WE ENABLE CLEAN ENERGY

Sensing and Safety Solutions
for Electrification

Honeywell

EV SENSING SOLUTIONS FROM HONEYWELL

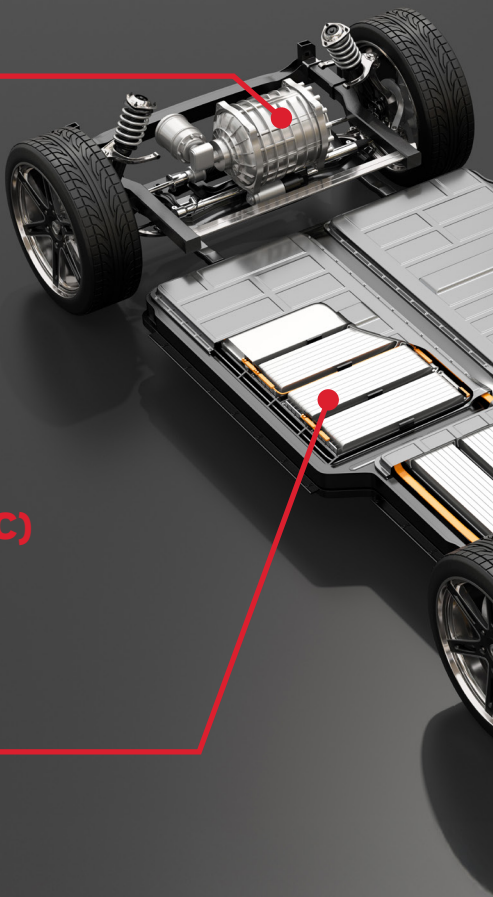
Honeywell battery management sensors include a range of specialized sen
current sensors, aerosol sensors, pressure sensors, and electrolyte vapor se
These sensors are engineered specifically for effective battery managemen
detecting early indications of thermal runaway in lithium-ion battery packs
By utilizing these sensors, Honeywell significantly enhances safety within b
electric 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

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BATTERY SAFETY SENSORS

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

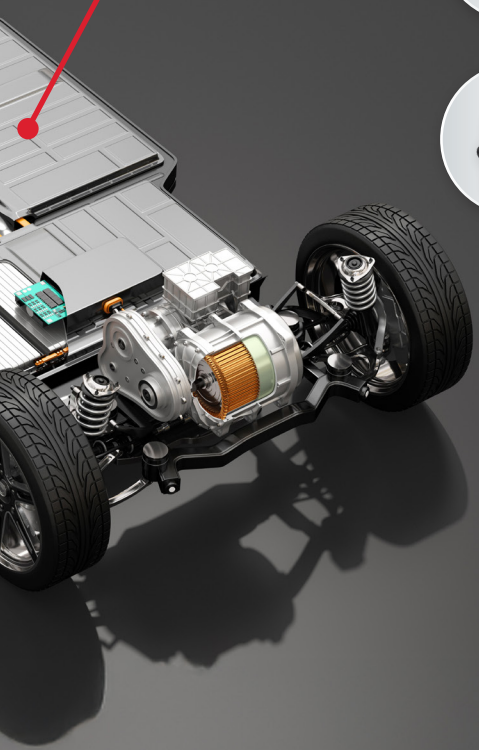
GEN • 1

BPS Series
(Pressure; 4W and Heavy-Duty Transportation)
Thermal Runaway Detection

