

 Toll-Free in USA 800-959-4464 716-684-0003



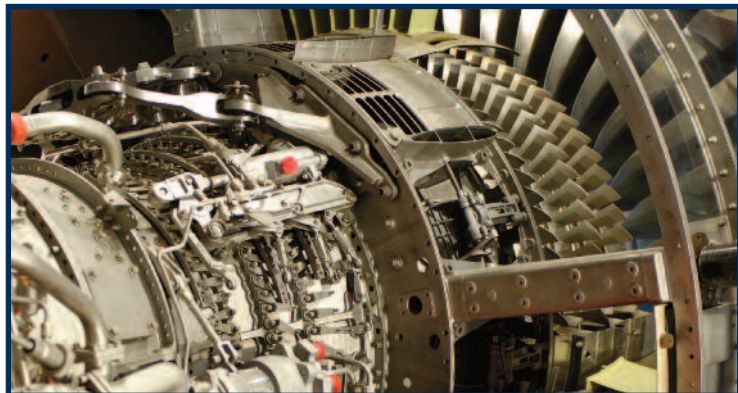
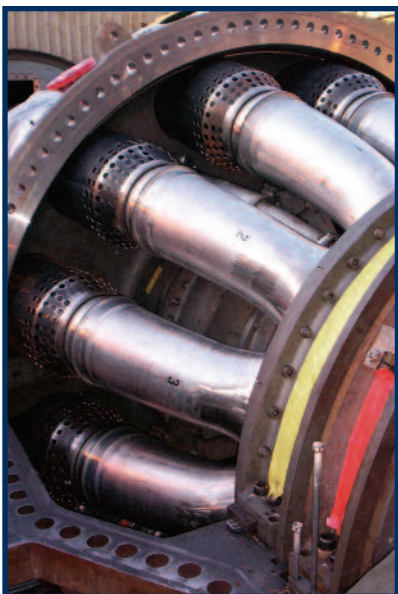
IMI Sensors: A Leader in Combustion Measurement & Gas Turbine Monitoring

For More Than 40 Years, PCB has specialized in the design and manufacture of innovative sensors and measurement systems for the gas turbine market. Spanning more than four decades, our expertise in combustion dynamics instrumentation has met the industry's most demanding requirements for dynamic combustion measurement and turbine engine monitoring.

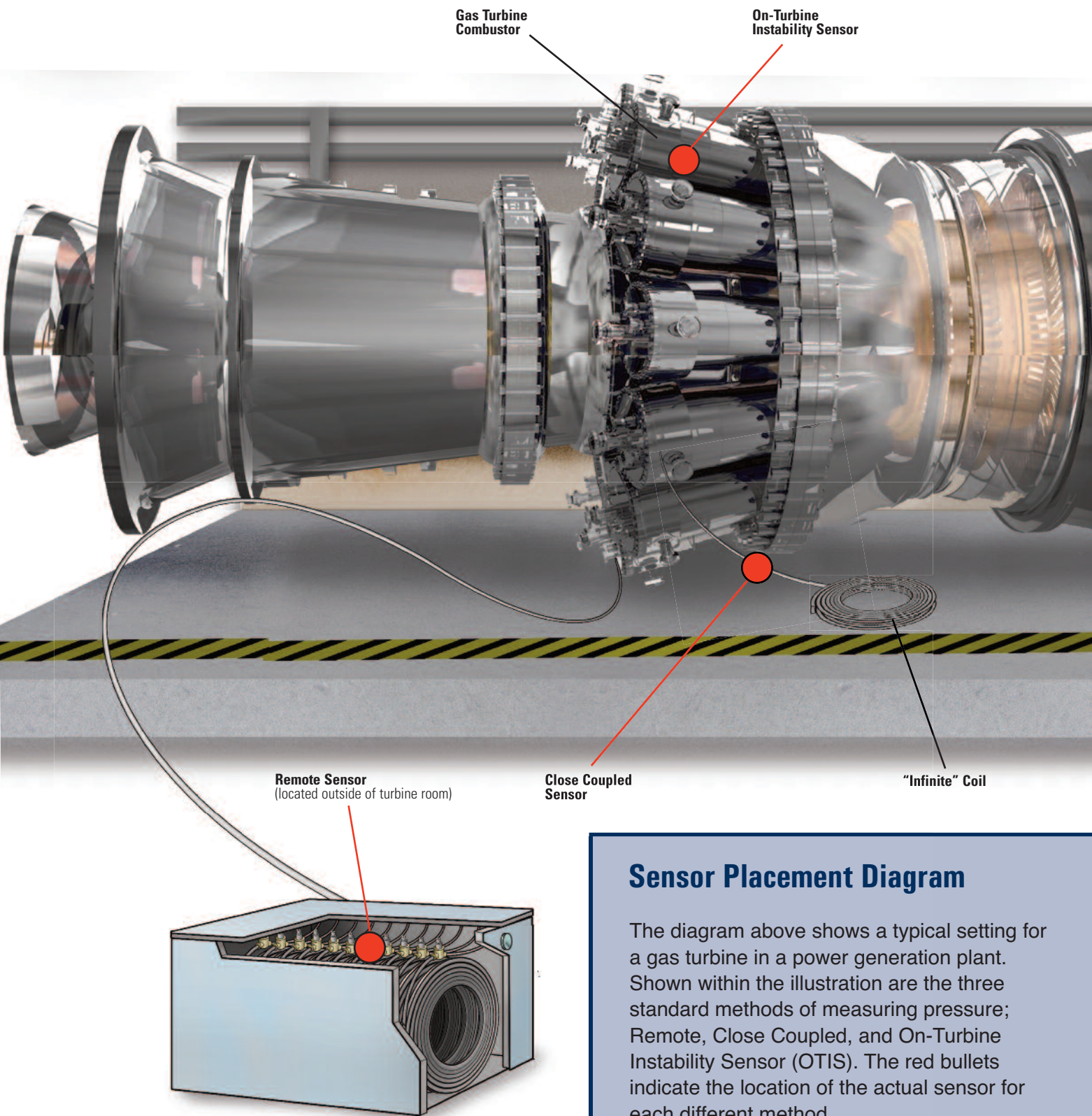
With the move toward increased fuel efficiency and lower exhaust emissions, today's gas turbine engines are based on technological innovation yet also bring potential problems. Burning a leaner flame keeps NOx emissions low but at the same time increases instability (combustion dynamics) in the gas turbine engine. This instability can damage components in the combustion chamber such as nozzles, baskets, and transition pieces, as well as downstream components such as blades, resulting in downtime and loss of revenue.

