

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

1.0 INTRODUCTION

Quartz charge mode pressure sensors offer high performance for precise pressure measurements over a wide range of near-static and dynamic pressures. The sensors use the piezoelectric properties of quartz to convert an applied pressure into an analogous electrical charge.

The internal design of a sensor incorporates a quartz sensing element that provides high sensitivity over a wide range of pressures. As pressure is applied to the diaphragm of the sensor, a charge is generated in the quartz crystals. The high-impedance electrostatic charge is then conditioned externally by either a laboratory-style charge amplifier or in-line charge converter prior to being sent to a readout or recording device.

Charge mode sensors are ideally suited for applications where wide dynamic range, high frequency response, and/or high shock phenomena are a consideration. Such applications include compressors, engines, blast, ballistic, pneumatic, hydraulic, and fluid pressures. Enclosed is a Specification Sheet that lists the complete performance characteristics of the sensor purchased.

In addition to the standard features offered with the sensor, a variety of options are also available on **some** sensor models. When listed before the model number, the following prefix letters indicate that the sensor is supplied with optional features:

A option	Ablative thermal barrier
E option	Emralon coating
H option	Hermetic seal
J option	Electrical isolation (mounting adaptor required)
M option	Metric thread
P option	Positive polarity output (for use with non-inverting amplifiers)
V option	Special attached cable (length/type)
W option	Waterproof cable connection

Other prefix letters, such as K, KR, GK, GKR, KL and GKL indicate that the sensor is ordered in kit form, which includes cabling, power supplies and accessory mounting hardware. See the enclosed Prefix Sheet for additional details.

2.0 DESCRIPTION

2.1 Series 111A General Purpose Miniature Sensor

The Series 111A General Purpose Miniature Sensor is a high-precision, charge mode pressure sensor used for dynamic measurement of compression, combustion, explosion, pulsation, cavitation, blast, pneumatic, hydraulic, fluid and other similar types of dynamic pressure. The series consists of the Models 111A, 111A02, and 111A03 (along with special versions), having pressure ranges of 3 000, 100, and 10 000 psi (20684, 689, and 68947 kPa), respectively. See Figure 2.1.

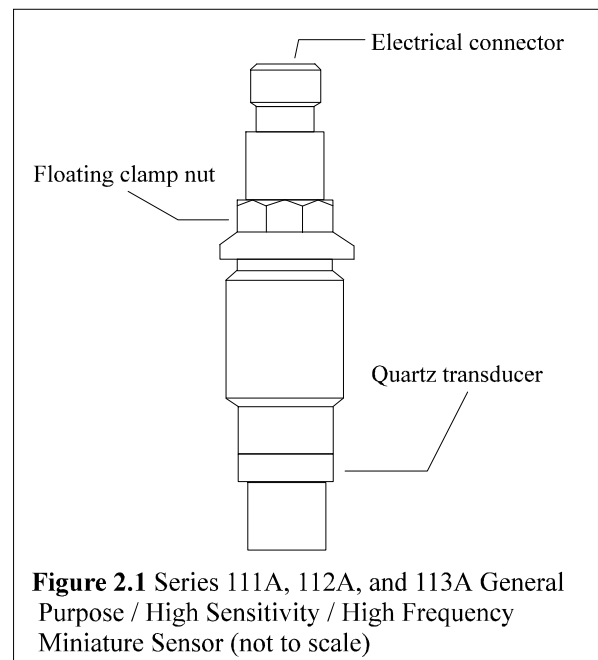


Figure 2.1 Series 111A, 112A, and 113A General Purpose / High Sensitivity / High Frequency Miniature Sensor (not to scale)

This rugged instrument measures transient or repetitive phenomena, relative to the initial or average level, over a wide amplitude and frequency range. It comfortably tolerates adverse environmental conditions. The sensor follows transient events up to a few percent of the system time constant, which, depending on the system, may be sufficient for static calibration by conventional methods. The sensor's internal design consists of a rigid, multi-plate, compression mode quartz element.

2.2 Series 112A High Sensitivity Miniature Sensor

The Series 112A High Sensitivity Miniature Sensor is a high-precision charge mode pressure sensor designed for higher charge sensitivities necessary when measuring compression, combustion, explosion, pulsation, actuation, cavitation, fluid, blast, turbulence and sound pressures. The series consists of the Models 112A, 112A02, and 112A03 (along with special versions), with pressure ranges of 3 000, 100, and 10 000 psi (20684, 689, and 68947 kPa), respectively. See Figure 2.1.

This quartz sensor measures near-static and dynamic pressures from full vacuum to 3 000 psi (15 000 psi optional). It measures transient or repetitive phenomena, relative to the initial or average pressure level, over wide amplitude and frequency ranges and under the most adverse environmental conditions. System voltage sensitivities range from 0.01 mV/psi to 1.0 volt/psi, depending on the charge amplifier involved.

The Series 112A High Sensitivity Sensor contains a rigid multi-plate sensing element with an integral compensating accelerometer to minimize vibration sensitivity. It is housed in all-welded stainless steel.

2.3 Models 112A04 and 112A05 High Temperature Miniature Sensor

The Model 112A04/112A05 High Temperature Miniature Sensor is a high-precision, charge mode pressure sensor designed specifically for use in compressors, engines, turbines, heat exchanger combustion chambers and bombs, at moderate and high temperatures. The Models 112A04 and 112A05 operate to a maximum temperature of 600°F (315°C). See Figure 2.1.

The all-welded, hermetic stainless steel construction of this sensor ensures reliable operation in high-temperature environments. It is constructed with a rigid, multi-plate sensing element and integral compensating accelerometer to minimize vibration sensitivity.

2.4 Series 113A High Frequency Miniature Sensor

The Series 113A High Frequency Miniature Sensor is a charge mode pressure sensor designed to measure shock wave, blast, explosion, ultrasonic and dynamic combustion pressures requiring ultra-fast response times. The Series 113A consists of the Models 113A, 113A02, and 113A03, having pressure ranges of 3 000, 100, and 15 000 psi (20684, 689, and 103420 kPa), respectively. All are acceleration compensated. See Figure 2.1.

This sensor measures transient or repetitive phenomena relative to the initial or average pressure level, over wide amplitude and frequency ranges and under the most adverse environmental conditions.

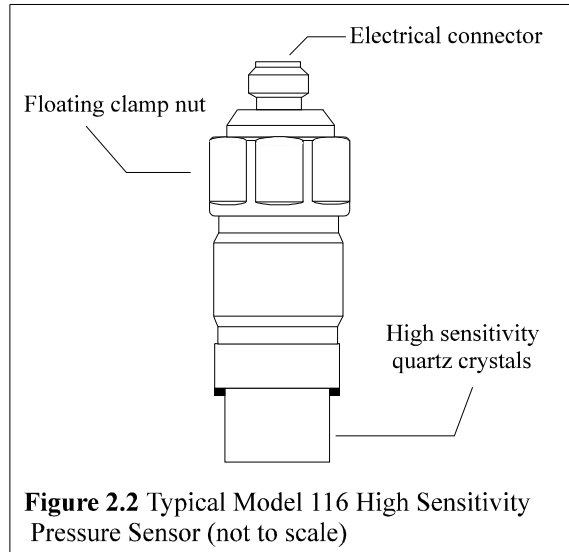
This stainless steel instrument contains an extremely rigid compression-mode quartz element with an integral compensating accelerometer to reduce vibration sensitivity and partially suppress internal resonance effects. This results in an accurate, dynamic high-frequency response from the sensor.

2.5 Series 116 High Sensitivity Sensor

The Series 116 High Sensitivity Sensor is a special-purpose high temperature charge mode pressure sensor designed specifically to measure low-level pressures in severe environments. The unit is most frequently used in engines, hydraulic and pneumatic devices, compressors and turbines. Ideal for sound pressure measurements, microphones and small pressure agitations, its maximum dynamic pressure range is 100 psi (689 kPa). It is acceleration compensated to minimize vibration sensitivity and is capable of a five-microsecond rise time. See Figure 2.2.

This sensor measures transient or repetitive phenomena relative to the initial or average pressure level, over a wide amplitude range and a usable frequency range near DC to between 20 000 and 30 000 Hz; the resonant frequency is 60 000 Hz, except for the Model 116A, which has a resonant frequency of 130 kHz. The Model 116 is extremely sensitive, with a nominal pressure response of 10 pC/psi. The operating temperature for the Series 116A ranges from -400°F to 400°F (-240°C to 204°C). The operating temperature for the Series 116B and 116C ranges from -400°F to 650°F (-240°C to 343°C).

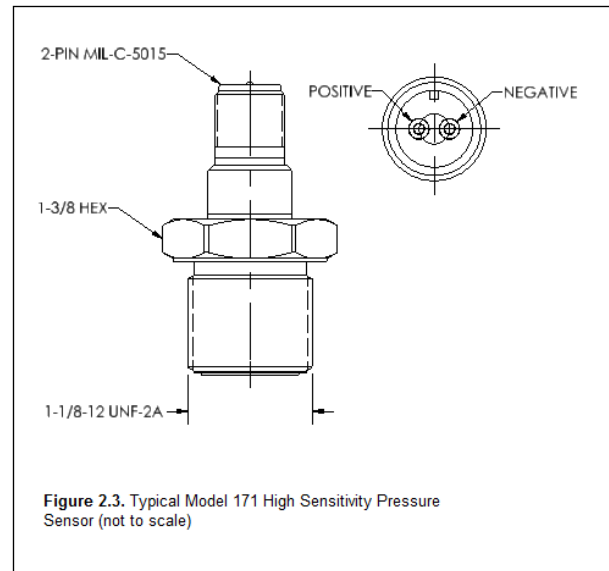
This hermetically sealed stainless steel sensor contains extremely rigid compression-mode quartz crystals with an integral acceleration compensating crystal to reduce vibration sensitivity and partially suppress internal resonance effects.



2.6 Series 171 High Sensitivity Sensor

The Series 171 High Sensitivity Sensor is a special-purpose high temperature charge mode pressure sensor designed specifically to measure low-level pressures in severe environments. The unit is most frequently used in acoustic devices, compressors and turbines. Ideal for sound pressure measurements, microphones and small pressure agitations, its maximum dynamic pressure range is 600 psi (4136 kPa). See Figure 2.3.

This sensor measures transient or repetitive phenomena relative to the initial or average pressure level, over a wide amplitude range and a usable frequency range near DC to between 5 000 and 10 000 Hz; the resonant frequency is 25 000 Hz. The Model 171 is extremely sensitive, with a nominal pressure response of 1100 pC/psi. The operating temperature for the Series 171 ranges from 0°F to 500°F (-18°C to 260°C).



3.0 INSTALLATION

3.1 Overview

When choosing an installation method, the advantages and disadvantages of each method must be carefully weighed. Characteristics like location, ruggedness, amplitude range, accessibility, temperature and portability may be greatly affected by the installation configuration and technique. Often, the most important and overlooked consideration is the affect the mounting technique has on the frequency of the pressure being measured by the sensor.

Two basic mounting techniques are recommended for pressure sensors: the recess mount and the flush mount. The technique used is determined by the specifics of the individual application. See the Installation Drawing in this manual for additional details on the individual sensor series.

Passage length (inches)	Passage resonance (kHz)	Approx. fastest pulse rise time (microseconds)
.050	66	5
.100	33	10
.200	16.5	20
.50	6.6	50
1.0	3.3	100

3.2 Recess Mount

A recess mount protects the sensor diaphragm from the effect of high flash temperature and particle impingement. This method is often selected because it can prolong sensor life and increase data integrity by reducing thermal effects. See Figure 3.1.

