WIND TUNNEL SENSORS
PCB® offers dynamic pressure sensors, force sensors and microphones for Aerodynamic Engineers to use in wind tunnels to test aircraft or rocket models. The chart below provides a recommendation of sensors based on the wind tunnel classification, from subsonic to hypersonic speeds. Wind tunnel sensors include; acoustic, high resolution and micro ICP® pressure sensors, prepolarized surface and pressure field microphones, and piezoelectric force sensors.

### WIND TUNNEL SENSORS

<table>
<thead>
<tr>
<th>PCB® Model</th>
<th>Model #</th>
<th>Subsonic</th>
<th>Transonic</th>
<th>Supersonic</th>
<th>Hypersonic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepolarized Microphone</td>
<td>377A14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microphone System</td>
<td>378A14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Acoustic Pressure Sensor</td>
<td>103B01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Res ICP® Pressure Sensor</td>
<td>112A22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini ICP® Pressure Sensor</td>
<td>112M362</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro ICP® Pressure Sensor</td>
<td>132B38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piezoelectric Force Sensor</td>
<td>260A01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Microphone</td>
<td>130B40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### APPLICATIONS
- Airfoil Studies on Aircraft
- Rockets Buffeting Tests
- Re-entry Vehicles
- Engine Nacelle Noise Testing
- Dynamic Force Balance
PIEZOELECTRIC FORCE SENSORS FOR WIND TUNNELS

3-COMPONENT FORCE SENSORS:
Piezoelectric force sensors are well suited for measuring dynamic and quasi-static force. They feature high stiffness, fast response, and repeatable performance, permitting them to capture high frequencies and follow fast transient events such as impacts. The high stiffness allows them to survive repetitive cycles without fatigue.

3-COMPONENT ICP® QUARTZ FORCE SENSOR
MODEL 260A01

- Sensitivity: 2.5 mV/lb (0.56 mV/N) (z-axis)
- Sensitivity: 10 mV/lb (2.2 mV/N) (x, y-axis)
- Compression range: to 1000 lb (4500 N) (z-axis)
- Compression range: to 500 lb (2200 N) (x, y-axis)
- Side-orientated 4-pin connector
- Low frequency response: 0.01 Hz
- Resonant frequency: 90 kHz
MICROPHONES FOR WIND TUNNELS

POLARIZATION VOLTAGE

Model 377A14 is a prepolarized design. When combined with a preamplifier it is designed to operate on ICP® sensor power, or any 2-20 mA constant current supply. This modern design is preferred for portable measurements or operation in high humidity applications. Design advantages include the use of ordinary coaxial cables and interchangeability with other ICP® sensors (accelerometers, pressure sensors, force sensors, etc.) resulting in set-up time savings and low channel cost.

PREPOLARIZED PRESSURE FIELD MICROPHONES

MODEL 377A14

- 1/4” Pressure microphone
- Open circuit sensitivity: 1.0 mV/Pa
- Dynamic range: >174 dB
- Noise: <35 dB
- Frequency range: 4 to 70,000 Hz
- IEC 60651 Type 1 compliant
- IEC 61672 Class 1 compliant for premium sound level meter use
- Calibration reference microphone, traceable through PTB, compliant with ISO 9001 & 17025, A2LA accredited

SIDE VENTED PRESSURE RESPONSE FIELD MICROPHONES

Model 377A14 is a side vented pressure field design which allows for equalization of atmospheric pressure when used in a flush mounted cavity, tube, wall or panel where the static operating pressure inside varies greatly compared to the outside of the structure. The 377A14 is used for high level or high frequency measurements and is mounted flush to the wind tunnel wall. For optimum results use with the PCB® model 426A05 vent-less preamplifier, or order as a Model 378A14, microphone and preamplifier mated pair.
LOW PROFILE SURFACE MICROPHONES

Model 130B40 is a cost effective microphone for measuring true surface pressure. Through CFD modeling software, the microphone and pad design were able to be optimized for wind induced noise applications. The flexible design allows for flush mounting or adhesive mounting on flat planar or curved surfaces. A low 1/8” (3 mm) profile height allows for noise measurements to be taken where traditional microphones would not fit. The water and dust resistant mesh grid cap makes it an excellent choice for tire well and other rough environments. The unit comes with a built-in preamplifier and attached 5 foot cable terminating in a 10-32 microdot coaxial connector. The vent for the microphone is at the surface for easy atmospheric pressure equalization. TEDS IEEE P1451.4 is supplied standard.

