



WE ENABLE **CLEAN ENERGY**

Sensing and Safety Solutions
for Electric Vehicles

Honeywell

BATTERY MONITORING SUITE

Honeywell sensors and switches for electric vehicles bring the best combination of performance and reliability. Honeywell is pleased to support the transition to a sustainable future.

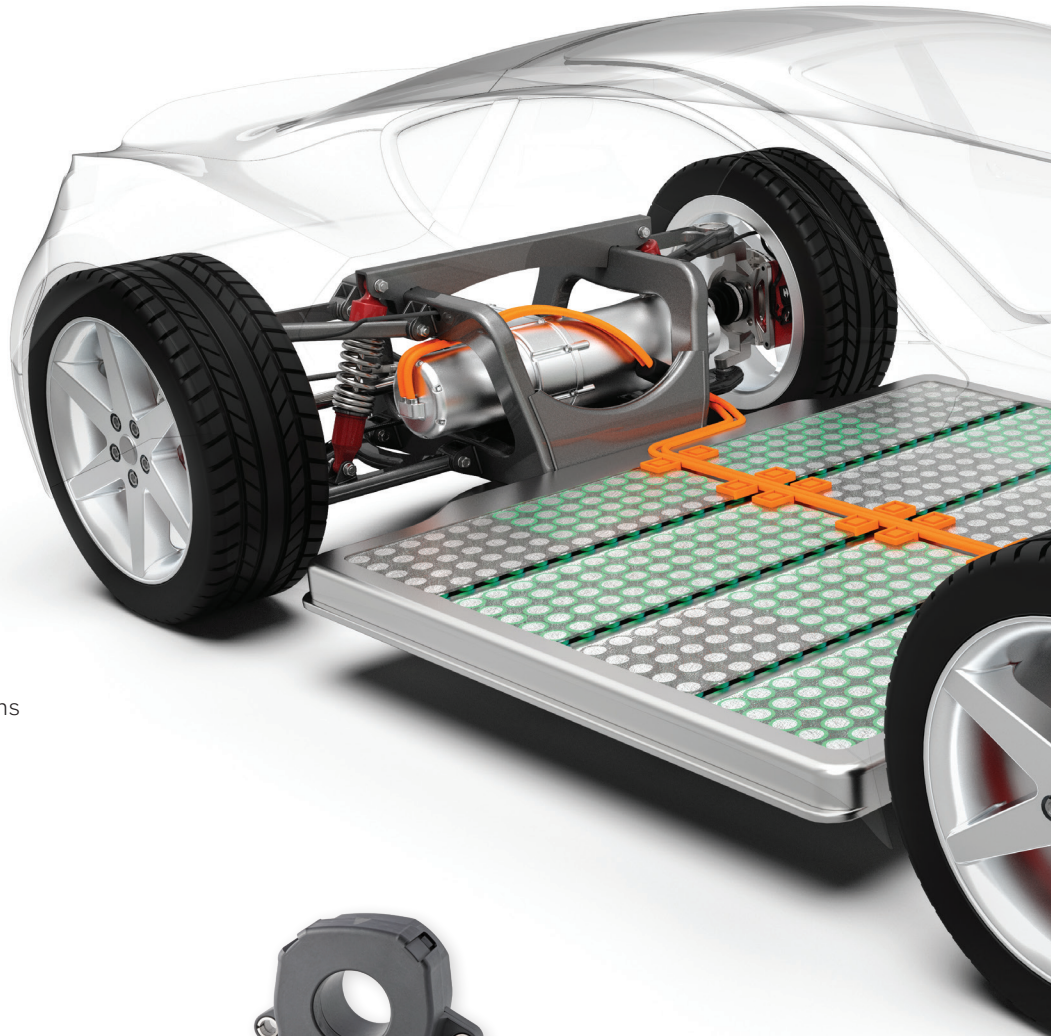


Current Sensors for Battery Management

CSNV Series

- ± 500 A: Closed loop sensing*
- ± 700 A: Closed loop sensing
- ± 1500 A: Advanced closed loop sensing*
- High accuracy and low temperature drift
- Excellent performance in diverse magnetic environments
- CAN Bus output with ID options
- Diagnostic functionality
- Designed for battery management systems

*CSNV700 Series available, other Series coming soon.



