



SBS-CH4

Methane Gas Detector Kit

For applications and processes where Methane gas may be present

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS



Protects Life, Property and Profits

Electrical Safety – UL 61010-1

*Compliant with NFPA 70E® and IEEE Recommendations
Pollution Degree 2*

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Warnings

- This detector is added protection, not a substitute for prudent safety measures, for where methane gas may be present.
- For large or highly-sensitive areas, SBS recommends installing additional sensors for increased coverage area.
- The methane sensor does not provide protection from fires or methane explosions. The relay contacts are intended to be connected to a safety system that would enable audible alarms, system shutdown and ventilation.
- Ensure that installation complies completely with all relevant Local, State, Federal and OSHA safety and health regulations.
- If a sensor enters warning or alarm mode there is a risk of combustion or explosion. To avoid injury, leave the area immediately.
- The sensor is calibrated for operation in air. Tampering with the sensor or operation in environments that are exposed to other types of gases can lead to inaccurate readings, false alarms or permanent damage.
- Please see troubleshooting guide for list of gases and compounds that may damage or alter a sensor's performance.
- Uncured silicone compounds or extended exposure to silicone off gassing can give inaccurate readings or false alarms on a sensor.

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Main Unit and Accessories

<u>Part No.</u>	<u>Description</u>
SBS-CH4	Methane Gas Detector Includes: one (1) main control, one (1) CH4-SENSOR and one (1) 25 ft. cable
CH4-JB	Junction Box with Knockouts, 4 11/16" X 4 11/16", Metal
CH4-SENSOR	Methane Gas Sensor Only (No Cable)
CH4-SENSOR-25FT	Additional/Replacement Methane Gas Sensor with 25 ft. Cable
CH4-SENSOR-50FT	Additional/Replacement Methane Gas Sensor with 50 ft. Cable
CH4-SENSOR-100FT	Additional/Replacement Methane Gas Sensor with 100 ft. Cable
CH4-TESTKIT	Field Test Kit for SBS-CH4 Includes: case, regulator, tubing and two (2) cylinders of CH4 gas (25%LEL and 50%LEL)
CH4-TESTKIT-INTL	Field Test Kit for SBS-CH4 Includes: case, regulator and tubing – does not include CH4 gas cylinders
E190399	110Vac 3 Prong AC Cord, 10 Ft., 18-3 AWG

1.0 Overview

At room temperature and pressure, methane is a colorless, odorless gas.

Concentrations of 4.4% to 17% CH₄ mixed with air can be explosive. Sparks or hot surfaces can ignite methane gas.

The SBS-CH₄ methane detector acts as a monitor and provides a visual and audible alarm when methane gas is detected. The unit also has a 25%LEL concentration relay that can trigger exhaust fan operation and a 50%LEL concentration relay that can trigger a building management/alarm system (via SCADA/Modbus) before the gas reaches the lower explosive limit (LEL) of 4.4%.

2.0 Benefits

In addition to protecting employees and property, the detector may also reduce the following costs:

Energy Efficiencies

Instead of continuously running an exhaust fan to prevent methane gas accumulation, use the detector to activate a fan only if the gas concentration reaches 25%LEL.

Insurance Savings

Installation of a detector in areas where batteries are charged may result in a premium reduction.

3.0 How it Works

Should the concentration of methane gas in the air surrounding the sensor reach 25%LEL by volume, the “**25%LEL Warning**” yellow LED will light up on the main control of the unit. In addition, the 25%LEL internal relay will energize and can be used to activate a remote exhaust fan.

Should the methane gas concentration reach 50%LEL by volume, the “**50%LEL Alarm**” red LED will light up, the strobe will flash and an audible alarm will sound. In addition, the 50%LEL internal relay will energize and can be used to activate a building management/alarm system (via SCADA/Modbus).

The SBS-CH₄ provides automatic operation, continuous detection, high sensitivity, stability and solid-state reliability. The unit uses 120/240 Vac 50/60 Hz and/or 12 - 48 Vdc operating voltages.

