Clutch actuation control

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TRANSMISSION SYSTEMS
Clutch applications

Context

In today's automotive world, driving comfort, safety and fuel economy are key objectives. Sensing solutions for advanced clutch actuation control help meet these needs, in particular for automated manual (AMT) and dual clutch (DCT) transmissions.

These systems use electric or hydraulic actuators to engage and disengage the clutch.
The driver no longer needs to press a pedal and manually shift gears. An electronic control system determines the right time to operate the actuators for optimum clutch control.

This decreases fuel consumption and increases driving comfort through smoother shifting without any driver intervention. 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 points for engaging or disengaging the clutch, the electronic control system needs precise information.

- **Position of the clutch**, generally measured via the displacement of the master and/or slave cylinder or the clutch release bearing
- **Speed of the input and output shafts**, i.e. the crankshaft and the primary shaft of the transmission, to determine the clutch engagement point
- **Oil temperature** to determine the viscosity of the lubricant, used to fine-adjust the clutch actuation control 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
- 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 clutch actuation control

- > **VR speed/position sensor**
- > **Active speed/position sensors (Hall or GMR)**
- > **LVDT linear/angular position sensor**
- > **Hall linear/angular position sensor**
- > **Eddy-current linear position sensor**

- **> Oil temperature sensor**