



Model 600A02

Sensor kit, industrial charge output (includes Model 612A01 accel, 045ER010CJ cable & 422E20 charge amp)

Installation and Operating Manual

This manual contains the 422E20, 612A01 installation and operating manuals that comprise a Model 600A02 Sensor kit, industrial charge output (includes Model 612A01 accel, 045ER010CJ cable & 422E20 charge amp) kit.

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

**Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
Fax: 716-684-3823
E-mail: imi@pcb.com
Web: www.imi-sensors.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

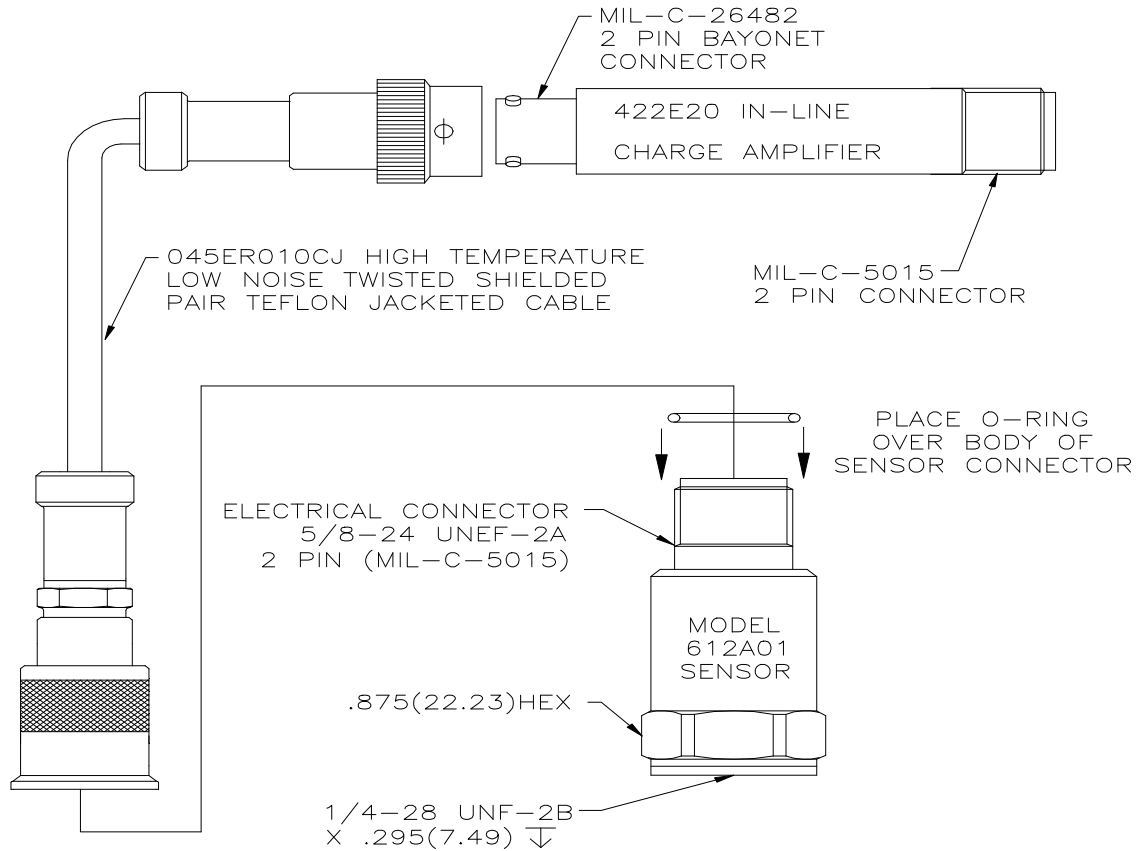
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X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.

