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FLAMEPROOF GAS SENSE DETECTOR
INSTRUCTION MANUAL

2. INTRODUCTION

The Zeta Flameproof Gas Sense detector is a fixed-position gas detector designed to continuously monitor for the presence of hazardous gases, it can be used as a stand-alone unit or as part of a 4 wire system connected to a central control panel.

The Zeta Flameproof Gas Sense detectors are designed for both toxic gas and combustible gas sensors for hazardous environments, the detector is in an aluminium case with an ATEX approved sensor.

The detector has three alarm levels each with an on-board voltage-free relay output that operate when gas levels are detected above each programmed threshold.

The Pre-Alarm relay output can be used as a Fault relay output by the selection of a jumper link located below the ribbon cable connector on the controller board.

The unit has a 24V output which is active with alarm1 and alarm2 gas levels above alarm thresholds. Note the output is not monitored but can be used to drive a sounder.

For toxic gases the unit will display the gas type and concentration as parts per million (PPM) or percentage of volume (%VOL) and for combustible gases the unit will display a percentage of the lower explosive limit (%LEL).

The sensor is housed in a separate module and can be easily replaced at the end of its life.

There are six cable entry points with blind cable glands provided.

2.1 DETECTOR OVERVIEW AND INDICATIONS

2.1.1 – NAVIGATION BUTTONS

←	Escape Used to leave current menu,
↓	Scroll Up / adjust settings downwards,
↑	Scroll Down / adjust settings upwards,
OK	Enter Used to confirm actions/settings

2.1.2 - LCD SCREEN DISPLAY

The information displayed on the LCD screen is shown below

DETECTOR TYPE ↘ ↓POLLING INDICATOR ↙GAS TYPE AND RANGE

DETECTOR STATUS ↘

```
SYS* GASTYPE ???
FAULT      000 %VOL
```

↙ GAS LEVEL READING

```
SYS*   H2S      100
NORMAL  000  ppm
```

HYDROGEN SULPHIDE 100ppm

```
STD    NH3     1.0k
FAULT  0.00k  ppm
```

AMMONIA 1000ppm

A stand-alone unit will display STD in the top left corner of the display or if the detector is part of a system connected to a control panel then SYS will be displayed and each time the detector is polled an asterisk '*' will flash.

The type of gas detector and the range of concentration are displayed to the top right of the display,.

2.1.3 - ALARM LEVELS

There are three programmable alarm levels.

PRE-ALARM - is the lowest gas concentration warning, when active will operate a L.E.D. Indicator and voltage free relay contact. Note this relay can be changed to operate on a fault condition by selecting a jumper link on the controller board.

ALARM1 - Alarm level 1 Warns of rising gas level. An indication of impending danger.

ALARM2 - Alarm level 2 Area has high toxic levels and a high risk to persons in the area, heath and safety procedures should be followed.

Both alarm levels have a L.E.D. Indicator and a voltage free relay contact that operate when active. A 24V output is available to connect a sounder.

The detector has default values for each alarm level, it is very important that programmed levels protect the area. It is up to the installation engineer to consider suitable alarm values for the site to be monitored, and adjust the thresholds on the unit accordingly.

The default value for the PRE-ALARM level is 20% of the full scale value.

The default values for the ALARM1 and ALARM2 levels are set to 40% of the full scale value.

Further instructions on how to set the alarm thresholds can be found in section 4.1.

