SEMICONDUCTOR GAS DETECTOR FOR FREON

SGS10/20 - R

TECHNICAL INSTRUCTIONS FOR INSTALLING, STARTUP AND MAINTENANCE
Gas Detector for Freon R404A - R407C - R410A

Technical Instructions

1 - WARNINGS

1.1 - do not use the sealed trimmer on the two circuits (their adjustment is factory preset)

1.2 - Contact with freon can cause freezing. Inhalation can cause the following symptoms: loss of breath, dizziness, weakness, nausea, headache, narcosis, cardiac abnormal activity. Freon gases can form explosive mixtures with air. The freon vapours are heavier than air and so move on the floor. They can move far away from the source and light up with return flame.

1.3 - Cautions to be used with Semiconductor Gas Sensor

1.3.1 - what must be avoided:

1) extremely corrosive environments
Long time exposure to high density corrosive materials like H2S, SOx, Cl2, HCl etc. can cause corrosion and failure of terminals or of the heating element part

2) contamination by alcaline metals
If the sensor is contaminated by alcaline metals, especially sea water (salty), a shift in the electrical parameters occur

3) contact with water
If the sensor is dipped in the water of is squirted with water a drift in the measure can occur

4) freezing
If the water fereezes on the senors’s surface the sensors material can break and its feature be compromized

5) excessive voltage supply
If a voltage higher than the one specified for the device is supplied the terminals and the components of the sensor can be damaged and the detector’s response can be drifted anche even if no phisical damage or break occurs

6) operation in an environment with low or zero oxigen level

1.3.2 - situation that have to be avoided whenever possible

1) water condensation
A low condensation is not a problem in an indoor operation condition. However, if the water condensation on the sensors surface persists for a long period of time, the response of the sensor could be drifted.

2) high gas concentration usage
The detector’s response can be modified if it is exposed to an high concentration of gas for a long period of time

3) long time storage
If the detector is stored for a long period of time without being powered, the catalytic sensor can be affected by a reversible variation of the resistance that depends on the environment where it is stored. The sensor should be stored in a sealed plastic bag containing clean air. You don’t have to use silicone gel. Please note that the longer in the storage time without supply, the longer will be the pre-heating time necessary for the sensor stabilization before the detector can be used.

4) long storage in bad wheater conditions
If the sensor is exposed to bad weather condition like high humidity, extremely high temperatures or an high level of contamination, the sensor’s features can be compromized.

5) vibrations
Too high vibrations can make the terminals resonate and so damage the sensor. This vibrations can be generated using compressed air tools, ultrasonic solders etc. Please avoid these situations.

6) shock
If the sensor sustains a severe shock its terminals can break.

1.3 - We suggest to periodically perform a readjustment of the detector as described in 8.2 ” Maintenance”.

2 - INSTALLATION

2.1 - The detector has to be installed in a suitable position and in any way near the possible gas leak origin.

2.2 - The freon gases are heavier than air. Their relative density is 4,76. So the detector has to be installed 50 cm above the floor level (CEI 31-33 CEI 3-35 norm)

3 - POWER SUPPLY

3.1 - Supply the detector with 12 - 24 Vdc using the V+ and V- terminal block (see fig. 3).

4 - CONDITIONING

4.1 - After powering the detector needs some time for conditioning to reach its normal working status. Normally some minutes are enough for conditioning, but if the detector had not been powered for a long time it may need hours.

5 - CONNECTIONS

The terminal board is on the upper circuit.

5.1 - On the OUT terminal (terminal block 3, fig. 3) a 0-5 V analog output, proportional to the gas concentration, is available. The output is related to the Methane concentration as shown in fig.1.

5.2 - The COM1-NA/NC1 COM2-NA/NC2 terminals (terminal blocks 6,7,8 and 9, only for SGS-20-R, fig. 3) are the NO (normally open) and NC(normally closed) contacts of the internal relays. These contacts can work in normally energized mode or in normally not energized mode and these two working
modes can be selected with the JP3, JP4, JP5 and JP6 jumpers (see fig. 3 and fig. 4). It is possible, for each relay, to select NO (normally open) or NC (normally closed) contact positioning the JP1 and JP2 in the suitable position (see fig. 3 and fig. 4). If the first threshold is reached the R1 relay is activated. If the second threshold is reached the R2 relay is activated.

5.3 - A Fault OC (open collector) output is available on the terminal block 5 (see fig. 3).

5.4 - If the corresponding option is mounted the 4-20mA output available is on the terminal board on the 10 and 11 blocks (AMP+ e AMP- in fig. 3).

5.5 - If the Digital Address (optional) is mounted on the board the external bus can be connected using the terminal board (fig. 2).

6 - SETUP

6.1 - The alarm thresholds (for EV/SGS/20/R) are fully adjustable using TR3 and TR4 trimmers of the upper circuit (fig. 3) and measuring on the TP6 and TP7 test points with the following operations:

- connect a 10 V full scale voltmeter between TP6 (+) and the negative power supply terminal (-)
- adjust the TR3 trimmer to read the desired voltage, refering to the fig. 1 diagram, on the voltmeter
- use the same procedure if you need to modify the second threshold using the TR4 trimmer and the TP7 test point

7 - WORKING TEST

We suggest to perform a working test periodically and at least 2 times a year. The test could be a simple functioning test or a calibration verification.