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

The Model 600A02 Industrial Accelerometer Kit



Operating Guide with Enclosed Warranty Information

3425 Walden Avenue, Depew, New York 14043-2495

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MANUAL NUMBER: 18662
MANUAL REVISION: NR

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description

The model 600A02 is an industrial accelerometer kit consisting of the 422E20 in-line charge amplifier, the 045ER010CJ high temperature cable and the 612A01 high temperature charge mode accelerometer. The kit is designed specifically for continuous use in harsh environments at high temperatures up to 500° F. The unique cable assembly has been designed to withstand high temperatures and resist contamination due to harsh environmental conditions.

Reference Specifications

<i>Sensitivity (±15%)</i>	100 mV/g [10,2 mV/m/s²]
<i>Frequency Range (±10%)</i>	100-180,000 cpm [1.67-3,000 Hz]
<i>Temperature Range</i>	-65 to +500° F [-54 to +260° C]
<i>Connector Type/Location</i>	Mil-C-5015/Top
<i>Pin A</i>	Signal
<i>Pin B</i>	Sensor Ground
<i>Mounting Thread</i>	Standard ¼-28 UNF
<i>Calibration Information Supplied</i>	Full Calibration
<i>Sensor Sealing</i>	Welded Hermetic
<i>Base Isolated</i>	Yes
<i>Mounting Stud Supplied</i>	#081A40 (¼-28 to ¼-28)

important notes

Please be sure to read the following.

before connecting the cable to the sensor

Be sure that the RED SILICONE O-RING is placed over the body of the sensor connector. Be sure there is another O-ring inside the cable connector collar.

mounting

Although the base of the 612A01 is hardcoated for base isolation, DO NOT OVER-TORQUE the sensor. Over-torquing can cause damage to the off-ground base, which may lead to an on-ground sensor.

amplifier placement

Although the 600A02 is a high temperature kit, the 422E20 is not designed for temperatures above 250° F. Be sure that the supplied cable length is long enough to bring the amplifier away from any temperature exceeding 250° F. If not, contact an IMI application specialist.

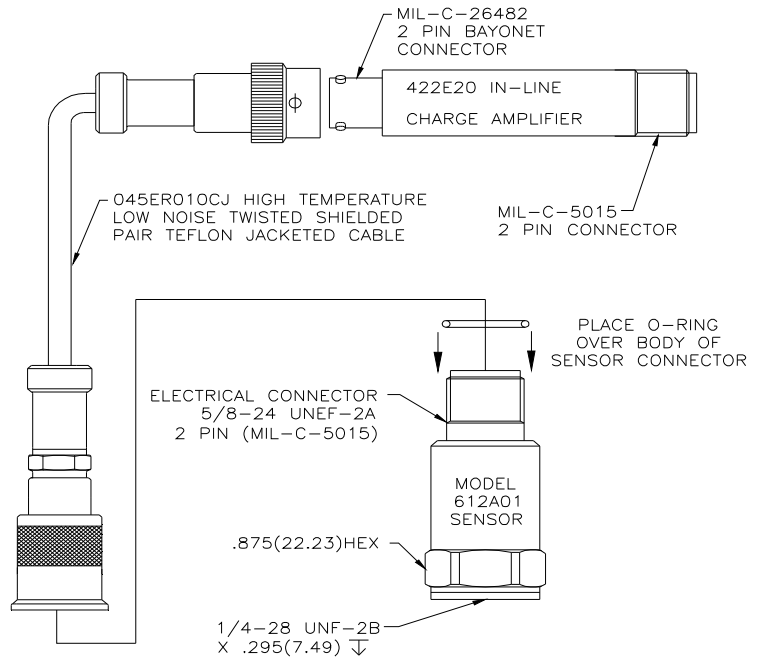
turn on

When the system is exposed to high temperatures, insulation resistance may decrease slightly, causing slow bias stabilization. Wait until bias is stable, approximately 13.5 VDC. See also settling time 600A02 specifications.

connector removal

If for any reason the connector needs to be removed from the sensor end, be sure that the pins will not be exposed to any contaminants. Contamination (moisture, oil, grease, debris, etc.) of the connector pins/sockets will cause low insulation resistance and may cause the system to work improperly.

figure 1
600A02 Industrial Accelerometer Kit



warning 1 – ESD sensitivity

The power supply/signal conditioner should not be opened by anyone other than qualified service personnel. This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

warning 2 – ESD sensitivity

This equipment is designed with user safety in mind; however, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by PCB Piezotronics, Inc.

