EXPLOSIVE, GUN & IMPACT TESTING

PCB PIEZOTRONICS
AN AMPHENOL COMPANY

ENDEVCO
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EXPLOSIVE, GUN & IMPACT TESTING

SENSORS FOR BLAST MEASUREMENTS

Shock Accelerometers: Our high amplitude shock accelerometers represent state-of-the-art industry technology for miniature, high amplitude, DC response acceleration sensors, capable of measuring long duration transient motion, as well as responding to and surviving extremely fast rise times typical of a high-G shock event. Both a packaged and an OEM configuration are offered to fulfill a variety of installation requirements.

Pressure Sensors: Our pressure sensors are designed for a broad range of explosion, blast, and shock wave testing. They are frequency tailored to capture both peak pressure and total impulse measurements. Applications include measuring air-blast pressure in free-field or closed bunker arenas to obtain peak pressure, total impulse, shock wave and time-of-arrival measurements often used to study blast effects on structures, vehicles, or other objects.

In this catalog, you will find a listing of PCB®'s and Endevco's most popular blast, high-G shock sensors and other hardware for these applications. Please visit www.pcb.com or www.endevco.com, and search the model series for detailed specifications. You can also contact us at 866-816-8892 or sales@pcb.com to discuss your specific requirements with an Application Engineer.

CIVILIAN APPLICATIONS INCLUDE:

- Mining
- Construction
- Demolition
- Pyrotechnics

DEFENSE APPLICATIONS INCLUDE:

- Aerial Bombs
- Mines
- Torpedoes
- Breeching Operations
- Ballistics
- Tactical Missiles & More

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MEMS PIEZORESISTIVE SHOCK ACCELEROMETERS

Piezoresistive shock accelerometers, manufactured using MEMS technology, have low power consumption while still providing +/- 200 mV full scale output at acceleration levels greater than 50 kg. The accelerometers are electrically compatible with the same type 4-wire circuit used to condition a strain gauge full bridge and since they have much greater output compared to a strain gauge, the requirement for signal amplification is greatly reduced. They afford a wider operating temperature range when compared to mechanically isolated ICP® accelerometers. Their frequency response, dependent on model, can be uniform from DC (0 Hz) to values as high as 20 kHz. To lessen the severity of response when their resonant frequency is excited, they incorporate squeeze film damping, achieving values of 0.02 to 0.06 of critical. These damping values are much higher than those found in legacy MEMS accelerometers. Since silicon is a brittle material, over range stops are also incorporated to minimize breakage of the sensing element, and then the sensing element is sealed within a hermetic package. At comparable G levels, MEMS technology enables the smallest package size to be attained for individual accelerometers.

HIGHLIGHTS:

- Single axis and triaxial arrangements
- Mechanical over-range stops improves survivability
- Slight damping reduces resonance amplification
- Excellent amplitude linearity
- Low power consumption

APPLICATIONS:

- Metal-to-metal impact & pyroshock
- Data recorders, penetrator & launch tests
- Consumer electronics drop testing
- Sporting goods and impact tool testing
- Blast loading & survivability of structures
- Fuze, safe and arm




SPECIFICATIONS				
Model Number	**Endevco 2262B**	**PCB 3501B12xxKG**	**Endevco 7280AM4**	**PCB 3991B12xxKG**
Description	High Sensitivity Multi-mode damping Rugged to 10000 g shocks	Stud mount Lightly damped	Extremely rugged Lightly damped	Thru hole mount Lightly damped
Range (g)	±1000 / ±2000 / ±6000	±20000 / ±60000	±2000 / ±20000 / ±60000	±20000 / ±60000
Sensitivity (uV/V/g)	0.45 / 0.3 / 0.015	1 / .3	30 / 1.6 / .5	1 / .3
Frequency response (kHz)	0 to 3000	0-10 / 0-20	0-5 / 0-10 / 0-13	0-10 / 0-20
Shock limit (g pk)	10000	60000 / 100000	10000 / 80000 / 240000	60000 / 100000
Temperature Range - Operating	-67 to 257 °F -55 to 125 °C	-65 to 250 °F -54 to 121 °C	-67 to +250 °F -55 to +121 °C	-65 to 250 °F -54 to 121 °C
Dimensions (in(mm))	0.935 x 0.625 x 0.79 23.68 x 15.88 x 20.1	0.375 HEX 9.5	0.312 HEX 7.92	0.12 x 0.56 x 0.28 3.05 x 14.22 x 7.11
Weight (gm)	22	2.5	2.1	1.3
Excitation voltage (V)	10	10	10	10
Mounting method	10-32 detachable stud	1/4-28 UNF-3A stud	1/4-28 UNF-3A stud	4-40 screws




SPECIFICATIONS				
Model Number	**Endevco 7280AM7**	**Endevco 7280A**	**PCB 3503A11xxKG**	**Endevco 7284A**
Description	Extremely rugged Lightly damped Low noise cable	Extremely rugged Lightly damped Low power consumption	Thru hole mount Lightly damped Triaxial output	Thru hole mount Lightly damped Triaxial output
Range (g)	±2000 g / ±20000 g / ±60000	±2000 g / ±20000 g / ±60000	±20000 g / ±60000	±2000 g /±20000 / ±60000
Sensitivity (uV/V/g)	30 / 1.6 / .5	30 / 1.6 / .5	1 / .3	30 / 1.6 / .5
Frequency response (kHz)	0-5 / 0-10 / 0-13	0-5 / 0-10 / 0-13	0-10 / 0-20	0-10 / 0-10 / 0-20
Shock limit (g pk)	10000 / 80000 / 240000	10000 / 80000 / 240000	60000 / 80000	10000 / 60000 / 180000
Temperature Range - Operating	-67 to 250 °F -55 to +121 °C	-67 to 250 °F -55 to +121 °C	-65 to +250 °F -54 to +121 °C	-67 to +250 °F -55 to +121 °C
Dimensions (in(mm))	0.56 x 0.35 x 0.16 (14.2 x 8.90 x 4.06)	0.56 x 0.35 x 0.16 (14.2 x 8.90 x 4.06)	0.25 x 0.47 x 0.47 (6.35 x 11.81 x 11.81)	0.56 x .304 x .245 (14.22 x 7.72 x 6.22)
Weight (gm)	4	4	2.83	3.6
Excitation voltage (V)	10	10	10	5
Mounting method	4-40 screws	4-40 screws	4-40 screws	4-40 screws

PIEZOELECTRIC ACCELEROMETERS

SERIES 660 (TO-5 PACKAGE) LOW COST, EMBEDDABLE ACCELEROMETERS

Series 660 accelerometers are ideal for continuous vibration monitoring in high-volume and commercial OEM applications.

The Series 660 low cost accelerometers offer an affordable solution for vibration and shock measurements in high-volume and commercial OEM applications. The units are particularly well suited for shock and impact detection of packages or components, as well as bearing and gear mesh vibration measurements in predictive maintenance and condition monitoring requirements. The compact designs may be imbedded into machinery at the OEM level to provide value-added monitoring protection.

The units employ field-proven, solid-state, piezoelectric sensing elements for durability and broadband performance. Choose from either charge mode types, which achieve high operating temperatures or voltage mode ICP® types, with built-in signal conditioning microelectronics, for simplified operation and connectivity to data acquisition and vibration monitoring instrumentation.

HIGHLIGHTS:

- Choice of standard TO-5 or TO-8 transistor-style packages
- Choice of charge mode piezoelectric, voltage mode ICP®, and 3-wire low power varieties
- Mountable via adhesive or soldering and choice of either integral cable or solder pin electrical connections
- Variety of sensitivities to accommodate a wide variety of applications
- Broad bandwidth, high shock survivability, wide operating temperature range, high resolution, and large dynamic range

OPTIONS:

- Low Output Bias Voltage
- High Temperature Operation to 365 °F (185 °C)
- High Range (less sensitivity)
- Temperature Output Signal

SPECIFICATIONS		
Package Size	**Low Profile TO-5**	**TO-5**
2-Wire ICP Configuration		
Primary Model Sensitivity (± 20%)	10 mV/g 1.02 mV/m/s²	100 mV/g 10.2 mV/m/s²
Measurement Range	500 g 5000 m/s²	50 g 500 m/s²
Frequency Range (± 3 dB)	0.4 to 10 k Hz	0.32 to 10k Hz
Resonant Frequency	>30 kHz	>25 kHz
Broadband Resolution	0.003 g pk	0.0003 g pk
Excitation Voltage	18 to 28 VDC	18 to 28 VDC
Excitation Constant Current	2 to 20 mA	2 to 20 mA
Output Impedance	<100 ohm	<100 ohm
Output Bias Voltage	8 to 12 VDC	8 to 12 VDC
Discharge Time Constant	≥0.4 sec	≥0.5 sec
Settling Time	2 sec	2.5 sec
Operating Temperature Range	-65 to +185 °F -54 to +85 °C	-65 to +185 °F -54 to +85 °C
Weight	0.08 oz 2.2 gm	0.1 oz 3 gm
Other Available Sensitivities	1 mV/g 0.102 mV/m/s²	N/A
3-Wire, Low-Power Configuration		
Primary Model Sensitivity (± 20%)	10 mV/g 1.02 mV/m/s²	100 mV/g 10.2 mV/m/s²
Measurement Range *	200 g 2000 m/s²	20 g 200 m/s²
Frequency Range (± 3 dB)	0.32 to 10k Hz	0.32 to 10k Hz
Resonant Frequency	>30 kHz	>25 kHz
Broadband Resolution	0.003 g pk 0.03 m/s² pk	0.001 g pk 0.01 m/s² pk
Excitation Voltage	3 to 5 VDC	3 to 5 VDC
Current Draw	0.75 mA	0.75 mA
Output Impedance	< 100 ohm	< 100 ohm
Output Bias Voltage (±10%)	0.5 × Excitation Voltage	0.5 × Excitation Voltage
Discharge Time Constant	≥0.5 sec	≥0.5 sec
Settling Time	2.5 sec	2.5 sec
Operating Temperature Range	-65 to +185 °F -54 to +85 °C	-65 to +185 °F -54 to +85 °C
Weight	0.08 oz 2.2 gm	0.1 oz 3 gm
Charge Mode Configuration		
Sensitivity (± 20%)	5 pC/g 0.51 pC/m/s²	11 pC/g 1.12 pC/ms²
Measurement Range	500 g	50 g
Frequency Range (± 3 dB)	10 kHz	10 kHz
Resonant Frequency	>30 kHz	>25 kHz
Operating Temperature Range	-65 to +185 °F -54 to +85 °C	-65 to +185 °F -54 to +85 °C
Capacitance	350 pF	350 pF
Weight	0.08 oz 2.2 gm	0.1 oz 3 gm
Common Specifications		
Transverse Sensitivity	≤5%	≤5%
Non-Linearity	≤1%	≤1%
Temperature Coefficient	0.10 %/°F 0.18 %/°C	0.10 %/°F 0.18 %/°C
Shock Limit	7000 g pk 70k m/s² pk	7000 g pk 70k m/s² pk
Housing Material	Stainless Steel	Stainless Steel
Mounting	Adhesive or Solder	Adhesive or Solder
Sealing (welded)	Hermetic	Hermetic
Size	0.36 × 0.26 in 9.1 × 6.6 mm	0.36 × 0.38 in 9.1 × 9.7 mm
Note:		
* Measurement range achieved is dependent upon excitation voltage supplied, i.e.: Measurement Range =		

LOW PROFILE TO-5

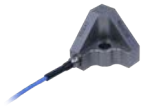
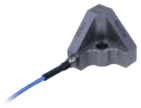
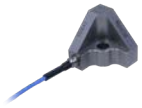
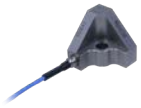
TO-5

HIGH AMPLITUDE ICP® SHOCK ACCELEROMETERS

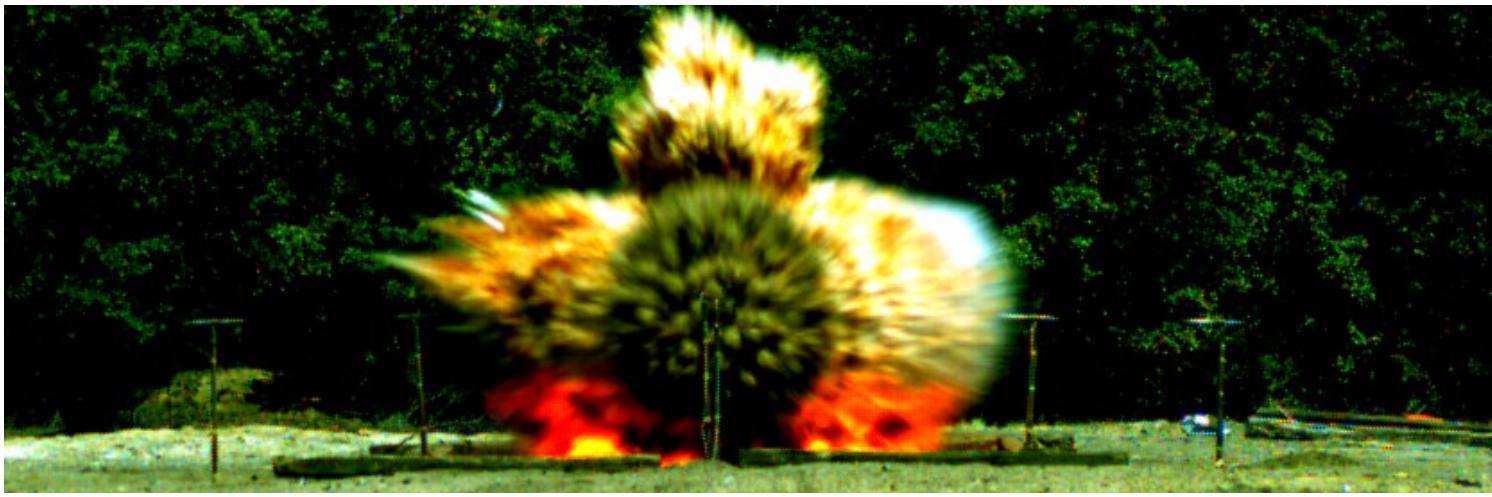
Piezoelectric ICP® accelerometers afford a very high signal output (+/- 5 volts full scale) and the ease of two-wire electrical connectivity. Their inherent ruggedness enables them to be severely over ranged without damage. The addition of internal mechanical isolation minimizes the high frequency stress that would otherwise be encountered by their ceramic sensing elements. This mechanical isolation, coupled with an internal 2-pole electrical filter, built into the ICP® circuitry, tailors the overall accelerometer response to assure data quality to frequencies as high as 10 kHz. Depending on the specific model, accelerations in excess of 50 kg can be successfully measured. These modern designs, with their internal elastomeric isolation materials are verified through calibration to remain dynamically linear and are enabling piezoelectric accelerometers to operate in increasingly severe acceleration environments.




