



Model EX378B02

Intrinsically safe 378B02 microphone and preamplifier, ATEX, IECEx, ETL, ANZEx, approved

Installation and Operating Manual

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

Toll-free: 716-684-0001

24-hour SensorLine: 716-684-0001

Fax: 716-684-0987

E-mail: info@pcb.com

Web: www.pcb.com



Repair and Maintenance

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

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

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

Calibration

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

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

Returning Equipment

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

Contact Information

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

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

Safety Considerations

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

Discontinue use and contact our 24-Hour Sensorline if:

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

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

Definition of Terms and Symbols

The following symbols may be used in this manual:



DANGER

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

**CAUTION**

Refers to hazards that could damage the instrument.

**NOTE**

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

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



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



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



This symbol indicates safety, earth ground.



PCB工业监视和测量设备 - 中国RoHS2公布表

PCB Industrial Monitoring and Measuring Equipment - China RoHS 2 Disclosure Table

| 部件名称 | 有害物质 | | | | | |
|--|--------|--------|--------|--------------|------------|--------------|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 住房 | 0 | 0 | 0 | 0 | 0 | 0 |
| PCB板 | X | 0 | 0 | 0 | 0 | 0 |
| 电气连接器 | 0 | 0 | 0 | 0 | 0 | 0 |
| 压电晶体 | X | 0 | 0 | 0 | 0 | 0 |
| 环氧 | 0 | 0 | 0 | 0 | 0 | 0 |
| 铁氟龙 | 0 | 0 | 0 | 0 | 0 | 0 |
| 电子 | 0 | 0 | 0 | 0 | 0 | 0 |
| 厚膜基板 | 0 | 0 | X | 0 | 0 | 0 |
| 电线 | 0 | 0 | 0 | 0 | 0 | 0 |
| 电缆 | X | 0 | 0 | 0 | 0 | 0 |
| 塑料 | 0 | 0 | 0 | 0 | 0 | 0 |
| 焊接 | X | 0 | 0 | 0 | 0 | 0 |
| 铜合金/黄铜 | X | 0 | 0 | 0 | 0 | 0 |
| 本表格依据 SJ/T 11364 的规定编制。 | | | | | | |
| 0：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。 | | | | | | |
| X：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。 | | | | | | |
| 铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。 | | | | | | |

CHINA RoHS COMPLIANCE

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

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

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

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

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

PRODUCT GUIDE
377 SERIES MICROPHONES
426 SERIES PREAMPLIFIERS



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1.0 Introduction

Thank you for your purchase of a PCB high quality microphone. These microphones offer highly accurate and reliable acoustic measurements and are typically used in research and design applications. They are accurate enough for laboratory usage, yet rugged enough for field-testing.

Sound within the typical 20 to 20,000 Hz audible range of a healthy human ear can either be pleasing to the ear, as in music, or unpleasant (or harmful), as in noise. As a result, many applications, from the development of consumer products to research in acoustics, measure sound, even sound outside the range of human hearing. The instrument typically used to measure sound is the microphone, which is designed, like the human ear, to transform pressure oscillations into a corresponding voltage oscillation.

2.0 Standards

Before selecting an acoustical instrument, it is important to identify which acoustical standards are appropriate for the application in which the instrument will be used. Whether for legal purposes or for quality assurance programs, these standards will help determine the required quality, accuracy and consistency of the instrument. Standards that correspond to the performance requirements, dimensions and characteristics of acoustical components are established for microphones, sound level meters, calibrators, or other related components. The most common organizations producing these standards are the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC). IEC 1094-4 establishes specifications for the mechanical dimensions and certain electroacoustic characteristics for standard industrial microphones. The performance specification sheet supplied with each PCB microphone identifies the standards to which the microphone is compliant.

3.0 Setting up a Microphone Measurement System

After the proper microphone has been selected, the corresponding preamplifier, cabling, power supplies, signal conditioning and data acquisition selections are ready to be installed. Not all of these components are required for all test set-ups. The figures below show typical set-ups for externally polarized and prepolarized microphone systems.

A prepolarized microphone can be used with a standard Microphone Power Supply designed for externally polarized microphones, and its preamplifier, provided the supply voltage is set to zero.

Phantom powered microphone systems use a 3 pin XLR connector. A phantom powered microphone system should use a 48V phantom power supply or signal conditioner for optimum performance; however these microphone systems may be powered with a 24V or a 12V phantom power supply, but this will limit the maximum output voltage.



Externally Polarized Microphone System

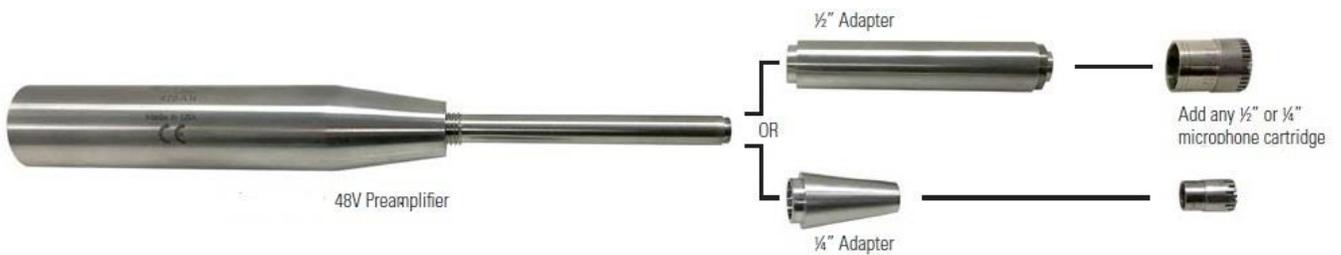


Prepolarized Microphone System



Phantom Powered Microphone System

The phantom powered preamp may be used with either a 1/4" or a 1/2" microphone cartridge by using the adapter provided. All IEC 61094-4 compliant microphones can be used with the phantom powered preamp.



Adapters for Phantom Powered Preamp

4.0 Taking Measurements

The following formula is used to calculate the pressure measured by the microphone from the output voltage signal. The sensitivity of a microphone is typically measured at 250 Hz.

$$\text{Pressure (Pa)} = \text{Voltage (mV)} / \text{Sensitivity (mV/Pa)}.$$

The lowest amplitude a healthy human ear can detect is 20 millionths of a Pascal (20 μ Pa). Another scale more commonly used to describe sound pressure level is the decibel (dB). To convert the output voltage signal (measured in V_{rms}) to sound pressure level (measured in decibels), use the following formula:

$$SPL = \left(20 \text{Log} \left(\frac{V_{rms}}{S P_{ref}} \right) \right) dB$$

where S is the sensitivity of the microphone in mV/Pa, and P_{ref} is the reference pressure in air, which is 20×10^{-6} Pa. The decibel scale is logarithmic and more closely matches the response reactions of the human ear to the pressure fluctuations. Some examples of typical sound pressure levels are shown in the table below.

| dB | Pressure | Example |
|-----|------------|----------------------|
| 0 | 0.00002 Pa | Threshold of Hearing |
| 60 | 0.02 Pa | Business Office |
| 80 | 0.2 Pa | Shop Noise |
| 94 | 1 Pa | Large Truck |
| 100 | 2 Pa | Jackhammer |
| 120 | 20 Pa | Airplane Take-Off |
| 140 | 200 Pa | Threshold of Pain |

At very high-pressure amplitudes, the microphone's diaphragm will start to distort the measured sound pressure. The maximum rated sound pressure level of a microphone is expressed as the amplitude at which the Total Harmonic Distortion (THD) reaches a specified amount, typically 3% THD. It is important to note that the highest sound pressure level that can be measured with a microphone system may be limited by other parts of the system, such as the preamplifier, signal conditioner, or instrumentation. Conversely, the Cartridge Thermal Noise (CTN) specification provides the lowest measurable sound pressure level that can be detected above the electrical noise inherent within the microphone.

Temperature and pressure will affect the sensitivity of a microphone but these effects can be accounted for by adjusting the recorded microphone values using the coefficients specified for each microphone model. Simply calculate the difference in temperature and ambient pressure from those recorded during calibration and multiply this value by the proper coefficient to determine the sensitivity offset. In most cases, the offset will be very small and is therefore unnecessary.

5.0 Accessories & Miscellaneous

Transducer Electronics Data Sheet (TEDS)

Preamplifiers can incorporate TEDS devices, which have a built in read/write memory that contains relevant information about the sensor and its use. Information includes manufacturer name, model number, serial number, sensitivity, etc. The operation of TEDS devices is defined by IEEE P1451.4. A TEDS microphone system includes a microphone mated with a preamplifier that contains the TEDS memory programmed with both the microphone and preamplifier information. This is particularly helpful when using large channel count systems and array set-up.

