



**Piezocryst offers its P-2, high-temperature pressure sensor for gas turbine combustion systems.**

## New Piezoelectric Pressure Sensor

Piezocryst of Graz, Austria, was formed in 2003 as a spin-off from AVL and has taken 50 years of experience in sensor development and production to offer the gas turbine marketplace a high-temperature pressure sensor — the type P-2 that can be mounted close to the gas turbine combustion chamber. Such a position enables the ability to monitor, in a very precise way, pressure pulsations that are induced by firing a very lean fuel/air mixture as required to minimize emissions.

Up until now, pressure transducers were frequently mounted at the end of a pipe connecting them to the combustion chamber in order to preserve them from the very hot environment. Such a position gives data that are strongly affected by oscillations and damping effects within the pipe. Additionally, those pipe assemblies quite often give false signals because of water condensation or strictions.

The type P-2 pressure sensor developed by Piezocryst has been designed to withstand temperatures up to 560 °C


and can be mounted directly at the combustion chamber, therefore providing very precise measurements. In this way, the gas turbine combustion system can be set in the most favorable condition to minimize exhaust emissions without submitting the machine to pressure pulsations — known as combustion instabilities or combustor humming — that could affect the life of its components.

The type P-2 pressure sensor features the Crystal Match patented sensing element based on GaPO<sub>4</sub> (gallium phosphate) single crystal, mounted inside a Nimonic 90 housing. The ground-insulated sensor is connected by a hard line cable and a LEMO connector to the charge amplifier.

The gallium phosphate crystal is a purely piezoelectric artificial material featuring very high stability over time, load and temperature and can withstand temperatures up to 970°C. The electrical signal transmitted by this type of crystal is sensitive only to pressure, but not to temperature, so the pressure signal is also very linear under changing environmental conditions.

The number of pressure sensors needed to monitor the behavior of a gas turbine combustion system depends on the combustor configuration — the number of cans, burners, etc. In theory, one instrument could be sufficient, but in practice several instruments are needed to have secure measurement results.

In fact, pressure pulsations are not evenly distributed over the combustor and one does not know in advance at which point of a potentially standing wave the instrument is placed. If the placement of the sensor coincides with the knot of such a standing wave it will create a problem. This can be avoided by mounting several instruments in different positions.

The main characteristics of the P-2 pressure sensor are: dynamic measuring range of 0 to 30 bar; an overload range of 50 bar, a sensitivity of 90 pC/bar; linearity of < 0.5 FSO; an operating temperature of -70° to 560°C; and a frequency range of 2 Hz to 15 kHz. 

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