



Model 112A22

High resolution ICP® pressure probe, 50 psi, 100 mV/psi, 0.218" dia. diaphragm, accel. comp.

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.

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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.

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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.

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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.

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PCB工业监视和测量设备 - 中国RoHS2公布表

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部件名称	有害物质					
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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。						
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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

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**OPERATION MANUAL FOR
ICP® PRESSURE SENSORS
Models 102A02, A05, A07, A09
Models 112A21, A22, A23**

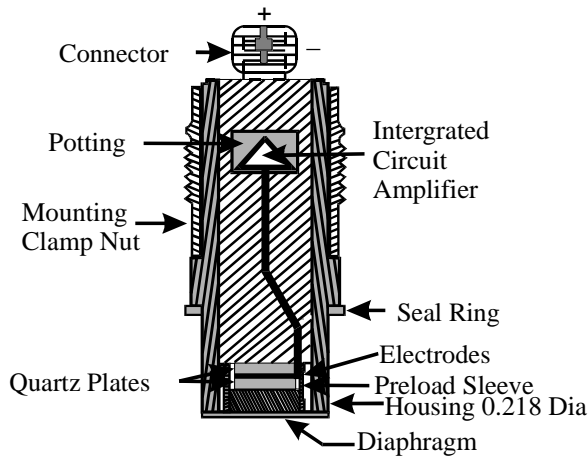
1.0 INTRODUCTION

The series of miniature pressure sensors described by this operating guide is designed for low pressure, high resolution applications and features acceleration compensation.

Uses include monitoring of low pressure hydraulic and pneumatic phenomena in the presence of shock and vibration such as on jet engines, compressors, turbines and other operating machinery, high intensity sound and turbulence measurements, and many other industrial R & D applications.

2.0 DESCRIPTION

This series is comprised of six sensor models having high sensitivities, but differing in mechanical configuration.

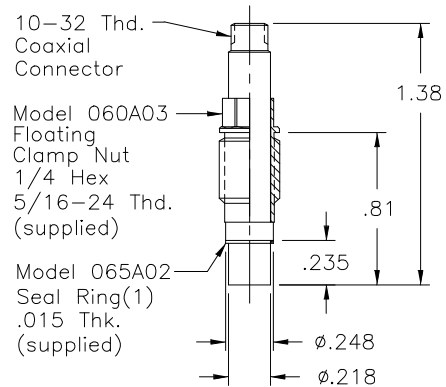


Typical ICP® Probe Style Sensor

Each model utilizes the basic ICP® pressure probe as shown in above figure. The pressure probe consists of the Model 112A high sensitivity acceleration-compensated quartz element and an IC source follower amplifier joined together as an inseparable assembly.

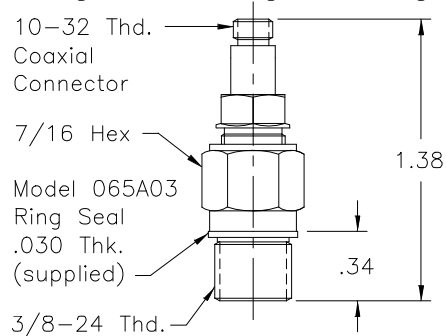
Refer to "General Guide to ICP® Instrumentation" G-0001B for a complete treatment of the ICP® concept.

Models 112A21, 112A22 and 112A23 are in the basic probe configuration as shown in Figure 1, and are installed with a hollow clamp nut with 5/16-24 external threads. The housings of these models are at electrical ground potential.



Series 111: Probe Style Sensor

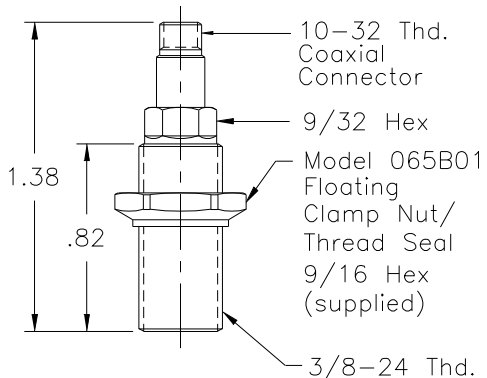
The Model 102A05 utilizes the same basic pressure probe, mounted in a 3/8-24 threaded mounting adaptor with shoulder seal. The probe is assembled into the adaptor at the factory in an "off ground" configuration, i.e., the probe body is electrically insulated from the external mounting adaptor body. Do not attempt to disassemble probe and adaptor.



