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 and Hybrid Electric Vehicles (EV/HEV) 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 EV/HEV stem from a limited availability of technologies to enable the use of electricity 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.
**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

**Battery Coolant**
Circulates around the battery cell to assist in maintaining optimum battery temperature.
- Temperature Sensors
- Pressure Sensors
- Combined Pressure & Temperature Sensors
- Ultrasonic Level Sensors

**Thermal Runaway**
Occurs when battery cells exceed allowable operating temperature causing an explosion/fire, which then propagates, or 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 cell to provide connectivity with the Battery Management System (BMS).
- Temperature Sensors

**Power Inverter / E-Motor**
Converts higher voltage DC electricity to lower voltage AC electricity that is required to power the electric motor.
- Temperature Sensors
- Inductive Position Sensors

**High Voltage Charger Connector**
Connects the high voltage source to charge the battery within the vehicle.
- Temperature Sensors

**Motor Coil**
Wire coils that generate a magnetic field and conduct electric current. The interaction between the two generates rotation of the motor shaft and the actual conversion of electrical to mechanical energy.
- Temperature Sensors

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**Image courtesy of the U.S. Department of Energy.**
**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: <35μA

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

**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
- Many part geometries: Inline tube, flying lead and integral sensor

Pressure Sensors
Measure the pressure in the cooling system to control pump capacity.
- Internal metal sealing for high 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 35bar) and R744 (up to 200bar)
- Tested LIN 2.1 conformity
- Automatic address assignment within LIN network (Slave Node Position Detection)

Ultrasonic Level & 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

**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

**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)

**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

**HIGH VOLTAGE CHARGER CONNECTOR**

Temperature Sensors
Detect over-temperature conditions during charging.
- Installed within the connector

**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.
- Inductive eddy-current with weight and size reduction
- Stable output over extended temperature range (-40°C/+160°C) and radial/axial misalignment
- Robust against magnetic flux and external stray fields
# MAJOR MARKETS SERVED

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<tr>
<th>Sensor Technologies</th>
<th>Thermometrics, Inc.</th>
<th>Telaire</th>
<th>NovaSensor</th>
<th>Protimeter</th>
<th>Kaye</th>
<th>Thermal Validation</th>
<th>SGX Sensortech</th>
<th>Piller Sensing Systems</th>
<th>Wilcoxon Sensing Technologies</th>
<th>Piezo Technologies</th>
<th>i2s</th>
<th>Pressure &amp; Temperature</th>
<th>All Sensors</th>
<th>SSI Technologies</th>
<th>Level, Quality &amp; Pressure</th>
<th>Ultra Low Pressure</th>
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