2.1.4 - VIEWING THE ALARM LEVELS

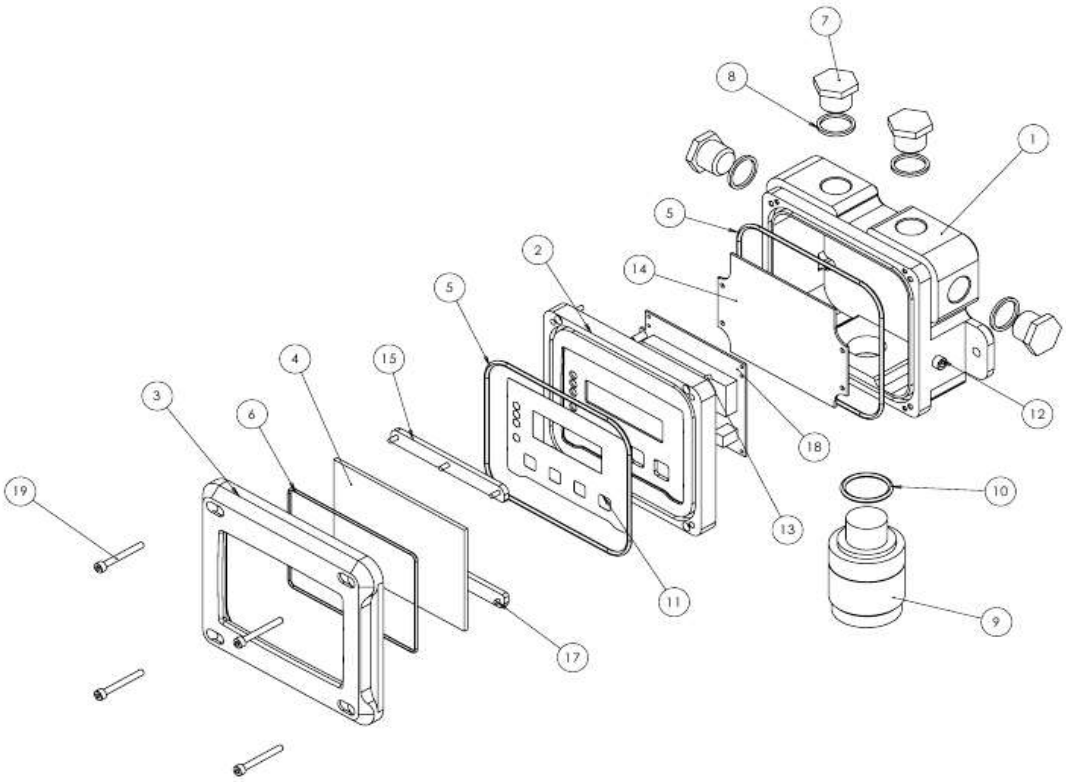
ON STAND-ALONE DEVICES - Pressing the OK button on the detector will change the display to view the alarm levels. Pressing the OK button again will change the display back to normal.

ON SYSTEM DEVICES – Pressing the UP and DOWN buttons together on the detector will change the display to view the alarm levels. Pressing the ESCAPE button will change the display back to normal.

PROGRAMMED ALARM LEVELS

2.3 INSTRUMENT CONSTRUCTION

The Detector design consists of a main chamber which houses all the electronics. Side-entry holes allow connections to external warning and signaling devices, as well as entry for the power, and the sensor element. The front of the unit has a glass window that allows unobstructed observation of the device condition, and can be removed to allow access to the controls.



Item	Description	Item	Description
1	Base housing	11	GasSense Label Overlay
2	Middle housing plate	12	Earth strap locations
3	Front Housing plate	13	M3x16 screws
4	Glass	14	GasSense Controller PCB
5	3mm Nitrile gasket	15	Glass Retaining Plate
6	2mm Nitrile gasket	16	M3x8
7	20mm Conduit plug	17	m3x4
8	20mm Conduit plug Gasket	18	GasSense Display PCB
9	Cyber-Head Sensor Module	19	M4x35
10	Detector Module Gasket		

3. INSTALLATION

The gas detectors are powered from an external 24V supply. Most power supplies require 2 x 12V batteries connected in series to provide the 24V backup power if the mains fails. It is very important that both batteries are of the same make and rating and changed as a set even if only one is defective.

To choose the size of power supply, each detector will require a maximum start-up current of 250mA this will need to be taken into consideration when choosing the size of the power supply. For the battery backup calculation use the quiescent current values for the detectors and devices.

Example, for a site with 10 detectors a 2.5A power supply will be the minimum required, it is good practice to have a supply big enough to allow later expansion.

Note- The detectors can be damaged if there is not enough power for them to start-up correctly.

3.1. CONDUCTING SITE SURVEY AND LOCATING DETECTORS

A thorough site survey should be undertaken prior to the installation of the detectors in order to identify areas where the target gases are most likely to be introduced and accumulate, and to identify ventilation patterns of the area that will affect the flow of the target gas.

To ensure continued reliable operation, attention should be made to the environment the gas detector will be installed in. The following key areas should include:

- The detector must be placed where it is easily visible and accessible for testing and or service.

