AEROSPACE GROUND TEST

PCB PIEZOTRONICS
AN AMPHENOL COMPANY

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INTRODUCTION

Ground testing of a new aircraft design or an aircraft that has undergone significant structural modification, is a prerequisite before any flight-test program can begin. In turn, ground testing follows and complements an extensive structural modeling program, which encompasses flight loads, material fatigue, structural dynamics, airborne and structure borne acoustics and more.

A design life or "life expectancy" goal, in flight cycles (takeoffs and landings) or flight hours, is established early in the development of a new aircraft. Due to their extreme operating environments, military fighter aircraft may have design life expectancies only in the high thousands of flight hours. For civilian transport aircraft, the design life goal is typically in the high tens of thousands of flight cycles. Before first flight, a significant number of these cycles are accumulated during ground testing performed on a full-scale aircraft structure. Knowledge of the anticipated flight load spectrum enables pressure cycling of the fuselage, as well as hydraulic loading of the wings, empennage and other principal structures. Large data acquisition systems enable monitoring of the applied pressures and loads and resultant structural deflections and strains. Periodic inspections with nondestructive testing equipment often accompany this process to monitor for any resultant crack growth.

As part of the ground test program, ground vibration testing (GVT) is also performed. The purpose of GVT is to obtain experimental vibration data for the entire aircraft structure for validating and improving its structural dynamics model. Assessment of the aircraft structure's linear or nonlinear behavior is also performed. During GVT testing, the aircraft must be in a configuration as close as possible to flight test. Successful correlation of structural frequencies and mode shapes between GVT and structural modeling enables assignment of accelerometer mounting locations to support the subsequent flight test program. In addition, GVT results provide inputs to predict flutter behavior to ensure the safety of these flight tests.

New engine development to support aircraft design requires its own test program beginning in test cells and culminating with "on-wing" testing in a test bed aircraft. Once the qualified engine(s) become integrated as part of the new aircraft, their noise influence on their surrounding environment and the passenger cabin must be assessed. Therefore, airborne and structure-borne acoustic transmission paths are also characterized as part of the aircraft ground test program.

The preceding has focused on aircraft. Ground testing of rotary wing aircraft and space launch vehicles follows the same pattern. Testing and structural modeling must correlate on the ground to assure structural integrity and safety in subsequent flight tests.

PCB® FOR GROUND TEST

This catalog documents many of the sensors and signal conditioners offered by PCB Piezotronics to the Aerospace Ground Test community. It is complemented by PCB®'s other Aerospace and Defense Sensors for applications such as flight testing, environmental testing, and Health and Usage Monitoring (HUMS), which are covered in the documents listed below.

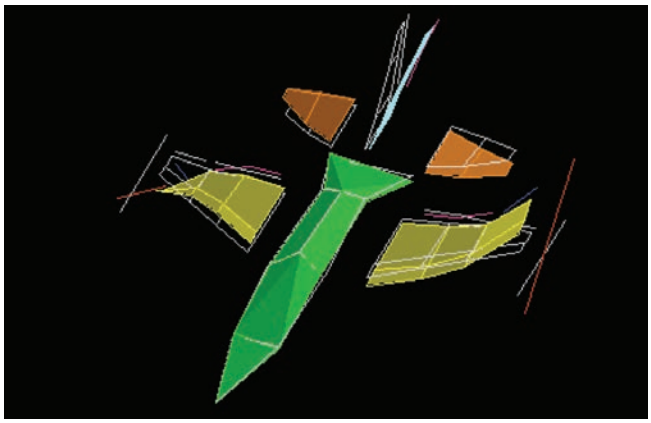
Because of the complexity of Aerospace Ground Test applications and the breadth of PCB®'s product line, this catalog offers the most commonly used subset of PCB®'s Ground Test sensors and signal conditioners. For a complete exploration of other options, we invite inquiries to PCB®'s Application Engineering team (see contact information on the back of this catalog).

PCB®'s service to ground testing applications encompasses sensors and signal conditioning that:

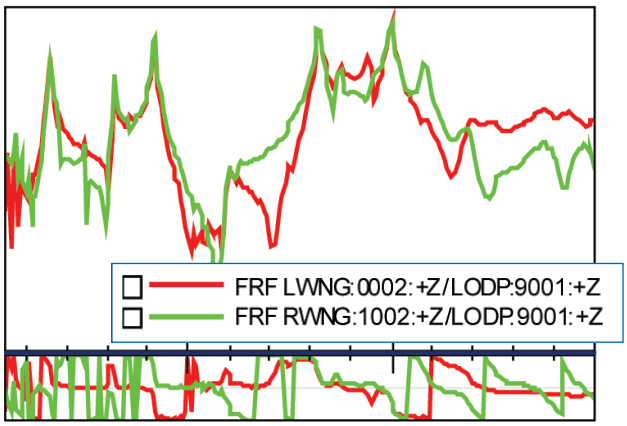
- Provide reliable, cost-effective service
- Are specifically tailored to the type of testing involved
- Interface effectively with the data acquisition systems being used by our customer base

For convenience, we categorize our products into four Ground Test application areas:

- GVT
- Static and Fatigue Testing
- Reliability and Functional Testing
- Acoustic Testing and Certification



Deformation mode shape of an F16 wing



F16 wing Frequency Response Function (FRF)

GROUND VIBRATION TESTING

PCB®'s focus on tailoring sensors and signal conditioning to specific applications is illustrated by our line of structural test accelerometers and signal conditioners. These products are designed for convenience, accuracy and reliability, whether the test involves extracting the natural frequencies, vibratory modes shapes and damping of a complete vehicle or an operating subsystem or requires only "quick and dirty" component vibration troubleshooting.

Since this kind of testing typically involves large channel counts, PCB®'s GVT specific products include:

A line of cost effective phase-matched structural accelerometers that feature accessories for simplified mounting. These accelerometers are available in a range of form factors for both single axis and triaxial measurements. High sensitivity piezoelectric force transducers are also available for vibration force control of compliant structures such as satellites.

Autonomous sensor property identification, using industry standard Transducer Electronic Data Sheet (TEDS). This capability can be further tailored to interface with specialized formats developed by major data acquisition providers. PCB® also offers a bar code reader tailored to the GVT application.

Cable management and signal conditioning systems including patch panels, multichannel cable, and bank switch systems. These save substantial installation and data management time and money, while allowing large channel GVT's to be accomplished with a limited number of data acquisition channels.

Modal shakers and shaker stands supported by a full line of impedance head systems that measure both the input force and driving point response.

A full line of instrumented modal hammers specifically designed for modal test excitation and force measurement, as an alternative to shaker excitation.

STATIC AND FATIGUE TESTING

Although PCB® is best known for our dynamic measurement sensors and signal conditioning, we also offer a complete line of fatigue-rated strain gage-based load cells for static and fatigue testing. These are available in either single bridge configurations or dual independent bridge configurations. The latter configuration is used in situations in which measurement redundancy is required. Similarly, DC response pressure transducers are available for aircraft fuselage pressurization cycling testing.

PCB®'s line of piezoelectric force sensors complements our strain gage based load cells for those applications that require measurement of dynamic (high frequency) forces. These piezoelectric force sensors can be integrated with strain gage-based load cells in a system that measures complex static loads plus high frequency dynamic loads. Again, PCB®'s Application Engineering team is available at your convenience to discuss these measurement system challenges.

RELIABILITY AND FUNCTIONAL TESTING

A great deal of aerospace ground testing involves exposing systems to realistic loading and operating conditions "on the bench". PCB®'s line of cost-effective fatigue and non-fatigue rated load cells and torque sensors are widely integrated into bench tests that measure operating loads and torques in aerospace systems. These sensors include reaction and rotating torque sensors with their associated signal conditioners. Among PCB®'s family of torque sensors, the TORKDISC® enables high bandwidth torque measurements in space constrained environments.

As mentioned above, PCB®'s ability to supply both piezoelectric and strain gage-based load cells allows us to uniquely address complex loading situations that involve combinations of high static plus dynamic forces and torques. For instance, integrating dynamic and static force/torque sensors provides our development engineering customers the ability to measure static loads related to an actuation system's primary function simultaneous with high frequency or fleeting dynamic pressure or force transients that cannot be accurately characterized by strain gage-based sensors. PCB®'s family of load and torque sensors is complemented by our complete family of AC and DC response accelerometers, as well as our line of dynamic and static pressure sensors. In some cases, even PCB®'s complete line of precision microphones are enlisted, to sense the condition of systems under test or to measure the acoustic environment of the airborne systems.

ACOUSTIC TESTING AND CERTIFICATION

PCB®'s complete line of 1/4", 1/2" and 1" microphones are available in two versions:

- Externally Polarized
- Prepolarized

The prepolarized type of microphone offers significant savings in signal conditioning costs. While the performance of these microphones is essentially identical to their conventionally powered, externally polarized counterparts, the microphones and their preamplifiers are designed to interface with constant current (e.g. PCB®'s, ICP®) signal conditioners.

Because ICP® signal conditioners are so widely employed for other sensor types, they are an order of magnitude less expensive than conventional microphone power supplies. The cables and connectors used with prepolarized microphones are also substantially less expensive than those employed with externally polarized microphone power supplies.

PCB®'s complete line of 1/4", 1/2" and 1" microphones are available in two versions:

- PCB®'s unique line of "HT" microphones and preamplifiers for acoustic characterization in environments as hot as 120 °C/250 °F.
- PCB® Model 377A26 probe microphone, high temperature acoustic measurements.
- PCB® Series 106 acoustic pressure sensors are widely used for such applications as launch vehicle acoustic environment characterization.

PCB®'s 40+ year history of reliability and responsiveness in providing dynamic measurement sensors now extends to this complete line of acoustic testing products.

IN SUMMARY

PCB® uses a range of measurement technologies:

- Piezoelectric for accelerometers, force and pressure sensors
- Capacitive for microphones and VC MEMS accelerometers
- Resistive for load cells, pressure sensors and accelerometers

These technologies allow our sensors to measure the performance of mechanical systems across both wide dynamic/amplitude ranges and broad frequency ranges. Whatever your aerospace ground test application, PCB® is likely to be a single supplier for all of your mechanical sensing requirements.

MINIATURE ICP® ACCELEROMETERS

PCB® offers various types of miniature accelerometers to suit all applications. Miniature ICP® accelerometers are especially well-suited for applications demanding high frequency range, small size and light weight. Teardrop style accelerometers, also very small and lightweight, exhibit minimum mass loading effects and install adhesively into tight locations.

