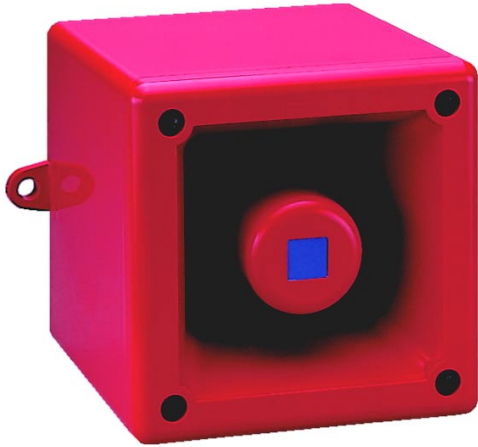


Instruction sheet for BA385-IIB and BA385-IIC Intrinsically safe Sounders



The BA385-IIB and BA385-IIC sounders are CE marked to show compliance with the European Explosive Atmospheres Directive 94/9/EC and the European EMC Directive 89/336/EEC

1. INTRODUCTION

The BA385-IIB and BA385-IIC are second generation ATEX certified intrinsically safe sounders which produce a loud warning signal in a hazardous area. Thirty two different first stage alarm sounds can be selected by internal switches and each one can be externally changed to a second or third stage alarm sound. The IIB model, which may be used with gases in groups IIA and IIB, has slightly more output than the IIC model which may be used with gases in all groups.

2. DESCRIPTION

Fig 1 shows a simplified block diagram of a BA385 sander. The device operates immediately power is applied to terminals 1 and 4 which are duplicated to allow a second sander to be connected in parallel, or for an end of line monitoring resistor to be installed. The output tone is defined by the position of the five internal switches and this tone can be changed to a second or third stage alarm tone by connecting terminal 2 or 3 to 0V. The tone generator is crystal controlled to ensure that when two sounders are started at the same time their output tones remain synchronised.

3. SUPPLY VOLTAGE

For hazardous area installations, BA385 sounders must be powered from a certified Zener barrier or galvanic isolator that will supply between 8 and 28V between terminals 1 and 4. Sounders may be tested or used in safe areas without a Zener barrier or galvanic isolator, but at supply voltages above 16V the internal current limit will function and the audio output will be reduced. Direct connection to supplies up to 30V of either polarity will not damage the sander, but it is recommended that sounders are not operated continuously with a direct supply greater than 16V.

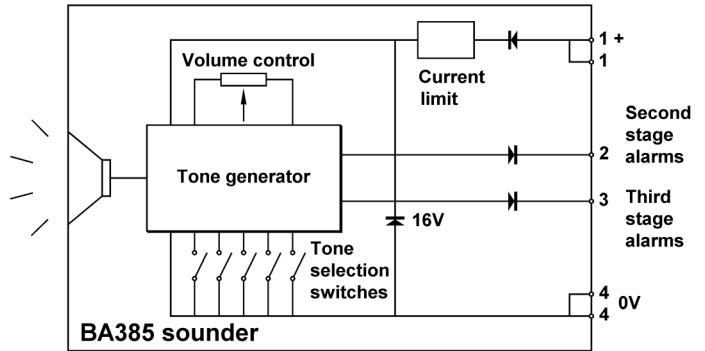


Fig 1 Simplified block diagram

4. INTRINSIC SAFETY CERTIFICATION

4.1 ATEX certificate

Both the BA385-IIB and the BA385-IIC sounders comply with EN50 014 & EN50 020 and they have been issued with EC-Type Examination Certificates BAS00ATEX1180 and 1181. This confirms compliance with the European ATEX Directive 94/9/EC for Group II, Category 1G equipment. The sounders carry the Community Mark and subject to local codes of practice, may be installed in any of the European Economic Area (EEA) member countries. i.e. Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Norway, The Netherlands, Portugal, Spain, Sweden and the United Kingdom. ATEX certificates are also accepted in Iceland, Liechtenstein, Switzerland and in the Czech Republic. This instruction sheet describes installations which conform with BS EN60079:Part14:1997 Electrical Installation in Hazardous Areas. When designing systems for installation outside the UK, the local Code of Practice should be consulted.