SPECIFICATIONS				
Model Number	**PCB 350C23**	**PCB 350C24**	**PCB 350D02**	**PCB 350B01**
Description	Single Axis Integral Cable Mechanically Isolated	Single Axis Integral Cable Mechanically Isolated	Single Axis Integral Cable Mechanically Isolated	Single Axis Integral Cable Mechanically Isolated
Range (g)	±10000 g pk	±5000 g pk	±50000 g pk	±100000 g pk
Sensitivity (mV/g)	0.5	1.0	0.1	0.05
Frequency response (Hz)	0.4 - 10000	0.4 - 10000	4 - 10000	4 - 10000
Shock limit (g pk)	±50000	±50000	±150000	±150000
Temperature Range (Operating)	-10 to +150 °F -23 to +66 °C	-10 to +150 °F -23 to +66 °C	-10 to +150 °F -23 to +66 °C	-10 to +150 °F -23 to +66 °C
Dimensions (in(mm))	0.375 x 0.88 9.5 x 22.4	0.375 x 0.88 9.5 x 22.4	0.375 x 0.87 9.5 x 22.1	0.375 x 1.04 9.5 x 26.5
Weight (gm)	5.4	5.4	4.5	5.5
Excitation voltage (V)	20 - 30	20 - 30	20 - 30	20 - 30
Mounting method	1/4-28 UNF-3A stud	1/4-28 UNF-3A stud	1/4-28 UNF-3A stud	1/4-28 UNF-3A stud

SPECIFICATIONS				
Model Number	**PCB 350B41**	**PCB 350B42**	**PCB 350B43**	**PCB 350B44**
Description	Triaxial Hermetically Sealed Mechanically Isolated	Triaxial Hermetically Sealed Mechanically Isolated	Triaxial Hermetically Sealed Mechanically Isolated	Triaxial Hermetically Sealed Mechanically Isolated
Range (g)	±100000	±50000	±10000	±5000
Sensitivity (mV/g)	0.05	0.1	0.5	1.0
Frequency response (Hz)	4 - 10000	4 - 10000	0.4 - 10000	0.4 - 10000
Shock limit (g pk)	± 150,000	± 150,000	±50000	±50000
Temperature Range (Operating)	-10 to +150 °F -23 to +66 °C	-10 to +150 °F -23 to +66 °C	-10 to +150 °F -23 to +66 °C	-10 to +150 °F -23 to +66 °C
Dimensions (in(mm))	1.02 x 1.02 x 1.02 (26.0 x 26.0 x 26.0)	1.02 x 1.02 x 1.02 (26.0 x 26.0 x 26.0)	1.02 x 1.02 x 1.02 (26.0 x 26.0 x 26.0)	1.02 x 1.02 x 1.02 (26.0 x 26.0 x 26.0)
Weight (gm)	27	27	27	27
Excitation voltage (V)	20 - 30	20 - 30	20 - 30	20 - 30
Mounting method	Through Hole, 1/4-28 x .87 screw	Through Hole, 1/4-28 x .87 screw	Through Hole, 1/4-28 x .87 screw	Through Hole, 1/4-28 x .87 screw



PRESSURE PRODUCTS FOR BLAST TESTING

MEASURING EXPLOSIONS AND PROPELLANT BURNS

Pressure sensors with quartz, ceramic and tourmaline sensing elements are used for a wide variety of shock wave, blast and explosive testing. Typical applications include measurement of shock and blast waves, combustion or detonation in closed bombs, projectile velocity, free field or underwater explosive testing, and squib lot acceptance testing. All of these applications require high frequency response and durability, ability to drive long cables, and operate in adverse environments.

In applications involving long input cables to data acquisition systems, care must be exercised to assure the measurement system has adequate frequency response. Capacitance associated with the long cables can act as a low pass filter. Sensor output voltage, cable capacitance and constant current are factors to be considered. More current is required to drive higher voltages over longer cables. PCB® signal conditioners can be easily field-adjusted up to 20 mA to drive long cables. Selecting a sensor to provide about 1 V full scale for the expected pressure to be measured, rather than 5V, will provide 5 times greater frequency response for a given current and cable length.

Most of the sensors listed in this section incorporate acceleration-compensating sensing elements with integral electronics, which provide a frequency-tailored, non-resonant response. Frequency tailored sensors have microsecond rise time and suppressed resonance to faithfully follow shock wave events without the characteristic “ringing” common in other sensors.

APPLICATIONS:

- Air Blast Measurement
- Underwater Explosion Measurement
- Peak and Total Impulse
- Explosive Research and Structural Loading
- Shock Tube or Closed Bomb Testing
- Wave Velocity and/or Time of Arrival Determinations
- Explosive Component (e.g., Squib) Lot Acceptance

SERIES 113B - HIGH FREQUENCY, GENERAL PURPOSE PRESSURE SENSORS

PCB® Series 113B dynamic pressure sensors set the standard for extremely fast, micro-second response and a wide amplitude and frequency range that allows them to excel in high-frequency applications where minimum sensor diameter is required. Typical applications include combustion studies, explosive component testing (e.g. detonators, explosive bolts), airbag testing, and measurement of air blast shock waves resulting from explosions.

HIGHLIGHTS:

- Fast rise time ≤ 1 µsec from quartz element
- Ultra-high resonant frequency of ≥ 500 kHz
- Frequency-tailored output without the “ringing” characteristic of most other sensors
- Internal acceleration compensation minimizes shock and vibration sensitivity

MOUNTING ADAPTOR

MODELS 061A01, 061A10, 062A01

- Model 061A01: 3/8-24
- Model 061A10: M10
- Model 062A01: 1/8-NPT

MOUNTING ADAPTOR

MODEL 061A59

- 3/8-24 Delrin, ground isolated, up to 500 psi

HIGH FREQUENCY ICP® PRESSURE SENSOR								
Model Number	**113B28**	**113B27**	**113B21**	**113B26**	**113B24**	**113B22**	**113B23**	**113B03**
Sensitivity	100 mV/psi (14.5 mV/kPa)	50 mV/psi (7.25 mV/kPa)	25 mV/psi (3.6 mV/kPa)	10 mV/psi (1.45 mV/kPa)	5 mV/psi (0.725 mV/kPa)	1 mV/psi (0.145 mV/kPa)	0.5 mV/psi (0.073 mV/kPa)	0.44 pC/psi (0.064 pC/kPa)
Measurement Range (±5 Volt Output)	50 psi (345 kPa)	100 psi (690 kPa)	200 kpsi (1380 kPa)	500 psi (3450 kPa)	1 kpsi (6895 kPa)	5 kpsi (34475 kPa)	10 kpsi (68950 kPa)	15 kpsi (103420 kPa)
Low Frequency Response	0.5 Hz	0.5 Hz	0.5 Hz	0.01 Hz	0.005 Hz	0.001 Hz	0.0005 Hz	—

SERIES 8500 - PIEZORESISTIVE PRESSURE TRANSDUCERS

With designs suitable for blast pressure measurements, these pressure sensors feature quick response times and high output for excellent signal-to-noise ratio. They measure both static and dynamic pressure. Our miniature pressure sensors measure structural loading by shock waves resulting from blast explosions.

PIEZORESISTIVE PRESSURE TRANSDUCER

ENDEVCO MODEL 8510B

Output type: Voltage (MEMS)

Reference type: Gage

Full scale: 200/500/2000 psi (29/72.6/290 kPa)

PIEZORESISTIVE PRESSURE TRANSDUCER

ENDEVCO MODEL 8511AM8

Output type: Voltage (MEMS)

Reference type: Gage

Full scale: 5000/10000/20000 psi (726/1451/2903 kPa)

PIEZORESISTIVE PRESSURE TRANSDUCER

ENDEVCO MODEL 8530C

Output type: Voltage (MEMS)

Reference type: Absolute

Full scale: 50/100 psi (7./ 14.5 kPa)

PIEZORESISTIVE PRESSURE TRANSDUCER

ENDEVCO MODEL 8530BM37

Output type: Voltage (MEMS)

Reference type: Absolute

Full scale: 200/500/1000/2000 psia (29/72.6/145/290 kPa)

PIEZORESISTIVE PRESSURE TRANSDUCER

ENDEVCO MODEL 8530CM37

Output type: Voltage (MEMS)

Reference type: Absolute

Full scale: 15/50/100 psia (2.2/7.3/14.5 kPa)

SERIES 102B - GROUND ISOLATED VERSION OF THE SERIES 113B

These sensors have all of the same features and benefits of the Series 113B, plus the added benefit of having their output electrically isolated from ground, which helps prevent ground loop problems. This series can accommodate an optional ablative coating (Prefix: CA) to protect the diaphragm from thermal shock in flash-temperature applications.

HIGHLIGHTS:

- Ultra-high frequency > 500 kHz
- Fast rise time < 1 µsec
- Peak pressure and total impulse

APPLICATIONS:

- Shock Tubes and Closed Bombs
- Time-of-arrival Measurements
- Explosion, Blast, and Shock Wave

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B18

Sensitivity: 100 mV/psi (14.5 mV/kPa)

Measurement Range (±5 Volt Output): 50 psi (345 kPa)

Low Frequency Response: 0.5 Hz

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B16

Sensitivity: 50 mV/psi (7.25 mV/kPa)

Measurement Range (±5 Volt Output): 100 psi (690 kPa)

Low Frequency Response: 0.5 Hz

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B15

Sensitivity: 25 mV/psi (3.6 mV/kPa)

Measurement Range (±5 Volt Output): 200 psi (1380 kPa)

Low Frequency Response: 0.5 Hz

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B06

Sensitivity: 10 mV/psi (1.45 mV/kPa)

Measurement Range (±5 Volt Output): 500 psi (3450 kPa)

Low Frequency Response: 0.01 Hz

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B04

Sensitivity: 5 mV/psi (0.725 mV/kPa)

Measurement Range (±5 Volt Output): 1 kpsi (6895 kPa)

Low Frequency Response: 0.005 Hz

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B

Sensitivity: 1 mV/psi (0.145 mV/kPa)

Measurement Range (±5 Volt Output): 5 kpsi (34475 kPa)

Low Frequency Response: 0.001 Hz

GROUND ISOLATED, DYNAMIC PRESSURE SENSOR

MODEL 102B03

Sensitivity: 0.5 mV/psi (0.073 mV/kPa)

Measurement Range (±5 Volt Output): 10 kpsi (68950 kPa)

Low Frequency Response: 0.0005 Hz

SERIES 106B - ICP® 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.

CE

HIGH SENSITIVITY, ICP® ACOUSTIC PRESSURE SENSOR

MODEL 106B52

Sensitivity: 5000 mV/psi (725 mV/kPa)

Measurement Range: 1 psi (6.89 kPa)

Low Frequency Response (-5%): 2.5 Hz

CE

HIGH SENSITIVITY, ICP® ACOUSTIC PRESSURE SENSOR

MODEL 106B50

Sensitivity: 500 mV/psi (72.5 mV/kPa)

Measurement Range: 5 psi (34.45 kPa)

Low Frequency Response (-5%): 0.5 Hz

CE

HIGH SENSITIVITY, ICP® ACOUSTIC PRESSURE SENSOR

MODEL 106B

Sensitivity: 300 mV/psi (43.5 mV/psi)

Measurement Range: 8.3 psi (57.2 kPa)

Low Frequency Response (-5%): 0.5 Hz

SERIES 132 - TIME OF ARRIVAL, ICP® MICRO-PRESSURE SENSORS

High-Sensitivity Micro-Pressure Sensors are well suited for short wavelength acoustic and shock wave measurements associated with high-frequency projectile detection systems. Incorporating a 1 mm diameter sensing element and integral microelectronics in a 3 mm housing, these sensors have very high sensitivity and microsecond response capable of identifying the bow and stern wave from a passing projectile. An internal 8 kHz high-pass filter eliminates low-frequency inputs. Series 132 Microsensors are available in five different physical configurations to accommodate a wide range of application requirements.

Series 132A30 Microsensors all have a sensitivity of 100 mV/psi and come in a variety of external configurations to suit your specific application.

HIGHLIGHTS:

- Shock wave time-of-arrival ICP® microsensors
- 50 psi (344 kPa) range
- Rise time <3 µsec
- Resonant frequency >1M Hz
- 0.124” (3.15 mm) diameter diaphragm

TIME OF ARRIVAL, ICP® MICRO-PRESSURE SENSORS

MODEL 132B38

- Sensitivity: 140 mV/psi (20.3 mV/kPa)
- Measurement Range: 50 psi (345 kPa)
- Low Frequency Response (-5%): 11 kHz

SERIES 134 - TOURMALINE PRESSURE BAR

This unique non-resonant sensor is designed for instantaneous, reflected (face-on) shock wave pressure measurements. A shock wave pressure impacting the very thin tourmaline crystal which operates into a silver alloyed “pressure bar”, eliminates sensor structure response. The sensor has a 0.2-microsecond rise time. Since the sensor diaphragm end is coated with a conductive silver epoxy, the sensor should not be used in water or chemical environments. Series 134 can be used for shock tube calibration in a dry gas environment.