MINIATURE ICP® ACCELEROMETERS						
	CE 	CE 		CE 	CE 	CE 
Model Number	**352C23**	**352C22**	**352B01**	**TLD352A56**	**353B12**	**352C41**
Sensitivity (nominal)	5 mV/g	10 mV/g	1 mV/g	100 mV/g	5 mV/g	10 mV/g
Measurement Range	±1000 g pk	±500 g pk	±5000 g pk	±50 g pk	±1000 g pk	±500 g pk
Broadband Resolution	0.003 g rms	0.002 g rms	0.02 g rms	0.0006 g rms	0.01 g rms	0.0008 g rms
Frequency Range (±10%)	1.5 Hz to 15k Hz	0.7 Hz to 13k Hz	1 Hz to 20k Hz	0.3 Hz to 15k Hz	0.7 Hz to 20k Hz	0.5 Hz to 10k Hz
Resonant Frequency	≥70 kHz	≥50 kHz	≥65 kHz	≥45 kHz	≥70 kHz	≥30 kHz
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C
Sensing Element	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Quartz/Shear	Ceramic/Shear
Electrical Connector	3-56 Coaxial Jack	3-56 Coaxial Jack	Integral Cable	5-44 Coaxial Jack	5-44 Coaxial Jack	10-32 Coaxial Jack
Electrically Ground Isolation	Yes	Yes	No	No	No	No
Housing Material	Anodized Aluminum	Anodized Aluminum	Titanium	Stainless Steel	Titanium	Titanium
Sealing	Epoxy	Epoxy	Hermetic	Hermetic	Hermetic	Hermetic
Weight	0.2 gm	0.5 gm	0.7 gm	1.8 gm	1.5 gm	2.8 gm
Size (H x L x W)	0.11 x 0.34 x 0.16 in 2.8 x 8.6 x 4.1 mm	0.14 x 0.45 x 0.25 in 3.6 x 11.4 x 6.4 mm	0.32 x 0.24 in 8.1 x 6.1 mm [1]	0.26 x 0.57 x 0.3 in 6.6 x 14.5 x 7.6 mm	9/32 x 0.58 in 9/32 in x 14.7 mm [1]	3/8 x 0.38 in 3/8 in x 9.7 mm [1]
Mounting	Adhesive	Adhesive	Adhesive	Adhesive	5-40 stud	Adhesive
Supplied Accessories						
Cable	030A10	030A10	—	—	—	—
Wax/Adhesive	080A109	080A109	080A109/080A90	080A109	080A109	080A109/080A90
Removal Tool	039A26	039A27	—	039A31	—	—
Adhesive Mounting Base	—	—	—	—	080A15	—
Additional Accessories						
Magnetic Mounting Base	—	—	—	—	080A30	—
Triaxial Mounting Adaptor	—	—	—	—	080B16, 080A196	—
Connector Adaptor	070A02	070A02	070A02	—	—	—
Mating Cable Connectors	EK	EK	PH	AG	AG	EB
Recommended Stock Cables	030	030	—	018	003	002
Additional Versions						
Electrical Ground Isolation	—	—	—	—	—	352C43
Titanium Housing	—	352A21	—	—	—	—
Metric Mounting Thread	—	—	—	—	M353B12	—
Notes						
[1] Hex x Height						

GENERAL PURPOSE ICP® ACCELEROMETERS

General purpose accelerometers can either be quartz or ceramic shear, and are typically (IEPE) or Integrated Circuit - Piezoelectric (PCB®'s trademarked name is "ICP®") sensors. The routine temperature range of ICP® accelerometers is 250 °F (121 °C); specialty units are available that operate to 325 °F (163 °C). They are versatile and can be used in many different applications, including vibration measurements, structural testing, and vibration control.

GENERAL PURPOSE ICP® ACCELEROMETERS							
							
Model Number	**352A73**	**352A71**	**352C03**	**353B03**	**353B04**	**353B31**	**353B32**
Sensitivity (nominal)	5 mV/g	10 mV/g	10 mV/g	10 mV/g	10 mV/g	50 mV/g	50 mV/g
Measurement Range	±1000 g pk	±500 g pk	±500 g pk	±500 g pk	±500 g pk	±100 g pk	±100 g pk
Broadband Resolution	0.002 g rms	0.003 g rms	0.0005 g rms	0.003 g rms	0.003 g rms	0.001 g rms	0.001 g rms
Frequency Range (±10%)	1.5 Hz to 25k Hz	0.35 Hz to 16k Hz	0.3 Hz to 15k Hz	0.7 Hz to 11k Hz	0.7 Hz to 11k Hz	0.7 Hz to 8k Hz	0.7 Hz to 8k Hz
Resonant Frequency	≥70 kHz	≥65 kHz	≥50 kHz	≥38 kHz	≥38 kHz	≥30 kHz	≥28 kHz
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C
Sensing Element	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Quartz/Shear	Quartz/Shear	Quartz/Shear	Quartz/Shear
Electrical Connector	Solder pins with attached cable	Solder pins with attached cable	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack
Electrical Isolation	No	No	No	No	No	No	No
Housing Material	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Weight	0.3 gm	.64 gm	5.8 gm	10.5 gm	10.5 gm	20 gm	20 gm
Size (Hex x Height)	0.11 x 0.34 x 0.16 in 2.8 x 8.6 x 4.1 mm	0.14 x 0.41 x 0.25 in 2.8 x 8.6 x 4.1 mm	7/16 x 0.62 in 7/16 in x 15.7 mm	1/2 x 0.81 in 1/2 in x 20.6 mm	1/2 x 1.14 in 1/2 in x 29.0 mm	3/4 x 0.85 in 3/4 in x 21.6 mm	3/4 x 1.18 in 3/4 in x 29.9 mm
Mounting	Adhesive	Adhesive	10-32 Thread	10-32 Thread	10-32 Thread	10-32 Thread	10-32 Thread
Supplied Accessories							
Wax/Adhesive	080A109	080A109	080A109	080A109	080A109	080A109	080A109
Adhesive Mounting Base	039A26	039A32	080A	080A	080A	080A12	080A12
Mounting Stud/Screw	—	—	081B05/M081B05	081B05/M081B05	081B05/M081B05	081B05/M081B05	081B05/M081B05
Additional Accessories							
Magnetic Mounting Base	—	—	080A27	080A27	080A27	080A27	080A27
Triaxial Mounting Adaptor	—	—	080B10	080B10	080B10	080B11	080B11
Mating Cable Connectors	PH	PH	EB	EB	EB	EB	EB
Recommended Cables	—	—	002	002	002	002	002
Additional Versions							
Built-in Low Pass Filter	—	352A72	—	—	—	—	—

HANDHELD CALIBRATOR AND MOUNTING ACCESSORIES

HANDHELD SHAKER
MODEL 394C06

Handheld Shaker is a small, self-contained, battery powered, vibration exciter specifically designed to conveniently verify accelerometer and vibration system performance. It accepts sensors weighing up to 210 grams and delivers a controlled, 1 g mechanical excitation at 159.2 Hz.

EASY-MOUNT CLIP
MODELS 080A160, 080A172, 080A173
(sensor not included)

ADHESIVE MOUNTING BASES
MODELS 080A, 080A12, 080A78, 080A19,

MAGNETIC MOUNTING BASES
MODELS 080A27, 080A30, 080A130, 080A54

REMOVAL TOOLS
MODELS 080A27, 080A30, 080A130, 080A54

ADHESIVE MOUNTING BASES
MODELS 080A, 080A12, 080A78, 080A19,

TRIAXIAL MOUNTING ADAPTORS
MODELS 080B10, 080B16

QUICK BONDING GEL
MODEL 080A90

Note: A debonder should always be used to avoid sensor damage.

HIGH TEMPERATURE ACCELEROMETERS ≥325 °F (163 °C)

The preceding pages summarized information on typical Integrated Circuit Piezoelectric (ICP®) accelerometers. The electronic systems in these sensors limits their operating temperature range to 250 °F (121 °C) in most cases, with "high temperature ICP®" accelerometers operating to 325 °F (163 °C).

In higher temperature environments, PCB® separates the electronics to an in line charge amplifier that can be placed in a temperature environment that is below 121 °C (250 °F). In these cases, PCB®'s accelerometer can be operated in environments with temperatures exceeding 1000 °F (538 °C). PCB®'s customers often refer to these sensors as "charge output" accelerometers, since their output is an electrical charge proportional to acceleration.

Because of its temperature and high/complex vibration environment, the turbine engine measurement environment is perhaps the most demanding application for accelerometers. With 30 years of high temperature measurement experience, PCB® has developed a range of piezoelectric materials and technologies that provide accurate, reliable measurements in this challenging environment. With the cost (and non-repeatability) of each turbine engine test, PCB®'s customers have come to expect and rely on this accuracy and reliability.

Since PCB® manufactures the majority of its own piezoelectric materials, we offer an extensive array of charge mode accelerometer form factors, sensitivities, frequency ranges and sizes. A few of the single-ended accelerometers for use in up to 288 °C (500 °F) environments are presented below. Complementing this range of sensors is a variety of in-line and laboratory grade bench top and rack mounted charge amplifiers. A small representative selection of these amplifiers is included below.