BA385 sounders employ good engineering practice to minimise the risk of injury to installers and users.

4.2 Zones, Gas Groups and T rating

The BA385-IIB sander has been certified EEx ia IIB T4 and the BA385-IIC model EEx ia IIC T4. When connected to approved Zener barriers or galvanic isolators they may be installed in:

Zone 0	explosive gas air mixture continuously present.
Zone 1	explosive gas air mixture likely to occur in normal operation.
Zone 2	explosive gas air mixture not likely to occur, and if it does, it will only exist for a short time.

Be used with gases in groups:

Group		Model BA385-IIB	Model BA385-IIC
Group A	propane	yes	yes
Group B	ethylene	yes	yes
Group C	hydrogen	no	yes

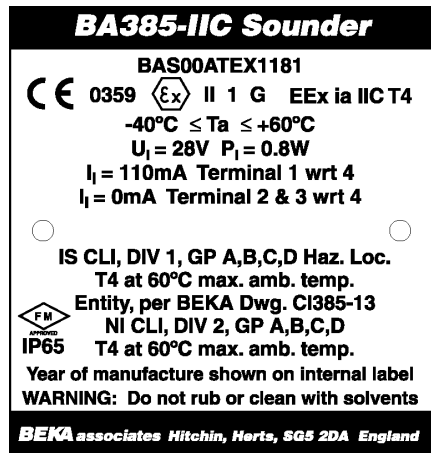
Having a temperature classification of:

T1	450°C
T2	300°C
T3	200°C
T4	135°C

Although certified intrinsically safe at ambient temperatures between -40 and +60°C the operating temperature range of both sounders is -20 to +60°C.

4.3 Certification label information

The certification label is fitted on the side of the sounder. It shows the model number, ATEX certification information and BEKA associates address. The year of manufacture and the sounder serial number are shown on a separate label within the enclosure.



In addition to ATEX certification information, the label also shows Factory Mutual approval information – see Appendix 1. Certification information from other authorities may also be shown.

WARNING

To prevent generation of an electrostatic charge do not rub, and to prevent damage to the enclosure do not clean with a solvent.

4.4 Terminals 1 & 4

Power is supplied to the sounder via terminals 1 & 4 which have the following maximum input safety parameters:

Ui	=	28V
Ii	=	110mA dc
Pi	=	0.8W

BA385 sounders may be powered from any Zener barrier or galvanic isolator having output parameters equal to, or less than, these limits which has been certified EEx ia IIC by an EC Notified Body. e.g. a certified 28V, 93mA, 0.65W Zener barrier or isolator may be used. Cable parameters are defined by the certificate for the Zener barrier or galvanic isolator

Up to three BA385 sounders may be connected in parallel and powered from a common barrier or isolator providing the voltage between terminals 1 and 4 does not fall below 8V. Connecting two sounders in parallel will reduce the output from each sounder by about 3dB.

4.5 Terminals 2 & 3

When terminals 2 or 3 are connected to 0V (terminal 4) the sounder output tone changes to the second or third stage alarm respectively. The input safety parameters for these terminals are:

Ui	=	28V
Ii	=	0mA

For control from the hazardous area the terminals may be connected to a mechanically operated switch in the hazardous area complying with the requirements for simple apparatus - Clause 5.4 of EN50 020. i.e. having IP20 protection and able to withstand a 500V rms insulation test to earth for one minute.

For control from the safe area terminals 2 & 3 may be connected to a certified diode return barrier, or the contacts of a certified intrinsically safe relay. Only diode return barriers with a voltage drop of less than 0.9V may be used.

5. INSTALLATION

BA385 sounders should only be installed by trained competent personnel.

5.1 Mounting

The BA385 sounder may be secured to any flat surface using the two 7mm diameter fixing holes. The enclosure provides IP65 protection and is suitable for installation in sheltered exterior locations providing it is positioned so that water can not collect in the horn, and the cable entry is sealed.