4.0 Specifications

Dimensions

- Main control: 4.7" L x 4.7" W x 1.2" D
- Sensor: 3.1" L x 1.6" W x 0.87" D

Mounting

- Wall: two 3/16" screws (not included)
- CH4-JB Junction box: 4 11/16" x 4 11/16" 2-gang junction box



Power Requirements/Options

Warning: Power requirements for the unit and relays should not exceed min/max specifications

- 120 Vac, 50/60 Hz Nominal (Terminal J8)
 - 93 - 121 Vac
 - 250mA / 10W Max
- 220 Vac, 50/60 Hz Nominal (Terminal J8)
 - 185 - 242 Vac
 - 125mA / 10W Max
- 12-48 Vdc Nominal (Terminal J9)
 - 9 - 58 Vdc
 - 600mA / 6W Max
 - **Note:** An earth ground must be supplied to the GND terminal on the AC terminal block when using only the DC power supply



Relays

- 25%LEL Warning Relay (Terminal J6)
 - 1 Normally Open and 1 Normally Closed contact
 - Rated for 15 A resistive @ 120 Vac
 - Rated for 10 A resistive @ 277 Vac
 - Rated for 10 A resistive @ 28 Vdc
- 50%LEL Alarm Relay (Terminal J3)
 - 1 Normally Open and 1 Normally Closed contact
 - Rated for 0.5A @ 28 Vdc

Temperature/Humidity

- Operating Temperature Range: 32°F (0°C) to 122°F (50°C)
- Operating Humidity Range: 20-95% non-condensing
- Storage Humidity Range: 5-95% non-condensing

Maximum Altitude

- 2000 meters

Audible Alarm

- 85 dB at 10' @ 1.6 - 3.2 KHz

Strobe LED

- 146 lumens at 1A @ 3.2-4.2V

5.0 Sensor

The CH₄-SENSOR consists of an electronic sensing element whose electrical conductivity increases when Methane is detected at its surface. Conductivity of the sensor is proportional to the gas concentration, which is continuously monitored by the electronic alarm circuits.

The sensor is calibrated specifically for methane gas (CH₄) and can detect other combustible gases that it is not specifically calibrated for.