- The detector must not be placed where water or other liquids can contaminate the sensor chamber.

- Avoid dusty environments as this can block the sensor. Where such areas are unavoidable, consider housing the unit in an enclosure with a filter (but which will still allow permeation of the target gas)

- Avoid areas where the unit is likely to experience strong head-on winds or pressure gradients.

- Alcoves, pits, ceilings or ducting where stagnant air is likely to accumulate, or be displaced by the target gases. These areas may also present a suffocation risk if oxygen is displaced from the area.

- Ventilation or corridors with turbulent air – gases are likely to be diluted as mixed with air in these areas

- Storage or piping for the target gas where leaks are likely to occur, particularly near inspection hatches, flanges, joints or inlets/outlets.

- Fixed equipment which uses the target gas or which may produce it as a by-product of either normal or abnormal operation.

- Ventilation, windows or doors which may reduce gas concentrations, or move the gas to a different area.

- Consult the gas safety datasheet for further information on potential dangers regarding the target gas that may be present. Consider that toxic gases may be hazardous to personnel at much smaller levels if exposure is over a longer period (see 15-minute exposure limits vs. 8 hour exposure limits)

- Gases may form a cloud in large areas that may not be detected. Reducing the spacing to reduce risk.

- Avoid exposure to chemicals that may damage or impair the sensitivity of the sensor, for example airborne lead or silicon compounds.

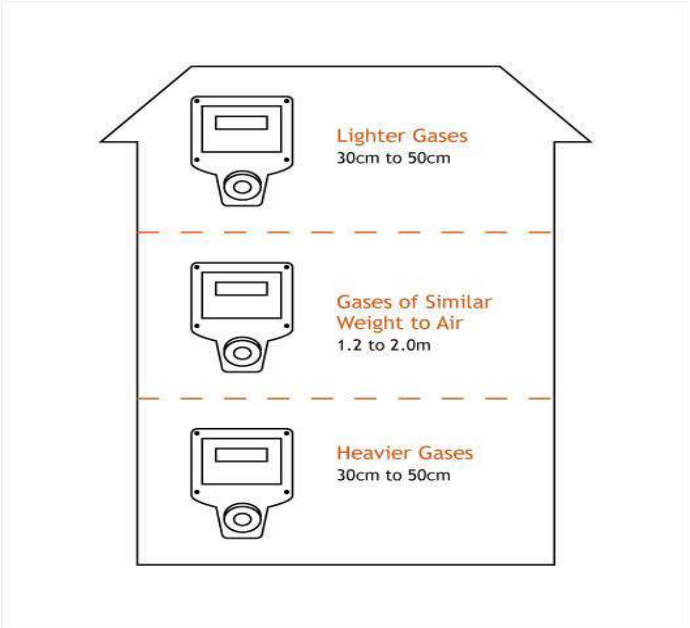
- Consider extra detectors where a failure or removal would pose a safety risk.

When choosing a suitable location for the detector, consider the detector will need to be visible and require regular testing. Place the detector on the wall where it cannot be obscured and secure with appropriate screws or bolts through the mounting holes provided.

For optimum coverage:
• A minimum spacing of 5M (16ft) between detectors is recommended.

• Position the sensor near any potential “leak source” or in the path of the gas; no more than 1.5m away.

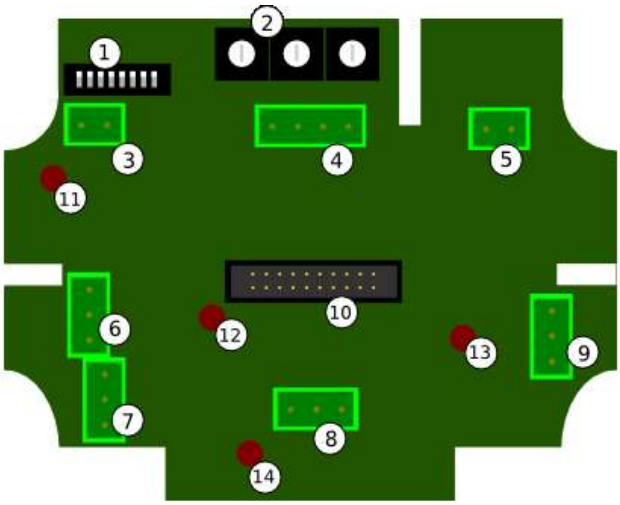
• Other installation information for gas detectors (where applicable) could be obtained from BS EN 50073:1999 code of practice.



