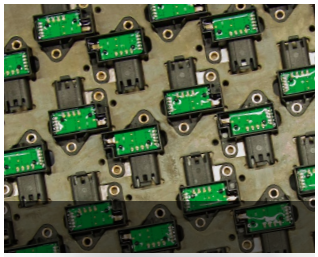


TE Connectivity's

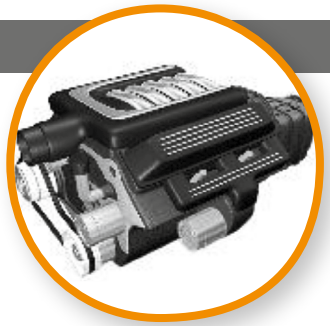
SENSOR TECHNOLOGIES

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

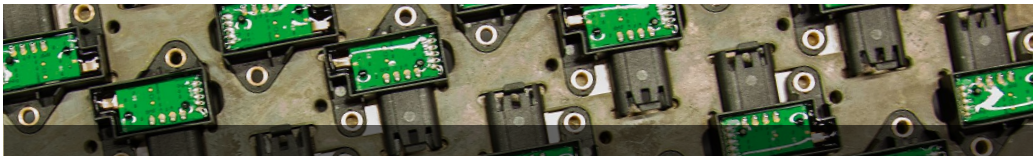
Our engine and e-motor sensors are used in vehicle applications such as travel sensor for turbo charger actuator, pneumatic (EGR) Cylinder, CAM and Crank Shaft Speed sensors and resolvers for e-motor commutation.

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

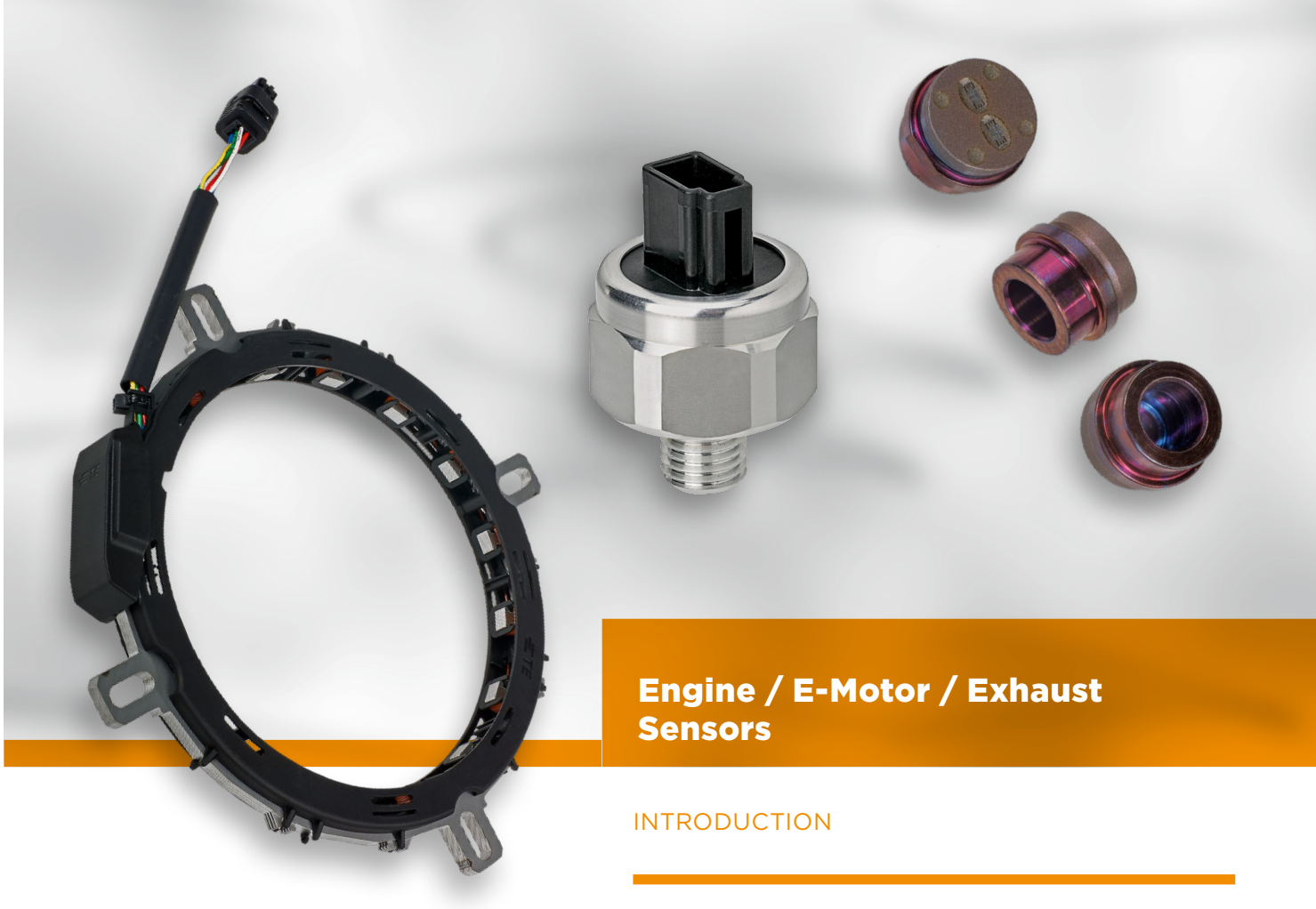
Our brake sensors are used in vehicle applications such as travel sensor for brake master cylinder position (optional redundancy), travel sensor for rear axle steering, rotary sensor for brake pedal position detection (optional redundancy); contactless brake light switch and wheel speed sensor. We also 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).