A-Weight Inline Filter

The inline filter is used in conjunction with an ICP[®] preamplifier to provide A-weighting for acoustical measurements. The filter's frequency response is weighted according to the A-weighting filter portion of both ANSI S1.4 and IEC 60651 Type 1 Sound Level Meter Standards. ICP[®] signal conditioners of 4 mA or greater are recommended when using inline filters.

Windscreens and Nose cones

Wind induced noise can be reduced by using a windscreen. This can offer some protection against dust particles and mechanical damage. In the presence of high-speed airflow from a well-defined direction, such as wind tunnels, a nose cone is recommended. When using windscreens and noise cones, the frequency response of the microphone will be attenuated at higher frequencies.

Clamps and stands

When holding a microphone in place, it is important to minimize the influence of the stand on the sound being measured. This can be accomplished by using low profile stands and clamps available from PCB.

Cables and Electronics

PCB carries LEMO® cables as well as coaxial cables with BNC and 10-32 connectors. Traditional externally polarized microphone power supplies along with a variety of ICP® signal conditioners are available that will fit almost any need.

6.0 Maintenance

Microphones are very stable over long periods of time, provided they are handled and stored properly. The microphone contains fragile components that can be damaged by misuse, in particular the diaphragm, which is made up of a very thin proprietary material and should be kept clean of dust, dirt, moisture and free any type of imperfection (scratch, dent, etc.).

The microphone's grid cap is designed to let the true sound pressure level through to the diaphragm while preventing items from coming in contact with it. We do not recommend that you ever remove the grid cap or clean the microphone. If you take the precautionary measures to keep the microphone clean and dry, it should not be necessary. Should you need to remove the grid cap to replace it with PCB's enhanced rugged grid cap (shown below, and as an independent part of a rugged kit) to extend the lifespan of the precision measuring device, caution should be taken to ensure the delicate diaphragm sensing element remains untouched and safe.



Use of accessories, like windscreens, and desiccants will help keep moisture off the microphone and maintain the specified sensitivity level. Nose cones will help keep turbulence off the microphone diaphragm and allow the sound pressure to be measured with greater accuracy.

Keep the microphone and preamplifier assembled while preparing for testing. Keep the rubber maintenance caps on the preamplifier's electrical connector only. Do not place these rubber caps over the microphone. This will create a vacuum and undo pressure on the microphone diaphragm, which can stretch the diaphragm and cause a change in sensitivity. Store the microphones and preamplifiers in their protective cases when not in use.

Dust, rain, oil, moisture or exposure to extreme temperatures may adversely affect the microphone and preamplifier's performance. If the microphone or the inside of the connection area of the preamplifier becomes contaminated, use a light pressure rubber bulb to gently blow clean, dry air onto the unit in order to remove the dust. In the event that you absolutely must take off the grid cap and clean the microphone diaphragm, we recommend using a blow bulb or a light pressure, clean and dry air hose to gently blow contamination off the diaphragm. The direction of the air should be parallel with the diaphragm, not directly (0 degree incidence) pointed at the diaphragm. Do not touch the microphone's diaphragm with your fingers or let it come in contact with any sharp or pointed object. Please note that any contact to the microphone's diaphragm can negatively impact the sensitivity and long term stability of the microphone.

If the microphone is ever dropped (the effects of this can be minimized by PCB's rugged grid cap or utilizing rugged microphone kits), or comes into contact with any contamination, or is exposed to extreme temperatures, immediate recalibration of the microphone should be performed. When using a rugged grid cap, a handheld calibrator with a 1" diameter (example CAL250, or pistonphone) is required for recalibration, along with the larger (079A59) calibration adapter. Please note that heat from your hands can affect the calibration results. It is always good practice to wait a minimum of 30 seconds after placing the microphone on a test system before taking a calibration reading in order to minimize the effect that heat from your hands has on the calibration. Changes in the environmental conditions: temperature, humidity or atmospheric pressure, may cause a change in your microphones sensitivity and thus, changes in your output accuracy. It is always recommended to calibrate both before and after your test, within the test environment. Performing a single point handheld calibrator check, both before and after your test, ensures reliability of the test data. With proper maintenance, the microphone and preamplifier should provide stable and accurate results for years to come.

7.0 Calibration

PCB offers recalibration services for our precision microphones, as well as units produced by other A2LA manufacturers. Our internal metrology laboratory is certified to ISO 9001, accredited by A2LA to ANSI/IEC 17025 and ANSI/NCSL Z540-1, complies with ISO 10012-1 (and former MIL-STD-45662A), and uses equipment directly traceable to one or more of the following National Labs (NIST, PTB or DFM). Our investment in equipment, traceability and conformance to industry standards ensures accurate calibration against relevant specifications. We also carry a line of acoustic calibrators that can be used to calibrate microphone sensitivity on site as needed.

Hand calibration of sensitivity for most prepolarized microphones may be performed with a Larson Davis CAL250 or CAL200 (or equivalent). The CAL250 produces 114 dB SPL at 251.2 Hz. The CAL 200 produces either 94 dB or 114 dB (user selectable) at 1000 Hz. Note that both the CAL250 and CAL 200 are compliant with ANSI S1.40-2006, Specifications and Verification Procedures for Sound Calibrators, Class1 and IEC 60942-2003, Class 1, Sound Calibrators.

8.0 Warranty and Service

All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a warranty against defective material and workmanship under a **Total Customer Satisfaction** policy. If, at any time, for any reason, you are not completely satisfied with any PCB product, PCB will repair, replace, or exchange it at no charge. You may also choose to have your purchase price refunded. See the supplemental sheet, contained with this manual, for information on our service, repair and return policies, procedures and instructions. When unexpected problems arise, call our 24-Hour SensorLineSM (716-684-0001) to speak with an Application Engineer. Visit www.pcb.com for a complete statement of our warranty.

3425 Walden Avenue, Depew, NY 14043-2495

E-Mail: info@pcb.com

Website: www.pcb.com

24-hour SensorLineSM: 716-684-0001

U.S.A. Fax: 716-684-0987

Toll-free (in the U.S.A.): 800-828-8840

A PCB GROUP COMPANY

ISO 9001 CERTIFIED

A2LA ACCREDITED to ISO 17025

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Manual Number: 27042

Manual Revision: F

ECO 51020



Printed in the U.S.A.

INSTRUCTIONS FOR USE - EX378XXXX Microphone System Series

| | |
|----------------------|---|
| Model(s) | EX378XXXX Series where “X” is any letter A-Z, “YYY” is up to three numbers 0-999 |
| Markings | PCB Depew, NY IECEX SIM 22.0005X Ex ia IIC T4 Ga Ex ia I Ma |
| Putting Into Service | <p>Powering: All ICP® Microphone Systems require constant current excitation for proper operation. For this reason, use only PCB constant-current signal conditioners or other approved constant-current sources. The power supply consists of a current-regulated, 18 to 30 VDC source. This power is regulated by a current-limiting circuit, which provides the constant-current excitation required for proper operation of ICP® Microphone Systems.</p> <p>In general, battery-powered devices offer versatility for portable, low-noise measurements, whereas line-powered units provide the capability for continuous monitoring. Consult the Vibration Division’s product catalog for more information about signal conditioners.</p> <p>NOTE: <i>Under no circumstances should a voltage be supplied to an ICP® Microphone System without a current-regulating diode or equivalent electrical circuit. This may include ohmmeters, multi-meters and continuity testers.</i></p> |
| Safe Use | <p>After completing the system setup, switch on the signal conditioner and allow 1 to 2 minutes for the system to stabilize. The meter (or LED) on the signal conditioner should be reading “green.” This indicates proper operation and you may begin taking measurements. If a faulty condition is indicated (red or yellow reading), first check all system connections, then check the functionality of the cable and signal conditioner. If the system still does not operate properly, consult a PCB factory representative.</p> <p>NOTE: <i>Always operate the Microphone System within the limitations listed on the enclosed Specification Sheet. Operating the device outside these parameters can cause temporary or permanent damage to the Microphone System.</i></p> |
| Assembling | The EX378XXXX Series come assembled in system consisting of a Microphone and a Pre-Amplifier. It does not require any assembly. Only mounting to low profile stands and clamps while taking measurements. |
| Dismantling | Other than removal from the mounting, there is no disassembly of the sensor required to take it out of service. |
| Maintenance | Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. |
| Servicing | Due to the sophisticated nature of the Microphone Systems and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. However, routine calibration of Microphone Systems and associated instrumentation is recommended as this helps build confidence in measurement accuracy and acquired data. |

