



**Model 602M64**  
**Industrial 3-Wire Accelerometer**  
**Installation and Operating Manual**

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

**Toll-free: 800-959-4464**  
**24-hour SensorLine: 716-684-0001**  
**Fax: 716-684-3823**  
**E-mail: [imi@pcb.com](mailto:imi@pcb.com)**  
**Web: [www.imi-sensors.com](http://www.imi-sensors.com)**



## Repair and Maintenance

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

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

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

## Calibration

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

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

## Returning Equipment

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

## Contact Information

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

For a complete list of distributors, global offices and sales representatives, visit our website, [www.pcb.com](http://www.pcb.com).

## Safety Considerations

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

Discontinue use and contact our 24-Hour Sensorline if:

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

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

## Definition of Terms and Symbols

The following symbols may be used in this manual:



### DANGER

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

**CAUTION**

Refers to hazards that could damage the instrument.

**NOTE**

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

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



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



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



This symbol indicates safety, earth ground.



PCB工业监视和测量设备 - 中国RoHS2公布表

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

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

CHINA RoHS COMPLIANCE

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

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

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

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

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

	ENGLISH	SI	
<b>Performance</b>			
Sensitivity(± 20 %)	100 mV/g	10.2 mV/(m/s <sup>2</sup> )	[1]
Measurement Range(12 VDC)	± 50 g	± 490 m/s <sup>2</sup>	[2]
Measurement Range(5 VDC)	± 15 g	± 147 m/s <sup>2</sup>	[2]
Frequency Range(± 3 dB)	90 to 480,000 cpm	1.5 to 8,000 Hz	[3]
Resonant Frequency	1,500 kcpm	25 kHz	[2]
Broadband Resolution(1 to 10,000 Hz)	2 mg	19.6 mm/s <sup>2</sup>	[2]
Non-Linearity	± 1 %	± 1 %	[4]
Transverse Sensitivity	≤ 7 %	≤ 7 %	
<b>Environmental</b>			
Overload Limit(Shock)	5,000 g pk	49,050 m/s <sup>2</sup> pk	
Temperature Range	-65 to +250 °F	-54 to +121 °C	
Temperature Response	See Graph	See Graph	[2]
Enclosure Rating	IP68	IP68	
<b>Electrical</b>			
Settling Time(within 1% of bias)	≤ 5.0 sec	≤ 5.0 sec	
Discharge Time Constant	≥ 0.1 sec	≥ 0.1 sec	
Excitation Voltage	5 to 12 VDC	5 to 12 VDC	
Output Impedance	< 100 Ohm	< 100 Ohm	
Current Draw	0.5 mA	0.5 mA	[2]
Output Bias Voltage	2.5 to 6 VDC	2.5 to 6 VDC	
Spectral Noise(10 Hz)	18 µg/√Hz	176.6 (µm/sec <sup>2</sup> )/√Hz	[2]
Spectral Noise(100 Hz)	4 µg/√Hz	39.2 (µm/sec <sup>2</sup> )/√Hz	[2]
Spectral Noise(1 kHz)	2 µg/√Hz	19.6 (µm/sec <sup>2</sup> )/√Hz	[2]
Electrical Isolation(Case)	> 10 <sup>8</sup> Ohm	> 10 <sup>8</sup> Ohm	
<b>Physical</b>			
Size (Length x Width x Height)	1.65 in x 0.74 in x 0.845 in	41.9 mm x 18.8 mm x 21.5 mm	
Weight	2.61 oz	74.0 gm	
Mounting Thread	1/4-28 Male	No Metric Equivalent	[5]
Mounting Torque	2 to 5 ft-lb	2.7 to 6.8 Nm	
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	3-Pin MIL-C-5015	3-Pin MIL-C-5015	
Electrical Connection Position	Side	Side	

**OPTIONAL VERSIONS**

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

**M** - Metric Mount  
Supplied Accessory: Model M081B97 Captive Mounting Bolt, M6 x 1 x 25 mm long, hex head (1)


**NOTES:**

[1] Conversion Factor 1g = 9.81 m/s<sup>2</sup>.  
 [2] Typical.  
 [3] The high frequency tolerance is accurate within ±10% of the specified frequency.  
 [4] Zero-based, least-squares, straight line method.  
 [5] 1/4-28 has no equivalent in S.I. units.  
 [6] See PCB Declaration of Conformance PS205 for details.

