



Model 121A23

Industrial ICP® pressure sensor, 5000 psi, 1 mV/psi, 1/4-18 NPT mtg thd, 2-pin MIL conn., case isolated

Installation and Operating Manual

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

Toll-free: 716-684-0001

24-hour SensorLine: 716-684-0001

Fax: 716-684-0987

E-mail: info@pcb.com

Web: www.pcb.com



Repair and Maintenance

PCB guarantees Total Customer Satisfaction through its “Lifetime Warranty Plus” on all Platinum Stock Products sold by PCB and through its limited warranties on all other PCB Stock, Standard and Special products. Due to the sophisticated nature of our sensors and associated instrumentation, **field servicing and repair is not recommended and, if attempted, will void the factory warranty.**

Beyond routine calibration and battery replacements where applicable, our products require no user maintenance. Clean electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the material of construction. Observe caution when using liquids near devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth—never saturated or submerged.

In the event that equipment becomes damaged or ceases to operate, our Application Engineers are here to support your troubleshooting efforts 24 hours a day, 7 days a week. Call or email with model and serial number as well as a brief description of the problem.

Calibration

Routine calibration of sensors and associated instrumentation is necessary to maintain measurement accuracy. We recommend calibrating on an annual basis, after exposure to any extreme environmental influence, or prior to any critical test.

PCB Piezotronics is an ISO-9001 certified company whose calibration services are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to our standard calibration services, we also offer specialized tests, including: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For more information, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

Returning Equipment

If factory repair is required, our representatives will provide you with a Return Material Authorization (RMA) number, which we use to reference any information you have already provided and expedite the repair process. This number should be clearly marked on the outside of all returned package(s) and on any packing list(s) accompanying the shipment.

Contact Information

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY14043 USA
Toll-free: (800) 828-8840
24-hour SensorLine: (716) 684-0001
General inquiries: info@pcb.com
Repair inquiries: rma@pcb.com

For a complete list of distributors, global offices and sales representatives, visit our website, www.pcb.com.

Safety Considerations

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions required to avoid injury. While our equipment is designed with user safety in mind, the protection provided by the equipment may be impaired if equipment is used in a manner not specified by this manual.

Discontinue use and contact our 24-Hour Sensorline if:

- Assistance is needed to safely operate equipment
- Damage is visible or suspected
- Equipment fails or malfunctions

For complete equipment ratings, refer to the enclosed specification sheet for your product.

Definition of Terms and Symbols

The following symbols may be used in this manual:



DANGER

Indicates an immediate hazardous situation, which, if not avoided, may result in death or serious injury.

**CAUTION**

Refers to hazards that could damage the instrument.

**NOTE**

Indicates tips, recommendations and important information. The notes simplify processes and contain additional information on particular operating steps.

The following symbols may be found on the equipment described in this manual:



This symbol on the unit indicates that high voltage may be present. Use standard safety precautions to avoid personal contact with this voltage.



This symbol on the unit indicates that the user should refer to the operating instructions located in the manual.



This symbol indicates safety, earth ground.



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	0	0	0	0	0	0
PCB板	X	0	0	0	0	0
电气连接器	0	0	0	0	0	0
压电晶体	X	0	0	0	0	0
环氧	0	0	0	0	0	0
铁氟龙	0	0	0	0	0	0
电子	0	0	0	0	0	0
厚膜基板	0	0	X	0	0	0
电线	0	0	0	0	0	0
电缆	X	0	0	0	0	0
塑料	0	0	0	0	0	0
焊接	X	0	0	0	0	0
铜合金/黄铜	X	0	0	0	0	0
本表格依据 SJ/T 11364 的规定编制。						
0：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.

