AERODYNAMIC AND AERO-ACOUSTICS SENSORS

PCB PIEZOTRONICS
AN AMPHENOL COMPANY

ENDEVCO
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AERODYNAMIC AND AERO-ACOUSTICS SENSORS

PCB Piezotronics and Endevco offer a comprehensive portfolio of high performance sensors and measurement equipment.

Aerodynamics, the study of forces and the resulting motion of objects through the air, and aero-acoustics, the study of noise generation via either turbulent fluid motion or aerodynamic forces interacting with surfaces, both require specific sensors in order to obtain the measurements needed.

When it comes to measurements in aerodynamics and aero-acoustics, the use of quality sensors with proven precision is paramount, and we offer a complete portfolio of sensors to meet your exact needs.

SENSORS TO MEASURE AERO-ACOUSTICS:

- Piezoelectric Microphones
- Piezoelectric Acoustic Pressure Sensors
- ICP® Acoustic Pressure Sensors
- Prepolarized Microphones
- Mini ICP® Accelerometers

SENSORS TO MEASURE AERODYNAMICS:

- Dynamic ICP® Pressure Sensors
- Piezoresistive Pressure Sensors
- Piezoelectric ICP® Force Sensors

DYNAMIC ICP® PRESSURE SENSORS

For measurement of short wavelength pressure pulses, micro ICP® pressure sensors feature micro-second response time that accurately measure pressure peaks from fast rising shock waves and very high frequency pressure phenomena. Miniature high sensitivity ICP® probes are used to measure small dynamic pressures such as turbulence, noise, sound, and pulsations, especially in adverse environments. They measure dynamic pressure, but with very high resolution.

SPECIFICATIONS			
Model Number	**PCB 112A22**	**PCB 112M362**	**PCB 132B38**
Description	High resolution ICP® pressure probe with clamp nut	Low profile, high resolution ICP® pressure probe, integral cable	Micro ICP® pressure sensor, integral cable, for high frequency or TOA measurements
Measurement Range	50 psi 345 kPa	50 psi 345 kPa	50 psi 345 kPa
Sensitivity	100 mV/psi 14.5 mV/kPa	100 mV/psi 14.5 mV/kPa	140 mV/psi 20.3 mV/kPa
Resonant Frequency	≥250 kHz	≥250 kHz	≥1,000 kHz
Ideal Use	Small dynamic pressures such as turbulence, noise, sound, cavitation and pulsations, especially in adverse environments	Small dynamic pressures such as turbulence, noise, sound, cavitation and pulsations, especially in constrained spaces	Measurement of short wavelength pressure pulses for wind tunnel boundary layer transition, time of arrival, and targeting

PIEZORESISTIVE PRESSURE SENSORS

With designs suitable for airflow measurements or high intensity sound, these pressure sensors feature quick response times and high output for excellent signal-to-noise ratio. They measure both static and dynamic pressure.

SPECIFICATIONS			
Model Number	**Endevco 8507C**	**Endevco 8510B**	**Endevco 8515C**
Description	Ultra-miniature, high sensitivity, internal temperature compensation	Miniature, high sensitivity, internal temperature compensation	Low profile, high sensitivity, internal temperature compensation
Measurement range	1, 2, 5 and 15 psig 6.9, 13.8, 34.5 and 103 kPa	1, 2 and 5 psig 6.9, 13.8 and 34.5 kPa	15 and 50 psia 103 and 345 kPa
Sensitivity	200/100/60/20 mV/psi 29, 14, 9 and 3 mV/kPa	200/100/60 mV/psi 29, 14, and 9 mV/kPa	13.3 and 4 mV/psi 2 and 0.6 mV/kPa
Resonance frequency	55/70/85/130 kHz	55/70/85 kHz	180/320 kHz
Ideal Use	Small scale models in wind tunnels and leading edge of aircraft wing	Aerodynamics and rocket acoustics	Small scale models in wind tunnels, aerodynamic surfaces during flight tests, and helicopter or turbine blade surface pressure measurements

PIEZOELECTRIC ICP® FORCE SENSORS

These force sensors are recommended for dynamic force measurement applications. They feature high stiffness, fast response and repeatable performance, permitting them to capture high frequencies and follow fast transient events such as reaction forces due to turbulence or shock waves.

SPECIFICATIONS			
Model Number	**PCB 260B01**	**PCB 260B02**	**PCB 260B03**
Description	Triaxial ICP® Force Sensor		
Measurement range (Z axis)	1000 lb	1000 lb	1000 lb
Measurement range (X or Y axis)	500 lb	1000 lb	4000 lb
Sensitivity (± 20%) (Z axis)	2.5 mV/lb	2.5 mV/lb	0.25 mV/lb
Sensitivity (± 20%) (X or Y axis)	10 mV/lb	5 mV/lb	1.25 mV/lb
Ideal Use	Dynamic force balance		

SENSORS TO MEASURE AERO-ACOUSTICS

Measuring high intensity acoustic noise and very low pressure fluctuations in harsh environments, both piezoelectric microphones and ICP® acoustic pressure sensors are designed for a wide range of environmental conditions, including insensitivity to altitude changes. These sensors use either quartz or manmade ceramic elements and vibration compensation is incorporated into the sensing element.

