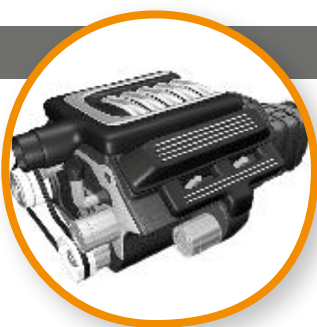


TE Connectivity's
**SENSOR
TECHNOLOGIES**
for the Automotive Industry

SENSOR TECHNOLOGIES FOR THE AUTOMOTIVE INDUSTRY

TE Connectivity (TE) is one of the largest sensor companies in the world, with innovative sensor solutions that help customers transform concepts into smart, connected creations. To transport passengers safely and efficiently, vehicles need data. Today's cars can sense and respond to changing conditions, inside and out.

TE sensors help provide the data for control, adaptation and response of vehicle functions that increase safety, comfort, and efficiency. Our technology is an integral part of many modern nervous systems in vehicles.



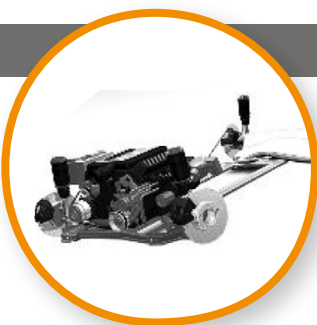
ENGINE/E-MOTOR

Our engine and e-motor sensors are used in vehicle applications such as travel sensor for turbo charger actuator, pneumatic (EGR) Cylinder, CAM and Crank Shaft Speed sensors and resolvers for e-motor commutation.



EXHAUST

TE provides a range of sensors for exhaust gas applications, such as urea quality, level and temperature, urea pump pressure and exhaust gas temperature (EGTS). These sensors help the OEM to comply with the latest emission regulations and significant performance improvement of modern aftertreatment systems.



CHASSIS

We provide a range of chassis solutions for roof and convertible switches, actuator and cylinder position, seat position and weight classification. Our humidity and temperature technologies are used in Heating, Ventilation and Air Conditioning (HVAC) systems to prevent wind screen fogging and for energy management.



TE Connectivity is committed to making cars safer, greener and more connected. We support this commitment by integrating innovative sensors in demanding application areas such as automated transmissions, engines, clutch, brake and other mission critical areas.

Our sensors are designed and manufactured to exacting specifications, often on a custom basis. Together with our customers, we are working to solve today's biggest application challenges in new and creative ways.



BRAKE

Our brake sensors are used in vehicle applications such as travel sensor for brake master cylinder position (optional redundancy), travel sensor for rear axle steering, rotary sensor for brake pedal position detection (optional redundancy); contactless brake light switch and wheel speed sensor. We also provide pressure sensors such as the vacuum brake booster sensor and brake line pressure for ABS/ESC modules.