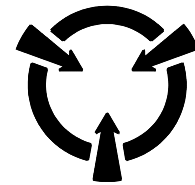
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- Laying on and moving across a rug,
- Any movement through air,
- The action of rolling out a cable, and/or
- Contact with a non-grounded person.

The PCB solution for product safety:

- Connect the cables only with the AC power off.
- Temporarily “short” the end of the cable before attaching it to any signal input or output.



CAUTION
ELECTROSTATIC
DISCHARGE SENSITIVE

caution 2 – ESD sensitivity

ESD considerations should be made prior to performing any internal adjustments on the equipment. Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should therefore be done ONLY at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.

warranty

IMI instrumentation is warranted against defective material and workmanship for 1 year unless otherwise expressly specified. Damage to instruments caused by incorrect power or misapplication, is not covered by warranty. *If there are any questions regarding power, intended application, or general usage, please consult with your local sales contact or distributor.* Batteries and other expendable hardware items are not covered by warranty.

service

Because of the sophisticated nature of IMI instrumentation, field repair is typically **NOT** recommended and may void any warranty. If factory service is required, return the instrumentation according to the "Return Procedure" stated below. *A repair and/or replacement quotation will be provided prior to servicing at no charge.* Before returning the unit, please consult a factory IMI applications engineer concerning the situation as certain problems can often be corrected with simple on-site procedures.

return procedure

To expedite returned instrumentation, contact a factory IMI applications engineer for a RETURN MATERIAL AUTHORIZATION (RMA) NUMBER. Please have information available such as model and serial number. Also, to insure efficient service, *provide a written description of the symptoms and problems with the equipment to a local sales representative or distributor, or contact IMI if none are located in your area.*

Customers outside the U.S. should consult their local IMI distributor for information on returning equipment. For exceptions, please contact the International Sales department at IMI to request shipping instructions and an RMA. For assistance, please call (716) 684-0003, or fax us at (716) 684-3823. You may also receive assistance via e-mail at imi@pcb.com or visit our web site at www.pcb.com.

customer service

IMI, a division of PCB Piezotronics, guarantees **Total Customer Satisfaction**. If, at any time, for any reason, you are not completely satisfied with any IMI product, IMI will repair, replace, or exchange it at no charge. You may also choose, within the warranty period, to have your purchase price refunded.

IMI offers to all customers, at no charge, 24-hour phone support. This service makes product or application support available to our customers, day or night, seven days a week. When unforeseen problems or emergency situations arise, call the **IMI Hot Line at (716) 684-0003**, and an application specialist will assist you.



3425 Walden Avenue, Depew, NY 14043-2495

Phone: (716) 684-0003 • USA Fax: (716) 684-3823 • INTL Fax: (716) 684-4703

**ICP® is a registered trademark of PCB Piezotronics, Incorporated,
which uniquely identifies PCB sensors that incorporate built-in microelectronics.**



Model 422E20

Sensor kit, industrial charge output (includes Model 612A01 accel, 045M06

Installation and Operating Manual

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住房	0	0	0	0	0	0
PCB板	X	0	0	0	0	0
电气连接器	0	0	0	0	0	0
压电晶体	X	0	0	0	0	0
环氧	0	0	0	0	0	0
铁氟龙	0	0	0	0	0	0
电子	0	0	0	0	0	0
厚膜基板	0	0	X	0	0	0
电线	0	0	0	0	0	0
电缆	X	0	0	0	0	0
塑料	0	0	0	0	0	0
焊接	X	0	0	0	0	0
铜合金/黄铜	X	0	0	0	0	0
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CHINA RoHS COMPLIANCE

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

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

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

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The Model 422E In-Line Charge Converter