For Gases lighter than air it is recommended to locate detectors 30cm to 50cm from the ceiling, and for gases heavier than air locate detectors 30cm to 50cm above the floor. For gases with similar weight to air it is advisable to locate the detectors at an average head height of between 1.2M -to 2.0M

3.2 SETTING-UP THE GAS SENSE DETECTOR

Legend
1 - Gas Type Switches
2 - Loop Address Switches
3 - 24V Alarm Output (Sounder)
4 - 24V Power Input (VAUX)
5 – Panel Loop Interface
6 - Pre-Alarm Relay Output
7 - Alarm1 Relay Output
8 - Sensor Interface
9 - Alarm2 Relay Output
10 - Display Interface
11 - Sounder Indication LED
12 - Pre-Alarm Indicator LED
13 - Alarm-2 Indicator LED
14 - Alarm-1 Indicator LED



Layout of controller board
Mini jumper link located below display connector (not shown)

3.3 IN STAND-ALONE MODE (STD)

- The Gas Sense detector is powered from a +24V Power Supply connected to the **VAUX+** and **VAUX-** terminals (4) a second pair of terminals are provided as output to next detector if required.
- A 24V output (3) can be connected to a sounder to activate on alarm. The cable is not monitored.
- Relays with change-over contacts are activated for each of the three alarm levels.
- The Gas Type switches (1) and Sensor terminal are factory set and do not require adjustment.
- The ribbon cable connection for the display (10) is located at the center of the board.

3.3.1 IN SYSTEM MODE (SYS)

- The Gas Sense detector is powered from a +24V Power Supply connected to the **VAUX+** and **VAUX-** terminals (4) a second pair of terminals are provided as output to next detector if required or loop back to power supply as circuit redundancy.
- The control panel loop terminals are connected to **+VLN1 and -VLN1** (5) on the detector, a second pair of terminals are provided as output to next detector..
- The gas detector address switches will need to be set, it is easier to do this before fitting.
- When all detectors are fitted, the control panel loop will need to be configured and check all devices are present and correct. See manual of control panel for further information
- If required the relays and sounder output can be used for additional local outputs.

3.4. **CONNECTING SOUNDERS TO THE DETECTOR**

The detector has a +24V sounder output terminal on the controller board, identify the connector terminals (3), **ZS-** and **ZS+**. **Note: polarity is negative on the left and positive on the right, the cable is not monitored for open or short circuit fault and is protected by a self-resetting thermal fuse.**

The sounder is active as soon as the gas level reaches alarm 1 and alarm 2. The output automatically resets when the gas level is below alarm 1 level.

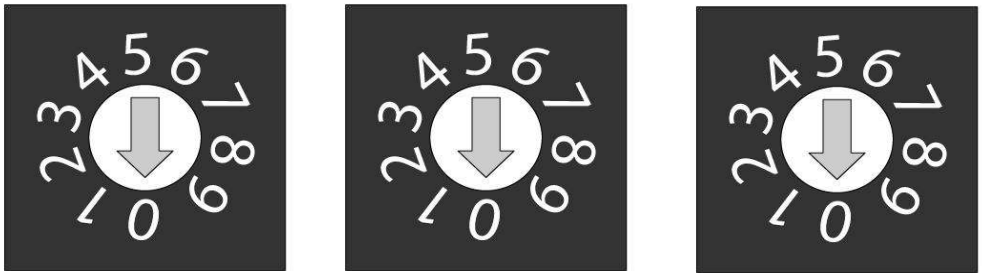
When a detector is connected to a gas control panel, it is possible to temporarily mute the sounder by resetting the detector from the panel’s reset button. It is also possible to control any number of sounders connected to the gas controller panel.

For further information consult the instruction manual for the gas control panel

4. GAS SENSE ADDRESSING (SYS MODE ONLY)

When the detector is connected to a gas control panel the address switches will need to be individually set it is important that each detector has a unique address setting for the panel to identify it. If two detectors have the same address the panel will report a 'double address' fault on the loop.
Each device connected to the loop can have an address in the range 1-126.