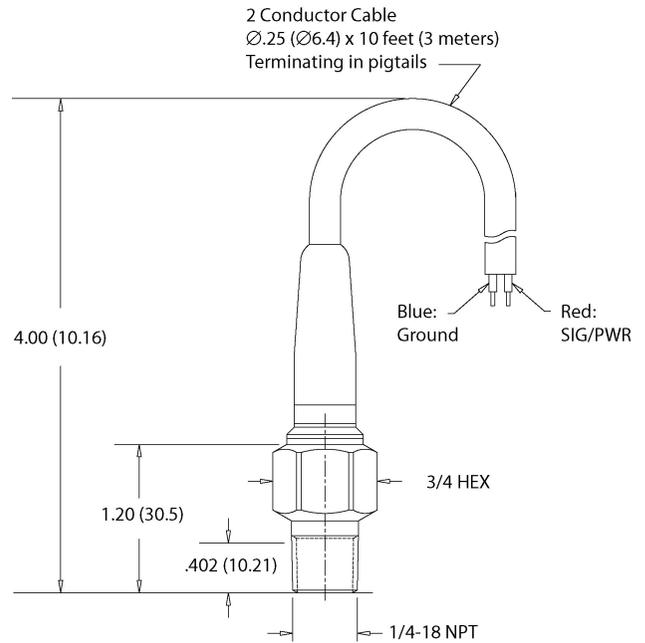
OPERATION MANUAL FOR
ICP® INDUSTRIAL PRESSURE SENSOR
Series 121
Models 121A21, 121A22, 121A23, 121A24
Models 121A31, 121A32, 121A33, 121A34

1.0 INTRODUCTION

The Series 121 consists of eight ruggedized quartz sensors designed for dynamic pressure measurements in harsh environments. Models 121A21-24 have two-pin MIL connectors, and Models 121A31-34 are provided with a molded integral cables, 10 feet (3 m) long.

The high impedance voltage signal produced by the quartz element in the Series 121 is impressed across the input of a built-in miniature source follower amplifier (actually an impedance converter with unity voltage gain) which converts the signal a low impedance voltage less than 100Ω, able to be fed directly into readout instruments such as oscilloscopes, peak meters, etc. over long cables.

Series 121 are designed for permanent installation by Original Equipment Manufacturers in pumps, compressors and pipelines for monitoring pressure fluctuations and/or surges.



Series 121A30 Industrial Pressure Sensor

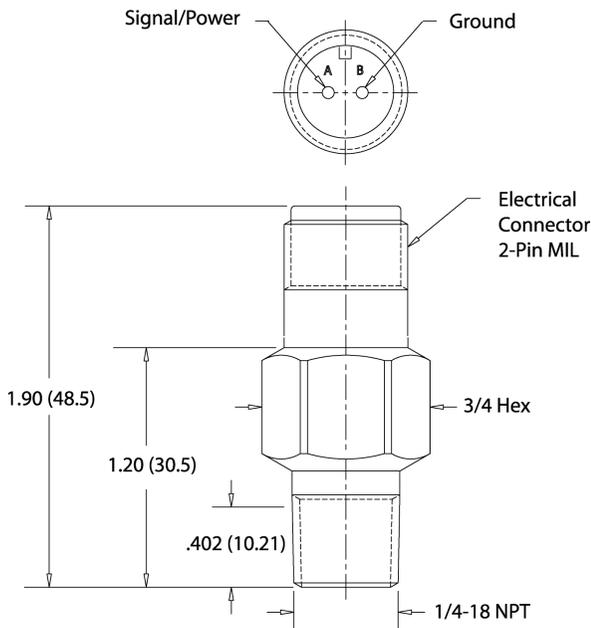
The models are dimensionally the same, and are designed to cover a pressure range from 125 to 10,000 psi. The temperature range is from -100 to 275°F (-73 to 135°C).

2.0 DESCRIPTION

See the installation drawing at the front of this manual for dimensional details of the Series 121A20 and 121A30.

The Series 121A20 and 121A30 have an integral housing diaphragm machined in stainless steel. The sensor incorporates 1/4 NPT mounting, and terminates in either a two-pin MIL or integral cable.

Quartz plates are stacked in a thickness compression mode to produce a relatively high natural frequency. When pressure is applied to the diaphragm of the sensor, the quartz element produces a high impedance voltage signal which the miniature amplifier converts to a low impedance level voltage (<100 Ω) which can



Series 121A20 Industrial Pressure Sensor

OPERATION MANUAL FOR
ICP[®] INDUSTRIAL PRESSURE SENSOR
Series 121
Models 121A21, 121A22, 121A23, 121A24
Models 121A31, 121A32, 121A33, 121A34

be read out on an oscilloscope or digital voltmeter. Power to operate the integrated circuit amplifier and the output signal are both conducted over a single coaxial cable.