	MINIATURE HIGH-TEMPERATURE	ICP® HIGH-TEMPERATURE		GENERAL PURPOSE HIGH-TEMPERATURE		TRIAXIAL HIGH-TEMPERATURE		
								
Model Number	**357B11**	**320C15**	**320C18**	**357B21**	**357B22**	**357A67**	**356A70**	**356A71**
Sensitivity (nominal)	3.0 pC/g	10 mV/g	10 mV/g	30 pC/g	30 pC/g	3.0 pC/g	2.7 pC/g	10 pC/g
Measurement Range	±2300 g pk	±500 g pk	±500 g pk	±1500 g pk	±1500 g pk	±1000 g pk	±500 g pk	±500 g pk
Broadband Resolution	[1]	0.005 g rms	0.005 g rms	[1]	[1]	[1]	[1]	[1]
Frequency Range (±10%)	16 kHz	1.5 Hz to 18k Hz	1.5 Hz to 18k Hz	7.5 kHz	7.5 kHz	10 kHz	7 kHz	7 kHz
Resonant Frequency	≥50 kHz	≥60 kHz	≥60 kHz	≥23 kHz	≥23 kHz	≥45 kHz	≥35 kHz	≥25 kHz
Temperature Range	-95 to +500 °F -71 to +288 °C	-100 to +325 °F -73 to +163 °C	-100 to +325 °F -73 to +163 °C	-95 to +500 °F -71 to +288 °C	-95 to +500 °F -71 to +288 °C	-76 to +392 °F -60 to +200 °C	-94 to +490 °F -70 to +254 °C	-95 to +490 °F -70 to +254 °C
Sensing Element	Ceramic/Shear	Quartz/Shear	Quartz/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear
Electrical Connector	5-44 Coaxial Jack	5-44 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	1/4-28 4-Pin	5-44 Coaxial Jack	10-32 Coaxial Jack
Housing Material	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Weight	2 gm	2 gm	1.7 gm	21 gm	21 gm	4.9 gm	7.9 gm	22.7 gm
Size (H x L x W)	5/16 x 0.33 in 5/16 in x 8.4 mm [2]	5/16 x 0.43 in [2] 5/16 in x 10.9 mm	9/32 x 0.74 in [2] 9/32 in x 18.8 mm	5/8 x 0.85 in 5/8 in x 21.6 mm [2]	5/8 x 1.16 in 5/8 in x 29.3 mm [2]	0.78 x 0.40 x 0.45 in 19.8 x 10.2 x 11.4 mm	0.4 x 0.73 x 0.9 in 10.2 x 18.5 x 22.9 mm	0.5 x 0.96 x 1.0 in 12.7 x 24.4 x 25.4 mm
Mounting	5-40 Stud	5-40 Stud	5-40 Stud	10-32 Thread	10-32 Thread	M3 x 0.50 Stud	Through Hole	Through Hole
Supplied Accessories								
Cable	—	—	—	—	—	—	—	—
Wax/Adhesive	—	080A109	080A109	080A109	080A109	—	080A90	080A90
Adhesive Mounting Base	—	080A15	080A15	—	—	—	—	080A170
Mounting Stud/Screw	—	—	—	081B05/M081B05	081B05/M081B05	081A134	081A46/039A23	081A94
Removal Tool	—	—	—	—	—		—	039A22
Additional Versions								
Metric Mounting Thread	M357B11	M320C15	M320C18	—	—	M081A134	M356A70	M356A71
Titanium Housing	—	—	—	—	—	—	—	—
Notes								
[1] Resolution is dependent upon cable length and signal conditioner [2] Hex x Height								

Series 422E
In-line Charge Amp

Model 422E11
In-line Charge Amplifier 10 mV/pC

Model 422E12
In-line Charge Amplifier for high temperature applications 1 mV/pC

Model 422E35
In-line Charge Amplifier 100 mV/pC

HIGH TEMPERATURE ACCELEROMETERS ≥500 °F (260 °C)

Many operating engine environments generate temperatures in excess of 550 °F (288 °C). Above this temperature, many of the design features and materials used in high temperature accelerometers change considerably.

For 550 °F to 1200 °F (288 °C to 650 °C) operating environments, PCB® offers a range of both single-ended (measurement output as a signal and ground) and differential (measurement output as a plus and minus signal) sensors. The former tend to be smaller and more suitable for short-term testing needs, while the latter are more appropriate for long-term monitoring applications.

Obviously, the environments in which these sensors operate are challenging. In fact, in some of the highest temperature operating environments, the operating sensor measures vibration signatures while glowing red hot!

These sensors are complemented by both lab-grade and in-line charge amplifier systems. This differential charge amplifier is suitable for interfacing to any of PCB®'s differential charge output accelerometers.

The accelerometers and charge amplifiers summarized here are only a small subset of the available sensors that are documented in PCB®'s Test and Measurement Catalog or on our web site at www.pcb.com. Of course, custom designed accelerometers are always available.

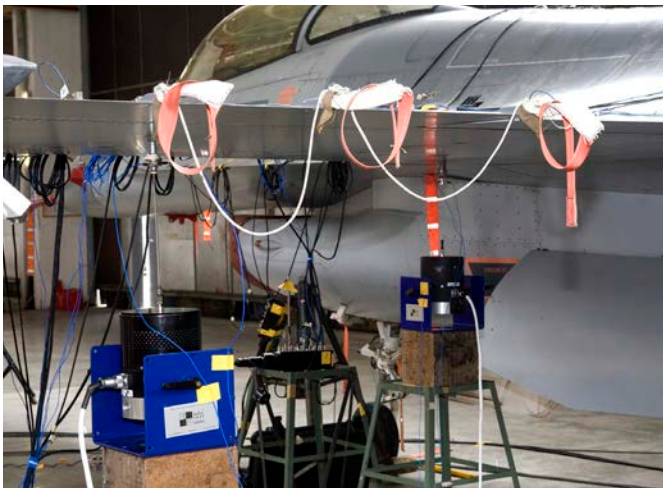
EXCLUSIVELY AT PCB®

TEARDROP ACCELEROMETER FOR AEROSPACE

MODEL 357A07

- Miniature teardrop
- Charge accelerometer 1.7 pC/g
- Low outgas
- Hermetically sealed
- High-Temperature

	CHARGE OUTPUT 500 °F / 260 °C	CHARGE OUTPUT 900 °F / 482 °C		DIFFERENTIAL OUTPUT 900 °F / 482 °C		SINGLE-ENDED 1200 °F / 650 °C
						
Model Number	**357B06**	**357B69**	**357B61**	**357C71**	**357C72**	**357D90**
Sensitivity (nominal)	5 pC/g	3 pC/g	10 pC/g	10 pC/g	50 pC/g	5 pC/g
Measurement Range	±1000 g pk	±500 g pk	±1000 g pk	±1000 g pk	±500 g pk	±1000 g pk
Broadband Resolution	[1]	[1]	[1]	[1]	[1]	[1]
Frequency Range (±5%)	10 kHz	6 kHz	5 kHz	4 kHz	2.5 kHz	3 kHz
Resonant Frequency	≥50 kHz	≥35 kHz	≥24 kHz	≥25 kHz	≥13 kHz	≥15 kHz
Temperature Range	-65 to +500 °F -54 to +260 °C	-65 to +900 °F -54 to +482 °C	-65 to +900 °F -54 to +482 °C	-65 to +900 °F -54 to +482 °C	-65 to +900 °F -54 to +482 °C	-65 to +1200 °F -54 to +649 °C
Sensing Element	Ceramic/Shear	Ceramic/Compression	Ceramic/Compression	Ceramic/Compression	Ceramic/Compression	Shear
Electrical Connector	5-44 Jack	10-32 Jack	10-32 Jack	7/16-27 2-Pin	7/16-27 2-Pin	10-32 Coaxial Jack
Electrical Case Isolation	No	No	No	Yes	Yes	Yes
Housing Material	Titanium	Inconel	Inconel	Inconel	Inconel	Inconel
Sealing	Welded Hermetic	Hermetic	Hermetic	Welded Hermetic	Welded Hermetic	Welded Hermetic
Weight	2.3 gm	17.8 gm	30 gm	75 gm	110 gm	75 gm
Size (Height x Dia.)	0.23 x 0.63 x 0.38 in. 5.8 x 16.4 x 9.6 mm [2]	0.875 x 0.45 in 22.2 x 11.4 mm	0.625 x 1.0 in 5/8 in x 25.4 mm	1.0 x 0.75 in 25.4 x 19 mm	1.25 x 0.75 in 31.8 x 19 mm	0.66 x 1.26 x 0.66 in 16.7 x 32 x 16.7 mm [2]
Mounting	Through Hole	10-32 Thread	10-32 Thread	Through Hole	Through hole	Through Hole
Supplied Accessories						
Cable	—	—	023A10	—	—	MI Hardline Cable with SS Braid
Mounting Stud/Screw	—	081A107/ M081A107	081A107/ M081A107	081A99 (3)	081A99 (3)	081A108
Tool	089A20	—	—	—	—	—
Cap Screw	081B36	—	—	—	—	—
Additional Accessories						
Mating Cable Connectors	AG	FZ	FZ	GN	GN	EB
Recommended Cables	003	023	023	013	013	003
Metric Mounting Thread	M357B06	—	—	—	—	—
Notes						
[1] Resolution is dependent upon cable length and signal conditioner [2] Height x Length x Width						



TRIAXIAL ACCELEROMETERS

PCB® provides a large range of sizes in triaxial accelerometers. Miniature triaxial accelerometers are especially well-suited for applications demanding high frequency range, small size and light weight. Triaxial accelerometers, used for structural analysis, are constructed of aluminum or titanium for the lowest mass, and exhibit excellent phase response and measurement resolution. High temperature, charge output, triaxial accelerometers (found on page 6) deliver high impedance measurement signals directly from their piezoelectric sensing elements. No internal circuitry is used, which permits operation to extreme temperatures.

TRIAXIAL ACCELEROMETERS							
							
Model Number	**356A01/03**	**356A06**	**356A19**	**356A43**	**356A44**	**356A45**	**356B18**
Sensitivity (nominal)	5/10 mV/g	5 mV/g	10 mV/g	10 mV/g	50 mV/g	100 mV/g	1000 mV/g
Measurement Range	±1000/500 g pk	±1000 g pk	±500 g pk	±500 g pk	±100 g pk	±50 g pk	±5 g pk
Broadband Resolution	0.003 g rms	0.003 g rms	0.0003 g rms	0.0008 g rms	0.0006 g rms	0.0005 g rms	0.00005 g rms
Frequency Range (±5%)	1 Hz to 8k Hz	2 Hz to 8k Hz	1.0 Hz to 13k Hz [1]	0.7 Hz to 7k Hz	0.7 Hz to 5k Hz	0.7 Hz to 5k Hz	0.3 Hz to 5k Hz [1]
Resonant Frequency	≥50 kHz	≥50 kHz	≥55 kHz	≥30 kHz	≥30 kHz	≥30 kHz	≥20 kHz
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +200 °F -54 to +93 °C	-65 to +185 °F -54 to +85 °C	-20 to +170 °F -29 to +77 °C
Sensing Element	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear
Electrical Connector	Integral Cable	8-36 4-Pin Jack	1/4-28 4-Pin Jack	1/4 - 28 4-pin Jack	1/4 - 28 4-pin Jack	1/4 - 28 4-pin Jack	1/4-28 4-Pin Jack
Electrical Ground Isolation	No	No	No	J option only	J option only	J option only	No
Housing Material	Titanium	Titanium	Titanium	Titanium	Titanium	Titanium	Anodized Aluminum
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Epoxy
Weight	1.0 gm	1.0 gm	4.0 gm	4.2 gm	4.2 gm	4.2 gm	25 gm
Size (H x L x W)	0.25 in Cube 6.35 mm Cube	0.25 in Cube 6.35 mm Cube	0.4 in Cube 10.2 mm Cube	0.4 x 0.4 x 0.75 in 10.2 x 10.2 x 19.1 mm	0.4 x 0.4 x 0.75 in 10.2 x 10.2 x 19.1 mm	0.4 x 0.4 x 0.75 in 10.2 x 10.2 x 19.1 mm	0.8 in Cube 20.3 mm Cube
Mounting	Adhesive	Adhesive	5-40 Thread	Adhesive	Adhesive	Adhesive	10-32 Thread
Supplied Accessories							
Cable	034G05	034K10	—	—	—	—	—
Wax/Adhesive	080A109/080A90	080A109/080A90	080A109	080A109/080A90	080A109/080A90	080A109/080A90	080A109
Adhesive Mounting Base	—	—	—	—	—	—	080A68
Mounting Stud/Screw	—	—	081B60	—	—	—	081B05/M081B05
Removal Tool	—	—	039A23	—	—	—	—
Additional Accessories							
Magnetic Mounting Base	—	—	080M162	—	—	—	080A27
Removal Tool	—	039A33	—	—	—	—	—
Mating Cable Connectors	AY	EH	AY	AY	AY	AY	AY
Recommended Cables	034	034	010	010	010	010	010
Additional Versions							
Integral Cable	Standard	356A01	—	356A19	—	—	—
Alternate Mounting Thread	—	—	M354C03	—	—	—	—
TEDS	TLD356A01/03						
Notes							
[1] Range shown is ±10% [2] Hex x Height							