| | |
|---|--|
| Repair | In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty. |
| Installation | Overview: The Microphone System must be mounted on low profile stands and clamps in order to be put into service. Characteristics like location, ruggedness, amplitude range, accessibility, temperature, and portability are extremely critical. Cabling: Care and attention to cable installation and cable condition is essential as the reliability and accuracy of any measurement system is no better than that of its weakest link. Due to the nature of vibration measurements, all sensor cables will ultimately fatigue and fail. Good installation practice will extend the life of a cable, however, it is highly recommended to keep spare cables on hand to enable continuation of the test in the event of a cable failure. Install Microphone system per drawing 65241. |
| Adjustment | The EX378XYYY series come assembled in a system and no user adjustments are possible. However, routine calibration of sensors by the manufacturer is recommended as this helps build confidence in measurement accuracy and acquired data. |
| Danger Areas (for pressure-relief devices) | N/A – not a pressure relief device. |
| Training Instructions | Industrial sensors must be installed in Hazardous Locations by trained professionals according to IEC 60079-14 requirements. |
| Details on Safety of Protection Category | Ex ia is “intrinsic safety”, which limits the energy of sparks and surface temperatures to safe levels |
| Entity Parameters and Limits (Values) | Temperature Range: -40°C to +80°C Ui :30V, Ii :100mA, Pi : 750mW, Ci: 0, Li: 0.36µH |
| Special Conditions of Use | Version Ex ia : The apparatus must only be connected to a certified associated intrinsically safe equipment. This combination must be compatible regarding intrinsic safety rules (see electrical parameters). The apparatus shall be connected according to drawing 65241. The mounting of the apparatus into an installation must be carried out in such a way that sensor metallic body and cable shield are reliably connected to the system earth. For final installation, the user shall take all necessary precautions to maintain the minimum degree of protection IP20 of the sensor connection when connected according to the requirements of IEC 60079-14 standard. |
| Essential Characteristics of tools fitted to the system (if any). | N/A – No tools are fitted to the system. |
| Drawings and Diagrams | 65673,77197 |
| Other | |

Note: Literature (such as the manual or marketing materials) describing the equipment or protective system must not contradict the instructions with regard to safety aspects.

| | | |
|---|-------------------------------------|-----------|
|  3425 Walden Ave Depew, New York 14043 | N° 77198 Rev. NR ECO #: 53307 | N° 2 of 2 |
|---|-------------------------------------|-----------|

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68216

SCHEDULE DRAWING

NO MODIFICATIONS PERMITTED WITHOUT REFERENCE TO THE NOTIFIED BODY

| REVISIONS | | |
|-----------|-----------------|-------|
| REV | DESCRIPTION | DIN |
| NR | INITIAL RELEASE | 47371 |

- 7 CERTIFICATE ETL C/US LISTED INTERTEK 5010230
- 6 THE EX378XXXX MICROPHONE SYSTEM ONLY CONSISTS OF AN APPROVED PCB AMPLIFIER CARTRIDGE, EX426XXXX SERIES, AND AN APPROVED MICROPHONE CARTRIDGE EX377XXXX SERIES. THE CARTRIDGES SHOULD NOT BE DISASSEMBLED WHEN LOCATED IN A HAZARDOUS LOCATION
- 5 APPROVED PCB SUPPLIED AMPLIFIER CARTRIDGE EX426XXXX SERIES
- 4 APPROVED PCB SUPPLIED MICROPHONE CARTRIDGE EX377XXXX SERIES
- 3 SHIELDS TO BE EARTHED AT BARRIER ENDS.
- 2 BARRIER WILL BE MOUNTED IN AN ENCLOSURE THE SUITABILITY OF WHICH WILL BE DETERMINED BY LOCAL AUTHORITIES.

1 ENTITY APPLICATION

| BARRIER | | I.S. APPARATUS |
|---------|---|-------------------------|
| Voc/Uo | ≤ | V _{MAX} / UI |
| Isc/Io | ≤ | I _{MAX} / II |
| Ca/Co | > | CI + C _{CABLE} |
| La/Lo | > | LI + L _{CABLE} |
| Po | ≤ | PI (CENELEC ONLY) |

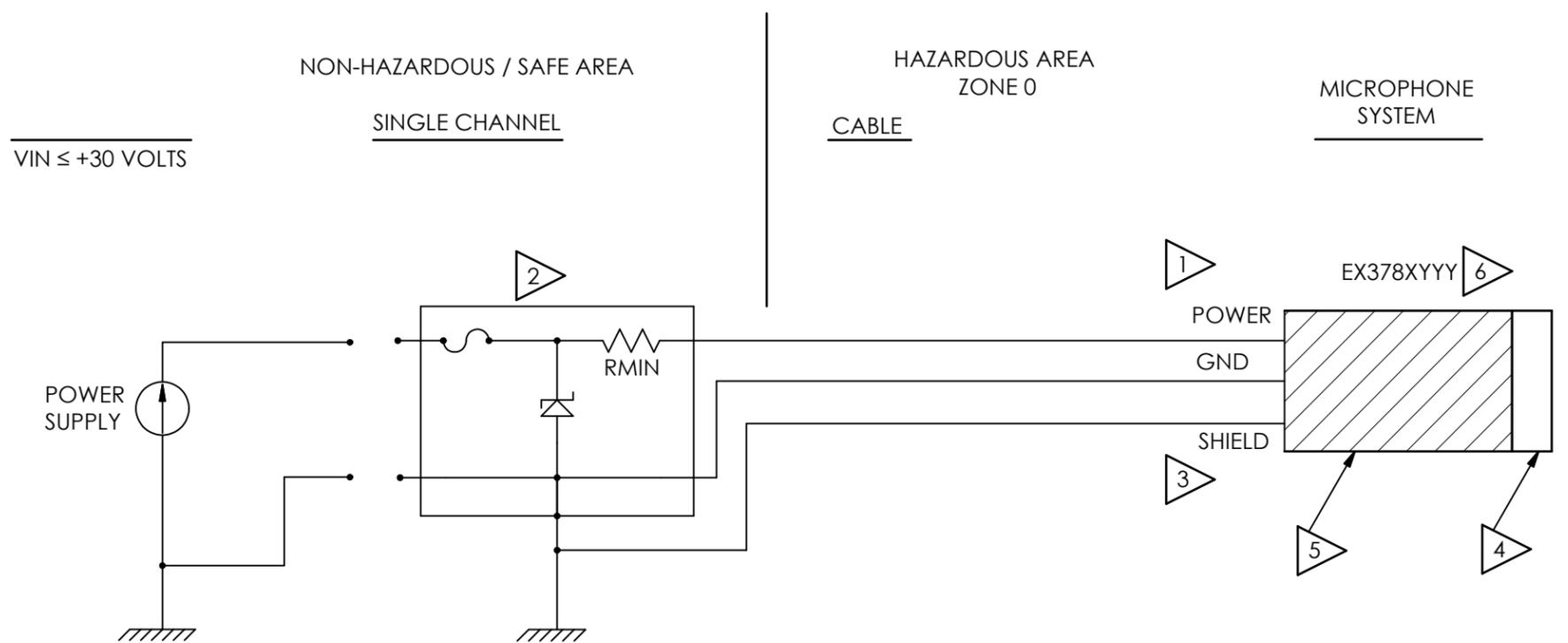
BARRIERS WITHIN THE SPECIFIED LIMITATIONS ARE PERMITTED

ENTITY PARAMETERS EX378XXXX SERIES

Ui = 30V
 Ii = 100mA
 Pi = 0.75W
 Ci = 0
 Li = 0.36uH

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

- CLASS 1
- ZONE 0
 - Ex ia IIC T4 Ga
 - AEx ia IIC T4 Ga
- CLASS 1, DIV 1, GROUPS A,B,C,D



NO CHANGES WITHOUT INTERTEK APPROVAL

| |
|-------------------------------|
| UNLESS OTHERWISE SPECIFIED |
| DIMENSIONS ARE IN INCHES |
| DECIMALS X ± .05 |
| XX ± .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 |
|--|--------------|--------------|
| KRM 12/21/17 | KRM 12/21/17 | GGG 12/21/17 |
| TITLE | | |
| INTERTEK APPROVAL INTERCONNECTION | | |