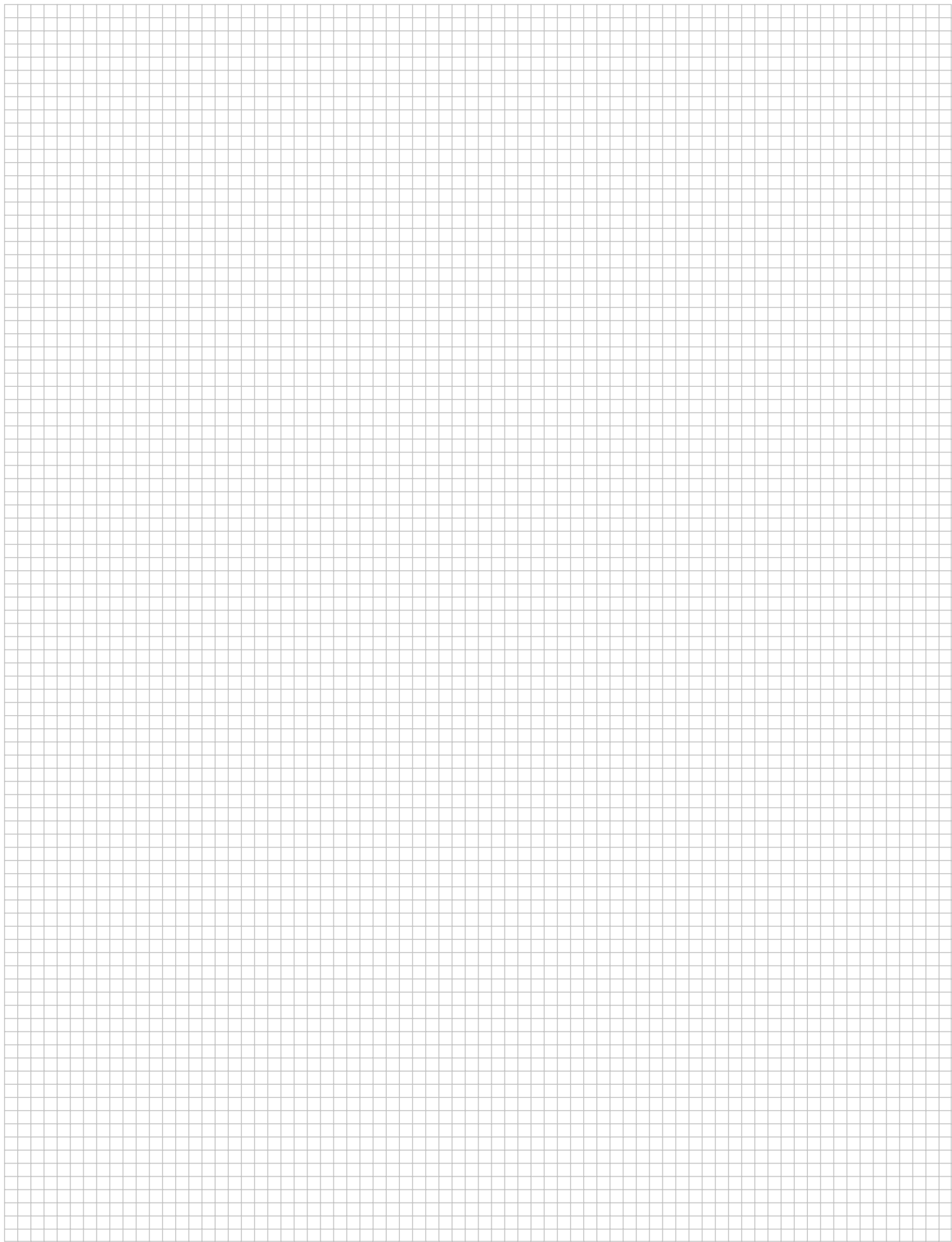
TRANSMISSION

TE's transmission sensors are used in vehicle applications such as all gear / neutral detection for manual transmission (MT) to support start and stop function, drive mode (travel or rotary) for automatic (AT), continuously variable (CVT), or dual clutch (DCT) transmissions. We also provide pressure and temperature solutions.



CLUTCH

The clutch sensors are used in vehicle applications such as Permanent-magnetic Linear Contactless Displacement (PLCD) sensors for concentric slave cylinder and clutch slave cylinder, rotary sensors for clutch pedal position detection; contactless switch for clutch master cylinder and travel sensor for clutch master cylinder and Dual Clutch Transmission (DCT).





Chassis Sensors

INTRODUCTION

Our chassis sensors are used in vehicle applications such as travel sensors for rear axle steering, wheel speed sensors for advanced Electronic Stability Program (ESP), steering angle position sensors, seat track position sensors and hall switches for position detection.

Position

- Rear Axle Steering
- Seat Position
- Chassis Switch
- Convertible Roof
- Fluid Level

Pressure

- Fuel Pump (Low Pressure)
- Power Steering
- Weight Classification
- Impact
- HVAC Fluid *

Temperature

- Fuel Temperature
- Passenger Cabin
- Ambient Air / HVAC
- Seat Heater
- Battery Management

Humidity

- Ambient
- Cabin
- Fog / Moisture
- HVAC
- EV Battery Management

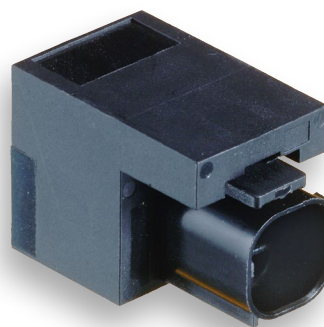
* in development

Seat Track Position Custom Sensor



Industry	Automotive
Application	Measure position of seat track
Functions	Input for dual stage airbags
Technology	Hall Switch (magnet integrated in sensor)
Features	• Non-contact switch triggered by seat track or ferrous target • No moving magnets • Custom package size and sensor mounting • Optional bushing • Operating temperature: -40°C to +85°C

Seat Track Position Platform Sensor



Industry	Automotive
Application	Measure position of seat track
Functions	Input for dual stage airbags
Technology	Hall Switch (magnet integrated in sensor)
Features	• Non-contact switch triggered by seat track or ferrous target • No moving magnets • Small package size • Operating temperature: -40°C to +85°C