STRUCTURAL TEST ICP® ACCELEROMETERS

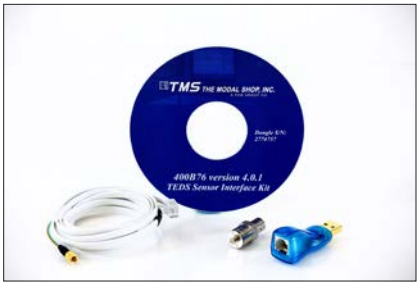
Series 333 is designed for structural testing and multipoint modal analysis. Shear mode sensing elements are utilized to provide stable, low frequency measurements. The mounting schemes utilize adhesive mounting pads for simplified, temporary installations and patch panels to eliminate tangled cables. Installation, set-up and channel identification is accomplished expediently.

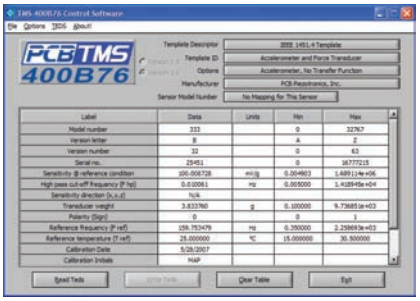
STRUCTURAL TEST ICP® ACCELEROMETERS					
					
Model Number	**333B**	**333B32**	**333B31**	**333B42**	**333B52**
Sensitivity (nominal)	100 mV/g	100 mV/g	100 mV/g	500 mV/g	1000 mV/g
Measurement Range	±50 g pk	±50 g pk	±50 g pk	±10 g pk	±5 g pk
Broadband Resolution	0.00007 g rms	0.00015 g rms	0.00015 g rms	0.00005 g rms	0.00005 g rms
Frequency Range (±5%)	2 Hz to 1k Hz	0.5 Hz to 3k Hz	0.5 Hz to 3k Hz	0.5 Hz to 3k Hz	0.5 Hz to 3k Hz
Resonant Frequency	≥5 kHz	≥40 kHz	≥40 kHz	≥20 kHz	≥20 kHz
Temperature Range	0 to +150 °F -18 to +66 °C	0 to +150 °F -18 to +66 °C	0 to +150 °F -18 to +66 °C	0 to +150 °F -18 to +66 °C	0 to +150 °F -18 to +66 °C
Sensing Element	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear	Ceramic/Shear
Electrical Connector	3-Pin Socket	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack
Housing Material	Polymer	Titanium	Titanium	Titanium	Titanium
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Weight	5.6 gm	4.0 gm	4.0 gm	7.5 gm	7.5 gm
Size	0.48 x 0.84 in 12.2 x 21.3 mm [1]	0.4 in cube 10.2 mm cube	0.44 x 0.57 in 11.2. x 14.5 mm [1]	0.45 in Cube 11.4 mm Cube	0.45 in Cube 11.4 mm Cube
Mounting	Adhesive (via base)	Adhesive	Adhesive	Adhesive	Adhesive
Supplied Accessories					
Wax/Adhesive	—	080A109/080A90	080A109/080A90	080A109/080A90	080A109/080A90
Additional Accessories					
Adhesive Mounting Base	080B37/080B38/ 080B40	—	—	—	—
Triaxial Mounting Adaptor	080B55, 080A141	—	—	—	—
Removal Tool	—	039A08	—	039A09	039A09
Mating Cable Connectors	Contact Factory	EB	EB	EB	EB
Recommended Cables	009M202, PD, PE	002	002	002	002
Notes					
[1] Diameter x Height					

TRANSDUCER ELECTRONIC DATA SHEET (TEDS)

A sensor incorporating a Transducer Electronic Data Sheet (TEDS) is a mixed-mode (analog/digital) sensor with a built-in read/write memory that contains information about the sensor and its use. A TEDS sensor has an internal memory that includes information about the manufacturer, specifications, and calibration, defined by IEEE standard 1451.4, effectively giving it the ability of “plug-and-play” self-identification within a measurement system. Using the same two-wire design of traditional piezoelectric with internal charge amplifier transducers, the TEDS sensor can flip between analog and digital modes, functioning with either a typical analog output, or with a digital bit stream output. Although a TEDS sensor can be connected to any ICP® sensor signal conditioner, only a TEDS capable ICP® signal conditioner and data acquisition equipment support the digital communication mode.

Most PCB® accelerometers are available to order with TEDS functionality by specifying the unit’s model number with a ”T” prefix. Model 400B76 TEDS sensor interface kit provides users with full access to support both reading and writing information to the TEDS sensor. Its Windows® GUI supports both IEEE and LMS templates, communicating with a TEDS sensor over a USB port. Model 400B76-T includes an adaptor that allows reading and writing to triaxial accelerometers with one mouse click.





SERIES 086 IMPACT HAMMERS

PCB's Modally Tuned® impact hammers are easy-to-use solutions for delivering impulse forces into test specimens and providing electrical measurement signals of the amplitude and frequency content of the applied force. Response accelerometers then measure the resultant motion of the test specimen for such requirements as resonance detection, modal analysis, transfer characteristics, and structural health determination.

Model 086E80

Models 086C02 & 086C03

Model 086D05

IMPACT HAMMERS				
Model Number	**086E80**	**086C02**	**086C03**	**086D05**
Sensitivity (±15%)	100 mV/lbf 22.5 mV/N	50 mV/lbf 11.2 mV/N	10 mV/lbf 2.25 mV/N	1 mV/lbf 0.23 mV/N
Measurement Range	±50 lbf pk ±220 N pk	±100 lbf pk ±440 N pk	±500 lbf pk ±2200 N pk	±5000 lbf pk ±22,000 N pk
Resonant Frequency	≥100 kHz	≥22 kHz	≥22 kHz	≥22 kHz
Sensing Element	Quartz	Quartz	Quartz	Quartz
Sealing	Epoxy	Epoxy	Epoxy	Epoxy
Hammer Mass	4.8 g	0.16 kg	0.16 kg	0.32 kg
Head Diameter	0.25 in (6.3 mm)	0.62 in (1.57 cm)	0.62 in (1.57 cm)	1.0 in (2.5 cm)
Tip Diameter	0.10 in (2.5 mm)	0.25 in (0.63 cm)	0.25 in (0.63 cm)	0.25 in (0.63 cm)
Hammer Length	4.2 in (107 mm)	8.5 in (21.6 cm)	8.5 in (21.6 cm)	9.0 in (22.7 cm)
Electrical Connection Position	Bottom of Handle	Bottom of Handle	Bottom of Handle	Bottom of Handle
Extender Mass Weight	1.25 gm	75 gm	75 gm	200 gm
Electrical Connector	5-44 Coaxial Jack	BNC Jack	BNC Jack	BNC Jack
Supplied Accessories				
Mounting Stud	—	081B05 (2)	081B05 (2)	081B05 (2)
Extender Mass	084A13	084A08	084A08	084A09
Hard Tip	—	084B03	084B03	084B03
Medium Tip	—	084B04	084B04	084B04
Soft Tip	—	084C05 (2)	084C05 (2)	084C05 (2)
Super Soft Tip	—	084C11 (2)	084C11 (2)	084A52/084A51
Tip Cover	084A28	085A10 (2)	085A10 (2)	085A10 (2)
NIST Calibration	HCS-2	HCS-2	HCS-2	HCS-2
Cable	018G10	—	—	—
Wax	080A109	—	—	—
Plastic Handle	084A14	—	—	—
Aluminum Handle	084A17	—	—	—

MODEL 485B36 USB POWERED SIGNAL CONDITIONER

USB-powered, 2-channel ICP® Signal Conditioner, serves to regulate available current from any conventional DC power supply or battery source to a constant value between 2 and 20 mA as required by ICP® sensors

PCB® recommends the use of Model 288D01 impedance sensor for modal testing applications. This sensor simultaneously measures an applied, driving point force and response acceleration in a single location. This is extremely important for multiple input test techniques to satisfy Maxwell's theory of reciprocity. In cases where it is not possible to use the impedance sensor, use of Series 208 force sensor is recommended.

ICP® IMPEDANCE HEAD, FORCE/ACCELEROMETER

MODEL 288D01

Sensitivity: (Acceleration)(±10%)
100 mV/g(10.2 mV/(m/s²))

Sensitivity: (Force)(±10%)
100 mV/lb(22.4 mV/N)

Frequency Range: (Acceleration)
(±5%) 1 to 5000 Hz

Size - Hex: 11/16 in(11/16 in)

Size - Height: 0.820 in(20.83 mm)

SERIES 208C
QUARTZ GENERAL PURPOSE, FORCE SENSORS

Quartz, piezoelectric force sensors are durable measurement devices, which possess exceptional characteristics for the measurement of dynamic force events. Typical measurements include dynamic and quasi-static forces, as encountered during actuation, compression, impact, impulse, reaction and tension. Applications for quartz force sensors include balancing, crash testing, drop testing, fatigue testing, fracture testing, machinery testing, materials testing and tensile testing.

