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## CERTIFICATE of RELIABILITY and FUNCTIONAL SAFETY

This is to certify that

The D1xS1&S2, GNExS1&S2, STExS1&S2, range of dc Sounders provided by European Safety Systems, Impress House, Mansell Road, London W3 7QH UK. has been assessed and is considered suitable for use in a low demand safety function:

- As an unvoted item (ie hardware fault tolerance of 0) at SIL 2

This claim is in respect of random hardware failures and architectural constraints (ie safe failure fraction). The assessment was based on the assumptions, proven-in-use data provided, and recommendations given in Technis Report T1023 (Issue 1.0). The product was assessed against the failure modes:

- Failure respond to an input with a correct tone
- Failure respond to an input even with a an alternative tone
  - Spurious sound output despite no input

The products include the following:

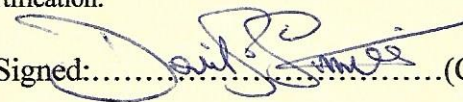
- D1xS1&S2; GNExS1&S2, STExS1&S2

The assessment was carried out having regard to the guidance in IEC 61508 [2010] and the related body of guidance in respect of:

- Random Hardware Failures and Architectural Constraints [route 1<sub>H</sub>]

The validity of this certificate requires that:

The product is used in accordance with any assumptions, limitations or intervals stipulated in the underpinning reliability/integrity report. The product build state continues to conform to the drawings and issues quoted in the underpinning reliability/integrity report. The product is used having regard to the instructions, limitations of use, intervals etc as outlined in the manufacturer's Safety Manual. The manufacturer maintains a credible level of Functional Safety Management in respect of (for example) design configuration control, procurement, manufacturing and defect analysis. The certificate will not apply to any product variation/modification or to the use of functions not addressed in the original study. It is recommended that the design, defect records and the company FSM procedure are reviewed, at least every 2 years, and should any changes have occurred since the original certification then the manufacture should contact Technis to request re-certification.

Signed:..........(Certificate No T1023-198) – 21 July 2021)

*Dr David J. Smith BSc, PhD, CEng, FIEE, FIQA, HonFSaRS, MIGasE*

*This certificate does not warrant fitness for any specific applications related purpose and is based on probabilistic and statistical assessment*



**FAILURE TO SOUND**

Integrity in respect of failure to function	SIL 2
Total Failure Rate	0.447 pmh
“hazardous” failure rate (revealed)	0.443 pmh
“hazardous” failure rate (unrevealed)	0.004 pmh
“safe” failure rate (revealed)	0.002 pmh
“safe” failure rate (unrevealed)	0
Diagnostic Coverage	99%
System Type	B
Hardware Fault Tolerance	0
Safe Failure Fraction	>99%
PFD (hazardous failure)	$3.3 \times 10^{-5}$
Proof Test Interval	Up to 1 year

**FAILURE TO SOUND OR INCORRECT TONE**

Integrity in respect of failure to function	SIL 2
Total Failure Rate	0.464 pmh
“hazardous” failure rate (revealed)	0.455 pmh
“hazardous” failure rate (unrevealed)	0.009 pmh
“safe” failure rate (revealed)	0.002 pmh
“safe” failure rate (unrevealed)	0
Diagnostic Coverage	98%
System Type	B
Hardware Fault Tolerance	0
Safe Failure Fraction	>97%
PFD (hazardous failure)	$5.2 \times 10^{-5}$
Proof Test Interval	Up to 1 year