INSTRUCTION MANUAL

MODEL GT810
TOXIC GAS SENSOR

70029

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MODEL GT810 TOXIC GAS SENSOR

DESCRIPTION

Model GT810 Toxic Gas Sensors measure the concentration of gas in a protected area and transmit this information to a central control point. The sensor includes a loop powered transmitter which converts the sensor output to a standard 4-20 mA signal. This signal may be connected to a suitable SST NOVA-5000 Gas Detection Module, or to any other device with a standard 4-20 mA input.

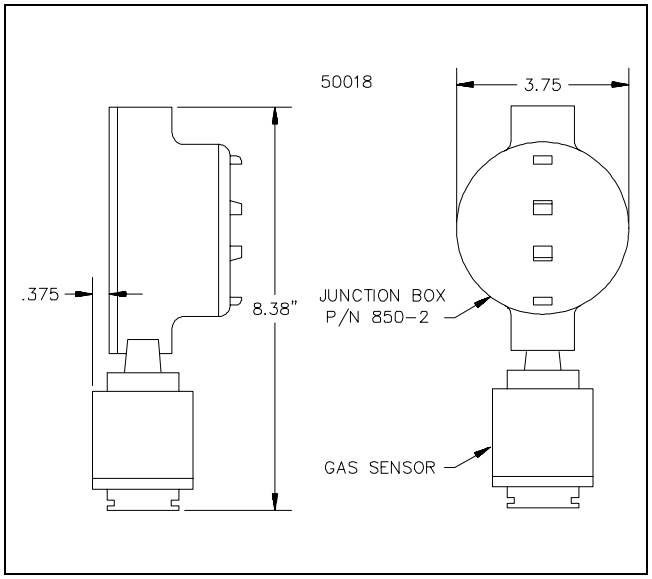

Figure 810-1 Mounting Dimensions

PRINCIPLE OF OPERATION

The toxic gas sensor uses an electrochemical fuel cell to sense the appropriate gas. Gas enters the cell through a diffusion barrier and gas permeable membrane. A reaction takes place at the working electrode (anode), releasing electrons which flow to the counter electrode (cathode), where a counter reaction occurs. The number of electrons released in the chemical reaction is linearly dependent on gas concentration. The gas diffusion barrier only allows a small quantity of sample atmosphere to reach the electrode. As a result, only a small fraction of the active electrolyte is reacted, leaving a large quantity “in reserve” for higher concentrations of gas. Cell output remains linear at concentrations of 1000 ppm and above.

The currents generated by the oxidation reaction are quite low, typically 0.4 uA/ppm. However, the intrinsically low background current and low noise output of the cell result in an excellent sensitivity to the gas.

ELECTRICAL SPECIFICATIONS

Power Supply required:

24 volts DC nominal. Will operate within specifications at any supply voltage between 16 and 32 volts.

Sensor output:

Integral transmitter will supply standard 4-20 mA signal into a load resistance of 700 ohms or lower.

ENVIRONMENTAL SPECIFICATIONS

Changes in humidity or direct exposure to moisture have little effect on the SST electrochemical cell. All reactions take place at the working electrode, where moisture is continually present. The electrolyte reservoir has sufficient overcapacity to allow the cell to accommodate all but the most prolonged periods over very high or very low humidity. The cell has been tested for three (3) months at a relative humidity of 0% without ill effects. In addition, once the RH was increased, the cell reabsorbed all lost moisture.

The temperature effects on the sensitivity of the SST electrochemical sensor are predictable and repeatable from cell to cell. From 0^{o}C to 40^{o}C, the span changes by less than 10% of the reading given at 20^{o}C. From 0^{o}C to -40^{o}C, there can be a further fall of 5% of the reading. The baseline shifts by less than 3 ppm for a temperature change from 20^{o}C to 40^{o}C.

LOCATION OF DETECTORS

Location of the sensors is important. For lighter than air gasses (Ammonia), the sensor should be located **above** the spot where a leak is likely. For heavier than air gasses (Hydrogen Sulfide, Sulphur Dioxide), locate the sensor **below** the expected leak. However, do not locate sensors closer than one foot to floor to prevent damage from water, dust, etc. You must also consider air circulation, the pressure of leaking gases, and obstructions that could trap “pockets” of gas or air when locating sensors. Carbon Monoxide has a vapor density of exactly 1.0, the same as air, so location of this sensor is determined more by the other criteria (air currents, gas pressure, etc.)

Preferred orientation of sensor is with screen pointing down. If necessary, it may be installed at an angle or horizontally. The sensor must never be installed pointing upwards.

INSTALLING AND WIRING THE DETECTORS

A junction box with 3/4 inch hubs for the sensor and conduit connections, SST part number 850-2, is required for mounting and terminating the sensor.