Identify the set of address switches (1) on the detector's main PCB



100's 10's 1's

Set each of them to desired device address

For example to set a detector address to 15 turn switches above to...

Set switch 100's to 0 = 0
Set switch 10's to 1 = 10
Set switch 1's to 5 = 5

Total = 0 + 10 + 5 = 15.

4.1 SETTING-UP OR ADJUSTING THE ALARM LEVELS

Before setting the alarm levels consult the relative regulations and exposure limits for the target gas to ensure the area is fully protected.

If the detector is connected to a gas control panel then we need to enter the 'detector setup mode' on the panel. The detectors will change from SYS mode to STD mode allowing the internal alarm levels to be edited, – refer to the instruction manual for the gas control panel.

To edit the Pre-Alarm level we need to first enter the ACCESS menu screen by pressing the UP↑ and DOWN↓ buttons simultaneously.

Firmware Name and Version -

Description of mode -

Pressing OK will display the **PRE-ALARM** level.

To edit the PRE-ALARM level press the OK button again, an arrow will appear to prompt editing mode.

Using the UP and Down Buttons you can scroll to the level required, then press OK to confirm level and exit to ACCESS screen.

To edit the Alarm1 level we need to first enter the ACCESS menu screen by pressing the UP↑ and DOWN↓ buttons simultaneously.

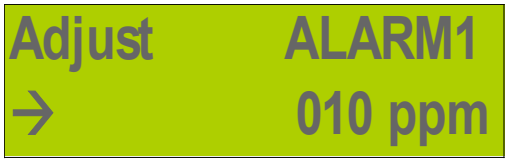
Firmware Name and Version -

Description of mode -

Pressing OK will display the **PRE-ALARM** level,
Press the UP↑ arrow you can scroll up to **ALARM1.**

To edit the ALARM1 level press the OK button again, an arrow will appear to prompt editing mode.

Using the UP and Down Buttons you can scroll to the level required, then press OK to confirm level and exit to ACCESS screen.



To edit the Alarm2 level we need to first enter the ACCESS menu screen by pressing the UP↑ and DOWN↓ buttons simultaneously.

Firmware Name and Version -

Description of mode -

Pressing OK will display the **PRE-ALARM** level,
Press the UP↑ arrow you can scroll up to **ALARM1.**
Press the UP↑ arrow again to scroll up to **ALARM2**.

To edit the ALARM2 level press the OK button again, an arrow will appear to prompt editing mode.

Using the UP and Down Buttons you can scroll to the level required, then press OK to confirm level and exit to ACCESS screen.

Pressing ESCAPE← button will exit the menu and return screen to normal.

5. **TEST REQUIREMENT AND TEST PROCEDURE - BUMP TESTING**

We recommend regular testing of the detector to confirm the device is still within calibration and working correctly. Apply an appropriate concentration of the target gas – ideally 50% of the instruments full scale range at least every 90 days. Keep a record of when tests are made, and their reading to pinpoint any drift in calibration.

Prior to testing the detector ensure that any critical systems connected to it (either through the alarm relays or via a control panel) are isolated so that they are not triggered during the test.

Do not use gas concentrations in excess of the instruments full scale value, as this may overload the sensor and damage its calibration.

The GasSense Flameproof detector will require a NET-CAP3 cap (Not Supplied) for controlled injection of gas.

The customer is advised to obtain a hose, appropriate concentration of target gas balanced in air or nitrogen and fixed flow regulator with a flow rate not exceeding 0.5l/min.