PCB PIEZOTRONICS™

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

CODE IDENT. NO. 52681

DWG. NO. 68216

SCALE: NONE SHEET 1 OF 1

4

3

2

1

INSTRUCTIONS FOR USE - EX378XYYY Microphone System Series

| | |
|----------------------|---|
| Model(s) | EX378XYYY Series where “X” is any letter A-Z, “YYY” is up to three numbers 0-999 |
| Markings | PCB Depew, NY LCIE 17 ATEX 3059 X IECEX LCIE 17.0063 X I M1 Ex ia I Ex ia IIC T4 Ga |
| Putting Into Service | <p>Powering: All ICP® Microphone Systems require constant current excitation for proper operation. For this reason, use only PCB constant-current signal conditioners or other approved constant-current sources. The power supply consists of a current-regulated, 18 to 30 VDC source. This power is regulated by a current-limiting circuit, which provides the constant-current excitation required for proper operation of ICP® Microphone Systems.</p> <p>In general, battery-powered devices offer versatility for portable, low-noise measurements, whereas line-powered units provide the capability for continuous monitoring. Consult the Vibration Division’s product catalog for more information about signal conditioners.</p> <p>NOTE: <i>Under no circumstances should a voltage be supplied to an ICP® Microphone System without a current-regulating diode or equivalent electrical circuit. This may include ohmmeters, multi-meters and continuity testers.</i></p> |
| Safe Use | <p>After completing the system setup, switch on the signal conditioner and allow 1 to 2 minutes for the system to stabilize. The meter (or LED) on the signal conditioner should be reading “green.” This indicates proper operation and you may begin taking measurements. If a faulty condition is indicated (red or yellow reading), first check all system connections, then check the functionality of the cable and signal conditioner. If the system still does not operate properly, consult a PCB factory representative.</p> <p>NOTE: <i>Always operate the Microphone System within the limitations listed on the enclosed Specification Sheet. Operating the device outside these parameters can cause temporary or permanent damage to the Microphone System.</i></p> |
| Assembling | The EX378XYYY Series come assembled in system consisting of a Microphone and a Pre-Amplifier. It does not require any assembly. Only mounting to low profile stands and clamps while taking measurements. |
| Dismantling | Other than removal from the mounting, there is no disassembly of the sensor required to take it out of service. |
| Maintenance | Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. |
| Servicing | Due to the sophisticated nature of the Microphone Systems and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. However, routine calibration of Microphone Systems and associated instrumentation is recommended as this helps build confidence in measurement accuracy and acquired data. |

| | | |
|---|-------------------------------------|-----------|
|  3425 Walden Ave Depew, New York 14043 | Nº 65238 Rev. NR ECO #: 45769 | Nº 1 of 3 |
|---|-------------------------------------|-----------|

| | |
|---|---|
| Repair | In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty. |
| Installation | <p>Overview: The Microphone System must be mounted on low profile stands and clamps in order to be put into service. Characteristics like location, ruggedness, amplitude range, accessibility, temperature, and portability are extremely critical. Cabling: Care and attention to cable installation and cable condition is essential as the reliability and accuracy of any measurement system is no better than that of its weakest link. Due to the nature of vibration measurements, all sensor cables will ultimately fatigue and fail. Good installation practice will extend the life of a cable, however, it is highly recommended to keep spare cables on hand to enable continuation of the test in the event of a cable failure.</p> <p>Install Microphone system per drawing 65241.</p> |
| Adjustment | The EX378XYYY series come assembled in a system and no user adjustments are possible. However, routine calibration of sensors by the manufacturer is recommended as this helps build confidence in measurement accuracy and acquired data. |
| Danger Areas (for pressure-relief devices) | N/A – not a pressure relief device. |
| Training Instructions | Industrial sensors must be installed in Hazardous Locations by trained professionals according to EN/IEC 60079-14 requirements. |
| Details on Safety of Protection Category | Ex ia is “intrinsic safety”, which limits the energy of sparks and surface temperatures to safe levels |
| Entity Parameters and Limits (Values) | Temperature Range: -40°C to +80°C Ui :30V, Ii :100mA, Pi : 750mW, Ci: 0, Li: 0.36μH |
| Special Conditions of Use | <p>Version Ex ia :</p> <p>The apparatus must only be connected to a certified associated intrinsically safe equipment. This combination must be compatible regarding intrinsic safety rules (see electrical parameters). The apparatus shall be connected according to drawing 65241.</p> <p>The mounting of the apparatus into an installation must be carried out in such a way that sensor metallic body and cable shield are reliably connected to the system earth.</p> <p>For final installation, the user shall take all necessary precautions to maintain the minimum degree of protection IP20 of the sensor connection when connected according to the requirements of EN 60079-14 and IEC 60079-14 standards.</p> |
| Essential Characteristics of tools fitted to the system (if any). | N/A – No tools are fitted to the system. |
| Drawings and Diagrams | 65666,65673 |
| Other | |

Note: Literature (such as the manual or marketing materials) describing the equipment or protective system must not contradict the instructions with regard to safety aspects.

INSTRUCTIONS FOR USE - EX378XYYY Microphone System Series

| | |
|----------------------|--|
| Model(s) | EX378XYYY Series where “X” is any letter A-Z, “YYY” is up to three numbers 0-999 |
| Markings | <p>PCB Depew, NY LCIE 17 ATEX 3059 X Ex I M1, Ex ia I Ma Ex II 1G, Ex ia IIC T4 Ga IECEX LCIE 17.0063X Ex ia I Ma Ex ia IIC T4 Ga ETL c/us Listed Intertek 5010230 CL I, DIV 1, GR A,B,C,D CL I, ZONE 0, AEx/Ex ia IIC T4 Ga $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +80^{\circ}\text{C}$</p> |
| Putting Into Service | <p>Powering: All ICP[®] Microphone Systems require constant current excitation for proper operation. For this reason, use only PCB constant-current signal conditioners or other approved constant-current sources. The power supply consists of a current-regulated, 18 to 30 VDC source. This power is regulated by a current-limiting circuit, which provides the constant-current excitation required for proper operation of ICP[®] Microphone Systems.</p> <p>In general, battery-powered devices offer versatility for portable, low-noise measurements, whereas line-powered units provide the capability for continuous monitoring. Consult the Vibration Division’s product catalog for more information about signal conditioners.</p> <p>NOTE: <i>Under no circumstances should a voltage be supplied to an ICP[®] Microphone System without a current-regulating diode or equivalent electrical circuit. This may include ohmmeters, multi-meters and continuity testers.</i></p> |
| Safe Use | <p>After completing the system setup, switch on the signal conditioner and allow 1 to 2 minutes for the system to stabilize. The meter (or LED) on the signal conditioner should be reading “green.” This indicates proper operation and you may begin taking measurements. If a faulty condition is indicated (red or yellow reading), first check all system connections, then check the functionality of the cable and signal conditioner. If the system still does not operate properly, consult a PCB factory representative.</p> <p>NOTE: <i>Always operate the Microphone System within the limitations listed on the enclosed Specification Sheet. Operating the device outside these parameters can cause temporary or permanent damage to the Microphone System.</i></p> |
| Assembling | The EX378XYYY Series come assembled in system consisting of a Microphone and a Pre-Amplifier. It does not require any assembly. Only mounting to low profile stands and clamps while taking measurements. |
| Dismantling | Other than removal from the mounting, there is no disassembly of the sensor required to take it out of service. |
| Maintenance | Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. |

| | |
|---|--|
| Servicing | Due to the sophisticated nature of the Microphone Systems and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. However, routine calibration of Microphone Systems and associated instrumentation is recommended as this helps build confidence in measurement accuracy and acquired data. |
| Repair | In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty. |
| Installation | Overview: The Microphone System must be mounted on low profile stands and clamps in order to be put into service. Characteristics like location, ruggedness, amplitude range, accessibility, temperature, and portability are extremely critical. Cabling: Care and attention to cable installation and cable condition is essential as the reliability and accuracy of any measurement system is no better than that of its weakest link. Due to the nature of vibration measurements, all sensor cables will ultimately fatigue and fail. Good installation practice will extend the life of a cable, however, it is highly recommended to keep spare cables on hand to enable continuation of the test in the event of a cable failure. Install Microphone system per drawing 68216. |
| Adjustment | The EX378XYYY series come assembled in a system and no user adjustments are possible. However, routine calibration of sensors by the manufacturer is recommended as this helps build confidence in measurement accuracy and acquired data. |
| Danger Areas (for pressure-relief devices) | N/A – not a pressure relief device. |
| Training Instructions | Industrial sensors must be installed in Hazardous Locations by trained professionals according to EN/IEC 60079-14 requirements. |
| Details on Safety of Protection Category | Ex ia is “intrinsic safety”, which limits the energy of sparks and surface temperatures to safe levels. |
| Entity Parameters and Limits (Values) | Temperature Range: -40°C to +80°C Ui: 30V, Ii:100 mA, Pi: 0.75 W, Ci: 0, Li: 0.36µH |
| Special Conditions of Use | Version Ex ia : The apparatus must only be connected to a certified associated intrinsically safe equipment. This combination must be compatible regarding intrinsic safety rules (see electrical parameters). The apparatus shall be connected according to drawing 68216. |
| Essential Characteristics of tools fitted to the system (if any). | N/A – No tools are fitted to the system. |
| Drawings and Diagrams | 65666, 65668, 65672, 65674 |
| Other | Conforms To UL STDS 913, 60079-0, & 60079-11 and Certified To CSA STD C22.2 # 157 |

Note: Literature (such as the manual or marketing materials) describing the equipment or protective system must not contradict the instructions with regard to safety aspects.