HIGHLIGHTS:

- Designed for reflected shock wave pressure measurement
- Unique non-resonating design, Tourmaline sensing element
- Pressure ranges from 1000 to 20k psi (6894 to 137,900 kPa)
- Rise time ≤ 0.2 µsec

TOURMALINE PRESSURE BAR

SERIES 134

- Sensitivity: 5 mv/psi to 0.25 mV/psi (0.73 mV/kPa to 0.04 mV/kPa)
- Measurement Range: 1000 psi to 20 kpsi (6895 kPa to 137900 kPa)
- Low Frequency Response (-5%): 0.25 kHz

SERIES 137 - ICP® FREE-FIELD BLAST PRESSURE "PENCIL" PROBE

Series 137 incorporates acceleration-compensated quartz elements and integral microelectronics for long cabledriving, improved stability and low thermal sensitivity.

MODEL 137B2XB (BNC CONNECTOR)

MODEL 137B2XA (10-32 CONNECTOR WITH PROTECTIVE COVER)

MODEL 137B25 (4-PIN CONNECTOR WITH 2-CHANNEL OUTPUT)

HIGHLIGHTS:

Pressure ranges from 25 to 1,000 psi (173 to 6,895 kPa)

Rise time ≤ 6.5 µsec (incident)

Resonant frequency ≥ 400 kHz

The 137 series is available in single and dual-sensing element housings

137B32 features an active sensor in the front and placebo in the rear

137B29B is high sensitivity with exceptional resolution (0.002 psi) for low pressure measurements

FREE-FIELD ICP® BLAST PRESSURE PROBE					
Model Number	**137B21B**	**137B22B**	**137B23B**	**137B24B**	**137B29B**
Measurement Range	1 kpsi [3] 6895 kPa [3]	500 psi 3447 kPa	50 psi 345 kPa	250 psi 1724 kPa	25 psi 173 kPa
Useful Overrange	—	1 kpsi [1] 6895 kPa [1]	100 psi [1] 690 kPa [1]	500 psi [1] 3447 kPa [1]	50 psi [1] 345 kPa [1]
Sensitivity	1 mV/psi 0.145 mV/kPa	10 mV/psi 1.45 mV/kPa	100 mV/psi 14.5 mV/kPa	20 mV/psi 2.9 mV/kPa	200 mV/psi 29 mV/kPa
Maximum Pressure	5 kpsi 34,475 kPa	5 kpsi 34,474 kPa	1 kpsi 6895 kPa	5 kpsi 34,474 kPa	1 kpsi 6895 kPa
Resolution	8.5 mpsi 0.059 kPa	1 mpsi 0.007 kPa	10 mpsi 0.069 kPa	0.7 mpsi 0.005 kPa	2 mpsi 0.01 kPa
Resonant Frequency	> 400 kHz	> 400 kHz	> 400 kHz	> 400 kHz	> 300 kHz
Rise Time (Incident)	< 4 µsec	< 4 µsec	< 4 µsec	< 4 µsec	< 6.5 µsec
Non-linearity	< 1 % [2]	< 1 % [2]	< 1 % [2]	< 1 % [2]	< 1 % [2]
Temperature Range	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C	-100 to +275 °F -73 to +135 °C
Discharge Time Constant(at room temp)	> 0.2 sec	> 0.2 sec	> 0.2 sec	> 0.2 sec	> 0.2 sec
Electrical Connector	BNC Coaxial Jack	BNC Coaxial Jack	BNC Coaxial Jack	BNC Coaxial Jack	BNC Coaxial Jack
Housing Material	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
Diaphragm Material	Invar	Invar	Invar	Invar	Invar
Sealing	Epoxy	Epoxy	Epoxy	Epoxy	Epoxy
Additional Accessories					
Mating Cable Connectors	—	—	AC	—	AC
Recommended Stock Cables (29 pF/ft, 95 pF/m)	002ACXXXAC	002ACXXXAC	002ACXXXAC	002ACXXXAC	002ACXXXAC
Dual Output Cable	010AYXXXQM	010AYXXXQM	010AYXXXQM	010AYXXXQM	—
Additional Versions					
10-32 Coaxial Jack Connector with Protective Cover	137B21A	137B22A	137B23A	137B24A	—
Placebo, BNC Jack Only	137BPBO	137BPBO	137BPBO	137BPBO	137BPBO
Two-Sensor Pencil Probe	137B28	137B27	137B25	137B26	—
Active Sensor in front, Placebo in rear	—	—	—	137B32	—
Notes					
[1] For +10 volt output, minimum 24 VDC supply voltage required. Negative 10 volt output may be limited by output bias. [2] Zero-based, least-squares, straight line method. [3] For +/- 1V output.					

SERIES 138 - ICP® TOURMALINE UNDERWATER BLAST SENSOR

Series 138 Sensors measure shock wave pressures associated with underwater explosion testing. The sensors are structured with a volumetrically sensitive tourmaline crystal, suspended and sealed in an insulating, oil-filled vinyl tube. They have integral microelectronics. These underwater shock wave sensors provide a clean, non-resonant, high-voltage output through long cables in adverse underwater environments. They can be supplied with a sealed cable of appropriate length, ready to operate. Two physical configurations are available.

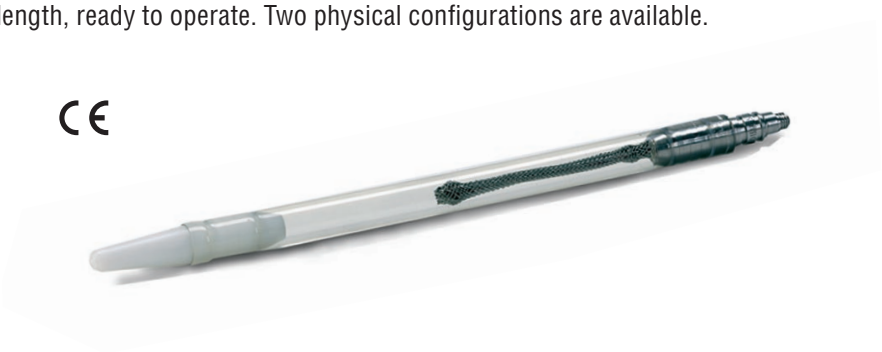
HIGHLIGHTS:

ICP® underwater blast explosion pressure probes

Ranges from 1000 to 50k psi (6894 to 344,740 kPa)

Rise time < 1.5 µsec

Resonant frequency > 1M Hz



UNDERWATER TOURMALINE BLAST SENSORS FOR PEAK, OVERPRESSURE AND HIGH-PRESSURE BUBBLE ENERGY MEASUREMENTS			
SERIES 138A MODEL NUMBERING SYSTEM			
1) Connector Type			
Default	10-32 Coaxial Jack		
W	Attached Waterproof Cable		
	2A) ICP® Output Pressure Range and Tube Length / Configuration		
	138A01	Measurement Range: 1000 psi (6895 kPa) with 7.6 in.(193 mm) Length and Sinker Hole for Vertical Mounting	
	138A02	Measurement Range: 1000 psi (6895 kPa) with 4.7 in. (120 mm) Length for Horizontal Mounting	
	138A05	Measurement Range: 5000 psi (34475 kPa) with 7.6 in.(193 mm) Length and Sinker Hole for Vertical Mounting	
	138A06	Measurement Range: 5000 psi (34475 kPa) with 4.7 in. (120 mm) Length for Horizontal Mounting	
	138A10	Measurement Range: 10 kpsi (68950 kPa) with 7.6 in.(193 mm) Length and Sinker Hole for Vertical Mounting	
	138A11	Measurement Range: 10 kpsi (68950 kPa) with 4.7 in. (120 mm) Length for Horizontal Mounting	
	138A25	Measurement Range: 25 kpsi (172375 kPa) with 7.6 in.(193 mm) Length and Sinker Hole for Vertical Mounting	
	138A26	Measurement Range: 25 kpsi (172375 kPa) with 4.7 in. (120 mm) Length for Horizontal Mounting	
	138A50	Measurement Range: 50 kpsi (344750 kPa) with 7.6 in. (193 mm) Length and Sinker Hole for Vertical Mounting	
	138A51	Measurement Range: 50 kpsi (344750 kPa) with 4.7 in. (120 mm) Length for Horizontal Mounting	
	2B) Charge Output Pressure Range and Tube Length / Configuration		
	138A	Measurement Range: 25 kpsi (172375 kPa) with 7.6 in.(193 mm) Length and Sinker Hole for Vertical Mounting	
	138A24	Measurement Range: 25 kpsi (172375 kPa) with 4.7 in. (120 mm) Length for Horizontal Mounting	
		3) Attached Model 038 Cable Length (add only if ordering the W option)	
		/038CYxxxAC	Specify total length xxx in feet. Cable is terminated with BNC plug connector
		/M038CYxxxAC	Specify total length xxx in meters. Cable is terminated with BNC plug connector
Example			
W	138A05	/038CY300AC	Attached 300 ft. 038 cable, 5000 psi measurement range, 7.6 in. length, sinker hole, BNC plug termination

PRESSURE PRODUCTS FOR BALLISTIC TESTING

BALLISTIC PRESSURE SENSORS

PCB® has supplied high frequency, durable, Quartz ballistics pressure sensors in both charge and ICP® voltage mode versions for over forty years. The Series 109 ICP® ballistic pressure sensors are acceleration compensated, and have a ceramic coated integral diaphragm to attenuate thermal shock associated with burning propellants. This series also features a floating clamp nut that reduces strain sensitivity on the sensor body due to mounting torque. The ICP® integral electronics are protected from shock such as that found in gun test applications. Series 119 charge output versions are also available.

In the early 1970's PCB® worked with members of the Sporting Arms and Ammunition Manufacturers' Institute (SAAMI) to develop an accurate, durable, standard test method for sporting arms ammunition. Pressure sensors suitable for implementation into a standardized test method for rapid-fire production testing of ammunition were required. This method involved a sensor with a machined curved diaphragm that measures pressure directly through the shell case. Based on this success, the conformal sensor became a SAAMI/ANSI "National Standard" for ammunition testing.

Series 117B conformal pressure sensors measure true gun chamber pressure directly through an unmodified shell case. Since the sensor diaphragm is machined to conform flush to the specific chamber diameter, the measurement process is not altered or changed in any way. There are no cartridges to be drilled or troublesome gas passages to be cleaned when using the conformal method. Conformal sensors have proven to be rugged, stable instruments, lasting thousands of rounds. Since the same sensor may outlast the life of many barrels, it is possible to start and finish ammunition batch qualification testing without experiencing sensor failure during the test.

APPLICATIONS:

- Ammunition and Gun Testing
- Explosives Testing
- Closed Bombs
- Recoil Mechanisms
- Ultra High-frequency Detonation

Keeping with our tradition, PCB® continues to offer a complete line of sensors for conformal and case mouth ballistic measurements. All PCB® sensors are provided with NIST traceable calibration. For pre-calibration stabilization purposes, all ballistic pressure sensors are hydraulically cycled at high pressures and most are test fired in the PCB® ballistic firing range. PCB® also offers a high pressure static calibration system, Model 905C, for on-site use in ballistic labs. Side-by-side dynamic/static comparison calibration services are offered for PCB® and competitors' ballistic sensors.

SERIES 109 ICP® BALLISTIC SENSORS

PCB® offers a complete line of high pressure ballistic sensors with integral electronics. They operate from a PCB® constant-current signal conditioner and provide a high-voltage, low-impedance output. ICP® sensors are well suited for applications involving long cables and operation in dirty factory or field environments.

These sensors incorporate a captivated floating clamp nut and a more stable structure for improved accuracy, reliability, and lower thermal transient sensitivity. They are structured with quartz sensing elements, built-in microelectronics, and an integral machined ceramic-coated diaphragm for greater durability, overrange capability, high-frequency response, and improved linearity.

Series 109 are acceleration-compensated ICP® sensors for high-energy, high-frequency applications, such as detonation, closed bomb combustion, and explosive blast measurements under extreme shock conditions.

CE

HIGH PRESSURE ICP® BALLISTIC PRESSURE SENSOR

MODEL 109D12

Sensitivity: 0.07 mV/psi (0.010 mV/kPa)

Measurement Range: 100000 psi (689000 kPa)

Maximum Pressure: 125000 psi (862000 kPa)

SERIES 119 CHARGE MADE BALLISTIC SENSORS

Charge Mode Pressure Sensors are well suited for high-pressure ballistics, detonation, and explosive research and test applications.

These sensors incorporate stable quartz-sensing elements, a durable-machined ceramic-coated integral diaphragm and floating clamp nut.

Series 119 are unique, acceleration-compensated, high resolution ballistic sensors designed for high-pressure, high-energy ballistics, detonation, and explosive applications under high-shock conditions, such as those that might be encountered in howitzer and liquid-propellant weapons.

