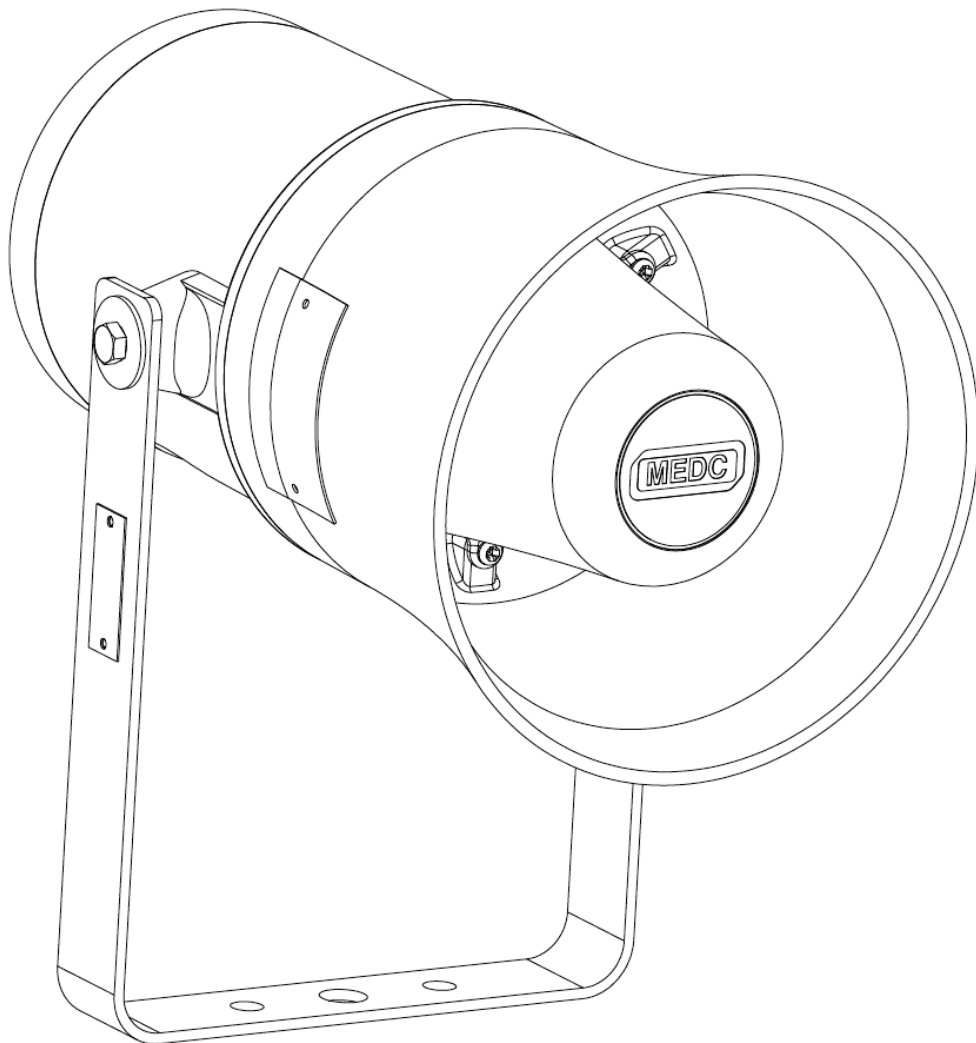




Technical Manual for the Speaker DB3 & DB3L



Please note that every care has been taken to ensure the accuracy of our technical manual. We do not, however, accept responsibility for damage, loss or expense resulting from any error or omission. We reserve the right to make alterations in line with technical advances and industry standards.

1.0 INTRODUCTION

This range of light weight all GRP, flameproof sounders is intended for use in potentially explosive gas and dust atmospheres and has been designed with high ingress protection to cope with the harsh environmental conditions found offshore and onshore in the oil, gas and petrochemical industries.

The flamepaths, flare and body are manufactured completely from a UV stable glass reinforced polyester. Stainless steel screws and sinter are incorporated thus ensuring a corrosion free product. A tapered Flamepath is used to overcome the problems of assembly of parallel spigot flamepaths.