Model 102A05 Thread Mount Design, Ground-Isolated Sensor

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Models 102A02, 102A07, and 102A09 utilize the same inner probe design but in a 3/8-24 threaded adaptor with floating clamp nut to allow adjustment of diaphragm depth where it is necessary to adapt to various wall thicknesses. These models are supplied only in low pressure (100 and 50 psi) versions and are also "off ground".



102A's: Thread Mount with Floating Clamp Nut, Ground-Isolated Sensor

3.0 INSTALLATION

This manual contains outline and installation information for your specific model in this series. Prepare mounting ports in accordance with the installation drawing for the specific model, paying particular attention to sealing surfaces. These surfaces must be smooth and free from chatter marks, nicks and other irregularities which could preclude a pressure-tight seal.

Seals are provided with each sensor and should always be used. Extra seals for all standard models are in stock at the factory. Replace seals when they become unserviceable.

In some cases, e.g., where flash temperatures such as those generated by combustion processes are present, it may be necessary to thermally insulate the diaphragm to minimize spurious signals generated by these effects.

Common black vinyl electrical tape has been found to be an effective insulating material in many cases. One or more layers may be used across the end of the diaphragm without affecting response or sensitivity.

A silicone rubber coating approximately .010" thick has also been proven effective in many applications. General Electric RTV type 106 silicone rubber is recommended. Apply the rubber coating and allow to cure in accordance with the manufacturer's instructions.

Although ICP® sensors have low output impedance and in general are not affected by moisture, in extreme environments it is good practice to protect cable connections with shrink tubing.

It is not necessary to use low-noise coaxial cable with this sensor series. In fact, a Model 070A09 solder connector adaptor that allows the use of ordinary two-wire cable is desired.

4.0 OPERATION

It is only necessary to supply the sensor with a 2 to 20 mA constant current at +20 to +30 VDC through a current-regulating diode or equivalent circuit. (See Guide G-0001B for powering and signal utilization information pertaining to all ICP® instrumentation).

Most of the signal conditioners manufactured by PCB have an adjustable current feature allowing a choice of input currents from 2 to 20 mA. In general, for lowest noise (best resolution) choose the low current ranges and for driving long cables (to several thousand feet) use the higher current, up to 20 mA maximum.

To operate system using a PCB signal conditioner:

1. Switch power on.
2. Wait several minutes for the IC amplifier to turn on and stabilize.
3. Proceed with measurements.

4.1 OPERATING CONSIDERATION FOR MODEL 112A23

The Model 112A23 features a low-noise amplifier which, based on a peak-to-peak broadband noise factor of 50 μ V, results in a resolution of .001 psi.

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Defined for practical purposes as the minimum readout signal, the resolution is based on the sensitivity of 50 mV/psi and a low noise amplifier of 50 μ V peak noise.

Thus, $50 \mu\text{V}/50\text{mV} = .001$ psi resolution

The output bias voltage of the Model 112A23 is 5.0 volts, half the bias voltage of most PCB pressure sensors. This will cause the bias monitor meter on PCB power supplies to read at the low end of the green band.

5.0 POLARITY

This sensor series produces a positive-going output voltage for increasing pressure input.

6.0 LOW FREQUENCY RESPONSE

The low frequency response of an ICP® system is determined by:

1. The discharge time constant of the sensor, and,
2. If AC-coupled at power unit, the coupling time constant.

Consult Section 7.0 in Guide G-0001B for detailed explanation of low frequency characteristics of ICP® instruments.

7.0 CALIBRATION

Piezoelectric sensors are dynamic devices, but static calibration methods may be employed if discharge time constants are sufficiently long. Generally, static methods are not employed below several hundred seconds discharge time constant.

To employ static methods, directly couple the sensor to the DVM readout using a T-connector from the XD4R jack or use the Model 484B in the "calibrate" mode. Apply pressure with dead weight tester and take readings quickly. Release pressure after each calibration point.

For the shorter discharge time constant series, a rapid pressure step must be generated by a pneumatic pressure pulse calibrator or dead weight tester and readout is by recorder or storage oscilloscope.

PCB offers a complete recalibration service. Consult factory for details.