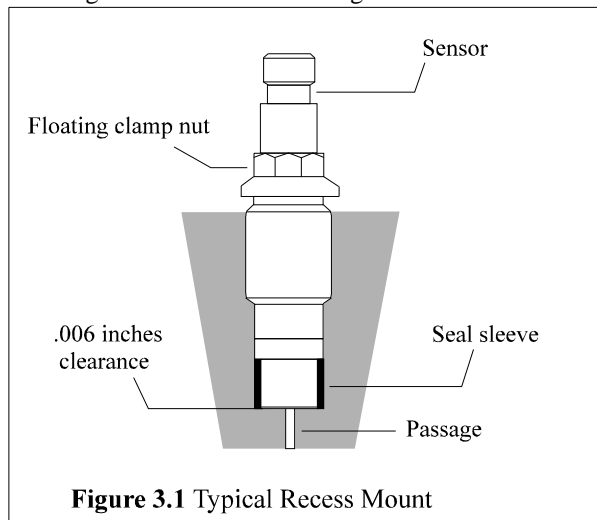


Figure 3.1 Typical Recess Mount

When using a recess mount, note that the length of the passage may limit the frequency range of the measurement. The effect the passage has is similar to that of an under-damped second order system, with the resonant frequency determined by passage length. The passage length thus limits pressure pulse rise time and may also cause passage ringing.

The function is described by the following equation:

$$F_r = \frac{V}{4L}$$

Where: F_r = resonant frequency passage (Hz)
 V = velocity of sound in air (feet/second)
 L = length of column (feet)

For air at room temperature, the equation becomes:

$$F_r = \frac{3300}{L}$$

Where: L = passage length (inches)

The natural frequency and approximately fastest pressure step rise time for various length passages are shown in the following chart, using a medium of air at 77°F (25°C).

Selected Values for 77°F (25°C)

Measured resonant frequencies may differ slightly from the chart values due to variations in the velocity of sound in the air from changes in temperature and pressure of the air in the passage.

To ensure diaphragm integrity, maintain .006 inches (.153 mm) of clearance ahead of the diaphragm using seal sleeve Model 065A05, shown in Figure 3.1.

3.3 Flush Mount

In a flush mount installation, there is no reduced area passage from the sensor diaphragm to the test chamber. Instead, the sensor diaphragm is mounted flush with, or slightly recessed from, the inside surface of the test chamber. See Figure 3.2.

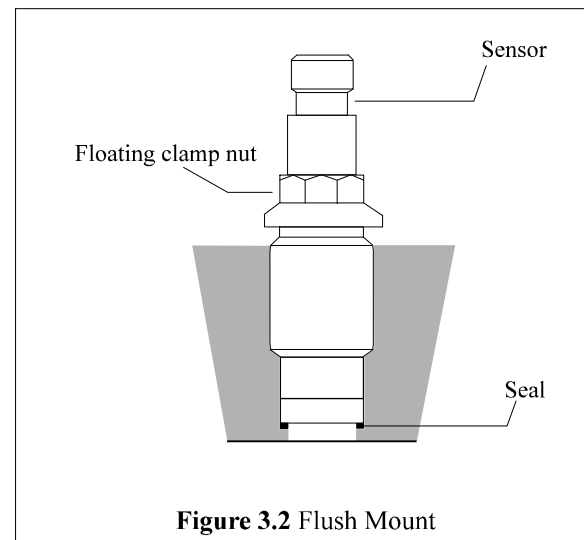


Figure 3.2 Flush Mount

If thermal transients or diaphragm impingement are concerns, use the flush mount technique only when space or frequency response considerations preclude the use of the recess mount installation.

In severe or pyrotechnic environments, sensor life may be seriously curtailed when using this mounting method.

3.4 Flash Thermal Protection

Several additional steps may be taken to provide protection from flash thermal effects. The sensor diaphragm may be thermally insulated at the factory, using a thin (.010 inches / 0.254 mm) coating of ablative silicone rubber, G.E. type 580 ("A" option). Before the insulation is applied, the surface of the diaphragm is treated with SS4004 primer.

If more protection is required, the recess mount may be filled with DC-4 silicone grease or its equivalent. In place of the silicone rubber, one or more layers of black vinyl electrical tape on the diaphragm may provide sufficient insulation.

3.5 Miscellaneous Installation Notes

Thread adaptors, such as the Series #61, 3/8-24 or Series #62, 1/8 NPT, provide quick installation where mounting port diameter is not limited. Other adaptors include Series #63 Needle Probe, and Series #64 Water-Cooled. Adaptor use simplifies mounting procedures and improves troubleshooting by reducing the incorrect data that can result from improper mounting. See the PCB General Catalog for details.

A floating clamp nut, Model 060A03 (Model 060A05 for metric), 1/4 hex, facilitates mounting and removal of the sensor by clamping the sensor in place without placing undue stress on the quartz element. The clamp nut is provided with either standard (5/16-24) or metric (M7 x 0.75) threads and is supplied along with three seal rings.

Model 008A Hardline Cable is recommended for operating temperatures above 500°F. This cable is supplied in lengths up to 40 feet (12,19 m).

3.6 Cabling

Care and attention to cable attachment is essential, as the reliability and accuracy of your system is no better than that of the output cable. First, check that you have ordered the correct cable type. As with sensors, no cable can satisfy all applications. Special low-noise cabling should be used (e.g., PCB Series 003) with high-impedance, charge output devices.

Connect the cable to the pressure sensor. A small amount of thread locking compound placed on the connector prior to attachment helps secure the cable during testing. For additional protection in harsh environments, the connection may be sealed with protective materials, such as silicon rubber, O-rings and flexible heat-shrink tubing (optional).

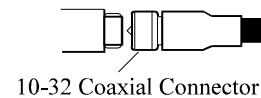


Figure 3.3 Coaxial Connector

Plug the male connector on the cable into the mating female connector on the sensor. Then, holding the sensor stationary, secure the connector in place by tightening down the attached cable sleeve. See Figure 3.3.

Route the cable to a charge amplifier or in-line charge converter, making certain to strain relieve the sensor/cable connection and minimize motion by clamping the cable at regular intervals. Common sense must be used to avoid physical damage and minimize electrical noise. Avoid routing cables near high voltage wires. Do not route cables along floors or walkways where they may be stepped on or become contaminated. Shielded cable should have the shield grounded at one end only.

To dissipate any charge that may have accumulated in the cable, short the signal to ground prior to attachment to the charge amplifier or charge converter.

4.0 CALIBRATION

These sensors may be calibrated using static hydraulic techniques, such as dead-weight testers, or by comparison with a reference gage.

When calibrating with a laboratory-style charge amplifier, set the charge amplifier to LONG, for the time constant setting, and allow the sensor to stabilize before applying pressure. If slow drift is apparent, apply the pressure to the desired level, and immediately take a reading. Release the pressure and take another reading at zero pressure to obtain the difference between the readings at the desired present level and zero pressure. If the drift is too fast to take a reading, clean the cable connections according to the procedures out-lined in Section 7.0, Maintenance.

NOTE: Do not attempt to use a charge amplifier which, in the long time constant position, has less than a 5 000-second time constant for quasi-static calibration of charge sensors. Any drift may cause error.

Several charge amplifiers are designed especially for use with ceramic sensors, for higher low-frequency measurements. In general, these types are unsuitable for calibration of quartz pressure sensors by quasi-static means.

A factory-supplied, NIST-traceable calibration graph is provided with each sensor, certifying its charge sensitivity in pC/psi, or when used with an in-line voltage amplifier, in mV/psi.

5.0 NORMAL OPERATION

The high impedance signal generated by a charge output sensor is usually conditioned with a laboratory-style charge amplifier, such as the PCB Model 462A. The charge amplifier converts the high-impedance charge signal generated by the sensor into a low-impedance voltage signal. This signal may then be transmitted to a readout or recording device for analysis. See Figure 5.1 for a drawing of a typical system connection.

NOTE: When using charge-amplified systems, the noise floor of the system is dependent on the input capacitance to the charge amplifier. To minimize noise, keep the cable length between the pressure sensor and the charge amplifier to a minimum. Cable length does not affect the system sensitivity.

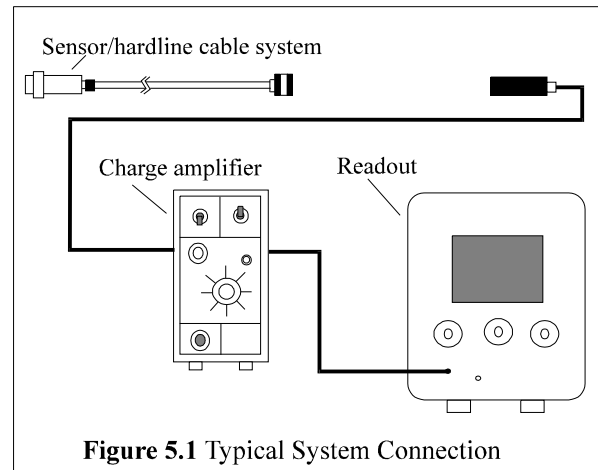


Figure 5.1 Typical System Connection

Before connecting the low-noise cable from the pressure sensor to the charge amplifier, be certain to ground the charge amplifier. This ensures that any excessive accumulated static charges across the sensor/cable combination are harmlessly discharged. If this precaution is not observed, the input FET of certain amplifiers may be destroyed. Press the ground button of the charge amplifier and adjust electrical zero if necessary.

Once system components are connected, wait a few minutes for the system to thermally stabilize. Place the switch in the OPR (operate) position and proceed with the measurement. Refer to the charge amplifier operating manual for further operating details.

For fixed sensitivity in-line charge amplifiers, such as the PCB Series 422, the system sensitivity (mV/psi) is determined as the product of the charge amplifier sensitivity (mV/pC) and the sensor sensitivity (pC/psi). With in-line voltage amplifiers, the system sensitivity is a function of the sensor, cable, and the in-line voltage amplifier.

5.1 Polarity

When subjected to increasing pressure, these pressure sensors have a standard negative-going charge output. Because most charge amplifiers are signal-inverting, the resultant signal is positive-going. Reverse-polarity sensors, for use with non-inverting source follower amplifiers, are available upon request ("P" option).

6.0 HIGH-TEMPERATURE OPERATION

6.1 Introduction

When subjected to elevated temperature, all piezoelectric sensors/hardline cable systems exhibit decreased insulation resistance, due in part to the piezoelectric element, but due mostly to the hardline cable necessary to withstand the high temperatures. This situation can cause serious voltage offset problems in direct-coupled charge amplifiers, such as PCB Models 462, 463, and 464, as well as with the miniature Series 422. To solve this problem, the user must AC couple (capacitor) the charge amplifier to the sensor/cable system. See Section 6.3, Solution to Reduced Resistance, for complete details.

6.2 Reduced Resistance at Charge Amplifier Input

Figure 6.1 illustrates a simplified schematic of a typical direct-coupled charge amplifier where:

- R_f = Feedback resistor (ohms)
- R_i = Input leakage resistance (ohms)
- E_o = Steady-state output voltage (volts)
- e_i = Offset voltage: FET leakage (volts)
- C_f = Feedback capacitor (farads)

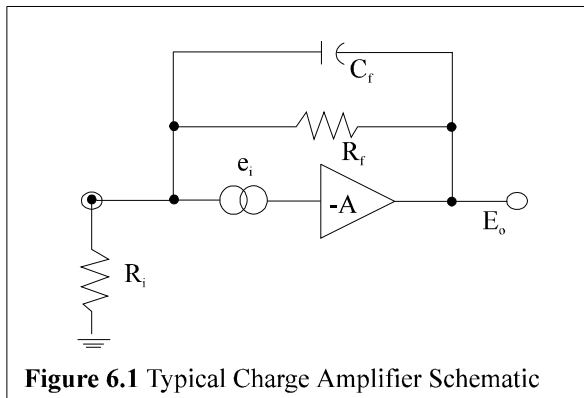


Figure 6.1 Typical Charge Amplifier Schematic

The feedback capacitor C_f comes into play only in the dynamic situation and its influence does not affect the steady-state situation. The voltage e_i is a DC offset voltage, usually very tiny (microvolts), that exists at the input gate of the MOSFET circuit. This minute leakage current exists in all real devices. As demonstrated in Equation 1, the steady-state (DC) output voltage E_o is:

Equation 1

$$E_o = e_i \left(1 + \frac{R_f}{R_i} \right)$$

This equation shows that if the input (leakage) resistance at the charge amplifier is extremely high (approaching infinity), the output DC voltage approaches e_i , usually a very tiny voltage. However, as R_i decreases, the term

$$1 + \frac{R_f}{R_i}$$

increases, such that the output voltage can, with large ratios of R_f / R_i , become large enough to result in a large E_o , perhaps large enough to be outside the normal output voltage range of the charge amplifier.