H2TG/D Defogging Sensor



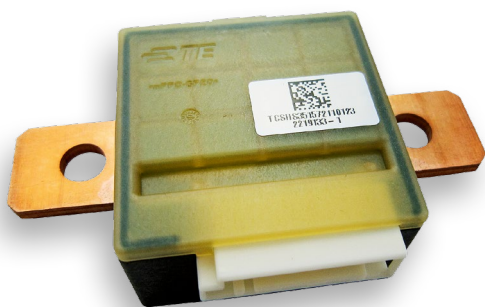
Industry	Automotive
Application	Cabin energy management and defogging (HVAC)
Functions	Measuring dew point and windshield temperature measurement
Technology	Capacitive and NTC
Features	• Humidity range: 0% RH to 100% RH • Temperature range: -40°C ... +125°C • Calibration: $\pm 1.5^\circ$ DP at 10°C, $\pm 0.8^\circ$ C at 25°C • Operating voltage: 12 V • Analog or digital (LIN) output

Coreless Current Sensor



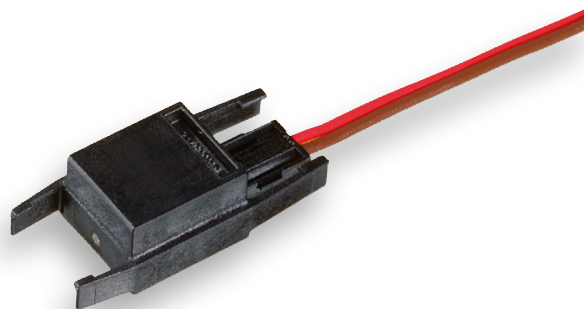
Industry	Automotive
Application	Battery Pack (BDU: Battery Disconnect Unit) Battery Management for xEV application
Functions	Measuring current of battery
Technology	Hall
Features	• Operating voltage: 5 V (4.5 to 5.5 V) • Operating temperature: -40°C to +85°C • Operating current range: -350 A ~ +350 A • Analog output • Accuracy @ 25°C: 1% (Hall)

Integrated Current Sensor



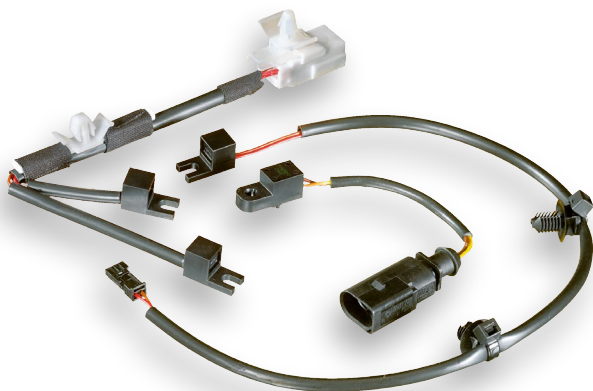
Industry	Automotive
Application	Battery Pack (BDU: Battery Disconnect Unit) Battery Management for xEV application
Functions	Measuring current of battery
Technology	Hall or Shunt
Features	• Operating voltage: 5V (4.5 to 5.5V) • Operating temperature: -40°C ... +85°C • Operating current range: -350 A ~ +350 A • Analog output • Accuracy @ 25°C: 1% (Hall) • Tolerance: 100 $\mu\Omega \pm 5\%$ • Temperature sensor: NTC

Cylinder Hall Switch



Industry	Automotive
Application	Hydraulic cylinder for convertible roofs
Functions	Measuring piston position of hydraulic cylinder
Technology	Hall Switch (magnet integrated in sensor)
Features	• No moving magnet inside cylinder • Small and robust design • Pigtail with flexible connector interface

Hall Switch Cable Assemblies



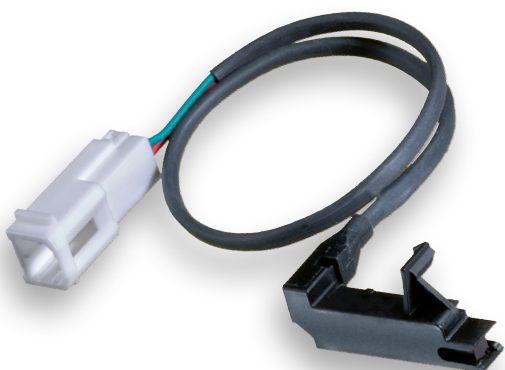
Industry	Automotive
Application	Convertible roof systems
Functions	Digital position detection
Technology	Hall Switch (magnet integrated in sensor)
Features	• Variety of cable assembly with integrated Hall switches

Roof Sensor



Industry	Automotive
Application	Roof railing detection
Functions	Adaptive ESP support
Technology	Hall (moving magnet)
Features	• Current interface • Small geometry • Diagnostics ability due to two-wire interface

Seat Buckle Switch



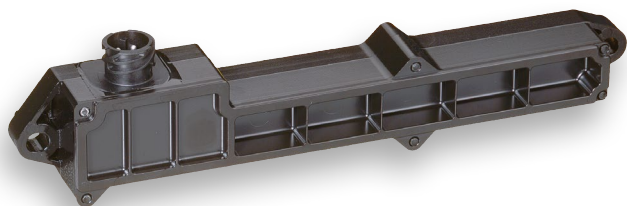
Industry	Automotive
Application	Airbag
Functions	Detecting buckle up status
Technology	Hall Switch (magnet integrated in sensor)
Features	• Non-contact measurement • Small design