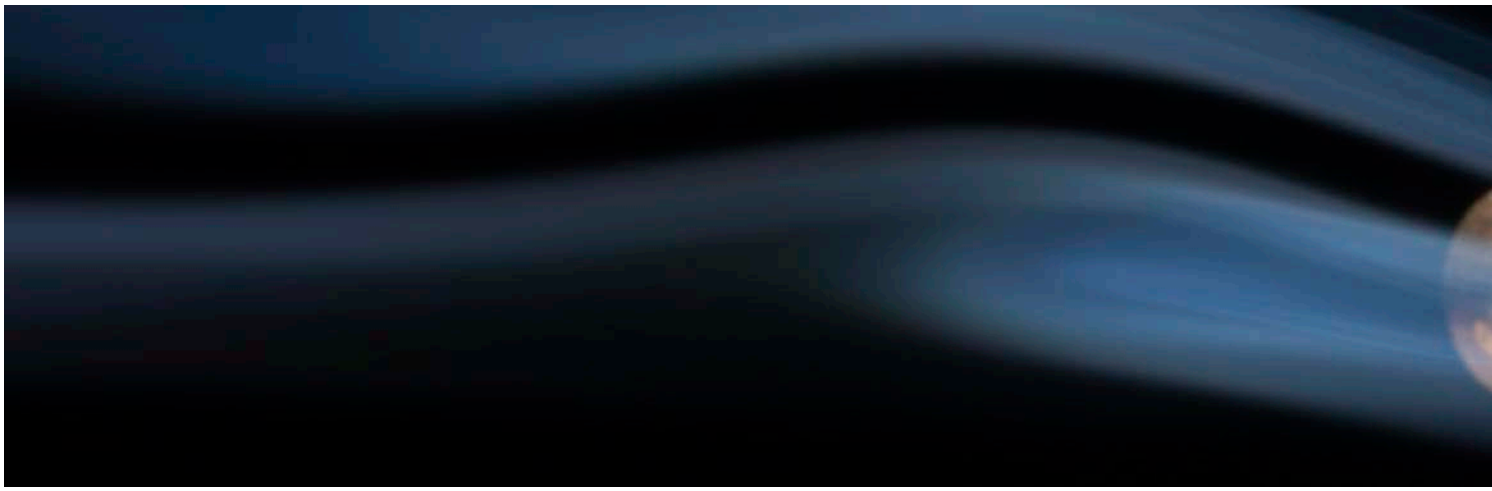
HIGH PRESSURE BALLISTIC PRESSURE SENSOR

MODEL 119C12

Sensitivity (±15%): 0.25 pC/psi (0.036 pC/kPa)

Measurement Range: 0 to 100000 psi (0 to 689000 kPa)

Maximum Pressure: 125000 psi (862000 kPa)



SERIES 117B - CHARGE MODE CONFORMAL BALLISTIC SENSORS

Conformal ballistic sensors measure true gun chamber pressure directly through the cartridge case. The diaphragm of the conformal sensor is contoured to match a specific chamber diameter. An alignment guide and spacers help the user to install the sensor flush with the gun chamber walls.

The conformal ballistic sensor, when correctly installed, has a proven life expectancy of hundreds of thousands of rounds, outlasting many test barrels. Rapid-fire testing is possible since there are no cartridges to drill and align, no diaphragm ablatives to apply, and no gas passages to clean. The conformal sensor does not affect operation of the test barrel, nor change the measurement process.

Developed in cooperation with members of SAAMI to provide an accurate rapid-fire electronic production test method to replace the mechanical “copper crusher,” the conformal sensor has experienced 20 years of proven performance.

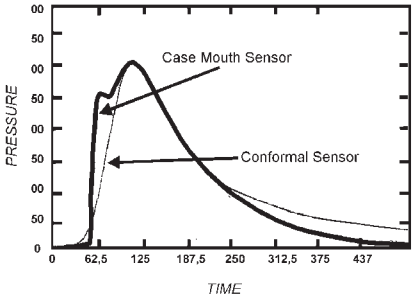
Conformal calibration through an unfired, unmodified empty cartridge shell case with PCB® Series 090B Calibration Adaptor accounts for the effects of the cartridge case. Output from the conformal sensor is compatible with any charge amplifier. The PCB® Model 443A53 Digital Peak Holding System with a charge amplifier and auto-reset peak meter facilitates rapid-fire testing of production ammunition.

The two machined flats near the connector end, an alignment guide, and a captive retaining nut facilitate installation. The nut automatically extracts the sensor when it is unscrewed. Series 090B Calibration Adaptor permits static calibration of the Model 117B Sensor, with pressures to be applied to the empty cartridge case. Spacer set is supplied to facilitate flush installation of the sensor.

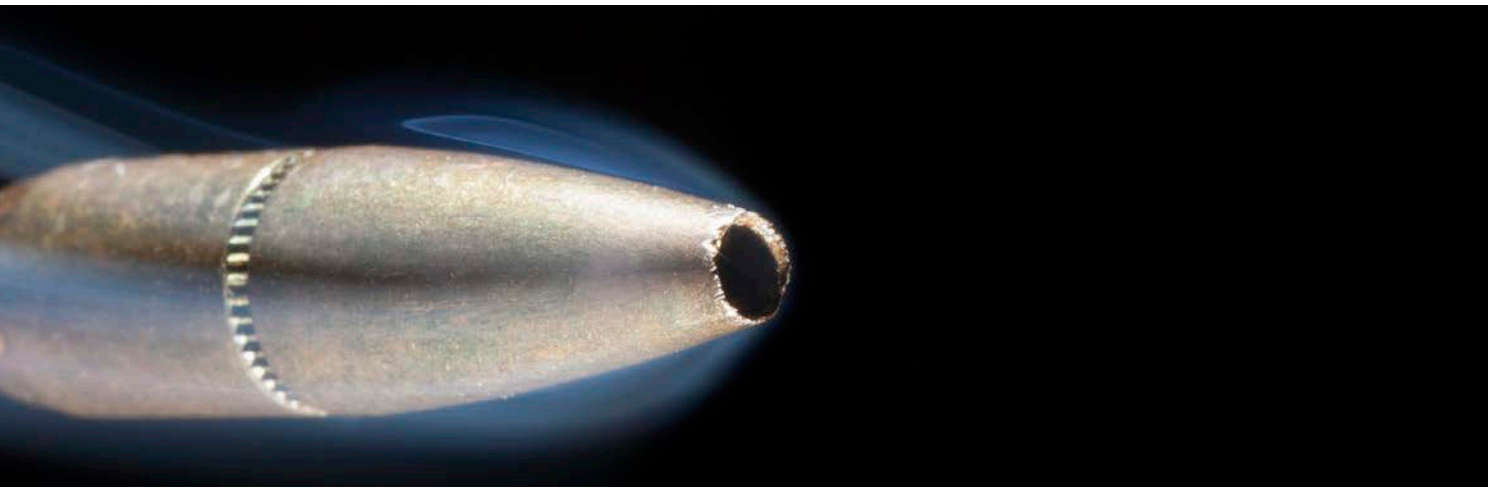
HIGHLIGHTS:

- Proven long life
- Outlasts life of many barrels
- ANSI/SAAMI standards Z299 test method
- Allows rapid-fire testing
- No drilled cases or recessed passages
- Cost effective

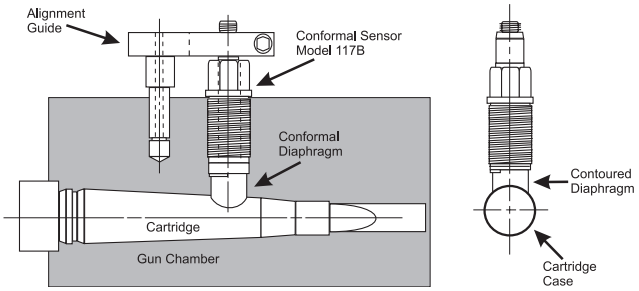
Conformal vs. Standard Case Mouth Installation



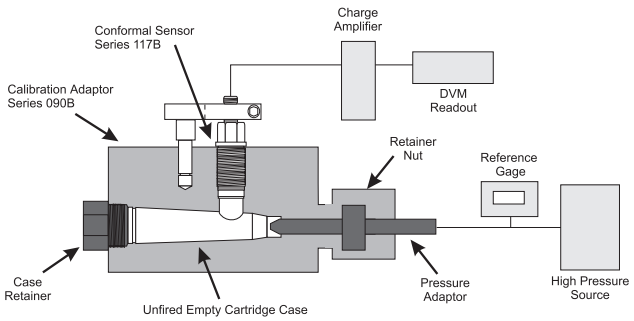
MODEL 117B



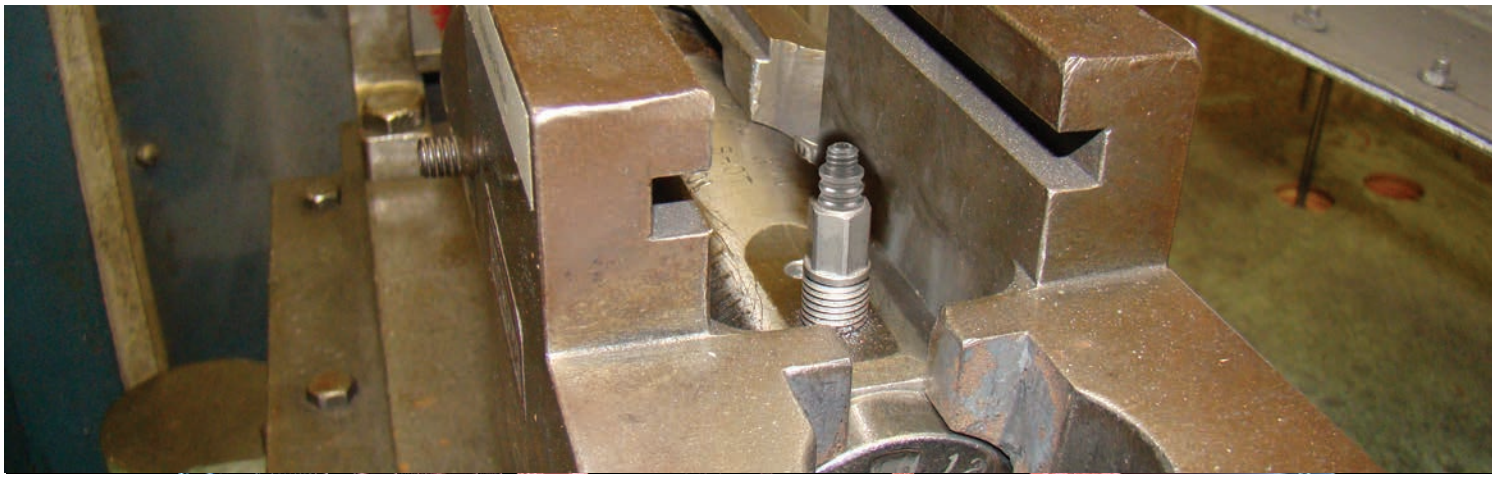
Typical Conformal Sensor Installation in Universal Receiver



Typical Conformal Calibration Adaptor System



BALLISTIC PRESSURE SENSORS SMALL ARMS TESTING		
	Conformal Gages	
	Contact factory for proper model number to match the caliber of ammunition under test	
Model Number	**117B Small Caliber**	**117B Large Caliber**
Measurement Range	35 kpsi 241 kPa	60 kpsi 414 kPa
Sensitivity	0.110 pC/psi 0.016 pC/kPa	0.140 pC/psi 0.021 pC/kPa
Maximum Pressure	40 kpsi 275 kPa	80 kpsi 552 kPa
Resolution	2 psi 14 kPa	2 psi 14 kPa
Resonant Frequency	> 300 kHz	> 300 kHz
Rise Time (Reflected)	<2 µsec	< 2 µsec
Non-linearity	<2 % [1]	< 2 % [1]
Acceleration Sensitivity	<0.02 psi/g <0.014 psi/(m/s²)	<0.02 psi/g <0.014 psi/(m/s²)
Temperature Range	-100 to +400 °F -73 to +204 °C	-100 to +400 °F -73 to +204 °C
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack
Housing Material	17-4SS	17-4SS
Diaphragm Material	17-4SS	17-4SS
Additional Accessories		
Conformal Calibration Adaptors	090B	090B
Brass Calibration	Contact factory for assistance, requires customer supplied brass casings and conformal adaptor	
Mating Cable Connectors	EB	EB
Recommended Stock Cables	003	003
Notes		
[1] Zero-based, least-squares, straight line method.		



MODEL 118A07 - CHARGE MODE SHOT SHELL SENSOR

For production testing of shotshell ammunition per SAAMI recommendations, this upgraded sensor measures chamber pressure through the case wall of an unmodified cartridge. The number of rounds capability has increased due to a recently modified design.

Recommended Ballistic Peak Pressure Monitoring System

MODEL 444A53
Ballistic Peak Pressure Monitoring System See Details on page 23.

BALLISTIC SHOT SHELL PRESSURE SENSOR

MODEL 118A07

Sensitivity (±15%): 0.28 pC/psi (0.041 pC/kPa)

Measurement Range: 15000 psi (103400 kPa)

Maximum Pressure: 35000 psi (241316 kPa)

FORCE & STRAIN PRODUCTS FOR STRUCTURAL IMPACT

IMPACT FORCE SENSORS

Quartz, piezoelectric force, and strain sensors are durable measurement devices, which possess exceptional characteristics for the measurement of dynamic force and strain events.

CE

ICP® QUARTZ FORCE RING FOR PERFORMANCE APPLICATIONS

SERIES 201B

Sensitivity: 50 to 1 mV/lb
(11240 to 224.8 mV/kN)

Measurement Range: 100 to 5000 lb
(0.4448 to 22.24 kN)

Low Frequency Response (-5%):
0.006 to 0.0003 Hz

CE

GENERAL PURPOSE QUARTZ FORCE SENSORS

SERIES 208C

Sensitivity: 500 - 1 mV/lb
(112.41 - 0.2248 mV/N)

Measurement Range: 10 - 5000 lb
(44.5 - 22.24 kN)

Low Frequency Response (-5%):
0.0003 - 0.01 Hz

APPLICATIONS:

Crash Testing

Crushing

Drop Testing

Fatigue Testing

Fracture Testing

Materials Testing

Penetration Testing

Dynamic Tension & Compression

Impact & Repetitive Applications

Drop Testing

Materials Testing

MODEL 740B02 - DYNAMIC ICP® STRAIN SENSORS

Structured with a quartz sensing element and microelectronic circuitry in a low-profile titanium housing, this sensor is ideal for high-resolution measurements of dynamic strain. This unit is compatible with PCB's ICP® Sensor signal conditioners and is capable of driving long cables. Typical applications include: active vibration control, noise-path analysis, modal testing, and use on aircraft and marine hulls, composite materials, and "smart" structures.