5.2 Installation procedure

- Secure the BA385 sounder to a flat surface via the two 7mm dia fixing holes in the mounting feet.
- Remove the front of the sounder by unscrewing the four captive corner screws and pulling the front away from the enclosure.
- Fit a 20mm cable gland or conduit entry into the untapped hole in the enclosure and connect the field wiring to the appropriate sounder terminals as shown in Fig 3. The power supply terminals 1 and 4 are duplicated so that sounders may be connected in parallel, or an end of line monitoring resistor may be fitted.
- Select the required output tone by positioning the five switches as shown in Table 1 and Fig 3. The sixth switch on the right hand side of the switch assembly is not used.
- Apply power to the sounder and adjust the internal volume control to provide the required sound level.
- Replace the front of the sounder and tighten the four corner screws.

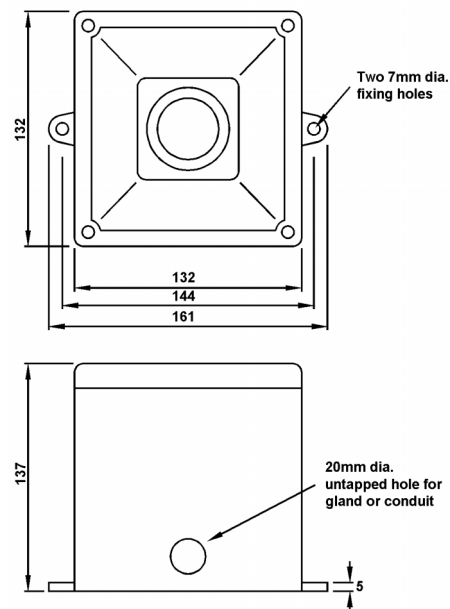


Fig 2 Enclosure

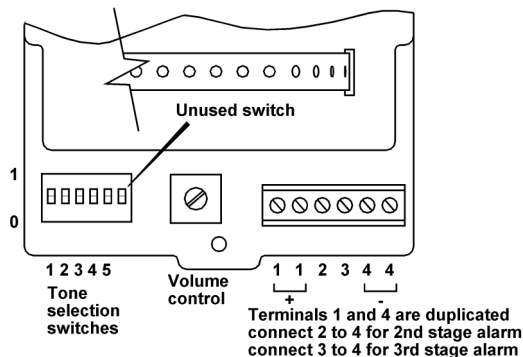


Fig 3 Location of field terminals and controls.