When the source terminal at the IC amplifier receives a 2 to 20mA constant current from a +18 to 24VDC supply the amplifier bias at the source will be +11 volts (nominal) and independent of supply voltage or current. The output voltage signal from the quartz element is added to the bias voltage at the source terminal (See General Guide to ICP[®] Signal Conditioning, G-0001).

3.0 INSTALLATION

For details of mounting hole preparation, refer to the installation drawing accompanying this manual.

Stay within the recommended torque range [(5-7 ft-lbs (0.6-0.8 Nm)] when mounting the sensor. It is advisable to use pipe joint compound to assure a tight seal.

Use good machining practice in preparing the mounting port. Make sure the seal surface is free of tool chatter marks.

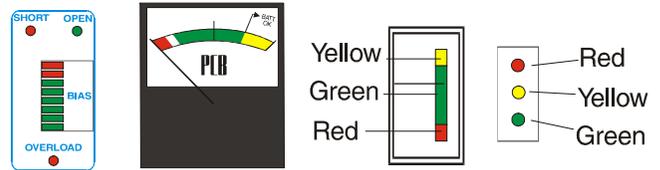
Note: Nicks, scratches, or other discontinuities in the surface can cause leaks at high pressures.

3.4 CABLE INSTALLATION

Series 121A20 has an integral 2-pin MIL connector. Connect one end of an industrial cable to the sensor and the other to the sensor input jack on an ICP[®] sensor signal conditioner (or equivalent). Series 121A30 is provided with an integral twisted pair cable (red is signal, blue is GND). This can be conveniently connected to a terminal strip on an ICP[®] compatible data acquisition system or can be ordered with a BNC connector to connect to an ICP[®] sensor signal conditioner (or equivalent).

4.0 OPERATION

If a PCB signal conditioner is being used, turn the power on and observe the voltmeter (or LED's) on the front panel. Typical indicators are marked as shown in the figure below.



The green area (or LED) indicates the proper bias range for the ICP sensor and the correct cable connectors. A red color indicates a short condition in the sensor, cable or connections. Yellow means the excitation voltage is being monitored and is an indication of an open circuit.

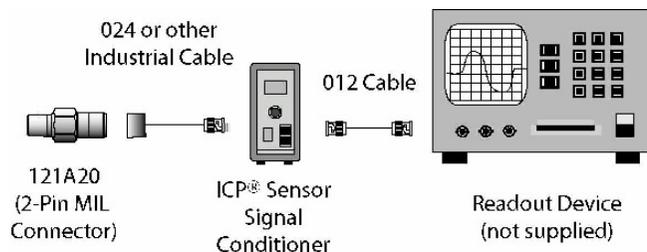
Note: Most PCB pressure sensors have an output bias of 8-14 V. Refer to the specification sheet in this manual for the bias range of the model you are using. If you are using a low bias sensor, the indicator will be at the bottom end of the green portion of the dial indicator, and may even be in the red portion. This is the expected range and indicates proper operation.

Allow the instrument to warm up and thermally stabilize.

When the output from the power unit is connected to readout instrument, a signal drift will be noticed. This drift is due to charging of the coupling capacitor in the power unit and will cease within several minutes.

3

**OPERATION MANUAL FOR
ICP® INDUSTRIAL PRESSURE SENSOR
Series 121
Models 121A21, 121A22, 121A23, 121A24
Models 121A31, 121A32, 121A33, 121A34**



Typical ICP® Connection

4.1 POLARITY

The 121 Series Pressure Sensors produce a positive-going output voltage in response to pressure on the diaphragm.

5.0 CALIBRATION

The discharge time constant of the Series 121 is too short to allow calibration of the sensor by static means. The 121 series can, however, be calibrated by dynamic means using a pulse calibrator such as the Model 903B02. By this method, the sensor is subjected to a series of calibrated step changes in which a linear graph can be plotted over the full range of the unit.

PCB provides recalibration service on request. If such service is needed or desired, consult the factory for details.

Four sensors in the 121 Series (121A21, 121A22, 121A23, and 121A24) have discharge time constants of sufficient duration (100 secs.) to use dead weight testers for calibration.

Following is a brief laboratory procedure for calibrating a pressure sensor using dead weights.