Since the measurement signal generated by a quartz sensor will decay over time, long-term, static force measurements are not practical. Short-term or quasi-static, measurements are possible within certain time limits, depending upon the sensor and signal conditioning used. Due to this limitation, it is not practical to use quartz force sensors in weighing applications where a strain gage-type load cell is best suited.

CE

For dynamic force applications, however, quartz force sensors offer many advantages and several unique characteristics.

GENERAL PURPOSE, QUARTZ FORCE SENSORS

Model Number	208C05	208C04	208C03	208C02	208C01
Sensitivity (±15%)	1 mV/lb 224.82 mV/kN	5 mV/lb 1124 mV/kN	10 mV/lb 2248 mV/kN	50 mV/lb 11,241 mV/kN	500 mV/lb 112,410 mV/kN
Measurement Range (Compression)	5000 lb 22.24 kN	1000 lb 4.448 kN	500 lb 2.224 kN	100 lb 0.4448 kN	10 lb 0.04448 kN
Maximum Static Force (Compression)	8000 lb 35.59 kN	6000 lb 26.69 kN	3000 lb 13.5 kN	600 lb 2.669 kN	60 lb 0.27 kN
Broadband Resolution	0.05 lb-rms	0.01 lb-rms	0.005 lb-rms	0.001 lb-rms	0.0001 lb-rms
Low Frequency Response (-5%)	0.0003 Hz	0.0003 Hz	0.0003 Hz	0.001 Hz	0.01 Hz
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Housing Material	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Weight	22.7 gm	22.7 gm	22.7 gm	22.7 gm	22.7 gm
Size (Hex x Height x Sensing Surface)	0.625 x 0.625 x 0.500 in 15.88 x 15.88 x 12.7 mm	0.625 x 0.625 x 0.500 in 15.88 x 15.88 x 12.7 mm	0.625 x 0.625 x 0.500 in 15.88 x 15.88 x 12.7 mm	0.625 x 0.625 x 0.500 in 15.88 x 15.88 x 12.7 mm	0.625 x 0.625 x 0.500 in 15.88 x 15.88 x 12.7 mm
Mounting	10-32 Thread	10-32 Thread	10-32 Thread	10-32 Thread	10-32 Thread
Supplied Accessories					
Thread Locker	080A81	080A81	080A81	080A81	080A81
Mounting Stud	(2) 081B05 (2) M081A62	(2) 081B05 (2) M081A62	(2) 081B05 (2) M081A62	(2) 081B05 (2) M081A62	(2) 081B05 (2) M081A62
Impact Cap	084A03	084A03	084A03	084A03	084A03

CE

ICP® PIEZOELECTRIC STRAIN SENSOR

MODEL 740B02

Measurement Range: 100 pk με

Sensitivity: (±20%) 50 mV/με

Broadband Resolution:
(1 to 10000 Hz) 0.6 nε

VC MEMS ACCELEROMETERS

PCB® Series 3711 (single axis), 3713 (triaxial), and 3741 (single axis, differential output), and 3743 (triaxial, differential output) variable capacitance MEMS (VC MEMS) accelerometers are designed to measure low-frequency vibration and motion and are offered in full-scale ranges from ± 2 to ± 200 g to accommodate a variety of testing requirements. The units feature gas-damped, silicon MEMS sensing elements for uniform, repeatable performance and offer high frequency overload protection.

Electrically, the units offer a single-ended or differential output signal with power, signal, and ground leads for each channel. Supply voltage regulation permits operation from +5 up to +32 VDC and the low-noise, low-impedance output signal may be transmitted over long cable lengths without degradation.

The rugged and durable single ended output Series 3711 & 3713 VC MEMS accelerometers are hermetically sealed in a robust titanium housing allowing for a very stable and accurate measurement in the most severe operating environments. In addition, this series is inherently insensitive to base strain and transverse acceleration effects. Supply voltage regulation permits operation from +5 to +28 VDC and the single-ended, low-noise, low-impedance output signal may be transmitted over long cable lengths without degradation. The series is available in single axis and triaxial versions with a multi-pin, threaded, electrical connector for easy installation and setup.

Series 3711F11 Series 3713F11 Series 3741F12 Series 3743G

The precision Series 3741 and 3743 VC MEMS accelerometers sensors offer a differential output signal for common-mode noise rejection and incorporate many advanced features. This includes supply voltage regulation and a temperature compensation circuit for stable performance over the entire operational temperature range. The 3741 features a low profile and lightweight hard-anodized aluminum housing with an integral, 4-conductor 10 ft (3 m) shielded cable. An optional mounting adaptor, 080A208, facilitates biaxial or triaxial configurations. The 3743 features a rugged, hermetic Stainless Steel package with an integral M8x1 8-pin connector or an integral cable rated to IP67 for stable performance in extreme measurement environments.

SINGLE ENDED OUTPUT – VC MEMS

Sensitivity	Measurement Range (pk)	Frequency (± 5%)	Broadband Resolution (rms)
6.75 mV/g	± 200 g	0 to 1500 Hz	6.0 mg
13.5 mV/g	± 100 g	0 to 1500 Hz	3.0 mg
27.0 mV/g	± 50 g	0 to 1500 Hz	1.5 mg
45.0 mV/g	± 30 g	0 to 1500 Hz	0.9 mg
135 mV/g	± 10 g	0 to 1000 Hz	0.3 mg
675 mV/g	± 2 g	0 to 250 Hz	0.06 mg

Model Number	3711 Single Axis	3713 Triaxial
Overload Limit (Shock)	± 5000 g pk	± 3000 g pk
Temperature Range	-65 to +250 °F (-54 to +121 °C)	-65 to +250 °F (-54 to +121 °C)
Excitation Voltage	5 to 32 VDC	5 to 28 VDC
Housing Material	Titanium	Titanium
Sealing	Hermetic	Hermetic
Size (H x L x W)	0.45 x 0.85 x 0.85 in (11.4 x 21.6 x 21.6 mm)	0.80 in cube (20.3 mm cube)
Weight: Connector style	0.58 oz (16.3 gm)	0.58 oz (17.3 gm)
Electrical Connector	1/4-28 4-Pin	9-Pin
Supplied Accessories		
Easy Mount Clip	080A152	—
Adhesive Base	—	080A12
Mounting Screw / Stud	081A113 / M081A113	081B05 / M081B05
Additional Accessories		
Triaxial Mounting Block	080A153	—
Mounting Cable Connector	AY	EN
Recommended Cable	010	037

DIFFERENTIAL OUTPUT – VC MEMS

Sensitivity	Measurement Range (pk)	Frequency (± 5%)	Broadband Resolution (rms)
13.5 mV/g	± 200 g	0 to 1500 Hz	6.0 mg
27 mV/g	± 100 g	0 to 1500 Hz	3.0 mg
54 mV/g	± 50 g	0 to 1500 Hz	1.5 mg
90 mV/g	± 30 g	0 to 1500 Hz	0.9 mg
270 mV/g	± 10 g	0 to 1000 Hz	0.3 mg
540 mV/g	± 5 g	0 to 1000 Hz	0.15 mg
1350 mV/g	± 2 g	0 to 250 Hz	0.06 mg

Model Number	3741 Single Axis	3743 Triaxial
Overload Limit (Shock)	± 5000 g pk	± 5000 g pk
Temperature Range	-65 to +250 °F (-54 to +121 °C)	-65 to +250 °F (-54 to +121 °C)
Excitation Voltage	5 to 32 VDC	5 to 32 VDC
Housing Material	Anodized Aluminum	Stainless Steel
Sealing	Epoxy	Hermetic or IP67 (integral cable)
Size (H x L x W)	0.30 x 1.00 x 0.85 in (7.62 x 25.4 x 21.6 mm)	0.76 x 1.03 x 0.66 in (19.3 x 26.2 x 16.8 mm)
Weight without cable	0.35 oz (9.9 gm)	0.92 oz (26 gm)
Electrical Connector	10 ft (3 m) integral cable to pigtails	M8x1 8-pin connector or 10 ft (3 m) integral cable
Supplied Accessories		
Mounting Screws/Studs	(2) 081A103 / (2) M081A103	(2) 081A135 screws
Additional Accessories		
Triaxial Mounting Block	080A208	—
Recommended Cable	—	528Gxx

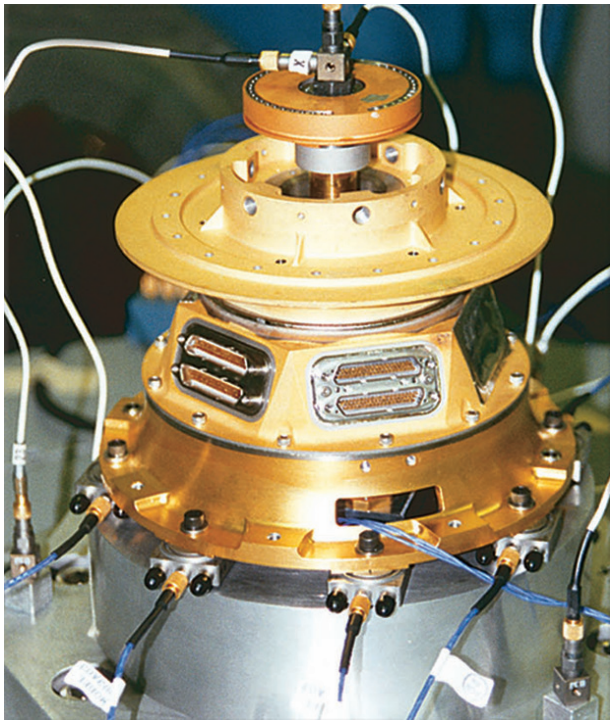
MODEL NUMBERING SYSTEM					
1) Series					
3711F	Single axis, VC MEMS accelerometer, singled ended				
3713F	Triaxial, VC MEMS accelerometer, singled ended				
3741F	Single axis, VC MEMS accelerometer, differential				
3743G	Triaxial, VC MEMS accelerometer, differential				
	2) Cable				
	11	Multi-pin, threaded, electrical connector (3741 & 3743 only)			
	12	Standard, 10 ft (3.0 m) integral cable and pigtail termination			
		3) Measurement Range			
		2G	± 2 g measurement range		
		5G	± 5 g measurement range (3741 & 3743 only)		
		10G	± 10 g measurement range		
		30G	± 30 g measurement range		
		50G	± 50 g measurement range		
		100G	± 100 g measurement range		
		200G	± 200 g measurement range		
			4) Integral Cable Length (add only if selecting other than standard 10 ft (3 m) length)		
			/XXX	Specify XXX as desired cable length in feet (specify MXXX for desired cable length in meters)	
				5) Cable Termination	
				AY	4-socket plug (Series 3741 only)
				JJ	Pigtail, stripped and tinned ends (Series 3741 only)
				NU	Pigtail, stripped and tinned ends (Series 3743 only)
				LN	8-pin mini DIN for mating to Models 482C27 or 483C28 signal conditioners (Series 3741 only)
Example					
3743G	12	5G	/020	NU	Triaxial VC MEMS accelerometer, ± 5 g measurement range, 20 ft (6.1 m) integral cable to pigtail leads

SERIES 260B 3-COMPONENT QUARTZ FORCE SENSORS

Three-component dynamic force sensors are offered in both ICP® and charge output configurations for dynamic and quasi-static force measurement applications. Each utilizes an array of precision-aligned, quartz sensing crystals. Measurements along the z-axis are proportional to applied compression, tension and impact forces. Measurements along the x- and y-axes are proportional to shear forces that are imposed upon preloaded crystals by the test fixture.

