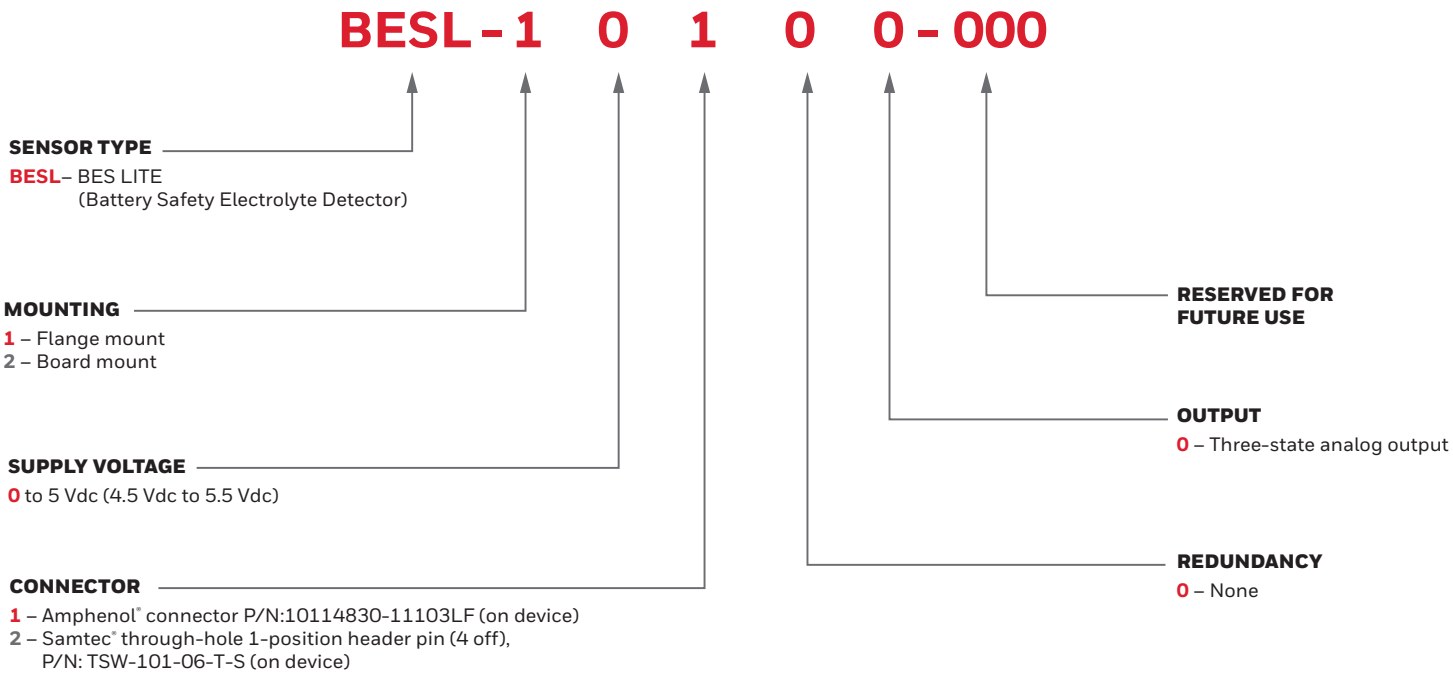
**Figure 4. Product Nomenclature**



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