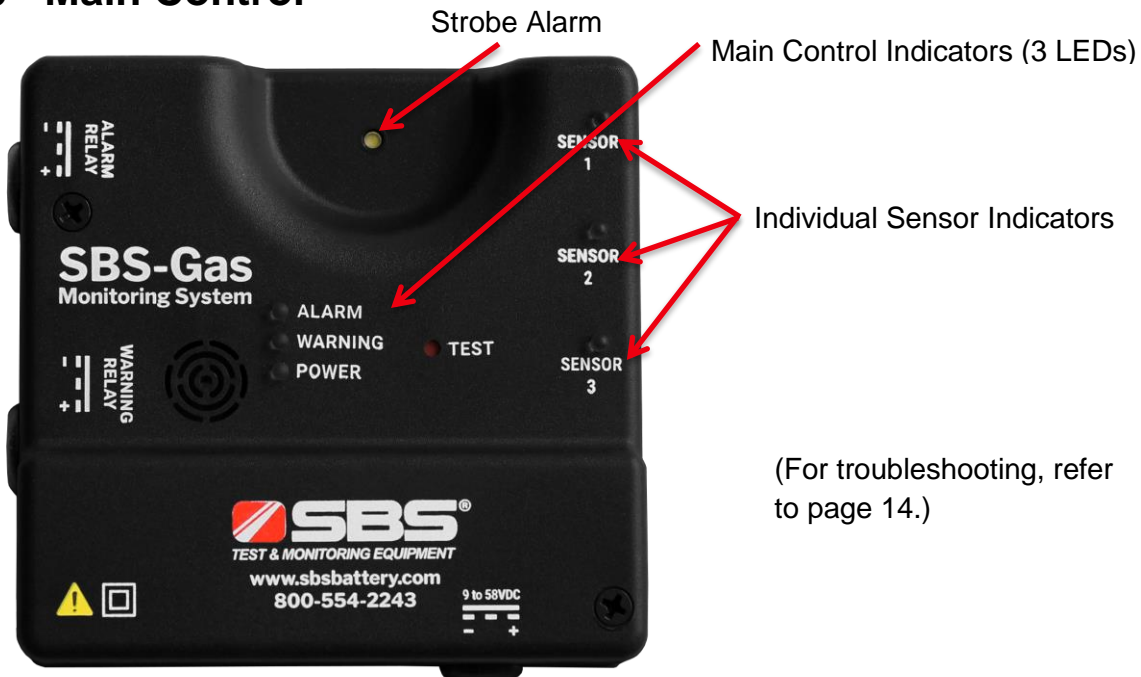


Methane Sensor



Cat5 Cable
(25 ft. std., 50/100 ft. optional)

6.0 Main Control



Main Control

(For troubleshooting, refer to page 14.)

7.0 Installation



WARNING

AC voltage relay terminals (120/240 Vac) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is removed from the detector relays prior to servicing the unit. Failure to do so may result in injury or death.

Mounting and Power Options



Alarm Wiring

Wall Mountable

Integrated back mounting plate allows user to easily mount directly to any wall using 3/16" screws (not included).

Wiring

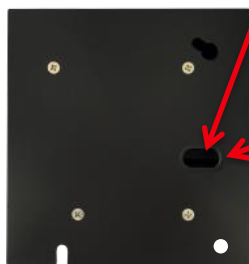
Power and alarm wires can run through the sides of the unit.



Input Power

CH4-JB Junction Box Mountable (optional)

Mounts to a standard, 4 11/16" x 4 11/16" 2-gang junction box



Hardwire Option

Run AC and/or DC power and alarm wires through back of the unit, into the gang box and out through conduit.



E190399 AC Line Cord

3-prong grounded AC cord, 18-3 AWG

Mounting Location

Methane is colorless and odorless; the leaks from a refrigerated liquid container are heavier than air due to increased density of the cold gas, however the gas at ambient temperature is lighter than air and thus rises. **The sensor should be installed in proper location for detection of leaking liquid gas, or rising ambient temperature gas accumulation.**

The detector measures methane gas concentration in the air immediately surrounding the sensor's surface. The area one sensor will monitor depends on the properties of the compartment or room. Methane gas may accumulate in several areas of the compartment or room and multiple sensors/detectors may be necessary depending upon construction and design of the application.

The main control can be mounted wherever is convenient for the user, but should be within the cable length range to connect to each sensor.

The sensor should be mounted at the **location where leak detection or gas concentration buildup is to be monitored**. Each sensor connects with the main control via the cable.

Carefully remove the main control cover by removing the two screws located on the front of the cover. Attach the main control to the wall, ceiling or optional junction box using the mounting holes at the top and bottom of the main control's mounting plate.

After the power and relay wiring is complete, connect each cable from main control to each sensor and refasten the main control cover.

Power Options

The detector has terminal blocks for connections to a single-phase 120/240 Vac 50/60 Hz power source (**Terminal J8**), and/or a 12-48 Vdc power source (**Terminal J9**). The power supply inputs are redundant, so the unit can use the DC input as a backup source.

Relays

The detector has two (2) internal alarm relays:

- 25%LEL warning relay (**Terminal J6**) is activated when a sensor detects 25%LEL concentration of methane gas. The 25%LEL relay's dry contacts are rated at 10A/250 Vac, sufficient for most 1/3 HP exhaust fans.
- 50%LEL alarm relay (**Terminal J3**) is activated when a sensor detects 50%LEL concentration of methane gas. The 50%LEL relay's dry contacts are rated for 0.5A/28 Vdc.
- *Note: For higher current requirements, add an external relay.*

Mounting Options

Junction Box Mounted

For 120/240 Vac power, use 18-3 gauge stranded wire.

For 9 - 58 Vdc power, use 18-2 conductor insulated wire.

For relay wires, use stranded wire. Maximum wire size for connector terminations is **14 AWG**.

Stranded conductors must be terminated in a manner to prevent shorting from one terminal to another by a loose strand. Tin the wires with solder if required.

