



Model EX649A71

Loop Powered 4-20 mA Output Reciprocating Machinery Protector (RMP) (CSA/ ATEX Approved)

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

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3425 Walden Ave.
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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	O	O	O	O	O	O
PCB板	X	O	O	O	O	O
电气连接器	O	O	O	O	O	O
压电晶体	X	O	O	O	O	O
环氧	O	O	O	O	O	O
铁氟龙	O	O	O	O	O	O
电子	O	O	O	O	O	O
厚膜基板	O	O	X	O	O	O
电线	O	O	O	O	O	O
电缆	X	O	O	O	O	O
塑料	O	O	O	O	O	O
焊接	X	O	O	O	O	O
铜合金/黄铜	X	O	O	O	O	O
本表格依据 SJ/T 11364 的规定编制。						
O：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。						
X：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。						
铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。						

CHINA RoHS COMPLIANCE

Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	O	O	O
Teflon	O	O	O	O	O	O
Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
Cables	X	O	O	O	O	O
Plastic	O	O	O	O	O	O
Solder	X	O	O	O	O	O
Copper Alloy/Brass	X	O	O	O	O	O
This table is prepared in accordance with the provisions of SJ/T 11364. O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572. X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572. Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.						



Operating Guide with Enclosed Warranty Information

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Table of Contents

Introduction	Page 3
General Features	
Operating Principles	Page 5
Installation.....	Page 6
Wiring.....	Page 7
Programming Software	Page 8
Program Installation	
Running the Software	
Programming Sections	
Reading and Writing Parameters	
Parameter Options	
Examples	
Equipment-Specific Usage Guidelines	Page 17
Determine Baseline Vibration Using the RMP	
Usage with Gas Compressors	
Usage with Piston Pumps and Other Types of Reciprocating Machinery	
Portable 4-20 mA Loop Calibrator	Page 20
Cable Ordering Information	Page 21
ESD Sensitivity	Page 22
Warranty, Service & Return Procedure	Page 23
Customer Service	Page 23

Introduction

Reciprocating compressors can develop devastating faults in a short period of time. Mechanical looseness can deteriorate quickly resulting in catastrophic failure of the compressor. In extreme cases, this can happen in a matter of minutes.

Causes of mechanical looseness include:

- Loose or broken bolts
- Loose or cracked rod nuts
- Cracked connecting or piston rod
- Excessive crosshead/slipper clearance
- Excessive clearance in connecting pins

Many of the serious faults associated with reciprocating compressors are characterized by impacting in the compressor. While the peak vibration levels associated with impacting are quite high, they add little energy to the overall vibration level that is usually monitored and trended, thereby allowing the faults to be missed. Additionally, since the time from fault to failure of compressors can be short, periodic monitoring is not generally a good option.

The Reciprocating Machinery Protector (RMP) is a patented smart vibration transmitter that detects impacts and outputs a Reciprocating Fault Index (RFI) signal that indicates the health of the compressor. Using a built-in accelerometer and microprocessor, the RMP detects, weights and quantifies the measured impacts and outputs a 4-20 mA signal proportional to the result. This data can be logged and trended to provide a historical view of condition.

The RMP accommodates two vibration threshold levels and allows different weighting for each, typically with the weighting associated with Threshold 2 being higher as those impacts are more severe. It also allows for peak acceleration trending when measured levels are below either threshold. Traditional impact transmitters essentially only count vibration peaks and therefore often result in missed faults or false trips. Using the multiple thresholds and acceleration trending features, the RMP avoids these problems and outperforms traditional impact transmitters.

Every RMP is factory-programmed. See Page 16 for more information.

The parameters can be field-programmed using an optional USB Programming Kit, as shown on page 8. With the USB Programming Kit, the unit can set in one of two ways:

- Dependent Mode: All parameters automatically calculated based on specified machine speed (RPM).
- Independent Mode: All parameters programmed by the user to tailor the analysis to a particular machine.

The RMP is loop-powered and compatible with most plant monitoring systems such as PLC, DCS, SCADA and Plant Information (PI) systems. When used in conjunction with one of these systems, the RMP provides 24/7 monitoring and protection of critical compressors.

General Features

- USB-programmable (with optional USB Programming Kit as shown on page 6)
- Interfaces with PLC, DCS, SCDA, and other PI systems
- Hermetically-sealed, stainless steel housing for use in harsh environments
- Imbedded piezoelectric accelerometer
- Loop-powered
- 4-20 mA output
- Two vibration threshold levels
- Small footprint, mounts like a sensor
- Programmable features
 - RPM
 - Time window
 - Vibration threshold levels
 - Weighting factors
 - Trending range
- Intrinsically safe versions available (EX prefix)
 - CSA
 - ATEX

Operating Principles

The RMP is a smart vibration transmitter that contains a piezoelectric accelerometer, high speed true peak detector, and a microprocessor. It operates off standard 24 volt loop power and outputs a 4-20 mA signal that is proportional to the Reciprocating Fault Index (RFI). The RFI is a “hybrid” index as defined below.

The RMP looks at data for a period of time equal to the length of the specified Time Window (TW). It detects each peak value (A_p) occurring in the window and compares it against Threshold Level 1 (N_1) and Threshold level 2 (N_2). If none of the peaks exceed Threshold Level 1 or Threshold Level 2, the RMP outputs a $4 - I_L$ mA signal proportional to the maximum peak value seen in the Time Window.

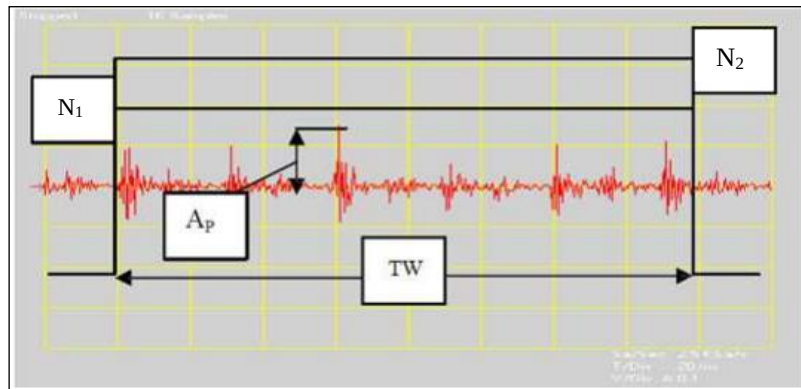


Figure 1 – Vibration Peaks Do Not Exceed Threshold Levels

If at least one peak exceeds Threshold Level 1 (N_1) or Threshold Level 2 (N_2), the RMP outputs $I_L - 20$ mA that is proportional to the calculated Reciprocating Fault Index (RFI).

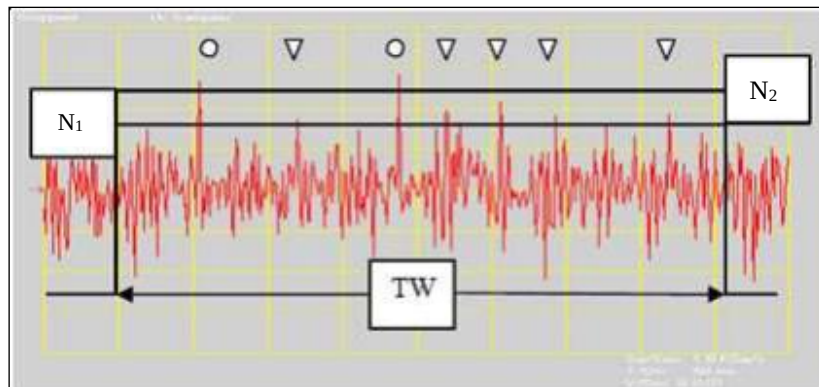


Figure 2 – Vibration Peaks Exceed Threshold Levels

The RFI is computed by:

- Counting the number of peaks that exceed Threshold Level 1 (N_1) and applying Weighting 1 (W_1) to them.
- Counting the number of peaks that exceed Threshold Level 2 (N_2) and applying Weighting 2 (W_2) to them.
- Adding them together along with the maximum value of the trending range current (I_L).

$$I_{OUT} = I_L + W_1 N_1 + W_2 N_2$$

Installation

For full equipment protection, one RMP is typically mounted on each compressor cylinder. The RMP is generally mounted to the crosshead or crosshead slipper (distance piece) with its sensing axis perpendicular to piston rod motion. If the compressor does not have a crosshead, it should be mounted to the crankshaft side of the cylinder.

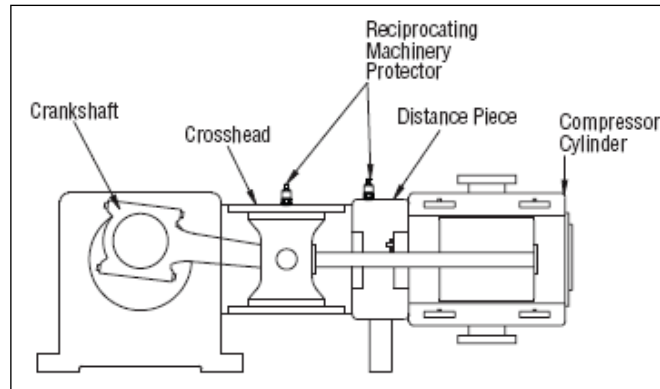


Figure 3 – Recommended Mounting Locations for the Reciprocating Machinery Protector

When choosing a mounting method, consider closely the advantages and disadvantages of each technique. Typical mounting types are stud, direct adhesive, adhesive mounting base and magnetic mounting base. It is highly recommended that the RMP be stud-mounted to the machine. If it is not possible to drill and tap the machine, then epoxy or weld a sensor mounting pad to the machine and stud mount the sensor to the pad. Most RMP models mount using a supplied $\frac{1}{4}$ -28 stud. Some models mount with an integral $\frac{1}{4}$ " NPT stud. It is not recommended to use a magnet for mounting. Magnetic mounting can cause false impacts and result in shutting down a good machine.

For additional information on $\frac{1}{4}$ -28 mounting pads, visit www.pcb.com and type mounting pad into the search box or call IMI for assistance.

Standard Stud Mount Procedure

This mounting technique requires smooth, flat contact surfaces for proper operation and is recommended for permanent and/or secure installations. Stud mounting is also recommended when testing at high frequencies. Note: Do not attempt mounting on curved, rough or uneven surfaces, as the potential for misalignment and limited contact surface may significantly reduce the sensor's upper operating frequency range.

	$\frac{1}{4}$ -28 Stud	$\frac{1}{4}$ -28 Captive Screw
A (in)	0.250	0.250
B (in)	0.350	0.350
Torque (ft-lb)	2 to 5	2 to 5

- Step 1: First, prepare a smooth, flat mounting surface and then drill and tap a mounting hole in the center of this area. A precision-machined mounting surface with a minimum finish of 63 μ in (0.0016 mm) is recommended. (If it is not possible to properly prepare the machine surface, consider using an adhesive mounting pad as a possible alternative.) Inspect the area, checking that there are no burrs or other foreign particles interfering with the contact surface.
- Step 2: Wipe clean the mounting surface and spread on a light film of grease, oil or similar coupling fluid prior to installation. Adding a coupling fluid improves vibration transmissibility by filling small voids in the mounting surface and increasing the mounting stiffness. For semi-permanent mounting, substitute epoxy or another type of adhesive.



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- Step 3: Hand-tighten the sensor/mounting stud to the machine, and then secure the sensor with a torque wrench to the mounting surface by applying the recommended mounting torque (see enclosed specification data sheet for proper mounting torque). It is important to use a torque wrench during this step. Under-torquing the sensor may not adequately couple the device; over-torquing may result in stud failure and possibly permanent damage.

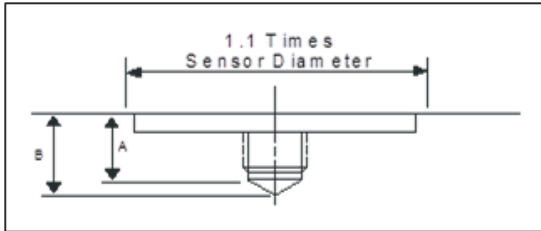


Figure 4 – Mounting Surface Preparation

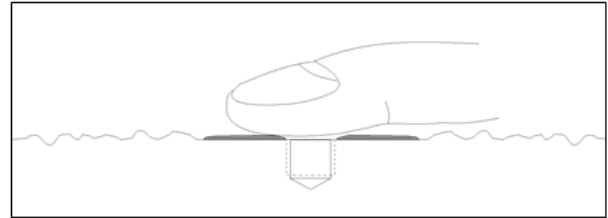


Figure 5 – Mounting Surface Lubrication

Adhesive Stud Mount Procedure

Adhesive mounting is often used for temporary installation or when the machine surface cannot be adequately prepared for stud mounting. Adhesives like hot glue or wax work well for temporary mounts; two-part epoxies and quick-bonding gels provide a more permanent mount.

Note: Adhesively mounted sensors often exhibit a reduction in high-frequency range. Generally, smooth surfaces and stiff adhesives provide the best frequency response. Contact the factory for recommended epoxies.

This method involves attaching a base to the machine surface, then securing the sensor to the base. This allows for easy removal of the accelerometer.

- Step 1: Prepare a smooth, flat mounting surface. A minimum surface finish of $63 \mu\text{in}$ (0.0016 mm) generally works best.
- Step 2: Stud-mount the sensor to the appropriate adhesive mounting base according to the guidelines set forth in Steps 2 and 3 of the Standard Stud Mount Procedure.
- Step 3: Place a small portion of adhesive on the underside of the mounting base. Firmly press down on the assembly to displace any extra adhesive remaining under the base.

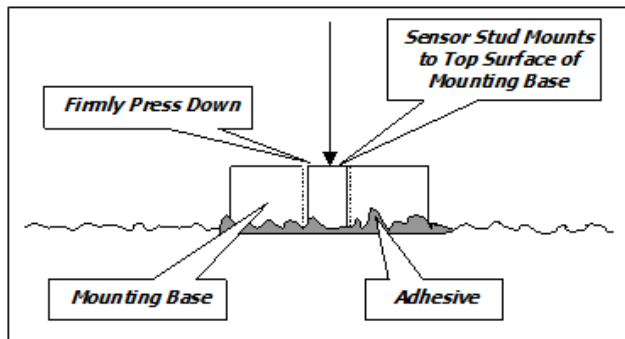


Figure 6 – Adhesive Installation of Mounting Base

Wiring

The RMP operates from a standard 2-wire, 4-20mA loop. If using a loop-powered unit, attach the positive (+) input from the power supply to Pin A on the sensor and the negative (-) input from the power supply to Pin B of the sensor.