| | |
|---|--|
|  3425 Walden Ave Depew, New York 14043 | N° 68249 Rev. NR ECO #: 47371 N° 2 of 2 |
|---|--|

| | | |
|---------------------------------|------------------------------|------------------------------|
| Model Number EX378B02 | ICP MICROPHONE SYSTEM | Revision: NR ECN #: 47683 |
|---------------------------------|------------------------------|------------------------------|

| | <u>ENGLISH</u> | <u>SI</u> | |
|--|-------------------------|-------------------------|--------|
| Performance | | | |
| Nominal Microphone Diameter | 1/2" | 1/2" | |
| Frequency Response Characteristic(at 0° incidence) | Free-Field | Free-Field | |
| Sensitivity | 50 mV/Pa | 50 mV/Pa | [3] |
| Sensitivity(± 1.5 dB) | -26 dB re 1 V/Pa | -26 dB re 1 V/Pa | [3] |
| Frequency Range(± 2 dB) | 3.75 to 20,000 Hz | 3.75 to 20,000 Hz | |
| Frequency Range(± 1 dB) | 7 to 10,000 Hz | 7 to 10,000 Hz | |
| Lower Limiting Frequency(-3 dB) | 1.0 to 3.0 Hz | 1.0 to 3.0 Hz | |
| Inherent Noise | 15.5 dB(A) re 20 µPa | 15.5 dB(A) re 20 µPa | [2] |
| Dynamic Range(3% Distortion Limit) | 137 dB re 20 µPa | 137 dB re 20 µPa | [2] |
| Environmental | | | |
| Temperature Range(Operating) | -40 to +176 °F | -40 to +80 °C | |
| Temperature Coefficient of Sensitivity(+14 to +158°F (-10 to +70°C)) | 0.005 dB/°F | 0.009 dB/°C | [2][3] |
| Static Pressure Coefficient | -0.013 dB/kPa | -0.013 dB/kPa | [2][3] |
| Humidity Coefficient of Sensitivity(0 to 100%, non-condensing) | ± 0.001 dB/%RH | ± 0.001 dB/%RH | [3] |
| Influence of Axial Vibration(0.1g (1 m/s ²)) | 63 dB re 20 µPa | 63 dB re 20 µPa | [2] |
| Electrical | | | |
| Polarization Voltage | 0 V | 0 V | [1] |
| Excitation Voltage | 20 to 30 VDC | 20 to 30 VDC | |
| Constant Current Excitation | 2 to 20 mA | 2 to 20 mA | |
| Output Bias Voltage | 10 to 14 VDC | 10 to 14 VDC | |
| Maximum Output Voltage | ± 7 Vpk | ± 7 Vpk | |
| Output Impedance | <50 Ohm | <50 Ohm | |
| Physical | | | |
| Housing Material | Stainless Alloy | Stainless Alloy | |
| Venting | Rear | Rear | [4] |
| Electrical Connector | BNC Jack | BNC Jack | |
| Mounting Thread(Grid) | 0.5 - 60 UNS | 0.5 - 60 UNS | |
| Size (Diameter x Height)(with grid) | 0.52 in x 4.02 in | 13.2 mm x 102.1 mm | |
| Size (Diameter x Height)(without grid) | 0.50 in x 3.99 in | 12.7 mm x 101.2 mm | |
| Weight | 1.87 oz | 53 gm | [2] |

OPTIONAL VERSIONS

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

NOTES:

[1] Prepolarized
 [2] Typical.
 [3] re 250 Hz
 [4] Venting through Preamp.
 [5] See PCB Declaration of Conformance PS172 for details.
 [6] See Model's "Instructions For Use" (IFU) for North American Conformity and Certification Statements.

SUPPLIED ACCESSORIES:
 Model ACS-63 Calibration (with TEDS) of Precision Condenser Microphones and Preamplifiers together (mated pair).

| | | | | |
|-----------------|-----------------|-----------------|-----------------|--------------|
| Entered: LK | Engineer: gs | Sales: MV | Approved: BAM | Spec Number: |
| Date: 1/16/2018 | Date: 1/16/2018 | Date: 1/16/2018 | Date: 1/16/2018 | 66400 |



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

ICP® is a registered trademark of PCB Group, Inc.



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

2

1

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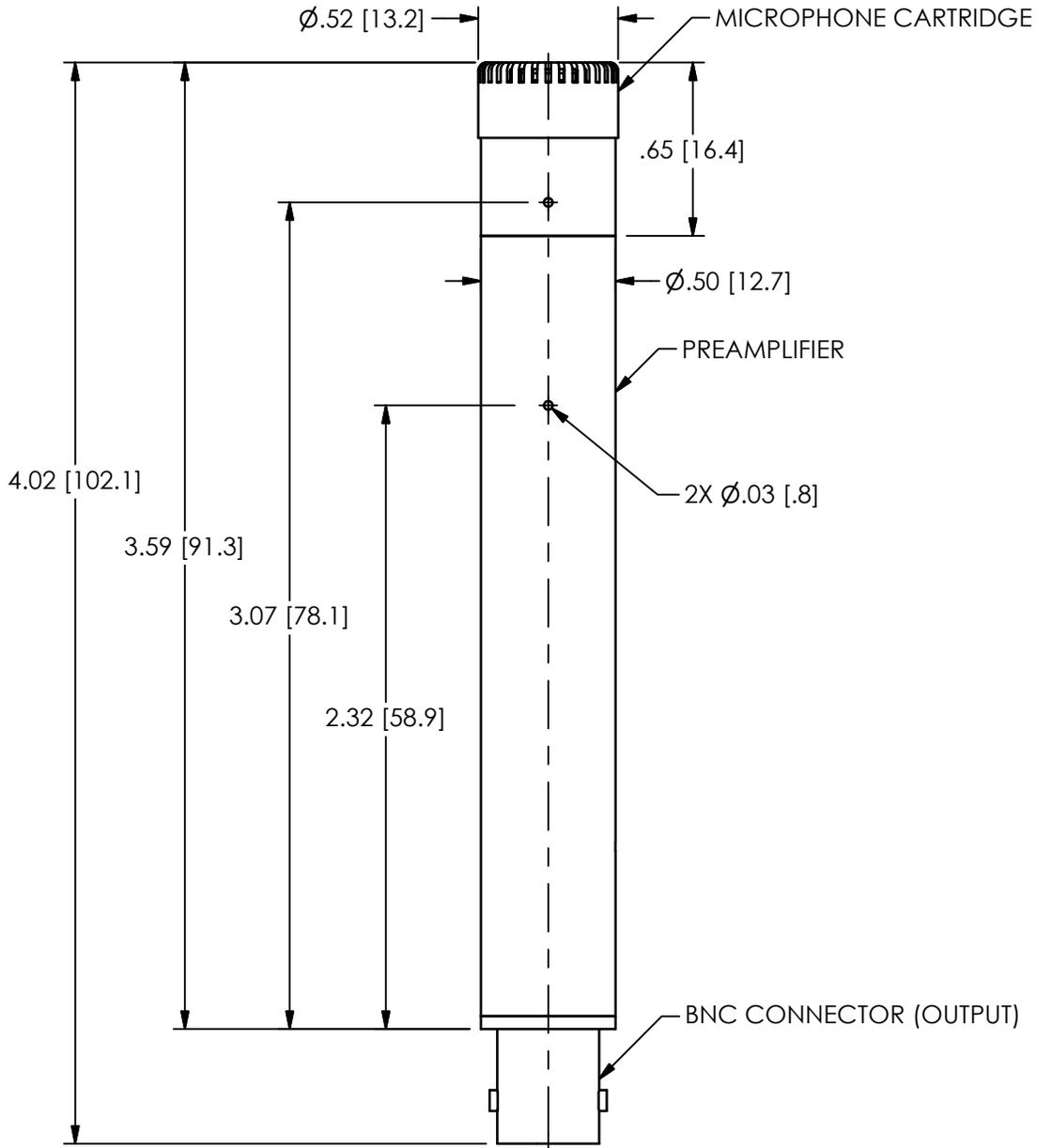
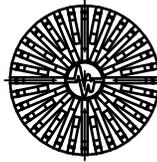
REVISIONS

| REV | DESCRIPTION | DIN |
|-----|---------------------|-------|
| A | REMOVED HEAT SHRINK | 47926 |

66401

RELATED DRAWING

NO MODIFICATIONS PERMITTED WITHOUT THE APPROVAL OF THE AUTHORIZED PERSON



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

| DRAWN | | CHECKED | | ENGINEER | |
|-------|--------|---------|--------|----------|--------|
| KRM | 3/1/18 | KRM | 3/1/18 | GGG | 3/1/18 |

| DIMENSIONS IN INCHES | DIMENSIONS IN MILLIMETERS [IN BRACKETS] |
|---|---|
| DECIMALS XX $\pm .03$ XXX $\pm .010$ | DECIMALS X ± 0.8 XX ± 0.25 |
| ANGLES ± 2 DEGREES | ANGLES ± 2 DEGREES |