Wall Mounted

For 120 Vac power, an 18-3 gauge insulated line cord is required.

For 9 - 58 Vdc power, use 18-2 conductor insulated cable from the DC supply.

For relay wires, use stranded wire. Maximum wire size for connector terminations is **14 AWG**.



SBS supplies a tie-wrap to secure the AC mains' wiring. The tie wrap can rotate up to 270 degrees to accommodate your installation.

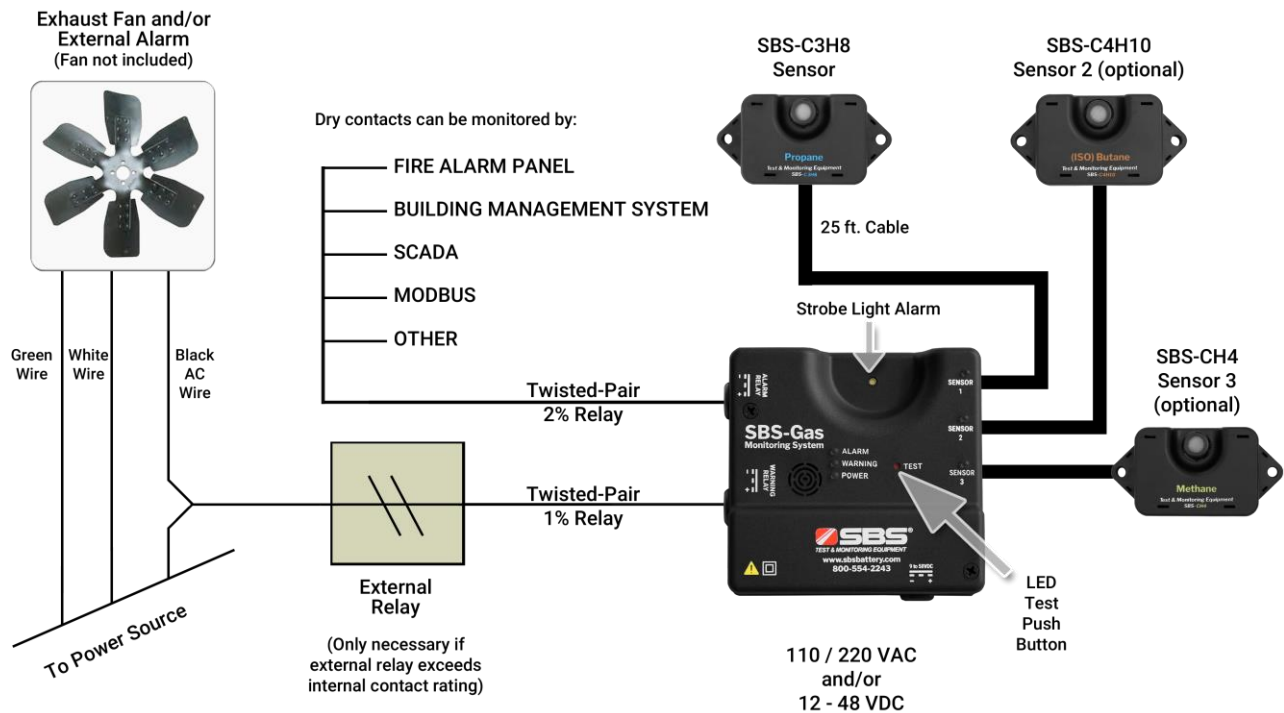
Disconnection of Supplying Power

When the unit is hard wired, an external 10 Amp (minimum) circuit-breaker or switch should be installed to act as a disconnecting device. The circuit-breaker must open all supply conductors simultaneously, be easily reached by operators and be marked as the disconnecting device for the equipment.

For Installation of Additional Sensors

A maximum of three (3) sensors may be connected to each main control. Multiple detectors and sensors can be installed to meet the space coverage requirements of your particular installation.

Locate the additional sensors' installation points within cable reach of the main control and mount the sensor. Connect the cables from any additional sensors to the Sensor 2 and Sensor 3 inputs on the main control.