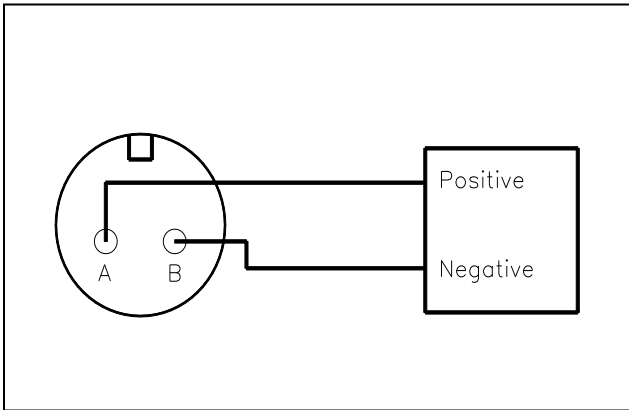


Figure 7– Loop-Powered Wiring

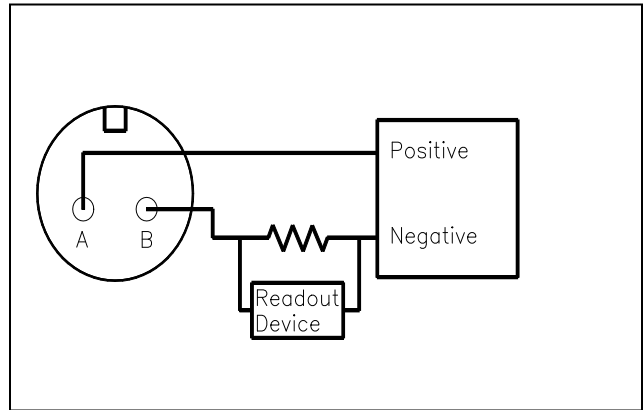


Figure 8 – Loop-Powered Wiring with DC Source

If using a standard DC power supply, install either an ammeter and/or load resistor in line with the output.

The resistor will generate a DC voltage that is proportional to current by:

$$V = IR$$

If $R = 500 \text{ ohms}$ and $I = 6 \text{ mA}$, then $V = 3 \text{ VDC}$

Note:

- Resistor value must be less than: $(V_{\text{supply}} - 12) \times 50$.
- For integral cable sensors: RED wire is positive, BLUE wire is negative.

Programming Software

The RMP can be user-programmed with either of two optional programming kits, Model 600A21 (non-ROHS compliant) or Model 600A35 (ROHS compliant). Both kits include a USB programmer cable/dongle (Model 600A21 kit includes Model 070A89 cable; Model 600A35 kit includes Model 070A103 cable), software (Model EE225) and terminal block/integral cable adapter (Model 042M17). The software can also be downloaded from IMI's website, www.pcb.com. This software must be installed prior to connecting the RMP to the computer using the USB programmer cable. The software includes both the drivers and user interface needed for programming the RMP. During initial installation, you may need administrative rights for the computer in order to install the drivers. Once installed, administrative rights are not required for use.



Figure 9 – Model 600A21/600A35 USB Programmer Kit

Program Installation

Installing the Software and USB Driver: Insert the software CD provided into the CD drive. The software will start the installation automatically if your PC is set to auto-install applications. If not, browse the CD and click on Setup.exe to start the installation process. The default installation directory is C:\PCB\EE225. It is recommended to use the default setting.

The installer will first install the software and then the WinUSB device driver. This device driver is required for the programmer software to communicate with the 070A89 or 070A103 USB programmer cable.

The following screens will be displayed when the installer starts. Click the Next button to proceed from step to step.

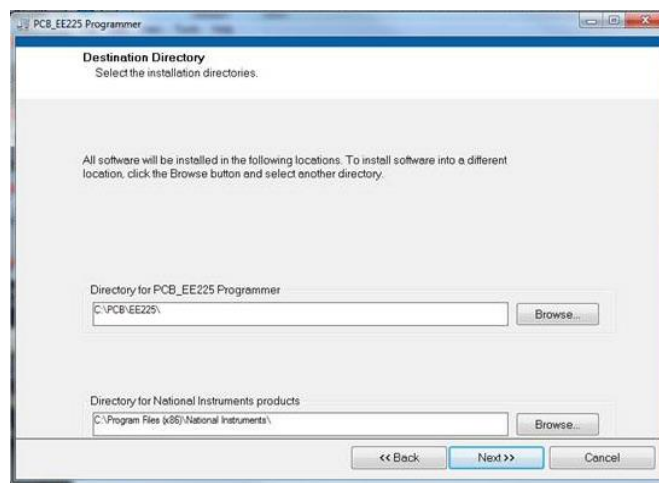


Figure 10 – Install Location Screen



Figure 11 – National Instruments Software License Agreement

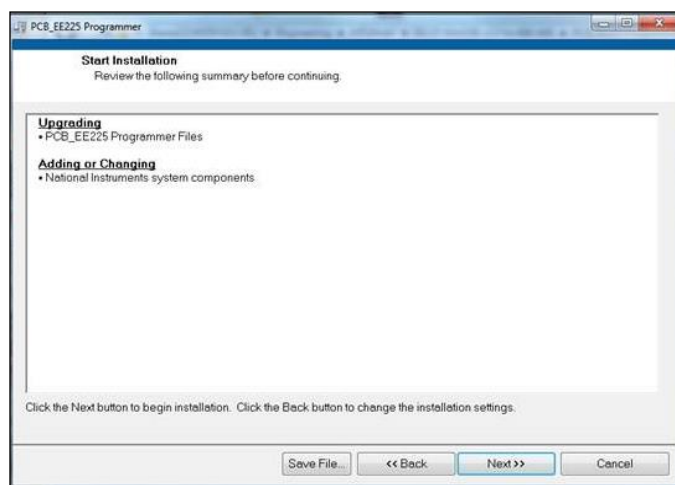


Figure 12 – Installation Verification Screen

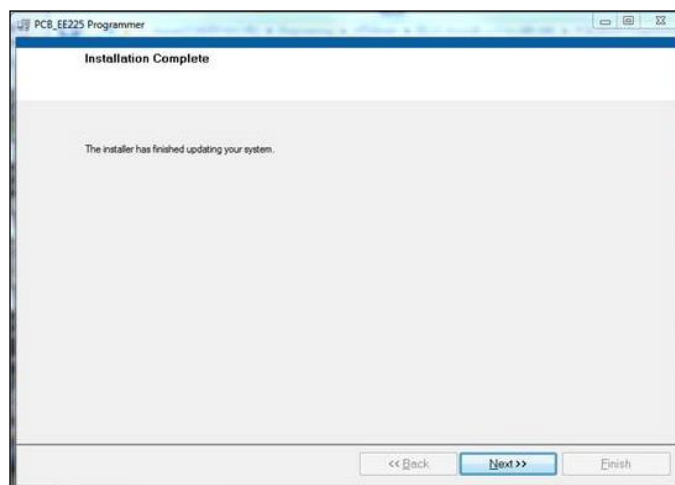


Figure 13 – Installation Complete Screen

After the software completes, the USB driver installer will start automatically. The initial USB installer will look similar to the one below.



Figure 14 – WinUSB Driver Installation Screen

The drivers will now be properly installed and you should get the following screen. Click “Finish”. The software is now ready to use.



Figure 15 – WinUSB Driver Installation Complete Screen

Running the Software

Connect the USB programmer cable to a USB port on the PC and then run the software from the Start | All Programs | PCB EE225 menu item

Initially the screen will appear as in **Error! Reference source not found.** with a yellow bar and status indicating 'Initializing...' followed by the message: "Connecting to USB Dongle..."

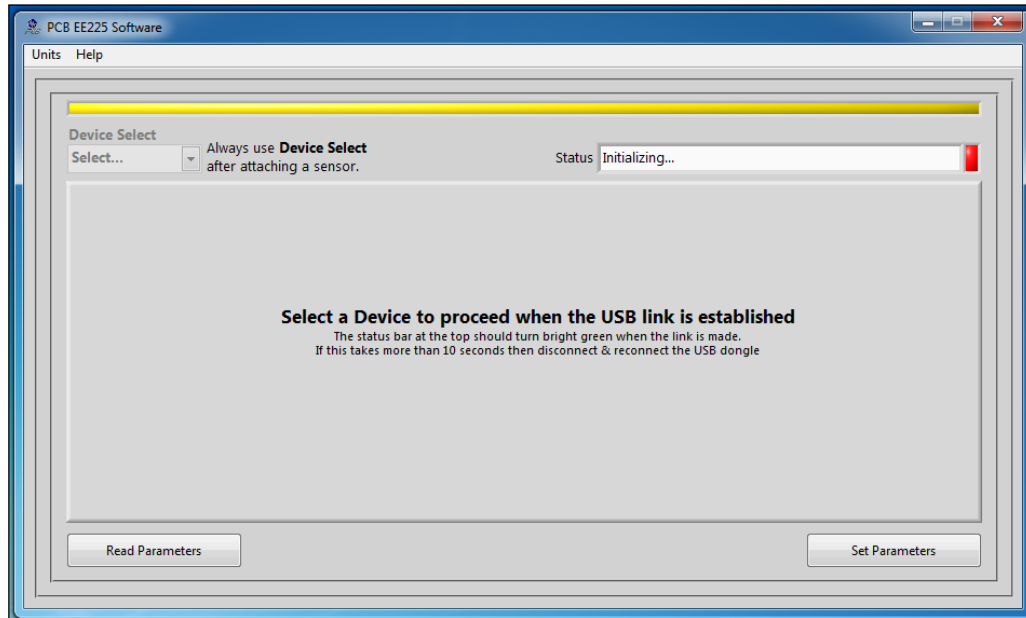


Figure 16 – Software While Connecting to USB Programmer Cable

Once the connection is made the bar at the top of the screen will turn green and the status will indicate "USB Connection Success - Select a device". If the software and USB programmer cable fail to connect, remove and reinsert the USB programmer cable.

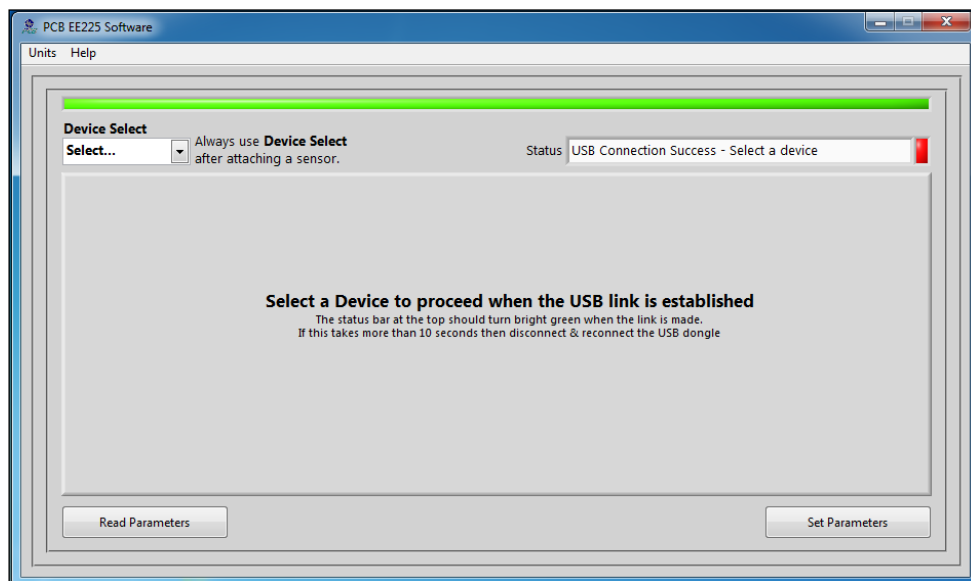


Figure 17 – Software After Connecting to USB Programmer Cable

To select a device, click on the Device Select pull down menu and select the device you'd like to program. In this case, select 649A01.

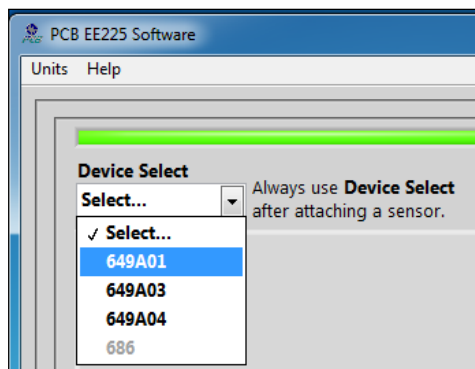


Figure 18 – Device Selection

Once a product is selected, the software will prompt you to confirm connection of the sensor to the PC using the USB programmer cable. Click OK to proceed.

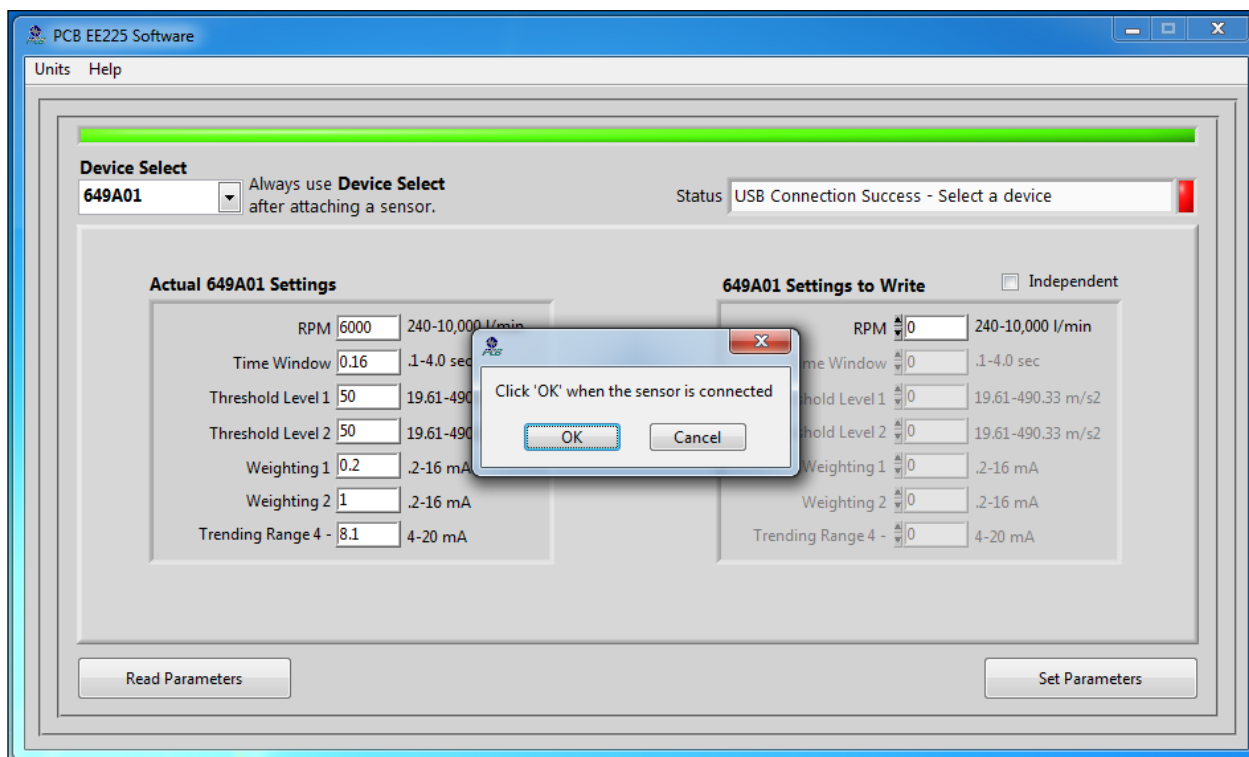


Figure 19 – Sensor Connection Screen

While the software is establishing communication with the sensor, the status will display 'Checking Status...' and the colored indicator box next to the status will alternate between red and yellow. This will take approximately 15 seconds. Once communication is established, the indicator box will turn green and the software will read the sensor's current settings and data. The fields presented in the main body of the screen will be specific to the selected sensor.