Engine / E-Motor / Exhaust Sensors

INTRODUCTION

Our Engine / E-Motor sensors are used in vehicle applications such as travel sensor for turbo charger actuator (truck), pneumatic EGR Cylinder (truck), and pneumatic turbo charger actuator; rotary sensor for EGR actuator, and resolver for e-motor commutation.

Position

- Actuator Valve
- Resolver Commutation
- Oil Level *

Pressure

- Oil Pressure
- Air Intake
- GDI Pressure
- MAP / TMAP / TMAP and Humidity *

Temperature

- Engine Oil

Humidity

- Air Intake
- Combined Humidity / Pressure / Temperature

* in development

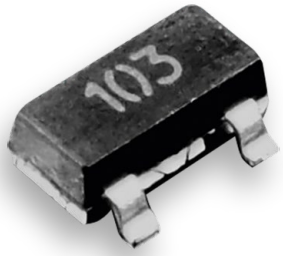
Single Coil Resolver (SCR)

Industry	Automotive
Application	Hybrid powertrain / e-motor
Functions	Angular position sensor for electric motors for EV and HEV cars
Technology	Inductive Magnetic Field
Features	• Temperature range -40° C to +170° C (works in oil if neccessary) • Up to 20,000 / min (rpm) • High accuracy • Pole pair numbers: 2-, 3-, 4-, 5-, 6-, 10-, 12-, and 18-speed • Customized cable assembly and connector interface • Fault-tolerant with excentricity (static / dynamic) through patented winding scheme • Fault-tolerant against external fields

Multi-Coil Resolver (MCR)

Industry	Automotive
Application	E-motor for hybrid and electrical vehicles
Functions	Measuring rotor position of E-motor
Technology	MCR (Multi-Coil Resolver)
Features	• Non-contact measurement of rotor position • Analog output • High accuracy • Temperature up to +150° C • Rotational speed up to 20,000 rpm • Adaptable to pole pairs of E-motor

Ni1000 SOT

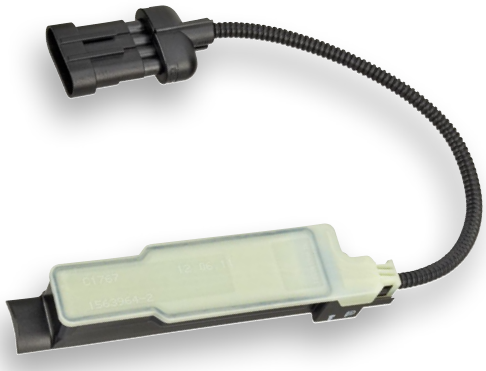


Industry	Automotive
Application	Engine Oil Temperature
Functions	Measuring temperature of engine oil
Technology	Nickel RTD
Features	• Resistance: 1000 ohms at 0° C • Temperature range: -55° C to +160° C • Measurement current: 0-5 mA, typ. 0.2 mA • ESD class 1 • Tolerance: ± (0.4+0.007 x |T|) in range from 0° C to +160° C

GDI Sensor Element

Industry	Automotive
Application	GDI Engine
Functions	Measuring pressure of fuel pipe
Technology	Kristal Bond
Features	• Pressure range up to 300 bar • Small Diameter < 6mm

EGR Actuator Sensor



Industry	Industrial & Commercial Transportation
Application	Exhaust Gas Recirculation
Functions	Measuring piston position of Pneumatic Cylinder for truck
Technology	Active PLCD (moving magnet)
Features	• Non-contact travel measurement through cylinder wall • Robust design for truck application