IMI's instrumentation is designed to detect and measure dynamic pressure spikes, pulsations and surges in gas turbine engines. Our pressure sensors have three basic applications for detecting and measuring dynamic pressure phenomena and combustion instability in gas turbine engines:

- **Remote Sensors**
- **Close Coupled Sensors**
- **On-Turbine Instability Sensors**



As the gas turbine industry has changed so has our technology. New "lean burn" and "dry low NOx" emission designs have made operating temperatures up to 1000 °F a reality. IMI's instrumentation is ideally suited to detect and measure dynamic pressure for gas turbine engines in extreme heat environments.



Sensor Placement Diagram

The diagram above shows a typical setting for a gas turbine in a power generation plant. Shown within the illustration are the three standard methods of measuring pressure; Remote, Close Coupled, and On-Turbine Instability Sensor (OTIS). The red bullets indicate the location of the actual sensor for each different method.

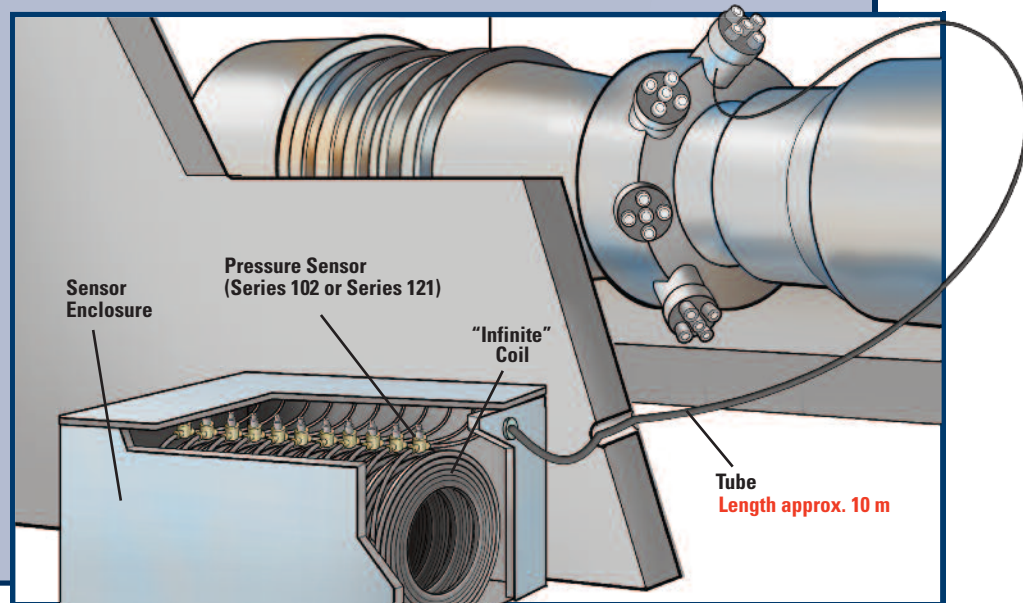




Remote Sensors

These pressure sensors have either a portable or permanent configuration. Portable systems consist of pressure sensors that are connected to sensing lines running to some or all of the combustors. Similar to the portable systems, permanent systems provide sensors mounted outside the turbine enclosure.