Tone Number	Tone description	Switch Settings 1 2 3 4 5	Second Stage Alarm	Third Stage alarm
Tone 1	Continuous 1000Hz <i>Toxic gas alarm</i>	0 0 0 0 0	Tone 31	Tone 11
Tone 2	Alternating 800/1000Hz at 0.25s intervals	1 0 0 0 0	Tone 17	Tone 5
Tone 3	Slow whoop 500/1200Hz at 0.3Hz with 0.5s gap repeated	0 1 0 0 0	Tone 2	Tone 5
Tone 4	Sweeping 500/1000Hz at 1Hz	1 1 0 0 0	Tone 6	Tone 5
Tone 5	Continuous 2400Hz	0 0 1 0 0	Tone 3	Tone 27
Tone 6	Sweeping 2400/2900Hz at 7Hz	1 0 1 0 0	Tone 7	Tone 5
Tone 7	Sweeping 2400/2900Hz at 1Hz	0 1 1 0 0	Tone 10	Tone 5
Tone 8	Siren 500/1200/500Hz at 0.3Hz	1 1 1 0 0	Tone 2	Tone 5
Tone 9	Sawtooth 1200/500Hz at 1Hz	0 0 0 1 0	Tone 15	Tone 2
Tone 10	Alternative 2400/2900Hz at 2Hz	1 0 0 1 0	Tone 7	Tone 5
Tone 11	Intermittent 1000Hz at 0.5Hz <i>General Alarm</i>	0 1 0 1 0	Tone 31	Tone 1
Tone 12	Alternating 800/1000Hz at 0.875Hz	1 1 0 1 0	Tone 4	Tone 5
Tone 13	Intermittent 2400Hz at 1Hz	0 0 1 1 0	Tone 15	Tone 5
Tone 14	Intermittent 800Hz 0.25s on, 1s off	1 0 1 1 0	Tone 4	Tone 5
Tone 15	Continuous 800Hz	0 1 1 1 0	Tone 2	Tone 5
Tone 16	Intermittent 550Hz 150nS on, 150ms off	1 1 1 1 0	Tone 18	Tone 5
Tone 17	Alternating 544Hz (100ms) / 440Hz (400ms)	0 0 0 0 1	Tone 2	Tone 27
Tone 18	Intermittent 660Hz 1.8s on, 1.8s off	1 0 0 0 1	Tone 2	Tone 5
Tone 19	1400Hz to 1600Hz sweep up over 1s 1600Hz to 1400Hz sweep down over 0.5s	0 1 0 0 1	Tone 2	Tone 5
Tone 20	Continuous 660Hz	1 1 0 0 1	Tone 2	Tone 5
Tone 21	Alternating 554/440Hz at 1Hz	0 0 1 0 1	Tone 2	Tone 5
Tone 22	Intermittent 544Hz at 0.875Hz	1 0 1 0 1	Tone 2	Tone 5
Tone 23	800Hz pulsing at 2Hz	0 1 1 0 1	Tone 6	Tone 5
Tone 24	Sweeping 800/1000Hz at 50Hz	1 1 1 0 1	Tone 29	Tone 5
Tone 25	Sweeping 2400/2900Hz at 50Hz	0 0 0 1 1	Tone 29	Tone 5
Tone 26	Simulated bell	1 0 0 1 1	Tone 2	Tone 1
Tone 27	Continuous 554Hz	0 1 0 1 1	Tone 26	Tone 5
Tone 28	Continuous 440Hz	1 1 0 1 1	Tone 2	Tone 5
Tone 29	Sweeping 800/1000Hz at 7Hz	0 0 1 1 1	Tone 7	Tone 5
Tone 30	420Hz repeating 0.625s off <i>Australian alert signal</i>	1 0 1 1 1	Tone 32	Tone 5
Tone 31	1200/400Hz at 1Hz <i>Prepare to abandon platform</i>	0 1 1 1 1	Tone 11	Tone 1
Tone 32	Sweeping 500/1200Hz 3.75s on, 0.25s off 15Hz <i>Australian evacuation signal</i>	1 1 1 1 1	Tone 26	Tone 1

Table 1 Function of tone selection switches

6. ELECTRICAL SYSTEM DESIGN FOR INSTALLATION IN HAZARDOUS AREAS USING ZENER BARRIERS

6.1 Single stage alarm

If the control switch is in the positive supply, or the power supply is being turned on and off, only a single channel Zener barrier is required as shown in Fig 4. This circuit may also be used if the sounder is being controlled from the hazardous area by a mechanically activated switch complying with the requirements for simple apparatus. See 4.5

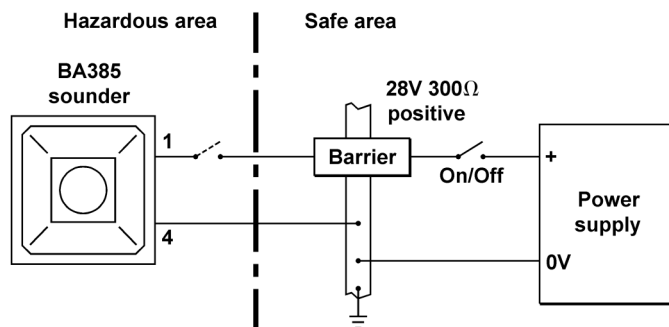


Fig 4 Single stage alarm using single channel barrier.

If the negative side of the power supply and one side of the control switch are earthed, the circuit shown in Fig 5 may be used.

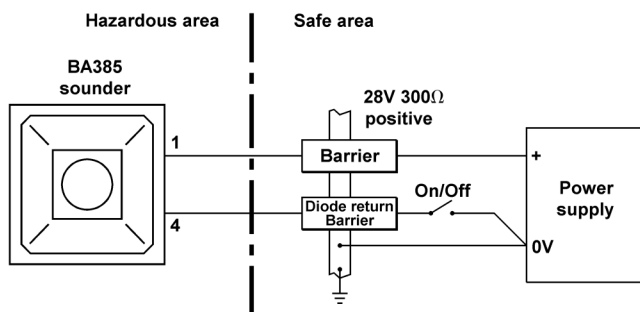


Fig 5 Single stage alarm using two channel barrier.