HTD 2610

Industry	Automotive
Application	Humidity at air intake manifold
Functions	Dew point measurement
Technology	Capacitive
Features	• Humidity range: 0 % RH to 100 % RH • Humidity time constant (with 2 m/s flow rate): typical 5 S • Temperature range: -40° C to +125° C • Calibration: +/-1° DP at 25° C • Operating Voltage: 12 V • LIN output

Turbocharger Pneumatic Actuator Position Sensor (Truck)

Industry	Industrial & Commercial Transportation
Application	Turbo charger for truck
Functions	Measuring piston position of Pneumatic Actuator (over pressure)
Technology	Active PLCD (moving magnet)
Features	• Non-contact travel measurement • Highly insensitive against vibration and temperature (up to +160° C)

Turbocharger Pneumatic Actuator Position Sensor (Automotive)

Industry	Automotive
Application	Turbo charger
Functions	Measuring piston position of pneumatic actuator (vacuum)
Technology	3D Hall (moving magnet)
Features	• Non-contact travel measurement inside the actuator • Unguided magnet • Wear and tear free • High life time accuracy

Urea Pressure Sensor U86B

Industry	Automotive Industrial & Commercial Transportation
Application	Selective Catalytic Reduction (SCR)
Functions	Pressure measurement of urea liquid in SCR systems
Technology	Piezoresistive
Features	• Analor or SENT output • Pressure range: 0-3, 7, 10, or 14 bar • Total Error Band: ±2.0 • Operating temperature: -7° C ... +105° C • Cable option

Urea Temperature Sensor

Industry	Industrial & Commercial Transportation
Application	Selective Catalytic Reduction (SCR)
Functions	Pressure measurement of urea liquid in SCR systems
Technology	NTC
Features	• Suitable for high pressure applications • NTC – Custom tolerances available: ±2%, ±3%, and ±5%, • Beta 25/85: 3976 • Operating temperature: -40° C ... +125° C • 8mm sensor tip diameter • Freeze cycle proven design

NTC Temperature Sensor

Industry	Automotive
Application	48 V Beltdriven Starter Generator (BSG) temperature monitoring
Functions	Monitor the temperature inside of the 48 V motor
Technology	NTC
Features	• Operating temperature: -40° C ... +200° C • Resistance @ 25° C: 30 KOhms • Beta value 25/85: 3960 K

Pressure Sensor Transmission

Industry	Automotive
Application	Transmission CVT, DCT, AT & others
Functions	Measuring transmission oil pressure
Technology	Semiconductor Strain Gage (SemSG)
Features	• Lightweight: <18 grams • Operating pressure: 1 - 80 / 20 bar (gauge) • Proof pressure: >2x or more to operating range • Burst pressure: > 500 bar or more to operating range • Operating temperature: -40° C to +140° C • Interface: Analog or SENT • Compliance with ASIL “B”, optional ASIL “C”

Transmission Sensors

INTRODUCTION

Our transmission sensors are used in vehicle applications such as neutral detection sensor for Manual Transmission (MT) to support the start and stop function; drive mode sensor (travel or rotary measurement) for Automatic Transmission (AT), Continuously Variable Transmission (CVT), and Dual Clutch Transmission (DCT).

Position

- All Gear Detection
- Drive Mode (P - R - N - D - L)
- DCT Gear / Shift
- Clutch

Pressure

- Transmission Control Unit (TCU) Hydraulic Oil
- Pneumatic Air
- Transfer Case 4WD

Temperature

- Oil Sump
- Wet Clutch
- Oil Pump

Speed

- Input Speed (TISS)
- Output Speed (TOSS)
- Gear Speed

Speed Sensor Platform

Industry	Automotive
Application	Transmission, Engine, Clutch, Chassis, Brake
Functions	Measuring gear speed, travel and angle position
Technology	Hall (moving magnet)
Features	• Triggered by ferromagnetic gear wheel • Current interface with direction detection • Sealed connector interface • Diagnostics ability due to two-wire interface • IP6K9 • Temperature range: -40° C up to +150°C

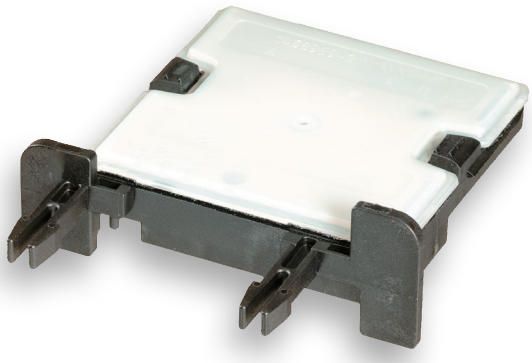
Hall Sensor T40MC2

Industry	Automotive
Application	Transmission, Engine, Clutch, Chassis, Brake
Functions	Measuring travel position
Technology	Hall (moving magnet)
Features	• Non-contact measurement up to 40mm • Highly insensitive to vibration • Temperature up to +150° C • Analog or PWM interface • Small geometry • Optional redundancy • Supply 5 V (optional 12 V) • 4-way MCON connector interface • Optional protocol (e.g. SENT)

