

Automotive On Board (AoB)

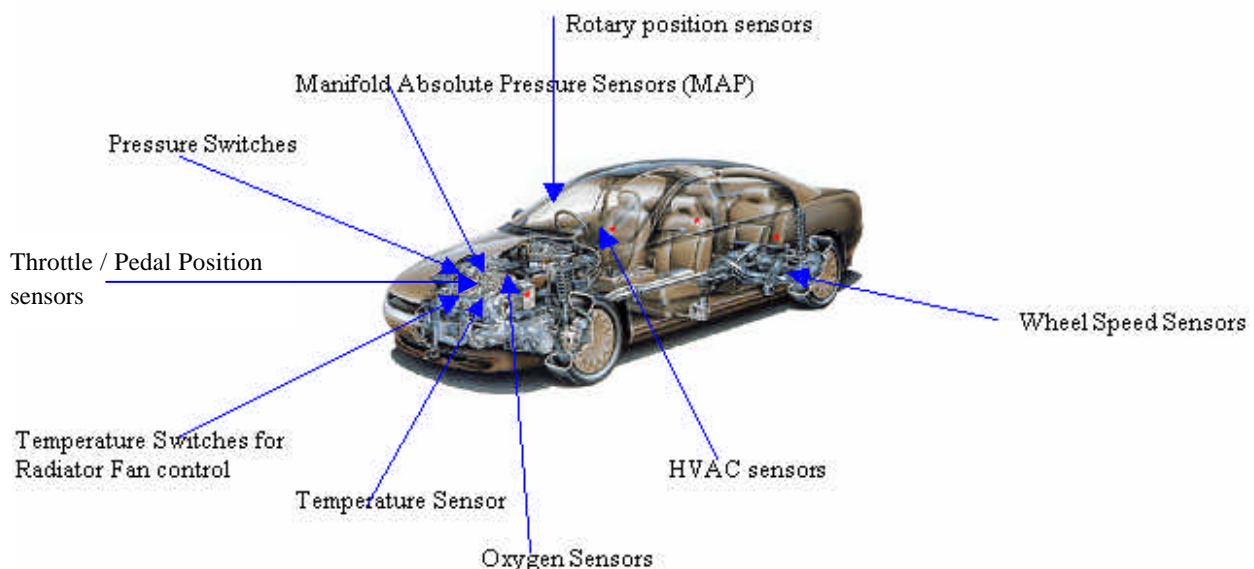
Honeywell has been a preferred name for the automotive manufacturers from 1960's, beginning with the production of vane sensors to replace breaker points in old distributor ignition systems. This was just one of our innovations and a big leap forward in automotive technology. For over 25 years, Honeywell Sensing and Control has been providing highly reliable, high-volume, on-time sensing solutions to the automotive industry. Today after 40 years of recognition and worldwide accolade, Honeywell sensors have been used almost in all the vehicles across the globe by OE manufacturers or their Tier-2 suppliers.

There is now more focus on sensing and control requirements for the Indian Automotive customers. With new emission norms and safety requirements coming up into the Indian subcontinent, customers require more and more sensing solutions for speed, position, pressure, temperature and humidity. Honeywell's strength in design, development and manufacturing from component level parts like Hall Effect Sensors IC's makes it a flexible solution provider capable of adjusting to customer requirements. Some of our offerings include:

- CRANKSHAFT CAMSHAFT POSITION
- ROTARY SPEED SENSORS
- TEMPERATURE SENSORS
- TEMPERATURE SWITCHES
- THROTTLE/ PEDAL POSITION SENSORS
- MANIFOLD ABSOLUTE PRESSURE SENSORS
- PRESSURE SENSORS- LUBE OIL PRESSURE SENSING
- AUTOMOTIVE COMPONENT LEVEL PRODUCTS

Honeywell has recognized the needs and requirements of the Indian customer and is in the process of setting up localized manufacturing line to support them. With the help of a strong design and development team in Honeywell Bangalore, Honeywell India is all set to outshine the expectations of the Indian customer as far as the product development time, project implementation and meeting the SOP are concerned. This brings more value to the customer in terms of:

- Localized Design and Development
- Better control over deliveries and Supply chain
- Competitive pricing
- Access to Global technology locally....



