



**Model 132A35**

**Micro ICP® pressure sensor, 240mV/psi, clamp nut, 1/4-28 mtg thd (for high  
Installation and Operating Manual**

**For assistance with the operation of this product,  
contact PCB Piezotronics, Inc.**

**Toll-free: 800-828-8840  
24-hour SensorLine: 716-684-0001  
Fax: 716-684-0987  
E-mail: [info@pcb.com](mailto:info@pcb.com)  
Web: [www.pcb.com](http://www.pcb.com)**





<b>Warranty, Service, Repair, and Return Policies and Instructions</b>
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**The information contained in this document supersedes all similar information that may be found elsewhere in this manual.**

**Total Customer Satisfaction** – PCB Piezotronics guarantees Total Customer Satisfaction. If, at any time, for any reason, you are not completely satisfied with any PCB product, PCB will repair, replace, or exchange it at no charge. You may also choose to have your purchase price refunded in lieu of the repair, replacement, or exchange of the product.

**Service** – Due to the sophisticated nature of the sensors and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. Caution should be observed to insure that liquids are not permitted to migrate into devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth and never submerged or have liquids poured upon them.

**Repair** – In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty.

**Calibration** – Routine calibration of sensors and associated instrumentation is recommended as this helps build confidence in measurement accuracy and acquired data. Equipment calibration cycles are typically established by the users own quality regimen. When in doubt about a calibration cycle, a good “rule of thumb” is to recalibrate on an annual basis. It is also good practice to recalibrate after exposure to any severe temperature extreme, shock, load, or other environmental influence, or prior to any critical test.

PCB Piezotronics maintains an ISO-9001 certified metrology laboratory and offers calibration services, which are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to the normally supplied calibration, special testing is also available, such as: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For information on standard recalibration services or special testing, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

**Returning Equipment** – *Following these procedures will insure that your returned materials are handled in the most expedient manner.* Before

returning any equipment to PCB Piezotronics, contact your local distributor, sales representative, or factory customer service representative to obtain a Return **Warranty, Service, Repair, and Return Policies and Instructions** Materials Authorization (RMA) Number. This RMA number should be clearly marked on the outside of all package(s) and on the packing list(s) accompanying the shipment. A detailed account of the nature of the problem(s) being experienced with the equipment should also be included inside the package(s) containing any returned materials.

A Purchase Order, included with the returned materials, will expedite the turn-around of serviced equipment. It is recommended to include authorization on the Purchase Order for PCB to proceed with any repairs, as long as they do not exceed 50% of the replacement cost of the returned item(s). PCB will provide a price quotation or replacement recommendation for any item whose repair costs would exceed 50% of replacement cost, or any item that is not economically feasible to repair. For routine calibration services, the Purchase Order should include authorization to proceed and return at current pricing, which can be obtained from a factory customer service representative.

**Warranty** – All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a limited warranty against defective material and workmanship for a period of one year from date of original purchase. Contact

PCB for a complete statement of our warranty. Expendable items, such as batteries and mounting hardware, are not covered by warranty. Mechanical damage to equipment due to improper use is not covered by warranty. Electronic circuitry failure caused by the introduction of unregulated or improper excitation power or electrostatic discharge is not covered by warranty.

**Contact Information** – International customers should direct all inquiries to their local distributor or sales office. A complete list of distributors and offices can be found at [www.pcb.com](http://www.pcb.com). Customers within the United States may contact their local sales representative or a factory customer service representative. A complete list of sales representatives can be found at [www.pcb.com](http://www.pcb.com). Toll-free telephone numbers for a factory customer service representative, in the division responsible for this product, can be found on the title page at the front of this manual. Our ship to address and general contact numbers are:

PCB Piezotronics, Inc.  
3425 Walden Ave.  
Depew, NY14043 USA  
Toll-free: (800) 828-8840  
24-hour SensorLine<sup>SM</sup>: (716) 684-0001  
Website: [www.pcb.com](http://www.pcb.com)  
E-mail: [info@pcb.com](mailto:info@pcb.com)



PCB工业监视和测量设备 - 中国RoHS2公布表  
 PCB Industrial Monitoring and Measuring Equipment - China RoHS 2 Disclosure Table

