







Sensing and Safety Solutions for Electrification

# **EV SENSING SOLUTIONS FROM HONEYWELL**

Honeywell battery management sensors include a range of specialized sen current sensors, aerosol sensors, pressure sensors, and electrolyte vapor so These sensors are engineered specifically for effective battery management detecting early indications of thermal runaway in lithium-ion battery packs By utilizing these sensors, Honeywell significantly enhances safety within lelectric vehicles and energy storage systems.

### **CURRENT SENSORS**



**CSHV Series** 

Motor Control Current Sensing



**CSNV Series** 

Battery Management Current Sensing



CSSV Series (ASIL-C)

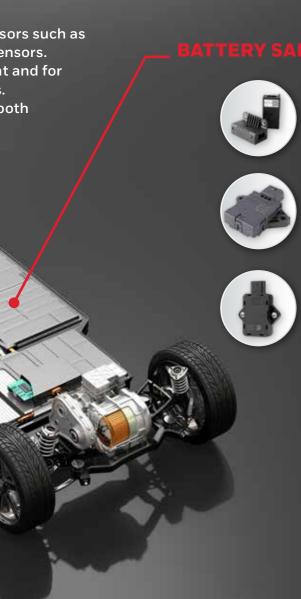
Battery Management Current Sensing

### HYDROGEN SENSORS



**HLD Series** 

Hydrogen Fuel Cell Hydrogen Leak Detection



(Aerosol; 4W, BESS, and **Heavy-Duty Transportation)** Thermal Runaway Detection

GEN•1 (Pressure; 4W and Heavy-Duty Transportation) Thermal Runaway Detection

(Electrolyte Vapor; 4W, **Heavy-duty & Light-duty** EVs, Automotive-grade) Early Thermal Runaway **Detection and Prevention** 

GEN•1

# BATTERY MONITORING

A suite of sensors for battery management systems, electric drive control, energy storage systems and battery safety applications.

#### APPLICATIONS

- Current measurement for battery in electrified vehicles (EV. HEV. PHEV. BEV)
- detection and fault charging systems
- Current measurement in energy storage
- Fault detection in heavy industrial

## CURRENT SENSORS BATTERY MANAGEMENT



Battery management



**CSHV Series** Motor control & fault detection



CSSV1500 Series Battery management



**CSNV700 Series** Motor control & fault detection Also available in 24 V

#### **TECHNOLOGY**

• Honeywell offers different sensing methods to deliver a superior combination of performance and value. The advanced closed loop method delivers higher levels of accuracy, enabling the optimization of battery systems. The open loop sensing method delivers cost competitive current sensing where fast response time is desired

#### **VALUE TO THE CUSTOMER**

- Offers high precision in battery state measurement for improved user experience
- High accuracy enables battery safety and extended battery life\*
- Dual sensing channel increases overall system redundancy
- Magnetic immunity allows for easy integration into applications where magnetic stray fields may be present
- Solutions may be tailored to specifications for improved time to market, lower total system costs, and enhanced reliability

\*Battery life is dependent on usage and other factors.

## BATTERY SAFETY SENSORS FOR THERMAL RUNAWAY DETECTION



**BAS Series** Battery safety aerosol sensor



**BPS Series** Battery safety pressure sensor



**BES Series** Battery safety electrolyte sensor

#### **TECHNOLOGY**

· Honeywell offers different sensing methods for detecting thermal runaway events in lithium-ion batteries. The Battery Safety Aerosol Sensor uses the principle of light scattering to detect presence of aerosols (particulate matter) while the Battery Safety Pressure Sensor uses MEMS (Micro-Electromechanical System) and ASIC (Application-Specific Integrated Circuit) technologies to detect transient pressure changes in the battery packs of electric vehicles

#### **VALUE TO THE CUSTOMER**

- Early detection of thermal runaway event
- ECO mode enables continuous system monitoring in low power mode
- Thermal runaway detection sensor allows compliance with international regulations and recommendations
- Solutions may be tailored to specifications for improved time to market, lower total system costs, and enhanced reliability

#### **TECHNOLOGY**

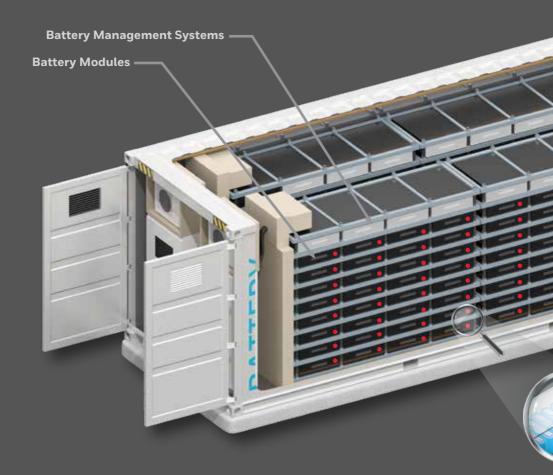
• The Battery Safety Electrolyte Sensor (BES) provides early and reliable detection of thermal runaway of lithium-ion batteries used in electric vehicles. Sensitive to electrolyte vapor, the BES sensor detects thermal runaway at the crucial first vent stage, enabling prevention. This early detection capability of the sensor enables vehicle to meet international safety regulations such as UN GTR 20. China GB38031 & US NHTSA FMVSS 305A

### **VALUE TO THE CUSTOMER**

- Detects electrolyte vapor released during the first vent (before thermal runaway)
- Responsive to H<sub>2</sub>, CO released during thermal runaway
- · Patented alarm algorithm ensuring critical alerts are not missed
- · Automotive product with CAN 2.0B output with diagnostic features

# **BATTERY SENSING SOLUTIONS FROM HONEYWELL**

Battery Energy Storage Systems (BESS) store and manage energy, ensurin efficiency, and integration with renewable sources. These complex units reensure safety and monitor battery charge and health.



