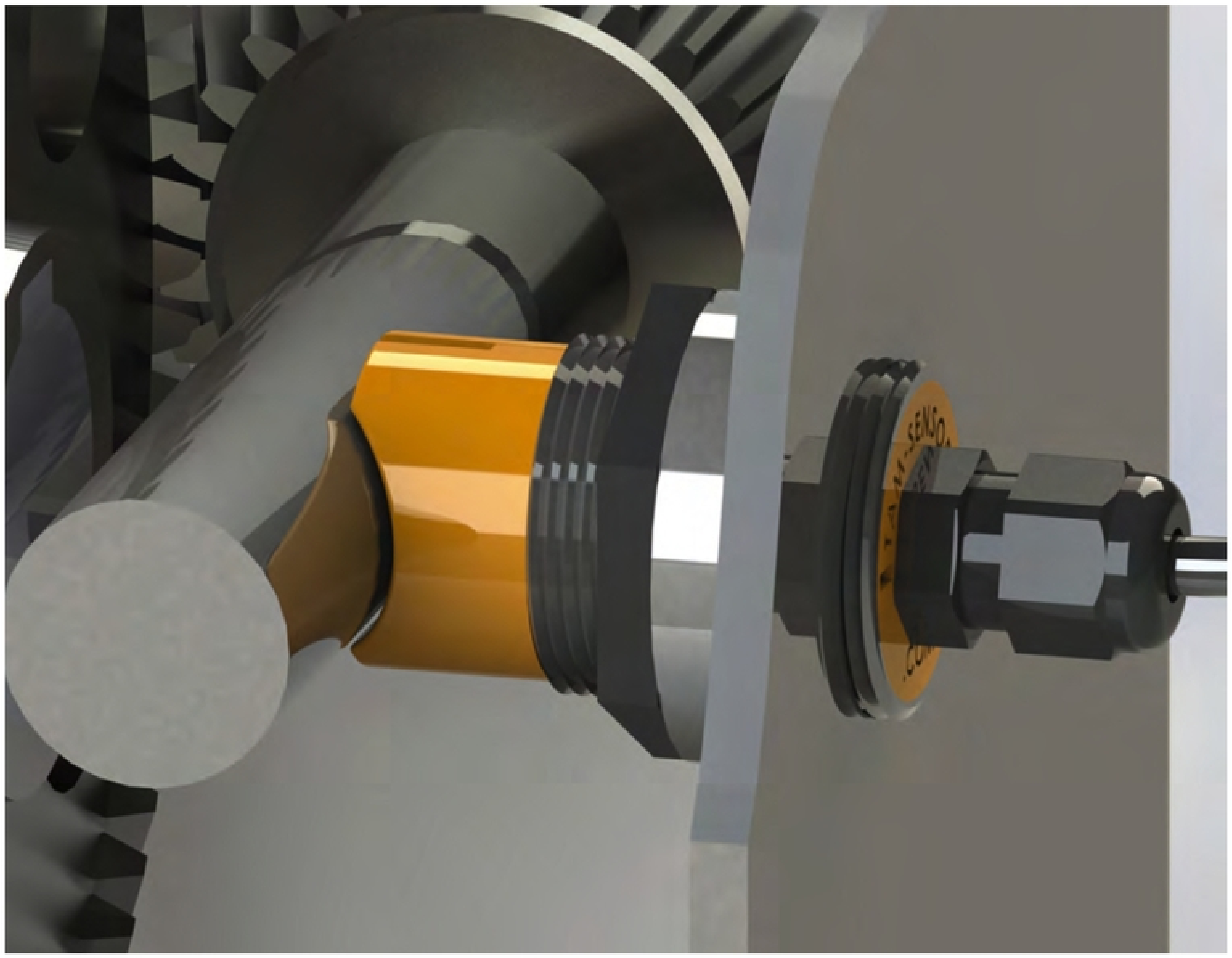

ACTIVE VS STRAIN GAUGES

Measurement specialist **Torque & More** explains the advantages that its Active Torque Sensors have over strain-type gauge sensors

A magnetic principle-based and non-contact sensing solution called Active Torque Sensors has been developed by Torque and More, an engineering team located in Germany.

In late 2014, the team introduced new features to the Active-2 torque sensor and they have now released the next generation of the sensor: Active-3. Key features of the new sensor are that it is now insensitive to changes in operating temperature and that it is insensitive to changes in the air gap between the sensing module and the test shaft. These developments mean that the sensor can be used in applications where the test shaft may have some play or wobble.

Transmission application where a standard A3 Sensing Module is placed onto a 25mm-diameter test shaft (main)

"THE SENSING MODULE DETECTS AND MEASURES THE ANGULAR CHANGES OF THE MAGNETIC FLUX LINES"

The active torque sensors are tested and used in applications including power tools, mining and drilling, electromobility, motorsport, process control, and in-car applications.

Active torque sensing technology has come a long way and the technology now represents a very competitive and serious measurement tool. The measurement linearity is better than 0.2% of full-scale (FS), and the signal hysteresis can be better than 0.2% of FS (dependent on the alloy used by the test-shaft and the applied hardening process).

The Active-3 sensing module shows virtually no performance change over the entire operating temperature range.

The sensing module contains an electrically powered and alternating magnetic field source. The emanating magnetic flux lines penetrate the surface of the ferromagnetic test shaft and are returned to a magnetic field measurement device, also located inside the sensing module. Mechanical stresses acting on the test shaft (i.e. torque forces) will modulate the properties of the magnetic field passing through the test shaft. These changes in properties are then detected and quantified by the sensor electronics. The alternating magnetic field is immune to a wide range of electromagnetic interferences.

As the magnetic field is actively produced by the sensor electronics, the sensor's performance will not deteriorate with age and cannot be damaged when applying over-torque to the test shaft.

Positive torque stress applied to the test shaft will result in an increasing concentration of the magnetic flux lines in a +45° angle (in relation to the main axis of the test object). Negative torque stresses result into a -45° angle (magnetic flux line concentrations). The density of the flux lines changes at these angles, in proportion to the mechanical stresses applied, until the plastic deformation of the test shaft.

The sensing module detects and measures the angular changes of the magnetic flux lines and any increase in the localized concentration of the magnetic flux lines nearest to the module. The built-in sensor signal processing unit then converts the measured signal into a 0 (zero) to +5V analog signal output, whereby a +2.5V signal is reserved for a mechanical stress-free situation (equivalent to 0Nm of torque).

Another feature of the new generation active torque sensors is that the sensing module need only be placed on one side of the test shaft, making it very easy to retrofit an existing application with a high performance and virtually maintenance-free torque sensor. <