This product is CE-marking compliant to European Union EMC Directive, based upon conformance testing to the following European norms:

EN 50081-1: 1992 Emissions

EN 50082-1: 1992 Immunity

HIGHLIGHTS:

Measures small strain on top of large static loads

Provides high resolution and wide dynamic range

Designed with low profile and integral cable

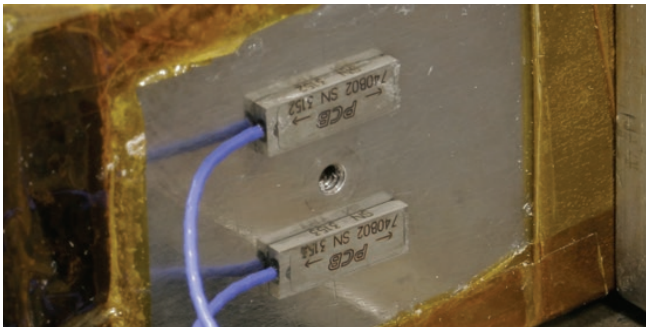
Contains built-in microelectronic circuitry

Detects wave propagation for material velocity characterization

Photo Courtesy of Siemens and Belgian Defense

TYPICAL APPLICATION:

An epoxy-bonded Model 740B02 Strain Sensor provides a control signal for an actively damped flexible robot manipulator, illustrated above. The electronic controller, with vibration feedback from the strain sensor, provides a signal to the amplifier, such that vibration amplitude is minimized. The active control system permits rapid settling time for a step rotation of the manipulator arm.



CE

ICP® PIEZOELECTRIC STRAIN SENSOR

MODEL 740B02

Sensitivity (±20%): 50 mV/με

Measurement Range: 0 to 120000 psi (552000 kPa)

Maximum Pressure: 125 kpsi (862000 kPa)

CE

ICP® PIEZOELECTRIC STRAIN SENSOR

MODEL 740M04

Sensitivity (±20%): 5 mV/με

Measurement Range: 0 to 120000 psi (552000 kPa)

Maximum Pressure: 125 kpsi (862000 kPa)

PLACEBO TRANSDUCERS

For any testing in which the environmental operating conditions of a transducer vary with time and/or location, several requirements must be fulfilled before measurement uncertainty analysis is justified. Included among the requirements are good measurement system design practices, such as adequate low- and high-frequency response and data-sampling rates, appropriate anti-aliasing filter selection, proper grounding and shielding, and much more.

In addition to these requirements, data validation must be performed to establish that each transducer responds only to the environmental stimulus for which it is intended. For piezoelectric and piezoresistive transducers, “placebo” (IEST-RP-DTE011.1) transducers enable data validation to be accomplished. The referenced IEST standard defines a placebo transducer as ‘identical to a “live” unit in every parameter except for mechanical sensitivities.’ The placebo transducer should respond only to extraneous “environmental factors.” Ideally, its output would be zero. Any signal output from it would indicate that signals from the “live” transducers could be corrupted.

Every transducer responds to its environment in every way it can. For example, accelerometer specifications include their response to thermal, acoustic, strain, and radiation stimuli, to name a few. While accelerometers must have their response to acoustic pressure specified, pressure transducers must have their response to acceleration specified. Thus, one transducer’s desired response becomes another’s undesired response.

These undesired responses can cause a change in transducer sensitivity or can result in additive, spurious signals at the transducer’s output attributable to thermoelectric, electromagnetic, triboelectric and other self-generating noise phenomena. Since the test or instrumentation engineer has the best understanding of the test environment, he/she becomes responsible for data validation. The transducer manufacturer can assist by supplying “placebo” transducers to support this validation process.

137BPB0

Endevco Model 7280A-Z

Model 102BPB0

Model 350B21PB0

Model 113B22PB0

Model 356A32PB0

Model 3991A11PB0

Model 354C03PB0

Model 356A33PB0

Other models available upon special request. Contact your local Sales Representative for more information.

CALIBRATION PRODUCTS

PRESSURE CALIBRATION SYSTEMS

In addition to the products listed below, PCB® is also able to perform a number of special calibration and testing services, upon request. These include acceleration sensitivity, ballistics firing range, cold gas shock tube, discharge time constant, temperature effects from –320 to +1000 °F (-196 to +535 °C), hydrostatic and hermeticity, mechanical shock, and PIND (Particle Impact Noise Detection).

LOW PRESSURE CALIBRATION SYSTEM

MODEL K9903C

Maximum pressure:
1 MPa (150 psi)

Pneumatic calibration media

'Step' pressure input

5 ms rise time

Automated pressure controller

MEDIUM PRESSURE CALIBRATION SYSTEM

MODEL K9907C

Maximum pressure:
6.9 MPa (1000 psi)

Compressed air or industrial helium media

'Step' pressure input

Fastest rise times using poppet valve mechanism

HIGH PRESSURE CALIBRATION SYSTEM

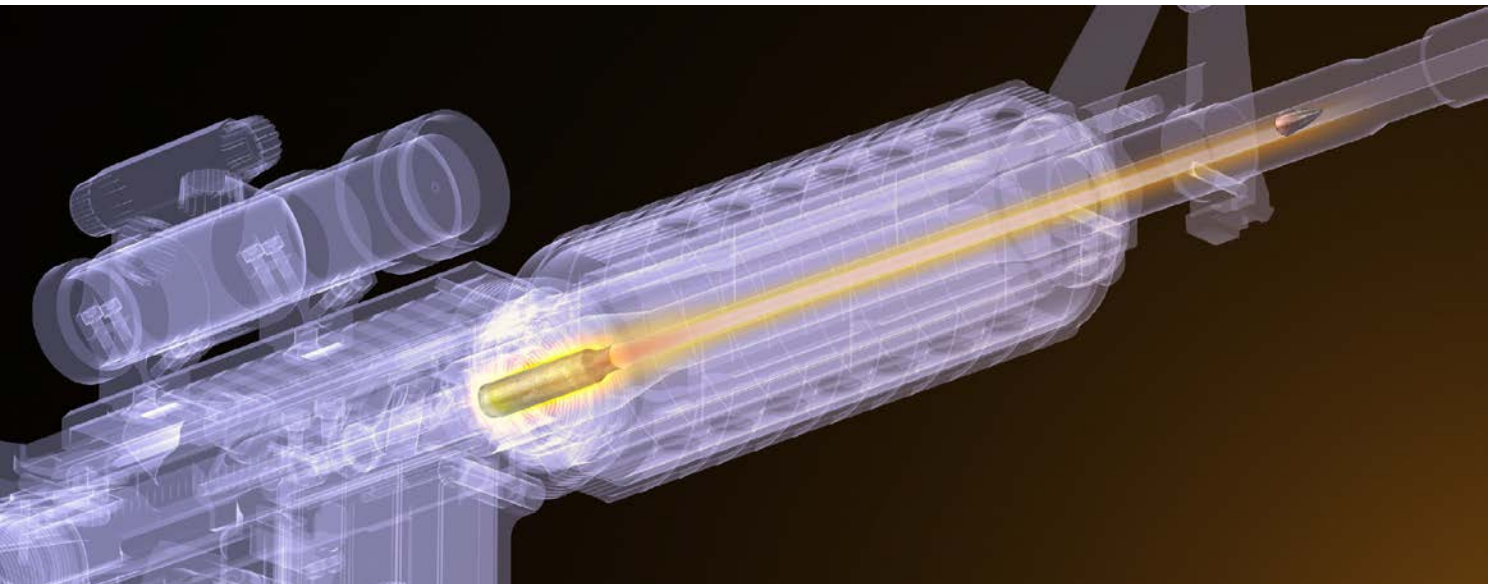
MODEL K9913C

Maximum pressure:
103 MPa (15000 psi)

Silicon oil media

'Impulse' pressure input

3 ms rise time with 7 ms pulse duration using drop mass



ULTRA HIGH PRESSURE CALIBRATION SYSTEM

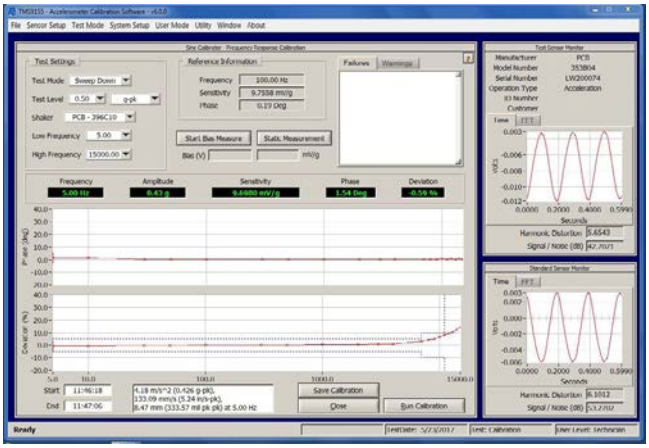
MODEL K9905D

- Maximum pressure: 550 MPa (80000 psi)
- Hydraulic calibration media
- ‘Step’ pressure input
- Quasi-static method available for ballistics sensors and brass calibration
- SAAMI standard brass calibration

INSTRUMENTED SHOCK TUBE

MODEL K9901C

- Enables high frequency resonant frequency measurement
- High speed time of arrival measurements
- Operates with compressed air or inert gas
- Max burst pressure 9.6 MPa (1400 psi)



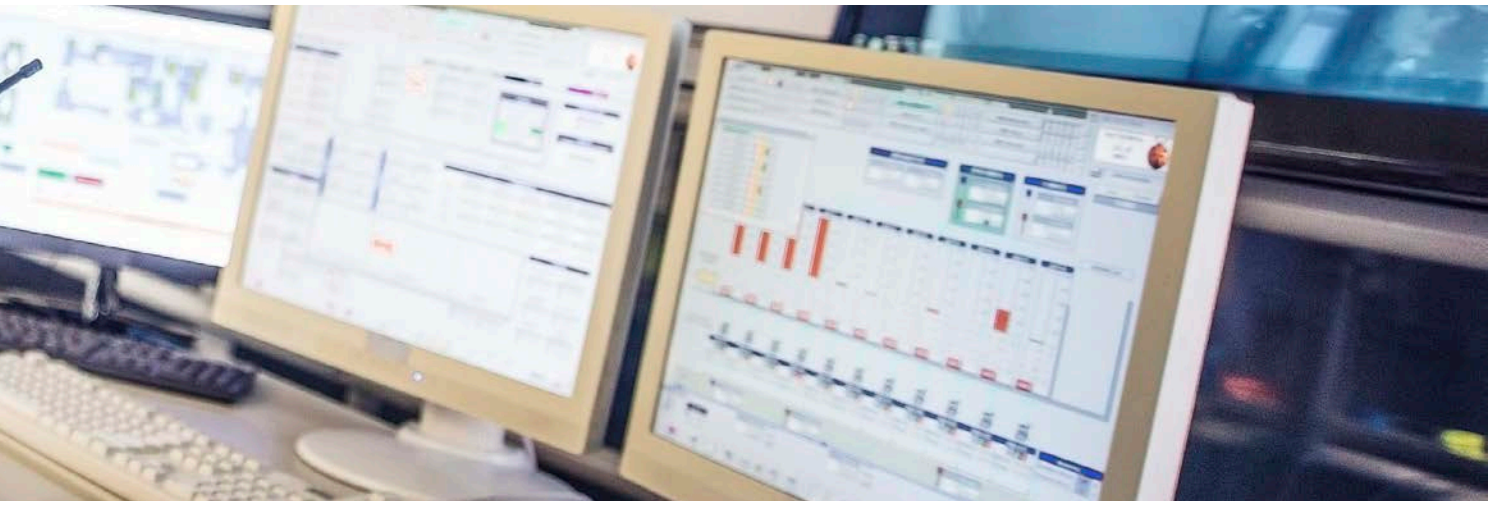
MODEL 9155D - ACCELEROMETER CALIBRATION WORKSTATION

The Accelerometer Calibration Workstation Model 9155D is a turnkey solution that provides all the necessary components out of the box. Principal components include a Windows® PC Controller, software, printer and 24-bit data acquisition card. System options allow custom configuration of the modular system with a variety of shakers and shock towers, accelerometer signal conditioning, test software modules and mounting accessories.

The system often includes the 9155D-830 or 9155D-831 air bearing shaker. With our air bearing shakers, customers benefit from two things: PCB's R&D investment in precision metrology and years of experience on PCB's accelerometer production line. The real world experience these shakers have in our factory results in a mature design that has been 'hardened' for durability and optimized for usability.

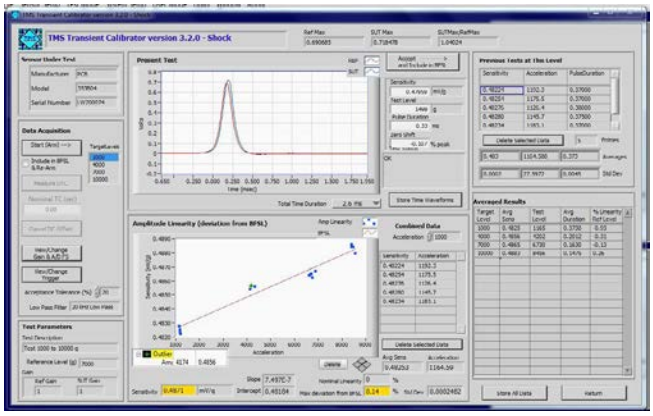
HIGHLIGHTS:

- Wide frequency range of 0.1 Hz to 20 kHz
- Resonant frequency testing up to 50 kHz
- Drastically reduces uncertainty by virtually eliminating transverse motion
- Integral quartz ICP® reference for long-term stability
- Lorentz force coil enables rapid centering of sensors with varying mass



MODEL K9525C - SHOCK ACCELEROMETER CALIBRATION WORKSTATION

The PneuShockTM Model K9525C is a turnkey calibration solution for shock accelerometers. Shocks pulses are created at accelerations from 20 g to 10000 g using a pneumatically operated projectile to strike an anvil and excite the sensor. By controlling both the level and the duration of the air pressure applied, the user gains greater control and consistency of the impacts. PneuShock provides verification and linearity check. We also offer Model 9155D-525 as an optional module for the 9155D Accelerometer Calibration Workstation.