ICP® styles contain built-in, microelectronic signal conditioning circuitry to provide clean, low-impedance output signals that can be transmitted over low cost cables and in adverse, industrial environments. Multi-pin connectors facilitate a single point hookup with common, multi-conductor cable. Charge output styles achieve higher temperature operation and are suitable for applications requiring flexible setup and maximum signal-to-noise.

A common use of three-component force sensors is Force Limited Vibration (FLV) testing. This is an alternative test method that improves the vibration testing approach based on measuring and limiting reaction force between shaker and test item. By using this method, the acceleration input to the test item is automatically notched at the equipment resonances by limiting shaker force values to those predicted for actual flight.



3-COMPONENT QUARTZ FORCE RINGS

						
Model Number	**260B01**	**260B02**	**260B03**	**260B11**	**260B12**	**260B13**
Sensitivity (z axis) (±20%)	2.5 mV/lb 0.56 mV/N	2.5 mV/lb 0.56 mV/N	0.25 mV/lb 0.06 mV/N	15 pC/lb 3.37 pC/N [3]	32 pC/lb 7.19 pC/N [3]	15 pC/lb 3.37 pC/N [3]
Sensitivity (x or y axis) (±20%)	10 mV/lb 2.25 mV/N	5 mV/lb 1.12 mV/N	1.25 mV/lb 0.28 mV/N	32 pC/lb 7.19 pC/N [3]	15 pC/lb 3.37 pC/N [3]	32 pC/lb 7.19 pC/N [3]
Measurement Range (z axis)	1000 lb 4.45 kN	1000 lb 4.45 kN	10000 lb 44.48 kN	1000 lb 4.45 kN	1000 lb 4.45 kN	10000 lb 44.48 kN
Measurement Range (x or y axis)	500 lb 2.22 kN	1000 lb 4.45 kN	4000 lb 17.79 kN	500 lb 2.22 kN	1000 lb 4.45 kN	4000 lb 17.7 kN
Maximum Force (z axis)	1320 lb 5.87 kN	1320 lb 5.87 kN	11000 lb 48.93 kN	1320 lb 5.87 kN	1320 lb 5.87 kN	11000 lb 48.93 kN
Maximum Force (x or y axis)	660 lb 2.94 kN	1000 lb 4.45 kN	4400 lb 19.57 kN	660 lb 2.94 kN	1000 lb 4.45 kN	4400 lb 19.57 kN
Maximum Moment (z axis)	16 ft-lb 21.7 N-m	58 ft-lb 78.6 N-m	375 ft-lb 508.4 N-m	16 ft-lb 21.7 N-m	58 ft-lb 78.6 N-m	375 ft-lb 508.4 N-m
Maximum Moment (x or y axis)	37 ft-lb 50.2 N-m	96 ft-lb 130.2 N-m	940 ft-lb 1274.5 N-m	37 ft-lb 50.2 N-m	96 ft-lb 130.2 N-m	940 ft-lb 1274.5 N-m
Broadband Resolution (z axis)	0.006 lb-rms 0.027 N-rms	0.006 lb-rms 0.027 N-rms	0.05 lb-rms 0.222 N-rms	[1]	[1]	[1]
Broadband Resolution (x or y axis)	0.002 lb-rms 0.0089 N-rms	0.006 lb-rms 0.027 N-rms	0.01 lb-rms 0.04 N-rms	[1]	[1]	[1]
Low Frequency Response (-5%) (z axis)	0.01 Hz	0.01 Hz	0.01 Hz	[2]	[2]	[2]
Low Frequency Response (-5%) (x or y axis)	0.001 Hz	0.001 Hz	0.001 Hz	[2]	[2]	[2]
Discharge Time Constant (z axis)	≥50 sec	≥50 sec	≥50 sec	—	—	—
Discharge Time Constant (x or y axis)	≥500 sec	≥500 sec	≥500 sec	—	—	—
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-100 to +350 °F -73 to +177 °C	-100 to +350 °F -73 to +177 °C	-100 to +350 °F -73 to +177 °C
Housing Material	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Electrical Connector	1/4-28 4-Pin Jack	1/4-28 4-Pin Jack	1/4-28 4-Pin Jack	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack
Size (Length x Width x Height)	1.075 x 0.95 x 0.39 27.3 x 24.1 x 9.9	1.35 x 1.25 x 0.39 34.3 x 31.8 x 9.9	2.25 x 2.25 x 0.79 57.1 x 57.1 x 20.07	0.950 x 0.950 x 0.39 24.1 x 24.1 x 9.9	1.25 x 1.25 x 0.39 31.8 x 31.8 x 9.9	2.25 x 2.25 x 0.79 57.1 x 57.1 x 20.07
Weight	26.6 gm	45 gm	274 gm	24.59 gm	42.5 gm	280 gm
Supplied Accessories						
Mounting Stud	081A70 / M081A70	081A74 / M081A74	081A71 / M081A71	081A70 / M081A70	081A74 / M081A74	081A71 / M081A71
Anti-Friction Washer	082B02	082M12	082B06	082B02	082M12	082B06
Pilot Bushing	083A10	083A13	083A11	083A10	083A13	083A11
Additional Accessories						
Mating Cable Connectors	AY	AY	AY	EB	EB	EB
Recommended Cables	010	010	010	003	003	003
Additional Versions						
Reverse Shear Polarity	—	—	—	260B31	260B32	260B33
Notes						
[1] Resolution is dependent upon cable length and signal conditioner [2] Low frequency is dependent upon system discharge time constant [3] Sensitivity (±15%)						

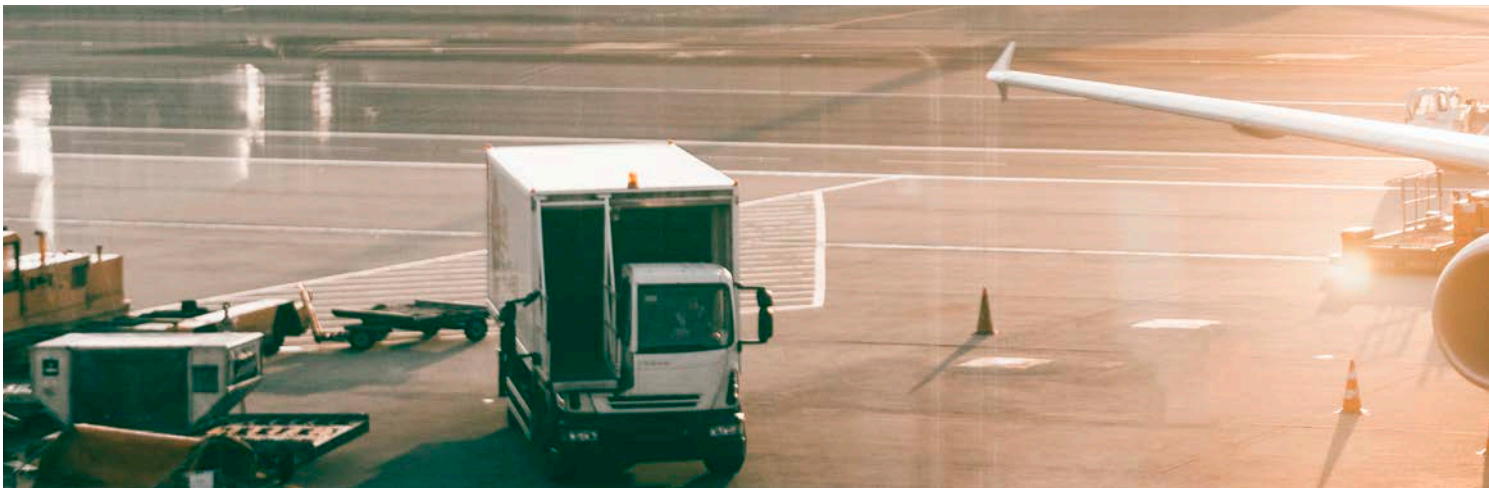
DUAL BRIDGE LOAD CELLS

PCB® manufactures a wide range of high-accuracy, strain gage load cells for aerospace, automotive, industrial and process control applications. General purpose load cells are suitable for a wide range of routine static force measurement applications, including weighing, dynamometer testing and material testing machines. Most of these designs operate in both tension and compression and offer excellent accuracy and value. Units range in capacity from as small as 500 lb, to as large as 20k lb (110N to 450k N) full scale. Fatigue-rated load cells are specifically designed for fatigue testing machine manufacturers and users or any application where high cyclic loads are present. Applications include material testing, component life cycle testing and structural testing.

PCB® dual bridge load cells address many force measurement, monitoring and control requirements in laboratory testing, industrial and process control applications. All models utilize strain gages, which are configured into a Wheatstone bridge circuit as their primary sensing element, along with temperature and pressure compensation. A variety of configurations and capacities address a wide range of installation scenarios. All fatigue-rated load cells are guaranteed against fatigue failure for 100 million fully reversed cycles. These rugged load cells are manufactured using premium, fatigue-resistant, heat-treated steels. Internal flexures are carefully designed to eliminate stress concentration areas. Close attention is paid to the proper selection and installation of internal strain gages and writing to ensure maximum life. Fatigue-rated load cells are available in capacities from 1k lb to 25k lb (1100 N to 220 kN) full-scale.

