

Amphenol Sensors

Connecting your world through Sensor Innovations

Vehicle Electrification Solutions

Amphenol Sensors is a leading innovator in sensor technologies and measurement solutions. Offering the most diverse sensor portfolio of standard and customized products for the world's most demanding regulatory and industry-driven applications, Amphenol creates value by providing critical information for real-time decisions.

The advantages of Electric, Hybrid, and Fuel Cell Electric Vehicles have been long-known. To the everyday driver, they offer reduced fuel costs. For the environment, they utilize renewable energy and offer reduced emissions.

Challenges associated with vehicle electrification stem from a limited availability of technologies to enable the use of electricity or hydrogen as a fuel source in a safe and cost-effective manner.

With our vast automotive expertise, engineering resources and manufacturing capabilities, Amphenol Sensors offers various sensor solutions that enable automotive manufacturers to accelerate the electrification of vehicles around the world.



Amphenol Sensors

Vehicle Electrification Solutions

Battery Pack

Consists of a cluster of individual batteries that serve as the primary fuel source of the vehicle, replacing hydrocarbon fuels used in conventional ICE automobiles.

- Temperature Sensors
- Current Sensors
- Acceleration Sensors

Thermal Runaway

Occurs when battery cells exceed allowable operating temperature causing an explosion/fire, which then spreads, to other cells within the battery pack.

- Temperature Sensors
- Pressure Sensors
- Gas Detection Sensors

Cell Connection System (CCS)

Used as top cover of the battery pack to provide connectivity with the Battery Management System (BMS).

- Temperature Sensors
- Current Sensors

Fuel Cell

Typically generates electricity by combining atmospheric oxygen and on-board compressed hydrogen.

- Temperature Sensors
- Pressure Sensors
- Gas Detection Sensors
- Level Sensors

High Voltage Charger Connector

Connects the high voltage source to charge the battery within the vehicle.

- Temperature Sensors

Power Inverter / E-Motor

Converts DC to AC electricity that is required to drive the traction motor.

- Temperature Sensors
- Inductive Position Sensors
- Current Sensors

Battery Coolant

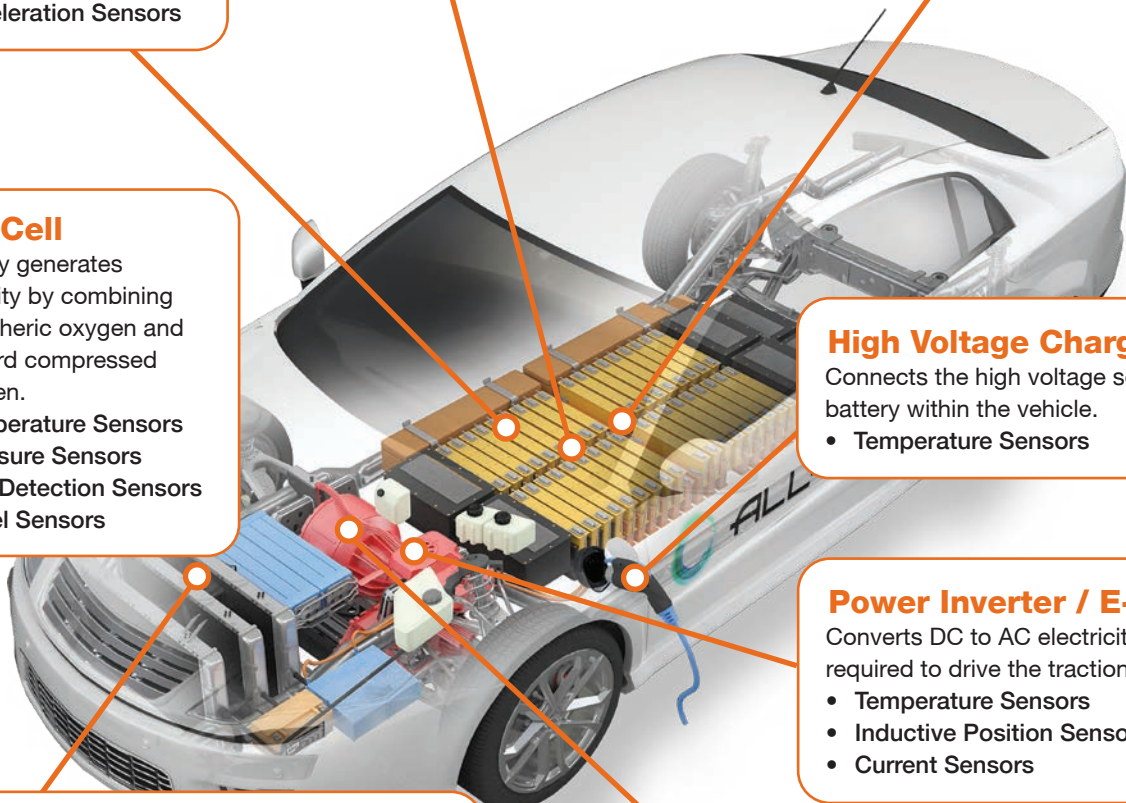
Circulates around the battery cell to maintain optimum battery management and life.

- Temperature Sensors
- Pressure Sensors
- Combined Pressure & Temperature Sensors
- Ultrasonic Level, Conductivity, and Concentration Sensors
- Coolant Breach/Water Intrusion Sensors

Motor Coil

Generates torque on the motor's shaft through the interaction of magnetic fields of the stator and rotor.

- Temperature Sensors



THERMAL RUNAWAY

Temperature Sensors

Measure and monitor battery temperature to detect Thermal Runaway conditions.

