



Model 102M295

Cryogenic ICP® pressure sensor, 3500 psi, 1.5 mV/psi, 7/16-20 UNF mtg thd

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.

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Depew, NY14043 USA
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General inquiries: info@pcb.com
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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.



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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

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OPERATING GUIDE
DYNAMIC (CRYOGENIC)
ICP® PRESSURE SENSORS
MODELS 102A10, A11, A13, A14

1.0 DESCRIPTION

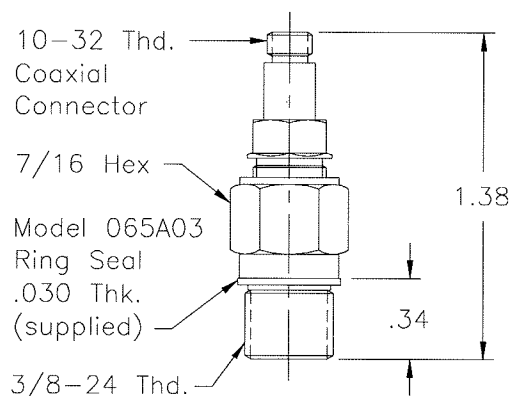
This sensor series consists of a Model 112A quartz pressure element coupled to a special MOSFET amplifier circuit to permit operation at cryogenic temperatures.

Cryogenic sensors use special electronics that have some characteristics differing from standard designs.

Polarity of the output signal is positive-going for increasing pressure.

2.0 INSTALLATION

Refer to installation drawing for mounting hole preparation. The outer housing of the thread adaptor is ground isolated from the sensing element.



Series 102A10: Cryogenic Pressure Sensor

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 prevent 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. It is recommended to replace the seals every time the sensor is re-installed.

Although these low-impedance sensors are not affected by moisture, in extreme environments such as cryogenic, it is advisable to protect cable connections with shrink tubing. Low-noise cable

(003A) is not necessary. Model 070A09 solder connector adaptor permits the use of ordinary two-wire cable.

3.0 OPERATION

These sensors are operated like standard ICP® sensors.

For general laboratory-type use, either Model 480C02 battery-powered signal conditioner or Model 482A06 line-powered signal conditioner is recommended for use with Cryogenic Sensors. Both Models provide 2 mA constant current to power the sensor electronics.

Other standard signal conditioners Series 481A, 482A, and 483A may also be used, provided the current is adjusted to 2 mA. All above Models include a bias de-coupling capacitor in series with the output connector.

For telemetry applications, Model 495A signal conditioner provides band pass filtering, adjustable gain, bias and limiting.

4.0 CALIBRATION

Because of the relatively short time constants of these sensors (see specification sheet at the front of this manual), only dynamic calibration methods can be used.

5.0 MAINTENANCE

Because of the miniature size and built-in electronics of these units, field maintenance is not recommended.

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6.0 CAUTION

The FET amplifier used in these sensors is a special low-noise device with gate breakdown voltage of 125 volts.

This voltage rating can be exceeded by either imposing a high-pressure step or a fast-rising pressure ramp to the diaphragm in excess of the rating for the sensor.

Slowly applied or released static pressure levels, within the mechanical capability of the sensor, are not dangerous since the charge generated by the quartz element has time to leak off through the FET bias resistor.

It is important to note that the following two pressure ratings are involved:

1. Maximum total pressure (mechanical consideration).
2. Maximum step pressure (electrical consideration).

NOTE: To avoid damage to the sensor, limit pressure application to maximum values on specification sheet at the front of this manual.

The maximum step pressure may be exceeded up to the maximum total pressure level provided the total pressure (rise or fall) takes place.