Photo Courtesy of NASA Langley Research Center

FATIGUE-RATED LOW PROFILE DUAL BRIDGE LOAD CELLS						
Model Number	**1403-05ADB**	**1404-02ADB**	**1404-03ADB**	**1408-02ADB**	**1411-02ADB**	**1414-02ADB**
Measurement Range	5k lb 22k N	12.5k lb 56k N	25k lb 111k N	50k lb 222k N	100k lb 445k N	200k lb 890k N
Overload Limit	15 klb 66.7 kN	37.5 klb 167 kN	75 klb 334 kN	150 klb 667 kN	300 klb 1334 kN	400 klb 1780 kN
Sensitivity	2 mV/V	2 mV/V	2 mV/V	2 mV/V	2 mV/V	2 mV/V
Non-Linearity	≤0.05 % FS	≤0.05 % FS	≤0.05 % FS	≤0.10 % FS	≤0.20 % FS	≤0.20 % FS
Hysteresis	≤0.05% FS	≤0.05% FS	≤0.05% FS	≤0.1% FS	≤0.2% FS	≤0.2% FS
Non-Repeatability	≤0.02 % RO	≤0.02 % RO	≤0.02 % RO	≤0.05 % RO	≤0.05 % RO	≤0.05 % RO
Temperature Range	-65 to +200 °F -54 to +93°C	-65 to +200 °F -54 to +93 °C	-65 to +200 °F -54 to +93 °C	-65 to +200 °F -54 to +93 °C	-65 to +200 °F -54 to +93 °C	-65 to +200 °F -54 to +93 °C
Temperature Range Compensated	+70 to +170 °F +21 to +76 °C	+70 to +170 °F +21 to +76 °C	+70 to +170 °F +21 to +76 °C	+70 to +170 °F +21 to +76 °C	+70 to +170 °F +21 to +76 °C	+70 to +170 °F +21 to +76 °C
Bridge Resistance	350 ohm	350 ohm	350 ohm	350 ohm	350 ohm	350 ohm
Excitation Voltage [1]	10 VDC	10 VDC	10 VDC	10 VDC	10 VDC	10 VDC
Size (Diameter x Height)	4.12 x 1.37 in 104.6 x 34.8 mm	6.06 x 1.75 in 153.9 x 44.5 mm	6.06 x 1.75 in 153.9 x 44.5 mm	8.00 x 2.50 in 203 x 63.5 mm	11.0 x 3.50 in 279 x 88.9 mm	11.0 x 3.75 in 279 x 95.3 mm
Mounting	5/8-18 Thread	1 1/4 -12 Thread	1 1/4 -12 Thread	1 3/4 -12 Thread	2 3/4 -8 Thread	2 3/4 -8 Thread
Electrical Connector	PT02E-10-6P	PT02E-10-6P	PT02E-10-6P	PT02E-10-6P	PT02E-10-6P	PT02E-10-6P
Supplied Accessories						
Shunt Calibration Resistor	Yes	Yes	Yes	Yes	Yes	Yes
Additional Versions						
Alternate Electrical Connector (PC04E-10-6P)	1403-05BDB	1404-02BDB	1404-03BDB	1408-02BDB	1411-02BDB	1414-02BDB
Alternate Attachment Thread	M1403-05A M1403-05B M16 x 2-4H	M1404-02A M1404-02B M33 x 2-4H	M1404-03A M1404-03B M33 x 2-4H	M1408-02A M1408-02B M42 x 2-4H	M1411-02A M1411-02B M72 x 2-4H	M1411-02A M1411-02B M72 x 2-4H
Available Accessories						
Mounting Bases	084A100 M084A100	084A101 M084A101	084A101 M084A101	084A103 M084A103	084A104 M084A104	084A104 M084A104
Mating Electrical Connectors	181-012A (PT) 182-025A (PC)	181-012A (PT) 182-025A (PC)	181-012A (PT) 182-025A (PC)	181-012A (PT) 182-025A (PC)	181-012A (PT) 182-025A (PC)	181-012A (PT) 182-025A (PC)
Recommended Cables	8311-01-10A (PT) 315-01-10A (PC)	8311-01-10A (PT) 8315-01-10A (PC)	8311-01-10A (PT) 8315-01-10A (PC)	8311-01-10A (PT) 315-01-10A (PC)	8311-01-10A (PT) 8315-01-10A (PC)	8311-01-10A (PT) 8315-01-10A (PC)
Note						
[1] Calibrated at 10 VDC, useable 5 to 20 VDC or VAC RMS						



MICROPHONES

PCB Piezotronics offers a variety of acoustic measurement products, including condenser, modern prepolarized, traditional externally polarized, array, probe, low-profile surface, and special-purpose microphones. Microphone products are complemented by an assortment of preamplifiers, signal conditioners, A-weighting filters, handheld calibrators, and accessories. A large number of established aerospace, military and defense, automotive, universities, OEM's, consultants, and white goods (appliance manufacturers have trusted their test requirements to PCB®.

The following selection is an example of PCB's wide range of acoustic sensors and accessories.

PREPOLARIZED & EXTERNALLY POLARIZED PRECISION CONDENSER MICROPHONES						
						
	Prepolarized (0V) Precision Condenser Microphones				Externally-polarized (200V) Precision Condenser Microphones	
Model Number	**377C01**	**377A12**	**377B02**	**377C20**	**2540**	**2570**
Nominal Microphone Diameter	1/4" 6.3 mm	1/4" 6.3 mm	1/2" 12.5 mm	1/2" 12.5 mm	1/2" 12.5 mm	1" 25.4 mm
Response Characteristic	Free-Field	Pressure	Free-Field	Random Incidence	Free-Field	Free-Field
Nominal Open Circuit Sensitivity	2 mV/Pa	0.25 mV/Pa	50 mV/Pa	50 mV/Pa	14.5 mV/Pa	48 mV/Pa
Frequency Range (±5%)	5.4 Hz to 80k Hz	4 Hz to 20k Hz	3.14 Hz to 20k Hz	3.14 Hz to 12.5k Hz	4 Hz to 40k Hz	2.6 Hz to 20k Hz
Dynamic Range - 3% Distortion Limit [1]	165 dB	187 dB	146 dB	146 dB	160 dB	146 dB
Dynamic Range - Cartridge Thermal Noise [1]	28 dB (A)	68 dB (A)	15 dB (A)	15 dB (A)	20 dB (A)	10 dB (A)
Operating Temperature Range	-40 to +248 °F -40 to +120 °C	-40 to +248 °F -40 to +120 °C	-40 to +248 °F -40 to +120 °C	-40 to +248 °F -40 to +120 °C	-40 to +302 °F -40 to +150 °C	-40 to +302 °F -40 to +150 °C
Polarization Voltage	0V (2 to 20 mA)	0V (2 to 20 mA)	0V (2 to 20 mA)	0V (2 to 20 mA)	200V	200V
Additional Accessories						
Holder	079A10/079B23	079A10/079B23	079A11/079B23	079A11/079B23	079A11/079B23	079A11/ 079B23, 079B25
Stands	079A15/079A16, 079A18	079A15/079A16, 079A18	079A15/079A16, 079A18	079A15/079A16, 079A18	079A15/079A16, 079A18	079A15/ 079A16, 079A18
Windscreens	079A07	079A07	079A06	079A06	079A06	N/A
Recommended Preamplifiers	426B03	426B03	426E01/426A10, 426A11/HT426E01	426E01/426A10, 426A11/HT426E01	426A30	426A30
Recommended Cables	002	002	002	002	—	—
Adaptor	—	—	—	—	—	079B25
Additional Versions						
TEDS Microphone and Preamplifier Systems	378C01/TLD378C01	378A12/TLD378A12	378B02/TLD378B02	378C20/TLD378C20	—	—
Notes						
[1] re 20 µPa						

Search "377" at www.pcb.com for complete offering.

MODERN PREPOLARIZED AND TRADITIONAL, EXTERNALLY-POLARIZED PRECISION CONDENSER MICROPHONES

A wide variety of traditional, externally-polarized and modern prepolarized free-field, pressure, and random incidence precision condenser microphones are available from PCB®. Externally-polarized models operate from a 200 V power source, while prepolarized models can operate from low cost, constant current (2 to 20 mA) ICP® signal conditioners. Prepolarized microphones can be interchanged with similar ICP® accelerometer set-ups, allowing tests and measurements with same data acquisition system. Furthermore, they show excellent performance suitable for aerospace and defense dedicated testing.

- Proven rugged design
- Exceptional performance in high humidity
- Individually tested for performance
- Meet IEC and ANSI standards
- Can be utilized in Type 1 systems
- Operate from ICP® sensor power (prepolarized)

Model HT426E01
High Temperature, 1/2” ICP® Preamplifier

Model 426B03
1/4” ICP® Preamplifier

Model 426E01
1/2” ICP® Preamplifier

ICP® ARRAY MICROPHONES WITH INTEGRAL PREAMPLIFIER			
Model Number	**130F20**	**130F21**	**130F22**
Microphone Diameter	1/4"	1/4"	1/4"
Response	Free-Field	Free-Field	Free-Field
Sensitivity (±3 dB at 250 Hz)	45 mV/Pa	45 mV/Pa	45 mV/Pa
Frequency Response (±2 dB)	20 to 10k Hz	20 to 10k Hz	20 to 10k Hz
Frequency Response (±5 dB)	20 to 20k Hz	20 to 20k Hz	20 to 20k Hz
Dynamic Range	<30 to > 122 dB	<30 to > 122 dB	<30 to > 122 dB
Polarization Voltage	0 V	0 V	0 V
Temperature Range	+14 to +122 °F -10 to +55 °C	+14 to +122 °F -10 to +55 °C	+14 to +122 °F -10 to +55 °C
Connector	BNC Jack	10-32 Jack	SMB Socket
TEDS IEEE 1451.4	Included	Included	Included

Model 130F20
(BNC Connector)

Model 130F21
(10-32 Connector)

Model 130F22
(SMB Connector)

MICROPHONE CALIBRATORS

Model CAL200
Acoustic Calibrator

Model CAL250
Acoustic Calibrator

SERIES 106B - ICP® FOR HIGH INTENSITY, ACOUSTIC PRESSURE SENSORS

Model 106B and 106B50 are high sensitivity, acceleration-compensated, ICP® quartz pressure sensors suitable for measuring intense acoustic phenomena. In fact, the series is widely used for measuring acoustic fields in operating launch vehicles and their associated payloads. The Series 106 family range spans from acoustic pressures of less than 80 dB to several psi. Similar piezoelectric technology is employed in PCB's complete range of hermetically sealed dynamic pressure sensors. These products measure pressure fluctuations from acoustic levels to tens of thousands of psi and frequencies from nearly DC to tens of kHz. Their ability to measure only pressure fluctuations above a specified frequency imposed on large static pressure fields makes them uniquely suited for such applications as combustion instability monitoring.

