

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 _{AV} ¹ | 7.45 x 10 ⁻⁵ | 7.45 x 10 ⁻⁵ |
| $\lambda_{du} \times 10^{-6}$ | 0.3348 | 0.3348 |
| SIL Capability (Low Demand Mode) | 2 | 2 |
| SIL Capability (Continuous Demand Mode) | 2 | 2 |
| MTTF ² | 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

3425 Walden Avenue, Depew, New York 14043-2495 USA

Phone: 716-684-0001 Fax: 716-684-0987

E-mail: info@pcb.com

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

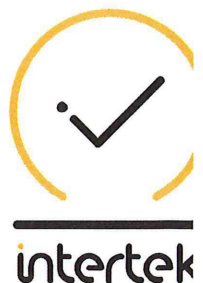
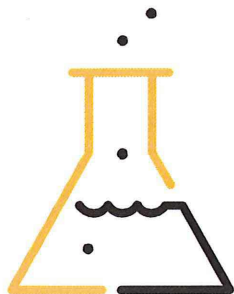
Ashton D. Hainge, CFSP, PMP

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 | 1001 |
| Proof test interval (Annual) | 8,760 h |
| PFD _{avg} | 7.45x10⁻⁵ |
| SFF | 79.59% |
| HFT | 0 |
| SIL Capability (Low Demand Mode) | 2 |
| SIL Capability (Continuous Demand Mode) | 2 |
| Architecture | 1001 |

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 61508¹. 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

¹ 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.