TEST PROCEDURE

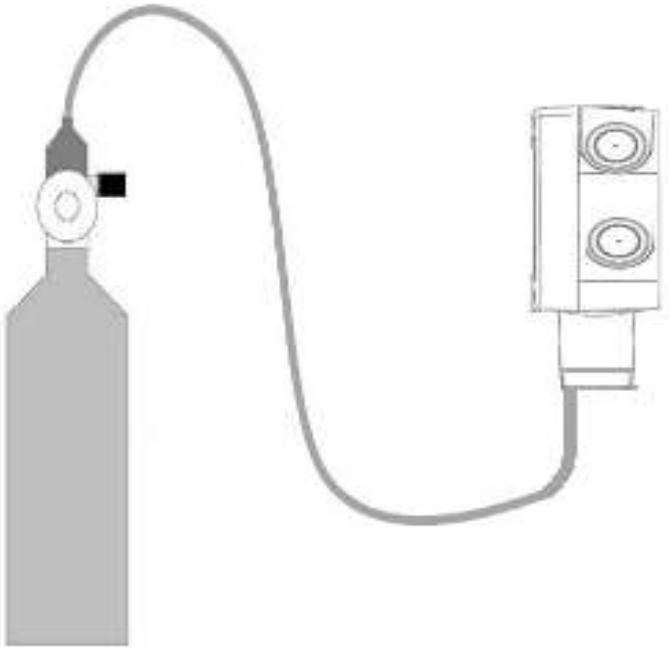
- Insert the white nozzle onto the calibration cap of the detector .

- Connect one end of the hose to the white nozzle. For best results keep the hose short (20-50cm). Ensure an airtight fit over both ends.

- Insert the other end of the hose to the fixed flow regulator of the gas cylinder. Recommended flow rate should be no more than 0.5 l/min

- Turn the flow regulator to release gas onto the sensor for 15-20 seconds, or until the gas concentration reading reaches a steady value.

- Record the reading obtained.



BUMP TEST RECORD

Unit serial number:_____ Unit target gas:_____ Range:_____

Date	Test gas concentration	Test gas serial number	Test gas expiration date	Reported concentration	Tested By-	Next test due

5.2. **DETECTOR SERVICING AND SENSOR REPLACEMENT**

As part of scheduled maintenance, arrange with GLT Exports (or your local supplier) for replacement sensor when it reaches the end of its working life, or if it is found to be severely out of calibration. The removal for maintenance or a failure of any sensor should not compromise the safety of the area being protected. In compliance to EN 50073 code of practice we recommend a duplication of the detection instrument where continuous monitoring is required. Repairs and servicing on the instrument should be carried out in a safe place outside the area being protected.

6. GENERAL FAULT-FINDING

The detector shows “FAULT” for the following conditions

- When first powered up as there is a delay for the sensor to warm up. It can take up a minute to clear.
- If no sensor is fitted or if the sensor fails.
- If the detector is not configured or there is a fault reported on the control panel, try resetting the panel..
- If the power supply cannot provide enough start-up current for the detector to operate correctly, each detector will require a minimum of 250mA. Note the detector can be permanently damaged if left in this state long term.

If the detector cannot be found by the panel try the following solutions

- When installing a system with several detectors on a loop, start off by connecting only one device and ensuring that it powers up correctly, and then configuring it on the control panel. Once the first device is confirmed to work satisfactorily, connect the second device and check that it is detected properly by the control panel. Continue in this manner until all devices have been installed.
- Check the detectors display shows system mode (SYS).
- Check there is no double address fault showing on the panel, check addresses on all devices and reconfigure loop, refer to panel manual for details.
- Check the detector is polled by the panel (flashing asterisk '*') and no faults are reported on the panel.
- Check the loop wiring terminations ensure there is no loose connection(s).
- If other devices work correctly try connecting the device to the panel on its own and configuring loop.
- Detectors for toxic gases will have a device type TOX

If the gas level reading is not at normal levels

- Confirm that the sensor has not reached the end of its working life. Contact us or your local supplier to arrange a replacement.
- The detector should read 000ppm in clean air, the unit is very sensitive to voltage variation of the sensor, so in most cases a reading of 1-2% is acceptable. The detector may give a false reading if installed in a location that allows air or other gases to create pressure gradients. Ensure the sensor has not been exposed to contaminants such as lead or silicon compounds, where possible verify the area is free of the target gas by comparing against a portable detector.
- The detector has been set to the correct gas type and range.
- In system mode the reading is only updated after each polling ('*') from the control panel and it is normal for the panel reading to be one scan behind the detector reading. Scan duration can be 4 – 8 seconds.

If the detector display is not showing correct gas type or Gastype???

- The Gas Sense detector is factory set to the correct gas type and normally do not require any adjustment. If the switches are altered it will display the wrong target gas type and readings from the sensor may be incorrect and may pose a reduction in protection of the area. Check correct settings with table in section 7.

If the detector display is corrupt or unreadable

- If there is no text on the display (either a blank screen or black squares), first check that the ribbon cable between the main board and the display has not become loose, or broken. If it has, power down and attach or replace the cable.