An Optional Exe terminal chamber is available

An uncertified version is available for use in non-explosive atmospheres.

2.0 INSTALLATION

General

When installing and operating explosion-protected equipment, requirements for selection, installation and operation should be referred to e.g. IEE Wiring Regulations and the 'National Electrical Code' in North America. Additional national and/or local requirements may apply.

Ensure that all nuts, bolts and fixings are secure.

Ensure that only the correct listed or certified stopping plugs are used to blank off unused gland entry points and that the NEMA/IP rating of the unit is maintained. MEDC recommend the use of a sealing compound such as HYLOMAR PL32 on the threads of glands and stopping plugs in order to maintain the IP rating of the unit.

The unit mounts via 2 off $\varnothing 9$ mm mounting holes in the 'U' shaped stirrup / mounting bracket. The holes have been designed to accept an M8 screw or bolt. If required the unit can be initially placed using the $\varnothing 13$ mm central hole in the mounting bracket. The unit can then be rotated into the correct orientation and fixed via the other two holes.

When the unit is fixed in the required position, its alignment can be adjusted by loosening the two M6 screws which fasten the mounting bracket to the speaker. The speaker can then be adjusted to the required position and the screws tightened. The unit should be positioned such that dust/debris or water cannot settle in the re-entrant horn

MEDC recommend the use of stainless steel screws.

Cable Termination

CAUTION: Before removing the cover assembly, ensure that the power to the unit is isolated.

On Exd versions, the cover is secured with 6 off M5 cover screws (4.0mm A/F hexagon key). Once the cover fixings are unscrewed, twist the cover assembly gently clockwise and anti-clockwise, whilst pulling it away from the base. Remove to gain access to the interior.

On Exde versions the removable cover is secured using 2 off M5 cover screws (4.0mm A/F hexagon key). Once the cover fixings are unscrewed, the cover can be lifted away from the enclosure to gain access to the interior.

Ensure all non-captive fixings are kept in a safe accessible location during cable termination.

Cable termination should be in accordance with specifications applying to the required application. MEDC recommends that all cables and cores should be correctly identified. Please refer to the wiring diagram provided with the product.

Ensure that only the correct listed or certified cable glands are used and that the assembly is shrouded and correctly earthed.

All cable glands should be of an equivalent NEMA/IP rating to that of the speaker and integrated with the unit such that this rating is maintained.

The internal earth terminal, where fitted, must be used for the equipment grounding connection and the

external terminal is for a supplementary bonding connection where local codes or authorities permit or require such a connection.

Once termination is complete, carefully replace the cover assembly back onto the body, avoiding damage to the mating surfaces. Replace the cover screws into the holes in the cover assembly and tighten evenly.

Ensure the O-ring is seated correctly on the cover during re-assembly. On Exd certified versions, ensure the required maximum gap of 0.15mm is maintained between the cover and the base once assembled.

Wiring options

The unit is available in six basic configurations:

1. Exd - DC Input, single tone
2. Exde - DC input, single tone
3. Exd - DC input, dual tone
4. Exde - DC input, dual tone
5. Exd - AC input, single tone
6. Exde - AC input, single tone

Types 1 & 2 have 6 terminals labelled as T1 to T6. The supply should be connected to T1 (+ve), T3 (-ve), loop out on T4 & T6 respectively

Types 3 & 4 have 6 terminals labelled as T1 to T6:

For a 2 wire system, the supply should be connected to T1 (+ve), T2 (-ve), loop out on T4 & T5 respectively to produce tone 1. Tone 2 is produced when the polarity of the supply is reversed T1 (-ve), T2 (+ve), loop out on T4 & T5 respectively. Optionally an EOL resistor may be connected to T4, T5.

For a 3 wire system, the supply should be connected to T1 (common +ve), T2 (-ve 1) & T3 (-ve 2), loop out on T4, T5 & T6 respectively. Tone 1 is produced when the supply is connected to T1 (Common +ve) & T2 (-ve 1). Tone 2 is produced when the supply is connected to T1 (common +ve) & T3 (-ve 2). Optionally an EOL resistor can be connected to T4, T5 or T4, T6.