Because of the feedback capacitor C_f , this output voltage change usually does not occur rapidly but rather, it manifests itself as a slow drift in the output voltage level. If R_i is low enough with respect to R_f , the voltage drift may continue until saturation of the charge amplifier occurs.

6.3 Solution to Reduced Resistance

Since the drift or offset problem is caused by a static or steady-state imbalance at the input of the charge amplifier, the solution involves blocking this steady-state effect while allowing the desired dynamic phenomena to pass. This may be accomplished by installing a series capacitor at the input of the charge amplifier, between the offending sensor (or low-impedance hardline) and the input.

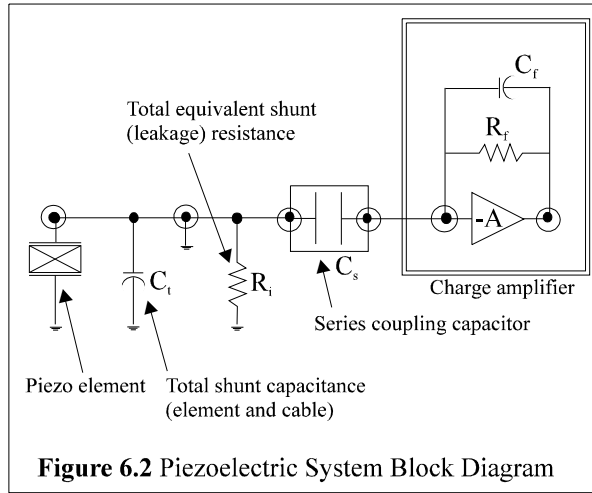


Figure 6.2 illustrates a block diagram of the piezo-electric system where:

- C_t = Shunt capacitor
- C_s = Series blocking capacitor

With the series blocking capacitor C_s in place as shown, the dynamic charge (Q) generated by the sensor element is distributed across the two capacitors, C_t and C_s , in proportion to the size (capacitance) of each. If C_s , for example, is equal to 100 times C_t , 99% of the charge appears at the input of the charge amplifier, while 1% is across the shunt capacitor C_t . This results in a 1% decrease in apparent sensitivity of the system.

This therefore demonstrates the importance of selecting the series blocking capacitor at least two orders of magnitude higher than the total shunt capacitance C_t across the input of the charge amplifier.

It is also important that this capacitor be of high quality, with a leakage resistance of greater than 10^{12} ohms, to avoid the DC offset discussed previously in 6.1, Introduction.

6.4 Low-Frequency Response Limitations

In a normal charge amplifier, the low-frequency response is set by the RC time constant, as established by the product of C_f and R_f . The system acts like a high-pass first order RC filter with a -3 dB frequency established by the relationship:

Equation 2

$$f_o = \frac{.16}{R_f C_f}$$

where:

- f_o = -3 dB Frequency (Hz)
- R_f = Feedback resistor (ohms)
- C_f = Feedback capacitor (farads)

However, after the addition of the series blocking capacitor C_s , the system becomes the equivalent of two high-pass filters in series, one as previously mentioned and one comprised of series capacitor C_s and total equivalent shunt resistance R_i . This new cutoff frequency is:

Equation 3

$$f_o = \frac{.16}{R_i C_s}$$

To avoid compromise of the low-frequency response established by the charge amplifier parameters and illustrated by Equation 2, the product of $R_i C_s$ should be several orders of magnitude higher than $R_f C_f$.

The approximate final system discharge time constant becomes:

Equation 4a

$$TC = \frac{1}{\frac{1}{R_i C_s} + \frac{1}{R_f C_f}} \quad \text{seconds}$$

If the input coupling time constant ($R_i C_s$) is very much greater than the discharge time constant of the charge amplifier ($R_f C_f$), Equation 4a then becomes:

Equation 4b

$$\frac{1}{R_i C_s} \Rightarrow 0 \text{ Seconds}$$

Equation 5

$$TC = R_f C_f$$

With the product $R_i C_s$ chosen to be $>$ than $R_f C_f$, the system discharge time constant is simply $R_f C_f$ (seconds). The feedback parameters of the charge amplifier establish the low frequency characteristics of the system, unaffected by the degraded input resistance parameters of the test sensor and/or cable.

The solution to most low-frequency response limitations lies in the selection of a high-quality coupling capacitor of sufficient size (capacitance) to allow a drastic reduction in insulation resistance of the sensor/cable, with little or no performance degradation. The PCB Model 072A coupling capacitor can solve many such problems; while optional, it is recommended for use with many high-temperature systems. It consists of a 10 000 pF high-quality polystyrene capacitor in a housing convenient for threading directly onto most hardline cable assemblies. See Figures 5.1 (system placement) and 6.3 (coupling capacitor drawing). The Model 072A is configured with a 10-32 micro-connector at each end, one end with the female jack and the other end with a male plug.

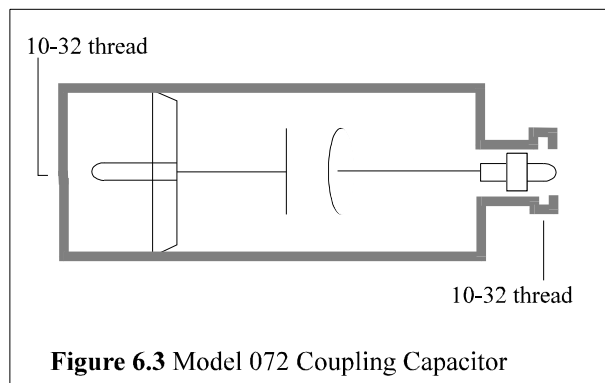


Figure 6.3 Model 072 Coupling Capacitor

6.5 Other Precautions

Always remember to keep the OPR-GND switch on the charge amplifier in the GND position while connecting or disconnecting sensors, cable, or capacitor to the input connector. Stray or accumulated electrostatic charges may build to the point that they may saturate or even damage the input circuitry of the charge amplifier.

Operate the charge amplifier in the SHORT time constant while the sensor is subject to elevated or changing temperatures. If it is not necessary to procure data during the transition from room temperature to operating temperature, place the OPR-GND switch in

the GND position to keep spurious, thermally generated charges grounded.

It is prudent to momentarily switch to the GND position even during the measurement period to ensure that excess charges do not accumulate at the input of the charge amplifier.

7.0 MAINTENANCE

The only maintenance required on the pressure sensor is to keep the connector clean. If it is operating in a dirty environment, protect the cable connections with heat-shrink tubing or similar material.

In the event that the electrical connection of the pressure sensor becomes contaminated with dirt or moisture, the insulation resistance degrades. This may cause a reduction of sensitivity or excessive drifting when connected to the charge amplifier. If this happens, brush off the connector with no-residue solvent or other approved cleaning solutions. To restore insulation, bake the sensor in a vacuum oven at 250°F for about four hours. If the condition persists even after cleaning and/or baking, please contact a PCB applications engineer for further assistance. The sensor is hermetically sealed; it must therefore be returned to the factory if the aforementioned measures fail to restore performance.

[illegible]

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SCHEDULE DRAWING

NO MODIFICATIONS PERMITTED
WITHOUT REFERENCE TO THE
NOTIFIED BODY

REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	52590

- 6.) THE INSTALLER SHALL INSURE THAT THE TRANSDUCER MOUNTING STRUCTURE IS AT THE SAME GROUND POTENTIAL AS THE BARRIER GROUND. TOTAL EARTH LOOP IMPEDANCE SHALL BE LESS THAN 1 OHM. USE AN OFF GROUND TO THE SENSOR HOUSING IF A NON ISOLATION BARRIER IS USED.

- 5.) CONNECTION METHOD TO THE EQUIPMENT SHOULD COMPLY WITH THE REQUIREMENT OF NEC AND CEC FOR NORTH AMERICAN CERTIFICATION.

- 4.) SHIELDS TO BE EARTHED AT BARRIER ENDS.

- 3 BARRIER WILL BE MOUNTED IN AN ENCLOSURE THE SUITABILITY OF WHICH WILL BE DETERMINED BY LOCAL AUTHORITIES. INSTALLATION IS CLASSIFIED HAZARDOUS LOCATION TO BE PERFORMED PER INSTALLATION REQUIREMENTS OF NEC AND CEC.

- ## 2 ENTITY APPLICATION:

<u>BARRIER</u>		<u>I.S. APPARATUS</u>
Voc/Uo	≤	V _{MAX} /Ui
Isc/Io	≤	IMAX/Ii
Ca/Co	>	Ci + C _{CABLE}
La/Lo	>	Li + L _{CABLE}
Po	≤	Pi (CENELEC ONLY)

BARRIERS WITHIN THE SPECIFIED LIMITATIONS ARE PERMITTED.

ENTITY PARAMETERS:

$U_i = 30 \text{ V}$
 $I_i = 100 \text{ mA}$
 $P_i = 0.7 \text{ W}$
 $C_i = 12 \text{ nF}$
 $L_i = 0$

CERTIFIED BY THE APPROPRIATE APPROVAL
AUTHORITY FOR CONNECTION TO THE FOLLOWING AREAS:

ZONE 0

Exia IIC

AExia IIC

Ex ia II C T6 TO T2 Ga

DIV 1

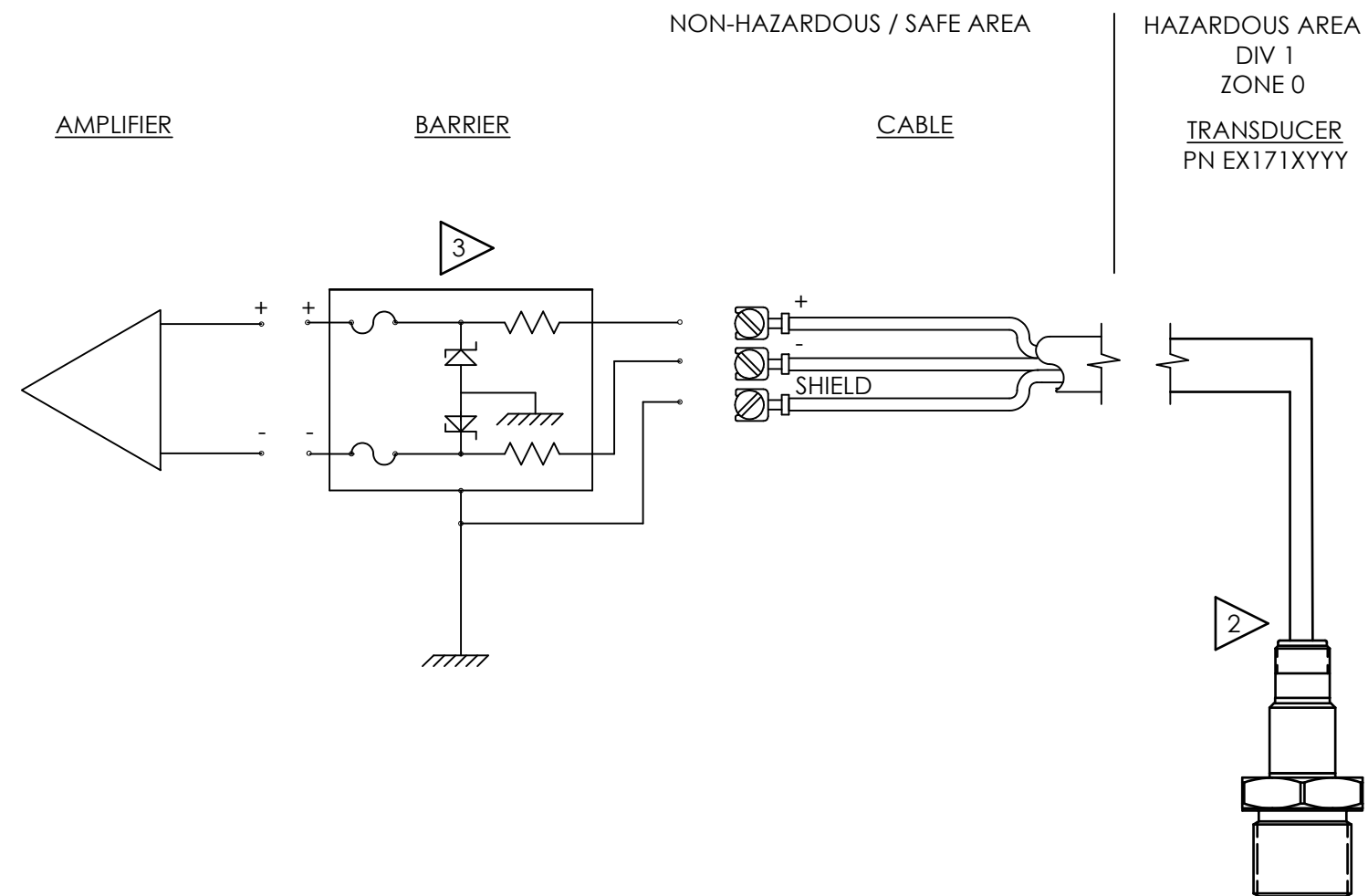
CLASS 1, GROUPS A,B,C,D

Exia IIC

AExia IIC

Ex ia IIC T6 TO T2

- 1.) PART NO IS EX171XYYY



UNLESS OTHERWISE SPECIFIED	
DIMENSIONS ARE IN INCHES	
DECIMALS	X ± .05
	XXX ± .01
	XXX ± .005
	XXXX ± .0005
ANGLES ± 2 DEGREES	
FILLETS AND RADII .003 - .005	
HEX DIMENSIONS ARE:	
	≤ .5 + .000 / .003
	> .5 + .000 / .005
INTERNAL THREAD DEPTH MIN.	
REMOVE ALL BURRS	
SHARP = R.000 - R.003	