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
住房	○	○	○	○	○	○
PCB板	X	○	○	○	○	○
电气连接器	○	○	○	○	○	○
压电晶体	X	○	○	○	○	○
环氧	○	○	○	○	○	○
铁氟龙	○	○	○	○	○	○
电子	○	○	○	○	○	○
厚膜基板	○	○	X	○	○	○
电线	○	○	○	○	○	○
电缆	X	○	○	○	○	○
塑料	○	○	○	○	○	○
焊接	X	○	○	○	○	○
铜合金/黄铜	X	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。						
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。						
X：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。						
铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。						

CHINA RoHS COMPLIANCE

Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	O	O	O
Teflon	O	O	O	O	O	O
Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
Cables	X	O	O	O	O	O
Plastic	O	O	O	O	O	O
Solder	X	O	O	O	O	O
Copper Alloy/Brass	X	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364.

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.

Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

DOCUMENT NUMBER: 21354

DOCUMENT REVISION: C

ECN: 45605

## 1.0 INTRODUCTION

132 Series Microsensors are small, piezoelectric pressure sensors featuring extremely fast response for measurement of short wavelength pressure pulses. The short time constant of some models filters off the longer duration portion of pressure pulses, allowing differentiation of consecutive pressure pulses.

132 Series Microsensors contain integrated ICP<sup>®</sup> circuit amplifiers which operate as source followers and provide very high-frequency response. These micro-integrated circuit amplifiers convert the high-impedance voltage from the crystals into low-impedance voltage of less than 100 ohms.

Output from the microsensors may be coupled directly into oscilloscopes, recorders and A to D converters. Power to operate the IC amplifier and the output signal are conducted over a single conductor, two-wire cable with the ground serving as signal return. Special low-noise cables are not required. The calibrated mV/psi output of these microsensors is not attenuated nor is noise appreciably increased by the cable.

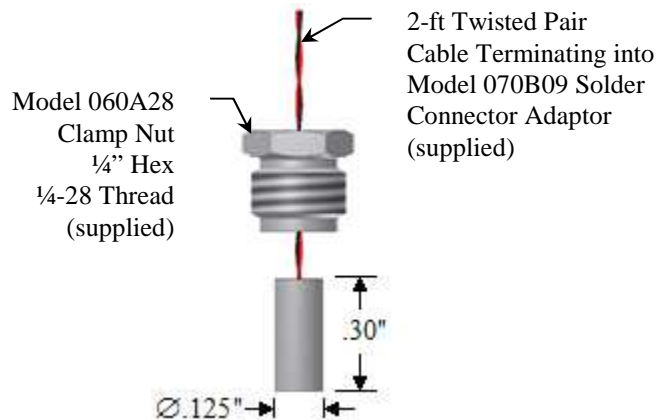
## 2.0 DESCRIPTION

132 Series Microsensors feature small diameter pressure-sensing surfaces incorporating very small (< 1 mm) piezoelectric sensing elements. The small size of the sensing elements imparts extremely fast response time to the microsensors.

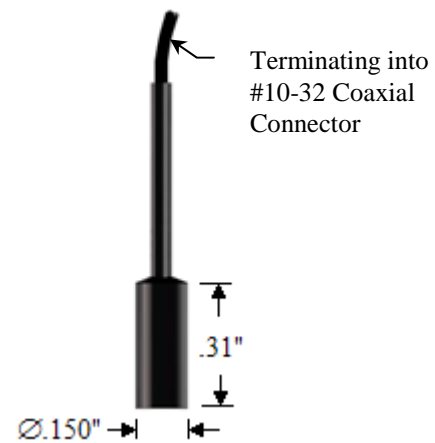
The charge generated by deflection of the piezoelectric element when subjected to shock pressures creates a voltage on the input capacitance at the gate of the microsensor ICP<sup>®</sup> amplifier. The amplifier, in conjunction with the source element, transforms the input into a low-impedance output signal of equal amplitude. The DC bias that exists on the signal lead is removed from the output signal by a coupling capacitor in the power supply. Resistors in the internal ICP<sup>®</sup> amplifiers of the microsensors set the internal discharge time constant, which

determines the low-frequency response of the microsensors. (Refer to General Guide to ICP<sup>®</sup> Instrumentation, G-0001, for complete details.)

