

# Gear-shift control

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## Gear-shift control



### TRANSMISSION SYSTEMS

Gear-shifting applications

Context

- Needs

- Solutions

## Context

**Electronically controlled transmissions offer major benefits in terms of driving comfort, safety and fuel economy. The electronic control systems that calculate optimum gear ratios and control gear engagement rely on sensors to provide the input information they need to perform their calculations.**

In today's automatic transmissions and recent automated manual (AMT) and dual clutch (DCT) transmissions, an electronic control system continuously analyzes key parameters to determine the optimum gear ratio.

It then controls actuators to engage gears at just the right time, decreasing fuel consumption and increasing driving comfort through smoother shifting without any driver intervention. This is especially important as the automotive world moves towards 6, 7 and soon 8-speed transmissions.

New safety functions can also be implemented, for instance the control system can automatically reduce the drive torque to avoid skidding on slippery roads or prevent unexpected gear shifting in curves. 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

**To determine the optimum gear ratio at any time and calculate the precise moment to change gears, the electronic control system needs accurate information.**

- Speed of input and output shafts.
- Direction of shaft rotation.
- Position of the clutch for gear engagement control on AMT and DCT transmissions.
- Shift fork position for DCT systems.
- Oil temperature to determine the viscosity of the lubricant, used to fine-adjust the gear-shifting strategy.
- Other information such as current and target transmission ratio, gas pedal position, etc.

# Sensors needs

The sensors that provide this information must offer:

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

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 gear-shift control

- > [Multi-sensor modules](#)
- > [LVDT linear/angular position sensor](#)
- > [Hall linear/angular position sensor](#)
- > [VR speed position sensor](#)
- > [Active speed/position sensors \(Hall or GMR\)](#)
- > [Oil temperature sensor](#)