Current Sensors for Motor Control and Fault Detection

CSHV Series

- ± 100 A to ± 1500 A
- Open loop sensing
- Analog voltage output
- High accuracy and low temperature drift
- Fast response time
- Designed for current measurement in energy storage systems
- Designed for leakage detection and fault isolation in battery charging systems



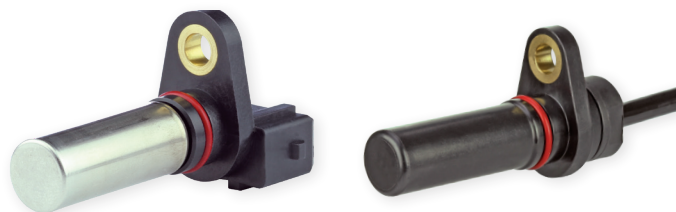
Current Sensors for Safety Critical Applications

CSSV Series*

(Designed to meet ASIL-C requirements)

- ± 1500 A
- Dual channel sensing method
- High accuracy and low temperature drift
- Excellent performance in diverse magnetic environments
- CAN Bus output with ID options
- Diagnostic functionality
- Designed for safety critical applications

*Series coming soon.



Hall-effect Digital Sensors for Speed and Position Detection

SNG-S & SNDH-H Series

- Reports speed information
- Back-biased Hall-effect technology
- Zero speed detection
- O-ring seal
- Moisture ingress protection rated to IP69K
- Speed sensing in gears and shafts in wheels, transmissions, hydraulic motors, pumps and gear boxes

SNDH-T & SNG-Q Series

- Reports speed and direction information
- Dual differential Hall-effect technology
- Air gap up to 2 mm [0.08 in]
- Short circuit and reverse voltage protection
- Open collector output
- Automotive under-the-hood packaging
- Speed and direction sensing in gears and shafts in transmissions, hydraulic motors, pumps and gear boxes

Battery Safety Sensors for Thermal Runaway Detection

BPS Series



- Pressure sensing principle
- Detects pressure changes in Lithium-ion battery packs
- Settable warning threshold for absolute pressure monitoring
- CAN Bus output with ID options
- Different operating modes including ECO mode

BAS Series



- Light scattering principle
- Detects particulate matter such as smoke in Lithium-ion battery packs
- Early detection of thermal runaway event
- CAN Bus output with ID options
- Different operating Modes including ECO mode

BATTERY MONITORING SUITE

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

CURRENT SENSORS BATTERY MANAGEMENT



CSNV500 Series*
CSNV700 Series
CSNV1500 Series*
CSSV1500 Series*



CSHV Series

Motor control and fault detection

Battery management

TECHNOLOGY

- Honeywell offers different sensing methods to deliver the best 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 effective current sensing where fast response time is desired

VALUE TO THE CUSTOMER

- Designed to enable precise 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 exact specifications for improved time to market, lower total system costs, and enhanced reliability.