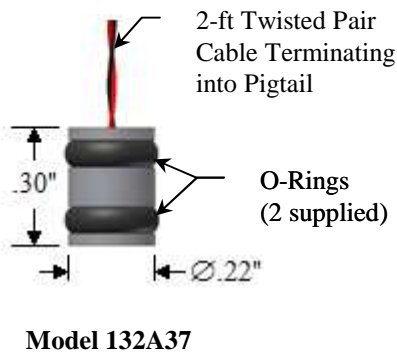
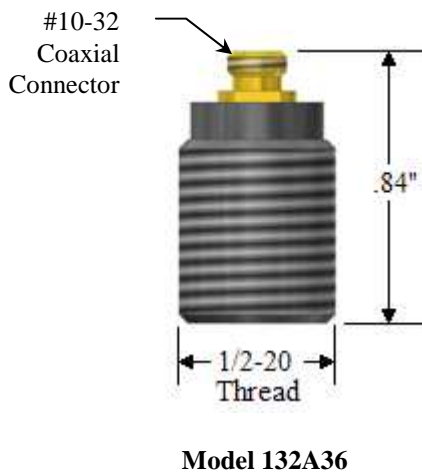
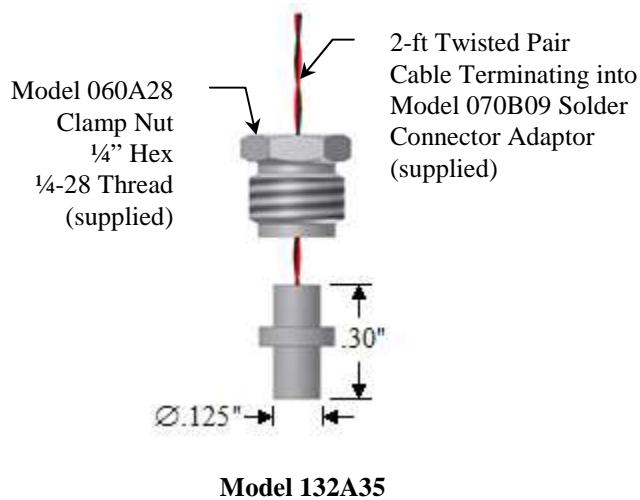
Below are the available configurations for the 132 Series Microsensors.



**Model 132A31 Time-of-Arrival  
ICP<sup>®</sup> Microsensor**



**Model 132A32**



### 3.0 INSTALLATION

Refer to the installation drawing for details. If the microsensors are to be subjected to pressures beyond their specified range, be sure to use backing nuts to prevent the sensors from backing out of their mounting ports. (Thread adaptors are available from PCB to facilitate mounting.)

Connect the microsensors to an ICP® power supply. Use standard two-conductor cable between the sensor and the ICP® power unit.

Next, connect the power unit to a readout device, e.g., oscilloscope, recorder or high-speed A to D converter.

### 4.0 OPERATION

Switch the ICP® power unit on and observe reading of bias-monitoring voltmeter on front panel of power unit.

If indicator is in green section of indicator panel, the IC amplifier is providing proper bias (normally +11 VDC), cable connections are normal and the system is ready to operate.

If the needle moves to the red area of the fault monitor meter, output is zero and a short is indicated. The short could be located in the amplifier cable connectors or in the power unit.

If the pointer moves into the yellow area of the fault monitor meter, an open circuit is indicated with full power supply voltage. An open circuit could be the result of a faulty amplifier, an open cable or open connectors.

Allow the sensor to thermally stabilize for about one minute. A signal drift may occur when the output cable is connected to the readout instrument.

The drift occurs during charging of the coupling capacitor in the power unit. The signal will stabilize in several minutes.

#### **4.1 OPERATION BEYOND RANGE SPECIFICATION**

Because 132 Series Microsensors can be installed using RTV-like potting materials to hold them in place, maximum pressure specifications are given to prevent the sensors from being extruded from the mounting holes. Static or slow dynamic overpressures are more apt to cause a problem than a short dynamic shock pulse. Use of backing nuts will minimize the possibility of a problem.

The microsensors are capable of responding to dynamic overpressures up to ten times the specified range. The output will be “clipped” (look flat-topped on the readout) after about 10 volts.

The initial rise of the output will be accurate up to the point of clipping. This can allow for an accurate time-of-arrival measurement, even though the peak pressure cannot be measured.

#### **5.0 CALIBRATION**

A shock tube is used to calibrate the microsensors.