HIGHLIGHTS:

- Amplitude linearity calibration of shock and crash sensors from 20 g to 10000 g, per ISO 16062-22
- Controlled and consistent impacts using state-of-the-art pneumatically
- Easy refinement of impulse shape and frequency content using a wide variety of impact anvils
- Superior impact control through drive pressure and duration control

SPECIALIZED INSTRUMENTATION

MODEL LXT1-QPR
TYPE 1 SOUND LEVEL METER
FIREARMS DETECTION SYSTEMS

Model LxT1-QPR handheld sound level meter features a small, lightweight ergonomic design, available real-time 1/1 and 1/3 octave frequency analysis, and comes standard with a 100dB dynamic range and a 377C10 microphone for measuring 178 dB typical. When configured with PCB Models 377C01 or 377A12 1/4" microphones, the system can safely measure high level acoustic signatures typically associated with gun-fire.

Model LxT1-QPR can be upgraded to allow easy comparison of multiple shots, high-speed data logging and a large LCD display which is easily readable in all lighting conditions. In addition, the unit can be powered for 16 hours on 4xAA batteries for ease of use in the field. Finally, Model LxT1-QPR has 2GB of on-board memory and a USB connection to PC for data downloading and reporting.

LARSON DAVIS
A PCB DIVISION

A full line of accessories is available including software, sound level calibrators, outdoor microphone systems, weatherproof enclosures for short and long-term monitoring and a variety of tripods and mounting hardware. For complete specifications on Model LxT1-QPR, please visit Larson Davis at http://www.larsondavis.com/Products/soundlevelmeters/modellxt1qpr.

DB LIMIT (1/4" MICROPHONE)

377C01 = 168dB

377A12 = 182dB

CE

MODEL 444A53: BALLISTIC PEAK PRESSURE MONITORING SYSTEM

The Model 444A53 is a modular-style signal conditioner that combines a dual-mode amplifier module (443B102), a peak voltage monitoring module (444A152), and an AC power supply module (441A101) into one, integrated device. The unit connects directly with an ICP® or charge output pressure sensor, normalizes sensor sensitivity, and displays peak transient measurement signals in voltage or pressure units.

Unlike a digitizing peak detector, which is limited in accuracy by the sampling rate, the 444A152 peak monitoring module captures the true peak voltage of the transient event. Additionally, the module incorporates a 20 kHz low pass filter, offers reset capability between events, and delivers an analog output signal to profile the entire pressure event.

This device is ideal for barrel chamber pressure testing, lot testing of ammunition, and cartridge load studies. Two alternative versions (Models 444A51 and 444A52) eliminate the dual mode amplifier module and are intended for direct connection to ICP® pressure sensors, any direct voltage input, or for existing systems that already utilize a separate charge amplifier.

SPECIFICATIONS	
Model	**444A53**
Performance	
Channels	1
Input Sensor Type (selectable)	ICP®, charge, voltage
Input Sensitivity Adjustment (normalization)	0.001 to 9999 (pC or mV per unit)
Excitation Supplied (ICP® mode)	24 VDC @ 0 to 20 mA
Voltage Gain (ICP® or voltage mode)	0.1 to 1000
Charge Converter (charge mode)	0.1 to 10000 mV/pC
Charge Input Limit	100000 pC
Drift (long DTC mode)	<0.03 pC/sec
Discharge Time Constant (selectable)	0.18, 1.8, 10, 100, 1000, >100000 sec
Peak / DVM Display	4-digit LCD
Peak Voltage Display Range (infinite hold)	± 10 V
Accuracy	± 1%
Display Mode	Peak, DVM, Bias Test (for ICP® sensors)
Rise Time	<1 µsec
Low Pass Filter	20 kHz
Peak Reset	Manual, Remote, or Auto (1 to 99 sec)
Environmental	
Temperature Range	+32 to +120 °F 0 to +50 °C
Electrical	
Power Required	100 to 240 VAC, 50 to 60 Hz
Relays (2 Form C each with HI or LOW setpoint)	1 A @ 30 VDC, 1/2 A @ 125 VAC
Physical	
Size (h x w x d)	6.2 x 6.06 x 10.2 in 157.5 x 153.9 x 259.1 mm
Electrical Connectors (input, peak/DVM output, analog output, remote reset)	BNC Jack

SIGNAL CONDITIONING & CONVERTERS

PCB® 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®

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

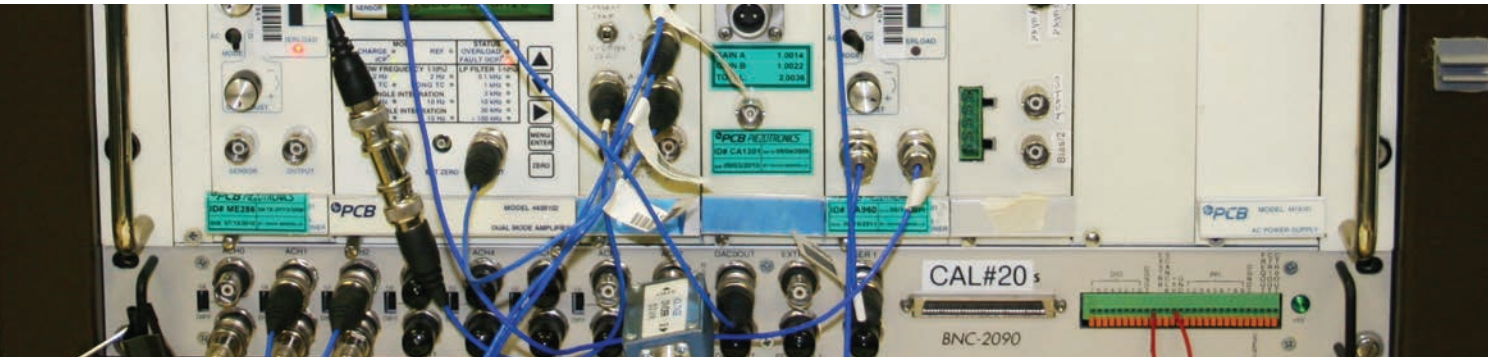
Frequency Range (-5%): 0.05 to 100000 Hz

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® SENSOR SIGNAL CONDITIONER
MODEL 482A21

Sensor Input Type(s): ICP®, Voltage

Channels: 3

Voltage Gain (±1%): 1:1

BATTERY-POWERED, ICP® SENSOR SIGNAL CONDITIONER
MODEL 482B11

Sensor Input Type(s): ICP®, Voltage

Channels: 1

Voltage Gain (±1%): x1 x10 x100

BATTERY-POWERED, ICP® SENSOR SIGNAL CONDITIONER
MODEL 480C02

Sensor Input Type(s): ICP®, Voltage

Channels: 4

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

BATTERY-POWERED, ICP® SENSOR SIGNAL CONDITIONER
MODEL 480E09

Sensor Input Type(s): ICP®, Voltage

Channels: 4

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

BATTERY-POWERED, ICP® SENSOR SIGNAL CONDITIONER
MODEL 480B21

Sensor Input Type(s): ICP®, Voltage

Channels: 3

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

SERIES 402 IMPEDANCE CONVERTERS AND IN-LINE VOLTAGE FOLLOWER AMPLIFIER

Series 402A In-line voltage follower amplifiers, similar to the Series 422E charge converters, serve to convert charge output sensor signals to low-impedance voltage signals. They are recommended for applications requiring high frequency response up to 1 MHz, and for applications where sensor output (pC/unit) exceeds the maximum input range (pC) allowed in the Series 422E.

The voltage sensitivity, V, of a system including a charge output sensor, low-noise cable and voltage follower amplifier can be determined mathematically by the equation V=Q/C where Q is the charge sensitivity of the sensor in Coulombs and C is the total system capacitance in Farads. The total system capacitance is the result of the sum of the capacitance of the sensor, the capacitance of the interconnect cable, and the input capacitance of the voltage amplifier. Choose a voltage follower amplifier with an input capacitance that provides the sensitivity desired, while keeping the total output voltage (range x sensitivity) within the ±10 volt limit. Voltage follower amplifiers do not invert the polarity of the measurement signal.

IN-LINE VOLTAGE FOLLOWER AMPLIFIERS
MODEL 402A

Input Capacitance: < 8.0 pF

Discharge Time Constant: 1.0 second

Frequency Response (± 5%): 0.5 to 1M Hz

IN-LINE VOLTAGE FOLLOWER AMPLIFIERS
MODEL 402A02

Input Capacitance: 100 ± 10% pF

Discharge Time Constant: 10 second

Frequency Response (± 5%): 0.05 to 1M Hz

IN-LINE VOLTAGE FOLLOWER AMPLIFIERS
MODEL 402A03

Input Capacitance: 1000 ± 10% pF

Discharge Time Constant: 100 second

Frequency Response (± 5%): 0.005 to 1M Hz

SERIES 422 IN LINE ICP POWERED CHARGE CONVERTERS

IN-LINE CHARGE CONVERTER
MODEL 422E52

Sensitivity (Charge Conversion) (±2.5%): 10 mV/pC

Output Voltage: ±5.0 V

Temperature Range (Operating): -65 to +250 °F(-54 to +121 °C)

IN-LINE CHARGE CONVERTER
MODEL 422E36

Sensitivity (±2%): 10 mV/pC

Output Voltage: ±2.5 V

Temperature Range: -65 to +250 °F (-54 to +121 °C)

IN-LINE CHARGE CONVERTER
MODEL 422E51

Sensitivity (±5.0%): 100 mV/pC

Output Voltage: ±5.0 V

Temperature Range: -65 to +250 °F (-54 to +121 °C)

IN-LINE CHARGE CONVERTER
MODEL 422E35

Sensitivity (±2%): 1 mV/pC

Output Voltage: ±2.5 V

Temperature Range: -65 to +250 °F (-54 to +121 °C)

CABLES & ADAPTERS

4-CONDUCTOR CABLE ASSEMBLIES

4-CONDUCTOR CABLE ASSEMBLIES									
Base Model	5 ft (1.5 m)	10 ft (3.0 m)	15 ft (4.6 m)	20 ft (6.1 m)	25 ft (7.6 m)	30 ft (9.1 m)	50 ft (15.2 m)		
034H	05	10		20		30	50	FEP, Lightweight	Mini 4-Socket Plug to (3) 10-32 Plugs
034K	05	10		20		30	50	FEP, Lightweight	Mini 4-Socket Plug to (3) BNC Plugs
019B	05	10	15	20		30		Silicone, Flexible, Lightweight	Mini 4-Socket Plug to (3) BNC Plugs
010P	05	10		20		30	50	FEP, General Purpose	4-Socket Plug to Pigtails
034A	05	10		20		30	50	FEP, Lightweight	4-Socket Plug to Pigtails
010D	05	10	15	20	25	30		FEP, General Purpose	4-Socket Plug to 4-Socket Plug
034D	05	10		20		30	50	FEP, Lightweight	4-Socket Plug to 4-Socket Plug
078D	05	10		20		30	50	Polyurethane, Flexible	4-Socket Plug to 4-Socket Plug
010F	05	10	15	20	25	30	50	FEP, General Purpose	4-Socket Plug to (3) 10-32 Plugs
034F	05	10		20		30	50	FEP, Lightweight	4-Socket Plug to (3) 10-32 Plugs
078F		10	15		25			Polyurethane, Flexible	4-Socket Plug to (3) 10-32 Plugs
010G	05	10	15	20	25	30	50	FEP, General Purpose	4-Socket Plug to (3) BNC Plugs
034G	05	10	15	20	25	30	50	FEP, Lightweight	4-Socket Plug to (3) BNC Plugs
036G	05	10	15	20	25	30		Silicone, Flexible	4-Socket Plug to (3) BNC Plugs
078G	05	10	15	20	25	30	50	Polyurethane, Flexible	4-Socket Plug to (3) BNC Plugs

Mini 4-Socket Plug

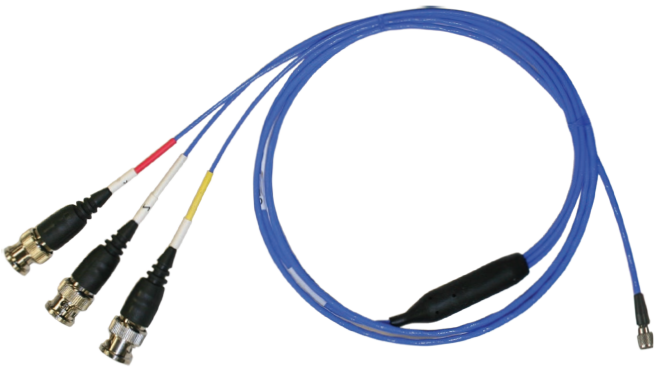
4-Socket Plug

BNC Plug

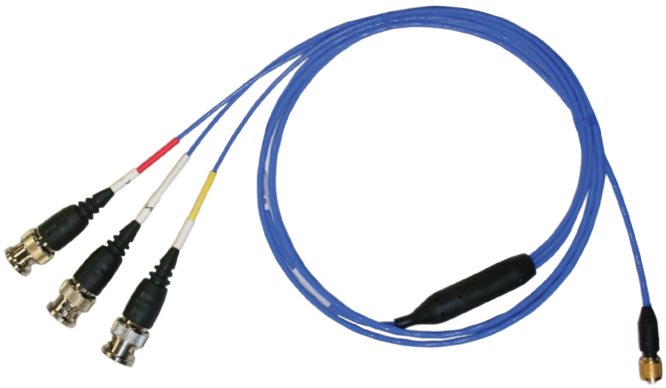
10-32 Plug

Series 010F

Series 034D



Series 034K



Series 010G

4-CONDUCTOR CABLE SPECIFICATIONS					
Model	**010**	**034**	**019**	**036**	**078**
Cable Style	General Purpose	Low Noise	Flexible Lightweight	Flexible	Flexible
Temperature Range	-130 to +392 °F -90 to +200 °C	-130 to +392 °F -90 to +200 °C	-76 to +500 °F -60 to +260 °C	-76 to +392 °F -60 to +200 °C	-58 to +185 °F -50 to +85 °C
Capacitance	16 pF/ft 52.4 pF/m	14 pF/ft 46 pF/m	15 pF/ft 49.2 pF/m	15 pF/ft 48 pF/m	25 pF/ft 81 pF/m
Cable Jacket Material	FEP	FEP	Silicone	Silicone	Polyurethane
Cable Jacket (Diameter)	0.1 in 2.54 mm	0.077 in 1.96 mm	0.070 in 1.77 mm	0.104 in 2.64 mm	0.119 in 3.02 mm