Operating Guide with Enclosed Warranty Information

3425 Walden Avenue, Depew, New York 14043-2495

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24 Hour Sensor Line 716 684-0001

***MANUAL NUMBER: 18882
MANUAL REVISION: A
ECN: 24741***

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introduction

The 422E series in-line charge converters are designed to convert the high impedance of a charge mode piezoelectric transducer to a low-impedance voltage by means of an ICP® signal conditioner. These units may be used with either quartz or ceramic charge-mode piezoelectric sensors.

description

The 422E series in-line charge amplifiers operate from an ICP® signal conditioner. The unit employs a high gain amplifier to perform the impedance transformation. The charge output of the transducers may be scaled in terms of acceleration, pressure or force. The output is then mV/g, mV/psi or mV/lb, respectively.

installation

Connect the 422E series to the transducer with low-noise cable (003A) only. Standard coaxial or two-wire cable may be used between the amplifier and the signal conditioner, and between the signal conditioner and the readout device.

Note: *For optimum noise performance, the cable length between the sensor and the 422E should be minimized.*

operation

To operate, simply connect the input of the 422E to the transducer using low-noise (003A) cable and the output to any ICP® signal conditioner using standard cable. The output of the signal conditioner may then be connected to an oscilloscope or other monitoring device. This output will be an AC signal (see **specification** for actual frequency response) with a DC bias. Many PCB signal conditioners remove the bias via an AC coupling circuit.

calculation of output scaling

The 422E contains a high-gain, low-noise amplifier connected in a charge amplifier configuration. The charge output of the transducer is transferred to the feedback capacitor of the amplifier to develop a voltage which may be calculated using the following equation.

$$V_{out} = 422E \text{ Scaling (mV/pC)} \times \text{Transducer Sensitivity (pC/Engineering Unit)}$$

where:

$$V_{out} = \text{Output of 422E in mV/Engineering Unit}$$

the Engineering Unit may be g's, Newtons, psi, etc., depending on the sensor

Example: A 357A12 (3 pC/g) is used with a 422E02 (10 mV/pC). Calculate the output in mV/g.

Answer: 10 mV/pC x 3 pC/g = 30 mV/g

TEDS functionality

422E units with a "T" prefix incorporate TEDS (Transducer Electronic Data Sheet) technology. Using a TEDS capable signal conditioner, or TEDS reader, the user is able to read calibration data stored in the sensor. Some systems allow the user to also write user data and calibration information to the 422E. All data is formatted in accordance with IEEE 1451.4.

special considerations

High source capacitance may degrade the performance of the 422E (source capacitance is the input capacitance defined as transducer capacitance + cable capacitance). In particular, noise may increase and high frequency response may decrease if source capacitance exceeds the recommended level. In some cases, low frequency oscillation of the output may occur. The maximum recommended level in pF's is determined using the following formula:

$$\text{maximum recommended source capacitance} = 10,000 / 422E \text{ sensitivity in mV/pC}$$

For example, the level for a 422E02/E12 would be $10,000/10 \text{ pF} = 1,000 \text{ pF}$, and the level for a 422E03/E13 would be $10,000 \text{ pF}$. If PCB 003 type low noise cable is used, these values correspond to 10 meters and 100 meters of length respectively.

422E series models for use with high temperature sensors

The 422E35 (1 mV/pC) and 422E36 (10 mV/pC) have been specifically designed to operate with the lower insulation resistance values which piezoelectric sensors may exhibit when subjected to very high temperatures (generally greater than 500° F). Both units will operate with insulation resistances as low as 10kΩ.