6.2 Multi-stage alarm

Connecting terminal 2 to 0V activates the second stage alarm, and similarly terminal 3 for the third stage alarm. Fig 6 shows how diode return barrier(s) may be used to control the sounder from the safe area. If only two stages of alarm are required the third stage barrier should be omitted, the 28V 300ohm barrier and the single diode return channel may then be contained in one package.

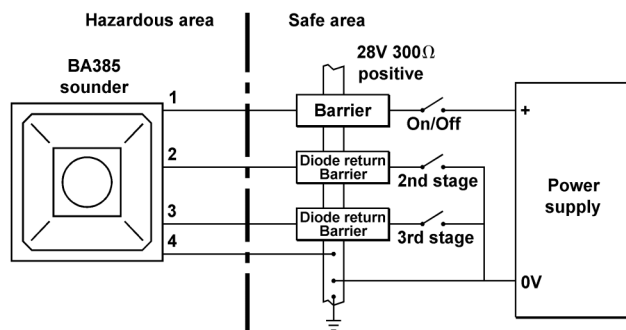


Fig 6 Multi stage alarm using Zener barriers.

7. ELECTRICAL SYSTEM DESIGN FOR INSTALLATION IN HAZARDOUS AREAS USING GALVANIC ISOLATORS.

Galvanic isolators although more expensive than Zener barriers, do not require a high integrity earth connection. For small systems where a high integrity earth is not already available, the use of galvanic isolators often reduces the overall installation cost and simplifies design.

7.1 Single stage alarm

The BA385-IIB and the BA385-IIC sounders may be powered by any EEx ia certified galvanic isolator having output parameters within the limits specified in section 4.4. The sounder may be controlled by turning the galvanic isolator on and off, or from the hazardous area by a mechanically activated switch complying with the requirements for simple apparatus. See 4.5

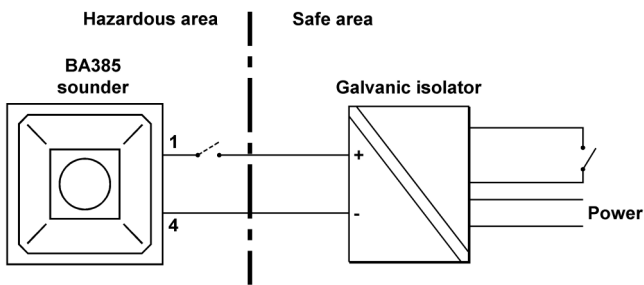


Fig 7 Single stage alarm using galvanic isolator.

7.2 Multi-stage alarm

Fig 8 shows a typical application in which the first and second stage alarm tones are activated by the alarm outputs of a BA327C intrinsically safe loop powered indicator. The BA327C alarm outputs have been certified as simple apparatus and may therefore be used to switch the BA385 sounder in the hazardous area. The contacts of most certified intrinsically safe relays may also be used in the same way.

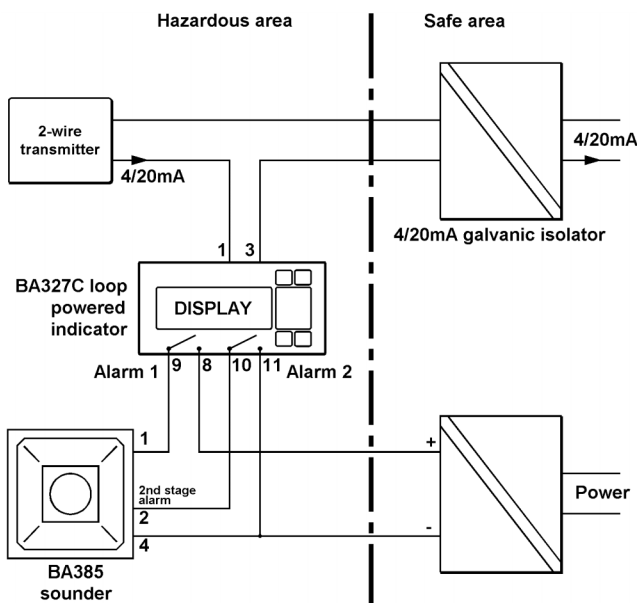


Fig 8 Loop-powered BA327C intrinsically safe indicator activating BA385 first and second stage alarms