The sensors are then connected through sensing lines (tubing) to each combustor. Because of the long sensing lines involved, the ability to "purge" condensation is required. There are advantages to this simple, low-cost approach. Because the sensors are mounted outside the turbine enclosure, the conditions the sensors must endure are relatively mild, thus allowing for the use of less expensive sensors with longer life expectancy. In addition, these sensors can be serviced while the turbine is online.



Series 102 +275 °F / +135 °C

ICP® Pressure Sensor

- Sensitivities from 10 to 100 mV/psi (1.45 to 14.5 mV/kPa)
- Measurement range 50 to 5000 psi
- 316 stainless steel diaphragm
- 3/8-24 UNF fitting



003CXX Cabling

Low Noise, Teflon®, Coaxial Cable
10-32 Coaxial Plug to BNC Plug



Series 121 +250 °F / +121 °C

ICP® Pressure Sensor

- Sensitivities from 10 to 100 mV/psi (1.45 to 14.5 mV/kPa)
- Measurement range 50 to 500 psi
- 316 stainless steel diaphragm
- 1/4" NPT fitting



052BRXXXAC Cabling

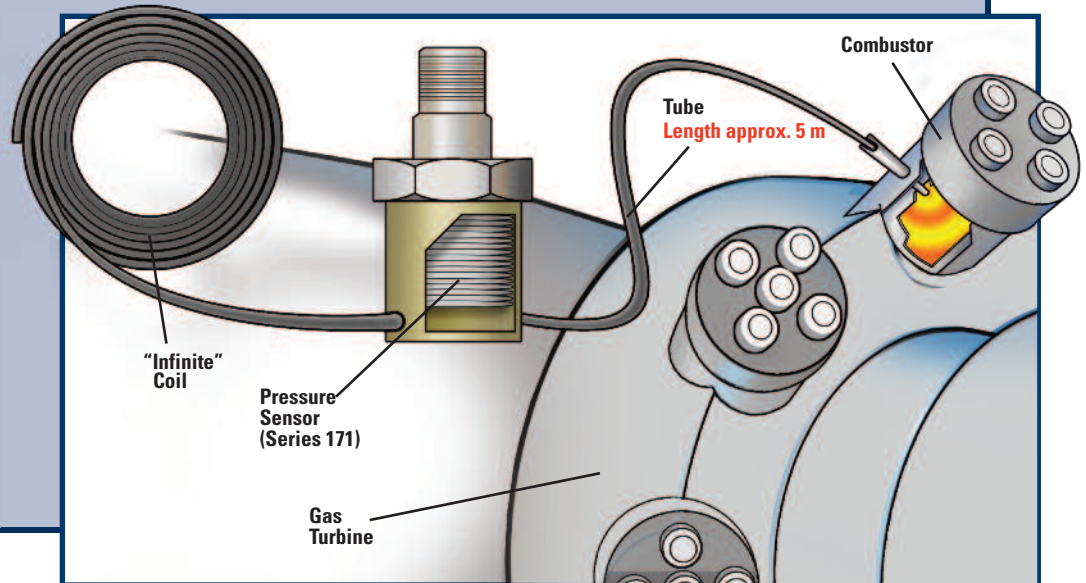
Polyurethane, Twisted Pair Cable
Composite 2-Socket MIL to BNC Plug



Close Coupled Sensors

Close coupled sensors permanently mounted to a gas turbine are ideal for monitoring combustion dynamics (instability). Operating at a wider frequency range than remote sensors, the high sensitivity and higher-temperature capability of these sensors allow for precision measurement in turbine locations where the application of other instrumentation is not possible.