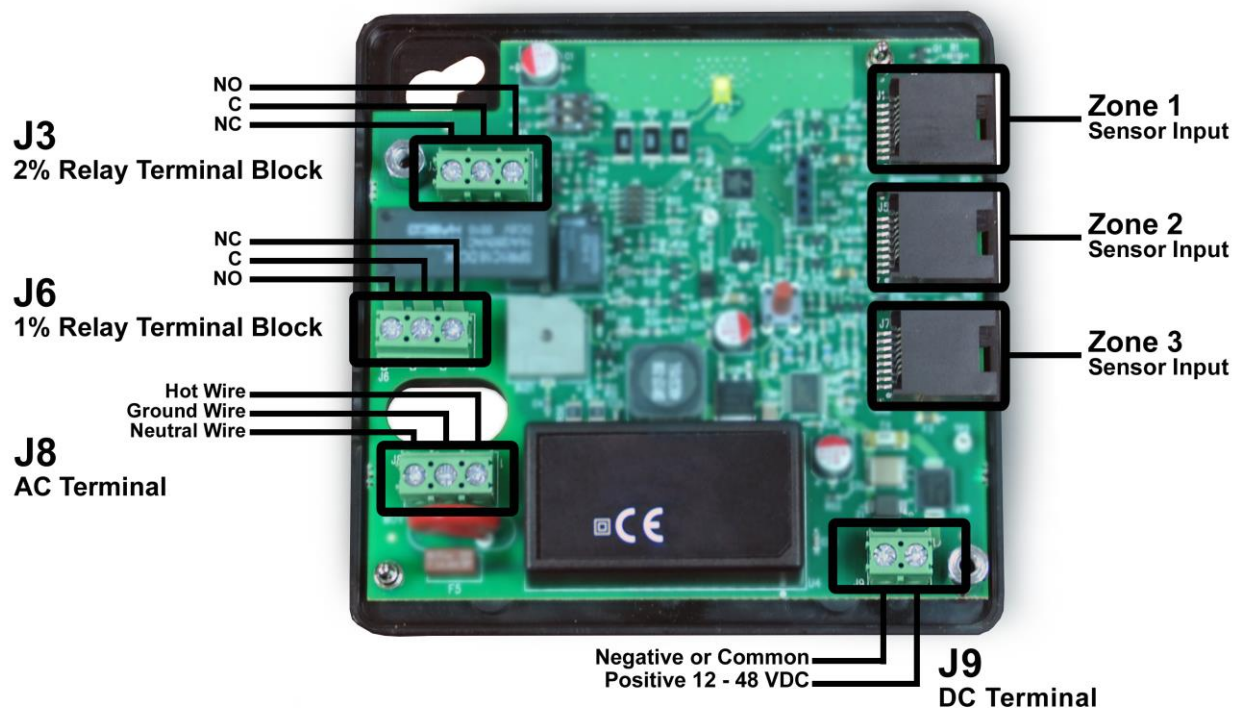


Alarm System Electronics

Please refer to the illustration below to identify proper power and relay connection points in the detector. It is advisable to use a pair of 14 gauge or smaller stranded wire for the relay contacts to help reduce any interference within the area that may cause false alarms.

Each of the Cat5 sensor input connections has a status indicator LED on the main control, which will illuminate solid green when a sensor is connected and operating normally. A sensor's corresponding LED will flash at the same rate as the strobe LED when detecting 25%LEL or 50%LEL CH4 concentration. The LED for a sensor that is in alarm mode will flash at the same rate as the strobe LED. The alarming sensor and strobe LED will flash at a faster rate than the LED for a sensor that is only in warning mode.

Terminal Connection Diagram



Using the Mechanical Relays

1. Remove the front cover of the main control by removing two fix screws and pulling straight off the body. This will reveal the inner electronics of the alarm box.
2. Locate the terminal blocks for the relays and determine which condition you would like the relay to be related to. Use the 25%LEL relay (**Terminal J6**) for the warning condition and the 50%LEL relay (**Terminal J3**) for the alarm condition.
3. Replace the front cover on the alarm box.