LOW PROFILE SURFACE MICROPHONE PAD

- Prepolarized (ICP®) microphone and preamplifier combination
- Open circuit sensitivity: 1.0 mV/Pa
- Dynamic range: 35 dBA to 142 dB (150 dB before clipping)
- 1/8” Height, fits where most microphones are not capable
- Water and dust resistant mesh grid
PRESSURE SENSORS FOR AERODYNAMIC TESTING AND ANALYSIS

FLIGHT TESTED ICP® ACOUSTIC PRESSURE MICROPHONES

Series 103B ICP® Acoustic Pressure Sensors measure pulsating, transient, and turbulent acoustic phenomena on air vehicles and other structures. For use in measurement of dynamic and acoustic pressure in aircraft and rocket applications. ICP® microelectronics are used for low impedance, high voltage output and ability to withstand shock during stage separations.

ACOUSTIC ICP® PRESSURE SENSOR
MODEL 103B01

- Measurement range: 3.00 psi (180.3 dB)
- Sensitivity: (±15%) 1500 mV/psi (217.5 mV/kPa)
- Resolution: 0.00002 psi (77 dB)
- Low frequency response: (-5%) 5 Hz
- Resonant frequency: ≥13 kHz
MINIATURE HIGH SENSITIVITY ICP® PROBES

Used to measure small dynamic pressures such as turbulence, noise, sound, cavitation and pulsations, especially in adverse environments. Capable of measuring high intensity sound pressures from 0.001 psi to 50 psi (111 to 205 dB in air) at any static level from full vacuum to 500 psi. Internal acceleration compensation minimizes vibration sensitivity and an internal discharging resistor automatically eliminates static (DC) signal components.

MICRO ICP® PRESSURE SENSOR

ICP® pressure micro sensor for measurement of hypersonic boundary-layer transition that measures shock and standing waves. With a resonant frequency greater than 1 mHz and acoustic pressure resolution of 7 Pascal, it is sensitive enough to detect the bow and stern of shock waves. The small size of 0.125 inch (3 mm) diameter and 0.3 inch (7 mm) length is easy to mount in small models typical of a hypersonic wind tunnel.

HIGH RESOLUTION ICP® PRESSURE SENSOR

MODELS 112A22 & 112M362

- Measurement range: 50 psi (345 kPa)
- Sensitivity: (±15%) 100 mV/psi (14.5 mV/kPa)
- Resolution: 0.001 psi (0.007 kPa)
- Low frequency response: (-5%) 0.50 Hz
- Resonant frequency: ≥250 kHz

MICRO ICP® PRESSURE SENSOR

MODEL 132B38

- Measurement range: 50 psi (345 kPa)
- Sensitivity: (±30%) 140 mV/psi (20.3 mV/kPa)
- Resolution: 0.001 psi (0.007 kPa)
- Low frequency response: (-5%) 0.50 Hz
- Resonant frequency: ≥1000 kHz
MTS Sensors, a division of MTS Systems Corporation (NASDAQ: MTSC), vastly expanded its range of products and solutions after MTS acquired PCB Piezotronics, Inc. in July, 2016. PCB Piezotronics, Inc. is a wholly owned subsidiary of MTS Systems Corp.; IMI Sensors and Larson Davis are divisions of PCB Piezotronics, Inc.; Accumetrics, Inc. and The Modal Shop, Inc. are subsidiaries of PCB Piezotronics, Inc.