CRANKSHAFT/ CAMSHAFT POSITION SENSORS:



Crank position sensors are used to detect engine speed/ engine rotation position. They allow the ECU to change the injector opening, spark timing in various engine conditions. Honeywell possesses prominently two technologies for these sensors:

1. Variable Reluctance Type or Magnetic Pick up type Sensors:

Each sensor creates AC signals created by the proximity of a rotor or flywheel teeth. This sensor, which is essentially a Magnetic Pick up or otherwise called as a Variable Reluctance type sensor consists of a permanent magnet, coil and a yoke. The coil is wound over the core and the whole assembly is placed in the proximity of the permanent magnet and over molded. This assembly when used along with a rotor or a toothed wheel produces alternating pulses on the coil because of the relative movement of the magnetic fluxes (Between that of the permanent magnet and that of the toothed wheel).



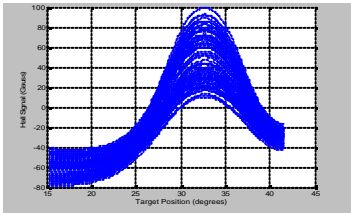
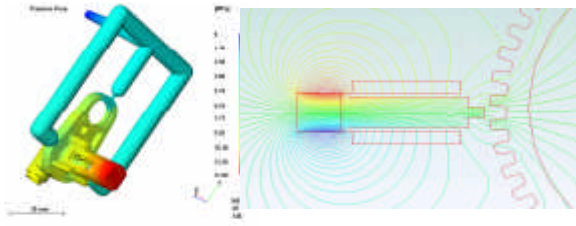
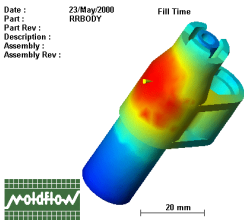
2. Hall Effect Sensor based Crankshaft/Cam Shaft Position Sensors

These are active sensors based on Solid-state Hall Effect sensors. They give digital or square wave pulses when operated along with a calibrated target wheel. Target wheel could be a magnetic wheel or a ferromagnetic rotor defined by the requirement of the customer. Honeywell possesses capability right from design development and manufacturing of the basic Hall element thereby holding capability to be a flexible, customer specific and tailor made solution provider.



Honeywell possesses following capabilities in the design and Development:

- ✓ **Magnetic Field Analysis & Modeling based on Hall, MR, and Inductive (VR) tech.**
- ✓ **Mold Flow Analysis and Optimized Design**
- ✓ **Test and evaluation for reliability verification**
- ✓ **Failure analysis capability**
- ✓ **Test Facilities for Temperature, EMC, Vibration, Dust and other severe critical conditions**



ROTARY SPEED SENSORS FOR VEHICLE SPEED AND ENGINE SPEED SENSING

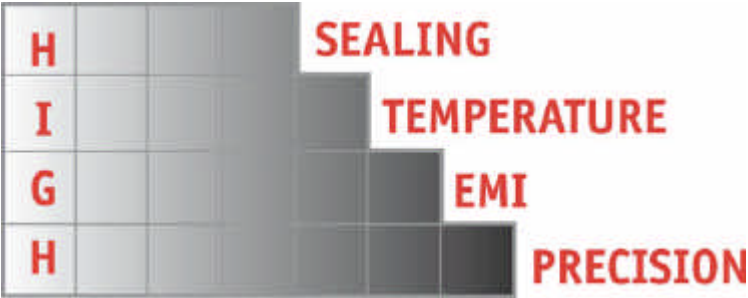


The Vehicle Speed Sensor or the engine speed sensor is used to modify engine functions depending upon the working conditions. The measurement is usually taken from the transaxle or the Transmission and is sent to the speed gauge or the Transmission Control Unit (TCU). For vehicles with Anti Lock Braking System (ABS), speed sensors are connected to the wheels and the output is taken to the Electronic Control unit to determine the speed, acceleration and deceleration of the vehicle.