Note: *Because of the special circuitry required, the 422E35 and 422E36 have somewhat higher noise and longer turn on time than the equivalent units designed for use with sensors with high insulation resistance (the 422E03 and 422E02 respectively). Consult the **specifications** for details.*

Caution! *Excessive accumulated charges on the input cables can destroy the field effect transistor (FET) in the amplifier. These charges can be grounded by shorting the center pin on the cable connector plug to its knurled nut with any metallic object.*

422E series models for use in radioactive environments

The 422E65 (1mV/pC) and 422E66 (10mV/pC) were designed to offer resistance to the effects of radiation exposure up to 1 Mrad Integrated Gamma Flux or 10^{10} N/cm² of Integrated Neutron Flux. They are also designed to operate with lower insulation values which piezoelectric sensors may exhibit when subjected to the high temperatures that generally accompany high levels of radioactivity.

warning 1 – ESD sensitivity

The power supply/signal conditioner should not be opened by anyone other than qualified service personnel. This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

warning 2 – ESD sensitivity

This equipment is designed with user safety in mind; however, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by PCB Piezotronics, Inc.

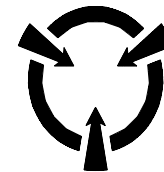
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- *Any movement through air,*
- *The action of rolling out a cable, and/or*
- *Contact with a non-grounded person.*

The PCB solution for product safety:

- *Connect the cables only with the AC power off.*
- *Temporarily “short” the end of the cable before attaching it to any signal input or output.*



**CAUTION
ELECTROSTATIC
DISCHARGE
SENSITIVE**

caution 2 – ESD sensitivity

ESD considerations should be made prior to performing any internal adjustments on the equipment. Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should therefore be done ONLY at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.

warranty

PCB instrumentation is warranted against defective material and workmanship for 1 year unless otherwise expressly specified. Damage to instruments caused by incorrect power or misapplication, is not covered by warranty. *If there are any questions regarding power, intended application, or general usage, please consult with your local sales contact or distributor.* Batteries and other expendable hardware items are not covered by warranty.

service

Because of the sophisticated nature of PCB instrumentation, field repair is typically **NOT** recommended and may void any warranty. If factory service is required, return the instrumentation according to the “Return Procedure” stated below. *A repair and/or replacement quotation will be provided prior to servicing at no charge.* Before returning the unit, please consult a factory PCB applications engineer concerning the situation as certain problems can often be corrected with simple on-site procedures.

return procedure

To expedite returned instrumentation, contact a factory PCB applications engineer for a RETURN MATERIAL AUTHORIZATION (RMA) NUMBER. Please have information available such as model and serial number. Also, to insure efficient service, *provide a written description of the symptoms and problems with the equipment to a local sales representative or distributor, or contact PCB if none are located in your area.*

Customers outside the U.S. should consult their local PCB distributor for information on returning equipment. For exceptions, please contact the International Sales department at PCB to request shipping instructions and an RMA. For assistance, please call (716) 684-0003, or fax us at (716) 684-3823. You may also receive assistance via e-mail at **electronics@pcb.com** or visit our web site at **www.pcb.com**.

customer service

PCB guarantees **Total Customer Satisfaction**. 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, within the warranty period, to have your purchase price refunded.

PCB offers to all customers, at no charge, 24-hour phone support. This service makes product or application support available to our customers, day or night, seven days a week. When unforeseen problems or emergency situations arise, call the **24 Hour SensorLine at 716 684-0001**, and an application specialist will assist you.



3425 Walden Avenue, Depew, NY 14043-2495

Phone 716 684-0001 **Fax** 716 684-0987 **E-Mail** electronics@PCB.com

PCB www.PCB.com **IMI** www.IMI-Sensors.com **Key** www.KeyTransducers.com

ISO 9001 Certified

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Model Number

422E20

IN-LINE CHARGE AMPLIFIER

Revision: C

ECN #: 23737

Performance

	ENGLISH	SI	
Sensitivity ($\pm 5\%$) (Charge Conversion)	4 mV/pC	4 mV/pC	
Input Range (Electrical Charge)	± 625 pC	± 625 pC	
Ovrrange	± 3 V	± 3 V	
Low Frequency Response (-5 %)	1 Hz	1 Hz	
High Frequency Response (2.2 mA)	50 kHz	50 kHz	[3]
High Frequency Response (4 mA)	75 kHz	75 kHz	[3]
High Frequency Response (20 mA)	100 kHz	100 kHz	[3]
Non-Linearity	$\leq 1.0\%$ FS	$\leq 1.0\%$ FS	