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8.0 MAINTENANCE

The miniature size sealed construction precludes field maintenance. Should service be required, return unit to factory with note describing problem.

®ICP is a registered trademark of PCB Piezotronics



Model 14907-01

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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

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Performance	ENGLISH	SI	
Sensitivity(+/- 15 %)	1.20 pC/psi	0.17 pC/kPa	
Measurement Range	500 psi	3,447 kPa	[1]
Cycle Pressure	16,000 psi	110,000 kPa	
Maximum Pressure(Total)	15,000 psi	103,421 kPa	
Resonant Frequency	≥ 250 kHz	≥ 250 kHz	
Rise Time(Reflected)	≤ 2.0 μ sec	≤ 2.0 μ sec	
Non-Linearity	≤ 1.0 % FS	≤ 1.0 % FS	[1]
Environmental			
Acceleration Sensitivity(Final)	≤ 0.002 psi/g	≤ 0.0014 kPa/(m/s ²)	
Temperature Range(Operating)	-100 to +275 °F	-73 to +135 °C	
Temperature Coefficient of Sensitivity	≤ 0.03 %/°F	≤ 0.054 %/°C	
Maximum Flash Temperature	3,000 °F	1,650 °C	
Maximum Vibration	2,000 g pk	19,600 m/s ² pk	
Maximum Shock	20,000 g pk	196,000 m/s ² pk	
Electrical			
Output Polarity(Positive Pressure)	Positive	Positive	
Capacitance	17 to 24 pF	17 to 24 pF	
Insulation Resistance(Room Temp.)	≥ 10 ¹² Ohm	≥ 10 ¹² Ohm	
Physical			
Sensing Element	Quartz	Quartz	
Sensing Geometry	Compression	Compression	
Housing Material	17-4 Stainless Steel	17-4 Stainless Steel	
Diaphragm	Invar	Invar	
Sealing	Epoxy	Epoxy	
Electrical Connector	10-32 Coaxial Plug	10-32 Coaxial Plug	
Mounting Torque	23 to 35 in-lb	26.4 to 40.3 kg-cm	[2]

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.

NOTES:
 [1] Calibration steps: 500 psi, 300 psi, 200 psi, 100 psi, 50 psi
 [2] When used with standard mounting hardware.

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Entered: LK	Engineer: NJL	Sales:	Approved: RPF
Date: 05/21/2020	Date: 05/21/2020	Date:	Date: 05/21/2020
		Spec Number: 72682	

PCB Internal Use Only

For Internal Use Only

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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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
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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.

	ENGLISH	SI
Performance		
Measurement Range(for ±5V output)	50 psi	345 kPa
Useful Overrange(for ± 10V output)	100 psi	690 kPa
Sensitivity(± 15 %)	100 mV/psi	14.5 mV/kPa
Maximum Pressure(step)	500 psi	3,450 kPa
Maximum Pressure(Total)	15,000 psi	103,421 kPa
Resolution	0.1 mpsi	0.000689 kPa
Resonant Frequency	≥ 250 kHz	≥ 250 kHz
Rise Time(Reflected)	≤ 2.0 μ sec	≤ 2.0 μ sec
Low Frequency Response(- 5 %)	0.50 Hz	0.50 Hz
Non-Linearity	≤ 1.0 % FS	≤ 1.0 % FS
Environmental		
Acceleration Sensitivity	≤ 0.002 psi/g	≤ 0.0014 kPa/(m/s ²)
Temperature Range(Operating)	-100 to +275 °F	-73 to +135 °C
Temperature Coefficient of Sensitivity	≤ 0.06 %/°F	≤ 0.108 %/°C
Maximum Flash Temperature	3,000 °F	1,650 °C
Maximum Vibration	2,000 g pk	19,613 m/s ² pk
Maximum Shock	20,000 g pk	196,133 m/s ² pk
Electrical		
Output Polarity(Positive Pressure)	Positive	Positive
Discharge Time Constant(at room temp)	≥ 1.0 sec	≥ 1.0 sec
Excitation Voltage	22 to 30 VDC	22 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 14 VDC	8 to 14 VDC
Physical		
Sensing Geometry	Compression	Compression
Sensing Element	Quartz	Quartz
Housing Material	17-4 Stainless Steel	17-4 Stainless Steel
Diaphragm	Invar	Invar
Sealing	Welded Hermetic	Welded Hermetic
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack
Weight(with clamp nut)	0.21 oz	6.0 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. [5]