® ICP is a registered trademark of PCB Piezotronics

Performance	ENGLISH	SI	
Measurement Range(for ±5V output)	3,500 psi	24,133 kPa	[1]
Sensitivity(± 15 %)	1.5 mV/psi	0.217 mV/kPa	
Maximum Pressure(Total)	10,000 psi	68,950 kPa	
Resolution	0.02 psi	0.14 kPa	[2]
Resonant Frequency	≥ 250 kHz	≥ 250 kHz	
Rise Time(Reflected)	≤ 2.0 μ sec	≤ 2.0 μ sec	
Low Frequency Response(- 5 %)	0.5 Hz	0.5 Hz	
Non-Linearity	≤ 1.0 % FS	≤ 1.0 % FS	[3]
Environmental			
Acceleration Sensitivity	≤ 0.002 psi/g	≤ 0.0014 kPa/(m/s ²)	
Temperature Range(Operating)	-320 to +212 °F	-196 to +100 °C	
Temperature Coefficient of Sensitivity	≤ 0.06 %/°F	≤ 0.108 %/°C	
Maximum Flash Temperature	3,000 °F	1,649 °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			
Discharge Time Constant(at room temp)	≥ 1.0 sec	≥ 1.0 sec	
Excitation Voltage	15 to 30 VDC	15 to 30 VDC	
Constant Current Excitation	2 to 20 mA	2 to 20 mA	
Output Impedance	< 500 Ohm	< 500 Ohm	
Output Bias Voltage	3 to 8 VDC	3 to 8 VDC	
Electrical Isolation	> 10 MOhm	> 10 MOhm	
Physical			
Sensing Geometry	Compression	Compression	
Sensing Element	Quartz	Quartz	
Housing Material(probe)	304L/316L Stainless Steel	304L/316L Stainless Steel	
Thread Adaptor Material	Inconel 718	Inconel 718	
Diaphragm	316L Stainless Steel	316L Stainless Steel	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	
Weight	0.92 oz	26 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.

NOTES:
 [1]-5V output may be limited by the output bias.
 [2]Typical.
 [3]Zero-based, least-squares, straight line method.
 [4]See PCB Declaration of Conformance PS023 for details.



Entered: LK	Engineer: NJL	Sales: RWM	Approved: RPF	Spec Number:
Date: 07/10/2020	Date: 07/10/2020	Date: 07/10/2020	Date: 07/10/2020	62261

Phone: 716-684-0001
Fax: 716-684-0987
E-Mail: info@pcb.com

3425 Walden Avenue, Depew, NY 14043

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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Model 061A01

Mounting adaptor, 3/8-24 external thd to 5/16-24 internal thd, 17-4 SS (for Series 111, 112 & 113)