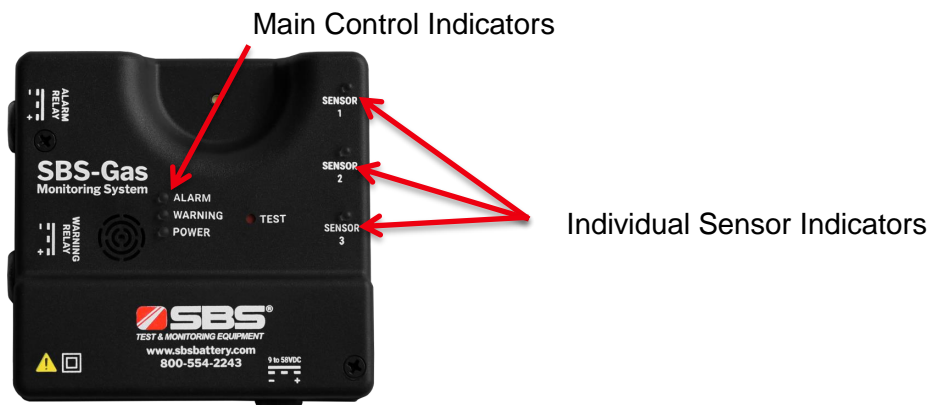
8.0 Operation

Keep the detector on at all times. The solid green LED for 'POWER' on the main control indicates that the detector is powered on.

When power is first turned on, a warm up period of 30 seconds will elapse before the unit will function. This delay is to prevent false activation of the internal relays and alarm.

Should the concentration of methane gas in the air surrounding the sensor reach 25%LEL by volume, the **"25%LEL Warning"** yellow LED will light up on the main control of the unit. In addition, the 25%LEL internal relay will energize and can be used to activate a remote exhaust fan.

Should the methane gas concentration reach 50%LEL by volume, the **"50%LEL Alarm"** red LED will light up, the strobe will flash and an audible alarm will sound. In addition, the 50%LEL internal relay will energize and can be used to activate a building management/alarm system (via SCADA/Modbus).



Condition	Main Control Indicators			Individual Sensor Indicators	Relay Closure	Audible Alarm	Strobe
	Power	Warning	Alarm				
Normal Operation				 (sensor installed)	None	None	None
CH4 Warning (25%LEL CH4)				 (blinking green)	Warning Relay Energized	None	None
CH4 Alarm (50%LEL CH4)				 (same flash rate as strobe)	Warning and Alarm Relay Energized	ON	ON
Sensor/Cable Fault					None	None	None
Communication with Sensor Lost				 (plugged in, but not lit)	None	None	None

9.0 Electrical Testing

A "TEST" button is located on the front of the main control. Push and hold this button for approximately 10 seconds to test the unit's electronic circuitry.

The warning and alarm LEDs will light up in sequence, the strobe will flash, the relays will activate whatever is connected to them and the internal warning alarm will sound.

Note: The "TEST" button does NOT test the sensor(s) itself – only the unit's electronic circuitry.

10.0 Testing the Sensor

The sensors and main controls are factory calibrated. It is recommended to test each sensor's functionality every 12-18 months with the CH4-TESTKIT.

The CH4-TESTKIT is intended for periodic testing of the functionality and proper operation of the system. Once a sensor is installed, calibration or adjustment of the sensor is not possible. Please contact your sales representative if sensor calibration is desired or required.

The CH4-TESTKIT includes the following:

- 25%LEL (17 liters) CH₄ in air calibrated gas canister
- 50%LEL (17 liters) CH₄ in air calibrated gas canister
- Regulator
- Flexible tubing with sensor head adapter



Testing the 25%LEL Warning and 50%LEL Alarm State

1. Connect the test fixture to the 25%LEL CH₄ air gas cylinder.
2. Secure the test fixture to the sensor module connected to sensor by pressing the flexible tubing completely over the inlet to the sensor head.
3. Turn on the gas flow by slowly cracking then fully opening the valve completely. Please wait 60 seconds to ensure the air in the tubing has been purged.
4. Continue gas flow and wait for the yellow LED warning to light up and the 25%LEL relay to energize.
5. Turn off gas and remove from sensor.
6. Repeat Steps 1-5 above using the 50%LEL CH₄ air gas cylinder to activate the 50%LEL alarm and relay. The 50%LEL alarm threshold is connected to the red LED, the audible alarm and the strobe light up, which will activate during testing.
7. Repeat steps for every sensor installed.