#### **6.0 MAINTENANCE AND REPAIR**

Except for repair of wires, the microsensors are not field-repairable. In case of serious malfunction, contact the PCB at (888) 684-0011.

It is well to observe the following precautions in using the microsensors:

1. Do not exceed specified pressure levels without proper mounting.
2. Do not subject microsensors to temperatures exceeding 174 °F (79 °C).
3. Do not apply voltage to sensors without current-limiting diodes or other current protection. (PCB ICP<sup>®</sup> power supplies feature proper voltage and current protection.)
4. Do not apply more than 20 mA of current to the microsensors.

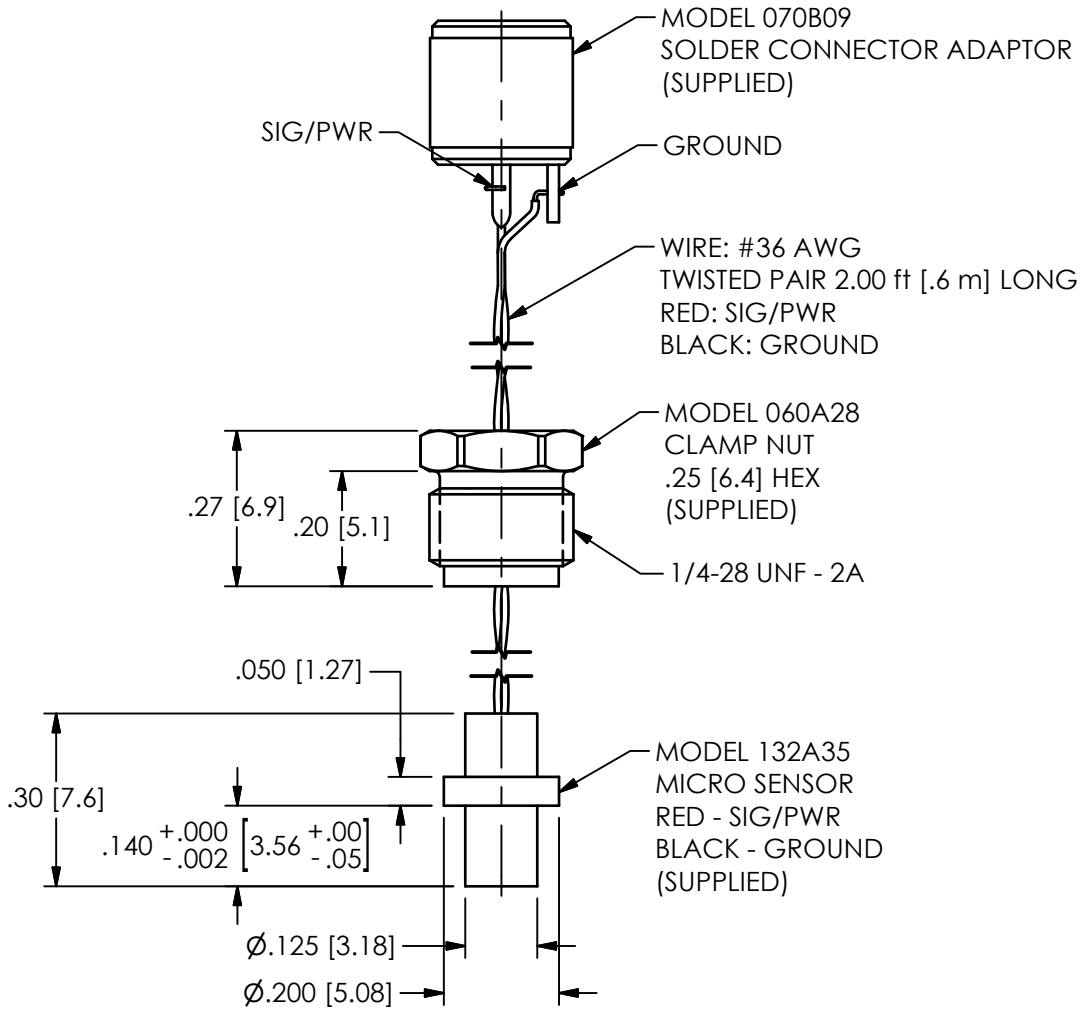


Model Number 132A35	<h1>ICP® PRESSURE SENSOR</h1>		Revision: N ECN #: 45431											
<b>Performance</b> Measurement Range Sensitivity(± 30 %) Maximum Pressure(Dynamic) Resolution Resonant Frequency Rise Time(Incident) Rise Time(Reflected) Low Frequency Response(-5 %) <b>Environmental</b> Temperature Range(Operating) <b>Electrical</b> Discharge Time Constant(at room temp) Excitation Voltage Constant Current Excitation Output Impedance Output Bias Voltage <b>Physical</b> Sensing Element Housing Material Sealing Electrical Connector Weight(with cable)	<b>ENGLISH</b> 48 psi 140 mV/psi 800 psi 1 mpsi ≥ 1000 kHz ≤ 3 μ sec ≤ 0.5 μ sec 11 kHz 0 to +175 °F ≥ .000045 sec 20 to 30 VDC 2 to 20 mA ≤ 100 Ohm 8 to 14 VDC Ceramic Stainless Steel Epoxy pigtail ends 0.018 oz	<b>SI</b> 330 kPa 20.3 mV/kPa 5515 kPa 0.007 kPa ≥ 1000 kHz ≤ 3 μ sec ≤ 0.5 μ sec 11 kHz -18 to +79 °C ≥ .000045 sec 20 to 30 VDC 2 to 20 mA ≤ 100 Ohm 8 to 14 VDC Ceramic Stainless Steel Epoxy pigtail ends 0.52 gm	[1] [2]	<div data-bbox="1417 235 1669 259" style="text-align: center;"> <b>OPTIONAL VERSIONS</b> </div> <p>Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.