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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
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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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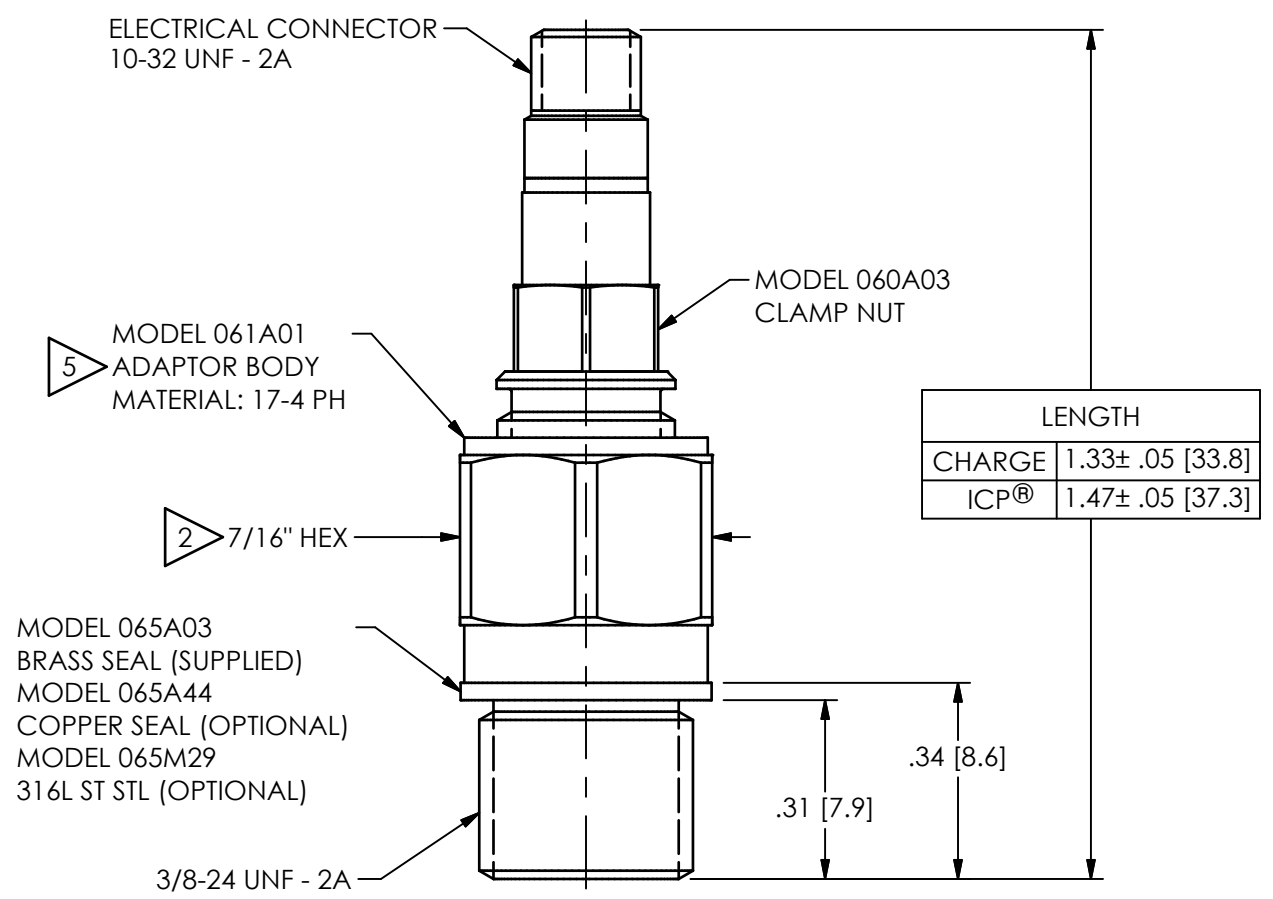
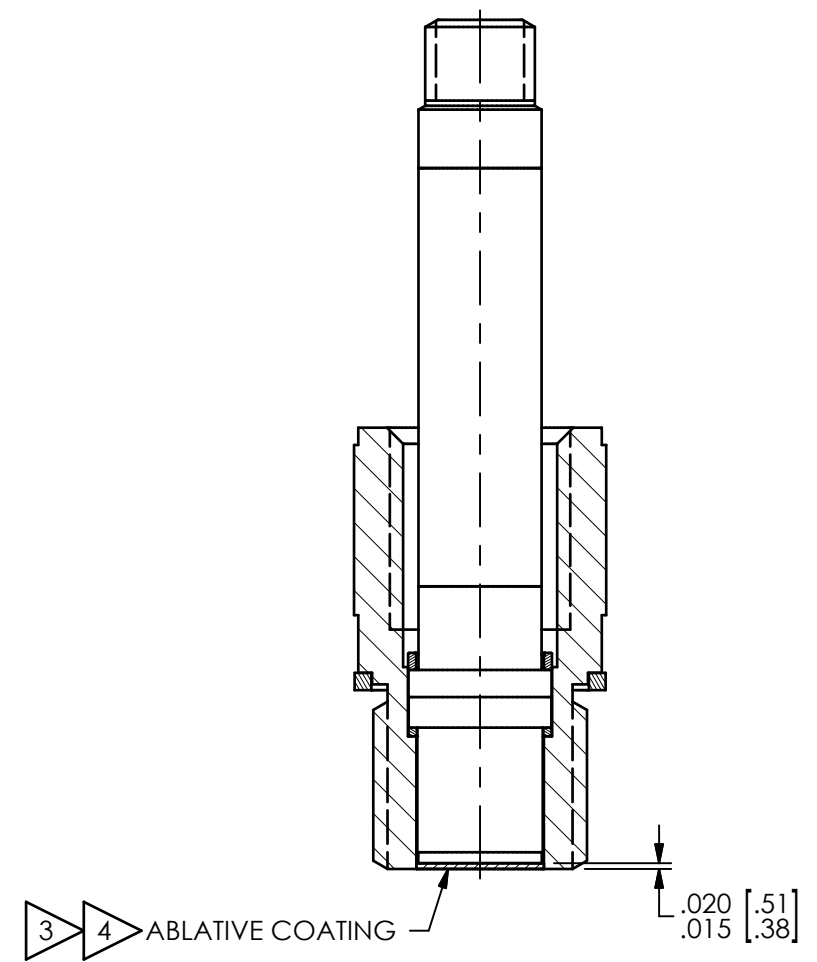
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PCB Piezotronics Inc. claims proprietary rights in the information disclosed hereon. Neither it nor any reproduction thereof will be disclosed to others without the written consent of PCB Piezotronics Inc.