5.1 STATIC CALIBRATION PROCEDURE FOR TIME CONSTANTS OF MORE THAN 100 BUT LESS THAN 500 SECONDS

1. Place sensor on test fixture with coaxial cable connected to oscilloscope.
2. Apply known pressure to sensor diaphragm (within range of instrument) using dead weight.
3. Remove weight and read change in output voltage (mV) corresponding to input pressure (psi).
4. Repeat Steps 2 through 4 in 20% increments within range of sensor.
5. Plot readings on x-y graph (voltage on the y-axis verses pressure on the x-axis).
6. The slope of the line and the sensor sensitivity is mV/psi.

6.0 PRECAUTIONS

1. To avoid destroying the built-in amplifier, do not apply a voltage to the sensor without a current limiting device (20 mA maximum) in the line such as those incorporated in all PCB units.
2. Do not subject sensor to temperatures exceeding 250°F (121°C).
3. Do not exceed maximum pressure rating.

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Performance	ENGLISH	SI	
Measurement Range(for ±5V output)	5,000 psi	34,473 kPa	
Sensitivity(± 20 %)	1 mV/psi	0.145 mV/kPa	
Maximum Pressure(Total)	7,200 psi	49,642 kPa	
Resolution	0.04 psi	0.276 kPa	[1]
Resonant Frequency	≥ 200 kHz	≥ 200 kHz	
Rise Time(Reflected)	≤ 2.5 μ sec	≤ 2.5 μ sec	
Low Frequency Response(- 5 %)	0.005 Hz	0.005 Hz	
Non-Linearity	≤ 2 % FS	≤ 2 % FS	[2]
Environmental			
Acceleration Sensitivity	0.2 psi/g	0.14 kPa/(m/s ²)	[1]
Temperature Range(Operating)	-65 to +250 °F	-54 to +121 °C	
Temperature Coefficient of Sensitivity	≤ 0.08 %/°F	≤ 0.144 %/°C	
Maximum Vibration	10,000 g pk	98,100 m/s ² pk	
Maximum Shock	10,000 g pk	98,100 m/s ² pk	
Electrical			
Output Polarity(Positive Pressure)	Positive	Positive	
Discharge Time Constant	≥ 100 sec	≥ 100 sec	
Excitation Voltage	20 to 30 VDC	20 to 30 VDC	
Constant Current Excitation	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	
Electrical Isolation	≥ 10 ⁸ Ohm	≥ 10 ⁸ Ohm	
Physical			
Sensing Geometry	Compression	Compression	
Sensing Element	Quartz	Quartz	
Housing Material	Stainless Steel	Stainless Steel	
Diaphragm	Stainless Steel	Stainless Steel	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	2-Pin MIL-C-5015	2-Pin MIL-C-5015	
Weight	2.08 oz	59 gm	

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

M - Metric Mount
 Maximum Pressure(Total) 10,000 psi 68,947
 Supplied Accessory: Model 065A15 Seal, .624" OD x .553" ID x .080", brass (3)

NOTES:
 [1]Typical.
 [2]Zero-based, least-squares, straight line method.
 [3]See PCB Declaration of Conformance PS023 for details.

SUPPLIED ACCESSORIES:
 Model PCS-1 Calibration of dynamic pressure sensors at 100% full scale, max 15 kpsi range.

Entered: ND	Engineer: AJA	Sales: RWM	Approved: RPF	Spec Number:
Date: 08/14/2024	Date: 08/14/2024	Date: 08/14/2024	Date: 08/14/2024	17149



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.
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PCB PIEZOTRONICS
 AN AMPHENOL COMPANY
 Phone: 716-684-0001
 Fax: 716-684-0987
 E-Mail: info@pcb.com

