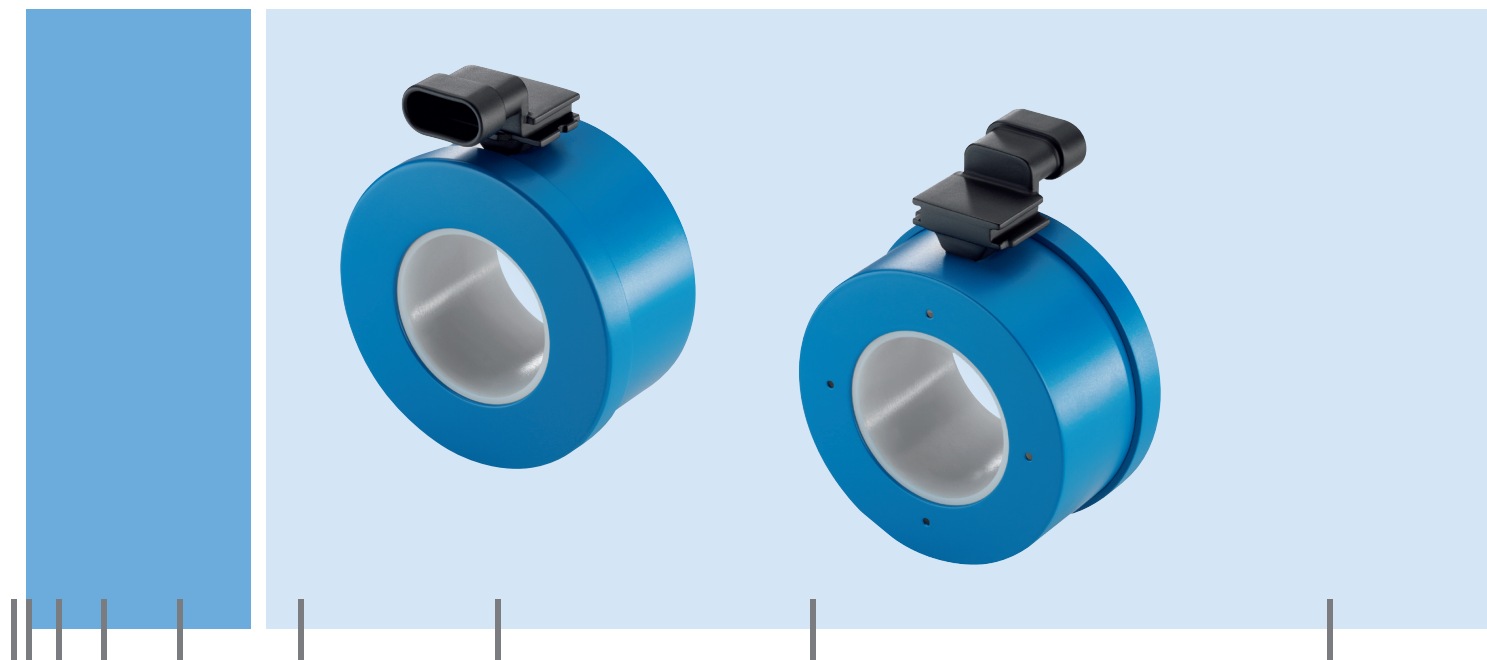


# Powertrain Torque Sensor



[www.siemensvdo.com](http://www.siemensvdo.com)

Our innovative sensors are helping customers meet increasing global performance requirements and emission regulations.

## Product introduction

We have developed a non-contacting, non-compliant torque sensor which, by design, is mechanically robust, highly reliable and extremely accurate. The sensor was developed for use in vehicle drivetrain applications.

## Product benefits

This sensor provides a means to accurately measure the magnitude and polarity of torque applied to a shaft. The sensor has the ability to survive extreme torque exposure without detrimental effects. Closed-loop control techniques are easy to implement and can provide a more accurate and stable system. Furthermore, the contactless measurement technique adds to the robustness of the overall system design.

## Product application

Many applications for the Non-Compliant Torque Sensor are apparent. The sensor can be adapted for transfer case, transmission, axle, differential and engine applications.