Honeywell offers Non Contact type Speed Sensors in Variable Reluctance (VR), Magneto Resistive (MR) and Hall effect technologies giving multitude of options to the customer to select the product of his choice. Honeywell offers you:



- High **S**ealing – under hood engine transmission
- High **T**emperature – greater than 150° C
- High **E**MI – 300V per m
- High **P**recision – repeatabilities as high as .025 degrees



Typical Applications:

- Wheel Speed sensing for ABS Application
- Vehicle Speed Sensing for Indication /Gauge purpose
- Engine Speed sensing for ECU purposes.
- Speed Sensing for Telematics and data capturing purpose

TEMPERATURE SENSORS

Temperature sensors provide a change in a physical parameter such as resistance or output voltage that corresponds to a temperature change. These sensors are suitable for applications that require small package size, accuracy, and linear outputs. They are interchangeable without recalibration.

Honeywell India holds custom specific design capabilities for Temperature sensors and Transducers for wide range of applications. With Honeywell's expertise in Thermal field the specific RT curve needed by the customer is available. We hold different testing and validation facilities for high quality and application specific temperature sensors. Typical applications include Coolant Temperature Sensors (ECU), Inlet Air Temperature sensors (for HVAC), Ambient Air Temperature Sensor (For 2 - Wheeler and 4 - wheeler applications as input for displaying air temperature in dashboard). Mechanical Fitments, RT curves, Accuracy, Response time etc. could be done to customer requirement with the help of professional and World class design facilities with the help of Honeywell.

Typical Applications:

- HVAC—Evaporator Temperature sensing
- Engine Coolant temperature Sensing- Used in EMS systems
- Engine oil Temperature Sensing – for 2-Wheeler applications
- Inlet Air Temperature Sensing to be fitted in Inlet manifold- An integral part of the modern Engine Management Systems.
- Ambient Air Temperature Sensor- For 2Wheelers and 4Wheelers mainly for displaying the

TEMPERATURE SWITCHES

You want a device to drive a part as per the temperature of a radiator and crank case. You want a relay output at a specific point of temperature. There is no space for complex circuits or the fitment space is so hostile to adjust a micro controller circuit or at the last cost is a concern. Are you in dilemma? Featuring Honeywell's bimetal thermostat product line consisting of Single-Pole, Single-Throw (SPST) hermetic and non-hermetic thermostats, including low-silhouette, logic level, auto reset, manual reset, one-shot, and subminiature thermostats and thermal switches.

These products are also defined by their ability to reliably maintain precision temperature tolerances or high amperage electrical loads. They provide temperature control and over temperature protection for your valuable circuits. Bimetal thermostats are snap-action devices designed to operate in extreme conditions, such as exposure to hazardous substances, dust particles and liquid immersion. Contacts are thermally and electrically isolated. Dust-proof performance is achieved by using a ceramic or phenolic base protected by a metal enclosure. A variety of custom configurations are available which provide environmental protection.



Think of this formula to serve you and your purpose better. Honeywell uses its own unique hermetically sealed thermostats technology and customizes temperature switches according to the mechanical fitments of the customer. Be it on the radiator housing, or on the engine head we provide you the optimized dimension solution, absolutely according to your switching needs.

Thermostat Switches:

- Operating Temperatures 0°C to 260°C.
- Wide Range of Packaging available
- 5A to 15A Switching Loads available

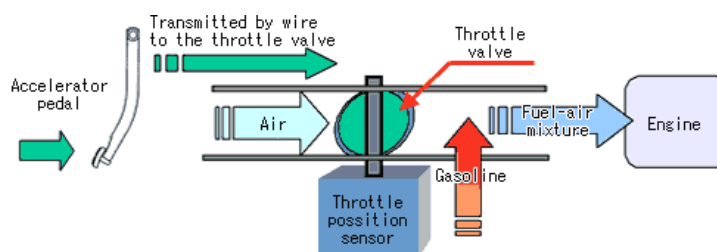
Typical Applications:

- Radiator Fan Controlling
- High Temperature Warning System for Engine Safety
- Transmission Oil Temperature warning/Indication
- Engine Cold start control application

THROTTLE / PEDAL POSITION SENSORS



The Throttle Position Sensor is normally fitted on the throttle body (for gasoline engines) and detects the degree to which the throttle valve is open, and converts this datum to an electronic signal, which it sends to the engine control unit. Because the depression of the accelerator pedal is equivalent to the degree to which the throttle valve is open, the engine control unit interprets this as indicative of the driver's desire to accelerate. This helps the ECU to control the functioning of the engine in combination with other engine parameter inputs like Engine Speed, Temperature, and Manifold Pressure etc... For Diesel engines, the same technology is used to detect the FIP shaft position, feeding the ECU with voltage signal corresponding to the rotational position.



Honeywell uses Six Sigma Plus DFSS tools during the design process and takes extensive care in designing the critical components for the sensor. Apart from that, Honeywell possesses exclusive production facilities for Thin and Thick film resistors in North America where exist proven technologies and processes for the design and manufacturing of Resistive films. Design and Development of these sensors are done locally with the help of Honeywell Technology Solutions Lab (HTSL) India, thereby proving the customer with local solutions for their needs. Honeywell India has set up state-of-the-art manufacturing facilities for production of these sensors.

In- Plant Facilities available includes:

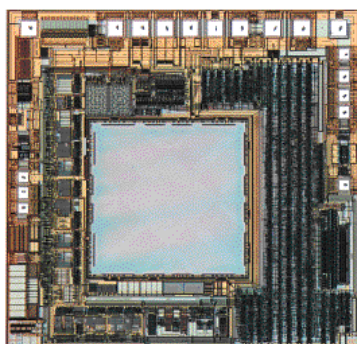
- 41,000 sq. ft, Air Conditioned factory area
- Modern and Sophisticated production facilities like Ultrasonic Welding Machines, Heat Stakers etc.
- Variety of testing, functional and validation machines like Hot Cold Chamber, Vibration Endurance Machine etc.

Honeywell's Product Offerings:

- Contact type Single Analog output Sensor
- Contact type Dual Analog output Sensor
- Non Contact type Single Analog output Sensor (Hall IC Based)
- Non Contact type Dual Analog output Sensor (Hall IC Based, Usually used for Pedal Position Sensors)

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE (TMAP) SENSORS

MAP sensor or the Manifold Absolute Pressure sensor contains a silicone wafer Piezo- Resistive element to sense the absolute pressure at the inlet manifold side of the engine. An NTC Thermistor is used along with this pressure sensor so as to sense the inlet air temperature as well. One side of the silicon chip is exposed to the inlet manifold air and the other side to a perfect vacuum chamber beneath the wafer. While used as a boost pressure sensor, the MAP sensor sends signals to the Engine Control Unit (ECU) corresponding to the charge air pressure in the inlet manifold. This results in optimized fuel consumption, power and performance aspects of the engine. The temperature output from the sensor would feed the ECU with signals corresponding to the temperature of the inlet air which in turn would help the ECU to calculate the density and mass of the inlet air to determine the fuel-air mixing ratio properly.



Honeywell's on-board Application Specific Integrated Circuit (ASIC) based Piezo Electric Pressure Sensors is an iconoclastic technology innovation in automotive segment. The On-Board ASIC gives out processed and ready to feed signals with lot many safety measures as Reverse Polarity Protection, Transient Surge Protection, EMI shielding etc and are used in System Critical applications all over the world. We offer a single sensor giving independent outputs of Pressure and Temperature saving your fitment space and money. Our domain expertise and technology know how can help you select the exact product for your application.