CAUTION
ELECTROSTATIC
DISCHARGE SENSITIVE

DRAWN		CHECKED		ENGINEER	
JJF	2/22/22	JJF	2/22/22	RF	2/22/22

TITLE

EX171XYYY
INTERCONNECTION

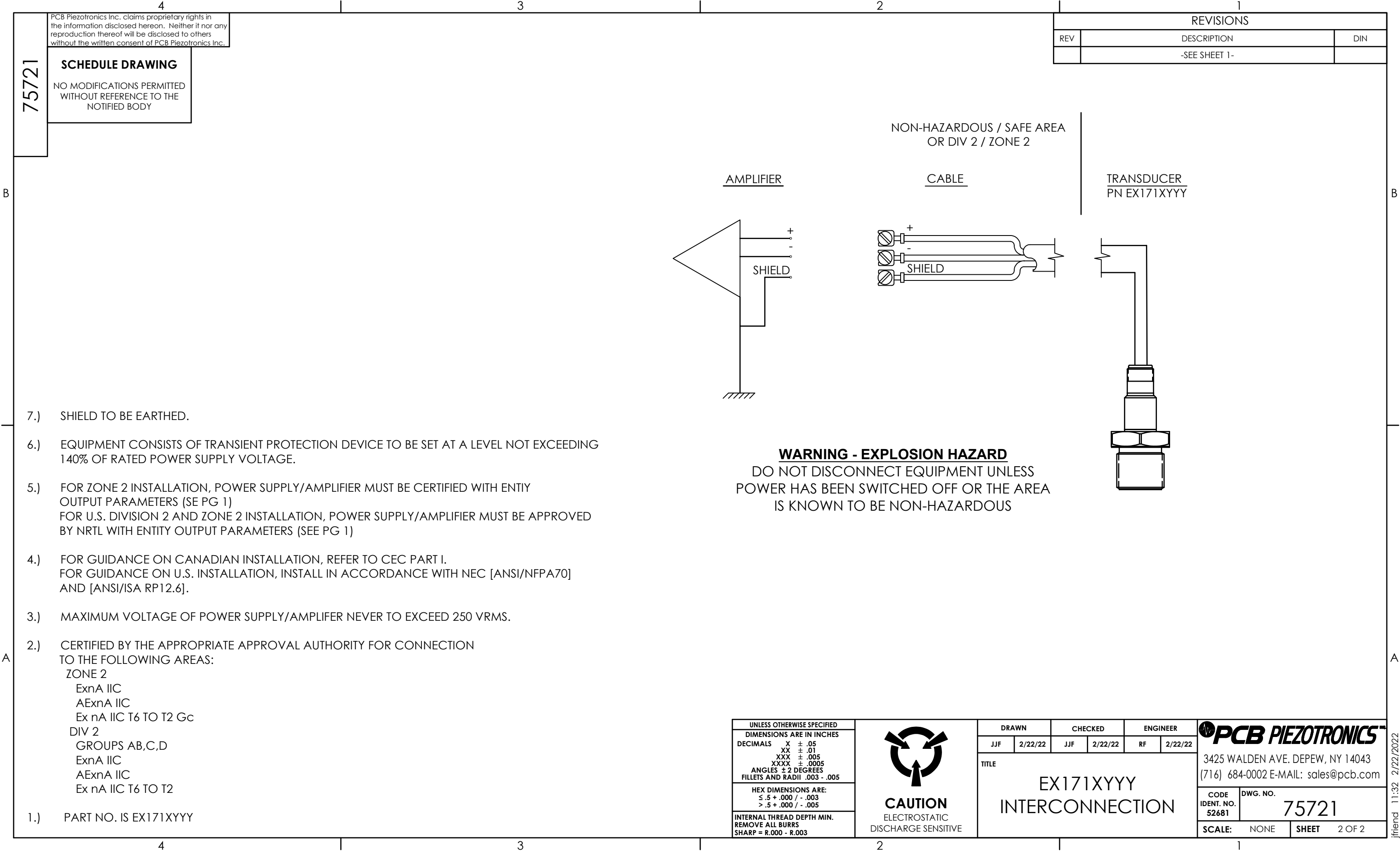


PCB PIEZOTRONICS^{INC.}

3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0002 E-MAIL: sales@pcb.com

CODE IDENT. NO. 52681	DWG. NO. 75721
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SCALE:	NONE	SHEET	1 OF 2
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2

1

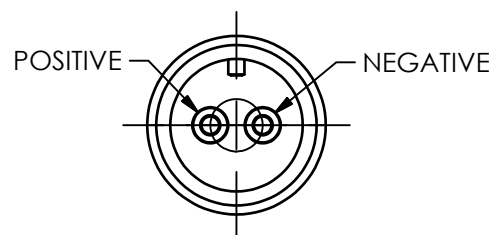
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REVISIONS

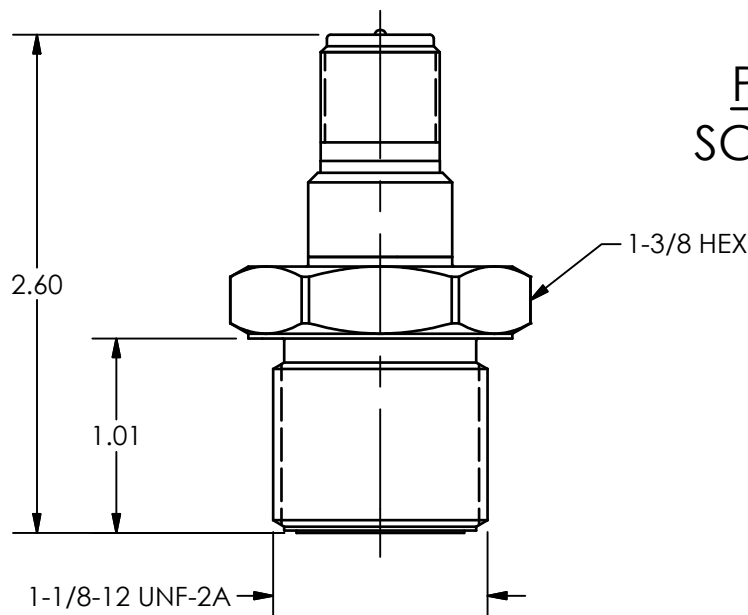
REV	DESCRIPTION	DIN
B	UPDATED TITLE	44106

RELATED DRAWING

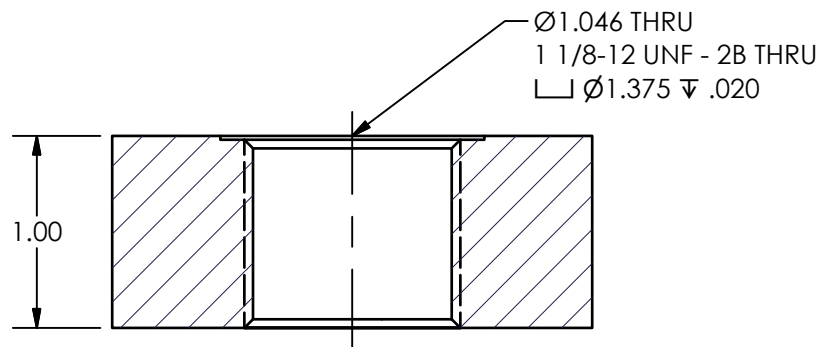
NO MODIFICATIONS PERMITTED WITHOUT THE APPROVAL OF THE AUTHORIZED PERSON




PIN OUT
SCALE 1.5X



BRASS SEAL
SUPPLIED



1.) RECOMMENDED MOUNTING TORQUE ON A 1-3/8 HEX IS: 55-60 FT/LBS [74.6-81.4 Nm]

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		<div>PCB PIEZOTRONICS™</div> <div>3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com</div>
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	BB	4/28/15	ECB	4/28/15	GGG	4/28/15	
DECIMALS XX ±.01 XXX ±.005	DECIMALS X ± 0.3 XX ± 0.13	TITLE INSTALLATION DRAWING MODEL 171XXXX SERIES						
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES							
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13							<div>CODE IDENT. NO. 52681</div> <div>DWG. NO. 33819</div>
		SCALE: FULL						SHEET 1 OF 1