GEN • 1

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

GEN • 2



BATTERY MONITORING SUITE

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

APPLICATIONS

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

CURRENT SENSORS BATTERY MANAGEMENT

CSNV500 Series
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

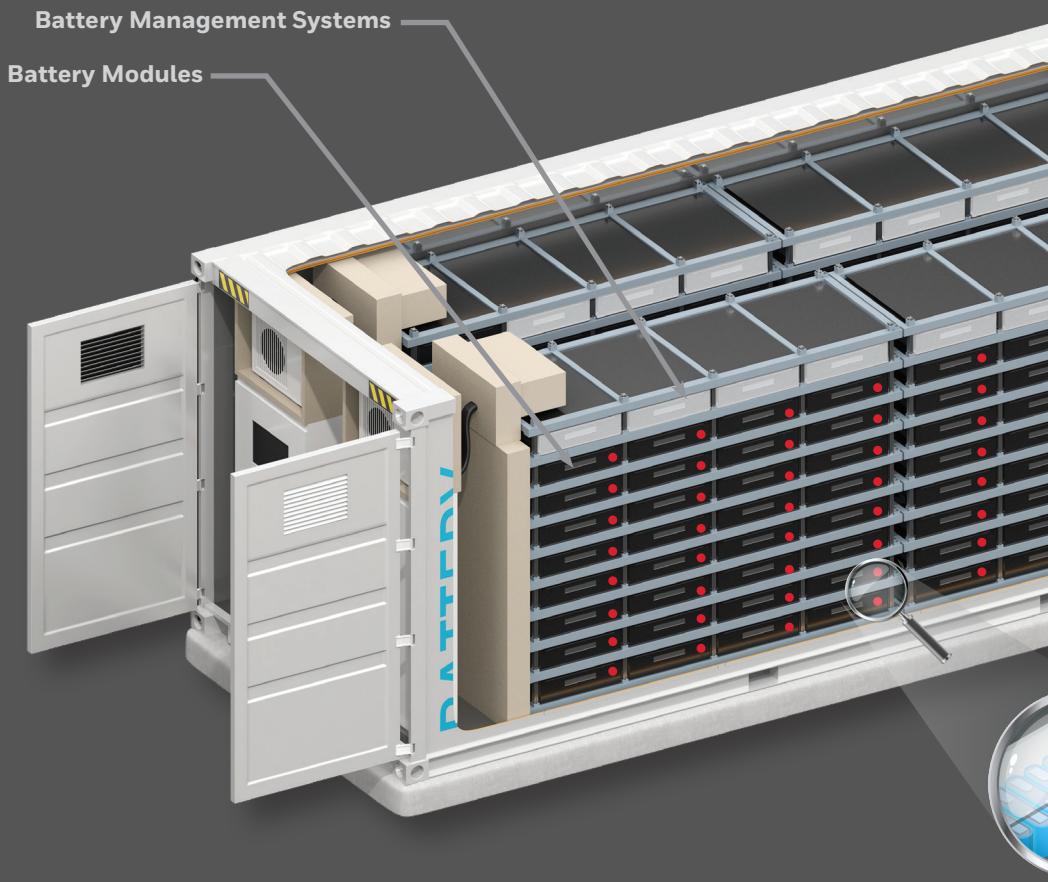
- The Battery Safety Electrolyte Sensor (BES) provides early and reliable detection of thermal runaway of lithium-ion batteries used in electric vehicles. Sensitive to electrolyte vapor, the BES sensor detects thermal runaway at the crucial first vent stage, enabling prevention. This early detection 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_2, 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 re ensure safety and monitor battery charge and health.



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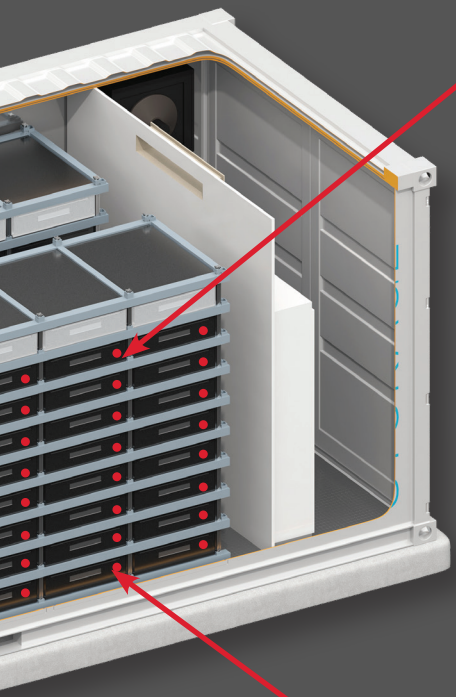
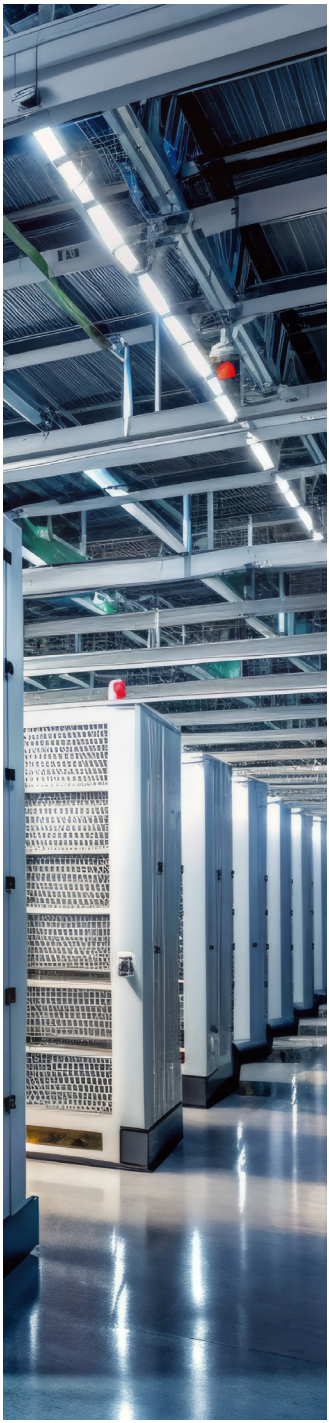