Note: If the unit does not alarm during these tests the sensor may need to be replaced.

Replacing the Sensor

In a typical operating environment SBS recommends that each sensor be replaced every three years. An abusive operating environment can and will shorten a unit's useful life. In dusty/dirty applications or in situations where a sensor is often subjected to different gases, it is recommended to replace each sensor after one (1) year.

11.0 Troubleshooting and Maintenance

No Power

Verify the AC and/or DC power cables are installed per the connection diagram on page 11.

Relays

The SBS-CH4 system was designed for the relays to operate in a failsafe condition when the power supply is interrupted. If the fan connected to a relay runs as soon as the unit is powered on, the unit has been wired for the use of the Normally Open contact instead of a Normally Closed contact.

False Alarms

Each sensor has been calibrated for the detection of methane gas, however any combustible gas that comes in contact with a sensor has the potential to activate the warning and/or alarm relays. Contact with any individual or combination of the following gases could trigger false alarms and/or contaminate a sensor.

Gases include but are not limited to:

- Acetone
- Acetylene
- Ammonia
- Benzene
- Butane
- n-Butyl Acetate
- Carbon Dioxide
- Carbon Monoxide
- Ethane
- Ethanol
- Ethyl Acetate
- Ethyl Ether
- Ethyl Oxide
- Gasoline
- Heptane
- Hexane
- Isopropyl Alcohol
- Methane
- Methane Cyanide
- Methane Sulfide
- Methanol
- Methyl Ethyl Ketone
- Nitric Oxide
- Nitric Dioxide
- Propane
- Propylene Oxide
- Styrene
- Sulfur Dioxide
- Toluene
- Turpentine
- Vinyl Acetate
- Xylene

If a sensor's warning or alarm condition is reached, **ventilate the area with clean air**. This should reduce the concentration of most gases and the warning or alarm condition should clear.

Note - when a warning occurs at 25%LEL, the warning will not clear until concentrations drop below 0.5%. Similarly, when an alarm occurs at 50%LEL, the alarm will not clear until concentrations drop below 1.5%.

Avoid installation in highly corrosive environments where high densities of Methane sulfide, sulfur oxide, chlorine, Methane chloride, etc. may be present. These gases can cause corrosion of the element and the power leads to the circuit board.

A sensor's output characteristics can be affected if the sensor becomes contaminated or exposed to heavy alkaline metals.

A sensor cannot operate in a zero or low oxygen content atmosphere.

If a sensor collects water condensation, its characteristics may temporarily drift. However, light levels of condensation under normal indoor use should not pose a significant problem with performance.

Storage

The longer a sensor is stored prior to being energized, the longer the warm up and stabilization period may become. Storage Humidity Range: 5 - 95% non-condensing.

Maintenance Tips

To maintain the unit, it is recommended to:

1. Test the detector once a month by pressing the 'TEST' button.
2. Vacuum the alarm cover once a month to remove accumulated dust.
3. Never use detergents or solvents to clean the unit or sensor. Chemicals can permanently damage or temporarily contaminate a sensor.
4. Avoid spraying air fresheners, hair spray, paint or other aerosols near a sensor.
5. Never paint the unit or sensor. Paint will seal the vents and interfere with proper sensor operation.



WARNINGS

Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair intrinsic safety, which may adversely affect product performance and result in injury

The SBS-CH4 Methane Alarm System is not a standalone safety device and does not provide protection from methane explosions. The relay contacts are intended to be connected to a safety system, enabling audible alarms, system shutdown, ventilation, or other measures to ensure monitoring of methane gas occurs before concentrations reach dangerous levels.

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