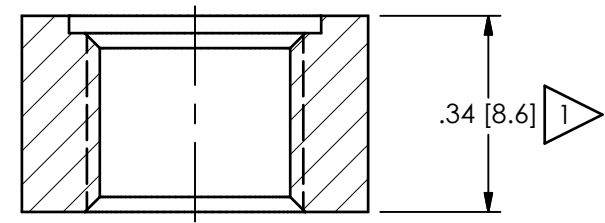
REVISIONS		
REV	DESCRIPTION	DIN
G	UPDATED NOTES	54569

ABLATIVE INSTALLATION



MOUNTING HOLE PREPARATION:

3/8-24 UNF - 2B THRU
 $\perp \text{ } \phi .437 \pm .001 [11.10 \pm .03] \nabla .030 [.76]$



- 5 ADAPTOR MAY BE PURCHASED SEPARATELY: 061A01 (17-4PH) OR 061A09 (316L)
- 4 BLACK VINYL ELECTRICIANS TAPE HAS BEEN FOUND TO BE AN EFFECTIVE ABLATIVE MATERIAL, AS IS DC-4 SILICON GREASE
- 3 "CA" OPTION ONLY
- 2 MOUNTING TORQUE ON 7/16" HEX: 5-8 FT-LBS [6.78-10.85 Nm]
- 1 ABOVE INSTALLATION SHOWN FOR WALL THICKNESS OF .34 [8.6]. \perp THICKER WALLS $\phi .75 [19.1]$ TO CLEAR 7/16" HEX AND ALLOW FOR SOCKET WRENCH

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:				DRAWN		CHECKED		ENGINEER	
DIMENSIONS IN INCHES		DIMENSIONS IN MILLIMETERS [IN BRACKETS]		NJF	02/02/24	JDM	02/02/24	MJB	02/02/24
DECIMALS XX ±.01	DECIMALS X ±.03	DECIMALS XXX ±.005	DECIMALS XX ±.013	TITLE					
ANGLES ± 2 DEGREES		ANGLES ± 2 DEGREES		INSTALLATION DRAWING MODELS 101A, 102A, 102B, 102M, 061A01, & 061A09 PRESSURE SENSOR					
CABLE TOLERANCES IN ENGLISH		CABLE TOLERANCES IN METRIC							
1" ≤ LENGTH < 1'	= +1"/ - 0	2.54cm ≤ LENGTH < 30.5cm	= +2.54cm / - 0						
1' ≤ LENGTH < 5'	= +2"/ - 0	30.5cm ≤ LENGTH < 1.5m	= +5.1cm / - 0						
5' ≤ LENGTH < 100'	= +6"/ - 0	1.5m ≤ LENGTH < 30.5m	= +15.2cm / - 0	CODE IDENT. NO. 52681		SHEET B		DWG. NO. 6450	
100' ≤ LENGTH	= +1' / - 0	30.5m ≤ LENGTH	= +30.5cm / - 0	SCALE: 3X		SHEET 1 OF 1			
FILLETS AND RADII .003 - .005		FILLETS AND RADII 0.07 - 0.13							

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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.