= BES LITE Sensor
One sensor mounted inside each battery module

The **BES LITE** 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

CSNV500 Series
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 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

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; easy to integrate via three-state analog output

KEY FEATURES

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

SAFETY SENSORS HYDROGEN LEAK DETECTOR

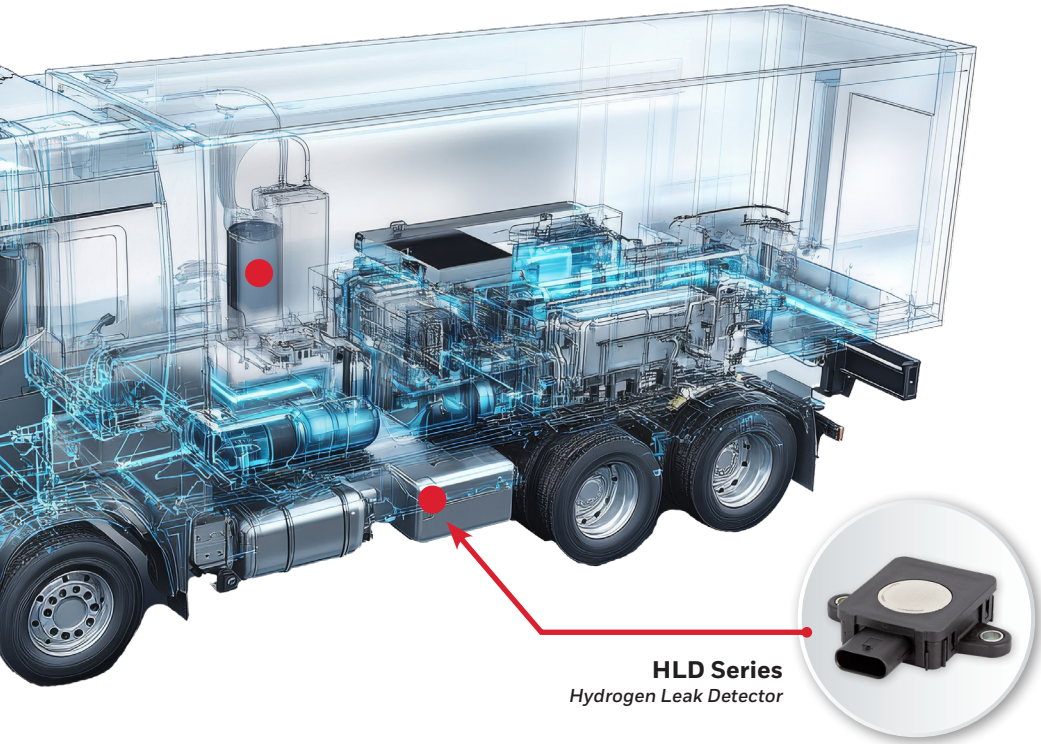
A thermal conductivity-based hydrogen gas sensor with high reliability, high stability and resistance to chemical poisoning for use in detection of hydrogen leakage.

TECHNOLOGY

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_2 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
- Hydrogen sensing range: 0 % to 4 %



HLD Series
Hydrogen Leak Detector

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-dutytrucks
- 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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