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The BES LITE, available in flange-mount and board-mount versions, is a compact and cost effective battery electrolyte vapor detector that is specifically designed for in-pack use. By installing a single BES LITE sensor in each battery pack, you can effectively ensure timely and proactive detection of thermal runaway events.







Honeywell **CSNV500** and **CSNV700** current sensors are housed within the BESS' battery management system (BMS).



## **CURRENT SENSORS**FOR BATTERY MANAGEMENT





CSNV700 Series Motor control & fault detection Also available in 24 V

The sensors are interfaced with the BMS to help measure the current in the modules. They can also monitor battery charge and health, provide overcurrent protection, optimize power use, extend battery life, managed the load, and ensure safety compliance.

- Measures up to 500 A, 700 A, respectively
- High accuracy, low-temperature drift
- Excellent zero-offset performance
- Uses AEC-Q components (CSNV700)
- Excellent stability, reliability, and EMC performance
- CAN communication

## BATTERY SAFETY DETECTORS FOR THERMAL RUNAWAY DETECTION



**BES LITE Series** Battery safety electrolyte detector



#### **TECHNOLOGY**

• BES LITE, available in flange-mount and board-mount versions, 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 enables the activation of mitigation actions that can prevent the loss of assets and protect lives

#### **KEY FEATURES**

- Early Detection: Identifies venting events well before thermal runaway
- Timely Alerts: Offers early warning for impending thermal runaway
- Selective Sensitivity: Selectively detects electrolyte vapor for accuracy
- Space-Saving Design: Compact design integrates seamlessly into battery packs
- In-built Diagnostics: Enabled through three-state analog output

#### VALUE TO THE CUSTOMER

- Enhanced asset protection by enabling early detection of thermal events
- Mitigates false alarms due to selective response to electrolyte vapor
- Reliable in critical environments as it is resistant to cross interference gases and siloxane poisoning
- · Easy to install in tight spaces due to low-profile construction and mounting flanges (flange-mount version) or mounting pins (board-mount version); easy to integrate via three-state analog output

# DROGEN **ETECTOR**

A thermal conductivitybased hydrogen gas sensor with high reliability, high stability and resistance to chemical poisoning for use in detection of hydrogen leakage.



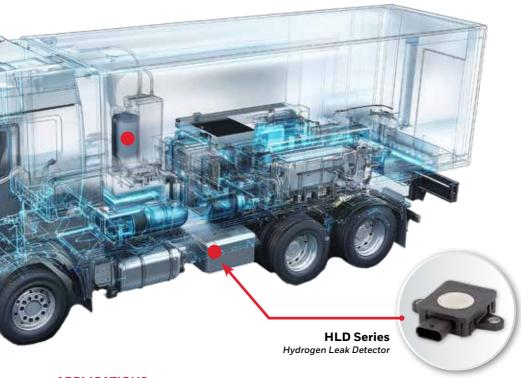
The Hydrogen Leak Detector (HLD) Sensor uses the Honeywell advanced compensation algorithm to detect Hydrogen leaks in different applications. Designed with precision and reliability in mind, the HLD Sensor employs cutting-edge Thermal Conductivity Detection (TCD) technology to deliver lasting performance for many applications that require a highly accurate solution without manual intervention for ten years. Its advanced detection capabilities ensure the identification of hydrogen leakage of 50 ppm or greater. Honeywell HLD Sensors can be utilized in many industries, such as automotive, industrial safety equipment, and residential power generators.





#### **VALUE TO THE CUSTOMER**

- Designed for precise H<sub>2</sub> measurements to improve safety
- TCD technology usage enables the customer to reduce downtime by eliminating false positives
- CAN communication protocol (available) and voltage reading output (coming soon)
- Thermal conductivity base sense element
- Fast response time: < 2 seconds
- Short startup time: < 1 second</li>
- Hydrogen sensing range: 0 % to 4 %



#### **APPLICATIONS**

The HLD sensor is typically adjacent to the hydrogen storage tank, hydrogen gas piping, fuel cell, or vehicle cabin.

The following are examples of Hydrogen applications:

- Hydrogen-powered heavy-duty trucks
- Hydrogen-powered buses
- Hydrogen-power generators
- Hydrogen-powered automobiles
- Hydrogen-powered construction equipment
- Hydrogen-powered aircraft

#### Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.

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Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.



#### For more information

Honeywell Sensing Solutions services its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing, or the nearest Authorized Distributor, visit automation.honeywell.com or call:

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