Programming Sections

The screen has two sections:

- Actual 649A01 Settings – This section shows the settings currently programed in the sensor.
- 649A01 Settings to Write – This section shows the options for programming the sensor.

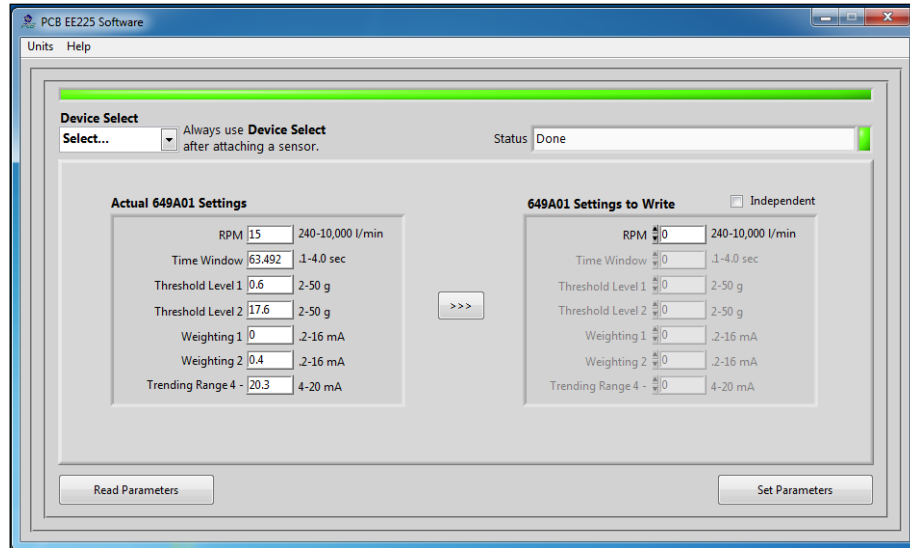


Figure 20 – Typical RMP Screen After Successful Parameter Read

Reading and Writing Parameters

- Reading Parameters - To read the current sensor settings, click the Read Parameters button. This operation takes approximately 45 seconds to complete.
- Transferring Actual Settings to Settings to Write Field - Use the '>>>' button to transfer all Actual Settings to the Settings to Write fields.
- Writing Parameters- Select the appropriate mode and enter any pertinent parameter information. Click the Set Parameters button. This causes the settings to be sent to the sensor and then read back and displayed in the Actual 649A01 Settings.

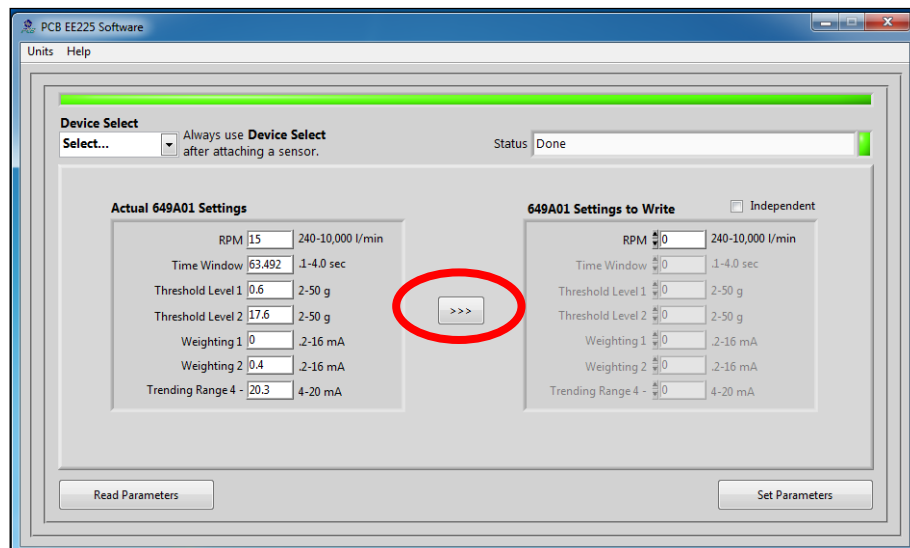


Figure 21 – Transferring Actual Settings to Settings to Write Field
Parameter Options

There are seven parameters (Figure 14) that can be programmed to optimize performance of the RMP. At any point during the programming process, the values can be changed between imperial and metric measurements by clicking the Units dropdown in the top navigation menu and then selecting the appropriate measurement type.

- **Dependent Mode** – If the Independent Mode checkbox is NOT selected, then the parameters will be based on Dependent Mode. When Dependent Mode is used, the user only needs enter the compressor RPM. The remaining six parameters (Time Window, Threshold Level 1, Threshold Level 2, Weighting 1, Weighting 2 and Trending Range) will be automatically calculated based on the compressor rotational speed. Calculation formulas are in table below. The formulas used assume use on reciprocating gas compressor. If RMP is being used on a piston pump or some other type of reciprocating machinery, see the section titled “Using the RMP with Piston Pumps Other Type of Reciprocating Machinery”.
- **Independent Mode** – If the Independent Mode checkbox is selected, then the parameters will be based on Independent Mode. When Independent Mode is used the user does NOT enter the RMP of the compressor and instead manually enters values for the Time Window, Threshold Level 1, Threshold Level 2, Weighting 1, Weighting 2 and Trending Range parameters. Value entered for each parameter must be within the software’s acceptable range for that parameter. Acceptable ranges are in table below as well as some guidelines for Independent Mode programming.

Parameter	Description	Dependent Mode	Independent Mode	
		Range or Formula	Acceptable Range	Guidelines for Typical Values
RPM	Rotational speed of equipment	240 - 10,000	N/A	N/A
Time Window	Time span (in seconds) during which data is collected for an analysis cycle; based on number of rotations of the shaft.	$TW = (60 / RPM) \times 16$	0.1-4.0 sec	Time span for 12-16 shaft rotations
Threshold Level 1	Cutoff levels (in g of acceleration) above which impacts are counted and weighted. When all vibration is below Threshold Level 1, sensor monitors peak acceleration within trending range.	$A_L = RPM / 80$	2-50 g 19.61-490.33 m/s ²	2-4 times of baseline acceleration
Threshold Level 2		$A_H = RPM / 50$	2-50 g 19.61-490.33 m/s ²	1.5-1.6 times of Threshold Level 1
Weighting 1	Factor (in mA of current) applied to impacts that exceed Threshold Level 1.	$W_L = 0.1 + (100 / RPM)$	0.2-16.0 mA (0.2 mA increments)	Less than Weighting 2 value
Weighting 2	Factor (in mA of current) applied to impacts that exceed Threshold Level 2.	$W_H = 0.9 - (100 / RPM)$	0.2-16.0 mA (0.2 mA increments)	Greater than Weighting 1 value
Trending Range	Maximum value (in mA of current) dedicated to trending peak acceleration when all impacts are below either threshold level. If impacts exceed either threshold level, trending range current maxes out.	$I_L = 8 + (6 \times (100/RPM))$	4-20 mA	If set at 20 mA, RMP will operate like vibration transmitter.

Examples

Example 1: Connect the RMP to computer with the USB programmer cable. Run the program. Be sure the Independent box is NOT checked and type 780 in the RPM box. Note that all of the other parameters are set automatically. Click Set Parameters to program the RMP with these settings. The RMP will be programmed, the status read, and the screen in Figure 19 displayed.

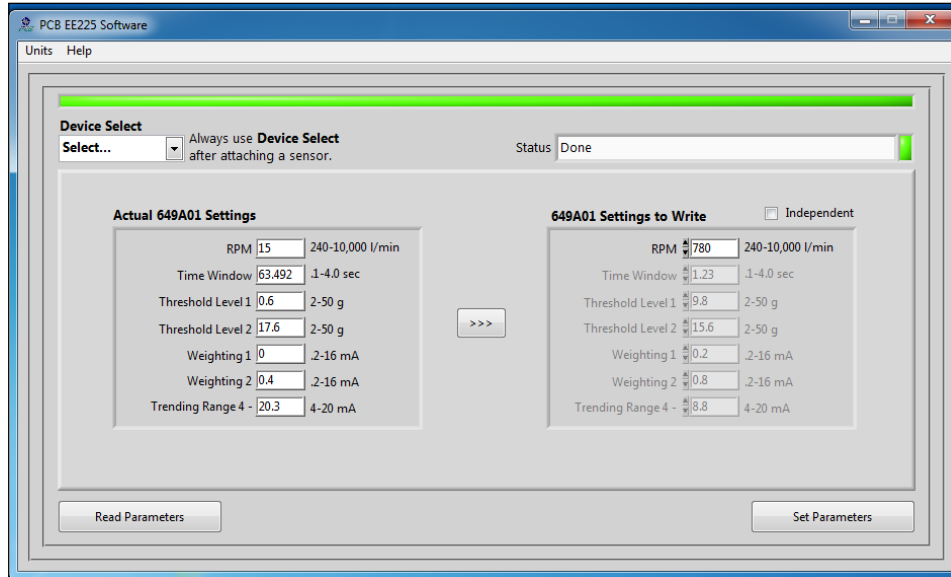


Figure 22 – RMP Programmer Screen with Default Setting

Example 2: Connect the RMP to computer with the USB programmer cable. Run the program. Check the Independent box. Note that the RPM field disappears. Type in the following values: Time Window = 1.2, Threshold Level 1 = 5, Threshold Level 2 = 7, Weighting 1 = 0.6, Weighting 2 = 0.8, and Trending Range = 10. Click Setup to program the RMP with these settings. The RMP will be programmed with the custom setting, the status read, and the screen in Figure 20 below displayed.

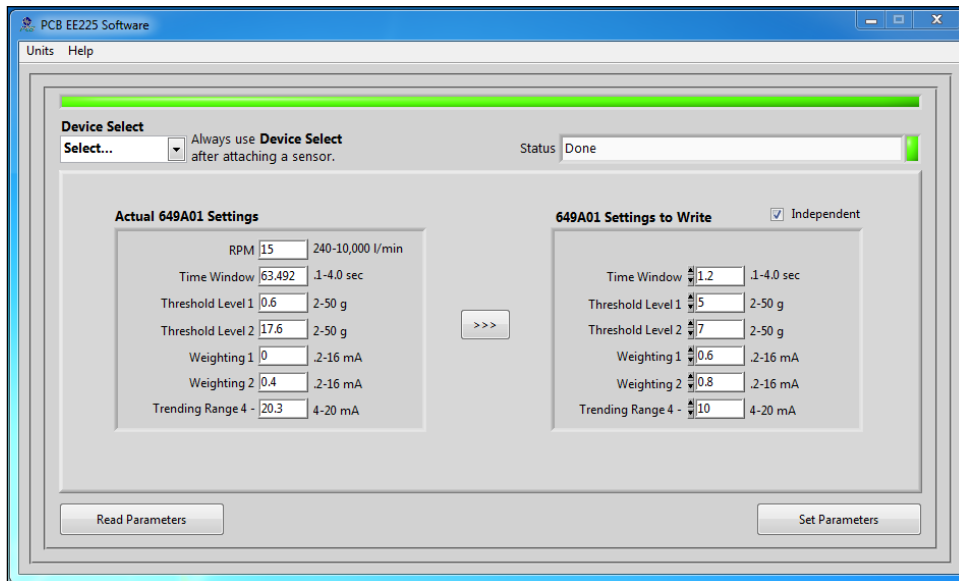


Figure 23 – RMP Programmer Screen with Independent Settings

Equipment-Specific Usage Guidelines

Determine Baseline Vibration using the RMP

When impacts occur in a machine, peak acceleration rises well above the vibration baseline. The default shock threshold values (Threshold Level 1 & Threshold Level 2) that are automatically inserted in the Programmer Screen based on the specified RPM assume a typical gas compressor with the sensor mounted as recommended in this manual. For some machine types and measurement locations, the default values for Threshold Level 1 and Threshold Level 2 may need to be adjusted. This would be the case if the machinery type or selected measurement location has a higher base vibration than normal.

If you want to measure the baseline peak vibration and do not have appropriate vibration analysis equipment, it can be done using the RMP. To determine the baseline level using the RMP, install the RMP programmed with the following settings and measure the output in mA. This can be done using the same system that will be used for monitoring the RMP.

Threshold Level 1 = 8 g (or 16 g)
Trending Range = 20 mA

Since the RMP outputs a 4-20 mA signal proportional to peak acceleration, 4 mA is zero and each mA over the 4 mA is equal to 0.5g (or 1g) of peak vibration. Example, if Threshold Level 1 is set to 8 g, the Trending Range to 20 mA, and the reading is 12.7 mA, then the actual peak vibration level is $(12.7 - 4) \times 0.5 = 4.35$ g. For more details see "Using the RMP with Piston Pumps Other Types of Reciprocating Machinery".

Usage with Gas Compressors

Unless otherwise specified, the RMP comes from the factory with default settings for a 1200 RPM reciprocating gas compressor.