| FILLETS AND RADII | FILLETS AND RADII |
|-------------------|-------------------|
| .003 - .005 | 0.07 - 0.13 |

TITLE
OUTLINE DRAWING
1/2" MICROPHONE

PCB PIEZOTRONICS™
 3425 WALDEN AVE. DEPEW, NY 14043
 (716) 684-0001 E-MAIL: sales@pcb.com

| | |
|--------------------------|-------------------|
| CODE IDENT. NO. 52681 | DWG. NO. 66401 |
|--------------------------|-------------------|

| | |
|-------------|--------------|
| SCALE: 1.5X | SHEET 1 OF 1 |
|-------------|--------------|

2

1

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65241

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SCHEDULE DRAWING

NO MODIFICATIONS PERMITTED WITHOUT REFERENCE TO THE NOTIFIED BODY

| REVISIONS | | |
|-----------|-----------------|-------|
| REV | DESCRIPTION | DIN |
| NR | INITIAL RELEASE | 45769 |

- 6 THE EX378XXXX MICROPHONE SYSTEM ONLY CONSISTS OF AN APPROVED PCB AMPLIFIER CARTRIDGE, EX426XXXX SERIES, AND AN APPROVED MICROPHONE CARTRIDGE EX377XXXX SERIES. THE CARTRIDGES SHOULD NOT BE DISASSEMBLED WHEN LOCATED IN A HAZARDOUS LOCATION
- 5 APPROVED PCB SUPPLIED AMPLIFIER CARTRIDGE EX426XXXX SERIES
- 4 APPROVED PCB SUPPLIED MICROPHONE CARTRIDGE EX377XXXX SERIES
- 3 SHIELDS TO BE EARTHED AT BARRIER ENDS.
- 2 BARRIER WILL BE MOUNTED IN AN ENCLOSURE THE SUITABILITY OF WHICH WILL BE DETERMINED BY LOCAL AUTHORITIES.

1 ENTITY APPLICATION

| BARRIER | | I.S. APPARATUS |
|---------|---|-------------------------|
| Voc/Uo | ≤ | V _{MAX} / UI |
| Isc/Io | ≤ | I _{MAX} / II |
| Ca/Co | > | CI + C _{CABLE} |
| La/Lo | > | LI + L _{CABLE} |
| Po | ≤ | PI (CENELEC ONLY) |

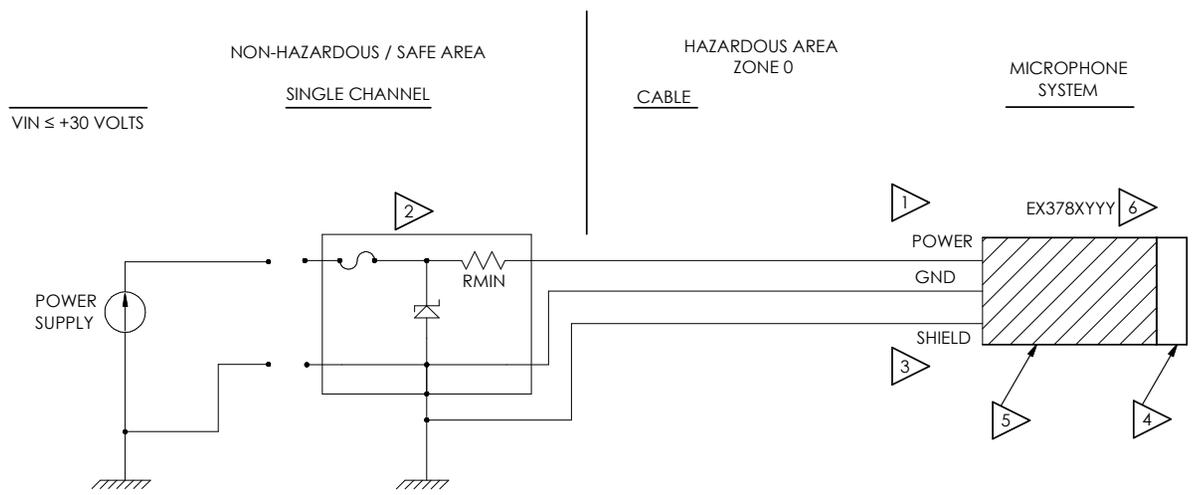
BARRIERS WITHIN THE SPECIFIED LIMITATIONS ARE PERMITTED

ENTITY PARAMETERS EX378XXXX SERIES

- Ui = 30V
- Ii = 100mA
- Pi = 0.75W
- Ci = 0
- Li = 0.36uH

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

- ZONE 0
- Ex ia IIC T4 Ga
- I M1 Ex ia I



NO CHANGES WITHOUT LCIE APPROVAL

| |
|-------------------------------|
| UNLESS OTHERWISE SPECIFIED |
| DIMENSIONS ARE IN INCHES |
| DECIMALS X ± .05 |
| XX ± .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 |
|--------------|--------------|--------------|
| JDG 10/18/16 | KRM 10/18/16 | GG5 10/18/16 |

TITLE

LCIE APPROVAL INTERCONNECTION

PCB PIEZOTRONICS™

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

CODE IDENT. NO. 52681

DWG. NO. 65241

SCALE: NONE SHEET 1 OF 1

4

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2

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IECEX Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification System for Explosive Atmospheres

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

Certificate No.: **IECEX SIM 22.0005X** Page 1 of 3 [Certificate history:](#)
Status: **Current** Issue No: 0
Date of Issue: **2022-11-02**
Applicant: **PCB Piezotronics Inc**
3425 Walden Avenue
Depew, New York 14043
United States of America
Equipment: **Microphone system - Type : Ex378YYYY**
Optional accessory:
Type of Protection: **Intrinsic Safety "i"**
Marking: **Ex ia I Ma**
Ex ia IIC T4 Ga

Approved for issue on behalf of the IECEX
Certification Body:

Geoffrey Barnier

Position:

Principal Engineer - Certification

Signature:
(for printed version)

2 November 2022

Date:
(for printed version)

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 www.iecex.com or use of this QR Code.



Certificate issued by:

Safety in Mines Testing and Research Station (Simtars)
2 Robert Smith Street, REDBANK QLD 4301
Australia

Simtars



IECEX Certificate of Conformity

Certificate No.: **IECEX SIM 22.0005X**

Page 2 of 3

Date of issue: 2022-11-02

Issue No: 0

Manufacturer: **PCB Piezotronics Inc**
3425 Walden Avenue
Depew, New York 14043
United States of America

Manufacturing
locations: **PCB Piezotronics Inc**
3425 Walden Avenue
Depew, New York 14043
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 equipment 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 Explosive atmospheres - Part 0: General requirements
Edition:6.0

IEC 60079-11:2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
Edition:6.0

This Certificate **does not** indicate compliance with 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/ExTR17.0074/00](#)

Quality Assessment Report:

[NL/DEK/QAR14.0004/05](#)



IECEX Certificate of Conformity

Certificate No.: **IECEX SIM 22.0005X**

Page 3 of 3

Date of issue: 2022-11-02

Issue No: 0

EQUIPMENT:

Equipment and systems covered by this Certificate are as follows:

The apparatus is an ICP Microphone Systems, type 378XYYY, integrating a microphone cartridge and a preamplifier.

The delivered signal from ICP Microphone Systems provides a typical +/- 7V peak voltage output signal when making acoustic measurements.

The microphone cartridge is the sensing element (piezoelectric element) and is primarily made from stainless metal alloys.

The preamplifier has a stainless steel housing that contains a PC board with a mating connector at on one end for the microphone cartridge and at the other end to provide the interface to an external cable assembly.

The equipment is intended to be used for leak detection and acoustic noise tests in gaseous or mining explosive areas.

SPECIFIC CONDITIONS OF USE: YES as shown below:

Ambient temperature range: -40°C to +80°C.

The intrinsically safe apparatus shall only be connected to associated intrinsically safe apparatus certified for the intended use. This association shall comply with the requirements of the standard IEC 60079-25.

The mounting of the apparatus into an installation must be carried out in such a way that sensor metallic body and cable shield are reliably connected to the system earth.

The apparatus must be connected according to instruction manual.

For final installation in mining application, the user shall take all necessary precautions to maintain the minimum degree of protection IP20 of the sensor connection when connected according to the requirements of IEC 60079-14 standard.