Type 5 has 4 terminals labelled as L, L, N, N. The supply should be connected to one L,N pair of terminals, loop out on the second L,N pair of terminals

Type 6 has 6 terminals labelled as T1 to T6. The supply should be connected to T1 (L), T2 (N), loop out on T4 & T5 respectively.

3.0 OPERATION

The sounder is available in various AC input voltage versions and a single DC voltage input version.

For AC versions, the nominal operating voltage is stated on the unit label and the supply voltage tolerance is $\pm 10\%$

For DC versions, the absolute input voltage range is 11.0Vdc to 58.0Vdc

The DC version can be operated as a dual-tone unit (if specified when ordering). The unit can be switched between the two tones by either:-

- a. Reversing the polarity of the supply (2 wire versions)
- b. Connecting as a 3 wire common +ve system and switching between the two -ve lines.

Note: - with T1 (+ve), T2 (-ve) tone 1 is produced (as set by DIL switch 'TONE 1')

- with T1 (+ve) T3 (-ve) or T1 (-ve), T2 (+ve) tone 2 is produced (as set by DIL switch 'TONE 2')

The unit is fitted with a volume control which is positioned adjacent to the DIL switches on dc units and is mounted on the transformer on ac units. Maximum volume is obtained when this control is turned fully clockwise. Minimum volume is obtained when this control is turned fully anticlockwise. **Please note that on the EN54-3 compliant version the minimum sound output is 65dB**

WARNING: Do not attempt to turn the volume control past its limits of movement as this may cause damage to the unit.

Tones

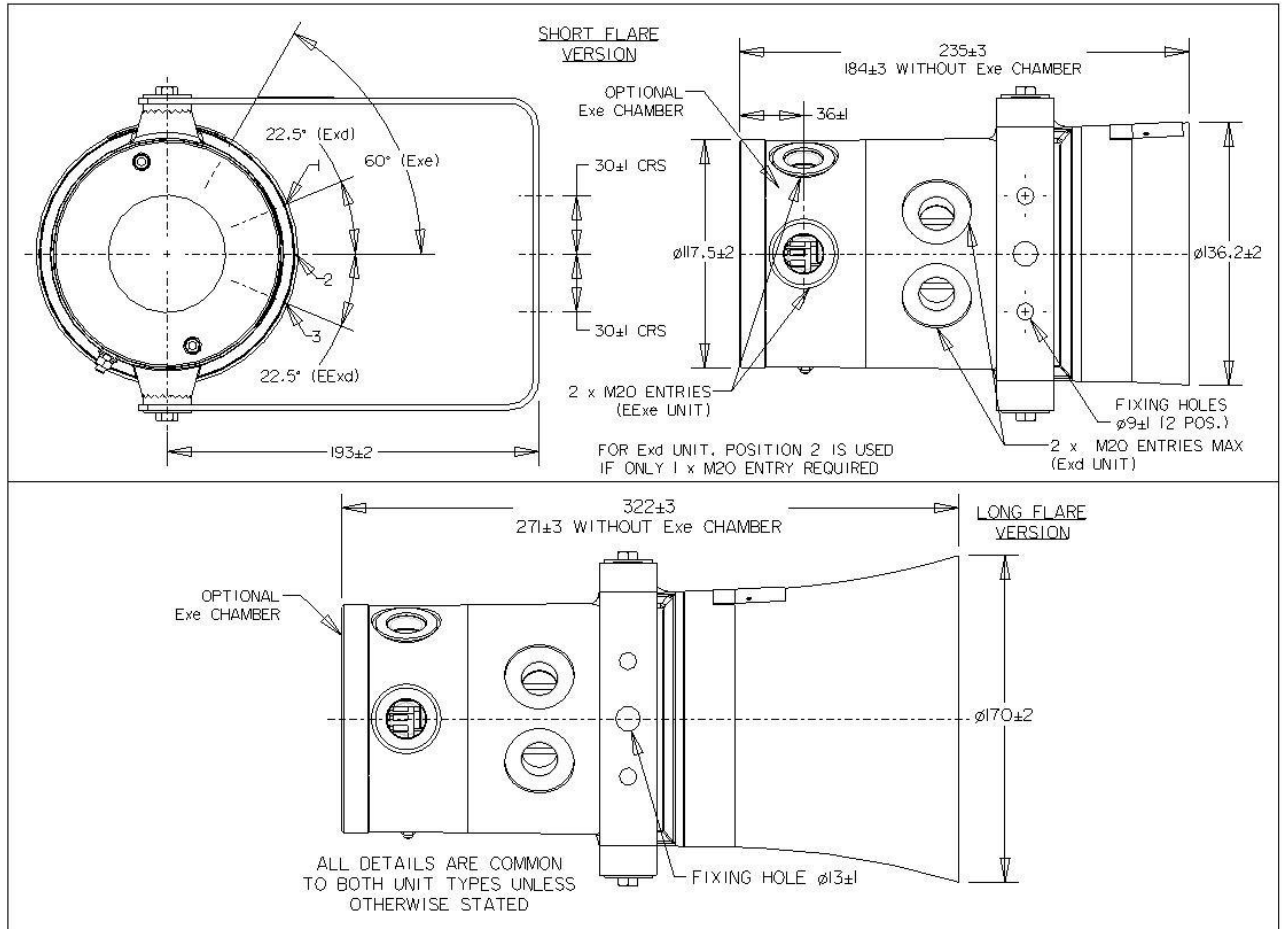
For all versions, a 5-way DIL switch selects the tone required. The settings for the standard tones are shown in table 1 below:

Table 1

STONE No.	STONE FREQ/DESCRIPTION	SWITCH SETTING 12345	STONE DESCRIPTION	Nominal SPL (dB(A) @ 1M)
1	Alt Tones 800/970 Hz at 1/4 sec	11111		114
2	Sweeping 800/970 Hz at 7 Hz	11110	Fast Sweep (LF)	114
3*	Sweeping 800/970 Hz at 1 Hz	11101	Medium Sweep (LF)	114
4	Continuous at 2850 Hz	11100		109
5	Sweeping 2400-2850 Hz at 7 Hz	11011	Fast Sweep	114
6	Sweeping 2400-2850 Hz at 1 Hz	11010		114
7*	Slow Whoop	11001	Slow Whoop	115
8*	Sweep 1200-500 Hz at 1 Hz	11000	Din Tone	115
9	Alt Tones 2400/2850 Hz at 2 Hz	10111		111
10	Int Tone of 970 Hz at 1 Hz	10110	Back-up Alarm (LF)	114
11	Alt Tones 800/970 Hz at 7/8 Hz	10101		114
12	Int Tone at 2850 Hz at 1Hz	10100	Back-up Alarm (HF)	109
13	970 Hz at 1/4 sec on 1 sec off	10011		114
14	Continuous at 970 Hz	10010		114
15*	554 Hz for 0.1S/440 Hz for 0.4S	10001	French Fire Sound	101
16	Int 660 Hz 150 mS on 150 mS off	10000	Swedish Fire Alarm	106
17	Int 660 Hz 1.8 sec on 1.8 sec off	01111	Swedish Fire Alarm	106
18	Int 660 Hz 6.5 sec on 13 sec off	01110	Swedish Fire Alarm	104
19*	Continuous 660 Hz	01101	Swedish Fire Alarm	106
20*	Alt 554/440 Hz at 1 Hz	01100	Swedish Fire Alarm	100
21	Int 660 Hz at 7/8 Hz	01011	Swedish Fire Alarm	106
22	Int 2850 Hz 150 mS on 100 mS off	01010	Pelican Crossing	109
23	Sweep 800-970 Hz at 50 Hz	01001	Low Freq. Buzz	113
24	Sweep 2400 -2850 Hz at 50 Hz	01000	High Freq. Buzz	112
25	3x970 Hz pulses 0.5 off, 1.5 off	00111		113
26	3x2850 Hz pulses 0.5on/0.5off, 1.5 off	00110		109
27	Int 3100 Hz 0.32s on/0.68s off	00101		110
28	Spare / Customer special tone	00100		
29	Spare / Customer special tone	00011		
30	Spare / Customer special tone	00010		
31	Spare / Customer special tone	00001		
32	Spare / Customer special tone	00000		

NOTE: If special tones were requested at the time of ordering, please see the separate tones list supplied with the unit for details of these special tones and their respective switch settings.