AMT Position Sensor

Industry	Industrial & Commercial Transportation
Application	Automated Manual Transmission (AMT)
Functions	Measure position of shift rails / forks (linear)
Technology	3D Hall (moving magnet)
Features	• Non-contact travel • Robust design for truck application • One fastener interface to reduce installation time • 3D Hall with temperature compensation factor • 4-way MCON sealed connector interface • Operating temperature: -40° C ... +150° C

Dual Clutch Position Sensor



Industry	Automotive
Application	Dual Clutch Transmission
Functions	Measuring piston position of clutch actuator
Technology	Active PLCD (moving magnet) or Hall
Features	• Two sensors in one housing • Small and robust design

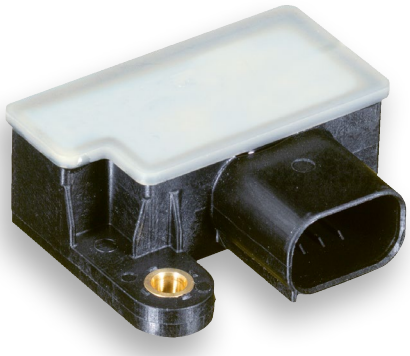
Drive Mode Sensor

Industry	Automotive
Application	Automated Transmission (AT)
Functions	Measuring drive mode position (PRND) inside the gearbox
Technology	Active PLCD (moving magnet) or Hall
Features	• Non-contact travel measurement • Robust and oil sealed design • High measurements accuracy • No wear and tear

All Gear Detection Sensor

Industry	Automotive
Application	Manual Transmission (MT)
Functions	Measuring gear and shift position
Technology	3D Hall
Features	• Non-contact rotary and travel measurement integrated in one housing • Robust design

Gear Fork Position Sensor



Industry	Automotive
Application	Dual Clutch Transmission
Functions	Measuring gear fork position
Technology	Active PLCD (moving magnet) or Hall
Features	• Non-contact measurement through transmission wall • High life time accuracy • Small magnet design

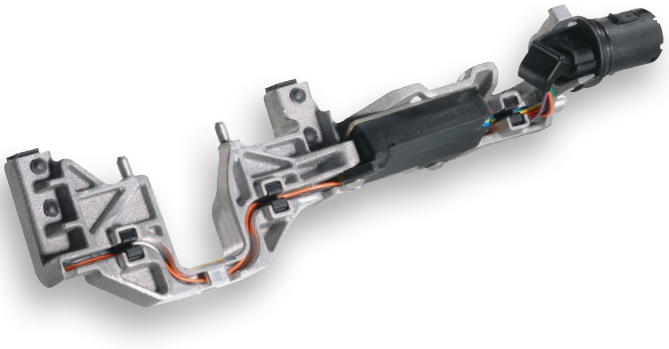
Neutral Position Sensor

Industry	Automotive
Application	Start-/Stop application
Functions	Measuring gear lever position inside manual transmission
Technology	Active PLCD (moving magnet) or Hall
Features	• Non-contact measurement through transmission wall • High life time accuracy • Small magnet design • Diagnostics ability due to two-wire interface

Speed Sensor SP1M

Industry	Automotive
Application	Transmission
Functions	Measuring gear speed
Technology	Hall (with integrated magnet)
Features	• Triggered by ferromagnetic gear wheel • Current interface with direction detection • Sealed connector interface • Diagnostics ability due to two-wire interface • IP69K • Temperature range: –40° C ... +150° C

DCT Transmission Sensor Module

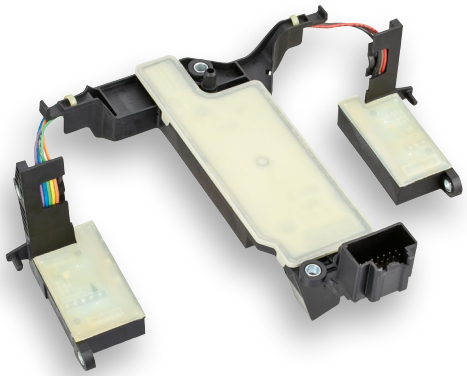


Industry	Automotive
Application	Dual Clutch Transmission
Functions	Measuring drive mode position and gear speed inside transmission
Technology	Active PLCD or Hall
Features	• Sensor module with integrated position and speed sensors • Oil sealed pass through connector system • Highly robust design