- RPM: 1200 RPM
- Time Window: 0.8 sec
- Threshold Level 1: 15 g
- Threshold Level 2: 24 g
- Weighting 1: 0.2 mA
- Weighting 2: 0.8 mA
- Trending Range: 8.5 mA

When field programming a unit in Dependent mode, the default parameters that are automatically inserted in Programmer Screen based on the RPM entry are intended for use with reciprocating gas compressors. If you are using the RMP with a piston pump or any other type of reciprocating machinery, see the section in this manual titled "Using the RMP with Piston Pumps Other Types of Reciprocating Machinery".

Usage with Piston Pumps and Other Types of Reciprocating Machinery

Although the RMP software has the ability to calculate suggested parameters based on rotational speed for gas compressors, these values may not be appropriate for use when monitoring piston pumps and other types of reciprocating machinery. Due to the nature of their operation, other mechanisms contribute to the maximum acceleration levels seen during normal pump operation. Therefore, it is important to determine what levels exist during normal operation before configuring the software. The following procedure will allow you use the RMP to measure the highest acceleration level occurring during normal operation. Based on this measurement, the RMP parameters can be calculated.

This procedure sets the parameters in the RMP such that 1 mA of incremental output equals 1 g of incremental vibration (i.e., 4 mA = 0 and 20 mA = 16 g pk). The Trending Range is set to 20 mA, which disables the alarm threshold feature of the unit; and thus outputs only the peak acceleration value. Follow these steps to properly set up the unit for this reading.

1. Connect the RMP to the computer using the USB Programmer and run the RMP software.
2. Check the Independent box at the top of the screen. This allows manual configuration of the parameters.
3. Type the following values into the appropriate boxes on the Programmer Screen. When these values have been entered, click the Setup button to download the configuration to the RMP.
 - a. Time Window: 1 s
 - b. Threshold Level 1: 16 g
 - c. Threshold Level 2: 20 g
 - d. Weighting 1: 0.2 mA
 - e. Weighting 2: 0.8 mA
 - f. Trending Range: 20 mA

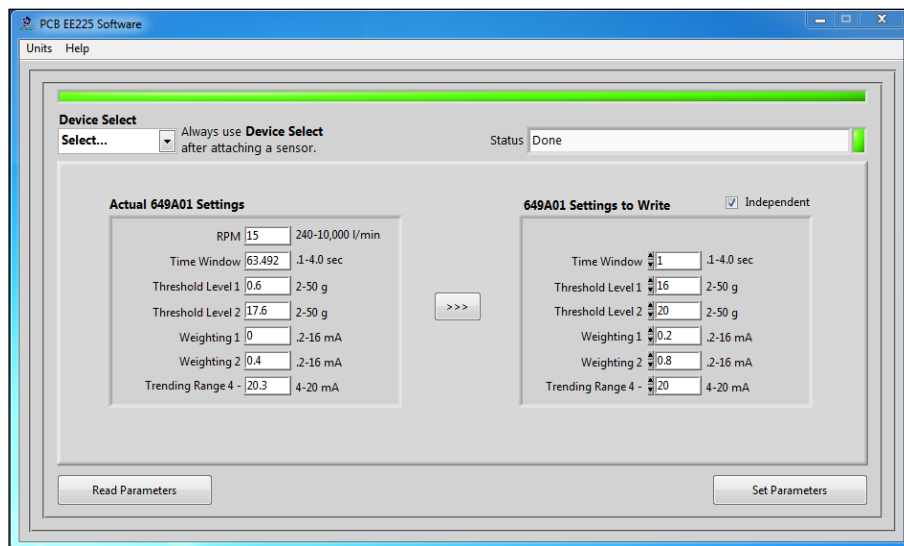


Figure 24 – RMP Programmer Screen Setup for Measuring Base Vibration

4. Disconnect the RMP from the computer and mount it on the pump. Wire it into a PLC or other 4-20 mA compatible system. Optionally, it can be used with a 4-20 mA loop calibrator such as the IMI Model 699A05. Record the output of the RMP in mA. Subtract 4 from that value to get the peak baseline acceleration. For example, if 10 mA is displayed, the peak level is $10 - 4 = 6$ g.
5. Based on the peak acceleration level determined in step 4, the RMP can now be programmed appropriately. Disconnect the RMP from the 4-20 mA compatible device, reconnect it to the computer and

run the RMP Software. Use the following guideline to calculate Threshold Level 1 and Threshold Level 2 values.

- a. If the peak acceleration value measured in step 4 is less than or equal to 10 g, multiply it by 3 and set the Threshold Level 1 equal to it. Then, multiply the Threshold Level 1 value by 1.6 and set the Threshold Level 2 value equal to it. For example, if the measured peak acceleration in step 4 is 6 g, set Threshold Level 1 to 18 g and Threshold 2 to 28.8 g.
 - b. If the peak acceleration value determined in step 4 is greater than 10 g, set Threshold Level 1 to 30 g and Threshold Level 2 to 50 g.
 - c. Set the remaining parameters as follows.
 - i. If the peak acceleration value measured in step 4 is less than or equal to 10 g, use the default values that are set automatically by the program based on machine RPM.
 - ii. If the peak acceleration value determined in step 4 is greater than 10 g, use the following parameters
 1. Time Window: 1 s
 2. Weighting 1: 0.5 mA
 3. Weighting 2: 0.5 mA
 4. Trending Range 10 mA
6. Using the example of 6 g peak acceleration from step 4, enter the parameters in the Programmer Screen, and click Setup to program the RMP. The following Programmer Screen should be displayed.

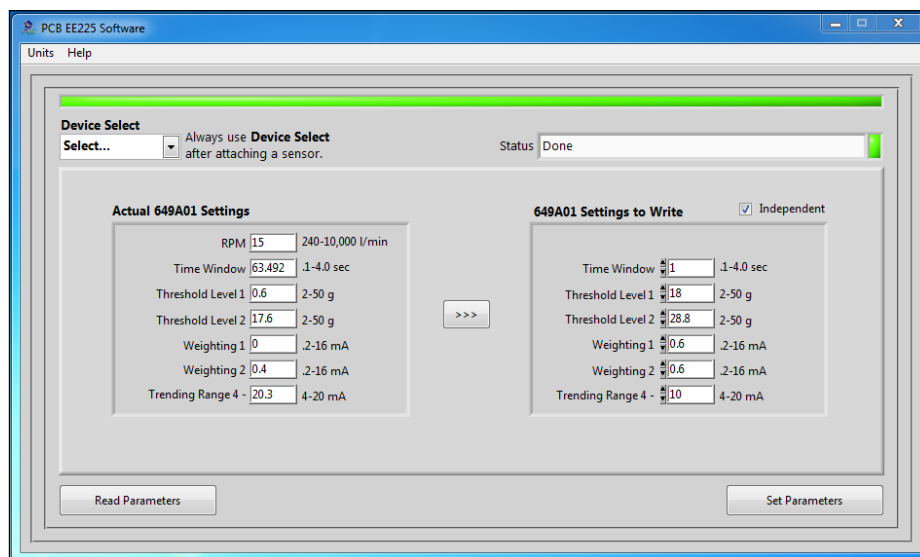


Figure 25 – RMP Programmer Screen for 6 g Peak Acceleration on a Piston Pump

Portable 4-20 mA Loop Calibrator

The loop calibrator (Model 699A05) provides 24V loop power and displays the transmitters electrical current output. This can be used with the sensor for measuring the baseline peak acceleration as described in “Determine Baseline Vibration using the RMP” on page 16. Visit www.pcb.com for more information on the loop calibrator.



Figure 26 – Loop Calibrator



IMISENSORS

A PCB PIEZOTRONICS DIV.

Cable Ordering Information

Listed below are some of the more popular cables for use with RMPs. For additional information on cable options, visit www.pcb.com and click on the "Cables & Connectors" tab or call IMI for assistance.

IMI Part Number: **052** **BR** **010** **BZ**

Cable Model Series

052 Polyurethane, Shielded, Twisted Pair
048 Armored Polyurethane, Shielded, Twisted Pair

Switch Connector Type

AE 2 socket MIL type with environmental boot
BP 2 socket MIL type high temp with strain relief
BR 2 socket MIL type molded composite
BQ 2 socket MIL type molded composite, right angle

Cable Length

010 10 feet
020 20 feet
030 30 feet
040 40 feet
050 50 feet
XXX Any length

Cable termination

BZ Blunt Cut



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.

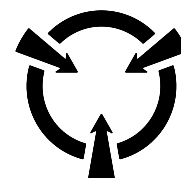
Warning 2 – ESD sensitivity

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.

Caution 1 – ESD sensitivity

Cables can kill your equipment. High voltage electrostatic discharge (ESD) can damage electrical devices. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, such as that which occurs in the following:

- 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.

**CAUTION**ELECTROSTATIC
DISCHARGE SENSITIVE**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 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 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.

[illegible]

ATEX Approved Sensors
Vibration Sensors (4-20mA)
(EX649A7X Series)

English

This sensor has been approved for Hazardous Locations Directive 94/9/EC, Ex ia IIC T4 and Ex nA IIC T4.

For safe use:

- All applicable local electrical laws must be followed
- The apparatus must only be connected to a certified associated intrinsically safe equipment and this combination must be compatible as regards intrinsic safety rules.
- The electrical parameters of the associated intrinsically safe equipment must not exceed any of the following values:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Ambient operating temperature range:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Deutsch

Die Sensoren der o. g. Serie wurden gemäß der EU-Richtlinie 94/9/EC, Ex ia IIC T4 und Ex nA IIC T4 ("Komponenten und Schutzsysteme für explosionsgefährdete Bereiche") zertifiziert.

Für den ordnungsgemäßen und sicheren Betrieb:

- müssen alle gültigen Gesetze und Vorschriften eingehalten werden
- darf der Transmitter ausschließlich an passendem, zugelassenem, eigensicherem Equipment angeschlossen werden und diese Kombination muss den Bestimmungen des Explosionsschutzes entsprechen
- dürfen die elektrischen Parameter des zugehörigen eigensicheren Equipments folgende Werte nicht überschreiten:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Umgebungstemperaturbereich:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Français

Ce détecteur a été approuvé pour les Emplacements Hasardeux Directif 94/9/EC, Ex ia IIC T4 et Ex nA IIC T4.

Pour l'usage sûr :

- Toutes lois électriques, locales et applicables doivent être suivies
- L'appareil doit être seulement connecté à un équipement intrinsèquement sûr, associé et certifié et cette combinaison doit être compatible comme considère des mesures de sécurité intrinsèques.
- Les paramètres électriques de l'équipement intrinsèquement sûr associé ne doivent pas dépasser n'importe quel des valeurs suivantes :
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- La gamme de température d'opération Ambiante :
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Italiano

Questo sensore è stato approvato per le Posizioni Pericolose Direttivo 94/9/EC, Ex ia IIC T4 e Ex nA IIC T4.

Per l'uso sicuro:

- Tutte le leggi applicabili, locali elettriche devono essere seguite
- Il dispositivo deve essere soltanto collegato a un'apparecchiatura certificata, associata intrinsecamente sicura e questa combinazione deve essere compatibile considera come le regole di sicurezza intrinseche.
- I parametri elettrici dell'apparecchiatura associata intrinsecamente sicura non devono eccedere qualunque dei valori seguenti:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- la gamma di temperatura di funzionamento di Ambiente:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Español

Este sensor se ha aprobado para Ubicaciones Peligrosas Directivas 94/9/EC, Ex ia IIC T4 y Ex nA IIC T4.

Para el uso seguro:

- Todas leyes eléctricas, locales y aplicables se deben seguir
- El aparato debe sólo sea conectado a un equipo intrínsecamente seguro, asociado y certificado y esta combinación debe ser compatible considera como las reglas intrínsecas de la seguridad.
- Los parámetros eléctricos del equipo intrínsecamente seguro asociado no deben exceder cualquiera de los valores siguientes:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- El Ambiente que opera la gama de la temperatura:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Русский

Директивой 94/9/ЕС настоящий датчик разрешен к применению по категориям, Ex ia IIC T4 и Ex nA IIC T4.

Для безопасного использования:

- все правила электробезопасности должны быть выполнены.
- датчик может быть подключен только к сертифицированному оборудованию и соединение должно соответствовать правилам электробезопасности.
- контактирующее с датчиком оборудование не должно выходить за следующие предельные значения:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Диапазон рабочих температур:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Norsk

Denne sensoren godkjenner for Farlige Plasseringer Direktiv 94/9/EC, Ex ia IIC T4 og Ex nA IIC T4.

For sikker bruk:

- Alle anvendelige lokale elektriske lover fulgt
- Apparatet koplet bare til et sertifisert tilknyttet indre sikkert utstyr og denne kombinasjonen er forenelig med hensyn til indre sikkerhetsregel.
- De elektriske parametrene av det tilknyttete indre sikkeret utstyret overskrider ikke noe av de følgende verdiene:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Omgivende betjeningsav temperaturrekkevidde:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Nederlands

Deze sensor is voor Gevaarlijke Locaties Leidinggevende 94/9/EC, Ex ia IIC T4 en Ex nA IIC T4 goedgekeurd worden.

Voor veilige gebruik:

- Alle toepasbare plaatselijke elektrische wetten moeten gevolgd worden
- Het apparaat moet enkel aan een gecertificeerde geassocieerde intrinsiek veilige uitrusting aangesloten worden en deze combinatie moet compatibel zijn als intrinsieke veiligheidsregels beschouwt.
- De elektrische parameters van de geassocieerde intrinsiek veilige uitrusting moeten enig van de volgende waarde niet overschrijden:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Het omgevend bediening temperatuur bereik:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Polski

Ten sensor ma być uznany pod kątem Hazardowy Rozmieszczenia Kierujący 94/9/EC Ex ia IIC T4 i Ex nA IIC T4.

Pod kątem kasa używać :

- Wszystko stosowny miejscowy elektryczny łańsk musi być nastąpił
- Ten aparat musi tylko być połączony wobec pewien poświadczony złączony wewnętrznie kasa wyposażenie i ten kombinacja musi być zgodny z co się tyczy wewnętrzny przepisy bezpieczeństwa.
- Ten elektryczny parametry od ten złączony wewnętrznie kasa wyposażenie musi nie przewyższać wszelki od ten kolejne wartość :
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Otaczający pracy temperatura rząd :
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Português

Este sensor foi aprovado para a Diretiva 94/9/EC de Posições Arriscada, Ex ia IIC T4 e Ex nA IIC T4.

Para uso seguro:

- Todas as leis elétricas locais aplicáveis devem ser seguidas
- O aparelho só deve ser unido a um equipamento associado intrinsecamente seguro certificado e esta combinação deve ser compatível quanto a regras de segurança intrínsecas.
- Os parâmetros elétricos do equipamento associado intrinsecamente seguro não devem exceder nenhum dos valores seguintes:
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Variedade de temperatura operacional ambiente:
 - o $-40^{\circ}C$ to $+100^{\circ}C$

Svensk

Den här sensoren er blitt gillat för Riskabel Lokaliseringarna Direktiv 94/9/ EC Ex ia IIC T4 och Ex nA IIC T4.