The Model GT810 uses a self-contained two wire transmitter. The operating power source for the transmitter electronics is obtained from the same 2 wires that are used to transmit the 4-20 mA output signal. Use two-conductor shielded cable, or two wires installed in metal conduit. These wires carry a maximum of 20 mA current. Wire size of 22 AWG is suitable for up to 6000 feet. Wire size of 0.35 mm^2 is suitable for distances up to 1800 meters. Typical connections are shown in Figure 810-2. Note that you can use the 4-20 mA indicator, the 1-5 volt indicator, or both. The total “loop resistance” of the circuit, including the field wiring to the sensor, must not exceed 700 ohms.

DETECTOR ACCEPTANCE TESTS

When power is applied to the transmitter, the output signal should be 4.0 mA, assuming pure air at the sensor face. Any current outside the 4-20 mA range indicates improper

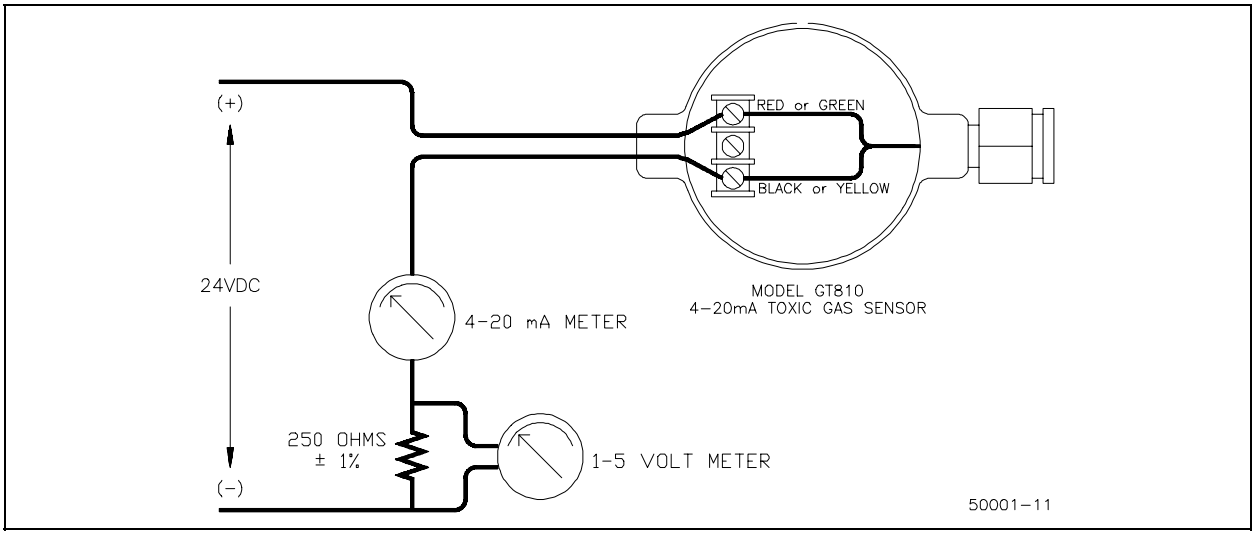

Figure 810-2 Typical Connections to GT810 Sensor

hookup. Final checkout should include application of test gas to the sensor. Check the indicator for proper reading; if not correct, perform the calibration procedures below.

MAINTENANCE

The design of the electrochemical toxic gas cell used in the GT810 is such that it will work for many years, with minimal long-term output drift. In practice, normal slow degradation of the cell leads to a gradual loss of output over the life of the sensor. At times, the sensitivity may also increase, as well as decrease. There are many other factors that may cause the output signal to alter over the life of the sensor in normal use, some of which are: continuous exposure to the target gas, exposure to excessive concentrations of the target gas, physical damage and excessive changes in the concentration of electrolyte caused by long term exposure to humidity levels outside the rated working range.

Recalibration Schedule

Under normal operating conditions, SST gas detectors should be recalibrated every 90 days. However, the change in calibration over time is a function of how much “background” gas is present during normal operation, and how often the sensor is exposed to higher concentrations. When the gas sensor is initially installed, we recommend that the calibration be checked on a more frequent basis to determine how much the calibration is changing. To check, expose the sensor to the same test gas as was used for the original calibration. Use the data taken over several tests to determine how often you should recalibrate the detector to keep the desired accuracy.

Calibration Gas

Toxic Gas sensors require a small supply of oxygen to the counter and reference electrodes for correct operation. SST calibration gases are mixed with air for this reason. However, if air-balanced gas is not available, you can usually calibrate by applying pure gas. Sufficient oxygen will still be retained inside the cell for proper calibration.

Calibration Instructions

Calibration requires access to the potentiometers on the transmitter PC board located inside the GT810 housing. Unscrew the front cover from the sensor housing to locate these pots. Some housings have a setscrew in the front of the housing which must be loosened before the front cover can be unscrewed.

! If the sensor is installed in a hazardous area, be sure that no combustible gasses are present before the front cover is removed from the housing.