Annex:

[IECEX SIM 22.0005X-0 Microphone EX378XYYY Annex.pdf](#)



IECEX Certificate of Conformity

Certificate No.: **IECEX SIM 22.0005X**
Annex

Issue No.: 0
Page 1 of 1

Manufacturer's documents:

Drawings associated with Issue 0:

| Drawing No | Subject | Rev. | Date |
|--------------------------------|---|------|----------|
| 65672 | DESCRIPTIVE NOTICE FOR THE CERTIFICATION OF ICP® Microphone Systems | NR | 10/05/16 |
| 65082 (Sheets 1 and 2 of 2) | APPROVAL SCHEMATIC AND BOM | NR | 10/7/14 |
| 65250 | APPROVAL ASSEMBLY MICROPHONE SYSTEM | NR | 8/23/16 |
| 65542 | PC BOARD APPROVAL LAYOUT | B | 5/22/17 |
| 77198 (Sheets 1 and 2 of 2) | Instructions for Use – EX378XXXX Microphone System Series | NR | - |
| 65241 | LCIE APPROVAL INTERCONNECTION | NR | 10/18/16 |
| 77197 (Sheets 1 and 2 of 2) | APPROVAL ETCHING DRAWING MICROPHONE CARTRIDGE | NR | 10/20/22 |

Certificate issued by:

**Safety in Mines Testing
and Research Station**

(Simtars)

2 Robert Smith Street
REDBANK QLD 4301
Australia

Simtars



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 17.0063X

Issue No: 0

Certificate history:

Issue No. 0 (2017-09-22)

Status: **Current**

Page 1 of 3

Date of Issue: **2017-09-22**

Applicant: **PCB Piezotronics**
3425 Walden Avenue
Depew, New York 14043
United States of America

Equipment: **Microphone system - Type : Ex378XYYY**

Optional accessory:

Type of Protection: **Ex ia**

Marking:

Ex ia I Ma

Ex ia IIC T4 Ga

Approved for issue on behalf of the IECEX
Certification Body:

Julien GAUTHIER

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.

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 17.0063X

Issue No: 0

Date of Issue: **2017-09-22**

Page 2 of 3

Manufacturer: **PCB Piezotronics**
3425 Walden Avenue
Depew, New York 14043
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 Explosive atmospheres - Part 0: General requirements
Edition:6.0

IEC 60079-11 : 2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
Edition:6.0

*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/ExTR17.0074/00](#)

Quality Assessment Report:

[NL/DEK/QAR14.0004/01](#)



IECEX Certificate of Conformity

Certificate No: IECEx LCIE 17.0063X

Issue No: 0

Date of Issue: 2017-09-22

Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

The apparatus is an ICP Microphone Systems, type 378XXXX, integrating a microphone cartridge and a preamplifier.

The delivered signal from ICP Microphone Systems provides a typical +/- 7V peak voltage output signal when making acoustic measurements.

The microphone cartridge is the sensing element (piezoelectric element) and is primarily made from stainless metal alloys.

The preamplifier has a stainless steel housing that contains a PC board with a mating connector at on one end for the microphone cartridge and at the other end to provide the interface to an external cable assembly.

The equipment is intended to be used for leak detection and acoustic noise tests in gaseous or mining explosive areas.

SPECIFIC CONDITIONS OF USE: YES as shown below:

- a) Ambient temperature range: -40°C to +80°C.
- b) The intrinsically safe apparatus shall only be connected to associated intrinsically safe apparatus certified for the intended use. This association shall comply with the requirements of the standard IEC 60079-25.
- c) The mounting of the apparatus into an installation must be carried out in such a way that sensor metallic body and cable shield are reliably connected to the system earth.
- d) The apparatus must be connected according to instruction manual.
- e) For final installation in mining application, the user shall take all necessary precautions to maintain the minimum degree of protection IP20 of the sensor connection when connected according to the requirements of IEC 60079-14 standard.

1 Version : 00

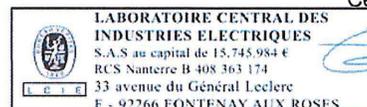
LCIE 17 ATEX 3059 X

Issue : 00

- 2 Directive 2014/34/UE
Appareil ou Système de Protection destiné à être utilisé en
Atmosphères Explosibles
- Equipment or Protective System Intended for use in
Potentially Explosive Atmospheres
- 3 Produit :
Système Microphone
- Product :
Microphone system
- Type: EX378XYYY
- 4 Fabricant :
PCB Piezotronics Inc.
- Manufacturer :
Address :
3425 Warden Avenue
DEPEW, NY 14043
UNITED STATES of AMERICA
- 5 Adresse :
- 6 Ce produit et ses variantes éventuelles acceptées sont décrits
dans l'annexe de la présente attestation et dans les
documents descriptifs cités en référence.
- This product any acceptable variation thereto is specified in
the schedule to this certificate and the documents therein
referred to.
- 7 Le LCIE, Organisme Notifié sous la référence 0081
conformément à l'article 17 de la directive 2014/34/UE du
Parlement européen et du Conseil du 26 février 2014, certifie
que ce produit est conforme aux Exigences Essentielles de
Sécurité et de Santé pour la conception et la construction de
produits destinés à être utilisés en atmosphères explosibles,
données dans l'annexe II de la Directive.
Accréditation Cofrac Certification de Produits et Services, n°5-
0014. Portée disponible sur www.cofrac.fr.
- LCIE, Notified Body number 0081 in accordance with article
17 of the Directive 2014/34/EU of the European Parliament
and the Council of 26 February 2014 certifies that product has
been found to comply with the Essential Health and Safety
Requirements relating to the design and construction of
products intended for use in potentially explosive
atmospheres, given in Annex II to the Directive.
Cofrac Accreditation Product and Services Certification n°5-
0014. Scope available on www.cofrac.fr.
- Les résultats des vérifications et essais figurent dans le(s)
rapport(s) confidentiel(s) N° :
- The examination and test results are recorded in confidential
report(s) N°:
144457-692709
- 8 Le respect des Exigences Essentielles de Sécurité et de
Santé est assuré par la conformité à :
- Compliance with the Essential Health and Safety
Requirements has been assured by compliance with :
EN 60079-0:2012+A11:2013,
EN 60079-11:2012
- 9 Le signe « X » lorsqu'il est placé à la suite du numéro de
l'attestation, indique que cet appareil est soumis aux
conditions particulières d'utilisation, mentionnées dans
l'annexe de cette attestation.
- If the sign "X" is placed after the certificate number, it
indicates that the product is subject to the Specific Conditions
of Use specified in the schedule to this certificate.
- 10 Cette Attestation d'Examen UE de Type concerne uniquement
la conception et la construction du produit spécifié.
Des exigences supplémentaires de la directive sont
applicables pour la fabrication et la fourniture du produit. Ces
dernières ne sont pas couvertes par la présente attestation.
- This EU Type Examination Certificate relates only to the
design and construction of the specified product.
Further requirements of the Directive apply to the
manufacturing process and supply of this product. These are
not covered by this certificate.
- 11 Le marquage du produit est mentionné dans l'annexe de cette
attestation.
- The marking of the product is specified in the schedule to this
certificate.

Fontenay-aux-Roses, le 22 septembre 2017

Responsable de Certification
Certification Officer



Julien Gauthier

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12 DESCRIPTION DU PRODUIT

L'appareil est un système Microphone ICP, type 378XXXX, intégrant un élément microphone et une carte de pré amplification du signal.

Le signal délivré par le système Microphone ICP est un signal classique de sortie +/- 7V pic lors des mesures acoustiques.

L'élément microphone est un élément sensible (élément piézoélectrique) et est monté dans une enveloppe en alliage inoxydable.

Le pré amplificateur est une enveloppe en acier inoxydable qui contient une carte électronique, avec un connecteur adapté au raccordement de l'élément microphone à l'une des extrémités, et de l'autre, un connecteur spécifique permettant un raccordement par câble.

L'équipement peut être utilisé pour des tests de détection de fuite et de interférences acoustiques dans des atmosphères explosives gazeuses et minières.

DETAIL DE LA GAMME

Liste des modèles / types de référence : 378XXXX

Lettre X: une lettre entre A et Z,

Lettres YYY: deux ou trois nombres compris entre 00 et 999 qui identifient les différentes valeurs de filtre, gain, réponse en fréquence.

Paramètres électriques :

U_i : 30V, I_i : 100mA, P_i : 750mW, C_i : 0, L_i : 0,36 μ H.

MARQUAGE

Le marquage du produit doit comprendre :

Marquage complet :

PCB Piezotronics Inc. ou IMI Sensors ou IMI

Adresse : ...

Type : ...

N° de fabrication : ...

Année de fabrication : ...

⊕ I M1

Ex ia I Ma

⊕ II 1 G

Ex ia IIC T4 Ga

LCIE 17 ATEX 3059 X

-40°C ≤ T_{amb} ≤ +80°C

U_i : 30V, I_i : 100mA, P_i : 750mW, C_i : 0, L_i : 0,36 μ H

Marquage réduit :

PCB Piezotronics Inc. ou IMI Sensors ou IMI

Type : ...

N° de fabrication : ...

Année de fabrication : ...

⊕ I M1

Ex ia I Ma

⊕ II 1 G

Ex ia IIC T4 Ga, Ta = 80°C

LCIE 17 ATEX 3059 X

DESCRIPTION OF PRODUCT

The apparatus is an ICP Microphone Systems, type 378XXXX, integrating a microphone cartridge and a preamplifier.