2

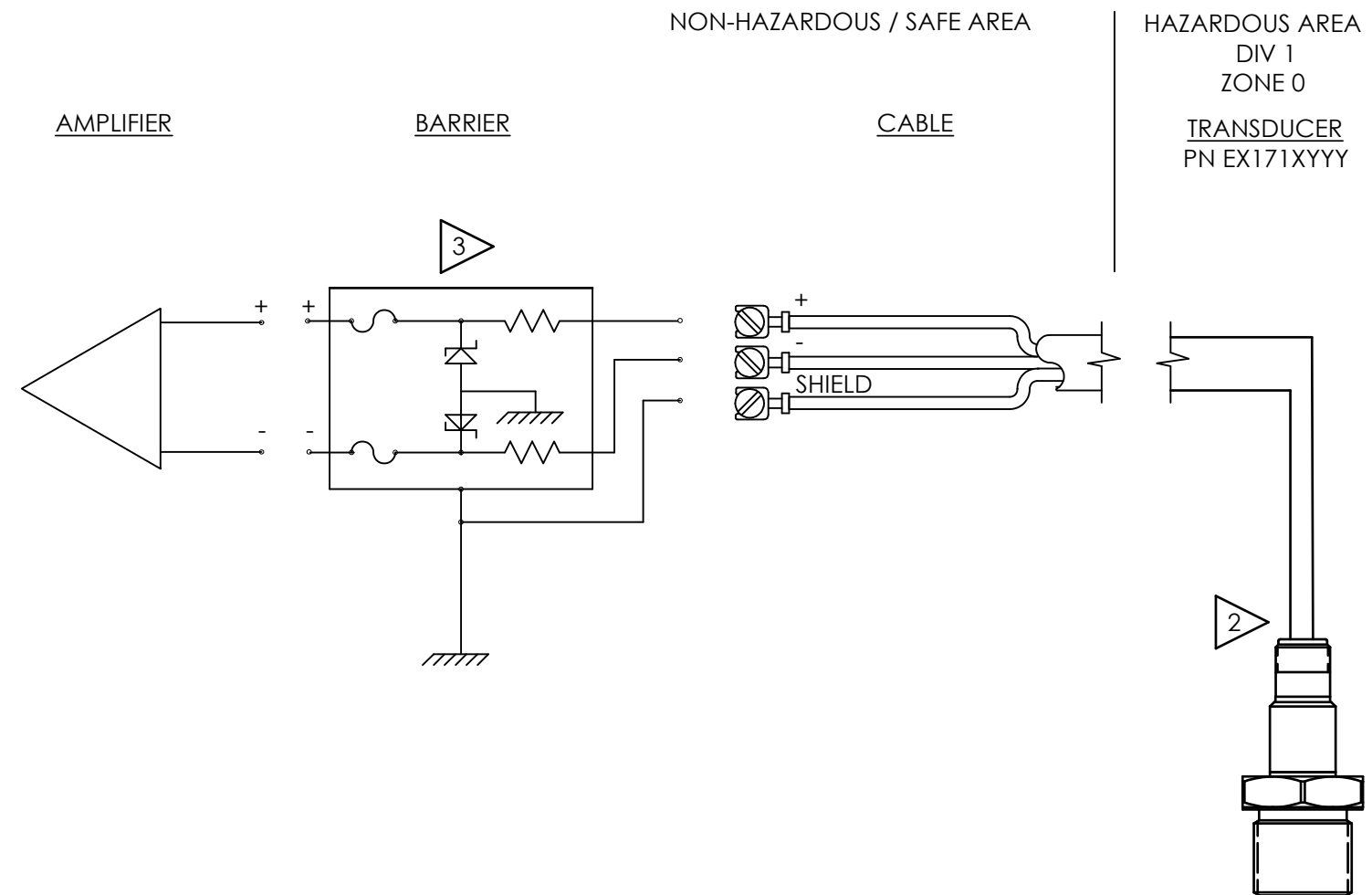
1

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SCHEDULE DRAWING

NO MODIFICATIONS PERMITTED
WITHOUT REFERENCE TO THE
NOTIFIED BODY

REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	43149



- 4.) SHIELDS TO BE EARTHED AT BARRIER ENDS.
- 3 BARRIER WILL BE MOUNTED IN AN ENCLOSURE THE SUITABILITY OF WHICH WILL BE DETERMINED BY LOCAL AUTHORITIES.

2 > ENTITY APPLICATION:

<u>BARRIER</u>		<u>I.S. APPARATUS</u>
Voc/Uo	≤	V _{MAX} /U _i
Isc/Io	≤	I _{MAX} /I _i
Ca/Co	>	C _i + C _{CABLE}
La/Lo	>	L _i + L _{CABLE}
Po	≤	P _i (CENELEC ONLY)

BARRIERS WITHIN THE SPECIFIED LIMITATIONS ARE PERMITTED.




ENTITY PARAMETERS:

$U_i = 30 \text{ V}$
 $I_i = 100 \text{ mA}$
 $P_i = 0.7 \text{ W}$
 $C_i = 12 \text{ nF}$
 $L_i = 0$

CERTIFIED BY THE APPROPRIATE APPROVAL
AUTHORITY FOR CONNECTION TO THE FOLLOWING AREAS:
ZONE 0

Exia IIC
AExia IIC
Exia IIC T6 TO T2 Ga

- 1.) PART NO IS EX171XYYY

<div>UNLESS OTHERWISE SPECIFIED</div> <div>DIMENSIONS ARE IN INCHES</div> <div>DECIMALS X ± .05 XX ± .01 XXX ± .005 XXXX ± .0005 ANGLES ± 2 DEGREES FILLETS AND RADII .003 - .005</div>		<div></div> <div>CAUTION</div> <div>ELECTROSTATIC DISCHARGE SENSITIVE</div>		<div>DRAWN</div> <div>JDM 1/20/15</div>		<div>CHECKED</div> <div>JDM 1/20/15</div>		<div>ENGINEER</div> <div>GGS 1/20/15</div>		<div> PCB PIEZOTRONICS™</div> <div>3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0002 E-MAIL: sales@pcb.com</div>			
<div>HEX DIMENSIONS ARE: ≤ .5 + .000 / - .003 > .5 + .000 / - .005</div>		<div></div>		<div>TITLE</div> <div>EX171XYYY</div> <div>INTERCONNECTION</div>								<div>CODE IDENT. NO. 52681</div> <div>DWG. NO. 60674</div>	
<div>INTERNAL THREAD DEPTH MIN. REMOVE ALL BURRS SHARP = R.000 - R.003</div>								<div>SCALE:</div> <div>NONE</div>		<div>SHEET</div> <div>1 OF 2</div>			

morawski 15:04 2/20/2015

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NO MODIFICATIONS PERMITTED
WITHOUT REFERENCE TO THE
NOTIFIED BODY

SCALE:	NONE	SHEET	2 OF 2
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This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant: PCB Piezotronics Inc
Address: 3425 Walden Ave
Depew, NY 14043-2417
Country: USA
Contact: Carrie Termin
Phone: (716) 684-0002 x2206
FAX: NA
Email: ctermin@pcb.com

Manufacturer: PCB Piezotronics Inc
Address: 3425 Walden Ave
Depew, NY 14043-2417
Country: USA
Contact: Carrie Termin
Phone: (716) 684-0002 x2206
FAX: NA
Email: ctermin@pcb.com

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Cortland, NY

Control Number: 5010230

Authorized by: _____

Kenneth Lavery
for L. Matthew Snyder, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

This Authorization to Mark is for the exclusive use of Intertek's Client and is provided pursuant to the Certification agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Authorization to Mark. Only the Client is authorized to permit copying or distribution of this Authorization to Mark and then only in its entirety. Use of Intertek's Certification mark is restricted to the conditions laid out in the agreement and in this Authorization to Mark. Any further use of the Intertek name for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. Initial Factory Assessments and Follow up Services are for the purpose of assuring appropriate usage of the Certification mark in accordance with the agreement, they are not for the purposes of production quality control and do not relieve the Client of their obligations in this respect.

Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s):	<p>Explosive Atmospheres – Part 0: Equipment – General Requirements [UL 60079-0:2019 Ed.7+R:15Apr2020]</p> <p>Explosive Atmospheres — Part 0: Equipment — General Requirements [CSA C22.2#60079-0:2019 Ed.4]</p> <p>Explosive Atmospheres - Part 11: Equipment Protection by Intrinsic Safety "i" [UL 60079-11:2013 Ed.6+R:14Sep2018]</p> <p>Explosive Atmospheres - Part 11: Equipment Protection by Intrinsic Safety "i" (R2018) [CSA C22.2#60079-11:2014 Ed.2]</p> <p>Explosive Atmospheres - Part 15: Equipment Protection By Type Of Protection 'N'>Expires on: 07Apr2022< [UL 60079-15:2013 Ed.4+R:05May2017]</p> <p>Explosive Atmospheres - Part 15: Equipment Protection by Type of Protection “n” [CSA C22.2#60079-15:2016 Ed.2]</p> <p>Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations [UL 121201:2017 Ed.9+R:01Apr2021]</p> <p>Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations [CSA C22.2#213:2017 Ed.3+U1;U2;U3]</p> <p>Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations [UL 913:2013 Ed.8+R:06Dec2019]</p>
Product:	<p>EX171 Series Pressure Sensor for use in:</p> <p>Class I, Division 1, Groups A, B, C and D</p> <p>Class I, Zone 0, AEx ia, Ex ia IIC T6...T2 Ga</p> <p>Class I, Division 2, Groups A, B, C and D</p> <p>Class I, Zone 2, AEx nA, Ex nA IIC T6...T2 Gc</p> <p>Temperature Class: T6...T2</p> <p>Ambient Temperature Range:</p> <p>-54°C ≤ Tamb ≤ +80°C (T6)</p> <p>-54°C ≤ Tamb ≤ +95°C (T5)</p> <p>-54°C ≤ Tamb ≤ +130°C (T4)</p> <p>-54°C ≤ Tamb ≤ +190°C (T3)</p> <p>-54°C ≤ Tamb ≤ +260°C (T2)</p>
Models:	EX171, followed by one letter, followed by up to three numbers.

**LCIE****1 ATTESTATION D'EXAMEN DE TYPE VOLONTAIRE****2 Appareil** destiné à être utilisé en atmosphères explosibles (Directive 94/9/CE)**3** Numéro de l'attestation d'examen de type
LCIE 14 ATEX 1030 X**4** Appareil

Capteur de pression

Type : EX121XYYY et EX171XYYY

5 Demandeur : PCB PiezotronicsAdresse : 3425 Walden Avenue
Depew, New York 14086 USA**7** Cet appareil ou système de protection et ses variantes éventuelles acceptées sont décrits dans l'annexe de la présente attestation et dans les documents descriptifs cités en référence.**8** Le LCIE certifie que cet appareil ou système de protection est conforme aux exigences essentielles de sécurité et de santé pour la conception d'appareils ou système de protection, électriques de catégorie 3 ou non électriques de catégorie 2 et 3, destinés à être utilisés en atmosphères explosibles, données dans l'annexe II de la directive 94/9/CE du Parlement européen et du Conseil du 23 mars 1994.

Les résultats des vérifications et essais figurent dans le rapport confidentiel N°129229-659586.

9 Le respect des exigences essentielles de sécurité et de santé est assuré par la conformité à :

EN 60079-0:2012 + A11:2013, EN 60079-15:2010

10 Le signe X lorsqu'il est placé à la suite du numéro de l'attestation, indique que cet appareil ou système de protection est soumis aux conditions spéciales pour une utilisation sûre, mentionnées dans l'annexe de la présente attestation.**11** Cette attestation d'examen de type concerne uniquement la conception, les vérifications et essais de l'appareil ou du système de protection spécifié, conformément à la directive 94/9/CE.

Des exigences supplémentaires de la directive sont applicables pour la fabrication et la fourniture de l'appareil ou du système de protection. Ces dernières ne sont pas couvertes par la présente attestation.

12 Le marquage de l'appareil ou du système de protection doit comporter les informations détaillées au point 15.

Fontenay-aux-Roses, le 13 février 2015

1 VOLUNTARY TYPE EXAMINATION CERTIFICATE**2** **Equipment** intended for use in potentially explosive atmospheres (Directive 94/9/EC)**3** Type Examination Certificate number
LCIE 14 ATEX 1030 X**4** Equipment

Pressure sensor

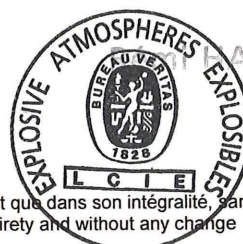
Type : EX121XYYY and EX171XYYY

5 Applicant : PCB PiezotronicsAddress : 3425 Walden Avenue
Depew, New York 14086 USA**7** This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.**8** LCIE certifies that this equipment or protective system has been found to comply with the essential Health and Safety Requirements that relate to the design of equipment or protective system, of category 3 electrical or categories 2 and 3 non electrical, which is intended for use in potentially explosive atmospheres, given in Annex II of the Directive 94/9/EC of the European Parliament and Council of 23 March 1994.

The examination and test results are recorded in confidential report N°129229-659586.

9 Compliance with the Essential Health and Safety Requirements has been assured by reference to :**10** If the sign X is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.**11** This type examination certificate relates only to the design, examination and tests of this specified equipment or protective system in accordance to the directive 94/9/EC.

Further requirements of the Directive may apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include informations as detailed at 15.Le Responsable de Certification ATEX
ATEX Certification OfficerSeul le texte en français peut engager la responsabilité du LCIE. Ce document ne peut être reproduit que dans son intégralité, sans aucune modification.
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13 ANNEXE

14 ATTESTATION D'EXAMEN DE TYPE VOLONTAIRE

LCIE 14 ATEX 1030 X

15 DESCRIPTION DE L'APPAREIL OU DU SYSTEME DE PROTECTION

Capteur de pression

Type : EX121XYYY et EX171XYYY

EX121XYYY : le capteur consiste en une enveloppe métallique cylindrique scellée, qui contient un circuit imprimé et un élément sensible.

EX171XYYY : le capteur consiste en une enveloppe métallique cylindrique scellée, qui contient un élément sensible.

Désignation du type :

EX121XYYY :

X : lettre de A à M qui signifie le type de la famille.

YYY : nombre de 1 à 999 qui signifie les différents filetages, gain, réponse en fréquence, etc... Les différences proviennent des valeurs de résistances et/ou de condensateurs et sont dans les limites spécifiées dans la nomenclature.

EX171XYYY :

X : lettre de A à M qui signifie le type de la famille.