For 4 wheel drive systems, a torque sensor can be used to control torque distribution between front and rear axles thereby improving traction control, vehicle stability dynamic algorithms and braking dynamics.

In automatic transmission control systems, the torque sensor can be used for improving shift quality and control thereby improving fuel economy and decrease of drivetrain component wear.

Torque sensors can be used to directly measure engine torque. Direct torque measurements can improve fuel economy by providing closed loop feedback to the engine controller. The closed loop system can eliminate errors in torque based engine control models caused by component aging, and engine variability. Another possible application for the torque sensor is engine misfire detection.

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## Product technology

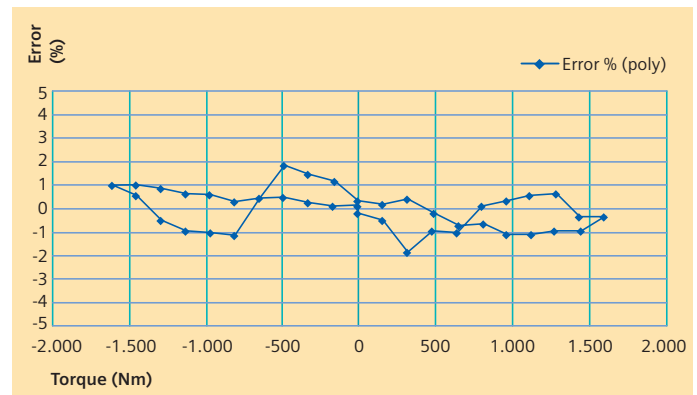
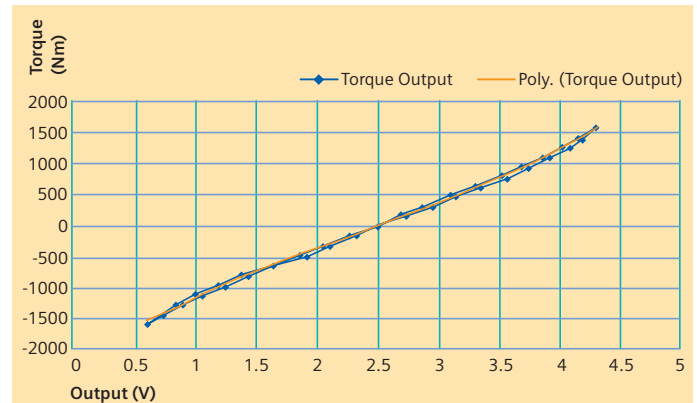
The key point is to create a magnetically active area within a base shaft containing magnetoelastic properties.

As torque is applied to the shaft, proportional stresses are imparted. This results in a measurable magnetic field change that correlates directly to the applied torque.

The electronics portion of the torque sensor consists of a circumferential magnetometer which measures the strength of a magnetic field emanating from the shaft. The magnetometer design is established on time-proven fluxgate (or saturable core) technology. It employs a patented flux-guide configuration to amplify the magnetic signal, integrate away magnetic field inhomogeneities, and provide shielding from both electromagnetic interference and stray magnetic fields. This principle has been successfully demonstrated for steering and powertrain applications.

Other features include temperature compensation, miswire/ESD protection and diagnostics within a compact housing design.

## Transfer case application



## Product features

- | Non-Contacting
- | Non-Compliant
- | Over-torque Survivability
- | Compact Size
- | High Accuracy
- | On-board self diagnostics
- | Non-volatile self calibration
- | Does Not Impose RPM or Angular Acceleration Limit
- | Differential Output Signals
- | Redundancy possible
- | Measurement range adaptable to customer requirements (shaft geometry and material dependant)

## Product technical specifications

- | Measuring Range: Customer Defined
- | Temperature range: -40° to +150°C
- | Supply Voltage: 5V or automotive switched 12V
- | Supply Current: ~ 75 mA
- | Total Error: ± 1.0%
- | Resolution: ~ 0.1%
- | Non-linearity: < 0.1%
- | Hysteresis: < 0.1%
- | Data Output: cutoff frequency: 1-3 KHz
- | Pulse Width Modulation (PWM) @ 1KHz

\* Overall system performance is dependent on final material selection and customer defined mechanical geometry