* = EN54-3 Compliant Tones



4.0 MAINTENANCE

During the working life of the unit, it should require little or no maintenance. GRP will resist attack by most acids, alkalis and chemicals and is as resistant to concentrated acids and alkalis as most metal products. However, if abnormal or unusual environmental conditions occur due to plant damage or accident etc., then visual inspection is recommended.

If the unit requires cleaning, then only clean exterior with a damp cloth to avoid electro-static charge build up. Repairs should be undertaken by returning the unit to MEDC or by an authorised repairer of Ex equipment. All parts of the unit are replaceable.

If you acquired a significant quantity of units, then it is recommended that spares are also made available. Please discuss your requirements with the Technical Sales Engineers at MEDC.

5.0 CERTIFICATION/APPROVALS

IECEx units

Certified to IEC 60079-0, IEC 60079-1 and IEC 60079-7

Ex d IIC unit (IEC certification No. IECEx BAS 11.0083X)

Ex d IIC T_G (T_{amb.}) Gb

Ex tb IIIC T_D (T_{amb.}) Db IP66

Ex de IIC unit (IEC certification No. IECEx BAS 11.0084X)

Ex de IIC T_G (T_{amb.}) Gb

Ex tb IIIC T_D (T_{amb.}) Db IP66

The IECEx certificate and product label carry the IECEx equipment protection level marking

Gb

Db

Where Gb signifies suitability for use in a Zone 1 surface industries area in the presence of gas.

Where Db signifies suitability for use in a Zone 1 surface industries area in the presence of dust.

ATEX units

Certified to EN50014:1997, EN50018:1994, EN50019:1994 & EN50281-1-1:1998

EExd IIC Atex Certification Number BAS 00ATEX2097X

EExde IIC Atex Certification Number BAS 00ATEX2098X

See special conditions for safe use for ambient temperature ranges and T-ratings

The ATEX certificate and product label carry the ATEX group and category marking:



II 2 GD

Where:



- Signifies compliance with ATEX
- II Signifies suitability for use in surface industries
- 2 Signifies suitability for use in a zone 1 area
- G Signifies suitability for use in the presence of gases
- D Signifies suitability for use in the presence of dust

The ATEX certificate and product label also carry the following mark:



This signifies unit compliance to the relevant European directives, in this case 94/9/EC, along with the number of the notified body issuing the EC type examination certificate.

EN54-3 Fire Alarm Device – Sounder (11-58V DC ABSOLUTE).

Environment Type B Outdoor applications
IP code (IP33C) to BS EN 60529:1992



0832-CPR-F0566



1120a/01

This signifies unit compliance to the relevant European regulations, in this case 305/2011, along with the name and number of the notified body issuing the certificate of conformity.

These units also have the following approvals

Electromagnetic compatibility to BS EN 50081-1:1992
BS EN 50081-2:1995

6.0 SPECIAL CONDITIONS FOR SAFE USE**a) Type DB3/DB3L - IECEx BAS 11.0083X & BAS00ATEX2097X (Exd)**

1. This apparatus is not suitable for use in atmospheres containing carbon disulphide
2. This apparatus is suitable for use only in ambient temperatures as follows:

Type	Max. Power rating	T _{amb.}	T _G	T _D
DB3	15W	-20°C to +55°C	T5	T100°C
	15W	-20°C to +70°C	T4	T135°C
DB3L	15W	-55°C to +55°C	T5	T100°C
	15W	-55°C to +70°C	T4	T135°C