För kassaskåp använda :

- All användbar lokal elektrisk lag måste bli följde efter
- Apparaten måste bara bli kopplet till en atterterat förbundet intrinsically kassaskåp utrustande och den här kombination måste bli förenlig vad angår intrinsic säkerhet reglerna.
- Den elektrisk paramenterna om förbundet intrinsically kassaskåp utrustande må inte överskrida någon av den följande värden :
 - o $U_i \leq 30V$, $I_i \leq 100mA$, $P_i \leq 1W$
- Omgivande opera- temperatur ställa i rad :
 - o $-40^{\circ}C$ to $+100^{\circ}C$

2

1

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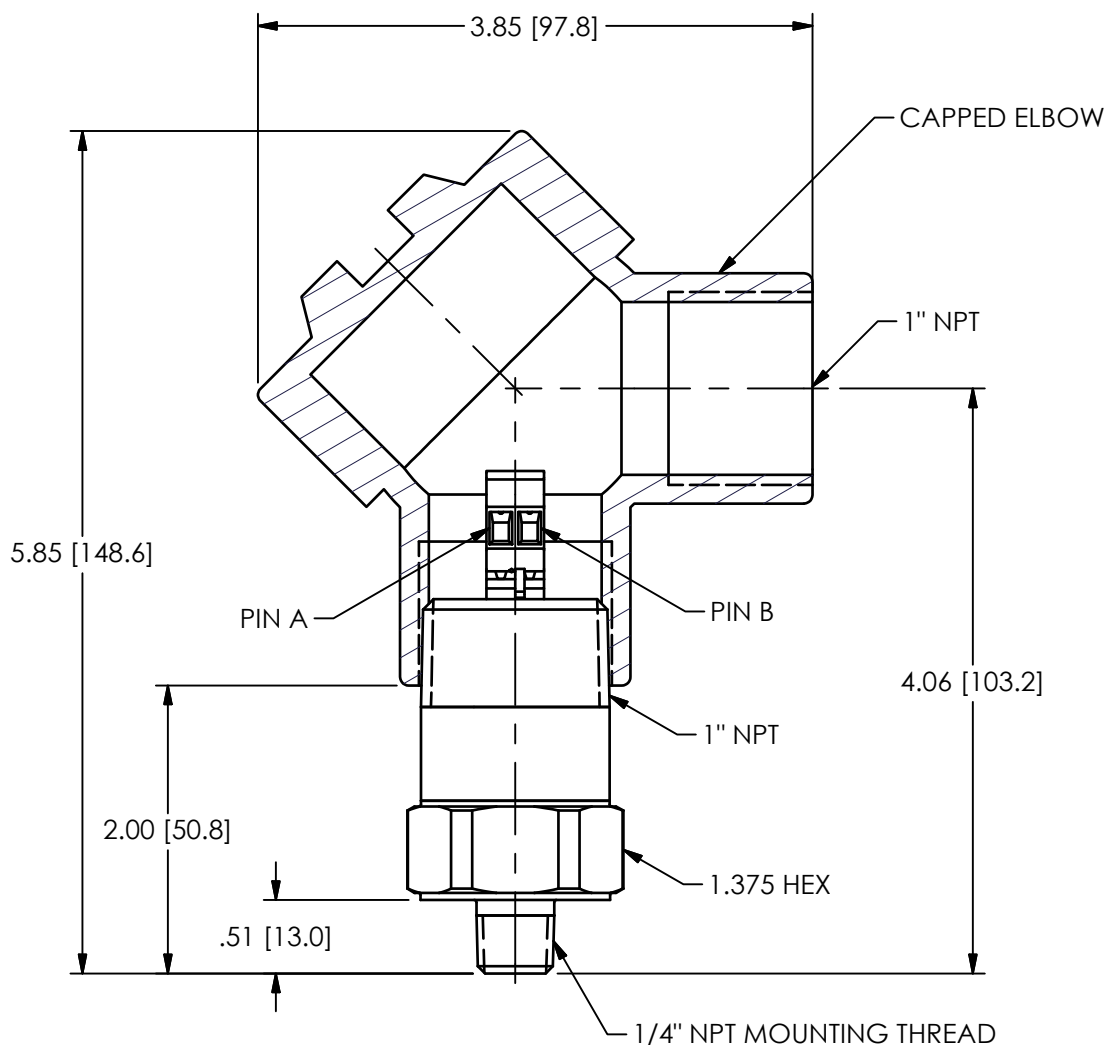
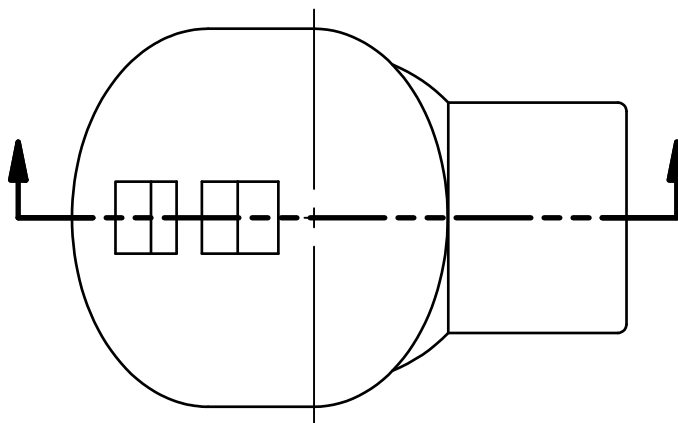
REVISIONS

REV	DESCRIPTION	DIN
B	CORRECTED SPELLING "1" NTP" TO "1" NPT"	45905

RELATED DRAWING

NO MODIFICATIONS PERMITTED WITHOUT THE APPROVAL OF THE AUTHORIZED PERSON

39465



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

DIMENSIONS IN INCHES

DECIMALS XX ± 0.03
XXX ± 0.010

ANGLES ± 2 DEGREES

FILLETS AND RADII
.003 - .005

DIMENSIONS IN MILLIMETERS
[IN BRACKETS]

DECIMALS X ± 0.8
XX ± 0.25

ANGLES ± 2 DEGREES

FILLETS AND RADII
0.07 - 0.13

DRAWN

JDG 9/27/16

CHECKED

KRM 9/27/16

ENGINEER

BAM 9/27/16

TITLE

OUTLINE DRAWING
MODEL EX649A71
RMP SENSOR

PCB PIEZOTRONICS

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

CODE
IDENT. NO.
52681

DWG. NO.

39465

SCALE: FULL

SHEET 1 OF 1

2

1

REVISIONS				
ZONE	REV	DESCRIPTION	ECN	DATE
	NR	RELEASED TO DRAFTING		1/18/08

Schedule Drawing
 No modifications permitted
 without reference to the
 Notified Body

- 8> PCB P/N 100-7094-90 OR EQUIVALENT. ALL CONDUIT AND JUNCTION BOXES MUST MEET THE CLASS, DIVISION, GROUP, AND INSTALLATION METHOD AS REQUIRED BY THE APPLICATION AND LOCAL GOVERNING AGENCY.
- 7> SHIELDS TO BE EARTHED AT BARRIER END.
- 6> THE INSTALLER SHALL INSURE THAT THE TRANSDUCER MOUNTING STRUCTURE IS AT THE SAME GROUNDING POTENTIAL AS THE BARRIER GROUND. TOTAL EARTH LOOP IMPEDANCE SHALL BE LESS THAN ONE OHM.
- 5> BARRIER WILL BE MOUNTED IN AN ENCLOSURE THE SUITABILITY OF WHICH WILL BE DETERMINED BY LOCAL AUTHORITIES.
- 4> ENTITY APPLICATION:

BARRIERS WITHIN THE SPECIFIED LIMITATIONS ARE PERMITTED.

PARAMETERS (EXCEPTED)
 $V_{max}/U_i = 30 \text{ V}$
 $I_{max}/I_i = 100 \text{ mA}$
 $P_{amx}/P_i = 1 \text{ W}$
 $C_i = 0$
 $L_i = 28 \text{ }\mu\text{H}$

NORTH AMERICA:

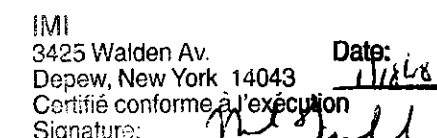
Exia IIC
AExia IIC

CLASS I, GROUPS A,B,C,D
CLASS II, GROUPS E,F,G
CLASS III

Exig 11C

- THE -XXXX SPECIFIES THE CABLE LENGTH AND TERMINATION TYPE
FOR METRIC LENGTHS, CABLE DESIGNATION IS MXXXXX

- NOTES: UNLESS OTHERWISE SPECIFIED.



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS X ± .05 XX ± .01 XXX ± .005 ANGLES ±2 DEGREES FILLETS AND RADI .003 - .005 HEX DIMENSIONS ARE: > 0.5 ±.000 - .003 > 0.5 ±.000 - .005 INTERNAL THREAD DEPTH MIN REMOVE ALL BURRS SHARP = R.000 - R.003 DD017 REV. 5 01/17/2003	 CAUTION ELECTROSTATIC DISCHARGE SENSITIVE	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">DRAWN</td> <td style="width: 10%;">ECB</td> <td style="width: 15%;">1/18/08</td> <td style="width: 10%;">MFG</td> <td style="width: 10%;">JR</td> <td style="width: 10%;">1/18/08</td> </tr> <tr> <td>CHK'D</td> <td>Dm</td> <td>1/18/08</td> <td>ENGR</td> <td>MMF</td> <td>1/18/08</td> </tr> <tr> <td>APP'D</td> <td>W.A.</td> <td>1/18/08</td> <td></td> <td></td> <td></td> </tr> </table> TITLE CSA/LCIE APPROVAL EX649A7X INTERCONNECTION	DRAWN	ECB	1/18/08	MFG	JR	1/18/08	CHK'D	Dm	1/18/08	ENGR	MMF	1/18/08	APP'D	W.A.	1/18/08				 PCB PIEZOTRONICS™ 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 EMAIL: SALES@PCB.COM <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">CODE IDENT. NO. 52681</td> <td style="width: 70%; text-align: center; font-size: 1.5em; font-weight: bold;">39021</td> </tr> <tr> <td colspan="2" style="text-align: center;"> SCALE: FULL SHEET 1 OF 2 </td> </tr> </table>	CODE IDENT. NO. 52681	39021	SCALE: FULL SHEET 1 OF 2	
DRAWN	ECB	1/18/08	MFG	JR	1/18/08																				
CHK'D	Dm	1/18/08	ENGR	MMF	1/18/08																				
APP'D	W.A.	1/18/08																							
CODE IDENT. NO. 52681	39021																								
SCALE: FULL SHEET 1 OF 2																									

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REVISIONS					
ZONE	REV	DESCRIPTION	ECN	DATE	APP'D
		- SEE SHEET ONE -			

Schedule Drawing
No modifications permitted
without reference to the
Notified Body

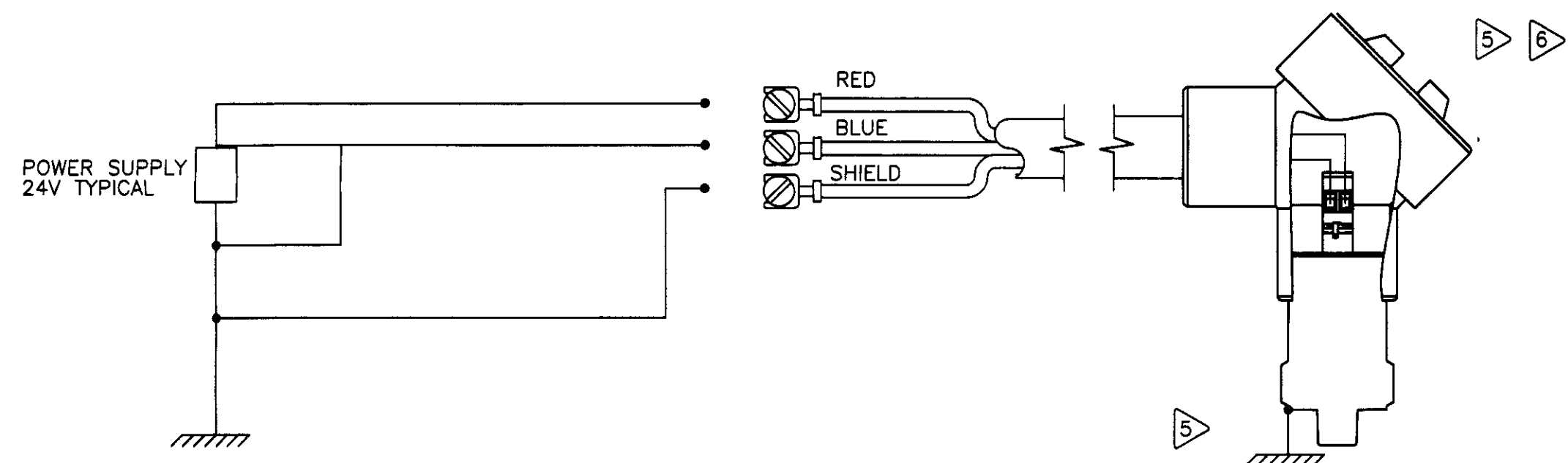
NON-HAZARDOUS / SAFE AREA
OR DIV 2 / ZONE 2

POWER SUPPLY/
SIGNAL CONDITIONER

CONDUIT/CABLE

TRANSDUCER

PN EX649A7X
OR
PN EX649A7X-XXXXX



NO CHANGES WITHOUT CSA/LCIE APPROVAL

WARNING - EXPLOSION HAZARD
DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN
SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

3425 Walden Ave.
Depew, New York 14043
Date: 1/12/02
Signature: [Signature]

PCB P/N 100-7094-90 OR EQUIVALENT. SENSOR MUST BE INSTALLED IN A SUITABLE ENCLOSURE, ACCEPTABLE TO THE LOCAL INSPECTION AUTHORITY HAVING JURISDICTION. SENSOR CASE MUST BE BONDED TO GROUND ACCORDING TO SECTION 18-182 OF THE CEC, PART 1 AND ACCORDING TO ARTICLE 501.16 OF THE NEC AS APPLICABLE.