**Typical Applications:**

- Boost Pressure and temperature Sensing (For Turbocharged Diesel Engines)
- Manifold Absolute Pressure and temperature Sensing (Gasoline Engines)

Grab your catalogue for the TMAP Sensor at:

<http://catalog.sensing.honeywell.com/datasheet.asp?PN=PTT+Manifold+Absolute+Pressure+and+Temperature+Transducer&FAM=automotivesensors>

PRESSURE SENSORS – LUBE OIL/ TRANSMISSION OIL/ AUTOMOTIVE HVAC PRESSURE SENSING

Piezo Electric Sensor Die based sensors from Honeywell are packaged so as to withstand the severe environment conditions.

Typical Applications for Pressure Sensors:

- Fuel Vapor Pressure Sensing (Compulsory as a part of Safety norms in Europe and US)
- Test Equipments
- Engine Test Beds and Jigs
- Automotive HVAC
- Engine Oil Pressure Sensing for Display and control in High End vehicles.
- Used in Hydraulic lines of Off-Road vehicles as Mining, Material Handling Vehicles, Earth Moving equipments etc...



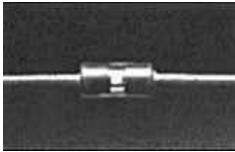
Please checkout for more detail at:

<http://catalog.sensing.honeywell.com/datasheet.asp?PN=PT1+Pressure+Transducer&FAM=automotivesensors>

AUTOMOTIVE GRADE HALL EFFECT SENSORS, NTC THERMISTORS AND COMPONENT LEVEL PRODUCTS

Designers working on custom specific applications would prefer to have components of their own selection at their fingertip. Trial and error systems would call for technical support and there we have our strength!! Honeywell's Product range includes:

- Hall Effect Sensors (Analog and Digital)
- Current Sensors
- NTC Thermistors
- Humidity Sensors
- Micro Switches, Sealed Switches, Limit Switches, Toggle Switches
- Pressure Sensors, Force Sensors
- Hermetically Sealer Thermostats and Thermal Cut Offs
- Torque Sensors
- Mass Airflow Sensors
- Relays
- Potentiometers, Encoders, Resolvers, LVDT's
- Emergency Switches
- Hourmeters, Battery Discharge Indicators
- Forward-Neutral- Reverse Switches
- Pressure Switches
- Rotary Position sensors
- Flexible heaters, Transparent heaters
- Load Cells/ Accelerometers and More.....



For more info on these products, go to: <http://www.honeywell.com/sensing>

HONEYWELL AUTOMATION INDIA LTD, CAPABILITIES

- 41,000 sq. ft, Air Conditioned factory area
- A part of Honeywell Worldwide manufacturing
- Staffed with qualified & highly trained manpower
- Technical support from Global Honeywell
- Systems Assembly and Staging Center
- PWA Manufacturing Facility
- IRDC (India Regional Delivery Center) and Smart Transmitter Mfg.

Facilities Include:

- Hot/ Cold Chamber –
 - a) -55°C to 120°C with rate of change of temperature up to 10°C/min
 - b) 0°C to 80°C with 1°C/min
- Vibration m/c – up to 600 kgf
- Dedicated test Set-up for 620LCS, 621 I/Os & HPM IOPs
- Stress test system for HPM IOP
- Wave soldering m/c
- PCB Cleaning m/c
- Conformal Coating Booth
- Voltage/Current measurement constants
- Precise Voltage/Current source for simulation
- Pressure calibration with accuracy of 35ppm
- Digital Storage Oscilloscopes up to 1GHz
- Vertical Automated store (Capacity =35 Racks with 120Kg) 2 nos.
- Calibration facility for sensors / transmitters / equipments etc.

For Enquiries on Automotive Sensors:

E-mail: Ravi.Shrivastava@honeywell.com

Phone: [+91-20 5603 9962](tel:+91-20-5603-9962)

Fax: [+91-20 5603 9979](tel:+91-20-5603-9979)

AoB / ATOM, Sensing and Control Products,
Honeywell Automation India Ltd.,
56 & 57 Hadapsar Industrial Estate,
Pune - 411013 (INDIA).