3. Painting and surface finishes, other than those applied by the manufacturer, are not permitted
4. When used in dust atmospheres the flameproof cable entry devices or stopping plugs shall be selected and installed to maintain the dust tight (IP6X) integrity of the enclosure

b) Type DB3E/DB3LE - IECEx BAS 11.0084X & BAS00ATEX2098X (Exe)

1. This apparatus is not suitable for use in atmospheres containing carbon disulphide.
2. Not more than one single or multiple strand wiring lead shall be connected into either side of any terminal, unless multiple conductors have been joined in a suitable manner, e.g. two conductors into a single insulated boot lace ferrule.
3. Leads connected to the terminals shall be insulated for at least 275V and this insulation shall extend to within 1mm of the metal of the terminal throat.
4. All terminal screws, used and unused, shall be fully tightened down.
5. This apparatus is suitable for use only in ambient temperatures as follows:

Type	Max. Power rating	T _{amb.}	T _G	T _D
DB3E	15W	-20°C to +55°C	T5	T100°C
	15W	-20°C to +70°C	T4	T135°C
DB3LE	15W	-50°C to +55°C	T5	T100°C
	15W	-50°C to +70°C	T4	T135°C

6. Minimum creepage and clearance distances between the terminals and adjacent conductive parts (including cable entry devices) must be at least 5mm.
7. Painting and surface finishes, other than those applied by the manufacturer, are not permitted.
8. When used in dust atmospheres the flameproof cable entry devices or stopping plugs shall be selected and installed to maintain the dust tight (IP6X) integrity of the enclosure.

7.0 FUNCTIONAL SAFETY

Introduction

The DB3 sounder has been designed for use in potentially explosive atmospheres and harsh environmental conditions. The glass reinforced polyester enclosures are suitable for use offshore or onshore, where light weight combined with corrosion resistance is required.

The DB3 sounder can be configured with or without an Exe Chamber on the rear. The FMEDA has considered the worst case scenario which includes the Exe Chamber on the rear.

The safety function of the sounder is to provide a pre-determined audible warning sound when required if the correct voltage is applied to the unit. The DC version of the sounder is designed to operate on a supply voltage between 12 and 48vDC; the AC versions of the sounder are designed to operate on a supply voltage tolerance of +/- 10%.

Under No fault (Normal) Operating conditions the DB3 sounder will provide an audible warning sound when required by the system.

Under fault conditions the failure mode of the sounder is a failure to provide an audible warning sound. For the failure rate associated with this failure mode please refer to the table below.