- Capable of single or multiple cell detection



Pressure Sensors

Detect pressure change inside the battery cell that indicates Thermal Runaway conditions.

- Surface mountable
- Simple 3-command I²C interface
- Very low current consumption: 35 µA



Gas Detection Sensors

Detect the out-gassing of Carbon Dioxide (CO₂) to indicate pre-combustion conditions.

- Single and dual channel configurations
- Self-calibration with patented ABC Logic™ Software



Gas Detection Sensors

Detect the presence of combustible gases.

- Sensitivity to multiple gases: H₂/CO₂/NH₃/CO
- Temperature / Humidity Sensor
- Pressure sensor (20 up to 250 kPa)
- Fast response time: <1 second
- IP6K7 rating



BATTERY PACK

Temperature Sensors

Measure and monitor surface temperature of the many batteries within the battery cell, which is critical to preserving the chemistry of the battery.

- Single point temperature sensors
- Rigid and flexible types
- Custom sensor packaging



Current Sensor

Measure and monitor current flowing from and to the battery.

- Based on open-loop Hall-effect and coreless TMR technology.
- Busbar, integrated busbar, flanged and wire mounting
- Simple or redundant analog ratiometric output
- Measured values of up to ±4,000A



Water Detection Sensors

Detects moisture leakage and feeds a signal to the Battery Management System.

- 510kΩ±3%
- Operating temp. range : -40 C to +85 C
- RoHS Compliance (Directive 2011/65/EU)



Accelerometers

Mechanical testing of battery pack.

- Electrically isolated sensors
- Wide frequency range
- High sensitivity with low noise



CELL CONNECTION SYSTEM (CCS)

Temperature Sensors

Provide temperature and voltage sensing to monitor the state of charge of the battery cells.

- High current circuit for battery cell connectivity
- Available styles: Wire Harness and Flexible Printed Circuit (FPC)



Current Sensor

Measure and monitor the state of charge of the battery cells.

- Based on open-loop Hall-effect and coreless TMR technology.
- Busbar, integrated busbar, flanged and wire mounting
- Simple or redundant analog ratiometric output
- Measured values of up to ±4,000A



HIGH VOLTAGE CHARGER CONNECTOR

Temperature Sensors

Detect over-temperature conditions during charging.

- Installed within the connector



MOTOR COIL

Temperature Sensors

Measure and monitor temperature of the motor coil to provide feedback on the operating conditions of the electric motor.

- Field-proven design
- Variety of lead lengths, terminal and connector options



BATTERY COOLANT

Temperature Sensors

Measure and monitor fluid temperature of inlet/outlet battery coolant to provide indication of battery cell temperature.

- No leak path - Sensor cavity and tube are one piece
- USCAR sealed connection system
- Various part geometries available



Coolant Breach/Water Intrusion Sensors

Detect the presence of coolant/water in the battery pack.

- Operates based on conductivity of the fluid being sensed
- Easy to install
- RoHS compliant



Pressure Sensors

Measure the pressure in the cooling system to control pump capacity.

- Internal metal sealing for media compatibility and no leakage
- Customized calibration for high accuracy



Combined Pressure & Temperature Sensors

Measure pressure in the cooling system, while, at the same time, measure temperature of the coolant for optimum thermal management.

- Available versions: R1234yf (up to 35 bar) and R744 (up to 200 bar)
- Tested LIN 2.1 conformity
- Automatic address assignment within LIN network



Ultrasonic Level, Conductivity, Concentration, and Temperature Sensors

Continuously monitor fluid level for early detection of coolant leakage.

- Level accuracy: ±2mm
- Temperature accuracy: ±2.5 C
- Output protocol offerings: Analog, PWM, SENT, CAN, LIN
- Input voltage options: 5V / 12V / 48V



POWER INVERTER / E-MOTOR

Temperature Sensors

Measure and monitor operating temperature of the power inverter to provide feedback on unsafe conditions.

- Fast response time
- Pigtail connector



Inductive Position Sensors

Provide data on the angular position of the rotating motor shaft to optimize control of the motor inverter.

- Low current consumption
- Through-shaft, end-of-shaft and ARC/off-axis configurations
- Robust against magnetic flux and external stray fields
- Flexible integration in on-axis and off-axis configuration
- Compact and lightweight alternative to resolvers



Current Sensor

Measure and monitor current to the motor.

- Based on open-loop Hall-effect and coreless TMR technology.
- Busbar, integrated busbar, flanged and wire mounting
- Simple or redundant analog ratiometric output
- Measured values of up to ±4,000A



FUEL CELL

Temperature Sensors

Monitor temperature in various areas of a fuel cell vehicle to enable safety and efficiency throughout the system, e.g., Battery, Fuel Cell, Cooling System, Transmission and Converter.

- Moisture proof construction
- Fast Response time
- High temperature monitoring



Gas Detection Sensors

Measure the concentration of H₂ and humidity.

- Sensitivity to H₂ gases
- Temperature / humidity sensor
- Fast response time: <1 second
- IP6K7 rating



Water Level Sensors

Ultrasonic Switch indicates water level in the steam / water separation tank.

- Single point ultrasonic switch
- Microprocessor controlled analog output (voltage)
- All-plastic design (PPS) eliminates opportunity for metal ionization



Pressure Sensors

Robust sensors for fuel-cell applications, specifically designed to withstand the harsh conditions in hydrogen environments.

- High accuracy and performance
- Wide pressure range - up to 900 bar for tank pressure measurement
- Custom options



Amphenol Sensors



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