**SUPPLIED ACCESSORIES:**

Model 081B97 Captive Mounting Bolt 316SS - 7/16 HEX 1/4-28 UNF (1)

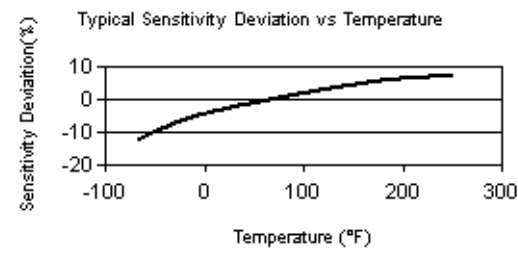
Entered: LK	Engineer: GD	Sales: MC	Approved: BAM	Spec Number:
Date: 09/15/2020	Date: 09/15/2020	Date: 09/15/2020	Date: 09/15/2020	36466



**IMI SENSORS**  
A PCB PIEZOTRONICS DIV.

3425 Walden Avenue, Depew, NY 14043

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

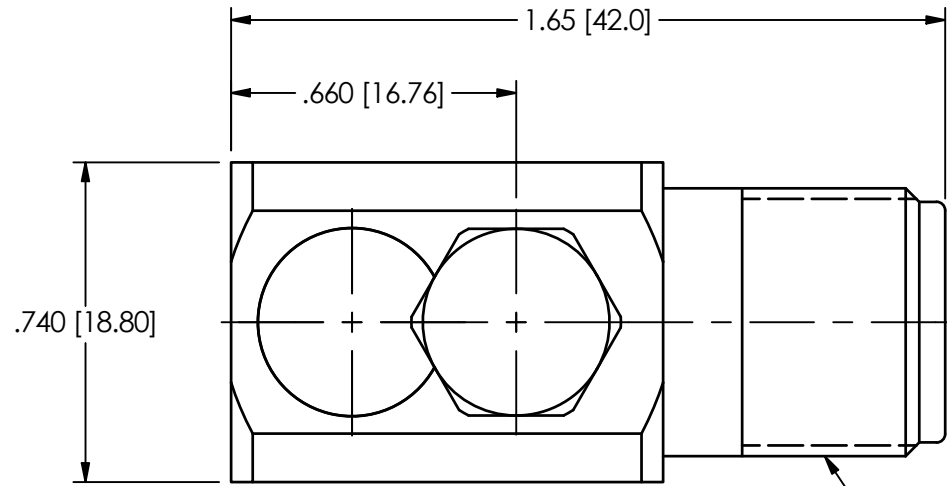


All specifications are at room temperature unless otherwise specified.  
 In the interest of constant product improvement, we reserve the right to change specifications without notice.  
 ICP® is a registered trademark of PCB Piezotronics, Inc.