E - Emralon coating
 Coating Emralon Emralon
 Electrical Isolation 10⁸ Ohm 10⁸ Ohm
 Supplied Accessory: Model 065A08 Isolation ring 0.250" OD x 0.218" ID x 0.027" thk anodized aluminum (3)
 Supplied Accessory: Model 065A22 Isolation Seal, .250" OD x .218" ID x .015", Torlon or Vespel (3) [5][6]

J - Ground Isolated
 Electrical Isolation(50 V) 10⁸ Ohm 10⁸ Ohm [5]

N - Negative Output Polarity [5]

S - Stainless Steel Diaphragm [5][7]

W - Water Resistant Cable
 Supplied Accessory: Model 060A03 Clamp nut, 5/16-24-2A thd, 1/4" hex, stainless steel (1) [5][7]

WM - Water Resistant Cable
 Supplied Accessory: Model 060A05 Clamp nut M7 x 0.75-6g thd (1)

NOTES:

[1]For +10 volt output, minimum 24 VDC supply voltage required. Negative 10 volt output may be limited by output bias.

[2]Typical value.

[3]Zero-based, least-squares, straight line method.

[4]See PCB Declaration of Conformance PS023 for details.

[5]For sensor mounted in thread adaptor, see adaptor installation drawing for supplied accessories and pressure limitations.

[6]Used with optional mounting adaptor.

[7]Clamp nut installed prior to cable attachment

SUPPLIED ACCESSORIES:

Model 060A03 Clamp nut, 5/16-24-2A thd, 1/4" hex, stainless steel (1)
 Model 060A05 Clamp nut M7 x 0.75-6g thd (1)
 Model 065A02 Seal ring, sensor flush mount, 0.248" OD x 0.219" ID x 0.015" thk, brass (3)
 Model 065A05 Seal sleeve sensor recess mount 0.248" OD x 0.221" ID x 0.240" thk 17-4 (1)

Entered: ND	Engineer: AK	Sales: RWM	Approved: RPF	Spec Number:
Date: 01/25/2023	Date: 01/25/2023	Date: 01/25/2023	Date: 01/25/2023	6476

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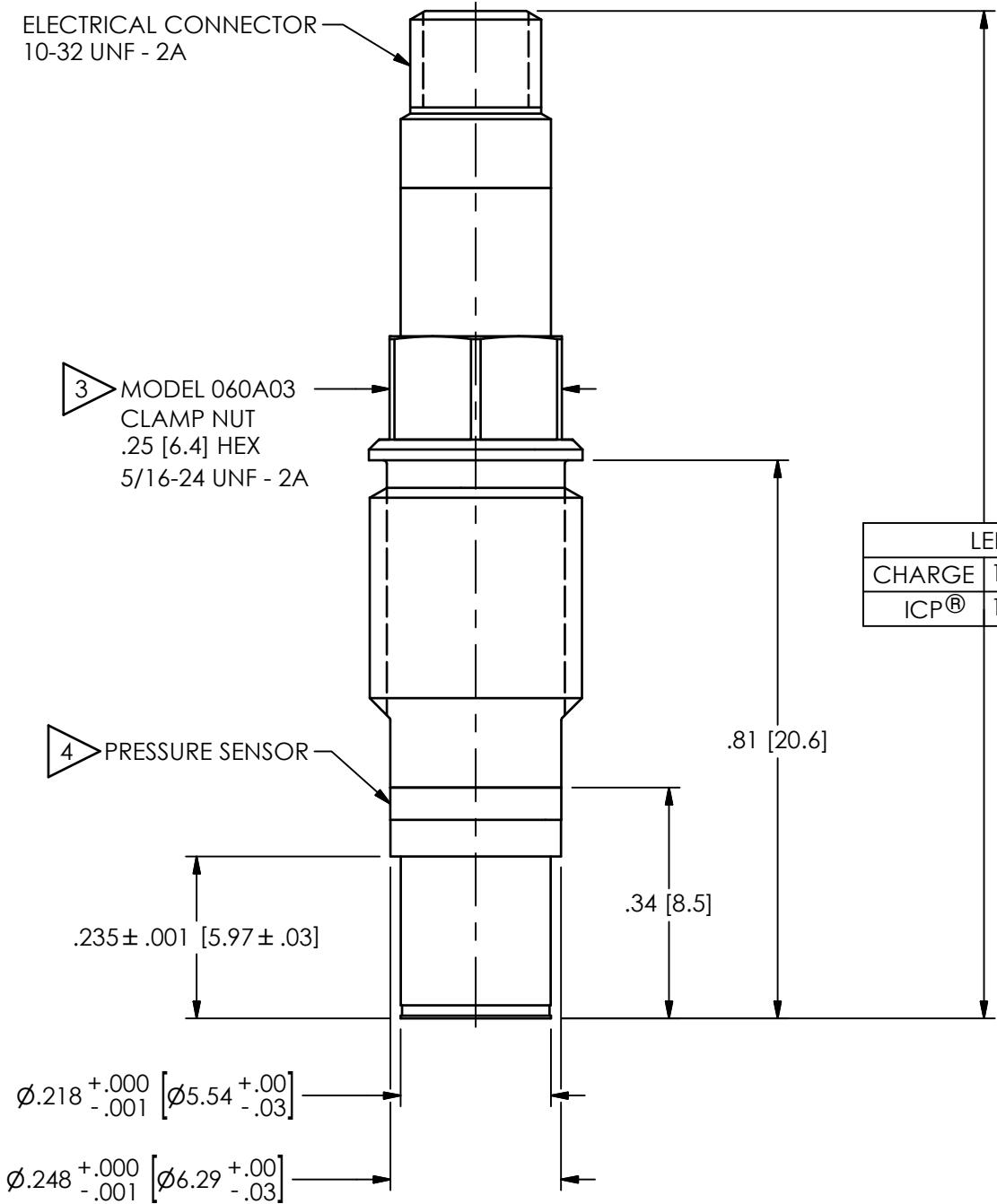