Environmental

Temperature Range (Operating)	-65 to +250 °F	-54 to +121 °C	
Temperature Response (Sensitivity Deviation)	<1 %	<1 %	
Maximum Shock	1000 g pk	9810 m/s ² pk	

Electrical

Excitation Voltage	18 to 28 VDC	18 to 28 VDC	
Constant Current Excitation	2.2 to 20 mA	2.2 to 20 mA	
Output Voltage (at specified measurement range)	± 2.5 Vpk	± 2.5 Vpk	
Output Impedance	<10 ohm	<10 ohm	
Output Bias Voltage	12.75 to 14.25 VDC	12.75 to 14.25 VDC	
Output Polarity	Inverted	Inverted	
Maximum Input Voltage	30 V	30 V	
Broadband Electrical Noise (1 to 10,000 Hz)	15 μ V	-96 dB	[1]
Spectral Noise (1 Hz)	10 μ V/ \sqrt Hz	-100 dB	[1]
Spectral Noise (10 Hz)	0.8 μ V/ \sqrt Hz	-122 dB	[1]
Spectral Noise (100 Hz)	0.2 μ V/ \sqrt Hz	-134 dB	[1]
Spectral Noise (1 kHz)	0.07 μ V/ \sqrt Hz	-143 dB	[1]
Spectral Noise (10 kHz)	0.07 μ V/ \sqrt Hz	-143 dB	[1]
Discharge Time Constant	≥ 0.5 sec	≥ 0.5 sec	
Resistance (Minimum required at input)	5,000,000 ohm	5,000,000 ohm	[2]
Source Capacitance Loading	0.0005 %/pF	0.0005 %/pF	

Physical

Housing Material	Stainless Steel	Stainless Steel	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector (Input)	2-Pin MIL-C-26482	2-Pin MIL-C-26482	
Electrical Connector (Output)	2-Pin MIL-C-5015	2-Pin MIL-C-5015	
Size (Diameter x Length)	0.62 in x 3.62 in	16 mm x 92.0 mm	
Weight	2.46 oz	69.7 gm	



[4]

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.

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.

T - TEDS Capable of Digital Memory and Communication Compliant with IEEE P1451.4
Temperature Range (Operating) -40 to +185 °F -40 to +85 °C
Output Bias Voltage 13.35 to 14.85 VDC 13.35 to 14.85 VDC

NOTES:

- [1] Tested using voltage source and input capacitor equal to the feedback capacitor, to simulate a charge output sensor.
[2] Not to be used with low values of source resistance such as charge mode sensors at elevated temperatures or contaminated sensor cables (preventing low frequency peaking and/or output bias problems).
[3] Above stated frequency, the amplifier becomes slew rate limited.
[4] See PCB Declaration of Conformance PS024 for details.

Entered: <i>JR</i>	Engineer: <i>BJ</i>	Sales: <i>MLA</i>	Approved: <i>CP</i>	Spec Number:
Date: <i>3-1-06</i>	Date: <i>3-3-06</i>	Date: <i>3/6/06</i>	Date: <i>3/7/06</i>	12098

 **PCB PIEZOTRONICS™**
ELECTRONICS DIVISION
3425 Walden Avenue, Depew, NY 14043

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



Model 612A01

High temperature (up to 500F), industrial charge output accel, 26 pC/g, 10 kHz max frequency response, top exit, 2-pin connector

Installation and Operating Manual

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

**Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
Fax: 716-684-3823
E-mail: imi@pcb.com
Web: www.imi-sensors.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.