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

**CSNV700 Series available, other Series coming soon.*

SAFETY SENSORS

THERMAL RUNAWAY DETECTION



BAS Series
Battery safety aerosol sensor



BPS Series
Battery safety pressure sensor

TECHNOLOGY

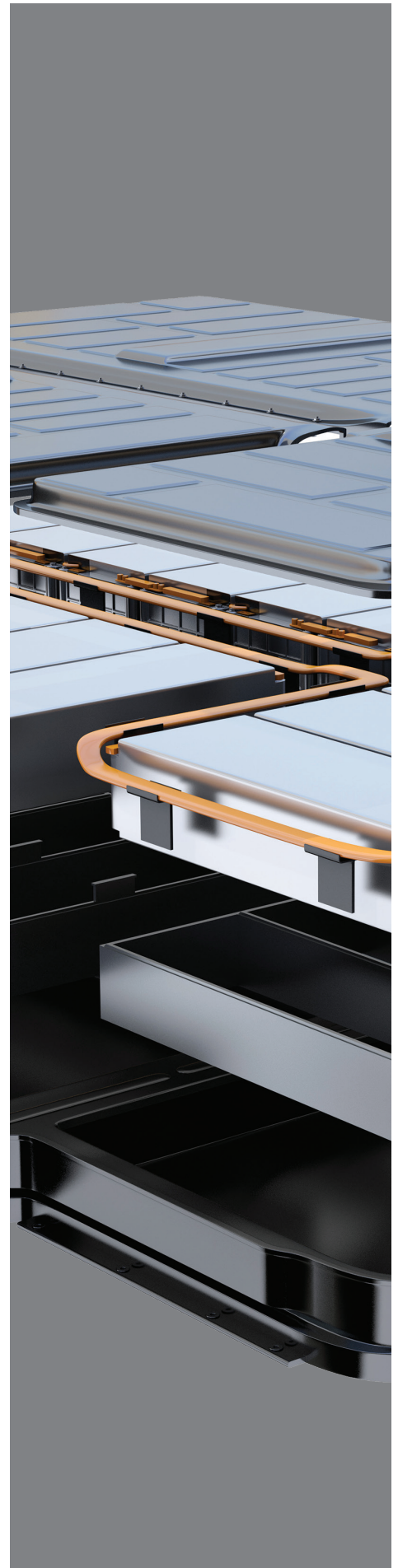
- Honeywell offers different sensing methods for detecting thermal runaway events in lithium-ion batteries. The Battery Safety Aerosol Sensor uses the **principle of light scattering** to detect presence of aerosols (particulate matter) while the Battery Safety Pressure Sensor uses MEMS (Micro-Electromechanical 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 allows for the mitigation of loss of life and property
- 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 exact specifications for improved time to market, lower total system costs, and enhanced reliability

APPLICATIONS

- Thermal runaway detection in lithium-ion battery packs for electric vehicles and in energy storage





FOR MORE INFORMATION

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

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Honeywell

Sensing and Safety Technologies

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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.

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is customer's sole responsibility to determine the suitability of the product in the application.

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.

TRANSPORTATION INDUSTRY PROVIDING TECHNICAL SAFETY & PRODUCTIVITY SOLUTIONS



Honeywell

TRANSPORT YOUR BUSINESS TO A BETTER PLACE: LEADING THE RACE

Honeywell is committed to providing the right product for your application. Whether you need a standard product or a highly customized solution, our sales and engineering teams have decades of experience in the Transportation industry.

We understand your applications and work diligently to ensure we provide a solution that optimally meets your technical and financial needs.

Our combination of a broad product portfolio, deep technical capabilities and extensive application experience culminates into a powerful ability to meet your design needs.



TABLE OF CONTENTS

TARS-IMU	3
Industrial & Military Toggles.....	4
Limit Switches	5
Basic Switches	6
Pressure Switches and Sensors.....	7
Position Sensors	8
Magnetic Sensors.....	9
Air Quality Monitoring	10
Proximity Sensors.....	10

TRANSPORTATION ATTITUDE REFERENCE SENSORS (TARS-IMU)

The Transportation Attitude Reference System or TARS-IMU is a packaged sensor array designed to report vehicle angular rate, acceleration and attitude data for demanding applications in industries such as heavy-duty and off-highway transportation.

FEATURES

- Reports angular rate, acceleration and inclination
- Ruggedized PB8 thermoplastic housing
- IP67 and IP69K certified
- Advanced filtering of raw sensor data
- Optional metal guard for added protection
- Supports 5 V and 9 V to 36 V vehicle power systems
- Operating temperature of -40°C to 85°C [-40°F to 185°F]
- Small form factor



BENEFITS

- Enables semi-autonomous vehicle operation and enhanced efficiency and productivity
- Suitable for the most demanding application and environmental conditions
- Improved positioning accuracy
- Minimizes unwanted noise and vibrations



APPLICATIONS

- Safety, productivity and comfort functions on agricultural, mining, material handling, platform lift and construction equipment
- Cab/equipment leveling
- Tip avoidance/stability control
- Operator-assisted control

HONEYWELL OFFERS A BROAD OFFERING OF POSITION SENSORS:

View our offering by clicking [here](#).