YYY : nombre de 1 à 999 qui signifie les différentes pressions.

Paramètres spécifiques du ou des modes de protection concernés :

$U \leq 30V$, $I \leq 100 \text{ mA}$, $P \leq 0,7W$

Le marquage doit être :

Type EX121XYYY :

PCB Piezotronics Adresse : ...

Type : EX121XYYY (complété avec le modèle)

N° de fabrication : ... Année de fabrication : ...

⊕ II 3 G

Ex nA IIC T4 Gc

LCIE 14 ATEX 1030 X

$-54^{\circ}C \leq T_a \leq +121^{\circ}C$

Type EX171XYYY :

PCB Piezotronics Adresse : ...

Type : EX171XYYY (complété avec le modèle)

N° de fabrication : ... Année de fabrication : ...

⊕ II 3 G

Ex nA IIC T6 Gc ($T_{amb} \leq 80^{\circ}C$)

Ex nA IIC T5 Gc ($T_{amb} \leq 95^{\circ}C$)

Ex nA IIC T4 Gc ($T_{amb} \leq 130^{\circ}C$)

Ex nA IIC T3 Gc ($T_{amb} \leq 190^{\circ}C$)

Ex nA IIC T2 Gc ($T_{amb} \leq 260^{\circ}C$)

LCIE 14 ATEX 1030 X

$-54^{\circ}C \leq T_a \leq +260^{\circ}C$

L'appareil doit également comporter le marquage normalement prévu par les normes de construction qui le concerne.

13 SCHEDULE

14 VOLUNTARY TYPE EXAMINATION CERTIFICATE

LCIE 14 ATEX 1030 X

15 DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM

Pressure sensor

Type : EX121XYYY and EX171XYYY

EX121XYYY : the sensor consists of a sealed cylindrical metal case, which houses a pcb substrate board and a quartz sensing element.

EX171XYYY : the sensor consists of a sealed cylindrical metal case, which houses a quartz sensing element.

Designation of the type :

EX121XYYY :

X is a letter from A to M that signifies family type.

YYY is a number from 1 to 999 that signifies changes to filtering, gain, frequency response, pressure etc. The changes pertain to values of resistors and/or capacitors and are within the limits specified in the component listing.

EX171XYYY :

X is a letter from A to M that signifies family type.

YYY is a number from 1 to 999 that signifies changes pressure.

Specific parameters of the concerned protection mode :

$U \leq 30V$, $I \leq 100 \text{ mA}$, $P \leq 0,7W$

The marking shall be :

Type EX121XYYY :

PCB Piezotronics Address :

Type : EX121XYYY (completed with the model)

Serial number : ... Year of construction : ...

⊕ II 3 G

Ex nA IIC T4 Gc

LCIE 14 ATEX 1030 X

$-54^{\circ}C \leq T_a \leq +121^{\circ}C$

Type EX171XYYY :

PCB Piezotronics Address :

Type : EX171XYYY (completed with the model)

Serial number : ... Year of construction : ...

⊕ II 3 G

Ex nA IIC T6 Gc ($T_{amb} \leq 80^{\circ}C$)

Ex nA IIC T5 Gc ($T_{amb} \leq 95^{\circ}C$)

Ex nA IIC T4 Gc ($T_{amb} \leq 130^{\circ}C$)

Ex nA IIC T3 Gc ($T_{amb} \leq 190^{\circ}C$)

Ex nA IIC T2 Gc ($T_{amb} \leq 260^{\circ}C$)

LCIE 14 ATEX 1030 X

$-54^{\circ}C \leq T_a \leq +260^{\circ}C$

The equipment shall also bear the usual marking required by the manufacturing standards applying to such equipment.



L C I E

13 ANNEXE (suite)

14 ATTESTATION D'EXAMEN DE TYPE VOLONTAIRE

LCIE 14 ATEX 1030 X

16 DOCUMENTS DESCRIPTIFS

Dossier de certification N°59439 Rév.NR du 16/02/2015.
Ce document comprend 8 rubriques (11 pages).

Dossier de certification N°60680 Rév.NR du 16/02/2015.
Ce document comprend 5 rubriques (8 pages).

17 CONDITIONS SPECIALES POUR UNE UTILISATION SÛRE

L'appareil ne doit être raccordé qu'à un équipement dont les paramètres électriques sont compatibles avec les paramètres électriques définis au paragraphe 15.

Température ambiante d'utilisation :
- type EX121XYYY :- 54°C à +121°C.
- type EX171XYYY :- 54°C à +260°C.

Type EX121XYYY : l'appareil doit être raccordé conformément au plan n°57258 Rév.NR (page2/2).
Type EX171XYYY : l'appareil doit être raccordé conformément au plan n°60674 Rév.NR (page2/2).

18 EXIGENCES ESSENTIELLES DE SECURITE ET DE SANTE

Couvertes par les normes listées au point 9.

19 VERIFICATIONS ET ESSAIS INDIVIDUELS

Chaque exemplaire du matériel devra avoir subi un essai de rigidité diélectrique d'une valeur efficace égale à 500V pendant une minute sous une tension sinusoïdale de 50 Hz.

13 SCHEDULE (continued)

14 VOLUNTARY TYPE EXAMINATION CERTIFICATE

LCIE 14 ATEX 1030 X

16 DESCRIPTIVE DOCUMENTS

Certification file N°59439 Rev.NR dated 2015/02/16.
This file includes 8 items (11 pages).

Certification file N°60680 Rev.NR dated 2015/02/16.
This file includes 5 items (8 pages).

17 SPECIAL CONDITIONS FOR SAFE USE

The apparatus must be only connected to an equipment whose electrical parameters are compatible with the electrical parameters.

Operating ambient temperature :
- type EX121XYYY :- 54°C to +121°C.
- type EX171XYYY :- 54°C to +260°C.

Type EX121XYYY : the apparatus shall be connected according to drawing n°57258 Rev.NR (page 2/2).
Type EX171XYYY : the apparatus shall be connected according to drawing n°60674 Rev.NR (page 2/2).

18 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS

Covered by standards listed at 9.

19 ROUTINE VERIFICATIONS AND TESTS

Each single apparatus must be submitted to a dielectric strength test of 500V r.m.s. during 1 minute, with a shine-shaped voltage 50Hz.



제2022-007693-01-1 호

안 전 인 증 서

PCB Piezotronics, Inc.

3425, Walden Avenue, Depew, New York 14086, USA

위 사업장에서 제조하는 아래의 품목이 「산업안전보건법」 제84조 및 같은 법 시행규칙 제110조제1항에 따른 안전인증 심사 결과 안전·보건기준에 적합하므로 안전인증표시의 사용을 인증합니다.

품 목

Pressure sensor

형식·모델(용량·등급) / 인증번호

EX171****(Ex nA IIC T6...T2 Gc) / 22-KA4BO-0354X

인 증 기 준

고용노동부고시 제2021-22호

인 증 조 건

1. 제조공장

·본 인증서는 '3425, Walden Avenue, Depew, New York 14086, USA' 에서 생산하는 제품에 한함.

2. 제품개요

·제품개요: 당 기기는 원통형 금속 외함에 수정센서기 내장되어 있는 압력센서임.

·제품정격: 30 V, 100 mA, 0.7 W

·사용주위온도: $-54^{\circ}\text{C} \leq T_a \leq T_{max}$

온도등급	T6	T5	T4	T3	T2
T_{max}	75 °C	90 °C	125 °C	185 °C	255 °C

3. 인증범위: 본 인증서는 아래의 형식번호에 한하여 유효함.

·EX171(a)(bbb)

- (a): A ~M, (bbb): 1 ~ 999

4. 안전한 사용을 위한 조건

·당기기는 제조자 문서 60674 2 페이지를 참조하여 설치할 것.

·관련 IECEx 인증서(IECEx LCIE 14.0050 X issue No.1) 3 페이지 SPECIFIC CONDITIONS OF USE 참조

5. 인증(변경)사항: 없음.

6. 그 밖의 사항

·안전인증품의 품질관리, 확인심사 수검, 변경사항 신고 등 인증 받은 자의 의무 준수

·본 안전인증서는 반드시 관련 IECEx 인증서(IECEx LCIE 14.0050 X issue No.1)와 함께 사용

2022 년 5 월 13 일

한국산업기술시험원장



안전인증을 받은 자의 유의사항 [Notification for recipient (certification holder)]

1. 본 인증서는 기재된 사업장에서 생산된 제품으로서 적용된 안전인증기준에 적합한 경우에 한하여 유효합니다. (This certificate is valid only when the product is suitable for the applied safety certification criteria and is manufactured from the manufacturing location that is stipulated on this certificate)
2. 안전인증을 받은 자가 다음 각 호의 어느 하나에 해당하면 인증정지 및 취소의 사유가 됩니다. (If a person who has received safety certification falls under any of the following subclause, this safety certification may be suspended or cancelled)
 - 1) 거짓이나 그 밖의 부정한 방법으로 안전인증을 받은 경우 (In case of being certified in false or other improper ways)
 - 2) 안전인증을 받은 안전인증대상 기계기구등의 안전에 관한 성능 등이 안전인증기준에 맞지 아니하게 된 경우 (In the case that the properties of the product for which safety certification has been received are not suitable for the safety certification criteria)
 - 3) 정당한 사유 없이 확인심사를 거부, 기피 또는 방해하는 경우 (In case of refusing, avoiding or disturbing regular surveillance audit without a justifiable reason)
3. 다음과 같은 사유가 발생할 경우에는 안전인증기관에 안전인증 변경 신청을 하여 안전인증서를 재교부 받아야 합니다. (In the case of the following subclauses, the revision of the safety certification shall be applied to the safety certification body and the safety certificate shall be reissued)
 - 1) 인증서의 분실 또는 훼손 (Losses or damages to this certificate)
 - 2) 제조자, 주소, 인증조건 등 인증서 기재사항의 변경 (Changes of stated items in the certificate such as manufacturer's name, manufacturer's address, certification conditions, etc)
4. 안전인증을 받은 자는 다음 사항을 이행해야 합니다. (The recipient of safety certificate (certification holder) shall comply with the following subclauses)
 - 1) 안전인증표시 등 인증요건의 유지관리 (Maintenance control of the certification requirements such as a safety certification mark)
 - 2) 안전인증을 받기 이전 또는 정지, 취소된 이후 생산된 제품에 안전인증표시를 하면 법에 의거 처벌을 받게 됩니다. (It will be punished by the ACT if the safety certification mark is used before issue of the safety certification or after suspension or cancellation of the safety certification)
5. 안전인증을 받은 자는 산업안전보건법 제84조제4항 및 동법 시행규칙 제111조에 따라 정기적인 확인심사를 받아야 합니다. (The recipient of the safety certification (certification holder) shall receive a regular surveillance audit under Paragraph 4 of Article 84 of OCCUPATIONAL SAFETY AND HEALTH ACT and Article 111 of ENFORCEMENT ORDINANCE in the same ACT)

연락처(Contact Information) : 서울 사무소(Seoul office) Tel +82-2-860-1540, Fax +82-2-860-1549
E-mail: dkim@ktl.re.kr, Homepage: www.ktl.re.kr



L C I E

1 ATTESTATION D'EXAMEN CE DE TYPE

2 Appareil ou système de protection destiné à être utilisé en atmosphères explosibles (Directive 94/9/CE)

3 Numéro de l'attestation d'examen CE de type
LCIE 14 ATEX 3059 X

4 Appareil ou système de protection :
Capteur de pression
Type : EX121XYYY et EX171XYYY

5 Demandeur : PCB Piezotronics
Adresse : 3425 Walden Avenue
Depew, New York 14086 USA

6 Fabricant : PCB Piezotronics
Adresse : 3425 Walden Avenue
Depew, New York 14086 USA

7 Cet appareil ou système de protection et ses variantes éventuelles acceptées sont décrits dans l'annexe de la présente attestation et dans les documents descriptifs cités en référence.