3425 Walden Avenue, Depew, NY 14043

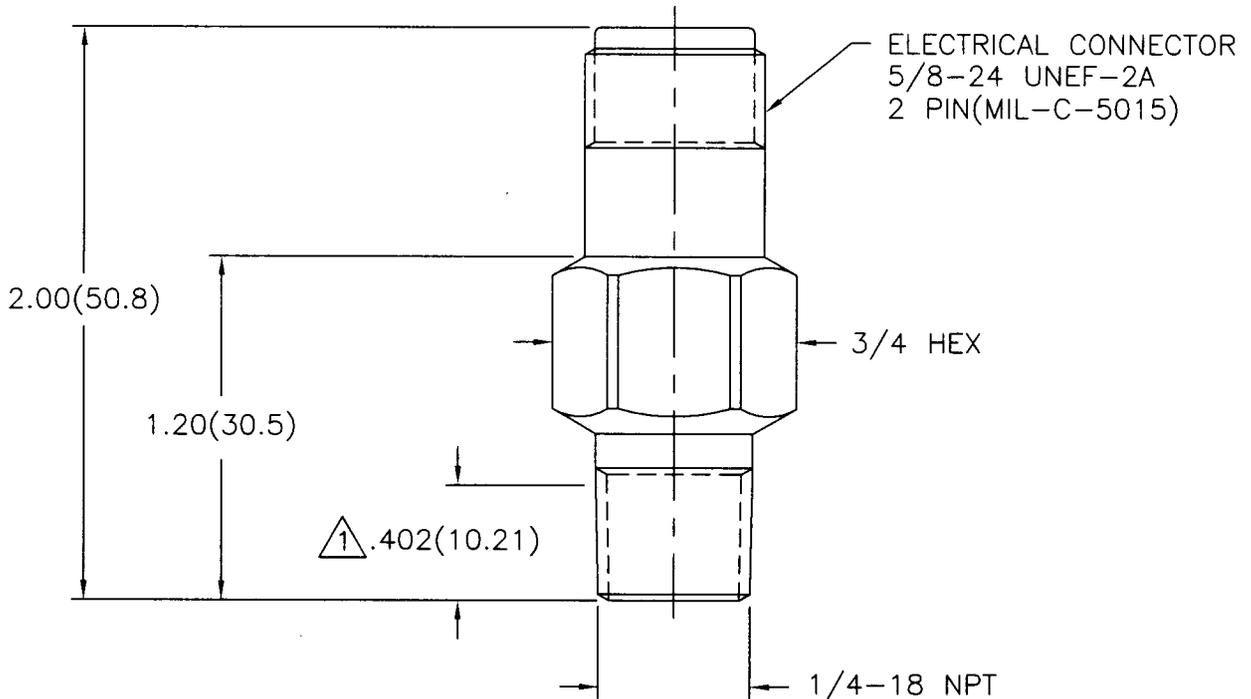
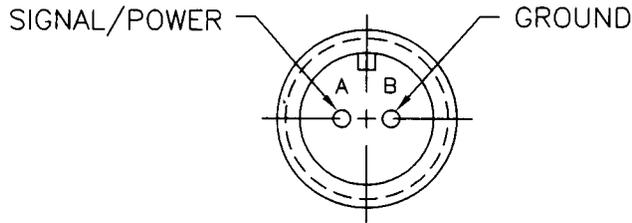
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APPLICATION		
NEXT ASS'Y	USED ON	VAR

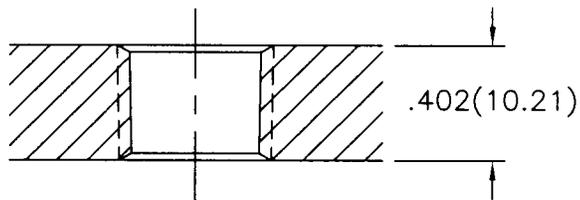
REVISIONS				
REV	DESCRIPTION	ECN	DATE	APP'D
A	REVISED PER ECN	13362	4/10/01	Om4/jj

TOP VIEW OF CONNECTOR



MOUNTING HOLE PREPARATION:

- ∅ .437(∅ 11.10)
- X .402(10.21) ∇ MIN.
- TAP 1/4-18 NPT
- X .402(10.21) ∇



2.) USE PIPE JOINT COMPOUND TO ASSURE TIGHT SEAL.

△ MAXIMUM INSERTION OF THREAD INTO MOUNTING HOLE.

UNLESS SPECIFIED TOLERANCES		DRAWN	rw	4/10/01	MFG	Dec	4/10/01	 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 EMAIL: SALES@PCB.COM
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS (IN PARENTHESIS)	CHK'D	sm	4/10/01	ENGR	BSH	4/10/01	
DECIMALS XX ± .01 XXX ± .005	DECIMALS XX ± 0.3 XXX ± 0.13	APP'D	WSH	4/10/01				CODE IDENT. NO. 52681
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES	TITLE						DWG. NO.
FILLETS AND RADII .003 - .005	FILLETS AND RADII (0.07 - 0.13)	INSTALLATION DRAWING MODEL 121A23 PRESSURE SENSOR						15411
DD011 REV. B 03/13/98								SCALE: 1.5X
							SHEET 1 OF 1	