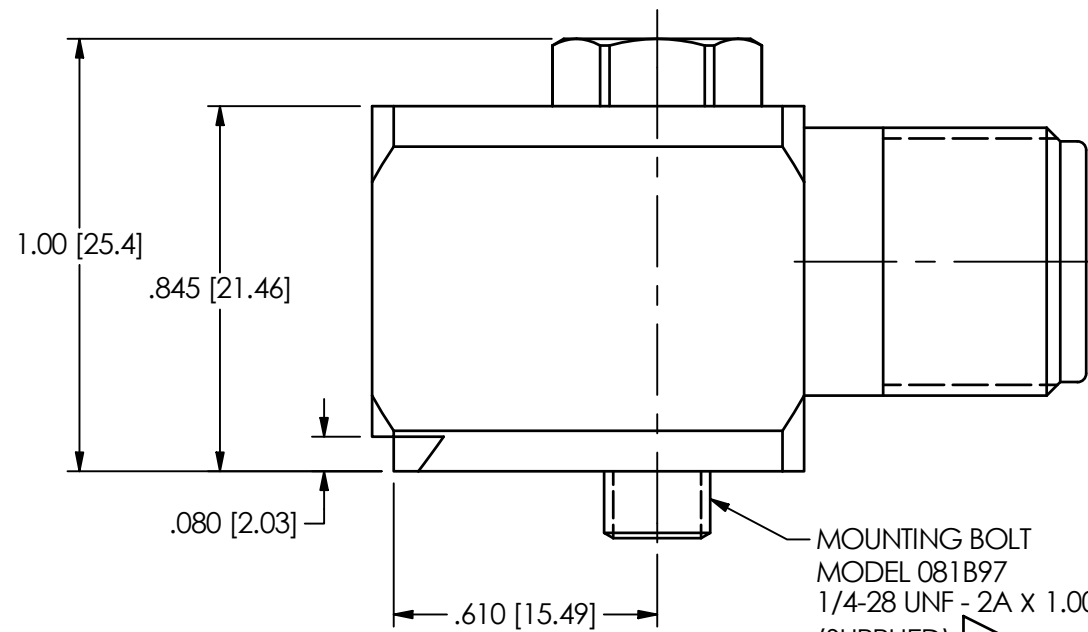
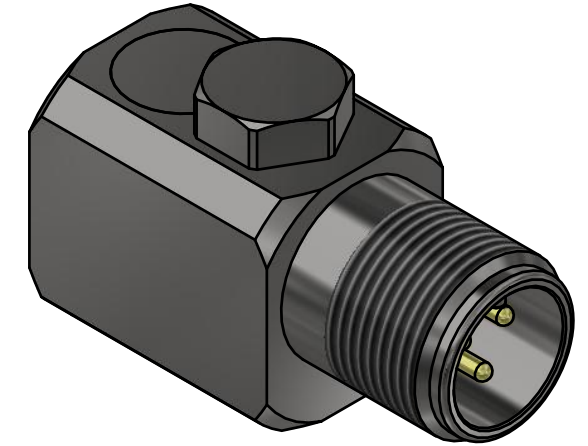
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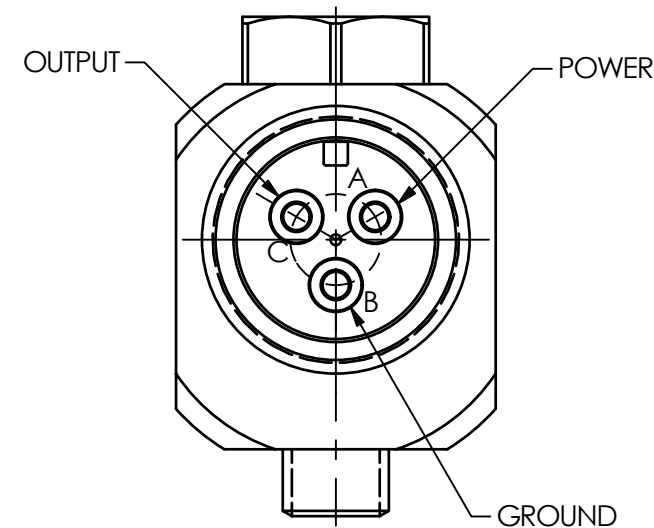
REVISIONS		
REV	DESCRIPTION	DIN
A	MODIFY TITLE BLOCK	51059



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



MOUNTING BOLT  
MODEL 081B97  
1/4-28 UNF - 2A X 1.00 [25.4] LONG  
(SUPPLIED) 1



1 FOR METRIC ACCELEROMETER USE MOUNTING BOLT MODEL M081B97, M6x1.00-6g X 1.00 [25.4] LONG

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	JJF	9/14/20	JJF	9/14/20	GCD	9/14/20		
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ±0.8 XX ±0.25	TITLE OUTLINE DRAWING 3-WIRE ACCELEROMETER						CODE IDENT. NO. 52681	DWG. NO. <b>36467</b>
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES							SCALE: 2.25X	
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13								



**SIL Declaration of Conformity**  
Functional safety according to IEC 61508

Manufacturer: PCB Piezotronics  
3425 Walden Avenue  
Depew, NY 14043 USA

PCB Piezotronics declares as manufacturer, that the vibration transmitters:

- 602 Series (XX)602yzzz/aaa
- 603 Series (XX)603yzzz/aaa
- 606 Series (XX)606yzzz/aaa
- 607 Series (XX)607yzzz/aaa
- 608 Series (XX)608yzzz/aaa

(XX) Options include one or more of the following:

EX – Approved for Hazardous Locations

M – Metric Mounting Hardware

TO – Dual Output (Vibration/Temperature)

Note: “yzzz” completes the model, “aaa” indicates cable length (if applicable)

Is hardware suitable for use in safety-instrumented systems according to IEC 61508, if the safety instructions and the following parameters are observed:

Parameter	60x Series*	EX60x Series*
SIL	2	2
Proof Test Interval (Annual)	8,760 h	8,760 h
Device Type	B	B
HFT	0	0
SFF	79.59%	79.59%
PFD <sub>AV</sub> <sup>1</sup>	7.45 x 10 <sup>-5</sup>	7.45 x 10 <sup>-5</sup>
$\lambda_{du} \times 10^{-6}$	0.3348	0.3348
SIL Capability (Low Demand Mode)	2	2
SIL Capability (Continuous Demand Mode)	2	2
MTTF <sup>2</sup>	9.5 y	9.5 y
1. The values comply with SIL2 according to ISA S84.01 2. According to Siemens SN29500 and Proven In Use data		

\* With or without the M (metric) option

The PCB sensor hardware is suitable for inclusion in Safety Instrumented Systems (SIS) that are designed using IEC 61511 (for the process industry sector), IEC 62061 (safety of machinery), EN 50129 (railway applications), and ISO 26262 (automotive industry).