All specifications are at room temperature unless otherwise specified.
 In the interest of constant product improvement, we reserve the right to change specifications without notice.
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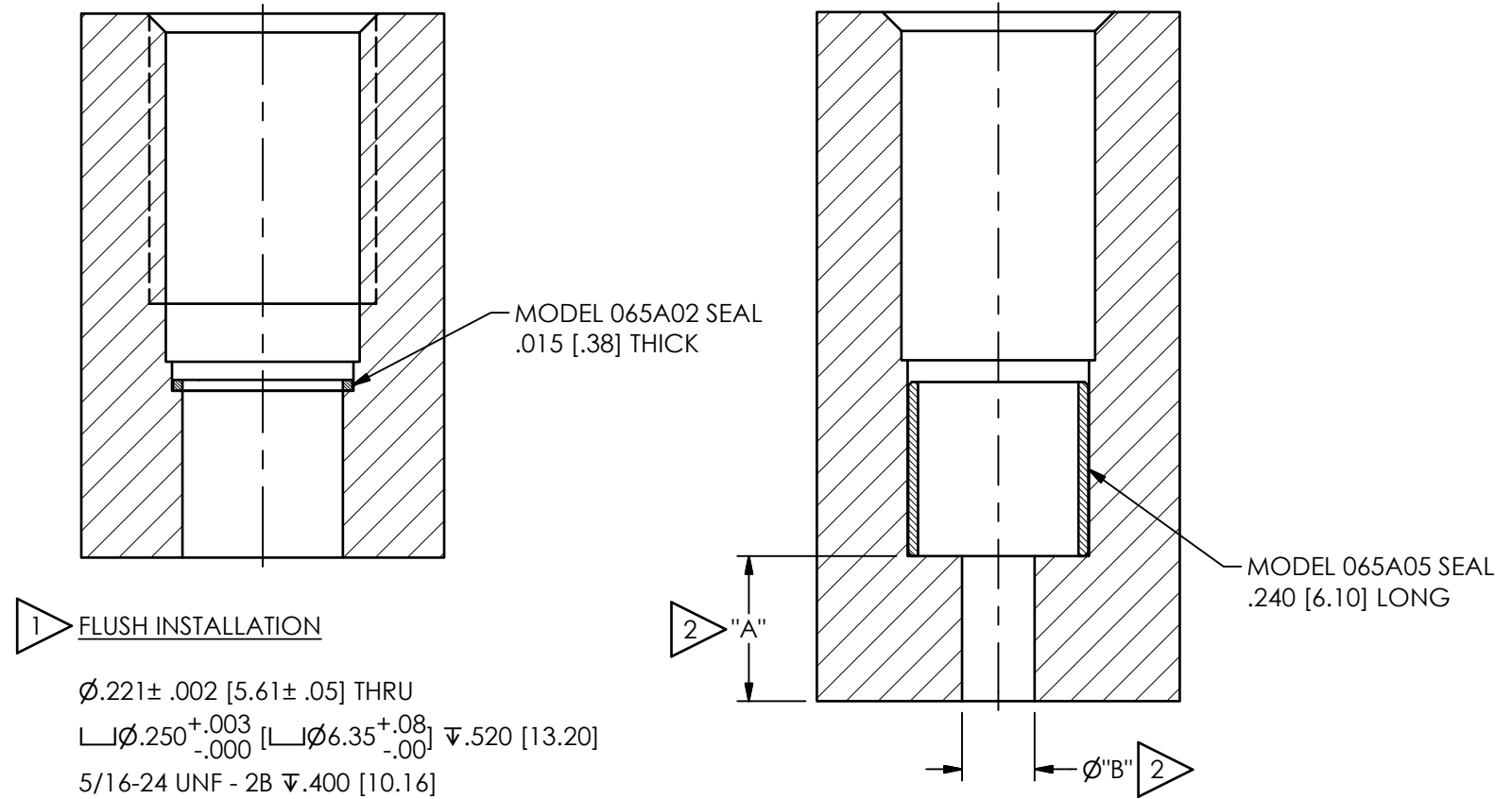
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40623