Close coupling of the sensors to the combustor enables the measurement and detection of dynamic pressure phenomena such as high-frequency events that can cause damage to downstream components such as blades. Like the portable and permanent remote sensors, close coupled sensors also require a purging system to eliminate condensation.



Series 171 +500 °F / +260 °C

High Sensitivity Pressure Sensor

- Measurement range: 10 psi (68.9 kPa)
- Sensitivity: (±20%) 1100 pC/psi (160 pC/kPa)
- 2-pin connector, 1-1/8"-12 UNF-2A port
- Weight: 6.5 oz (185 gm)



045ERXXXAC Cabling

Low noise, Teflon®, Twisted Pair Cable
2-Socket MIL to BNC Plug



Model 422E55/D +250 °F / +121 °C

Slim In-Line Charge Amplifier

- Output voltage: (at specified measurement range) ±5 Vpk
- Sensitivity: (±2.5%) (charge conversion) 0.5 mV/pC
- Frequency range (±5%) 0.5 Hz to 100 kHz
- Housing material: stainless steel



visit us online at www.imi-sensors.com

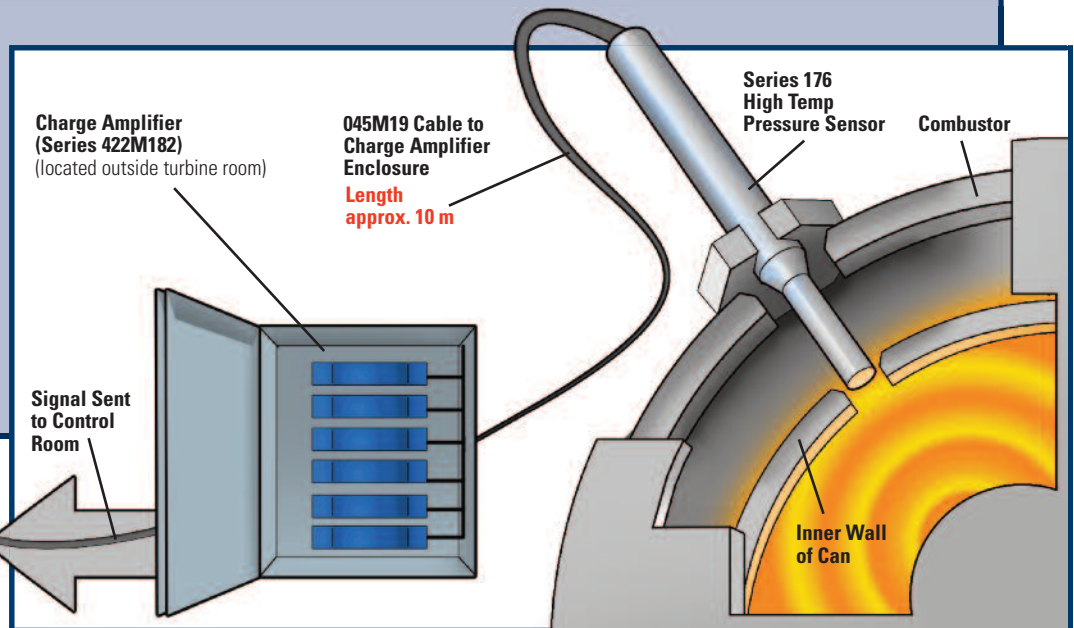
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On-Turbine Instability Sensor (OTIS)

High-temperature sensors directly mounted to the combustor basket provide 24/7, consistent, reliable combustion dynamics data monitoring so that tuning changes can be made at anytime. On Turbine Instability Sensors allow for diagnostics, part fatigue analysis, and the ability to continuously monitor and control emissions. The higher frequency capability of the OTIS sensors enable the use of auto-tuning and on-line diagnostic monitoring systems. In addition, these sensors provide an output that can easily connect to legacy combustion dynamics monitoring systems.

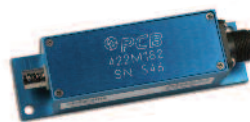
By having sensors directly mounted to the combustor, operators save time during combustion analysis.