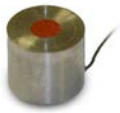
Piezoelectric microphones are self-generating devices that require no external power source for operation and have charge output. With ICP® acoustic pressure sensors, ICP® constant current provides power.

Both are useful for measuring transient pressure events, air turbulence, and other such acoustic phenomena on aircraft structures, rockets, or aerodynamic models.

PIEZOELECTRIC MICROPHONES

SPECIFICATIONS			
Model Number	**Endevco 2510**	**Endevco 2510M4A**	**PCB 116B**
Description	Bracket mount, rugged, hermetically sealed, ceramic, wide temperature range -67 °F to +500 °F (-55 °C to +260 °C)	Flush mount, rugged, hermetically sealed, ceramic, wide temperature range -67 °F to +500 °F (-55 °C to +260 °C)	Quartz, high temperature pressure sensor, wide temperature range -400 to +650 °F (-240 to +345 °C)
Measurement range	100 to >180 (dB SPL)	100 to >180 (dB SPL)	100 psi
Sensitivity	31 pC rms @ 140 dB SPL	31 pC rms @ 140 dB SPL	6 pC/psi
Resonance frequency	30 kHz	30 kHz	≥55 kHz
Ideal Use	High intensity acoustic noise and very low pressure fluctuations		

ICP® ACOUSTIC PRESSURE SENSORS



SPECIFICATIONS						
Model Number	**PCB 103B01**	**PCB 106B**	**PCB 106B5X**			**PCB 103M49A**
Description	Integral 2-wire cable	High sensitivity, excellent resolution, capable of measuring sound pressures from 111 - 210 dB				3 ft integral cable, high intensity
Measurement range	3 psi 20.7 kPa 180.3 dB	8 psi 57.2 kPa 189.1 dB	1 psi 6.89 kPa 184.7 dB	5 psi 6.89 kPa 184.7 dB	5 psi 34.45 kPa 170.7 dB	20 psi 137.9 kPa 196.8 dB
Sensitivity (±15%)	1500 mV/psi	300 mV/psi	5000 mV/psi	1000 mV/psi	500 mV/psi	250 mV/psi
Resonance frequency	≥13 kHz	≥60 kHz	≥40 kHz			≥13 kHz
Ideal Use	Dynamic and acoustic pressure in aircraft and rocket applications					