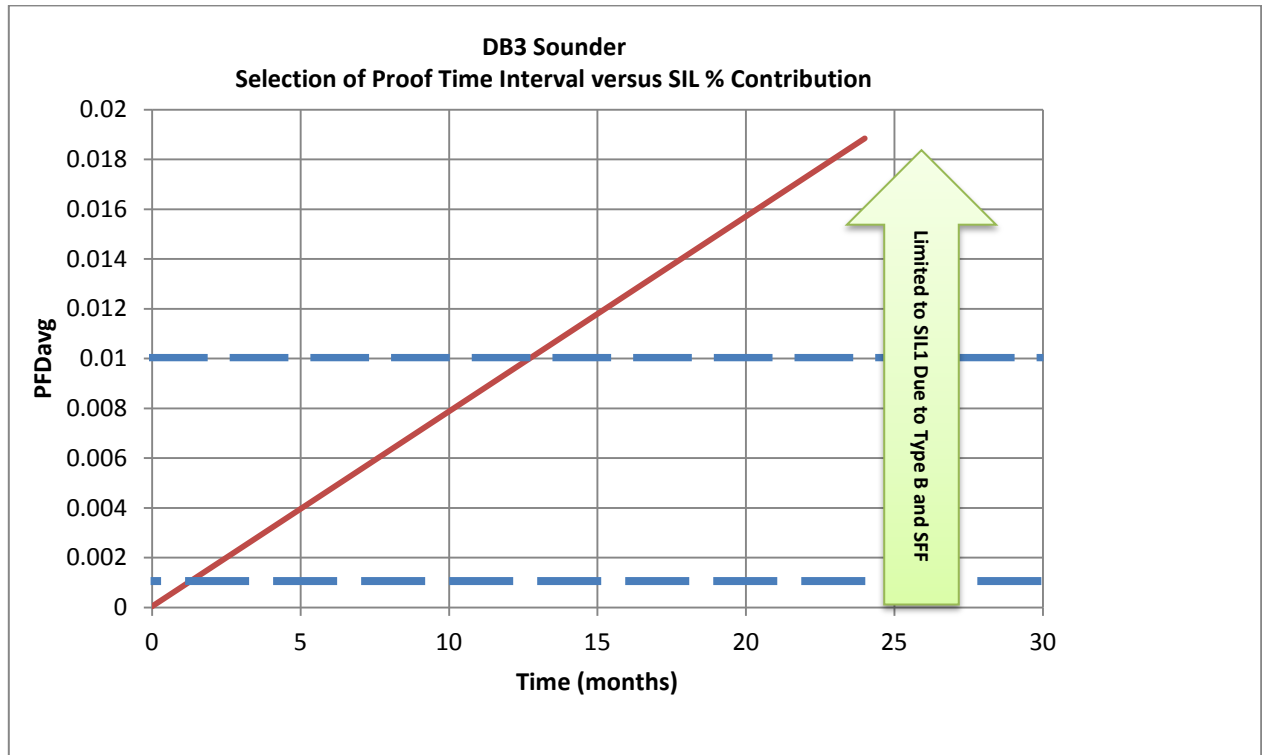
Assessment of Functional Safety

This sounder is intended for use in a safety system conforming to the requirements of IEC61508.

Sira Test & certification Ltd has conducted a Failure Modes Effect and Diagnostic Analysis (FMEDA) of the DC version of DB3 sounder against the requirements of IEC 61508-2 using a Proof Test Interval of 8760hrs. The DC version of the sounder was considered to be the worst case. The results are shown below and are based on Route 1_H

The sounder is classed as a Type B device.

DB3 SOUNDER			
Safety Function of DB3 Sounder: <i>'To provide a pre-described audible warning sound when required'</i>			
Architectural constraints:	Type B HFT=0 SFF = 74.00%	Proof Test Interval =8760Hrs ^[4] MTTR = 8 Hrs ^[4]	SIL 1
Random hardware failures:	$\lambda_{DD} = 3.25E-06$ $\lambda_{DU} = 2.15E-06$	$\lambda_{SD} = 2.20E-08$ $\lambda_{SU} = 2.81E-06$	
Probability of failure on demand:	PFD _{AVG} =9.44E-03 (Low Demand Mode)		SIL 2
Probability of Dangerous failure on safety function:	PFH = 2.15E-06 (High Demand Mode)		SIL 1
Hardware safety integrity compliance	Route 1 _H		
Systematic safety integrity compliance	Route 1 _S		
Systematic Capability	SC 2 (Ref to 56A24816B)		
Overall SIL-capability achieved	SIL 1 (Low Demand) SIL 1 (High Demand)		

**Conditions of Safe use**

The following conditions apply to the installation, operation and maintenance of the assessed equipment. Failure to observe these may compromise the safety integrity of the assessed equipment:

1. The user shall comply with the requirements given in the manufacturer's user documentation (This Safety Manual and Technical manual) in regard to all relevant functional safety aspects such as application of use, installation, operation, maintenance, proof tests, maximum ratings, environmental conditions, repair, etc;
2. Selection of this equipment for use in safety functions and the installation, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing all the manufacturer's conditions and recommendations in the user documentation.
3. **All information associated with any field failures of this product should be collected under a dependability management process (e.g., IEC 60300-3-2) and reported to the manufacturer.**
4. The unit should be tested at regular intervals to identify any malfunctions; in accordance with this safety manual.