DCT Transmission Sensor Module

Industry	Automotive
Application	Dual Clutch Transmission
Functions	Measuring shift fork position, gear speed and temperature inside transmission
Technology	Hall and NTC
Features	• Sensor module with integrated speed (2x), position (4x) and temperature sensors • Oil sealed 12 pin pass through connector system • Highly insensitive against vibration, temperature and pollution inside the transmission

DCT Transmission Sensor Module



Industry	Automotive
Application	Dual Clutch Transmission
Functions	Measuring shift fork position, gear speed and temperature inside transmission
Technology	Active PLCD, Hall and NTC
Features	• Sensor module with integrated speed (2x), position (4x) and temperature sensors • Oil sealed connector system • Highly insensitive to vibration, temperature and pollution inside the transmission

Gear-Shift-Split Detection Sensor

Industry	Industrial & Commercial Transportation
Application	Automated Manual Transmission (AMT)
Functions	Measuring gear-shift and split position
Technology	Active PLCD (moving magnet)
Features	• Non-contact measurement • High life time accuracy • Small magnet design

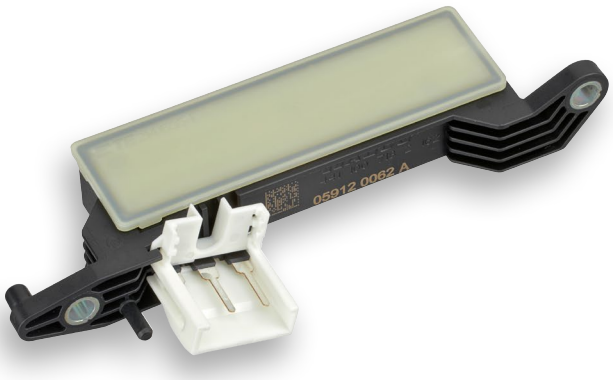
Neutral Position Sensor

Industry	Automotive
Application	Start-/Stop application
Functions	Measuring gear lever position inside manual transmission
Technology	Hall (moving magnet)
Features	• Non-contact measurement • Oil tight connector interface • High life time accuracy • Small magnet design • Diagnostics ability due to three-wire interface

Water in Fuel Detection Sensor

Industry	Automotive
Application	Fuel Filter
Functions	Water detection
Technology	Resistance measurement
Features	• Flexible electrical interface (AC or DC, 12 V or 24 V) • Different measurement levels • Bayonet or thread interface • Optional header or pigtail interface

Gear Detection Sensor



Industry	Industrial & Commercial Transportation
Application	Automated Manual Transmission
Functions	Measuring gear position
Technology	Active PLCD (moving magnet)
Features	• Non-contact measurement • High life time accuracy • Small magnet design • Highly insensitive to vibration, temperature and pollution inside the transmission

Redundant Neutral Position Sensor

Industry	Automotive
Application	Start-/Stop application
Functions	Measuring gear lever position inside manual transmission
Technology	Active PLCD (moving magnet) or Hall
Features	• Non-contact measurement through transmission wall • High lifetime accuracy • Small magnet design • Diagnostics ability due to two-wire interface

Shift Detection Sensor

Industry	Industrial & Commercial Transportation
Application	Automated Manual Transmission
Functions	Measuring shift position
Technology	Active PLCD (moving magnet)
Features	• Non-contact measurement • High lifetime accuracy • Small magnet design • Highly insensitive to vibration, temperature and pollution inside the transmission

Drive Mode / Transmission Rotary Sensor (TRS)

Industry	Automotive
Application	Transmission
Functions	Drive mode and shift drum detection
Technology	Hall 3D with integrated magnet
Features	• Operating voltage: 5 ±0.5 V • Operating temperature: -40° C to -140° C • Operating travel range: 360° • Analog and digital (SENT) output • Accuracy over lifetime 1% • Compliance with ASIL “C”

Pressure Sensor Transmission

Industry	Automotive
Application	Transmission CVT, DCT, AT & others
Functions	Measuring transmission oil pressure
Technology	Semiconductor Strain Gage (SemSG)
Features	• Lightweight: <18 grams • Operating pressure: 1 - 80 / 20 bar (gauge) • Proof pressure: >2x or more to operating range • Burst pressure: > 500 bar or more to operating range • Operating temperature: -40° C to +140° C • Interface: Analog or SENT • Compliance with ASIL “B”, optional ASIL “C”