

Air circulation applications



ENGINE MANAGEMENT
Air circulation applications

Context

- Needs

- Solutions

Context

Today's automobile engines are increasingly managed by electronic control units (ECU) using closed-loop control strategies to optimize engine performance while reducing fuel consumption and emissions. One important aspect is air circulation.

For instance, the throttle regulates the amount of air entering the engine. It can be controlled by the ECU rather than directly by the accelerator pedal. The ECU takes various performance factors such as air/fuel ratio, pumping losses and engine speed into account to determine the optimum throttle position.

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For exhaust gas recirculation (EGR) systems, designed to keep vehicles in line with emission regulations, the ECU monitors the recirculation flowrate to maintain optimum engine performance and emission control.

Finally, for turbochargers, the ECU uses the speed of rotation of the turbine and the position of the actuators controlling the turbocharger wastegate and variable geometry functions to maximize performance and ensure safe operation.

To do all this, the electronic control system requires information - creating a need for sensors.

Electricfil masters all the leading sensor technologies to bring you the right sensing solution for your every need.

Function needs

The electronic control systems that optimize the performance of today's automobile engines need precise information concerning various components including:

- **Throttle position**, for closed-loop control of the throttle actuator by the ECU
- **EGR valve position**, used by the ECU to calculate the recirculation flowrate and control the EGR valve actuator
- **Turbocharger wastegate and variable geometry actuator positions**, for closed-loop control by

the ECU

- **Turbocharger speed**, an essential parameter for engine performance and turbocharger safety.

Sensors needs

The sensors that provide this information must offer:

- High accuracy
- Small size
- Fast response
- Easy integration
- High reliability
- Diagnostic capabilities
- lowest possible cost

Depending on where they are installed, they must also withstand severe environmental conditions:

- High temperatures
- Rapid temperature fluctuations
- Electromagnetic disturbances
- Vibrations
- Corrosive liquids

Electricfil solutions

Electricfil Automotive masters **all leading sensor technologies** to produce optimum sensing solutions for every need. The solution path is based on more than 25 years of experience in the field.

- **Analysis of customer needs** to select the most suitable sensor type from our proven core technologies (LVDT, Hall, Eddy-Current, GMR, AMR, VR, etc.)
- **Determination of degree of integration** (single sensor, sensor cluster or mechatronic module)
- **Circuit design and ASIC development** if required
- **Selection of electronic components and assembly technology** (e.g. surface mounted devices, discrete components)
- **Package design**, including the selection of materials (PA, PPS, PBT, etc.), assembly process (laser, thermal or vibration welding), potting, overmolding and encapsulation techniques, sizing, etc.
- **Selection of interconnections** (leadframe, flex foil, cable harness, etc.)
- **Magnetic circuit design** (magnet materials, pole piece dimensions, etc.)
- **FMEA, reliability studies, computer simulations, prototyping, initial samples**, etc.

Electricfil sensing solutions for air circulation applications

- > Eddy-current linear position sensor
- > Hall linear/angular position sensor
- > [LVDT linear/angular position sensor](#)