Models 106B52 & 106B50

Model 106B

HIGH SENSITIVITY, ICP® ACOUSTIC PRESSURE SENSORS			
Model Number	**106B52**	**106B50**	**106B**
Measurement Range (±2 V output)	1 psi 6.89k Pa [1]	5 psi 34.45k Pa	8.3 psi 57.2k Pa
Sensitivity	5000 mV/psi 725 mV/kPa	500 mV/psi 72.5 mV/kPa	300 mV/psi 43.5 mV/psi
Maximum Dynamic Pressure Step	10 psi 68.9k Pa	100 psi 690k Pa	200 psi 1379k Pa
Maximum Static Pressure	50 psi 345k Pa	500 psi 3448k Pa	2 kpsi 13,790k Pa
Resolution	0.02 mpsi 0.00013k Pa	0.07 mpsi 0.00048k Pa	0.1 mpsi 0.00069k Pa
Resonant Frequency	≥40k Hz	≥40k Hz	≥60k Hz
Low Frequency Response (-5 %)	2.5 Hz	0.5 Hz	0.5 Hz
Acceleration Sensitivity	≤0.002 psi/g ≤0.0014 kPa/(m/s²)	≤0.002 psi/g ≤0.0014 kPa/(m/s²)	≤0.002 psi/g ≤0.0014 kPa/(m/s²)
Temperature Range	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C	-65 to +250 °F -54 to +121 °C
Discharge Time Constant (at room temp)	≥0.2 sec	≥1 sec	≥1 sec
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	10-32 Coaxial Jack
Housing Material	17-4 Stainless Steel	17-4 Stainless Steel	304/304L Stainless Steel
Diaphragm Material	316L Stainless Steel	316L Stainless Steel	316L Stainless Steel
Sealing	Welded Hermetic	Welded Hermetic	Welded Hermetic
Supplied Accessories			
English Clamp Nuts	(1) 060A11, 3/4-16, Acetal	(1) 060A11, 3/4-16, Acetal	(1) 060A12, 9/16-18 thd
Metric Clamp Nuts	(1) 060A13, M20x1.25, Acetal	(1) 060A13, M20x1.25, Acetal	(1) 060A14, M14 x 1.25 thd
Seal Rings	(3) 065A36 Acetal, 0.060 in thk	(3) 065A36 Acetal, 0.060 in thk	(1) 065A37, brass, 0.025 in thk
Additional Accessories			
Pipe Thread Adaptor	062A07, 1/2 NPT	062A07, 1/2 NPT	062A06, 1/2 NPT
English Thread Adaptor	—	—	061A60, 3/4-16 thd
Ground Isolated Adaptor, English Thread	061A65, 1.0-12 thd, Acetal	061A65, 1.0-12 thd, Acetal	061A61, 3/4-16 thd, Acetal
Water Cooled Adaptor	064A07	064A07	064B06
Mating Cable Connectors	EB	EB	EB
Recommended Stock Cables	002	002	002
Notes			
[1] For ±5 V output			

SIGNAL CONDITIONING

LINE POWERED, ICP® SIGNAL CONDITIONER

MODEL 483C28

Sensor Input Type(s): ICP®, Voltage, Bridge/Differential

Channels: 8

Frequency Range (-5%): 0.05 to 100000 Hz

LINE POWERED, ICP® SIGNAL CONDITIONER

MODEL 482C05

Sensor Input Type(s): ICP®

Channels: 4

Frequency Range (-5%): 0.1 to >1000 kHz

LINE POWERED, ICP® SIGNAL CONDITIONER

SERIES 483C

Sensor Input Type(s): ICP®, Voltage, Bridge/Differential

Channels: 8

Frequency Range (-5%): 0.1 to >1000 kHz

LINE POWERED, ICP® SIGNAL CONDITIONER

MODEL 482C64

Sensor Input Type(s): ICP®, Voltage, Charge

Channels: 4

Frequency Range (-5%): 0.05 to 75000 Hz

LINE POWERED, ICP® SIGNAL CONDITIONER

MODEL 482C27

Sensor Input Type(s): ICP®, Voltage, Bridge/Differential

Channels: 4

Frequency Range (-5%): 0.05 to 100000 Hz

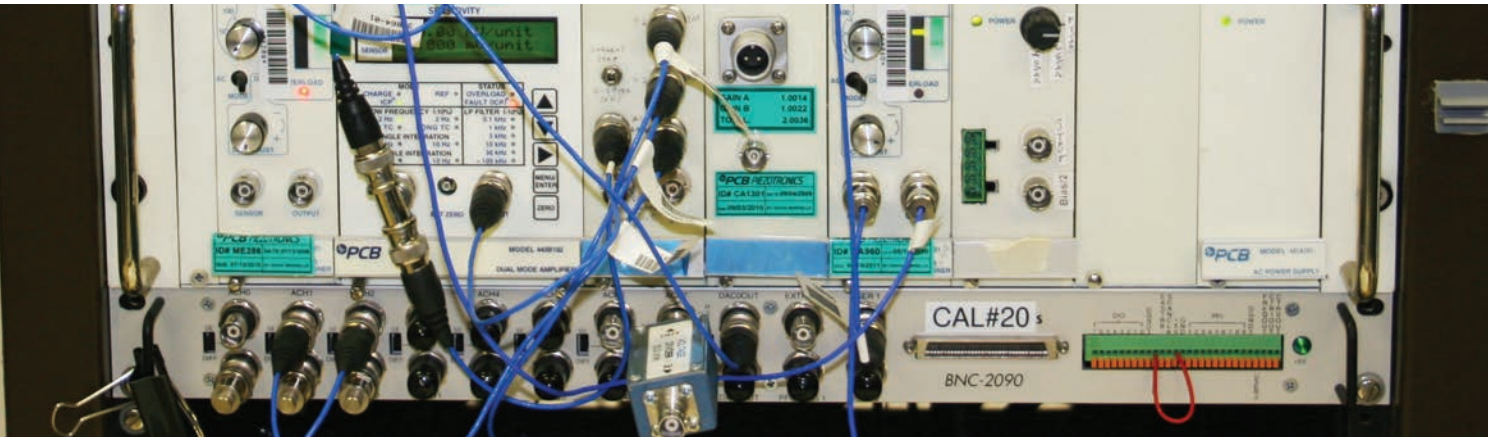
LINE POWERED, ICP® SIGNAL CONDITIONER

MODEL 482C16

Sensor Input Type(s): ICP®, Voltage

Channels: 4

Frequency Range (-5%): 0.05 to 100000 Hz



BATTERY POWERED, ICP® SIGNAL CONDITIONER

MODEL 480C02

Sensor Input Type(s): ICP®, Charge

Channels: 1

Frequency Range (-5%): 0.05 to 500,000 Hz

BATTERY POWERED, ICP® SIGNAL CONDITIONER

MODEL 480E09

Sensor Input Type(s): ICP®, Charge

Channels: 1

Frequency Range (-5%): 0.15 to 100,000 Hz

BATTERY POWERED, ICP® SIGNAL CONDITIONER

MODEL 480B21

Sensor Input Type(s): ICP®, Charge

Channels: 3

Frequency Range (-5%): 0.15 to 100,000 Hz

BATTERY-POWERED, ICP® SENSOR SIGNAL CONDITIONER

MODEL 483C28

Sensor Input Type(s): ICP®, Voltage, Bridge/Differential

Channels: 8

Frequency Range (-5%): 0.05 to 100000 Hz

BATTERY-POWERED, ICP® SENSOR SIGNAL CONDITIONER

MODEL 482C05

Sensor Input Type(s): ICP®

Channels: 4

Frequency Range (-5%): 0.1 to >1000 kHz

DIFFERENTIAL PIEZOELECTRIC SIGNAL CONDITIONER

ENDEVCO MODEL 6634D

Sensor Input Type(s): Differential PE, PE, ICP®/IEPE, VELCOIL/RCC

Channels: 1

Outputs: acceleration, velocity and displacement

THE MODAL SHOP
AN AMPHENOL COMPANY

SERIES 2100 – EXCITATION STINGERS

An excitation stinger consists of a thin, flexible rod, with attachment means at both ends. The stinger transmits force in the stiff axial direction and flexes laterally to reduce input side loads to the structure. The uniaxial force delivered by the flexible stinger increases the accuracy of the measurement. The stinger also helps to isolate the exciter armature from the structure, lessening inadvertent shocks and possibly preventing damage to the exciter armature. Likewise, the stinger can protect a fragile structure from large, inadvertent excitations.

- Proven and convenient excitation connection
- Alleviates need for alignment accuracy
- Reduces force sensor measurement error
- Isolates exciter armature
- Adapts to different mounting threads

For complete specifications on modal shakers and accessories, please visit www.modalshop.com or call 800-860-4867

SERIES 2100 STINGERS – EXCITATION STINGERS			
Model Number	**2110GXX***	**2125GXX**	**2150GXX**
Material	Threaded nylon rod w/support tube	Threaded stainless steel rod	Steel rod w/threaded end
Dia/thread (in)	10-32	1/4-28	0.0625
Std Lengths (in)	6, 9, 12	9, 12, 18	12
Load sensor attachment	10-32	1/4-28	10-32
Exciter attachment	10-32	1/4-28	Collet
Quantity	pack of 3	pack of 3	pack of 3
Notes			
* XX indicates stinger length (in) Example: To order a pack of 3 stingers in 9" Nylon, use Model # 2110G09			

ELECTRODYNAMIC EXCITER FAMILY

In addition to the state-of-the-art precision air-bearing shakers for accelerometer calibration and the new industry standard 100 lbf modal shaker, the product line now includes two mini-shakers and two dual-purpose platform shakers. These shakers are ideal for applications ranging from accelerometer calibration and experimental modal analysis to general vibration testing of small components and sub-assemblies.

ELECTRODYNAMIC EXCITER FAMILY				
				
Model	**2004E**	**2007E**	**2025E**	**2060E**
Application	Mini Shaker	Mini Shaker	Modal Shaker	Modal Shaker
Force lbf (N) pk	4.5 (20)	7 (31)	25 (111)	60 (267)
Stroke in pk-pk	0.2	0.5	0.75	1.4
Weight lb (kg)	6 (272)	6 (272)	11 (5)	28 (127)
Max Freq	11 kHz	9 kHz	9 kHz	6 kHz

PCB PIEZOTRONICS
AN AMPHENOL COMPANY

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AD-GroundTest-1225