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

CLIENT NAME
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REPORT NO
103685042CSLT-003

COMPILED BY
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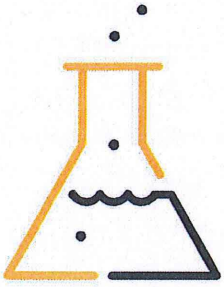

PCB FUNCTIONAL SAFETY SIL SUMMARY AND RESULTS

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_{avg}	**$7.45x10^{-5}$**
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 x 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[1]. 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 PFDavg has the range of SIL 4, the hardware fault tolerance limits the capability to SIL 2.

Senior Consultant,

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[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.