SENSOR MUST BE MOUNTED DIRECTLY ON A CONDUCTIVE STRUCTURE, WHICH IS VERIFIED TO BE CONNECTED TO SUPPLY SOURCE GROUND. OTHERWISE, USE CORTEM CONDUIT JUNCTION BOX PART NUMBER SB-36 OR EQUIVALENT CONTAINING INTEGRAL GROUND SCREW CONNECTED TO SUPPLY SOURCE GROUND.

FOR GUIDANCE ON CANADIAN INSTALLATION, REFER TO CEC PART I.
FOR GUIDANCE ON U.S. INSTALLATION, INSTALL IN ACCORDANCE WITH NEC [ANSI/NFPA70] AND [ANSI/ISA RP12.6].

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

NORTH AMERICA:

ZONE 2

ExnA IIC

AExnA IIC

DIV 2

CLASS I, GROUPS A,B,C,D

EUROPE:

ZONE 2

ExnA IIC

WIRING (EX649A7X-XXXXX):
2 CONDUCTOR CABLE
.25 INCH(6.4MM) X 999 FEET (304.5 METERS) MAX.
RED/PIN A (POWER)
BLUE/PIN B (RETURN)

THE -XXXXX SPECIFIES THE CABLE LENGTH AND TERMINATION TYPE
FOR METRIC LENGTHS, CABLE DESIGNATION IS MXXXXX

PART NO. IS EX649A7X OR EX649A7X-XXXXX

NOTES: UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMALS X ± .05
XX ± .01
XXX ± .005
ANGLES ±2 DEGREES
FILLET AND RADIUS .003 - .005
HEX DIMENSIONS ARE:
< 0.5 ±.000 / -.003
> 0.5 ±.000 / -.005
INTERNAL THREAD DEPTH MIN
REMOVE ALL BURRS
SHARP = R.000 - R.003
DD017 REV. D 01/17/2003



CAUTION
ELECTROSTATIC
DISCHARGE SENSITIVE

DRAWN: ECB 1/13/08 MFG: JR 1/13/08
CHK'D: DM 1/16/08 ENGR: ME 1/16/08
APP'D: JC 1/16/08

CSA/LCIE APPROVAL
EX649A7X INTERCONNECTION

PCB PIEZOTRONICS
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 EMAIL: SALES@PCB.COM
CODE IDENT. NO. 52681
DWG. NO. 39021
SCALE: FULL SHEET 2 OF 2

EU Declaration of Conformity PS070

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: 4-20ma Transmitter(s)

Whose Product Models Include: EX649A7x Series
 Note: "x" is a place holder for one number.
 For example: EX649A71

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 4-20ma Transmitter(s) of the above series which have the CE & (EX) ATEX mark on their data sheets and where those data sheets refer to this declaration of conformity. The data sheets for all model numbers referenced above, which include the CE & (EX) ATEX mark on such data sheets and refer to this Declaration of Conformity are hereby incorporated by reference into this Declaration.

Conform to the following EU Directive(s) when installed per product documentation:	2014/30/EU 2014/34/EU 2011/65/EU w/2015/863/EU	EMC Directive ATEX Directive RoHS Directive
---	--	---

Standards to which Conformity is Declared:

Harmonized Standards	EN 61326-1:2013 EN 61326-2-3:2013 EN 61010-1:2010 EN 60079-0 :2012+ A11:2013 EN 60079-11 2012 EN 63000:2018	Electrical Equipment for Measurement, Control and Laboratory Use- EMC Electrical Equipment for Measurement, Control and Laboratory Use- EMC Safety and EMC requirements for electrical equipment in a laboratory setting. General Explosive Atmosphere Intrinsic safe, i 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
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	GM29047c GM29048s
EC Type Examination	ATEX Certification	LCIE 08 ATEX 6003 X Ex ia IIC T4, II 1G
Voluntary Certification	Supplemental ATEX Certification	LCIE 08 ATEX 6004 X Ex nA IIC T4, II 3G

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: 07/06/2021

Signature:



Name: Carrie Termin

Title: Regulatory Affairs and Product Certification Specialist



Certificate of Compliance

Certificate: 1916514 (103164_0_000)

Master Contract: 184981

Project: 70034576

Date Issued: 2015-11-20

Issued to: Industrial Monitoring Instr. (IMI) A Div. of PCB Piezotronics, Inc.
3425 Walden Ave
Depew, New York 14043
USA
Attention: Carrie Termin

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Aisha Sreenath
Aisha Sreenath

PRODUCTS

CLASS 2258 04 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations
CLASS 2258 84 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations
- Certified to US Standards

Class I, Div. 1, Groups A, B, C and D; Class II, Div. 1, Groups E, F and G; Class III, Div 1:
Ex ia IIC T4:
AEx ia IIC T4:

Models EX649A0x Vibration Sensors, input rated 12-30 Vdc max, 4-20mA; intrinsically safe with entity parameters of: U_i (V max) = 30V, I_i (I max) = 100mA, P_i (Pmax) = 1W, C_i = 0, L_i = 28 μ H; when installed per installation Dwg 39018; Temp Code T4 @ Max Ambient 100 Deg C.

Models EX649A1x and EX649A6x Vibration Sensors, input rated 12-30 Vdc max, 4-20mA; intrinsically safe with entity parameters of: U_i (V max) = 30V, I_i (I max) = 100mA, P_i = 1W (Pmax), C_i = 61 nF, L_i = 333 μ H; when installed per installation Dwg 39018; Temp Code T4 @ Max Ambient 100 Deg C.

Models EX649A7x and CS649A91 Vibration Sensors, input rated 12-30 Vdc max, 4-20mA; intrinsically safe with entity parameters of: U_i (V max) = 30V, I_i (I max) = 100mA, P_i (Pmax) = 1W, C_i = 0, L_i = 28 μ H; when



Certificate: 1916514
Project: 70034576

Master Contract: 184981
Date Issued: 2015-11-20

installed per installation Dwg 39021 for model EX649A7x and Dwg 62195 for model CS649A91; Temp Code T4 @ Max Ambient 100 Deg C.

Notes:

1. For Canadian Installations, sensor case must be bonded to ground according to Section 18 of the CEC, Part 1.
2. For US Installations, sensor case must be bonded to ground according to Articles 501 and 505 of the NEC.
3. The "x" in the model code may be a number from 0 thru 9 which denotes variations in frequency response, sensitivity, and mounting configuration of the sensors.
4. An alphanumeric code (-XXXXX) following the Model Number indicates cable length and termination. Cable length not to exceed 304.5m (999ft).

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 0-M91	General Requirements – Canadian Electrical Code, Part II
C22.2 No. 142-M1987	Process Control Equipment
CAN/CSA-C22.2 No. 157-92	Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
UL 913 (7 th Ed.)	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II and III, Division 1, Hazardous Locations
UL 916 (3 rd Ed.)	Energy Management Equipment
CAN/CSA-C22.2 No. 60079-0:07	Electrical apparatus for explosive gas atmospheres - Part 0: General Requirements
CAN/CSA-E60079-11:02	Electrical apparatus for explosive gas atmospheres - Part 11: Intrinsic Safety "i"
ANSI/UL 60079-0:05	Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements
ANSI/UL 60079-11:07	Electrical apparatus for Explosive Gas Atmospheres - Part 11: Intrinsic Safety "i"

CLASS 2258 03 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations

CLASS 2258 83 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations - CERTIFIED TO U.S. STANDARDS

Ex nL IICT4:

AEx nA IICT4:

Class I, Div. 2, Groups A, B, C, D:

Models EX649A0x Vibration Sensors, input rated 12-30 Vdc max, 4-20 mA; non-incendive with entity parameters of: U_i (V max) = 30V, I_i (I max) = 100mA, P_i (Pmax) = 1W, C_i = 0, L_i = 28 μ H; when installed per installation Dwg 39018; Temp Code T4 @ Max Ambient 100 Deg C.

Models EX649A1y and EX649A6y Vibration Sensors, input rated 12-30 Vdc max, 4-20mA; non-incendive with entity parameters of: U_i (V max) = 30V, I_i (I max) = 100mA, P_i (Pmax) = 1W, C_i = 61 nF, L_i = 333 μ H; when installed per installation Dwg 39018; Temp Code T4 @ Max Ambient 100 Deg C.



Certificate: 1916514
Project: 70034576

Master Contract: 184981
Date Issued: 2015-11-20

Notes:

1. For Canadian Installations, sensor case must be bonded to ground according to Section 18 of the CEC, Part 1.
2. For US Installations, sensor case must be bonded to ground according to Articles 501 and 505 of the NEC.
3. The "x" in the model code may be a number from 0 thru 9 which denotes variations in frequency response, sensitivity, and mounting configuration of the sensors.
4. An alphanumeric code (-XXXXX) following the Model Number indicates cable length and termination. Cable length not to exceed 304.5m (999ft).

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 0-M91	General Requirements – Canadian Electrical Code, Part II
C22.2 No. 142-M1987	Process Control Equipment
C22.2 No. 213-M1987	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
UL 916 (3 rd Ed.)	Energy Management Equipment
UL 1604 (3 rd Ed.)	Electrical Equipment for Use in Class I and II, Division 2; Class III Hazardous (Classified) Locations
ANSI/ISA 12.12.01-2007	Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
CAN/CSA-E60079-15:02	Electrical apparatus for explosive gas atmospheres - Part 15: Type of Protection "n"
ANSI/UL 60079-15:02	Electrical apparatus for Explosive Gas Atmospheres - Part 15: Type of Protection "n"

CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations

CLASS 2258 82 - PROCESS CONTROL EQUIPMENT – For Hazardous Locations - CERTIFIED TO U.S. STANDARDS

Ex nA IICT4:

AEx nA IIC T4:

Class I, Div. 2, Groups A, B, C, D:

Models EX649A7x and CS649A91 Vibration Sensors, input rated 12-30 Vdc max, 4-20mA; suitable for use in Class I, Div. 2 or Class I, Zone 2 locations, when installed per installation Dwg 39021 for model EX649A7x and Dwg 62195 for model CS649A91; Temp Code T4 @ Max Ambient 100 Deg C.

Notes:

1. Sensor must be installed in a suitable enclosure, acceptable to the local inspection authority having jurisdiction.
2. The "x" in the model code may be a number from 0 thru 9 which denotes variations in frequency response, sensitivity, and mounting configuration of the sensors.



Certificate: 1916514
Project: 70034576

Master Contract: 184981
Date Issued: 2015-11-20

3. An alphanumeric code (-XXXXX) following the Model Number indicates cable length and termination. Cable length not to exceed 304.5m (999ft).

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 0-M91	General Requirements – Canadian Electrical Code, Part II
C22.2 No. 142-M1987	Process Control Equipment
C22.2 No. 213-M1987	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
UL 916 (3 rd Ed.)	Energy Management Equipment
UL 1604 (3 rd Ed.)	Electrical Equipment for Use in Class I and II, Division 2; Class III Hazardous (Classified) Locations
ANSI/ISA 12.12.01-2007	Non-incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
CAN/CSA-E60079-15:02	Electrical apparatus for explosive gas atmospheres - Part 15: Type of Protection "n"
ANSI/UL 60079-15:02	Electrical apparatus for Explosive Gas Atmospheres - Part 15: Type of Protection "n"



Supplement to Certificate of Compliance

Certificate: 1916514 (103164_0_000)

Master Contract: 184981

*The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.*

Product Certification History

Project	Date	Description
70034576	2015-11-20	Update to Report 1916514 to add new model CS649A91.
1916514	2008-01-24	Model EX649Axx Series Vibration Sensors for Hazardous Locations - ia, nL, nA (North America)



LCIE

1 ATTESTATION D'EXAMEN DE TYPE VOLONTAIRE

2 **Appareil** destiné à être utilisé en atmosphères explosibles (Directive 94/9/CE)

3 Numéro de l'attestation d'examen de type
LCIE 08 ATEX 6004 X

4 Appareil

Capteur de vibrations

Type : EX649A7x

5 Demandeur : IMI Sensors

Adresse : A PCB PIEZOTRONICS DIVISION
3425 Walden Avenue
Depew, New York 14043-2495 USA

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

8 Le LCIE certifie que cet appareil ou système de protection est conforme aux exigences essentielles de sécurité et de santé pour la conception d'appareils de catégorie 3 ou système de protection destinés à être utilisés en atmosphères explosibles, données dans l'annexe II de la directive 94/9/CE du Parlement européen et du Conseil du 23 mars 1994.

Les résultats des vérifications et essais figurent dans le rapport confidentiel N° 77018/565527/4.

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

- EN 60079-0 (2006)
- EN 60079-15 (2005)

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

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

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

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

1 VOLUNTARY TYPE EXAMINATION CERTIFICATE

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

3 Type Examination Certificate number
LCIE 08 ATEX 6004 X

4 Equipment

Vibrations sensor

Type : EX649A7x

5 applicant : IMI Sensors

Address : A PCB PIEZOTRONICS DIVISION
3425 Walden Avenue
Depew, New York 14043-2495 USA

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

8 LCIE certifies that this equipment or protective system has been found to comply with the essential Health and Safety Requirements that relate to the design of category 3 equipment or protective system which is intended for use in potentially explosive atmospheres, given in Annex II of the Directive 94/9/EC of the European Parliament and Council of 23 March 1994.

The examination and test results are recorded in confidential report N° 77018/565527/4.

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

- EN 60079-0 (2006)
- EN 60079-15 (2005)

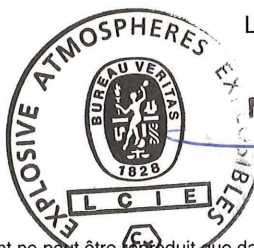
10 If the sign X is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

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

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

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

Fontenay-aux-Roses, le 30 janvier 2008



Le responsable de certification ATEX
ATEX certification manager

Marc GILLAUX

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LCIE 33, av du Général Leclerc
Laboratoire Central BP 8
des Industries Electriques 92266 Fontenay-aux-Roses cedex
Une société de Bureau Veritas France

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Société par Actions Simplifiée
au capital de 15 745 984 €
RCS Nanterre B 408 363 174

Page 1 sur 2
03-Annexe III_typ_app - rev1.DOC

13 ANNEXE

14 ATTESTATION D'EXAMEN DE TYPE
VOLONTAIRE

LCIE 08 ATEX 6004 X

15 DESCRIPTION DE L'APPAREIL OU DU SYSTEME DE
PROTECTION

Capteur de vibrations

Type : EX649A7x

Ce capteur est compose d'un ensemble piézo-cristal, d'une
carte électronique et d'un connecteur.

Paramètres spécifiques du ou des modes de protection
concernés :

$U_i \leq 30V$, $I_i \leq 100\text{ mA}$, $P_i \leq 1\text{ W}$, $C_i \approx 0$, $L_i = 28\text{ }\mu\text{H}$

Le marquage doit être :

IMI Sensors Adresse :...