8. CABLE PARAMETERS

The BA385 has zero total equivalent capacitance and inductance C_i and L_i . The maximum permitted cable parameters specified on the certificate for the barrier or isolator connected to the sounder therefore apply. normally these limits are not restrictive. Only the maximum permitted capacitance in IIC applications is likely to limit practical cable length.

9. ACCESSORIES

9.1 Tag number

The BA385-IIB and BA385-IIC sounders can be supplied identified by a tag number thermally printed on a self adhesive label.

10. Servicing

No attempt should be made to repair a faulty BA385-IIB or BA385-IIC sounder. Suspect sounders should be returned to BEKA associates or our local agent for repair.

11. Guarantee

Sounders which fail within the guarantee period should be returned to BEKA associates or our local agent. It is helpful if a brief description of the fault symptoms is provided.

12. Customer comments

BEKA associates are always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

APPENDIX 1 Installation in USA

A1.0 Factory Mutual Approval

For installations in the USA the BA385-IIB and the BA385-IIC sounders have been approved by Factory Mutual as intrinsically safe for Class I, Divisions 1 and 2; and as nonincendive for Class I, Division 2.

BA385-IIB installations must comply with the BEKA associates control drawing CI385-12 and BA385-IIC installations with control drawing CI385-13. All installations must also comply with ANSI/ISA RP12.6 and the National Electrical Code ANSI/NFPA70.

Copies of the FM control drawings are available from BEKA associates and:

Exloc Corporation
PO Box 1100
Manassas
VA 20108
USA
Tel: 703 361 5364
Fax: 703 368 3221
e-mail: exloc@ix.netcom.com

All the intrinsically safe circuits shown in this instruction manual may be used for installations in the USA, providing the Zener barriers and galvanic isolators comply with the specified Factory Mutual entity parameters.

A1.1 intrinsic Safety Approval

Both the BA385-IIB and the BA385-IIC sounders have been evaluated under the entity concept. The sounders may be connected to any intrinsically safe circuit having output parameters equal to or less than:

$V_{oc}, V_t = 32V$
 $I_{sc}, I_t = 110mA$
 $P_o = 0.8W$

The input terminals of both sounders have no equivalent capacitance and inductance, i.e. C_i and L_i are zero. The maximum permissible cable capacitance and inductance allowed for the Zener barrier or galvanic isolator powering the sounder may therefore be used subject to the limitation defined on the control drawings.

A1.2 Nonincendive Approval

The BA385-IIB and the BA385-IIC are Factory Mutual approved as nonincendive for Class I, Division 2 locations, which allows both sounders to be installed in Division 2 without the need for Zener barriers or galvanic isolators. The maximum supply voltage must be less than 32V, and the wiring must be nonincendive or 'Division 2 suitable' as defined in the National Electrical Code ANSI/NFPA70. For supply voltages above 16V, a series resistor having a value of $(V_{supply} - 16) / 0.04$ ohms is required.

A1.3 Classes, Divisions, Gas Groups and Temperature rating

The two models have been approved by Factory Mutual for installation in the following Divisions and Gas Groups.

BA385-IIB sounder

Intrinsic Safety	Nonincendive
Division 1 or 2	Division 2
Class I Group C Group D	Class I Group C Group D

BA385-IIC sounder

Intrinsic Safety	Nonincendive
Division 1 or 2	Division 2
Class I Group A&B Group C Group D	Class I Group A&B Group C Group D

Both sounders have a T4 rating and may be used at ambient temperatures between -20 and $+60^{\circ}C$.

Note: The BA385-IIB and BA385-IIC are not approved for use with Class II and III dusts and fibers.