8 Le LCIE, organisme notifié sous la référence 0081 conformément à l'article 9 de la directive 94/9/CE du Parlement européen et du Conseil du 23 mars 1994, certifie que cet appareil ou système de protection est conforme aux exigences essentielles de sécurité et de santé pour la conception et la construction d'appareils et de systèmes de protection destinés à être utilisés en atmosphères explosibles, données dans l'annexe II de la directive. Les résultats des vérifications et essais figurent dans le rapport confidentiel N°129229-659586.

9 Le respect des exigences essentielles de sécurité et de santé est assuré par la conformité à :

EN 60079-0:2012 + A11:2013, EN 60079-11:2012

10 Le signe X lorsqu'il est placé à la suite du numéro de l'attestation, indique que cet appareil ou système de protection est soumis aux conditions spéciales pour une utilisation sûre, mentionnées dans l'annexe de la présente attestation.

11 Cette attestation d'examen CE de type concerne uniquement la conception et la construction de l'appareil ou du système de protection spécifié, conformément à l'annexe III de la directive 94/9/CE.

Des exigences supplémentaires de la directive sont applicables pour la fabrication et la fourniture de l'appareil ou du système de protection. Ces dernières ne sont pas couvertes par la présente attestation.

12 Le marquage de l'appareil ou du système de protection doit comporter les informations détaillées au point 15.

Fontenay-aux-Roses, le 13 février 2015

1 EC TYPE EXAMINATION CERTIFICATE

2 Equipment or protective system intended for use in potentially explosive atmospheres (Directive 94/9/EC)

3 EC type examination certificate number
LCIE 14 ATEX 3059 X

4 Equipment or protective system :
Pressure sensor
Type : EX121XYYY and EX171XYYY

5 Applicant : PCB Piezotronics
Address : 3425 Walden Avenue
Depew, New York 14086 USA

6 Manufacturer : PCB Piezotronics
Address : 3425 Walden Avenue
Depew, New York 14086 USA

7 This equipment or protective system and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

8 LCIE, notified body number 0081 in accordance with article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment or protective system has been found to comply with the essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in confidential report N°129229-659586

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with :

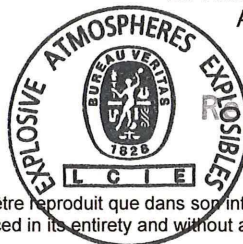
10 If the sign X is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type examination certificate relates only to the design and construction of this specified equipment or protective system in accordance with annex III to the directive 94/9/EC.

Further requirements of the directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include information as detailed at 15.

Le Responsable de Certification ATEX
ATEX Certification Officer



mi HANOT

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01-Annexe III_CE_typ_app - rev2.DOC
Page 1 of 3

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au capital de 15 745 984 €
RCS Nanterre B 408 363 174



LCIE

13 ANNEXE

14 ATTESTATION D'EXAMEN CE DE TYPE

LCIE 14 ATEX 3059 X

15 DESCRIPTION DE L'APPAREIL OU DU SYSTEME DE PROTECTION

Capteur de pression
Type : EX121XYYY et EX171XYYY

EX121XYYY : le capteur consiste en une enveloppe métallique cylindrique scellée, qui contient un circuit imprimé et un élément sensible.

EX171XYYY : le capteur consiste en une enveloppe métallique cylindrique scellée, qui contient un élément sensible.

Désignation du type :

EX121XYYY :

X : lettre de A à M qui signifie le type de la famille.

YYY : nombre de 1 à 999 qui signifie les différents filetages, gain, réponse en fréquence, etc... Les différences proviennent des valeurs de résistances et/ou de condensateurs et sont dans les limites spécifiées dans la nomenclature.

EX171XYYY :

X : lettre de A à M qui signifie le type de la famille.

YYY : nombre de 1 à 999 qui signifie les différentes pressions.

Paramètres spécifiques du ou des modes de protection concernés :

Type EX121XYYY : U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :0, L_i :0

Type EX171XYYY : U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :12nF, L_i :0

Le marquage doit être :

PCB Piezotronics Adresse : ...

Type : EX121XYYY (complété par le modèle)

N° de fabrication : ... Année de fabrication : ...

⊕ II 1 G

Ex ia IIC T4 Ga ($T_{amb} \leq 72^\circ\text{C}$)

Ex ia IIC T3 Ga ($T_{amb} \leq 121^\circ\text{C}$)

LCIE 14 ATEX 3059 X

$-54^\circ\text{C} \leq T_a \leq +121^\circ\text{C}$

U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :0, L_i :0

PCB Piezotronics Adresse : ...

Type : EX171XYYY (complété par le modèle)

N° de fabrication : ... Année de fabrication : ...

⊕ II 1 G

Ex ia IIC T6 Ga ($T_{amb} \leq 80^\circ\text{C}$)

Ex ia IIC T5 Ga ($T_{amb} \leq 95^\circ\text{C}$)

Ex ia IIC T4 Ga ($T_{amb} \leq 130^\circ\text{C}$)

Ex ia IIC T3 Ga ($T_{amb} \leq 190^\circ\text{C}$)

Ex ia IIC T2 Ga ($T_{amb} \leq 260^\circ\text{C}$)

LCIE 14 ATEX 3059 X

$-54^\circ\text{C} \leq T_a \leq +260^\circ\text{C}$

U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :12nF, L_i :0

L'appareil doit également comporter le marquage normalement prévu par les normes de construction qui le concerne.

13 SCHEDULE

14 EC TYPE EXAMINATION CERTIFICATE

LCIE 14 ATEX 3059 X

15 DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM

Pressure sensor
Type : EX121XYYY and EX171XYYY

EX121XYYY : the sensor consists of a sealed cylindrical metal case, which houses a pcb substrate board and a quartz sensing element.

EX171XYYY : the sensor consists of a sealed cylindrical metal case, which houses a quartz sensing element.

Designation of the type :

EX121XYYY :

X is a letter from A to M that signifies family type.

YYY is a number from 1 to 999 that signifies changes to filtering, gain, frequency response, pressure etc. The changes pertain to values of resistors and/or capacitors and are within the limits specified in the component listing.

EX171XYYY :

X is a letter from A to M that signifies family type.

YYY is a number from 1 to 999 that signifies changes pressure.

Specific parameters of the concerned protection mode:

Type EX121XYYY : U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :0, L_i :0

Type EX171XYYY : U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :12nF, L_i :0

The marking shall be :

PCB Piezotronics Address :

Type : EX121XYYY (completed with the model)

Serial number : ... Year of construction : ...

⊕ II 1 G

Ex ia IIC T4 Ga ($T_{amb} \leq 72^\circ\text{C}$)

Ex ia IIC T3 Ga ($T_{amb} \leq 121^\circ\text{C}$)

LCIE 14 ATEX 3059 X

$-54^\circ\text{C} \leq T_a \leq +121^\circ\text{C}$

U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :0, L_i :0

PCB Piezotronics Address :

Type : EX171XYYY (completed with the model)

Serial number : ... Year of construction : ...

⊕ II 1 G

Ex ia IIC T6 Ga ($T_{amb} \leq 80^\circ\text{C}$)

Ex ia IIC T5 Ga ($T_{amb} \leq 95^\circ\text{C}$)

Ex ia IIC T4 Ga ($T_{amb} \leq 130^\circ\text{C}$)

Ex ia IIC T3 Ga ($T_{amb} \leq 190^\circ\text{C}$)

Ex ia IIC T2 Ga ($T_{amb} \leq 260^\circ\text{C}$)

LCIE 14 ATEX 3059 X

$-54^\circ\text{C} \leq T_a \leq +260^\circ\text{C}$

U_i :30 V, I_i :100 mA, P_i :0,7W, C_i :12nF, L_i :0

The equipment shall also bear the usual marking required by the manufacturing standards applying to such equipment.



LCIE

13 ANNEXE (suite)

14 ATTESTATION D'EXAMEN CE DE TYPE

LCIE 14 ATEX 3059 X

16 DOCUMENTS DESCRIPTIFS

Dossier de certification N°59428 Rév.NR du 20/02/2015.
Ce dossier comprend 8 rubriques (11 pages).

Dossier de certification N°60678 Rév.NR du 16/02/2015.
Ce dossier comprend 5 rubriques (8 pages).

17 CONDITIONS SPECIALES POUR UNE UTILISATION SÛRE

L'appareil ne doit être raccordé qu'à un matériel associé certifié de sécurité intrinsèque. Cette association doit être compatible vis-à-vis de la sécurité intrinsèque (voir les paramètres électriques au paragraphe 15).

Température ambiante d'utilisation :
Type EX121XYYY : - 54°C à + 121°C.
Type EX171XYYY : - 54°C à + 260°C

Type EX121XYYY : l'appareil doit être raccordé conformément au plan n°57258 Rév.NR (page 1/2).
Type EX171XYYY : l'appareil doit être raccordé conformément au plan n°60674 Rév.NR (page 1/2).

18 EXIGENCES ESSENTIELLES DE SECURITE ET DE SANTE

Couvertes par les normes listées au point 9.

19 VERIFICATIONS ET ESSAIS INDIVIDUELS

Néant.

20 CONDITIONS DE CERTIFICATION

Les détenteurs d'attestations d'examen CE de type doivent également satisfaire les exigences de contrôle de production telles que définies à l'article 8 de la directive 94/9/CE.

13 SCHEDULE (continued)

14 EC TYPE EXAMINATION CERTIFICATE

LCIE 14 ATEX 3059 X

16 DESCRIPTIVE DOCUMENTS

Certification file N°59428 Rev.NR dated 2015/02/20.
This file includes 8 items (11 pages).

Certification file N°60678 Rev.NR dated 2015/02/16.
This file includes 5 items (8 pages).

17 SPECIAL CONDITIONS FOR SAFE USE

The apparatus must be only connected to a certified associated intrinsically safe equipment. This combination must be compatible regarding intrinsic safety rules (see electrical parameters clause 15).

Operating ambient temperature :
Type EX121XYYY : - 54°C to + 121°C.
Type EX171XYYY : - 54°C to + 260°C

Type EX121XYYY : the apparatus shall be connected according to drawing n°57258 Rev.NR (page 1/2).
Type EX171XYYY : the apparatus shall be connected according to drawing n°60674 Rev.NR (page 1/2).

18 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS

Covered by standards listed at 9.

19 ROUTINE VERIFICATIONS AND TESTS

None.

20 CONDITIONS OF CERTIFICATION

Holders of EC type examination certificates are also required to comply with the production control requirements defined in article 8 of directive 94/9/EC.



IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:

IECEx LCIE 14.0050X

issue No.:1

Certificate history:

Issue No. 1 (2015-11-9)

Issue No. 0 (2015-3-13)

Status:

Current

Date of Issue:

2015-11-09

Page 1 of 4

Applicant:

PCB Piezotronics
3425 Walden Avenue
Depew, New York 14086
United States of America

Electrical Apparatus:

Pressure sensor

Optional accessory:

Types EX121YYYY and EX171YYYY

Type of Protection:

Ex ia, Ex nA

Marking:

Type EX121YYYY : Ex ia IIC T4 to T3 Ga, Ex nA IIC T4 Gc
Type EX171YYYY : Ex ia IIC T6 to T2 Ga, Ex nA IIC T4 Gc
IECEx LCIE 14.0050X
(see Annex for full marking)

Approved for issue on behalf of the IECEx
Certification Body:

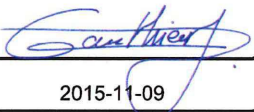
Julien GAUTHIER

Position:

Certification Officer

Signature:

(for printed version)



2015-11-09

Date:

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](http://www.iecex.com).

Certificate issued by:

Laboratoire Central des Industries Electriques (LCIE)
33 Avenue du General Leclerc
FR-92260 Fontenay-aux-Roses
France

Documents relative to LCIE certification activities (Certificates, QARs, ExTRs) can be registered under the references "LCI" or "LCIE".