- The detector will fail to start up correctly if the power supply is unable to provide sufficient current to meet the needs of all devices connected. You should allow 250mA per detector, plus enough to power up and run any other equipment attached to the power supply.

- If the ribbon cable becomes disconnected from the display or main-board whilst the unit is running, you will need to power the unit off and on again to re-initialize the display.

7. GAS TYPES AND SWITCH SETTINGS FOR FLAMEPROOF DETECTORS

Note: For gases not listed there are five Toxic gas type settings and one setting for a Combustible gas that can be used but this does not guarantee that the sensor is available that target gas. Ranges are displayed as ppm, %Vol for toxic or %LEL for combustible gases.

Alteration of the switches does not change the type or full-scale range of the installed sensor and may lead to incorrect operation of the unit. In most cases the switches are factory set and should not be changed.

Part No.	TOXIC Gas Types	Formula	Specific Gravity Air=1	Ranges	Replacement Sensor Part Number	Switches
47-963	Chlorine	Cl_2	2.45	0-20ppm	ZET/32-ATX-NT-CL2-PL20	0 1 1 0 0 1 0 0
47-964	Hydrogen Sulphide	H_2S	1.19	0-100ppm	ZET/32-ATX-NT-H2S-PL100	0 1 1 0 1 1 1 1
47-965	Ammonia	NH_3	0.59	0-100ppm	ZET/32-ATX-NT-NH3-PL100	0 1 1 1 1 0 0 1
47-966	Ammonia	NH_3	0.59	0-300ppm	ZET/32-ATX-NT-NH3-PL300	0 1 1 1 1 0 1 0
47-967	Ammonia	NH_3	0.59	0-1000ppm	ZET/32-ATX-NT-NH3-PL1000	0 1 1 1 1 1 1 0
47-968	Ammonia	NH_3	0.59	0-5000ppm	ZET/32-ATX-NT-NH3-PL5000	0 1 1 1 1 1 0 1
47-969	Nitrogen Oxide, Nitric Oxide	NO	1.04	0-100ppm	ZET/32-ATX-NT-NO-PL100	0 1 0 0 1 0 0 0
47-970	Nitrogen Oxide, Nitric Oxide	NO	1.04	0-300ppm	ZET/32-ATX-NT-NH3-PL300	0 1 0 0 1 0 0 1
47-971	Nitrogen Dioxide	NO_2	1.1	0-30ppm	ZET/32-ATX-NT-NO2-PL30	0 1 0 1 1 0 1 1
47-972	Sulphur Dioxide	SO_2	2.26	0-20ppm	ZET/32-ATX-NT-SO2-PL20	0 1 1 0 1 0 0 1
47-973	Carbon Monoxide	CO	0.97	0-300ppm	ZET/32-ATX-NT-CO-PL300	0 1 0 0 0 0 1 0
47-974	Carbon Monoxide	CO	0.97	0-1000ppm	ZET/32-ATX-NT-CO-PL1000	0 1 0 0 0 1 0 1
47-975	Carbon Dioxide	CO_2	1.52	0-5000ppm	ZET/32-AIN-INP32-CO2P	0 1 0 1 0 1 0 1
47-976	Carbon Dioxide	CO_2	1.52	0-5% Vol	ZET/32-AIN-INP32-CO25	0 1 0 1 0 1 1 1
47-977	Carbon Dioxide	CO_2	1.52	0-10% Vol	ZET/32-AIN-INP32-CO2D	0 1 0 1 1 0 0 1
47-978	Oxygen	O_2	1.14	0%-25% Vol.	ZET/32-AO2-NT-O2-A2	1 0 1 1 1 1 1 0
	Toxic 0-10ppm			0-10ppm	RESERVED	0 0 1 1 1 1 0 0
	Toxic 0-50ppm			0-50ppm	RESERVED	0 0 1 1 1 1 0 1
	Toxic 0-100ppm			0-100ppm	RESERVED	0 0 1 1 1 1 1 0
	Toxic 0-500ppm			0-500ppm	RESERVED	0 0 1 1 1 1 1 1
	Toxic 0-1000ppm			0-1000ppm	RESERVED	0 1 0 0 0 0 0 0