REVISIONS		
REV	DESCRIPTION	DIN
A	UPDATED OVERALL LENGTH	53183



MOUNTING HOLE PREPARATION



RECESSED INSTALLATION

⌊Ø.250^{+.003}/_{-.000} [⌊Ø6.35^{+.08}/_{-.00}] ⌋.750 [19.05]
 5/16-24 UNF - 2B ⌋.400 [10.16]

- 4 IC AMP & SENSOR ARE SEALED ASSEMBLIES & SHOULD BE RETURNED TO THE FACTORY FOR SERVICE &/OR REPAIR
- 3 RECOMMENDED TORQUE ON .25 [6.3] HEX: 25-35 IN-LBS [2.8-3.9 N-m]
- 2 DIMENSIONS "A" & "B" TO SUIT USER REQUIREMENTS
- 1 THESE DIMENSIONS FOR .750 [19.05] THICK WALL. C'BORE FOR THICKER WALLS

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER	
DIMENSIONS IN INCHES		NJF	09/23/22	JDM	09/23/22	AJA	09/23/22
DECIMALS XX ±.01 XXX ±.005		TITLE					
ANGLES ± 2 DEGREES		INSTALLATION DRAWING					
CABLE TOLERANCES IN ENGLISH		ENGLISH MOUNT					
1" ≤ LENGTH < 1' = +1"/-0		MODELS 111, 112, & 113 SERIES					
1' ≤ LENGTH < 5' = +2"/-0		PRESSURE SENSOR					
5' ≤ LENGTH < 100' = +6"/-0		SCALE: 4X		SHEET 1 OF 2		PCB PIEZOTRONICS AN AMPHENOL COMPANY	
100' ≤ LENGTH = +1"/-0		DWG. NO. 40623		3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com			
FILLETS AND RADII .003 - .005		CODE IDENT. NO. 52681					
FILLETS AND RADII 0.07 - 0.13							

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40623

REVISIONS

REV	DESCRIPTION	DIN
	-SEE SHEET 1-	

ELECTRICAL CONNECTOR
10-32 UNF - 2A

3 MODEL 060A05
CLAMP NUT
.25 [6.4] HEX
M7x0.75 - 6g

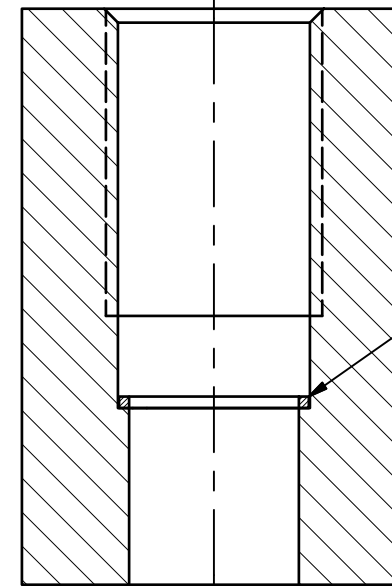
4 PRESSURE SENSOR

$\phi .218^{+.000}_{-.001}$ [$\phi 5.54^{+.00}_{-.03}$]