Type : EX649A7x

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

 II 3G

Ex nA IIC T4

LCIE 08 ATEX 6004 X

$U_i \leq 30V$, $I_i \leq 100\text{ mA}$, $P_i \leq 1\text{ W}$, $C_i \approx 0$, $L_i = 28\text{ }\mu\text{H}$

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

16 DOCUMENTS DESCRIPTIFS

Dossier de certification N° 39029 rev NR du 18/01/08.
Ce document comprend 7 rubriques (17 pages).

17 CONDITIONS SPECIALES POUR UNE UTILISATION
SÛRE

Le matériel ne doit être raccordé qu'à un matériel dont les
paramètres électriques n'excèdent pas les valeurs
mentionnées au paragraphe 15.

Le matériel doit être installé conformément au plan
d'installation n° 39021.

Température ambiante d'utilisation : - 40°C à + 100°C.

18 EXIGENCES ESSENTIELLES DE SECURITE ET DE
SANTE

Couvertes par les normes listées au point 9.

19 VERIFICATIONS ET ESSAIS INDIVIDUELS

Néant.

13 SCHEDULE

14 VOLUNTARY TYPE EXAMINATION
CERTIFICATE

LCIE 08 ATEX 6004 X

15 DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM

Vibrations sensor

Type : EX649A7x

This apparatus is made of a piezo-cristal assembly, an
electronic board and a connector.

Specific parameters of the mode(s) of protection concerned :

$U_i \leq 30V$, $I_i \leq 100\text{ mA}$, $P_i \leq 1\text{ W}$, $C_i \approx 0$, $L_i = 28\text{ }\mu\text{H}$

The marking shall be :

IMI Sensors Adresse :...

Type : EX649A7x

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

 II 3G

Ex nA IIC T4

LCIE 08 ATEX 6004 X

$U_i \leq 30V$, $I_i \leq 100\text{ mA}$, $P_i \leq 1\text{ W}$, $C_i \approx 0$, $L_i = 28\text{ }\mu\text{H}$

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

16 DESCRIPTIVE DOCUMENTS

Certification file N° 39029 rev NR dated 18/01/08.
This file includes 7 items (17 pages).

17 SPECIAL CONDITIONS FOR SAFE USE

The apparatus must be only connected to an equipment which
electrical parameters shall not exceed the values mentioned
clause 15.

The apparatus must be installed per installation drawing 39021.

Operating ambient temperature : - 40°C to + 100°C.

18 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS

Covered by standards listed at 9.

19 ROUTINE VERIFICATIONS AND TESTS

None.



СЕРТИФИКАТ СООТВЕТСТВИЯ

№ EAЭС RU C-US.AA87.B.00217/19

Серия RU № 0124866



ОРГАН ПО СЕРТИФИКАЦИИ

Орган по сертификации взрывозащищенного и рудничного оборудования (ОС ЦСВЭ) Общества с ограниченной ответственностью «Центр по сертификации взрывозащищенного и рудничного оборудования» (ООО «НАНИО ЦСВЭ»). Адрес места нахождения юридического лица: Россия, 140004, Московская область, Люберецкий район, город Люберцы, поселок ВУГИ, АО «Завод «ЭКОМАШ», литера В, Объект 6, этаж 3, офис 26. Адрес места осуществления деятельности в области аккредитации: Россия, 140004, Московская область, Люберецкий район, город Люберцы, поселок ВУГИ, АО «Завод «ЭКОМАШ», Литера В, Объект 6, этаж 3, офисы 26/3, 26/4, 26/5, 27/6, 30/1, 32. Аттестат № RA.RU.11AA87 от 20.07.2015 г. Телефон: +7 (495) 558-83-53, +7 (495) 558-82-44. Адрес электронной почты: ccve@ccve.ru

ЗАЯВИТЕЛЬ

Общество с ограниченной ответственностью «Альфатех».

Адрес места нахождения юридического лица: Россия, 125009, Москва, Малый Гнезниковский переулок, дом № 12, помещение I, комната 4. Адрес места осуществления деятельности: Россия, 127495, Москва, Долгопрудненское шоссе, дом № 3, Технопарк «Физтехпарк».

ОГРН: 1167746393792. Телефон: +7 (495) 642-49-14. Адрес электронной почты: info@alphatechgroup.ru

ИЗГОТОВИТЕЛЬ PCB Piezotronics, Inc

Адрес места нахождения юридического лица и адрес места осуществления деятельности по изготовлению продукции: 3425 Walden Av., Depew, NY 14043, США

ПРОДУКЦИЯ

Пьезоэлектрические преобразователи, вибропереключатели, предусилители с Ex-маркировкой согласно приложению (см. бланки №№ 0621345, 0621346, 0621347).

Документы, в соответствии с которыми изготовлены изделия – см. приложение, бланк № 0621344. Серийный выпуск.

КОД ТН ВЭД ЕАЭС 9031 80 3800, 9026 20 2000, 8517 69 9000

СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ

ТР ТС 012/2011 «О безопасности оборудования для работы во взрывоопасных средах».

СЕРТИФИКАТ СООТВЕТСТВИЯ ВЫДАН НА ОСНОВАНИИ

Протокола испытаний № 235.2019-Т от 11.09.2019 Испытательной лаборатории технических устройств Автономной некоммерческой организации «Национальный испытательный и научно-исследовательский институт оборудования для взрывоопасных сред» ИЛ Ex TU (аттестат № РОСС RU.0001.21MШ19 от 16.10.2015); Акта анализа состояния производства № 35-A/19 от 14.03.2019 Органа по сертификации взрывозащищенного и рудничного оборудования (ОС ЦСВЭ) Общества с ограниченной ответственностью «Центр по сертификации взрывозащищенного и рудничного оборудования» (ООО «НАНИО ЦСВЭ») (аттестат № RA.RU.11AA87 выдан 20.07.2015); Документов, представленных заявителем в качестве доказательства соответствия продукции требованиям ТР ТС 012/2011 (см. приложение, бланк № 0621344).
Схема сертификации – 1с.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Перечень стандартов, применяемых на добровольной основе для соблюдения требований ТР ТС 012/2011 (см. приложение, бланк № 0621344). Условия и срок хранения указаны в эксплуатационной документации. Назначенный срок службы – 10 лет.

СРОК ДЕЙСТВИЯ С 13.09.2019

ПО 12.09.2024

ВКЛЮЧИТЕЛЬНО

Руководитель (уполномоченное лицо) органа по сертификации

(подпись)

Эксперт (эксперт-аудитор)
(эксперты (эксперты-аудиторы))

(подпись)



Залогин Александр Сергеевич

(Ф.И.О.)

М.П. Рафалович Борис Александрович

(Ф.И.О.)

ПРИЛОЖЕНИЕ

К СЕРТИФИКАТУ СООТВЕТСТВИЯ № ЕАЭС RU C-US.AA87.B.00217/19 Лист 1

Серия RU № 0621344

**I. ПЕРЕЧЕНЬ СТАНДАРТОВ, ПРИМЕНЯЕМЫХ НА ДОБРОВОЛЬНОЙ ОСНОВЕ
ДЛЯ СОБЛЮДЕНИЯ ТРЕБОВАНИЙ ТР ТС 012/2011 «О БЕЗОПАСНОСТИ ОБОРУДОВАНИЯ
ДЛЯ РАБОТЫ ВО ВЗРЫВООПАСНЫХ СРЕДАХ»**

Обозначение стандартов	Наименование стандартов
ГОСТ 31610.0-2014 (IEC 60079-0:2011)	Взрывоопасные среды. Часть 0. Оборудование. Общие требования
ГОСТ IEC 60079-1-2011	Взрывоопасные среды. Часть 1. Оборудование с видом взрывозащиты «взрывонепроницаемые оболочки «d»
ГОСТ 31610.11-2014 (IEC 60079-11:2011)	Взрывоопасные среды. Часть 11. Оборудование с видом взрывозащиты «искробезопасная электрическая цепь «i»
ГОСТ 31610.15-2012/МЭК 60079-15:2005	Электрооборудование для взрывоопасных газовых сред. Часть 15. Конструкция, испытания и маркировка электрооборудования с видом защиты «п»

**II. ДОКУМЕНТЫ, ПРЕДСТАВЛЕННЫЕ ЗАЯВИТЕЛЕМ В КАЧЕСТВЕ ДОКАЗАТЕЛЬСТВА
СООТВЕТСТВИЯ ПРОДУКЦИИ ТРЕБОВАНИЯМ ТР ТС 012/2011**

Руководства по эксплуатации: № 750119 от 23.01.19, № 830119 от 23.01.19, № 940219 от 07.02.19, № 630119 от 22.01.19, № 610119 от 22.01.19, № 910219 от 07.02.19, № 950219 от 08.02.19, № 970219 от 08.02.19.
Технические файлы: № 54202 от 02.02.2017, № 54204 от 02.02.2017, № 22438 С от 19.07.2012, № 62501 от 06.10.2016, № 33699 от 16.06.2016, № 56178 от 01.07.2016, № 70893 от 24.07.2019, № 54707 от 10.08.2016, № 48813 от 06.01.2011
Чертежи: № 47912 от 31.03.2017, № 49038 от 31.03.2017.
Перечень стандартов см. п. I.

III. ДОКУМЕНТЫ, В СООТВЕТСТВИИ С КОТОРЫМИ ИЗГОТОВЛЕНА ПРОДУКЦИЯ

Технические файлы: № 54202 от 02.02.2017, № 54204 от 02.02.2017, № 22438 С от 19.07.2012, № 62501 от 06.10.2016, № 33699 от 16.06.2016, № 56178 от 01.07.2016, № 70893 от 24.07.2019, № 54707 от 10.08.2016, № 48813 от 06.01.2011
Чертежи: № 47912 от 31.03.2017, № 49038 от 31.03.2017

Руководитель (уполномоченное
лицо) органа по сертификации

(подпись)

Эксперт (эксперт-аудитор)
(эксперты (эксперты-аудиторы))

(подпись)



Залогин Александр Сергеевич
(Ф.И.О.)

М.П.

Рафалович Борис Александрович
(Ф.И.О.)

ПРИЛОЖЕНИЕ

К СЕРТИФИКАТУ СООТВЕТСТВИЯ № ЕАЭС RU C-US.AA87.B.00217/19 Лист 2

Серия **RU** № **0621345**

1. НАЗНАЧЕНИЕ И ОБЛАСТЬ ПРИМЕНЕНИЯ

Пьезоэлектрические преобразователи (далее – преобразователи) предназначены для контроля параметров вибрации, динамического давления и преобразования их в электрический сигнал.

Вибропереключатели предназначены для контроля уровня вибрации и защиты оборудования от повышенной вибрации.

Предусилители предназначены для преобразования зарядового сигнала в вольтовый.

Область применения - взрывоопасные зоны помещений и наружных установок согласно Ех-маркировке, ГОСТ IEC 60079-14-2013, регламентирующих применение во взрывоопасных средах.

2. СТРУКТУРНОЕ ОБОЗНАЧЕНИЕ

2.1. Преобразователи 176ХУУ/МЗЗЗ-АА

Х – от А до Z ревизия продукта, не влияющая на взрывозащиту

УУ – от 01 до 99 для индикации вариантов монтажа, диафрагмы, кабелей или разъемов

М – опционально для указания метрической длины кабеля

ЗЗЗ – от 001 до 999 опционально для указания длины кабеля в футах: (не более 200 футов) или метрах: (не более 61 м)

АА – от 01 до 99 опционально для указания дробной длины кабеля в дюймах или сантиметрах, не влияющей на взрывозащиту

2.2. Преобразователи 351abcd

a – ревизия продукта, может быть: А, В, С, D, E, F, G, H, I, J, K, L или М, не влияющая на взрывозащиту

b – первая цифра вариации продукта, может быть: 0, 1, 2, 3, 4, 5, 6, 7, 8 или 9, не влияющая на взрывозащиту

c – вторая цифра вариации продукта, может быть: 0, 1, 2, 3, 4, 5, 6, 7, 8 или 9, не влияющая на взрывозащиту

d – третья цифра вариации продукта, может быть: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 или отсутствует, не влияющая на взрывозащиту

2.3 Преобразователи EX(TO)(M)602yzzzlaaa, EX(TO)(M)603yzzzlaaa, EX(TO)(M)606yzzzlaaa, EX(TO)(M)607yzzzlaaa,

EX(TO)(M)608yzzzlaaa, EX(M)637ХУУУУ, (M)638ХУУУУ

ХХ = ТО (с температурным выходом), М (с метрической резьбой),

y = одна буква от А до Z, не влияющая на взрывозащиту

zzz = две или три цифры от 00 до 999, не влияющие на взрывозащиту

aaa = длина кабеля и/или тип разъема

2.4 Предусилители EX682ХУУУ

Х – ревизия продукта (А, В ... М), не влияющая на взрывозащиту

УУУ: параметры фильтрации, усиления, частотная характеристика, ... (от 1 до 999), не влияющие на взрывозащиту

2.5. Преобразователи EX(RV)(TO)(M)64хухх, EX(RV)(TO)(M)649ухх, EX (RV)(TO) (M)686ухх

ХХ = М (с метрической резьбой), ТО (с температурным выходом), RV (с доп. вольтовым выходом).

Буквы х являются переменными цифрами (значения от 0 до 9), не влияющими на взрывозащиту

y = одна буква от А до Z, не влияющая на взрывозащиту

2.6 Преобразователи EX (ХХ) 622yzzzl / aaa, EX (ХХ) 623yzzzl / aaa, EX (ХХ) 625yzzzl / aaa, EX (ХХ) 628yzzzl / aaa

ХХ = НТ (Высокотемпературная версия), М (с метрической резьбой), ТО (с температурным выходом), VO (с выходом по скорости).

y = одна буква от А до Z, не влияющая на взрывозащиту

zzz = две или три цифры от 00 до 999, не влияющие на взрывозащиту

aaa = длина кабеля и/или тип разъема

2.7 Вибропереключатели 685ухх

Буквы х являются переменными цифрами (значения от 0 до 9), не влияющими на взрывозащиту

y = одна буква от А до Z, не влияющая на взрывозащиту

Руководитель (уполномоченное
лицо) органа по сертификации

(подпись)

Эксперт (эксперт-аудитор)
(эксперты (эксперты-аудиторы))

(подпись)



Залогин Александр Сергеевич
(Ф.И.О.)

Рафалович Борис Александрович
(Ф.И.О.)