Steering Position Sensor



Industry	Automotive
Application	Steering / Attention Assistant
Functions	Measuring steering angle
Technology	Hall (moving magnet)
Features	• Non-contact measurement • High resolution of steering angle (single turn) • Adapted to actuator motor

Truck Rear Axle Steering Sensor



Industry	Industrial & Commercial Transportation
Application	Truck Rear Axle Steering
Functions	Measuring piston position of Hydraulic Steering Cylinder
Technology	Active PLCD (moving magnet)
Features	• Non-contact measurement through cylinder wall • Robust design • Truck specific connector interface

Weight Sensor



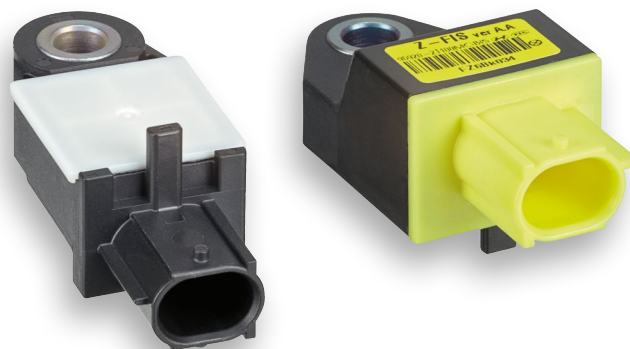
Industry	Automotive
Application	Passenger detection
Functions	Measuring seat weight to classify passenger for airbag deployment
Technology	Strain gage technology
Features	• High resolution of weight • Very small package (integration to seat track) • Sensor array with ECU for in system calibration • Mechanical overload protection • Very robust design

P-SIS Side Impact Sensor



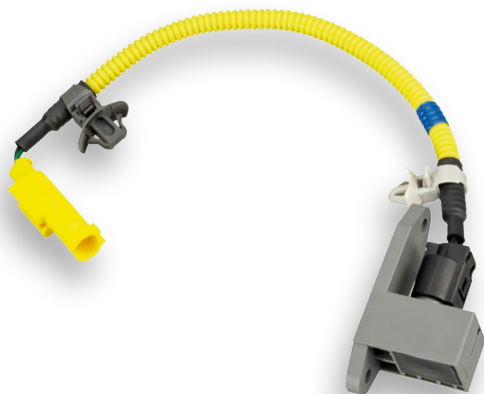
Industry	Automotive
Application	Side impact detection
Functions	Measuring the quick increase of pressure within the cavities of passenger car door to determine the airbag deployment
Technology	MEMS
Features	• Small package and robust design • PAS4 data transmission mode

FIS / Z-Fis Front Impact Sensor



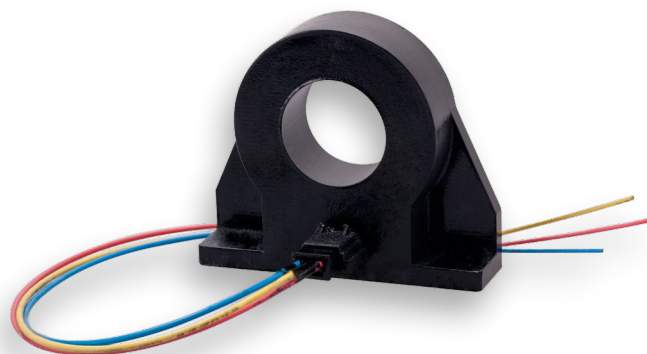
Industry	Automotive
Application	Front impact detection
Functions	Measuring acceleration data for front impact detection
Technology	MEMS
Features	• Small package and robust design • PSI5-A data transmission mode

Seat Track Position Sensor - Option 3



Industry	Automotive
Application	Dual staged airbag
Functions	Measuring seat track position
Technology	Hall Switch (magnet integrated in sensor)
Features	• Triggered by seat track (no moving magnet) • Current interface • Small geometry • Diagnostics ability due to two-wire interface

Current Sensor for BMS



Industry	Automotive
Application	Current sensing for Battery Management System (BMS)
Functions	Indicates the real-time current flowing through the battery, which would be used to calculate the "start of charge" of the battery
Technology	Fluxgate
Features	• Operating voltage: $\pm 12V$ or 0-12V • Operating temperature: $-40^{\circ}C$ to $+85^{\circ}C$ • Operating current range: 0 ~ 300 A • Analog and digital (SENT) output: current output or analog output • Accuracy @ room temperature: 1%