LCIE



IECEx Certificate of Conformity

Certificate No.: IECEx LCIE 14.0050X

Date of Issue: 2015-11-09

Issue No.: 1

Page 2 of 4

Manufacturer: **PCB Piezotronics**
3425 Walden Avenue
Depew, New York 14086
United States of America

Additional Manufacturing location
(s):

**PCB Piezotronics of
North Carolina Inc.**
10869 Hwy 903
Halifax, NC 27839
United States of America

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Edition: 6.0	Explosive atmospheres - Part 0: General requirements
IEC 60079-11 : 2011 Edition: 6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
IEC 60079-15 : 2010 Edition: 4	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:
FR/LCIE/ExTR14.0055/00

FR/LCIE/ExTR15.0113/00

Quality Assessment Report:

NL/DEK/QAR14.0004/01



IECEx Certificate of Conformity

Certificate No.: IECEx LCIE 14.0050X

Date of Issue: 2015-11-09

Issue No.: 1

Page 3 of 4

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

Type EX121XYYY : the sensor consists of a sealed cylindrical metal case, which houses a pcb substrate board and a quartz sensing element. The circuitry is connected to a connector.
Type EX171XYYY : the sensor consists of a sealed cylindrical metal case which houses a quartz sensing element.

Marking : *see annex*

Electrical parameters : *see annex*

CONDITIONS OF CERTIFICATION: YES as shown below:

Version "ia" :

The apparatus must be only connected to a certified associated intrinsically safe equipment. This combination must be compatible regarding intrinsic safety rules (see electrical parameters).

Operating ambient temperature :

- type EX121XYYY: - 54°C to + 121°C.

- type EX171XYYY : - 54°C to + 260°C

Type EX121XYYY : the apparatus shall be connected according to drawing n°57258 (page 1/2).

Type EX171XYYY : the apparatus shall be connected according to drawing n°60674 (page 1/2).

Version "nA" :

The apparatus must be only connected to an equipment whose electrical parameters are compatible with the electrical parameters.

Operating ambient temperature :

- type EX121XYYY :- 54°C à +121°C.

- type EX171XYYY :- 54°C à +260°C.

Type EX121XYYY : the apparatus shall be connected according to drawing n°57258 (page 2/2).

Type EX171XYYY : the apparatus shall be connected according to drawing n°60674 (page 2/2).



IECEx Certificate of Conformity

Certificate No.: IECEx LCIE 14.0050X

Date of Issue: 2015-11-09

Issue No.: 1

Page 4 of 4

DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):

Issue 01 :

Modification of QAR

Addition of a manufacturing site

Annex: IECEx LCIE 14.0050 X - issue 01 - Annex 01.pdf



Annex 01 to Certificate IECEx LCIE 14.0050 X issue 01



Marking :

PCB Piezotronics

Address : ...

Type : EX121XYYY ⁽¹⁾

Serial number : ...

Year of construction : ...

Ex ia IIC T4 Ga (Tamb ≤ +72°C)

Ex ia IIC T3 Ga (Tamb ≤ +121°C)

Ex nA IIC T4 Gc (Tamb ≤ +121°C)

IECEx LCIE 14.0050 X

-54°C ≤ Tamb ≤ +121°C

Model ia :

U_i : 30V, I_i : 100mA, P_i : 0.7W, C_i : 0, L_i : 0

PCB Piezotronics

Address : ...

Type : EX171XYYY ⁽¹⁾

Serial number : ...

Year of construction : ...

Ex ia IIC T6 Ga (Tamb ≤ +80°C)

Ex ia IIC T5 Ga (Tamb ≤ +95°C)

Ex ia IIC T4 Ga (Tamb ≤ +130°C)

Ex ia IIC T3 Ga (Tamb ≤ +190°C)

Ex ia IIC T2 Ga (Tamb ≤ +260°C)

Ex nA IIC T6 Gc (Tamb ≤ +80°C)

Ex nA IIC T5 Gc (Tamb ≤ +95°C)

Ex nA IIC T4 Gc (Tamb ≤ +130°C)

Ex nA IIC T3 Gc (Tamb ≤ +190°C)

Ex nA IIC T2 Gc (Tamb ≤ +260°C)

IECEx LCIE 14.0050 X

-54°C ≤ Tamb ≤ +260°C

Model ia

U_i : 30V, I_i : 100mA, P_i : 0.7W, C_i : 12nF, L_i : 0

⁽¹⁾ completed by the model

Electrical parameters :

Model ia :

Type EX121XYYY : U_i : 30V, I_i : 100mA, P_i : 0.7W, C_i : 0, L_i : 0

Type EX171XYYY : U_i : 30V, I_i : 100mA, P_i : 0.7W, C_i : 12nF, L_i : 0

Model nA :

Type EX121XYYY : U : 30V, I : 100mA, P : 0.7W

Type EX171XYYY : U : 30V, I : 100mA, P : 0.7W



IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx LCIE 14.0050X

Issue No: 0

Certificate history:

Status: **Current**

Issue No. 1 (2015-11-09)

Issue No. 0 (2015-03-13)

Date of Issue: **2015-03-13**

Page 1 of 3

Applicant: **PCB Piezotronics**
3425 Walden Avenue
Depew, New York 14086
United States of America

Equipment: **Pressure sensor types EX121XYYY and EX171XYYY**

Optional accessory:

Type of Protection: **ia and nA**

Marking:

Type EX121XYYY : Ex ia IIC T4 to T3 Ga, Ex nA IIC T4 Gc

Type EX171XYYY : Ex ia IIC T6 to T2 Ga, Ex nA IIC T4 Gc

IECEx LCIE 14.0050X

(see attachment for more informations)

Approved for issue on behalf of the IECEx
Certification Body:

Rémi HANOT

Position:

Certification Officer

Signature:
(for printed version)

Date:

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](http://www.iecex.com).

Certificate issued by:

Laboratoire Central des Industries Electriques (LCIE)
33 Avenue du General Leclerc
FR-92260 Fontenay-aux-Roses
France





IECEx Certificate of Conformity

Certificate No: IECEx LCIE 14.0050X

Issue No: 0

Date of Issue: **2015-03-13**

Page 2 of 3

Manufacturer: **PCB Piezotronics**
3425 Walden Avenue
Depew, New York 14086
United States of America

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Edition:6.0	Explosive atmospheres - Part 0: General requirements
IEC 60079-11 : 2011 Edition:6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "I"
IEC 60079-15 : 2010 Edition:4	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

[FR/LCIE/ExTR14.0055/00](#)

Quality Assessment Report:

[CA/CSA/QAR09.0018/02](#)



IECEx Certificate of Conformity

Certificate No: IECEx LCIE 14.0050X

Issue No: 0

Date of Issue: 2015-03-13

Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

Type EX121XYYY : the sensor consists of a sealed cylindrical metal case, which houses a pcb substrate board and a quartz sensing element. The circuitry is connected to a connector.

Type EX171XYYY : the sensor consists of a sealed cylindrical metal case which houses a quartz sensing element.

Marking : see attachment

Electrical parameters : see attachment

SPECIFIC CONDITIONS OF USE: YES as shown below:

Version "ia" :

The apparatus must be only connected to a certified associated intrinsically safe equipment. This combination must be compatible regarding intrinsic safety rules (see electrical parameters°).

Operating ambient temperature :

- type EX121XYYY: - 54°C to + 121°C.

- type EX171XYYY : - 54°C to + 260°C

Type EX121XYYY : the apparatus shall be connected according to drawing n°57258 (page 1/2).

Type EX171XYYY : the apparatus shall be connected according to drawing n°60674 (page 1/2).

Version "nA" :

The apparatus must be only connected to an equipment whose electrical parameters are compatible with the electrical parameters.

Operating ambient temperature :

- type EX121XYYY :- 54°C à +121°C.

- type EX171XYYY :- 54°C à +260°C.

Type EX121XYYY : the apparatus shall be connected according to drawing n°57258 (page 2/2).

Type EX171XYYY : the apparatus shall be connected according to drawing n°60674 (page 2/2).

Annex:

LCIE 14.0050X - attchment 01 - version 1.pdf



IECEX LCIE 14.0050 X issue 00 Attachment n°01



Marking :

PCB Piezotronics Address :
Type : EX121XYYY (completed with the model)
Serial number : ... Year of construction : ...
Ex ia IIC T4 Ga (Tamb ≤ 72°C)
Ex ia IIC T3 Ga (Tamb ≤ 121°C)
Ex nA IIC T4 Gc (Tamb ≤ 121°C)
IECEX LCIE 14.0050 X
-54°C ≤ Ta ≤ +121°C
Version « ia » only : Ui :30 V, Ii :100 mA, Pi :0,7W, Ci :0, Li :0

PCB Piezotronics Address :
Type : EX171XYYY (completed with the model)
Serial number : ... Year of construction : ...
Ex ia IIC T6 Ga (Tamb ≤ 80°C)
Ex ia IIC T5 Ga (Tamb ≤ 95°C)
Ex ia IIC T4 Ga (Tamb ≤ 130°C)
Ex ia IIC T3 Ga (Tamb ≤ 190°C)
Ex ia IIC T2 Ga (Tamb ≤ 260°C)
Ex nA IIC T6 Gc (Tamb ≤ 80°C)
Ex nA IIC T5 Gc (Tamb ≤ 95°C)
Ex nA IIC T4 Gc (Tamb ≤ 130°C)
Ex nA IIC T3 Gc (Tamb ≤ 190°C)
Ex nA IIC T2 Gc (Tamb ≤ 260°C)
IECEX LCIE 14.0050X
-54°C ≤ Ta ≤ +260°C
Version « ia » only : Ui :30 V, Ii :100 mA, Pi :0,7W, Ci :12nF, Li :0

Electrical parameters :

Version "ia" :
Type EX121XYYY : Ui :30 V, Ii :100 mA, Pi :0,7W, Ci :0, Li :0
Type EX171XYYY : Ui :30 V, Ii :100 mA, Pi :0,7W, Ci :12nF, Li :0

Version « nA » :
Type EX121XYYY : U :30 V, I :100 mA, P :0,7W
Type EX171XYYY : U :30 V, I :100 mA, P :0,7W

EU Declaration of Conformity PS132

In Accordance with ISO/IEC 17050

Manufacturer: PCB Piezotronics, Inc. 3425 Walden Avenue Depew, New York 14043 USA	Authorized European Representative: PCB Piezotronics Europe GmbH Porschestrasse 20-30 41836 Hückelhoven, Germany
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Certifies that type of equipment: Pressure Sensor(s)

Whose Product Models Include: EX121XYYY and EX171XYYY

Note: "X" is a place holder for one letter
 "YYY" is a place holder for up to three numbers
 For example: EX121M40

These letter and numbers are included in the model numbers of the series. For details see the related data sheets.

This declaration is applicable to all Sensor(s) of the above series which have the CE & ATEX mark on their data sheets and where those data sheets refer to this declaration of conformity. The data sheets for all model numbers referenced above, which include the CE & ATEX mark on such data sheets and refer to this Declaration of Conformity are hereby incorporated by reference into this Declaration.

Conform to the following EU Directive(s) when installed per product documentation:	2014/30/EU 2014/34/EU 2011/65/EU w/2015/863/EU	EMC Directive* ATEX Directive RoHS Directive
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*Note: The EMC Directive, 2014/30/EU only applies to the EX121XYYY Series, as EX171XYYY Series contains no electronics.

Standards to which Conformity is Declared:

Harmonized Standards	EN 60079-0:2018 EN 60079-11:2012 EN 60079-15:2010 EN 61326-1:2013 EN 61326-2-3:2013 EN 63000:2018	Explosive Atmosphere General Requirements Explosive Atmosphere Intrinsic safety Explosive atmospheres. Equipment protection by type of protection "n" Electrical Equipment for Measurement, Control and Laboratory Use- EMC Electrical Equipment for Measurement, Control and Laboratory Use- EMC Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
Test Reports	EMC Reports Safety Reports	GM214094c (Only applies to the EX121XYYY Model Series) GM214095s
	ATEX Certificates	LCIE 14 ATEX 3059 X and LCIE 14 ATEX 1030 X Ex ia IIC Tx Ga and Ex nA IIC Tx Gc
Notified Body Name		Laboratoire Central des Industries Electriques (0081)

Notified Body's Address		FONTENAY-AUX-ROSES (Head Office) 33, avenue du Général Leclerc FR- 92260 Fontenay-aux-Roses Tel. : + 33 1 40 95 60 60 Fax : + 33 1 40 95 86 56
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I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) Standard(s)

Place: Depew, NY **Date:** 04/12/2022

Signature:



Name: Carrie Termin

Title: Regulatory Affairs and Product Certification Specialist