Model Number
612A01

HIGH TEMPERATURE INDUSTRIAL CHARGE ACCELEROMETER

Revision: C
ECN #: 53216

Performance

	ENGLISH	SI	
Sensitivity(± 15 %)	26 pC/g	2.6 pC/(m/s ²)	[1]
Frequency Range(+ 10 %)	300 kcpm	5,000 Hz	[2]
Frequency Range(+ 3 dB)	600 kcpm	10 kHz	
Resonant Frequency	1,800 kcpm	30 kHz	[3]
Non-Linearity	± 1 %	± 1 %	[4]
Transverse Sensitivity	≤ 5 %	≤ 5 %	

Environmental

Overload Limit(Shock)	5,000 g pk	49,050 m/s ² pk
Temperature Range(Operating)	-65 to +500 °F	-54 to +260 °C
Temperature Response	See Graph	See Graph
Enclosure Rating	IP68	IP68

Electrical

Capacitance	1,500 pF	1,500 pF	[3]
Insulation Resistance(at 500°F)	> 10 ⁹ Ohm	> 10 ⁹ Ohm	[3]
Insulation Resistance(at room temp)	≥ 0.5 x 10 ¹² Ohm	≥ 0.5 x 10 ¹² Ohm	[3]
Electrical Isolation(Base)	> 10 ⁸ Ohm	> 10 ⁸ Ohm	[3]
Output Polarity	Negative	Negative	

Physical

Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Sealing	Welded Hermetic	Welded Hermetic	
Size (Hex x Height)	7/8 in x 2.12 in	22.2 mm x 53.8 mm	
Weight	2.95 oz	83.6 gm	[3]
Electrical Connection Position	Top	Top	
Electrical Connector	2-Pin MIL-C-5015	2-Pin MIL-C-5015	
Mounting Thread	1/4-28 UNF	No Metric Equivalent	
Mounting Torque	2 to 5 ft-lb	2.7 to 6.8 Nm	

OPTIONAL VERSIONS

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

M - Metric Mount

Supplied Accessory: Model M081A61 Mounting Stud 1/4-28 to M6 X 1 replaces Model 081A40

NOTES:

[1] Conversion Factor 1g = 9.81 m/s².

[2] 1Hz = 60 cpm (cycles per minute).

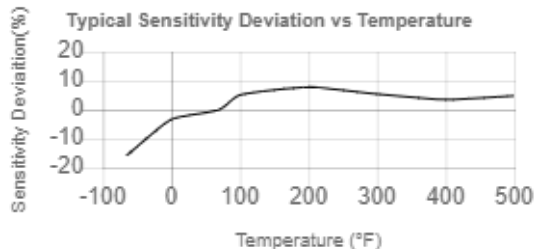
[3] Typical value.

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

SUPPLIED ACCESSORIES:

Model 081A40 Mounting Stud

Model ICS-1 NIST-traceable single-axis amplitude response calibration from 600 cpm (10 Hz) to upper 5% frequency



All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.
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Entered: ND	Engineer: NJF	Sales: EGY	Approved: JS	Spec Number:
Date: 10/14/2022	Date: 10/14/2022	Date: 10/14/2022	Date: 10/14/2022	13075

IMI SENSORS
A PCB PIEZOTRONICS DIV.
3425 Walden Avenue, Depew, NY 14043

Phone: 800-959-4464
Fax: 716-684-3823
E-Mail: imi@pcb.com

10159

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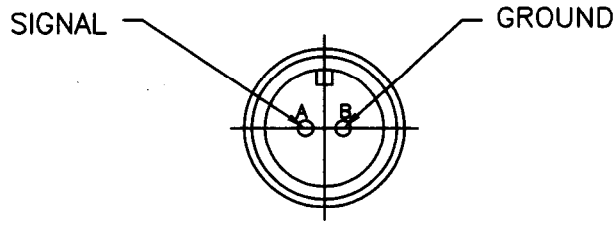
APPLICATION