INDUSTRIAL-GRADE SEALED TOGGLE SWITCHES NT SERIES



FEATURES

- NEMA 3, 3R, 4, 13 and IP67/68
- UL recognized; CSA, CE, UKCA certified
- Three popular styles of termination and many configuration options
- Larger standard metal or plastic levers
- Optional “Easy Start” threaded bushing

BENEFITS

- Environmental sealing for demanding applications
- Qualified for global use
- Configurable to your specific needs
- Well suited for gloved-hand operation.
- Quick alignment of the mounting nut to minimize any cross threading
- Enables more compact designs

MILITARY-GRADE SEALED TOGGLE SWITCHES TL SERIES



FEATURES

- MIL-DTL-3950 qualified; UL recognized; CSA, CE, UKCA certified
- 1-, 2- and 4-pole, 2- and 3-position, maintained and momentary toggle action
- Optional locking levers for critical applications
- Step-design case
- Choice of silver alloy or gold-plated contacts

BENEFITS

- Designed to withstand the most demanding indoor and outdoor applications
- Qualified for global use
- Configurable to your specific needs
- Added space between terminals to prevent shorting



HONEYWELL OFFERS AN EXTENSIVE RANGE OF TOGGLE SWITCHES INCLUDING TS, MT, NT, TL, TW, AT AND ET SERIES:

View our offering by [clicking here](#).

MICRO SWITCH LIMIT SWITCHES

Available with a variety of actuators, electrical specifications, terminations, circuitries and sealing ratings, Honeywell MICRO SWITCH limit switches offer superior flexibility and performance. These precision snap-action switches — sealed in rugged housings — are used to detect presence or absence in areas where physical contact is allowed.



NGC Series FEATURES

- SPDT or DPDT configurable circuitry
- Snap-action, positive-break contacts
- IEC 60947-5-1, IEC 61373, EN45545-2
- NEMA 1, 4, 12, 13; IP67 sealing
- Mechanical life up to 5 million operations



14CE Series FEATURES

- IP65/66/67/68 environmental sealing
- Pre-leaded or M12 four-pin connector
- 25 mm mounting centers
- 10 million actuation cycles



GLC Series FEATURES

- EN 50047 footprint
- EN 45545-2 emission standard
- Sealed to IP66; NEMA/UL 1, 4, 12 and 13
- Mechanical life up to 10 million operations
- Positive opening EN/IEC 60947-5-1-3



HDLS Series FEATURES

- IP65/66/67 environmental sealing
- Sintered bronze bearing on 303 stainless steel operating shaft for enhanced mechanical life up to 50 million actuation cycles
- Corrosion-resistant zinc head and body are phosphate treated and epoxy coated

HONEYWELL OFFERS A WIDE RANGE OF LIMIT SWITCHES INCLUDING NGC, 14CE, GLC AND HDLS SERIES:

View our offering by [clicking here](#).

MICRO SWITCH BASIC SWITCHES

With decades of engineering excellence in the design of snap action switches, Honeywell offers a range of products to meet market demands. No matter if you require a simple or precision on/off detection, or an electromechanical interface for pressure monitoring or to support a manual operator interface, there are options to serve numerous applications.



Miniature V15 Series

FEATURES

- Max 26 A Load
- Up to 1 million mechanical cycles
- Highly configurable



Miniature V15W Series

FEATURES

- Max 10 A load
- Up to 1 million mechanical cycles
- IP67 sealed
- Pre-cabled or terminal options



Large Basic BZ/BA/BM/BE Series

FEATURES

- Max 25 A load
- Up to 20 million mechanical cycles
- MIL-PRF-8805 on selected listings



Subminiature HD1 Series

FEATURES

- Max 0.1 A load
- Up to 300,000 mechanical cycles
- IP67 sealed

**HONEYWELL OFFERS AN EXTENSIVE RANGE OF BASIC SWITCHES
INCLUDING BZ, V15W, V15 AND HD1 SERIES:**

View our offering by [clicking here](#).

PRESSURE SENSORS AND SWITCHES



MIP Series

The MIP Series offers a heavy duty, media-isolated pressure transducer in a compact, stainless steel construction for use with a wide range of media including aggressive fluids and water. The MIP Series provides a cost-competitive solution for wide-ranging potential applications in tough environments.

- Pressure range 0 psi to 175 psi
- 1 mS response time
- High freeze/thaw resistance
- Life-time rating: 10 million cycles



MLH Series

MLH heavy duty pressure sensors are utilised in a wide range of applications and industries where proven reliability and durability is a top priority. Extensive media compatibility combined with greater than one million configurations makes MLH the ideal pressure sensing solution for demanding applications.