Part No.	COMBUSTIBLE Gas Types	Formula	Specific Gravity Air=1	Ranges %Vol 0%-100%LEL	Replacement Sensor Part Number	Switches
47-980	Methane	CH_4	0.55	5.00%	ZET/32-AIN-INP32-CH45	1 0 1 1 0 1 0 0
47-984	Propane	C_3H_8	1.57	2.10%	ZET/32-AIN-INP20-PRO2	1 0 0 0 1 1 0 0
47-979	n-Butane	C_4H_{10}	2.06	1.80%	ZET/32-AIN-INP20-BUNL	1 0 0 0 0 0 1 0
47-983	n-Pentane	C_5H_{12}	2.49	1.40%	ZET/32-AIN-INP20-PENL	1 0 0 0 0 1 1 0
47-982	n-Hexane	C_6H_{14}	2.97	1.02%	ZET/32-AIN-INP20-HEXL	1 0 0 0 0 1 0 0
47-981	n-Heptane	C_7H_{16}	3.45	1.05%	ZET/32-AIN-INP20-HEPL	1 0 0 0 0 0 1 1
47-985	Acetone	C_3H_6O	2	2.60%	ZET/32-AIN-INP20-ACTL	1 0 1 0 0 0 0 0
47-986	Isopropyl Alcohol	C_3H_8O	2.07	2.20%	ZET/32-AININP20-IPAL	1 0 1 0 0 0 1 0
47-987	Ethanol	C_2H_6O	1.59	3.30%	ZET/32-AIN-INP20-ETAL	1 0 1 0 1 0 1 0
47-988	Ethyl Acetate	$C_3H_8O_2$	3.03	2.20%	ZET/32-AIN-INP20-EACL	1 0 1 0 1 0 1 1
	Combustible			0 – 100% LEL	RESERVED	1 1 1 0 0 0 0 0

Note – when sensors reach the end of their operating lifetime make sure replacement sensors are of correct gas type and range when ordering. Contact us or your local supplier for details.

8. TECHNICAL DATA

Operating Voltage	+21V – 30V Max. (24V Nominal).
Initial Power Up Current	250mA maximum for 1-2 seconds
Quiescent Current	60mA Typical.
Alarm Current	80mA Typical excluding Sounder Current
Power Up Time	typically less than 10 seconds
Sensor Warm Up Delay	typically less than 90 seconds
Response Time	< 10 seconds
IP Rating	65
Maximum Humidity	20-90% RH @ 40°C
Operating Temperature	-10 - +50°C
Sensor Type (Typical):	Electro-Chemical Sensor for Toxic Gases, NDIR for Combustible Gases.
Sensor Operating Mode	4 – 20 mA
Sensor Lifetime	2 Years Typical depending on application.
Operating Modes	Stand-Alone and Central Controlled System
System Connection	4-Wire System, Power and Loop Connection
System Isolation	Optical
Programmable Alarm Levels	Pre-Alarm, Alarm1, Alarm2
Fault Relay Mode (Optional)	Pre-Alarm Relay operates as a normally energised Fault output by selection of a jumper link on the gas board.
Alarm outputs	Changeover Relay Contact for Pre-Alarm, Alarm1, Alarm2 and a 24V Output for Sounders (Not Monitored).
Alarm Isolation	Mechanical
Alarm relay contact ratings	(DC) 2A @ 30VDC (60W) Thermal Fuse Protection (AC) 0.5A @ 125VAC (62.5VA) Thermal Fuse Protection (AC) 0.25A @ 250VAC (62.5VA) Thermal Fuse Protection
Maximum sounder current	800mA @30VDC Thermal Fuse Protection
Sounder Isolation	None
Dimensions	200 x 150 x 70 mm (Length x Width x Depth)
Net Weight	2.2 Kg

9. REFERENCES

BSI (2000). BS EN 45544-1 Workplace atmospheres – electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours. Part 1: General requirements and test methods. BS EN 45544-2 Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours. Part 2: Performance requirements for apparatus used for measuring concentrations in the region of limit values. BS EN 45544-3 Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours. Part 3: Performance requirements for apparatus used for measuring concentrations well above limit values. BS EN 45544-4 Workplace atmospheres - Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours. Part 4: Guide for selection, installation, use and maintenance.

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