The delivered signal from ICP Microphone Systems provides a typical +/- 7V peak voltage output signal when making acoustic measurements.

The microphone cartridge is the sensing element (piezoelectric element) and is primarily made from stainless metal alloys.

The preamplifier has a stainless steel housing that contains a PC board with a mating connector at one end for the microphone cartridge and at the other end to provide the interface to an external cable assembly.

The equipment is intended to be used for leak detection and acoustic noise tests in gaseous or mining explosive areas.

RANGE DETAILS

List of models / types references : 378XXXX

Letter X: one letter A to Z,

Letters YYY: two or three numbers 00 to 999 that signifies changes to filtering, gain, frequency response.

Electrical parameters :

U_i : 30V, I_i : 100mA, P_i : 750mW, C_i : 0, L_i : 0,36 μ H

MARKING

The marking of the product shall include the following :

Full marking :

PCB Piezotronics Inc. or IMI Sensors or IMI

Address: ...

Type : ...

Serial number: ...

Year of construction: ...

⊕ I M1

Ex ia I Ma

⊕ II 1 G

Ex ia IIC T4 Ga

LCIE 17 ATEX 3059 X

-40°C ≤ T_{amb} ≤ +80°C

U_i : 30V, I_i : 100mA, P_i : 750mW, C_i : 0, L_i : 0,36 μ H

Reduced marking :

PCB Piezotronics Inc. or IMI Sensors or IMI

Type : ...

Serial number: ...

Year of construction: ...

⊕ I M1

Ex ia I Ma

⊕ II 1 G

Ex ia IIC T4 Ga, Ta = 80°C

LCIE 17 ATEX 3059 X

L'appareil doit également comporter le marquage normalement prévu par les normes de construction qui le concernent sous la responsabilité du fabricant.

The equipment shall also bear the usual marking required by the product standards applying to such equipment under the manufacturer responsibility.

13 CONDITIONS PARTICULIERES D'UTILISATION

SPECIFIC CONDITIONS OF USE

- a. Plage de température ambiante : -40°C à +80°C.
- b. Les matériels de sécurité intrinsèque ne doivent être raccordés qu'à des matériels associés de sécurité intrinsèque certifiés pour l'usage considéré. Cette association doit répondre aux exigences de la norme EN 60079-25.
- c. Le montage du produit dans une installation doit être effectué de telle sorte que le corps métallique du capteur et le blindage du câble soient reliés de manière fiable à la terre du système.
- d. L'appareil doit être raccordé conformément au manuel d'instruction.
- e. Pour l'utilisation finale, l'utilisateur devra prendre toutes les précautions nécessaires pour maintenir un degré de protection minimum IP20 de la connexion du capteur lors de son raccordement selon les préconisations de la norme EN 60079-14.

Ambient temperature range: -40°C to +80°C.

The intrinsically safe apparatus shall only be connected to associated intrinsically safe apparatus certified for the intended use. This association shall comply with the requirements of the standard EN 60079-25.

The mounting of the apparatus into an installation must be carried out in such a way that sensor metallic body and cable shield are reliably connected to the system earth.

The apparatus must be connected according to instruction manual.

For final installation, the user shall take all necessary precautions to maintain the minimum degree of protection IP20 of the sensor connection when connected according to the requirements of EN 60079-14 standard.

14 EXIGENCES ESSENTIELLES DE SANTE ET DE SECURITE

ESSENTIAL HEALTH AND SAFETY REQUIREMENTS

Couvertes par les normes listées au point 8.

Covered by standards listed at 8.

15 DOCUMENTS DESCRIPTIFS

DESCRIPTIVE DOCUMENTS

| N° | Description | Reference | Rev. | Date | Page(s) |
|----|---|-----------|------|------------|---------|
| 1. | Notice d'instructions <i>Instructions notice</i> | 65238 | NR | 2016/06/10 | 2 |
| 2. | Dossier technique <i>Technical file</i> | 65666 | NR | 2016/06/10 | 12 |

16 INFORMATIONS COMPLEMENTAIRES

ADDITIONAL INFORMATION

Essais individuels

Néant

Routine tests

None

Conditions de certification

Les détenteurs d'attestations d'examen UE de type doivent également satisfaire les exigences de contrôle de production telles que définies à l'article 13 de la Directive 2014/34/UE.

Conditions of certification

Holders of UE type examination certificates are also required to comply with the production control requirements defined in article 13 of Directive 2014/34/UE.

17 DETAILS DES MODIFICATIONS

DETAILS OF CHANGES

Version 00 : Version initiale
(actuel)

Issue 00 Initial issue
(current)

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CERT-ATEX-FORM 04 Rev. 02

EU Declaration of Conformity PS172

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 |
|--|---|

Certifies that type of equipment: Microphone with Preamplifier

Who's Product Models Include: EX378XYYY Series

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

For example: EX378B02

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

This declaration is applicable to all 378 models of the above series which have the CE 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 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: | 2014/34/EU 2014/30/EU 2014/35/EU 2011/65/EU w/2015/863/EU | ATEX Directive EMC Directive Low Voltage Directive RoHS Directive |
|---|--|--|

Standards to which Conformity is Declared:

| | | |
|---|---|---|
| Harmonized Standards | EN 60079-0:2018 EN 60079-11 2012 EN 61326-1:2013 EN 61326-2-3:2013 EN 61010-1:2010 EN 63000:2018 | General Explosive Atmosphere Explosive atmospheres — Part 11: Equipment protection by intrinsic safety 'i' Electrical Equipment for Measurement, Control and Laboratory Use- EMC Electrical Equipment for Measurement, Control and Laboratory Use- EMC Electrical Equipment for Measurement, Control and Laboratory Use- EMC Safety Standard Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |
| Emissions Test Standards | EN 55011:2009 +A1:2010 | Industrial, scientific and medical(ISM) radio frequency equipment Electromagnetic disturbance characteristics- Limits and methods of Measurement Class B |
| Immunity Test Standards | EN 61000-6-1:2007 EN 61000-6-2:2005 | Electromagnetic Compatibility (EMC) - Generic standards — Immunity for residential, commercial and light-industrial environments Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments |
| Other Standards Applied (non-OJEU) Immunity Test Standards | EN 61000-4-2:2001 EN 61000-4-3:2006 EN 61000-4-4:2004 EN 61000-4-5:2005 EN 61000-4-6:2006 EN 61000-4-8:2001 | Electrostatic discharge (ESD) Radiated, radio-frequency, electromagnetic field immunity Electrical fast transient (EFT) / Burst immunity Surge immunity Immunity to RF conducted line disturbances Power frequency magnetic field immunity |
| Test Reports | EMC Reports Safety Reports | GM215053c GM215054s |
| EC Type Examination | ATEX Certification | LCIE 17 ATEX 3059 X I M1 Ex ia I Ma II 1 G Ex ia IIC T4 Ga |

| | | |
|---------------------------------|---------------------|---|
| IEC Certification Scheme | IECEX Certification | IECEX LCIE 17.0063X Ex ia I Ma Ex ia IIC T4 Ga |
| 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 |

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) Standard(s)

Place: Depew, NY **Date:** 04/13/2022

Signature:



Name: Carrie Termin

Title: Regulatory Affairs and Product Certification Specialist

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.
3425 Walden Ave
Address: Depew, NY 14043-2417
Country: USA
Contact: Ms. Carrie Termin
Phone: 716-684-0002 ext. 2206
FAX: NA
Email: ctermin@pcb.com

Manufacturer: PCB Piezotronics Inc.
3425 Walden Ave
Address: Depew, NY 14043-2417
Country: USA
Contact: Ms. Carrie Termin
Phone: 716-684-0002 ext. 2206
FAX: NA
Email: ctermin@pcb.com

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Cortland

Control Number: 5010230

Authorized by: Molly Dalton
for Dean Davidson, Certification Manager



J. Conway

11/28/2017

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): | Intrinsically Safe And Non-Incendive Equipment For Use In Hazardous Locations (R2016) [CSA C22.2#157:1992 Ed.3+G1;U2] |
| | Intrinsically Safe Apparatus And Associated Apparatus For Use In Class 1, 2, 3, Division 1, Hazardous (Classified) Locations [UL 913:2013 Ed.8+R:16Oct2015] |
| | UL 60079-0 Issued: 2013/07/26 Ed: 6 Explosive Atmospheres - Part 0: Equipment - General Requirements Explosive Atmospheres - Part 11: Equipment Protection By Intrinsic Safety 'i' [UL 60079-11:2013 Ed.6 +R:28Mar2014] |
| Product: | Microphone System for use in Class I, Division 1, Groups A, B, C and D Hazardous (Classified) Locations Temperature Code: T4 Ambient Temperature: -40°C to + 80°C |
| Models: | EX378 followed by A to Z; followed by 00 to 999. |