- Pressure ranges up to 8,000 psi (550 bar)
- Absolute, gage and sealed-gage
- Wide selection of port/connector types
- High-end stainless steel (corrosion resistance)

HONEYWELL OFFERS A LARGE PORTFOLIO OF PRESSURE SENSORS:

[View our offering by clicking here.](#)



5000 Series

Honeywell's 5000 Series pressure switch is specifically designed to stand up to extended duty applications. This switch is factory set but capable of field adjustment. It features a Kapton diaphragm for compatibility with a wide variety of fluids, and various terminations including a Metri-Pack connector.

- Brass or stainless steel base
- 75 psi to 150 psi
- Four set-point ranges
- 1 million mechanical cycles



LE Series

Pressure switches form the last line of defence in many critical applications, protecting people, equipment and the environment. Extensive configurable options with high proof/burst pressure ratings make Honeywell pressure switches the ideal solution for demanding applications.

- 3.5 psi to 10 psi (± 1 psi)
- >10 psi to 50 psi (± 3 psi)
- >50 psi to 100 psi (± 7 psi)
- >100 psi to 150 psi (± 10 psi)

HONEYWELL OFFERS AN EXTENSIVE RANGE OF PRESSURE SWITCHES:

[View our offering by clicking here.](#)

SPEED & POSITION SENSING



SPEED & DIRECTION SENSORS

SNG-Q, SNDH-T, SNG-S and SNDH-H Series sensors are utilised to monitor and control the speed and direction of rotating ferrous gears and tone wheels. Magnetic speed sensors contain no moving parts and provide superior performance and reliability.

- Speed detection up to 20 kHz and some models with zero speed detection
- Wide selection of connector types
- Environmental sealing: IP69K
- Life-time rating: 2 million cycles



SMART POSITION SENSORS

SMART position sensors are durable, adaptable and lightweight, enabling enhanced accuracy in motion control and improving operational efficiency and safety. The non-contact design facilitates ease of integration in the application, promoting performance even in the harshest environments.

- Non-contact design eliminates wear & tear
- Easy to install, reducing set-up costs
- Life-time rating: 35 million cycles
- Environmental sealing: IP67, IP69K
- **NEW!** SMART Arc 145° CAN-enabled position sensor

ROTARY POSITION SENSORS



RTP Series

Takes non-contact sensing to the next level by separating the magnet from the sensor body. The absence of the actuator shaft removes the wear and tear on the bearings caused by radial forces.

- Life-time rating: Infinite
- Operating range: 50° to 360°
- Supply voltage: 5 Vdc to 30 Vdc
- Environmental sealing: IP67 & IP69K



RTY Series

These shaft activated products are available in two versions: an integral shaft with or without a lever.

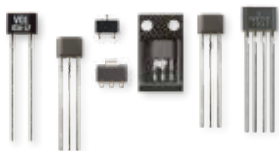
- Life-time rating: 35 million cycles
- Operating range: 50° to 360°
- Supply voltage: 5 Vdc to 30 Vdc
- Environmental sealing: IP67 & IP69K

HONEYWELL OFFERS A WIDE RANGE OF POSITION SENSORS:

View our offering by clicking [here](#).

MAGNETIC SENSORS

HALL AND AMR SENSOR ICs



VF401

The VF401 is a high performance, digital, 2-wire, AMR (anisotropic magnetoresistive) sensor in a miniature, flat, TO-92-style, plastic package with a current output, designed for sensing fine pitch ring magnets. Its robust design operates from -40 °C to 150 °C [-40 °F to 302 °F] and can withstand short durations up to 175 °C [347 °F], allowing use in potential applications with extreme temperature requirements.

VF526DT

The VF526DT bipolar latch, dual Hall-effect digital position sensor has two distinct Hall sensing elements precisely located 1,4 mm [0.055 in] apart on a single integrated circuit chip. The elements are encapsulated in a thermoset molding material.