NEXT ASS'Y	USED ON	VAR

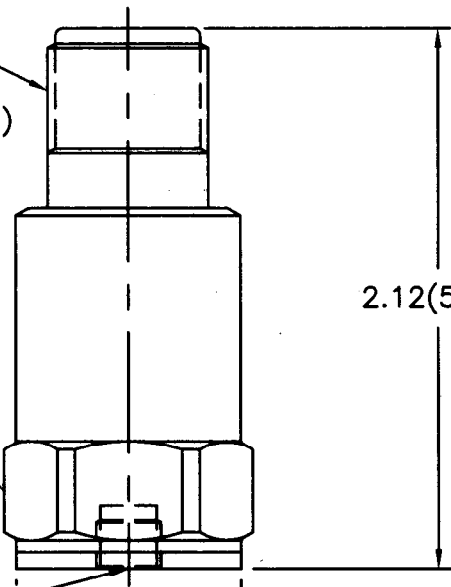
REVISIONS

REV	DESCRIPTION	ECN	DATE	APP'D
B	REVISED PER ECN	14210	10/14/01	em 10/21

TOP VIEW OF CONNECTOR



CONNECTOR
5/8-24 UNEF-2A
2-PIN (MIL-C-5015)



2.12(53.8)

7/8(22) HEX

1/4-28 UNF-2B
X .29(7.4) ▽

ø.870(ø22.1)
TYP

UNLESS SPECIFIED TOLERANCES

DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS (IN PARENTHESIS)
DECIMALS XX ±.01 XXX ±.005	DECIMALS XX ±0.3 XXX ±0.13
ANGLES ±2 DEGREES	ANGLES ±2 DEGREES

FILLETS AND RADII	FILLETS AND RADII
.003 - .005	(0.07 - 0.13)

DRAWN	<i>MVB</i>	1426.d	MFG	<i>P.L.H</i>	10/24/01
CHK'D	<i>em</i>	10/26/01	ENGR	<i>U.S</i>	11/16/01
APP'D	<i>ma</i>	11/24/01	SALES	<i>ECM</i>	11/24/01

PCB PIEZOTRONICS
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 EMAIL: SALES@PCB.COM

TITLE
OUTLINE DRAWING
MODEL 612A01, 322M12
CHARGE SENSOR

CODE IDENT. NO. 52681	DWG. NO. 10159
--------------------------	-------------------

DD011 REV. B 03/13/98

SCALE: 1.33 :1 SHEET 1 OF 1



Model 422E20

Sensor kit, industrial charge output (includes Model 612A01 accel, 045M06

Installation and Operating Manual

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

**Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
Fax: 716-684-3823
E-mail: imi@pcb.com
Web: www.imi-sensors.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.

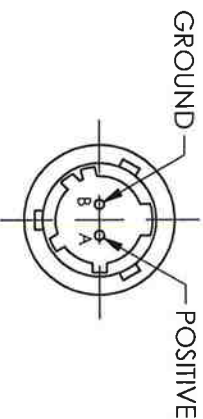
Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

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12115

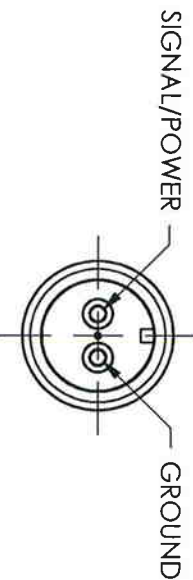
REVISIONS		ECCO
REV	DESCRIPTION	
A	ADDED ETCHING	31390
B	CHANGED PIN OUT	31968

TOP VIEW OF CONNECTOR



INPUT CONNECTOR
2 PIN (MIL-C-26482)

OUTPUT CONNECTOR
2 PIN (MIL-C-5015)



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER	
DIMENSIONS IN INCHES		DIMENSIONS IN MILLIMETERS [IN BRACKETS]		CPH		12/18/09	
DECIMALS XX ±.03	XXX ±.010	DECIMALS X ±0.8	XXX ±0.25	TITLE			
ANGLES ± 2 DEGREES		ANGLES ± 2 DEGREES		OUTLINE DRAWING MODEL 422E20 IN-LINE AMPLIFIER			
FILLET AND RADIUS .003 - .005		FILLET AND RADIUS 0.07 - 0.13		CODE IDENT. NO. 52681			
				DWG. NO. 12115			
				SCALE: 1.25X SHEET 1 OF 1			

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