Note: The use of SIL Hardware in specific safety standard application may apply different number of sequences or definitions to those in IEC 61508.

July 2, 2019

PCB Piezotronics Authorized Representative:

Carrie Termin  
Regulatory Affairs and Product Certification Specialist



**PCB PIEZOTRONICS, INC. — CORPORATE HEADQUARTERS**

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Web site: www.pcb.com

**AS9100 and ISO9001 Certified**  
**ISO17025 Accredited**



# INTERTEK ASSURANCE SAFETY INTEGRITY LEVEL SUMMARY REPORT 60X PCB SIL SENSOR RATING

**CLIENT NAME**

PCB Piezotronics, Inc.  
3425 Walden Ave  
Depew, NY 14043-2417

**REPORT NO**

103685042CSLT-003

**COMPILED BY**

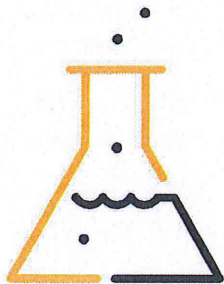
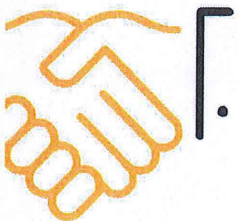
Ashton D. Hainge, CFSP, PMP

**PROJECT NAME**

G103685042

**DATE**

02 April 2019





## PCB FUNCTIONAL SAFETY SIL SUMMARY AND RESULTS

### Summary

This report details the results of the reliability analysis performed on the PCB Piezotronics ICP Sensor model 60X series. Design changes from this documentation package would need to be evaluated for the impact on the reliability characteristics. These results are based on the following PCB Piezotronics documentation:

1. Electrical schematic 23402-NR
2. 603C01 MTTF Calculation
3. 602C11 – 602D11 MTTF Calculation
4. 607-608 MTTF Calculation
5. Manual of 603C01

### Results

The results from the FMEA are given below for the ICP Sensor model 60X Series:

Name	Result
Architecture	1oo1
Proof test interval (Annual)	8,760 h
PFD <sub>avg</sub>	7.45x10 <sup>-5</sup>
SFF	79.59%
HFT	0
SIL Capability (Low Demand Mode)	2
SIL Capability (Continuous Demand Mode)	2
Architecture	1oo1

**PCB Sensor Product Meets SIL 2 Capability**





Name		Result
Safe Detected failure rate	$\lambda_{SD} \times 10^{-6}$	0.019
Safe Undetected failure rate	$\lambda_{SU} \times 10^{-6}$	0.013
Dangerous Detected failure rate	$\lambda_{DD} \times 10^{-6}$	0.033
Dangerous Undetected failure rate	$\lambda_{DU} \times 10^{-6}$	0.017
Average frequency of a dangerous failure on demand	PFH $\times 10^{-6}$	0.796

#### Type B components: 60X Series

The safety relevant parameter  $PFD_{avg}$  is in compliance with the corresponding requirements for SIL 2 according to IEC 61508<sup>1</sup>. The safety relevant parameters HFT and SFF are in compliance with the corresponding requirements for SIL 1 according to IEC 61508. The user should consider, that the hardware fault tolerance of all inspected devices is zero and that a single fault can lead to a dangerous failure. Even though  $PFD_{avg}$  has the range of SIL 4, the hardware fault tolerance limits the capability to SIL 2.

Senior Consultant,

Ashton Hainge, Intertek  
CFSP, PMP

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<sup>1</sup> The assessment results described in this report only refer to the safety-related parameters PFD avg, HFT, and SFF according to IEC 61508.

This report does not make any statements, that the manufacturer meets all other requirements of the above cited standards for hardware, software, documentation, management of functional safety, verification, and validation.

This report does not imply that the examined pressure sensors have been certified for functional safety by the assessor according to IEC 61508 or any other standards.

The sensors are only one part of a complete safety function. It is at the responsibility of the end-user to prepare and to apply an extensive reliability model, that brings out the complete safety function and that meets all requirements of the claimed SIL level according to IEC 61508.