- Temperature-compensated magnetics and ultra-low offset drift with temperature
- Single, miniature 4-pin SOT-89B plastic package supplied on tape and reel for automated assembly
- Wide operating voltage range of 3.4 Vdc to 24 Vdc

VG481V1

The VG481V1 back biased Hall-effect speed sensor IC contains a dual peak detecting circuit that is coupled with a Hall-effect element to detect the speed of a ferrous gear tooth target wheel.

- Zero-speed capable
- Low cost and easy to use
- 4 V to 24 V supply voltage range

VF360ST, VS360NT, VF460S

These high sensitivity latching digital Hall-Effect sensor ICs are small, sensitive and versatile devices that are operated by the magnetic field from a permanent magnet or an electromagnet.

- Qualified to the AEC-Q100 standard
- Fast response time (1.5 µs)
- Repeatable magnetics (no jitter)

VF495A-SP

The VF495A-SP Series are small, versatile, linear Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet.

- Quad-Hall IC design
- Responds to positive or negative Gauss

VM821Q1

The VM821Q1 AMR 4-pin quadrature sensor IC is designed to detect the speed and direction and position of a ring magnet encoder target.

- Integrated quadrature sensor IC
- Pole size independent operation
- 4-pin quadrature, open collector outputs

HONEYWELL OFFERS A LARGE PORTFOLIO OF MAGNETIC SENSORS:

View our offering by clicking [here](#).

AIR QUALITY MONITORING



HPM Series

Enables the ability to more accurately and cost competitively monitor or control environmental particulate.

- Industry-leading long life of 10 years of continuous use
- Proven EMC performance enables the ability to perform more accurately in a variety of tough industrial environments

HONEYWELL OFFERS A NUMBER OF PARTICULATE SENSORS:

[View our offering by clicking here.](#)

PROXIMITY SWITCHES



GAPS Series

Environmentally rugged, fully hermetic packages provide long-term reliability in very harsh environments by eliminating the potential for contamination of the sensor from the application environment.

- Integral Health Monitoring Capability: Optional third output state to indicate the health of the sensor (whether it is healthy or failed).

HONEYWELL OFFERS A WIDE VARIETY OF PROXIMITY SENSORS:

[View our offering by clicking here.](#)

BOARD-MOUNT PRESSURE



HSC, SSC, ABP2 Series

Utilises a specialized piezoresistive, micro-machined, sensing element which allows part interchangeability and enhanced performance, reliability and accuracy.

HONEYWELL OFFERS A RANGE OF BOARD-MOUNT SENSORS:

[View our offering by clicking here.](#)

BOARD-MOUNT FORCE



FMA Series

Measures the addition or backup of force, meaning the resistance of silicon-implemented piezoresistors will increase when flexed under applied force.

HONEYWELL OFFERS A WIDE RANGE OF FORCE SENSORS:

[View our offering by clicking here.](#)

SENSOR AND SWITCH APPLICATIONS



PRODUCT	APPLICATIONS
Hall-effect sensor IC	Wheel speed, power seat motor Cam/crankshaft
Inertial measurement unit (IMU)	Vehicle angular rate, acceleration and inclination
Key switch Smart key	On/off Operator-specific functionality
Limit and basic switch	Back-up alarm Machine and cab position Jib, outrigger position Brake switch
Current sensor	Battery management systems and charging infrastructure
Board-mount products	Filter clogging Fuel level detection
Particle sensor	Environmental particle detection
Pressure sensor	Hydraulic/brake system Fuel level Outrigger load

PRODUCT	APPLICATIONS
Pressure switch	Hydraulic/engine oil sensing Brake monitoring Airflow monitoring
Rotary Hall-effect position sensor Linear Hall-effect sensor	Jack position Power steering control Stability control Throttle position
Rotary position sensor SMART position sensor	Boom and steering angle sensing Reach arm & steering position Gear position Throttle by wire Vehicle and load position
Speed sensor Speed & direction sensor	Wheel speed Hydraulic pump speed Cam/crankshaft speed Turbo speed RPM/MPH/speedometer Forward/reverse sensing
Thermostat	Fan control Fire suppression sensing
Toggle and rocker switch	Manual operator switch

SERVING THE TRANSPORTATION INDUSTRY



Heavy Duty On and Off Road



Agricultural



Material Handling Equipment



Mining and Construction



Power Generation



Rail



Aerial Lifts



Electrification



Cranes

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. 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. While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application. 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.

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