EN54-3 Compliant Tones Data

Minimum Volume dB(A)					
Angle	Horizontal Plane		Vertical Plane		
	Max 58V	Min 11V	Max 58V	Min 11V	
TONE 3	15°	97.4 dB(A)	95.8 dB(A)	99.1 dB(A)	97.6 dB(A)
	45°	101.9 dB(A)	101.2 dB(A)	102.6 dB(A)	102.7 dB(A)
	75°	106.2 dB(A)	104.9 dB(A)	106.7 dB(A)	105.6 dB(A)
	105°	106.1 dB(A)	104.8 dB(A)	105.5 dB(A)	104.2 dB(A)
	135°	103.4 dB(A)	102.9 dB(A)	102.7 dB(A)	101.5 dB(A)
	165°	98.7 dB(A)	98.5 dB(A)	98.1 dB(A)	97.1 dB(A)
TONE 7	15°	97 dB(A)	96.5 dB(A)	98.7 dB(A)	98.5 dB(A)
	45°	104.7 dB(A)	101.8 dB(A)	102.4 dB(A)	103 dB(A)
	75°	105.6 dB(A)	104.5 dB(A)	106.3 dB(A)	105.3 dB(A)
	105°	105.5 dB(A)	104.4 dB(A)	105.2 dB(A)	104.1 dB(A)
	135°	104.8 dB(A)	103.6 dB(A)	103.8 dB(A)	103.5 dB(A)
	165°	100.6 dB(A)	99.7 dB(A)	98.1 dB(A)	98.9 dB(A)
TONE 8	15°	97 dB(A)	95.9 dB(A)	95.9 dB(A)	95.1 dB(A)
	45°	103.3 dB(A)	102.8 dB(A)	102.6 dB(A)	100.6 dB(A)
	75°	104.6 dB(A)	103.3 dB(A)	104.1 dB(A)	103.2 dB(A)
	105°	104.6 dB(A)	103 dB(A)	104.8 dB(A)	104.1 dB(A)
	135°	104.4 dB(A)	105 dB(A)	106.4 dB(A)	105.9 dB(A)
	165°	99.3 dB(A)	100.3 dB(A)	102.6 dB(A)	101 dB(A)
TONE 15	15°	89.7 dB(A)	88.4 dB(A)	90.4 dB(A)	89.1 dB(A)
	45°	93.5 dB(A)	92.2 dB(A)	94 dB(A)	92.7 dB(A)
	75°	98.5 dB(A)	97.3 dB(A)	99.1 dB(A)	97.8 dB(A)
	105°	98.5 dB(A)	97.3 dB(A)	97.3 dB(A)	96.1 dB(A)
	135°	93.1 dB(A)	91.6 dB(A)	92.7 dB(A)	91.1 dB(A)
	165°	89 dB(A)	87.9 dB(A)	87.8 dB(A)	86.4 dB(A)
TONE 19	15°	88.6 dB(A)	86.8 dB(A)	89 dB(A)	87.8 dB(A)
	45°	94.2 dB(A)	92.7 dB(A)	94.5 dB(A)	93.3 dB(A)
	75°	93.1 dB(A)	91.2 dB(A)	94.4 dB(A)	93.3 dB(A)
	105°	93.4 dB(A)	92.2 dB(A)	91.1 dB(A)	90.5 dB(A)
	135°	94.4 dB(A)	93 dB(A)	94.3 dB(A)	93.1 dB(A)
	165°	90 dB(A)	88.5 dB(A)	88.5 dB(A)	87.2 dB(A)
TONE 20	15°	89.5 dB(A)	88.4 dB(A)	90.6 dB(A)	89.3 dB(A)
	45°	93.5 dB(A)	92.3 dB(A)	94 dB(A)	92.9 dB(A)
	75°	98.6 dB(A)	97.3 dB(A)	99.1 dB(A)	97.9 dB(A)
	105°	98.5 dB(A)	97.3 dB(A)	97.3 dB(A)	96 dB(A)
	135°	93.3 dB(A)	91.9 dB(A)	92.6 dB(A)	91.5 dB(A)
	165°	89 dB(A)	87.8 dB(A)	87.7 dB(A)	86.5 dB(A)

REV'D

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