Series 176   
+986 °F / +530 °C
High Temp Pressure Sensor
■ Sensitivities to 17 pC/psi
■ Measurement range 20 psi



045M19 Cabling
Low noise, Teflon® Cable,
2-socket 7/16 MIL
to 2-Socket MIL-C-5015






Series 422M182
Charge Amplifier
■ Sensitivity 4 mV/pC
■ Frequency Ranges from
2 Hz to 30 kHz



052BRXXXAC Cabling
Polyurethane Cable, Composite
2-Socket MIL to BNC Plug



Series 176   
+986 °F / +530 °C
High Temp Pressure Sensor
■ Sensitivities to 17 pC/psi
■ Measurement range 20 psi



045M19 Cabling
Low noise, Teflon® Cable,
2-socket 7/16 MIL
to 2-Socket MIL-C-5015



Series 495B30
Differential Charge
Amplifier
■ Sensitivity 9 μ A/pC
■ Frequency ranges from
60 Hz to 10 kHz



052ACXXXAD
Polyurethane Cable,
BNC Plug to Pig Tails



Series 682A70
Galvanic Isolator
■ Sensitivity 1 V/mA
■ Frequency range from
0.16



High Temperature Accelerometers for Gas Turbine Monitoring

Vibration monitoring of gas turbines can provide crucial information to diagnose potential problems, leading to an increase in uptime and a decrease in unplanned maintenance, catastrophic failures and accidents.

Innovations in high temperature accelerometer technology for gas turbine monitoring now enable vibration measurement in extreme heat environments up to +1200°F (+649°C). IMI's high-temp accelerometers come in a variety of frequencies, temperature ranges, and configurations. Integral charge amplifiers allow for use with standard data acquisition equipment.



IMI's high temperature accelerometers interface directly with handheld data collectors for both permanent mount and route based applications.



CE

Series HT62X +325 °F / +163 °C

Model 622A01 ICP® Accelerometer with High Temperature Range Option

- Sensitivity: (±5%) 100 mV/g (10.2 mV/(m/s²))
- Frequency Range: (±3dB) 12 to 480000 cpm (0.2 to 8000 Hz)
- Measurement Range: ±50 g (±490 m/s²)
- Electrical Connector: 2-Pin MIL-C-5015



Series 612 +500 °F / +260 °C

High Temperature Industrial Charge Accelerometer

- Sensitivity: (±10%) 26 pC/g (2.6 pC/(m/s²))
- Temperature Range: (Operating) -65 to +500 °F (-54 to +260 °C)
- Electrical Connector: 2-Pin MIL-C-5015
- Electrical Connection Position: Top

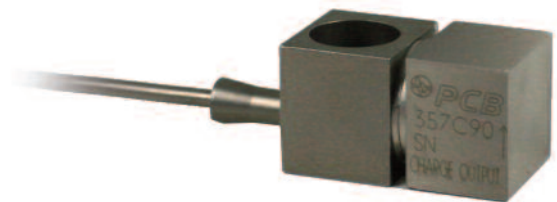


CE

Series 600A13 +900 °F / +482 °C

Very High Temperature Accelerometer Kit

- Sensitivity: (±5%) 100.0 mV/g (10.2 mV/(m/s²))
- Frequency Range: (±5%) 282 to 240000 cpm (4.7 to 4000 Hz)
- Measurement Range: (Peak) ±50 g (±490 m/s²)
- Mounting: Through Holes (3)



Series 357C90 +1200 °F / +649 °C

Charge Output Accelerometer, Integral 10-ft Hardline Cable

- Sensitivity: (±10%) 5 pC/g (.51 pC/(m/s²))
- Measurement Range: ±1000 g pk (±9800 m/s² pk)
- Frequency Range: (±5%) 2.5 kHz
- Electrical Connector: Integral Hardline Cable



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About IMI Sensors

IMI Sensors, a division of PCB Piezotronics, Inc., is dedicated to addressing the machinery vibration sensing needs for condition monitoring, predictive maintenance, and process control requirements. All IMI sensors and vibration switches are designed to withstand the rigors of harsh industrial environments. Included are sensors that interface directly with vibration data collectors and analysis equipment, as well as process monitoring equipment, PLC, DCS, alarm, and SCADA systems. For more information about IMI Sensors please call us anytime at 800-959-4464, or visit www.imi-sensors.com.

PCB Piezotronics, Inc. is a global leader in the design and manufacture of force, torque, load, strain, pressure, acoustic and vibration sensors, as well as the pioneer of ICP® technology. This instrumentation is used for test, measurement, monitoring, and feedback control requirements in automotive, aerospace, industrial, R&D, military, educational, commercial, and OEM applications. From ready-to-ship stock products, to custom-made specials, PCB® proudly stands behind all products with services customers value most, including 24-hour customer support, a strategic global distribution network, and the industry's only commitment to Total Customer Satisfaction. For more information about PCB® visit www.pcb.com.



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