COAXIAL CABLE ASSEMBLIES

Model 023A10

Series 002C

Series 018C

Series 012A

Series 003A

COAXIAL CABLE ASSEMBLIES

Base Model	1 ft (0.3 m)	3 ft (0.9 m)	5 ft (1.5 m)	10 ft (3.0 m)	20 ft (6.1 m)	30 ft (9.1 m)	50 ft (15.2 m)	Construct cable assembly model by combining base model with desired length, e.g., 002C10.	
030A		03	05	10	20	30	50	PTFE, Low Noise, Miniature	3-56 Plug to 10-32 Plug
030C			05	10	20	30	50	PTFE, Low Noise, Miniature	3-56 Plug to BNC Plug
018G		03	05	10	20	30		PVC, Miniature	5-44 Plug to 10-32 Plug
003G		03	05	10	20	30		TFE, Low Noise	5-44 Plug to 10-32 Plug
002P		03	05	10	20	30		FEP	5-44 Plug to BNC Plug
003P		03	05	10	20	30		TFE, Low Noise	5-44 Plug to BNC Plug
018C		03	05	10	20	30		PVC, Miniature	5-44 Plug to BNC Plug
030B			05	10	20			PTFE, Low Noise, Miniature	M3 Plug to 10-32 Plug
003R			05	10	20			TFE, Low Noise	M3 Plug to 10-32 Plug
002A		03	05	10	20	30	50	FEP	10-32 Plug to 10-32 Plug
003A	01	03	05	10	20	30	50	TFE, Low Noise	10-32 Plug to 10-32 Plug
023A				10				Hardline	10-32 Plug to 10-32 Jack
002C		03	05	10	20	30	50	FEP	10-32 Plug to BNC Plug
003C		03	05	10	20	30	50	TFE, Low Noise	10-32 Plug to BNC Plug
002B	01	03						FEP	10-32 Plug to BNC Jack
003B	01	03						TFE, Low Noise	10-32 Plug to BNC Jack
003U				10				TFE, Low Noise	SMB Female Plug to SMB Female Plug
003V				10				TFE, Low Noise	SMB Female Plug to BNC Plug
002T		03	05	10	20	30		FEP	BNC Plug to BNC Plug
003D		03		10	20			TFE, Low Noise	BNC Plug to BNC Plug
012A		03	05	10	20	30	50	PVC, RG58/U	BNC Plug to BNC Plug
012E				10	20		50	PVC, RG58/U	2-Socket Env. Sealed to BNC Plug
012R				10	20		50	PVC, RG58/U	2-Socket MIL to BNC Plug

3-56 PLUG

5-44 Plug

10-32 Plug

10-32 Jack

BNC Plug

BNC Jack

M3 Plug

SMB Plug

2-Socket Plug

2-Socket
Env. Sealed Plug

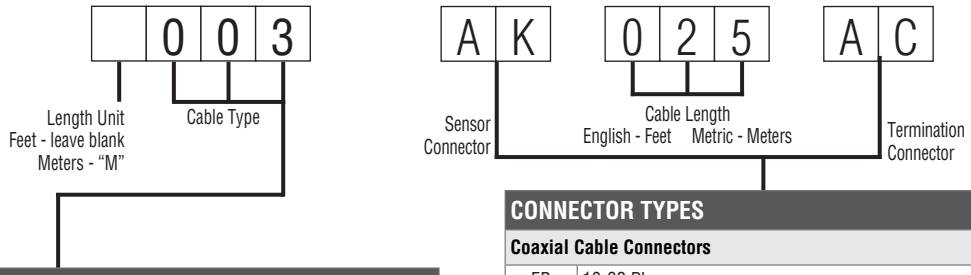
COAXIAL CABLE SPECIFICATIONS					
Model	**002**	**003**	**012**	**018**	**030**
Cable Style	General Purpose	Low Noise	General Purpose	General Purpose	Low Noise
Temperature Range	-130 to +400 °F -90 to +204 °C	-320 to +500 °F -196 to +260 °C	-40 to +176 °F -40 to +80 °C	-22 to +221 °F -30 to +105 °C	-130 to +500 °F -90 to +260 °C
Impedance	50 Ohm	50 Ohm	52 Ohm	32 Ohm	50 Ohm
Capacitance	29 pF/ft 95 pF/m	30 pF/ft 98 pF/m	29 pF/ft 95 pF/m	55 pF/ft 180 pF/m	30 pF/ft 98 pF/m
Cable Jacket Material	FEP	TFE	PVC	PVC	PTFE
Cable Jacket Diameter	0.075 in 1.9 mm	0.079 in 2.01 mm	0.193 in 4.9 mm	0.054 in 1.37 mm	0.042 in 1.09 mm

OTHER COAXIAL CABLE SPECIFICATIONS					
Model	**005**	**006**	**023**	**038**	**098**
Cable Style	Ruggedized	Low Noise Ruggedized	Hardline	Low Noise	Low Noise Flexible
Temperature Range	-67 to +275 °F -55 to +135 °C	-67 to +275 °F -55 to +135 °C	-300 to +1200 °F -184 to +650 °C	-58 to +250 °F -50 to +121 °C	-130 to +500 °F -90 to +260 °C
Impedance	50 Ohm	50 Ohm	—	50 Ohm	50 Ohm
Capacitance	29 pF/ft 95 pF/m	30 pF/ft 98 pF/m	100 pF/ft 328 pF/m	30 pF/ft 100 pF/m	35 pF/ft 115 pF/m
Cable Jacket Material	Polyolefin over Steel Braid	Polyolefin over Steel Braid	Stainless Steel	Polyurethane	TFE
Cable Jacket Diameter	0.200 in 5.08 mm	0.200 in 5.08 mm	0.059 in 1.5 mm	0.119 in 3.02 mm	0.079 in 2.01 mm

HOW TO CONFIGURE CUSTOM CABLE MODELS

1. Choose the cable length format desired, either English (ft) or Metric (m) unit lengths.
2. Choose the desired raw cable type.
3. Choose desired sensor connector type.
4. Determine the cable length required in English (ft) or Metric (m) unit lengths.
5. Choose desired termination connector type.

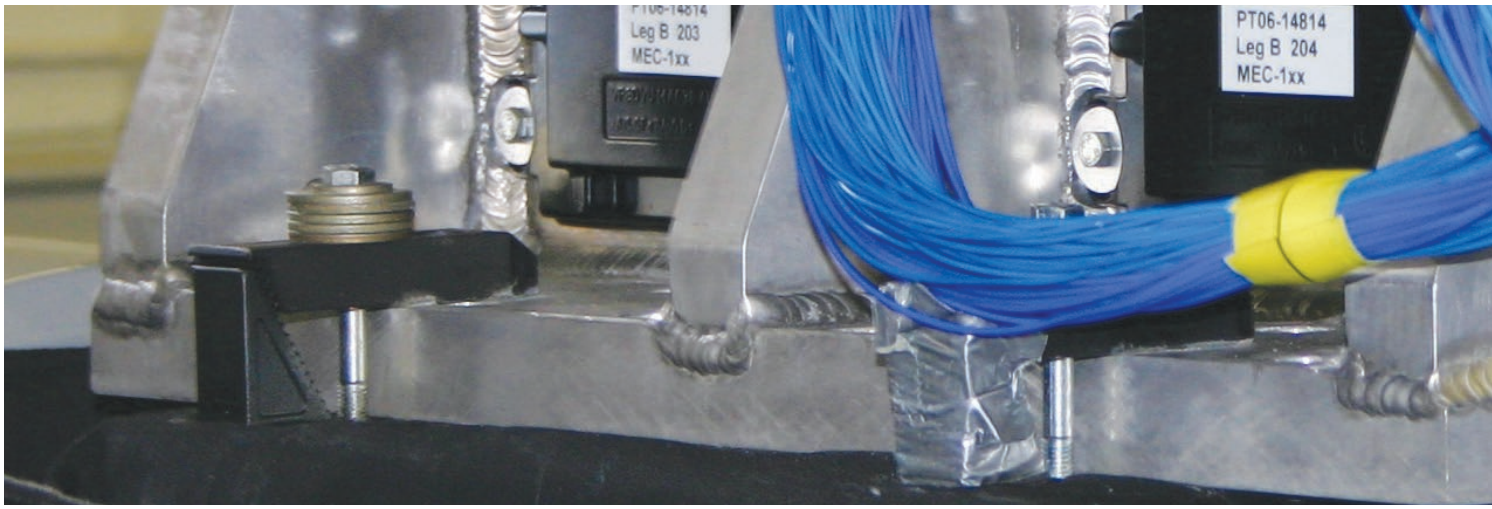
Example:
Model 003AK025AC defines a 25 ft, low-noise cable with right angle 10-32 plug sensor connector, BNC plug termination connector.



RAW CABLE TYPE						
Coaxial Cables			**Diameter**		**Max. Temp**	
002	General Purpose, White FEP Jacket	CE	0.075 in	1.9 mm	400 °F	204 °C
003	Low Noise, Blue TFE Jacket	CE	0.079 in	2.0 mm	500 °F	260 °C
005	Ruggedized 002 Type, General Purpose	CE	0.2 in	5.08 mm	275 °F	135 °C
006	Ruggedized 003 Type, Low Noise	CE	0.2 in	5.08 mm	275 °F	135 °C
012	RG-58/U, Black Vinyl Jacket	CE	0.193 in	4.90 mm	176 °F	80 °C
018	Lightweight, Black PVC Jacket		0.054 in	1.37 mm	221 °F	105 °C
030	Low Noise, Mini, PTFE Jacket	CE	0.043 in	1.1 mm	500 °F	260 °C
038	Low Noise, Blue Polyurethane Jacket	CE	0.119 in	3.02 mm	250 °F	121 °C
098	Flexible, Low Noise, Green TFE Jacket	CE	0.079 in	2.06 mm	500 °F	260 °C
Twisted/Shielded Pair Cable						
024	General Purpose, Black Polyurethane Jacket	CE	0.250 in	6.35 mm	250°F	121 °C
032	Lightweight, FEP Jacket		0.085 in	2.16 mm	392 °F	200 °C
045	High Temperature, Red PFA Jacket	CE	0.204 in	5.18 mm	250 °F	121 °C
053	High Temperature, Red FEP Jacket	CE	0.157 in	3.99 mm	392 °F	200 °C
Shielded 4-Conductor Cable						
010	General Purpose, FEP Jacket	CE	0.1 in	2.54 mm	392 °F	200 °C
034	Lightweight, FEP Jacket	CE	0.077 in	1.96 mm	392 °F	200 °C
019	Lightweight, Blue Silicon Jacket	CE	0.068 in	1.73 mm	500 °F	260 °C
036	General Purpose, Blue Silicon Jacket	CE	0.104 in	2.64 mm	392 °F	200 °C
078	General Purpose, Blue Polyurethane Jacket	CE	0.119 in	3.02 mm	185 °F	85 °C
Hardline Cable						
013	Hardline, 2-conductor, Inconel Jacket		0.125 in	3.20 mm	1200 °F	650 °C
023	Hardline, Coaxial, 304L Stainless Steel Jacket		0.059 in	1.5 mm	1200 °F	650 °C
Miscellaneous Cable						
031	Red/White Twisted Pair, PTFE Jacket		0.03 in*	0.8 mm*	392 °F	200 °C
037	10-cond. Shielded, Black Poly Jacket		0.024 in	0.61 mm	250 °F	121 °C

* diameter of each conductor
The combination of cables and connectors listed are only recommended configurations; other configurations may be available. Consult PCB® before ordering.
CE designates that cable maintains CE conformance

CONNECTOR TYPES	
Coaxial Cable Connectors	
EB	10-32 Plug
EJ	10-32 Plug (Spring Loaded)
AH	10-32 Plug (Hex)
AK	10-32 Plug (Right-Angle)
AW	10-32 Plug (Solder Adaptor)
FZ	10-32 Plug (for 023 Hardline Cabling)
AL	10-32 Jack
GA	10-32 Jack (for 023 Hardline Cabling)
AG	5-44 Plug
AF	5-44 Plug (Right-Angle)
EK	3-56 Plug
EP	M3 Plug
AC	BNC Plug
AB	BNC Jack
FW	SMB Plug
FX	SMB Jack
Multi-Lead Connectors (For Triaxial Sensors)	
AY	4-Socket Plug
CA	4-Pin Jack
EH	4-Socket Miniature Plug
HJ	4-Pin Miniature Jack
EN	9-Socket Plug
GJ	9-Pin Plug
JY	Splice Assembly to (3) EB Connectors
LA	Splice Assembly to (3) EJ Connectors
JZ	Splice Assembly to (3) AL Connectors
JW	Splice Assembly to (3) AC Connectors
JX	Splice Assembly to (3) AB Connectors
JS	Splice Assembly to (3) AY Connectors
Miscellaneous Connectors	
AE	2-Socket Plug MS3106 5/8-24 thd (with Environmental Boot)
AM	2-Socket Plug MS3106 5/8-24 thd
AP	2-Socket Plug MS3106 5/8-24 thd (with Strain Relief)
BP	2-Socket Plug MS3106 5/8-24 thd (High Temperature)
ET	2-Socket Plug MIL 7/16-27 thd (High Temperature)
GN	2-Socket Plug MIL 7/16-27 thd (for 013 Hardline Cabling)
GP	2-Pin Jack MIL 7/16-27 thd (for 013 Hardline Cabling)
LN	8-Pin Mini DIN (for 4-Wire Bridge)
BZ	Blunt Cut
DZ	Pigtail (Leads Stripped and Tinned for 3711/3713 Series)
JJ	Pigtail (Leads Stripped and Tinned for 3741 Series)
AD	Pigtail (Leads Stripped and Tinned for all Others)