ПРИЛОЖЕНИЕ

К СЕРТИФИКАТУ СООТВЕТСТВИЯ № ЕАЭС RU C-US.AA87.B.00217/19 Лист 3

Серия RU № 0621346

3. ОСНОВНЫЕ ТЕХНИЧЕСКИЕ ДАННЫЕ

3.1. Ех-маркировка: преобразователей 176XYU/MZZ-AA	0Ex ia IIC T660°C...T6 Ga X
преобразователей 351abcd	0Ex ia IIC T4 Ga X
вибропереключателей 685yxx	1Ex d IIB+H ₂ T4 Gb
преобразователей EX(TO)(M)602yzzz1aaa, EX(TO)(M)603yzzz/aaa, EX(TO)(M)606yzzz/aaa, EX(TO)(M)607yzzz/aaa, EX(TO)(M)608yzzz/aaa	2Ex nA IIC T4 Gc X или 0Ex ia IIC T4 Ga X
преобразователей EX(M)637XYUZY, (M)638XYUZY	0Ex ia IIC T4 Ga X или 2Ex nA IIC T4 Gc X
предусилителей EX682XYUZY	0Ex ia IIC T4 Ga X или 2Ex nA IIC T4 Gc X
EX(RV)(TO)(M)64хухх, EX(RV)(TO)(M)649ухх, EX (RV)(TO) (M)686ухх	1Ex d IIC T4 Gb X или 1Ex d IIC T3 Gb X
преобразователей EX (XX) 622yzzz / aaa, EX (XX) 623yzzz / aaa, EX (XX) 625yzzz / aaa, EX (XX) 628yzzz / aaa	2Ex nA IIC T4 Gc X
3.2. Диапазон температур окружающей среды, °C, преобразователей 176XYU/MZZ-AA	от -70 до 650
преобразователей 351abcd	от -196 до 121
вибропереключателей 685yxx	от -25 до 60
преобразователей EX(TO)(M)602yzzz1aaa, EX(TO)(M)603yzzz/aaa, EX(TO)(M)606yzzz/aaa, EX(TO)(M)607yzzz/aaa, EX(TO)(M)608yzzz/aaa	от -54 до 121
преобразователей EX(M)637XYUZY, (M)638XYUZY	от -196 до 121
предусилителей EX682XYUZY	от -40 до 85
преобразователей EX(RV)(TO)(M)64хухх, EX(RV)(TO)(M)649ухх, EX (RV)(TO) (M)686ухх	от -20 до 80
преобразователей EX (XX) 622yzzz / aaa, EX (XX) 623yzzz / aaa, EX (XX) 625yzzz / aaa, EX (XX) 628yzzz / aaa	от -54 до 121

3.3. Входные искробезопасные электрические параметры преобразователей, предусилителей:

Модель	U _i , В	I _i , мА	P _i , Вт	C _i , нФ	L _i , мГн
преобразователей 176XYU/MZZ-AA	30	300	1	5	0,5
преобразователей 351abcd	28	200	1,2	61	305 мкГн
преобразователей EX(TO)(M)602yzzz1aaa, EX(TO)(M)603yzzz/aaa, EX(TO)(M)606yzzz/aaa, EX(TO)(M)607yzzz/aaa, EX(TO)(M)608yzzz/aaa	28	200	1	16,2 или 77,2 (с кабелем)	пренебрежимо мала или 305 мкГн (с учетом кабеля 305м)
преобразователей EX(M)637XYUZY, (M)638XYUZY	28	93	0,65	6,5	пренебрежимо мала
предусилителей EX682XYUZY	28	100	0,7	пренебрежимо мала	пренебрежимо мала

Руководитель (уполномоченное
лицо) органа по сертификации

Эксперт (эксперт-аудитор)
(эксперты (эксперты-аудиторы))



Залогин Александр Сергеевич

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М.П. Рафалович Борис Александрович

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ПРИЛОЖЕНИЕ

К СЕРТИФИКАТУ СООТВЕТСТВИЯ № ЕАЭС RU C-US.AA87.B.00217/19 Лист 4

Серия RU № 0621347

3.4. Электрические параметры:

3.4.1 вибропереключателей 685ухх

Напряжение питания, В 85-245 (AC), 24 (DC)
Максимальный ток, mA 1503.4.2 преобразователей EX(TO)(M)602yzzz/aaa, EX(TO)(M)603yzzz/aaa, EX(TO)(M)606yzzz/aaa, EX(TO)(M)607yzzz/aaa, EX(TO)(M)608yzzz/aaa, EX (XX) 622yzzz / aaa, EX (XX) 623yzzz / aaa, EX (XX) 625yzzz / aaa, EX (XX) 628yzzz / aaa
с Ex-маркировкой 2Ex пА ПС Т4 Gc X:Напряжение питания, В 28
Максимальный ток, mA 200
Мощность, Вт 1

3.4.3 преобразователей EX(M)637XYYYZ, (M)638XYYYZ

Напряжение питания, В 18 – 28
Максимальный ток, mA 1,6 – 20
Мощность, Вт 0,5

3.4.4 Предусилителей EX682XYYY

Напряжение питания, В 22 – 28
Максимальный ток, mA 3,1 – 4,1
Мощность, Вт 0,1

3.4.5 преобразователей EX(RV)(TO)(M)64уххх, EX(RV)(TO)(M)649ухх, EX (RV)(TO) (M)686ухх

Напряжение питания, В 18 – 30
Максимальный ток, mA 1,6 – 20
Мощность, Вт 0,5

4. ОПИСАНИЕ КОНСТРУКЦИИ И СРЕДСТВ ОБЕСПЕЧЕНИЯ ВЗРЫВОЗАЩИЩЕННОСТИ

Преобразователи состоят из герметичного цилиндрического металлического корпуса, в котором размещается печатная плата и пьезокристаллический элемент. Сборка подключается к разъему или встроенному кабелю. На наружной поверхности корпуса преобразователя нанесена маркировка.

Вибропереключатели серии 685ухх выполнены в металлическом корпусе, внутри которого размещена электронная плата. На наружной поверхности корпуса нанесена маркировка.

Предусилители серии EX682XYYY выполнены в прямоугольном пластиковом корпусе с креплением на DIN рейку. Внутри корпуса размещена электронная плата. На корпусе размещен съемный клеммный блок. На наружной поверхности корпуса нанесена маркировка.

Подробное описание конструкции приведено в Руководствах по эксплуатации №750119 от 23.01.19, №830119 от 23.01.19, №940219 от 07.02.19, №630119 от 22.01.19, №610119 от 22.01.19, №910219 от 07.02.19, №950219 от 08.02.19, №970219 от 08.02.19

Взрывозащищенность преобразователей, вибропереключателей и предусилителей обеспечивается выполнением требований: ГОСТ 31610.15-2012/МЭК 60079-15:2005, ГОСТ 31610.0-2014 (IEC 60079-0:2011), ГОСТ IEC 60079-1-2011, ГОСТ 31610.11-2014 (IEC 60079-11:2011), в соответствии с Ex-маркировкой.

5. МАРКИРОВКА

Маркировка, наносимая на преобразователи, вибропереключатели и предусилители, включает следующие данные:

- товарный знак или наименование предприятия-изготовителя;
- серийный номер или номер партии;
- диапазон значений температур окружающей среды при эксплуатации;
- Ex-маркировку;
- специальный знак взрывобезопасности;
- наименование центра по сертификации и номер сертификата;
- предупредительные надписи;
- искробезопасные параметры

и другие данные, которые изготовитель должен отразить в маркировке, в соответствии с требованиями нормативной и технической документации.

6. СПЕЦИАЛЬНЫЕ УСЛОВИЯ ПРИМЕНЕНИЯ

5.1 Знак X, стоящий после Ex-маркировки, означает, что при эксплуатации преобразователей, вибропереключателей, предусилителей необходимо соблюдать следующие специальные условия:

- преобразователи, вибропереключатели, предусилители должны быть подключены к сертифицированному на соответствие требованиям ТР ТС 012/2011 источнику питания с соответствующей областью применения.

5.2 Свободные концы постоянно подсоединенного кабеля должны подключаться в сертифицированной на соответствие требованиям ТР ТС 012/2011 соединительной коробке или вне взрывоопасной зоны.

Специальные условия применения, обозначенные знаком X, отражены в сопроводительной документации, подлежащей обязательной поставке в комплекте с каждым изделием.

Внесение изменений в конструкцию изделий возможно только по согласованию с ОС ЦСВЭ в соответствии с требованиями ТР ТС 012/2011.

Руководитель (уполномоченное
лицо) органа по сертификации

Эксперт (эксперт-аудитор)
(эксперты (эксперты-аудиторы))

(подпись)

(подпись)



Залогин Александр Сергеевич

(Ф.И.О.)

М.П. Рафалович Борис Александрович

(Ф.И.О.)



LCIE

1 ATTESTATION D'EXAMEN CE DE TYPE

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

3 Numéro de l'attestation d'examen CE de type
LCIE 08 ATEX 6003 X

4 Appareil ou système de protection :
Capteur de vibrations
Type : EX649A7x

5 Demandeur : IMI Sensors
Adresse : A PCB PIEZOTRONICS DIVISION
3425 Walden Avenue
Depew, New York 14043-2495 USA

6 Fabricant : IMI Sensors
Adresse : A PCB PIEZOTRONICS DIVISION
3425 Walden Avenue
Depew, New York 14043-2495 USA

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

8 Le LCIE, organisme notifié sous la référence 0081 conformément à l'article 9 de la directive 94/9/CE du Parlement européen et du Conseil du 23 mars 1994, certifie que cet appareil ou système de protection est conforme aux exigences essentielles de sécurité et de santé pour la conception et la construction d'appareils et de systèmes de protection destinés à être utilisés en atmosphères explosibles, données dans l'annexe II de la directive. Les résultats des vérifications et essais figurent dans le rapport confidentiel N° 77018/565527/1.

9 Le respect des exigences essentielles de sécurité et de santé est assuré par la conformité à :
- EN 60079-0 (2006)
- EN 60079-11 (2007)

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

11 Cette attestation d'examen CE de type concerne uniquement la conception et la construction de l'appareil ou du système de protection spécifié, conformément à l'annexe III de la directive 94/9/CE. Des exigences supplémentaires de la directive sont applicables pour la fabrication et la fourniture de l'appareil ou du système de protection. Ces dernières ne sont pas couvertes par la présente attestation.

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

Fontenay-aux-Roses, le 30 janvier 2008

1 EC TYPE EXAMINATION CERTIFICATE

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

3 EC type examination certificate number
LCIE 08 ATEX 6003 X

4 Equipment or protective system :
Vibrations sensor
Type : EX649A7x

5 Applicant : IMI Sensors
Address : A PCB PIEZOTRONICS DIVISION
3425 Walden Avenue
Depew, New York 14043-2495 USA

6 Manufacturer : IMI Sensors
Address : A PCB PIEZOTRONICS DIVISION
3425 Walden Avenue
Depew, New York 14043-2495 USA

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

8 LCIE, notified body number 0081 in accordance with article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment or protective system has been found to comply with the essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in confidential report N° 77018/565527/1.

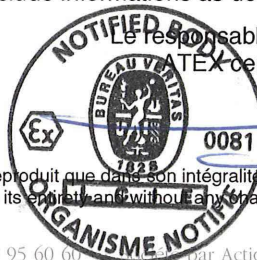
9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with :
- EN 60079-0 (2006)
- EN 60079-11 (2007)

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

11 This EC type examination certificate relates only to the design and construction of this specified equipment or protective system in accordance with annex III to the directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

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

Le responsable de certification ATEX
ATEX certification manager



Marc Gillaux
MARC GILLAUX

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Page 1 of 2
01-Annexe III_CE_typ_app - rev0.DOC



LCIE



13 ANNEXE

14 ATTESTATION D'EXAMEN CE DE TYPE

LCIE 08 ATEX 6003 X

15 DESCRIPTION DE L'APPAREIL OU DU SYSTEME DE PROTECTION

Capteur de vibrations

Type : EX649A7x

Ce capteur est composé d'un ensemble piézo-cristal, d'une carte électronique et d'un connecteur.

Paramètres spécifiques du ou des modes de protection concernés :

$U_i \leq 30V$, $I_i \leq 100 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \approx 0$, $L_i = 28 \mu\text{H}$

Le marquage doit être :

IMI Sensors Adresse : ...

Type : EX649A7x

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

Ex II 1G

Ex ia IIC T4

LCIE 08 ATEX 6003 X

$U_i \leq 30V$, $I_i \leq 100 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \approx 0$, $L_i = 28 \mu\text{H}$

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

16 DOCUMENTS DESCRIPTIFS

Dossier de certification N° 39027 rev NR du 18/01/08.
Ce document comprend 7 rubriques (17 pages).

17 CONDITIONS SPECIALES POUR UNE UTILISATION SÛRE

Le matériel ne doit être raccordé qu'à un matériel associé de sécurité intrinsèque certifié et cette association doit être compatible du point de vue de la sécurité intrinsèque (voir paramètres électriques au paragraphe 15).

Le matériel doit être installé conformément au plan d'installation n° 39021.

Température ambiante d'utilisation : - 40°C à + 100°C.

18 EXIGENCES ESSENTIELLES DE SECURITE ET DE SANTE

Couvertes par les normes listées au point 9.

19 VERIFICATIONS ET ESSAIS INDIVIDUELS

Néant.

13 SCHEDULE

14 EC TYPE EXAMINATION CERTIFICATE

LCIE 08 ATEX 6003 X

15 DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM

Vibrations sensor

Type : EX649A7x

This apparatus is made of a piezo-cristal assembly, an electronic board and a connector.

Specific parameters of the mode(s) of protection concerned :

$U_i \leq 30V$, $I_i \leq 100 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \approx 0$, $L_i = 28 \mu\text{H}$

The marking shall be :

IMI Sensors Address : ...

Type : EX649A7x

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

Ex II 1G

Ex ia IIC T4

LCIE 08 ATEX 6003 X

$U_i \leq 30V$, $I_i \leq 100 \text{ mA}$, $P_i \leq 1 \text{ W}$, $C_i \approx 0$, $L_i = 28 \mu\text{H}$

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

16 DESCRIPTIVE DOCUMENTS

Certification file N° 39027 rev NR dated 18/01/08.
This file includes 7 items (17 pages).

17 SPECIAL CONDITIONS FOR SAFE USE

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

The apparatus must be installed per installation drawing 39021.

Operating ambient temperature : - 40°C to + 100°C.

18 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS

Covered by standards listed at 9.

19 ROUTINE VERIFICATIONS AND TESTS

None.