</p> <p>M - Metric Mount          Supplied Accessory : Model 060A29 Clamp Nut M6x1.0-6g (1) replaces Model 060A28</p> <p>W - Water Resistant Cable</p> <hr/> <p><b>NOTES:</b>          [1]Rise time in air at Mach 1          [2]Rise time at 20mA</p> <hr/> <p><b>SUPPLIED ACCESSORIES:</b>          Model 060A28 Clamp Nut, 1/4-28 x 1/4" Hex (1)          Model 070B09 Solder adaptor (1)</p> <table border="1" data-bbox="1144 690 1946 771"> <tr> <td>Entered: LK</td> <td>Engineer: MJK</td> <td>Sales: MFG</td> <td>Approved: APB</td> <td>Spec Number:</td> </tr> <tr> <td>Date: 5/12/2016</td> <td>Date: 5/12/2016</td> <td>Date: 5/12/2016</td> <td>Date: 5/12/2016</td> <td>132-1350-80</td> </tr> </table>	Entered: LK	Engineer: MJK	Sales: MFG	Approved: APB	Spec Number:	Date: 5/12/2016	Date: 5/12/2016	Date: 5/12/2016	Date: 5/12/2016	132-1350-80
Entered: LK	Engineer: MJK	Sales: MFG	Approved: APB	Spec Number:										
Date: 5/12/2016	Date: 5/12/2016	Date: 5/12/2016	Date: 5/12/2016	132-1350-80										
<p><i>All specifications are at room temperature unless otherwise specified.          In the interest of constant product improvement, we reserve the right to change specifications without notice.          ICP® is a registered trademark of PCB Group, Inc.</i></p> <div style="display: flex; justify-content: space-between;"> <div data-bbox="1134 820 1585 901">  <p>3425 Walden Avenue, Depew, NY 14043</p> </div> <div data-bbox="1648 820 1921 909"> <p>Phone: 716-684-0001          Fax: 716-684-0987          E-Mail: info@pcb.com</p> </div> </div>														

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REVISIONS		
REV	DESCRIPTION	DIN
D	REMOVED NOTES	45431

6764



MOUNTING HOLE PREPARATION

Ø.1285 [3.250] THRU

└─┬─┐ Ø.203<sup>+.002</sup><sub>-.000</sub> [Ø5.20<sup>+.05</sup><sub>-.00</sub>] ▽.230 [5.84]

1/4-28 UNF - 2B ▽.150 [3.81]

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		<p>3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com</p>
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	JDM	5/12/16	ECB	5/12/16	MJK	5/12/16	
DECIMALS XX ±.01 XXX ±.005	DECIMALS X ±0.3 XX ±0.13	TITLE INSTALLATION DRAWING MODEL 132A35 MICRO SENSOR						
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES							
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13	CODE IDENT. NO. 52681		DWG. NO. 6764		SCALE: 3X		SHEET 1 OF 1