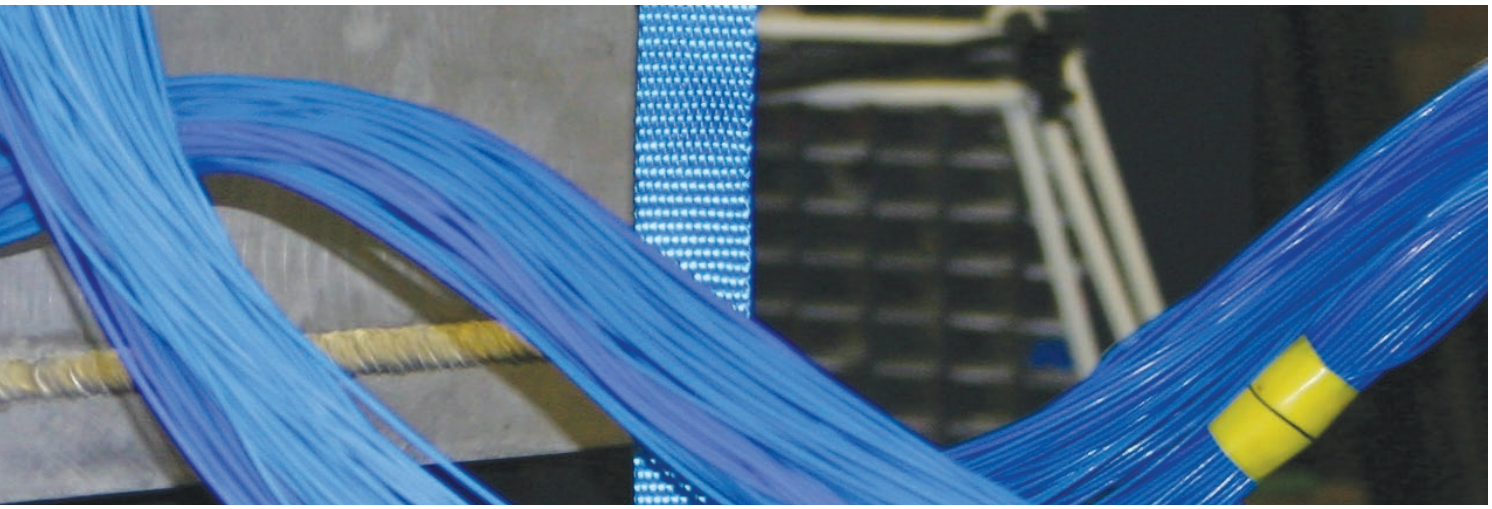


COAXIAL CUSTOM CABLE ASSEMBLIES

Custom Cable Assemblies

PCB® offers many standard cable assemblies, however, in the event that a standard cable assembly will not fulfill the requirements of the application, the ability to configure a custom cable assembly is offered. Start by ensuring compatibility of the connector type with the cable type desired from the chart below, and then configure the custom cable model number from the steps on the previous page.

Cable	002	003	005	006	012	013	018	023	024	030	031	032	038	045	053	098
Connector																
AB	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔
AC	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔
AD	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔
AE		✔			✔				✔						✔	
AF	✔	✔	✔	✔			✔			✔						
AG	✔	✔	✔	✔			✔			✔	✔	✔	✔			✔
AH	✔	✔	✔	✔			✔			✔		✔				
AK	✔	✔	✔	✔			✔			✔		✔	✔			✔
AL	✔	✔	✔	✔			✔			✔	✔	✔				✔
AP	✔	✔	✔	✔	✔				✔			✔	✔	✔	✔	
AW											✔					
BP	✔	✔		✔									✔	✔	✔	✔
BZ	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔
EB	✔	✔	✔	✔			✔			✔	✔	✔	✔			✔
EJ	✔	✔	✔	✔			✔			✔		✔	✔			✔
EK										✔						
EP	✔	✔	✔	✔			✔			✔						
ET														✔	✔	
FW	✔	✔	✔	✔			✔			✔						
FX	✔	✔														
FZ								✔								
GA								✔								
GN						✔										
GP						✔										

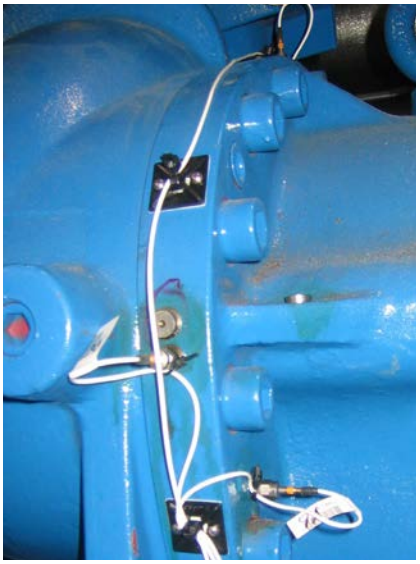


MULTI-CONDUCTOR CUSTOM CABLE ASSEMBLIES

Cable - Connector Compatibility Matrix

The following table provides compatibility information for cables and cable connectors. A "3" denotes compatibility of the connector type shown in the rows going down the table with the cable type of the intersecting column going across the table.

Cable	010	019	034	036	037	078
Connector						
AD	✔	✔	✔	✔	✔	✔
AY	✔	✔	✔	✔		✔
BZ	✔	✔	✔	✔	✔	✔
CA	✔	✔	✔	✔		✔
DZ	✔		✔		✔	✔
EH		✔	✔			
EN					✔	
GJ					✔	
HJ			✔			
JJ	✔					
JS					✔	
JW	✔	✔	✔	✔		✔
JX	✔	✔	✔	✔		✔
JY	✔	✔	✔	✔		✔
JZ	✔	✔	✔	✔		✔
LA	✔	✔	✔	✔		✔



CABLE CONNECTORS

* Max temp may be less depending on cable assembly

BNC JACK
MODEL AB

Max temp: 329 °F (165 °C)

5-44 COAXIAL PLUG
MODEL AF

Right angle

Max temp: 329 °F (165 °C)

10-32 COAXIAL JACK
MODEL AL

Straight

Max temp: 500 °F (260 °C)

BNC PLUG
MODEL AC

Max temp: 329 °F (165 °C)

5-44 COAXIAL PLUG
MODEL AG

Straight

Max temp: 500 °F (260 °C)

2-SOCKET MS3106 PLUG
MODEL AP

With strain relief

Max temp: 257 °F (125 °C)

PIGTAIL
MODEL AD

Leads stripped and tinned

Max temp: 490 °F (254 °C)*

10-32 COAXIAL PLUG
MODEL AG

Straight, with wire locking hex

Max Temp: 450 °F (232 °C)

10-32 COAXIAL PLUG / SOLDER ADAPTOR
MODEL AW

User repairable

Max temp 500: °F (260 °C)*

2-SOCKET MS3106 PLUG
MODEL AD

With environmental boot

Max temp: 325 °F (163 °C)

10-32 COAXIAL PLUG
MODEL AK

Right angle

Max temp: 329 °F (165 °C)

4-SOCKET PLUG, 1/4-28 THREAD
MODEL AY

For triaxial sensors

Max temp: 325 °F (163 °C)

4-PIN JACK, 1/4-28 THREAD
MODEL CA

Triaxial sensors

Max temp: 329 °F (165 °C)

3-56 COAXIAL PLUG
MODEL EK

Max temp: 500 °F (260 °C)

10-32 COAXIAL JACK
MODEL FZ

For hardline cable

Max temp: 900 °F (482 °C)

10-32 COAXIAL PLUG
MODEL EB

Straight

Max temp: 500 °F (260 °C)

9-SOCKET PLUG
MODEL EN

For triaxial capacitive accelerometers

Max temp: 275 °F (135 °C)

2-SOCKET MS3106 PLUG
MODEL GA

For hardline cable

Max temp: 550 °F (288 °C)

4-SOCKET MINI PLUG, 8-36 THREAD
MODEL EH

For triaxial sensors

Max temp: 356 °F (180 °C)

M3 COAXIAL PLUG
MODEL EP

Max temp: 500 °F (260 °C)

2-SOCKET PLUG, 7/16-27 THREAD
MODEL GN

High temperature

Max temp: 900 °F (482 °C)

10-32 COAXIAL PLUG
MODEL EJ

Straight, o-ring seal, spring loaded

Max temp: 500 °F (260 °C)

2-SOCKET PLUG, 7/16-27 THREAD
MODEL ET

Max temp: 500 °F (260 °C)

2-PIN JACK, 7/16-27 THREAD
MODEL GP

High temperature

Max temp: 900 °F (482 °C)

CONNECTOR ADAPTORS

SCOPE INPUT ADAPTOR
MODEL 070A02

10-32 coaxial jack to BNC plug. For adapting BNC connectors for use with 10-32 coaxial plugs.

CABLE ADAPTOR
MODEL 070A08

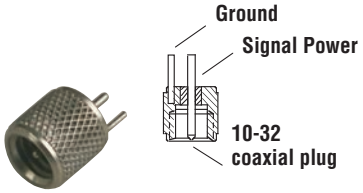
10-32 coaxial jack to BNC jack. Joins cables terminating in a BNC plug and a 10-32 coaxial plug.

BNC COUPLER
MODEL 070A12

BNC jack to BNC jack. Joins two cables terminating in BNC plugs.

CONNECTOR ADAPTOR
MODEL 070A03

10-32 coaxial plug to BNC jack. Converts 10-32 connectors for use with BNC plugs. Do not use on sensor connectors.



SOLDER CONNECTOR ADAPTOR
MODEL 070B09

10-32 coaxial plug to solder terminals. Excellent for high-shock applications. User-repairable.

FEED-THRU ADAPTOR
MODEL 070A13

10-32 coaxial jack to BNC jack. Bulkhead connects BNC plug to 10-32 coaxial jack.

1/8 in max wall thickness 1/2 in mtg thd

10-32 COAXIAL COUPLER
MODEL 070A05

10-32 coaxial jack to 10-32 coaxial jack. Joins two cables terminating in 10-32 coaxial plugs.

BNC T CONNECTOR
MODEL 070A11

BNC plug to two BNC jacks. Used as a cable splitter.

10-32 HERMETIC FEED-THRU
MODEL 070A14

10-32 coaxial jack to 10-32 coaxial jack.

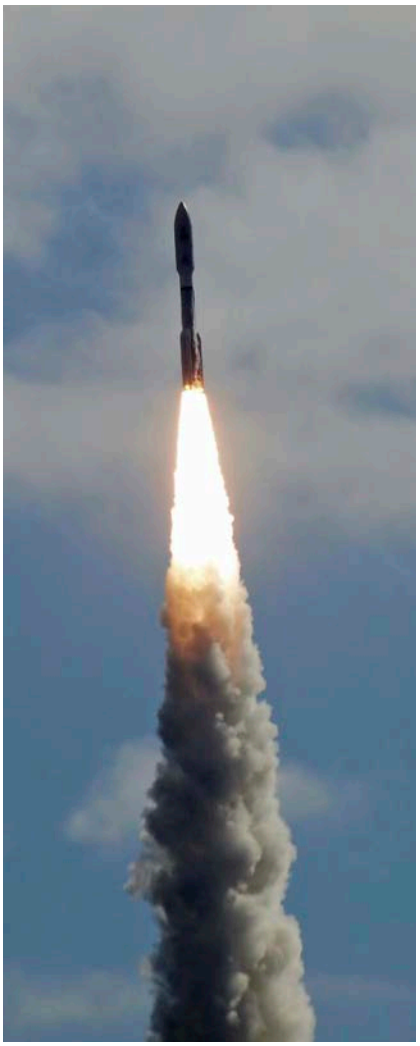
1/4 in max wall thickness 5/16-32 in mtg thd

10-32 COAXIAL RIGHT ANGLE ADAPTOR
MODEL 070A20

10-32 coaxial jack to 10-32 coaxial plug. For use in confined locations. For ICP® sensors only.

10-32 COAXIAL PLUG
MODEL 076A05

Microdot connector, screw-on type.



PLASTIC PROTECTIVE CAP
MODEL 085A18

Provides strain relief for solder connector adaptors, as well as protects 10-32 cable ends.

CONNECTOR TOOL
MODEL 076A25

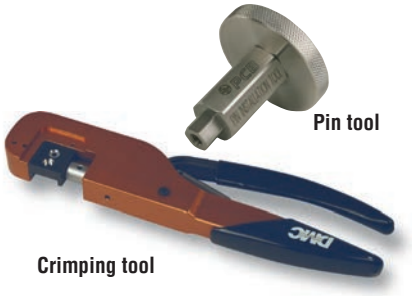
Used to install 076A05 screw-on type microdot connector.

10-32 COAXIAL SHORTING CAP
MODEL 085A40

Used to short charge output sensor connectors during storage and transportation.

COAXIAL CONNECTOR
MODEL EB

10-32 crimp-on style coaxial connector. Requires tools contained in Model 076C31 kit.



10-32 COAXIAL CRIMP-ON CONNECTOR KIT
MODEL 070A20

Includes 1 pin insertion tool, 1 sleeve-crimping tool, and 20 Model "EB" connectors with cable strain reliefs. (Wire stripper and soldering iron not included).

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