Once the front cover is removed, you must identify the type of transmitter pc board that is used in your detector. Use Figures 810-3 and 810-4 to identify your board. Note that the board in figure 810-3 has three adjustment pots, whereas the board in figure 810-4 has two pots.

Calibrating transmitter type shown in Figure 810-3

Potentiometers for routine span and zero adjustment are located on the transmitter circuit board inside the sensor housing (see figure 810-3).

The circuit board has an additional coarse gain potentiometer, which may also be used to calibrate the transmitter. However, this pot is factory adjusted, and resetting is not necessary for routine recalibration.

For calibration purposes, the signal may be monitored using either a standard milliammeter inserted into the 4-20 mA circuit, by connecting a millivolt meter to connector CN2 (which is across a 10 Ohm precision resistance on the circuit board), or by observing the reading on the associated gas detection module.

! If using CN2, accessory calibration cable, SST part no. 20185-1, is required.

To adjust the potentiometers a small screwdriver is required. Perform the following procedure to calibrate the sensor/transmitter combination:

1. Ensure the sensor is free from the gas being measured either by purging the sensor with pure air, or sealing the sensor from the atmosphere with the plastic plug shipped with the sensor.

2. Adjust the zero potentiometer until 0 ppm is shown in the measuring system. At 0 ppm the current in the system should be 4.0 mA, and there will be 40 mV across CN2 on the transmitter circuit board.

3. Apply a test gas whose known concentration is 50% of the desired full scale reading to the sensor. (For instance, apply 25 PPM gas to a sensor that is to be calibrated to read 0 to 50 PPM Toxic Gas.)

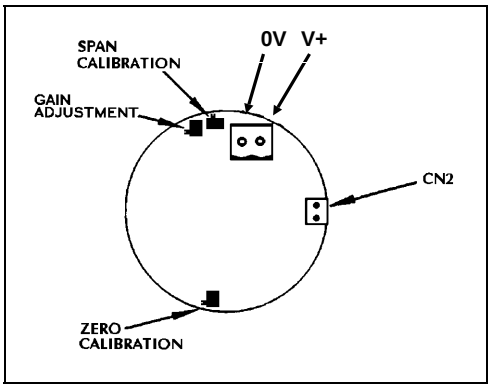

Figure 810-3 Transmitter circuit board layout

4. Wait for a stable reading to be obtained.
This could require up to five minutes, although required time is usually much shorter.

5. Adjust the span potentiometer until the correct reading (in PPM) is shown in the measuring system, or until the current drawn by the sensor is exactly 12.0 mA. This can also be read as 0.12 volts across connector CN2.

Calibrating transmitter type shown in Figure 810-4

Potentiometers for routine span and zero adjustment are located on the transmitter circuit board inside the sensor housing (see figure 810-4).

For calibration purposes, the signal must be monitored using either a standard milliammeter inserted into the 4-20 mA circuit, or by observing the reading on the associated gas detection module. To adjust the potentiometers a small screwdriver is required. Perform the following procedure to calibrate the sensor/transmitter combination:

1. Ensure the sensor is free from the gas being measured either by purging the sensor with pure air, or sealing the sensor from the atmosphere with the plastic plug shipped with the sensor.

2. Adjust the zero potentiometer until 0 ppm is shown in the measuring system or 4.0 mA output is obtained. Turn the zero pot counter clockwise to increase the output.

3. Apply a test gas whose known concentration is 50% of the desired full scale reading to the sensor. (For instance, apply 25 PPM gas to a sensor that is to be calibrated to read 0 to 50 PPM Toxic Gas.)

4. Wait for a stable reading to be obtained. This could require up to five minutes, although required time is usually much shorter.

5. Adjust the span potentiometer until the correct reading (in PPM) is shown in the measuring system, or until the current drawn by the sensor is exactly 12.0 mA. Turn the span pot counter clockwise to increase the output.

Replacing the fuel cell

The operating life of the fuel cell is affected by temperature, relative humidity and the amount of gas to which it has been exposed. After several years of operation, it may no longer be possible to calibrate the transmitter to the output of the cell. In that case, order replacement cells from SST. Unscrew the cover from the GT810 housing, then unplug the transmitter card from the cell. Unscrew the cell from the stainless steel front cover, and replace with a new one. After replacement, recalibrate the transmitter output.

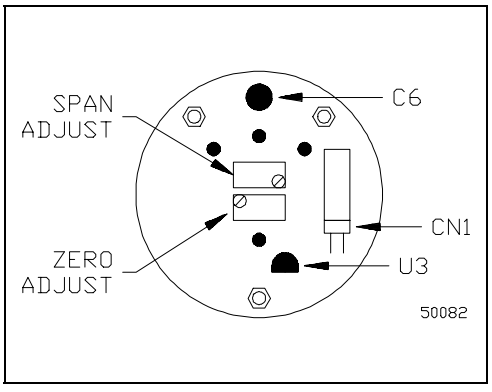

Figure 810-4 Transmitter circuit board layout

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