PREPOLARIZED MICROPHONES

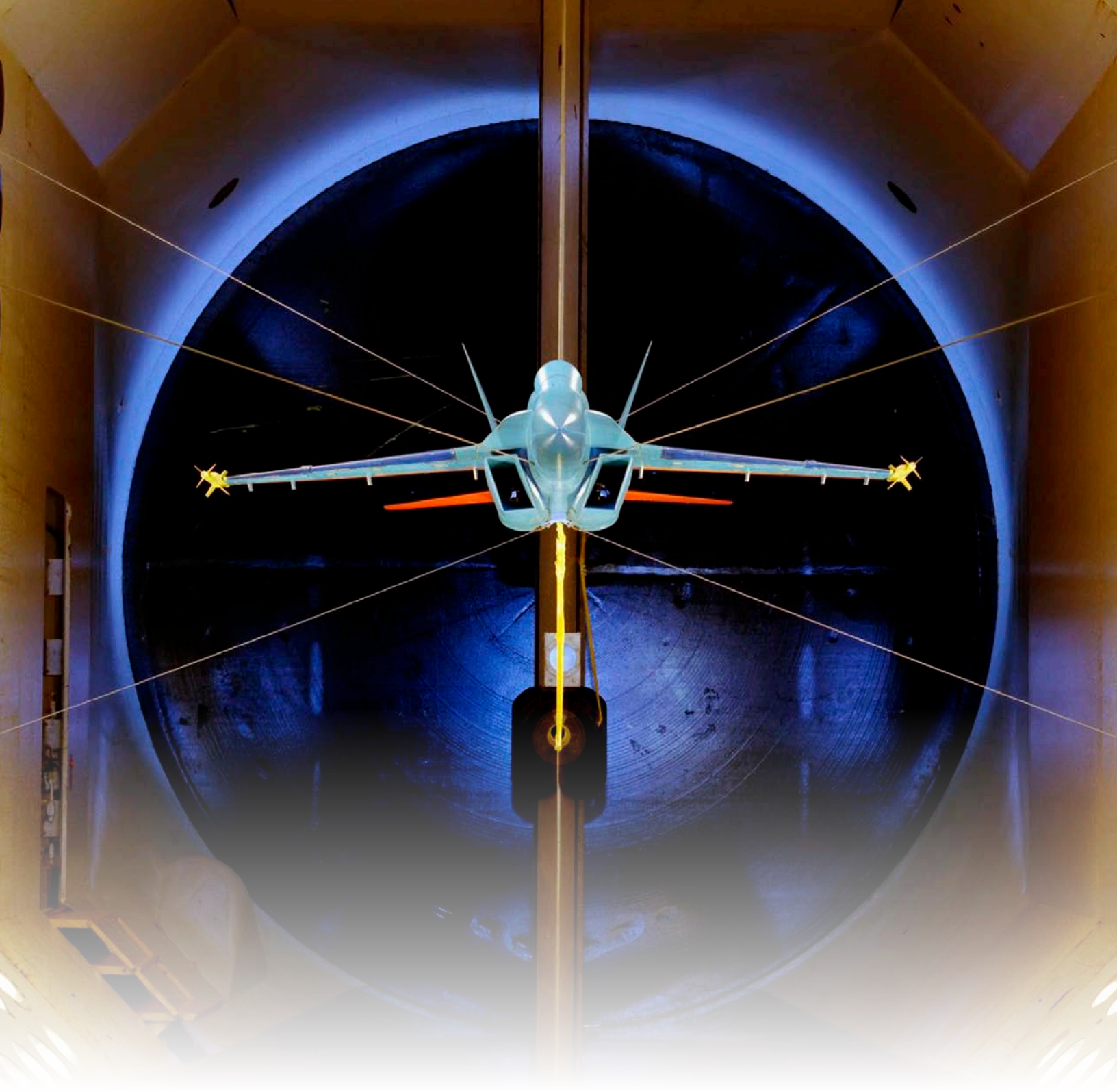
Modern prepolarized microphones are designed with newer technology than traditional externally polarized microphones. They are better suited for portable applications or those in high humidity environments, and are interchangeable with other test equipment such as accelerometers or piezoelectric pressure sensors. These microphones use ICP® power circuitry invented for sensors by PCB®. PCB microphones are used for aircraft cabin noise testing, noise source identification, aircraft flyover certification, acoustics stress testing of spacecraft, direct field acoustic noise (dfan) testing, and direct field acoustic testing.

SPECIFICATIONS			
Model Number	**PCB 378A14**	**PCB 378C13**	**PCB 130B40**
Description	Front vented, 1/4" pressure response, prepolarized microphone and preamplifier with TEDS	TEDS 377C13 pressure microphone and 426E01 preamplifier	Low-profile, prepolarized surface pressure microphone and preamplifier
Measurement range	173 dB	150 dB	150 dB
Sensitivity (±3dB)	1 mV/Pa	12.6 mV/Pa	8.5 mV/Pa
Frequency Range	4.0 Hz to 70 kHz	3.15 Hz to 20 kHz	20 Hz to 10 kHz
Ideal Use	Wind tunnels and landing gear bays	Acoustic testing and certification in aircraft and automobile cabins	External surface noise on aircraft and automobile cabins

MINI ICP® ACCELEROMETERS

Miniature piezoelectric accelerometers are required for applications demanding high frequency range, small size, and low weight. Available in both single-axis and triaxial configurations, mini ICP® accelerometers are used extensively for measuring a flight vehicle or aerodynamic model vibration response during flight testing or wind tunnel testing.

SPECIFICATIONS							
Model Number	**PCB 352A21**	**PCB 352A24**	**PCB 352A26**	**PCB 352C22**	**PCB 356A03** (Integral Cable)	**PCB 356A09** (8-36 4-pin Jack)	**PCB 356A19** (With TEDS)
Description	Single axis, miniature, lightweight ceramic shear ICP® accelerometer				Triaxial, miniature, lightweight ceramic shear ICP® accelerometer		
Measurement Range	±500 g pk	±50 g pk	±500 g pk	±500 g pk	±500 g pk	±500 g pk	±500 g pk
Sensitivity	10 mV/g	100 mV/g	10 mV/g	10 mV/g	10 mV/g	10 mV/g	10 mV/g
Resonance frequency	≥50 kHz	≥30 kHz	≥70 kHz	≥50 kHz	≥50 kHz	≥50 kHz	≥55 kHz
Mass	0.6 gm	0.8 gm	0.2 gm	0.5 gm	1.0 gm	1.0 gm	4.0 gm
Ideal Use	Wind tunnel models that are space constrained				Wind tunnel models that require vibration in X, Y and Z axis		



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