Sensors that deliver

High-precision eddy current sensors for automotive development

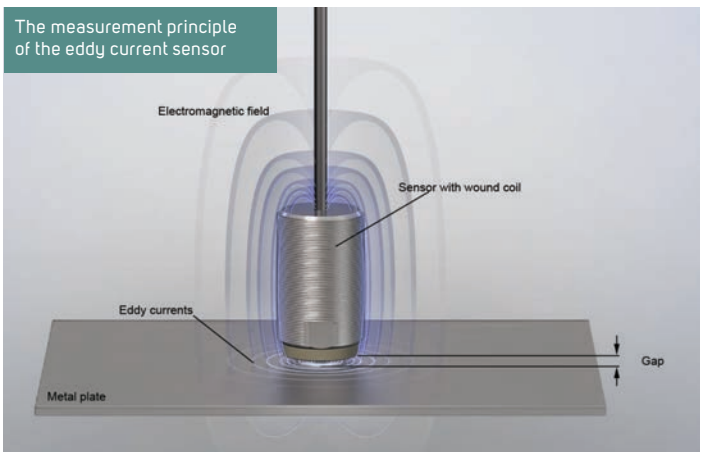
Eddy current displacement sensors are one of the main pillars of non-contact industrial measurement technology, being used to measure distances, displacements or positions of any electrically conductive target. The principle offers many advantages that no other procedure can replicate. The conventional sensor design is now being supported by new developments in materials and components. This makes handling these sensitive sensors easier, while extending the number of applications.

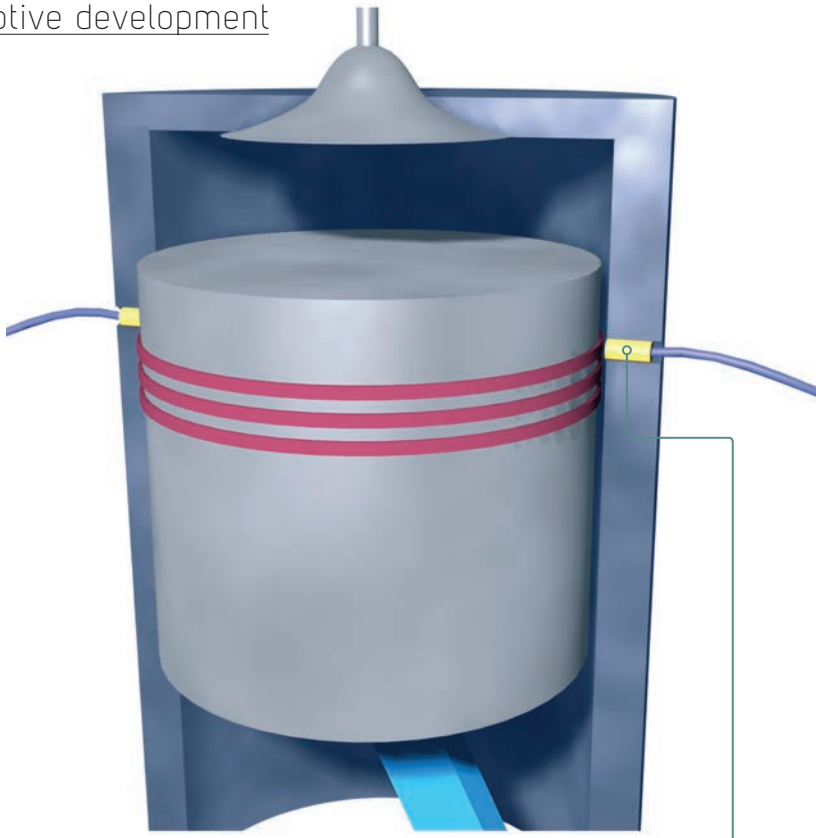
The eddy current principle is used in applications with measurements on electrically conducting materials that may have ferromagnetic or non-ferromagnetic properties. A high-frequency alternating current is passed through a coil built in to the sensor housing. The electromagnetic field of the coil induces eddy currents in the conducting measurement object, whereby the resulting impedance of the coil changes. This change in impedance causes an electrical signal that is proportional to the distance of the measurement object to the sensor coil. Eddy current sensors from Micro-Epsilon are suited for applications in harsh industrial environments caused by pressure, dust and temperature.

The innovative Embedded Coil Technology (ECT) permits the normal limitations of the material and design to be exceeded. ECT for the production of coils in sintered inorganic carrier material has only been applied to customized applications. However, standard ECT eddy current sensors are now available.

Eddy current sensors with ECT differ greatly from standard sensors that use a wound coil. The sensor itself is embedded in an inorganic carrier material and the electronic components can be positioned on the carrier material itself. This technology has been developed by Micro-Epsilon for customized applications, which have high requirements in terms of temperature and long-term stability, as well as excellent repeatability. As this technology has been tested in OEM applications for several years, it can now be applied to standard eddy current sensors. ECT-sensors are even suitable for harsh environments. At temperatures up to 180°C they are permanently applied and the version with an integrated high-temperature cable can be used at up to 350°C. The sensors are available with the new high-performance eddyNCDT DT3300 controller.

The measurement principle of the eddy current sensor





The subminiature sensor, with only a 2.4mm external diameter, is integrated directly into the cylinder wall and ground to its shape

IC engines withstand maximum loads during a long service life. In order to deal with this need, eddy current sensors from the eddyNCDT series are installed in the engine for many measurements. As the smallest eddy current sensors in the world, they can be used in the fueled condition. Examples of measurements already being carried out are valve lift, needle lift, breathing of the cylinder head, lubrication gap on the cylinder and piston secondary movement.

The oil film thickness for combustion engines describes the gap and thus the quantity of oil between piston and cylinder wall – sometimes a determining factor for smooth operation and durability. As the oil film can only be integrated and measured in the firing condition, it is extremely difficult to manufacture sensors for these environmental conditions and also find space for them, but specially miniaturized eddy current sensors from Micro-Epsilon are perfect for the job. The smallest, with a 2.4mm external diameter, is integrated into the cylinder wall and ground to its shape. It measures the distance from sensor to piston (the space available for the engine oil) with every stroke.

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