press release

KOLBENSCHMIDT PIERBURG

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Pierburg GmbH

Lower emissions thanks to new exhaust gas mass flow sensor

Euro 6 will be with us in 2014. To comply with its emission standards, new engines will require both internal modifications and aftertreatment systems for their exhaust gas. The full potential of such systems can only be exploited, however, if the rerouted exhaust gas is accurately measured under all engine operating modes. Pierburg GmbH has therefore developed a sensor that directly measures the mass flow of hot gas in the exhaust and thus allows it to be controlled precisely. It is based on the principle of hot-film anemometry and is fitted out with ceramic sensor elements. Compatible with both car and commercial vehicle engines it will go into series production starting from 2012.

On today's Euro 4 and Euro 5 engines, it is mostly the rate of recirculating exhaust gas that is regulated and there is no feedback indicating the actual volume rerouted into the combustion chamber throughout the engine's service-life. Because of such factors as sooting of the EGR components, measurements vary and hence inevitably exhibit substantial deviations. In terms of engine service-life this is not conducive to optimize combustion or compliance with prescribed standards.

The new mass flow sensor, in contrast, continuously measures during engine operation the exhaust gas as a variable in the control loop and reports its findings to the engine controller. This latter then works out the volume of exhaust gas, depending on engine operating conditions, and uses its calculations to time EGR valve actuation. Hence, the sensor is part of a complex control circuit closely adapted to the needs of the engine, and forms the foundation for maintenance-free, rugged and reliable controlling of exhaust gas flow. A particular advantage over conventional methods is the greater accuracy and measuring speed. An example: in acceleration mode (causing high amounts of particulate emissions) the EGR rate is exactly adapted to the air ratio.

First-hand information

Featuring its own electronic analysis unit, the sensor comes as a plug-in system and ensures dependable operation and, at the same time, customer configured communication with the engine controller via a CAN-bus system.

Nested directly in the EGR system, the sensor provides "first-hand" information. For this purpose it has temperature-resistant ceramic elements

able to withstand operating temperatures of up to 650 °C, thus allowing a broad range of applications within the exhaust-gas system.

The need for temperature-resistant sensor elements arises because of soot contamination of the exhaust gas. A film of soot on the heating element strongly impairs heat flow, which is the sensor's key measurement variable. For trouble-free operation, it is therefore imperative that the ceramics remain free of deposits. This is achieved with the cyclic heating of the sensor elements to over 600 °C. At these temperatures, any deposited soot particles are burnt off. In addition to this burn-off procedure, the heating element's operating strategy is designed for a constant minimum temperature of 250 °C to ensure that soot contamination is largely prevented during operation. With the simultaneous application of these two countermeasures, it is possible to keep the ceramics soot-free and maintain trouble-free sensor operation throughout engine service-life.

Photo
Sensing element on the exhaust gas sensor.

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