$\phi .248^{+.000}_{-.001}$ [$\phi 6.29^{+.00}_{-.03}$]

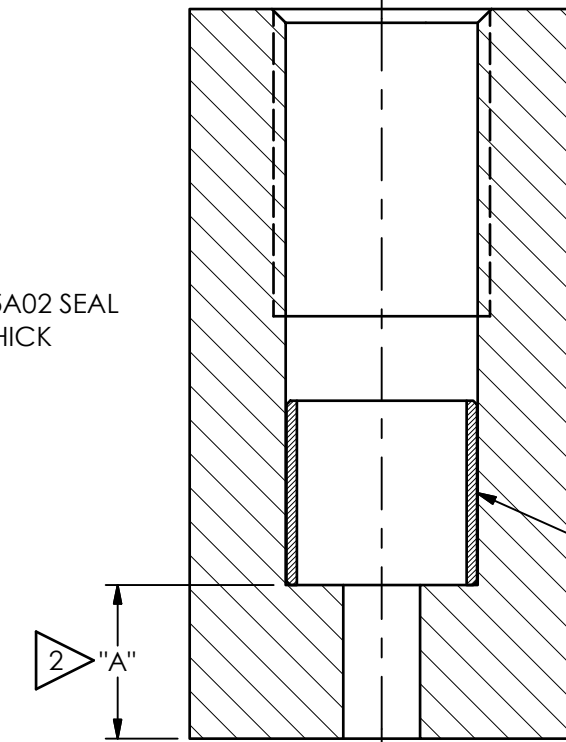
	LENGTH
CHARGE	1.32± .05 [33.5]
ICP®	1.46± .05 [37.1]

MOUNTING HOLE PREPARATION



1 FLUSH INSTALLATION

$\phi .221 \pm .002$ [5.61± .05] THRU
 $\perp \phi .250^{+.003}_{-.000}$ [$\perp \phi 6.35^{+.08}_{-.00}$] $\nabla .520$ [13.20]
 M7x0.75 - 6H $\nabla .400$ [10.16]



2 "A"

RECESSED INSTALLATION

$\perp \phi .250^{+.003}_{-.000}$ [$\perp \phi 6.35^{+.08}_{-.00}$] $\nabla .750$ [19.05]
 M7x0.75 - 6H $\nabla .400$ [10.16]

MODEL 065A05 SEAL
.240 [.610] LONG

4 IC AMP & SENSOR ARE SEALED ASSEMBLIES & SHOULD BE RETURNED TO THE FACTORY FOR SERVICE &/OR REPAIR

3 RECOMMENDED TORQUE ON .25 [6.3] HEX: 25-35 IN-LBS [2.8-3.9 N-m]

2 DIMENSIONS "A" & "B" TO SUIT USER REQUIREMENTS

1 THESE DIMENSIONS FOR .750 [19.05] THICK WALL. C'BORE FOR THICKER WALLS

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	
DIMENSIONS IN INCHES DECIMALS XX ±.01 XXX ±.005 ANGLES ± 2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ± 0.3 XX ± 0.13 ANGLES ± 2 DEGREES
CABLE TOLERANCES IN ENGLISH 1" ≤ LENGTH < 1' = +1' / - 0 1' ≤ LENGTH < 5' = +2' / - 0 5' ≤ LENGTH < 100' = +6' / - 0 100' ≤ LENGTH = +1' / - 0	CABLE TOLERANCES IN METRIC 2.54cm ≤ LENGTH < 30.5cm = +2.54cm / - 0 30.5cm ≤ LENGTH < 1.5m = +5.1cm / - 0 1.5m ≤ LENGTH < 30.5m = +15.2cm / - 0 30.5m ≤ LENGTH = +30.5cm / - 0
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13

DRAWN	CHECKED	ENGINEER
NJF 09/23/22	JDM 09/23/22	AJA 09/23/22
TITLE		
INSTALLATION DRAWING METRIC MOUNT MODELS 111, 112, & 113 SERIES PRESSURE SENSOR		

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CODE IDENT. NO. 52681
DWG. NO. 40623

SCALE: 4X SHEET 2 OF 2