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REVISIONS		
REV	DESCRIPTION	DIN
A	NOTE 3 WAS NOTE 4	44997

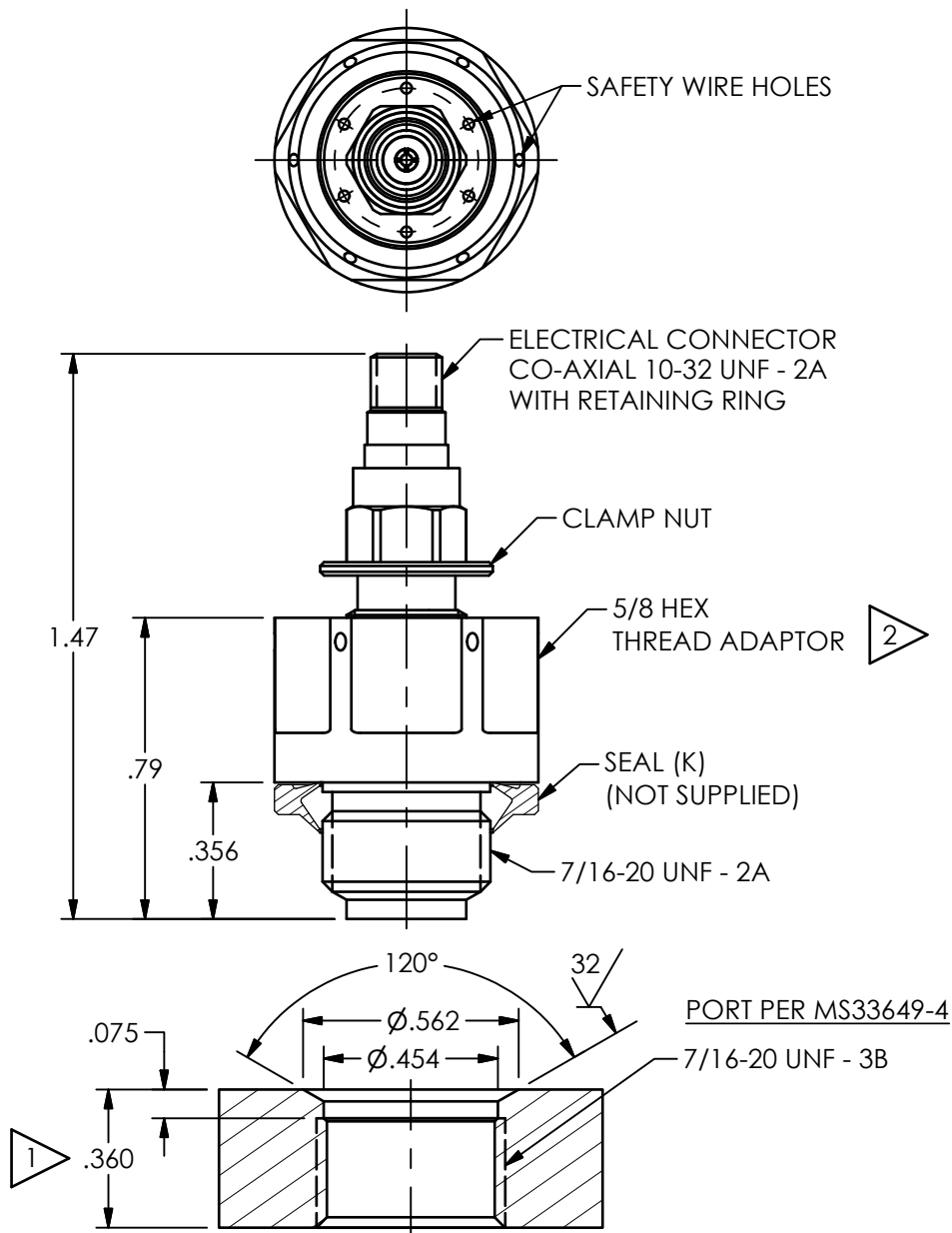
62262

B

B

A

A



3.) THE ABOVE UNIT IS A SEALED ASSEMBLY AND SHOULD BE RETURNED TO THE FACTORY SHOULD SERVICE BE REQUIRED

2 MOUNTING TORQUE ON A 5/8 HEX: 120-130 IN-LBS

1 DIMENSIONS SHOWN ARE FOR .36 WALL THICKNESS, COUNTERBORE FOR THICKER WALLS

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	JDM	2/15/16	AF	2/15/16	DRK	2/15/16		
DECIMALS XX ±.01 XXX ±.005	DECIMALS X ± 0.3 XX ± 0.13	TITLE INSTALLATION DRAWING MODEL 102M295 CRYOGENIC PRESSURE TRANSDUCER						SCALE: 2X	SHEET 1 OF 1
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES							FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13