

Speed measurement

Switchable target material, miniature size, a wide speed range and high operating temperature are among the advantages of a new generation of turbo speed sensor

▶▶ The turboSPEED DZ140 speed sensor is the fourth and latest generation of revolution-counting sensors for turbochargers manufactured by Micro-Epsilon. The high-tech measuring system reaches maximum interference immunity in harsh test bench conditions and in road tests. The built-in temperature measurement also offers the opportunity for a true ambient temperature measurement of the sensor, while a new electronic circuit boosts signal levels from the sensor and dramatically improves circuit shielding to give the sensor EMC levels of immunity that are several factors higher than other devices on the market.

The system has been designed to replace the sensor mounted in the turbo housing without having to recalibrate the system electronics. Like its predecessor, the DZ136, the DZ140 eddy-current measurement system is immune to the effects of the oil, dirt and carbon particles that can be found in the engine and affect the output quality of other measurement principles, particularly capacitive and optical measurement technologies.

The turboSPEED DZ140 speed sensor employs the eddy-current measuring principle, which is traditionally used in applications measuring electrically conducting materials with ferromagnetic or non-ferromagnetic properties. A coil is potted in a sensor case and energized by a high-frequency alternating current. Eddy currents in the turbocharger blades are generated by the electromagnetic field from the coil and every blade generates a pulse. The controller identifies the speed (analog 0-5V) by considering the number of blades relative to the number of pulses. The turboSPEED DZ140 works with speed ranges from



The sensor system for counting turbocharger revolutions is optimized for modern, thin blades that can be made out of aluminum or titanium

Non-contact turbo speed measurement is possible at levels up to 400,000rpm



200rpm all the way through to 400,000rpm. The eddy-current technique is highly suitable for miniaturization, and the miniature sensor design (3mm diameter) helps by simplifying the mounting process on to the turbocharger unit.

The turboSPEED DZ140 is able to work with distance targets of up to 2.2mm. The blade material (aluminum or titanium) can be set up in the sensor and no modification of the compressor wheel is required.

The sensor has a status LED and it can be operated from outside without opening the controller housing, so the sensor adjustment and setup can be made easily. All the settings – number of blades, sensitivity and the speed range – are selected at the front of the controller. While positioning the sensor, LEDs on the controller show the distance to the measuring object and so prevent any incorrect sensor positioning. The sensor

enables a wide range of applications in motor development and testing, including test bench operation and road tests thanks to a high operating temperature of up to 285°C.

For over 45 years, Micro-Epsilon has been developing non-contact displacement measurement and infrared temperature sensors for applications in the automotive arena and motorsport. These sensors are used in almost every conceivable area of a vehicle, as well as for R&D, test cells, production and for on-vehicle testing. Applications can range from measuring the wear on brake discs and clutches through to measuring turbocharger speeds, displacement of engine pistons, valve lift and ride height, as well as monitoring the temperature profile of tires. ©

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