7.1 - Functioning test

It’s simply performed by putting some combustible gas in front of the sensor’s mouth (for ex. ligther gas, alcohol, petrol vapours). The gas sample should be kept in position for some time to permit the diffusion of the gas inside the filter. After about 10 seconds the detector must give out an alarm.

7.2 - Calibration Verification

It’s performed using a disposable gas cylinder containing a known gas (Methane-air mixture quantity). It’s necessary to avoid that the cylinder’s gas-air mixture mixes with the air using a suitable mounth coupling. After a certain time after the gas application, the sensor must give out an analog output corresponding to the gas concentration (see the following graph, fig. 1).

A little error in the measure is normal because to have a really precise measure laboratory conditions are required (known temperature, pressure, volume and gas). It’s not possible to meet these conditions in the environment where the sensor is installed.

8 - MAINTENANCE

8.1 - Maintenance must be periodically performed on the SGS10-20R detector. After a certain working time, that depends on the environment conditions, the breathing element of the detector (inox filter on the front of the device) could be possibly be covered by dust somehow preventing the gas diffusion inside the sensor, where the detection is done. So it’s necessary to clean the filter very well with at time intervals depending on the dirt conditions of the environment to protect.

We suggest to do the filter cleaning as follows:

- take off the breathing element of the device, containing the inox filter, by screwing it after loosing the stop screw
- dip the filter in una bacinella containing solvent liquid (nitro solvent, acetone, trichloroetylene, petrol etc.), Warning: this operation must be done away from the device to avoid to influence it’s measure with the solvent's vapours!
- clean the filter with a brush to take off the dirt
- if an ultrasonic cleaner is available, clean the filter with it instead of the method above as the cleaning results are better
- after cleaning, dry the filter and keep it in the open air for some time in order to permit the total evaporation of the solvent used for cleaning
- mount the filter screwing it and the tightening the stop screw

8.2 - A readjustment of the detector’s measuring zero has to be done only if the detector has been exposed to an high concentration of gas for a long time and, after the gas has disappearad, maintains an output offset. To do this readjustment you have to:

- take the power off for 30 seconds
- insert the JP10 jumper of the lower circuit (see fig. 2)
- repower the device. The led will blink 3 times
- wait for 5 minutes.
- adjust the TR3 trimmer (fig. 2) of the lower circuit until the output signal, that can be checked with a multimeter on the OUT terminal block (fig. 2), to 0.5V. As the output signal does not fall under this voltage level (it is the measuring zero) you must verify to be in a point where the signal rises turning the trimmer.
- finally take off JP10 (fig.2) and wait 5 minutes for the signal to stabilize

After this time the detector is fully operative.

8.3 - if it is not possible to regulate the output signal to 0.5V with TR3 trimmer, it means that the sensor have experimented a large drift. Therefore it needs the following set up procedure:

- insert the JP10 jumper of the lower circuit
- power the device for at least 4 hours
- after this time read the signal on TP8 in the absence of ammonia gas (normally 0.2 - 0.9V)
- regulate P6 the signal on TP7 to TP4+0.2V value (ex. if TP4=0.3V, regulate P6 to TP3=0.3+0.2=0.5V)
- regulate the output signal level to 0.5V with TR3 trimmer
10 - OPTIONS

10.1 - 4-20mA Output: it’s an option that to have a current output on the 9-10 terminals on the terminal board (fig. 2).

10.2 - Digital Address: it’s a module that permits to connect the detector to EDS Control Units by means of a data bus.

11 - AVAILABLE VERSIONS

EV-SGS10-R: microcontrolled, has an analog 0-5V output, a 4-20mA analog output and OC fault output

EV-SGC20-R: microcontrolled, has an analog 0-5V output, a 4-20mA analog output, OC fault output and 2 relay outputs each with its preset threshold.
- regulate the output signal level to 0.5V with TR1 trimmer

9 - AUTOREGULATION

9.1 - The detector’s electronics are controlled by a Microcontroller that autoregulates the signal output. This autoregulation is very slow and is done to compensate the sensor’s degradation over time but do not affect the measuring performance.

Fig. 1
DS1498_SGS

**Fig. 2**

Fig. 3

**Digital ID connector**

Alimentazione

Entrata analogica 0,5-5V

Uscita di guasto OC (Open Collector- NPN)

Uscita relè 1

Uscita relè 2

Uscita 4-20mA

Uscita Indirizzo Digitale

**Fig. 3**

**DS1497**

1. V+
2. V-
3. OUT
4. NC
5. FAULT
6. COM1
7. NA/NC1
8. COM2
9. NA/NC2
10. AMP+
11. AMP-

**Uscita OC - FAULT**

**Uscita 4-20mA**

**Uscita Indirizzo Digitale**

**BUS centrale EDS**

**IDB**

**IDA**

Rappresentazione grafica dei connettori e terminali per la connessione di due PCB.
<table>
<thead>
<tr>
<th>RELE' RELAY</th>
<th>PONTICELLO JUMPER</th>
<th>POSIZIONE POSITION</th>
<th>USCITA OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R1</strong></td>
<td>JP1</td>
<td>1-2</td>
<td>NA*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3</td>
<td>NC*</td>
</tr>
<tr>
<td></td>
<td>JP3</td>
<td>1-2</td>
<td>normally non attratto normally de-energized</td>
</tr>
<tr>
<td></td>
<td>JP4</td>
<td>2-3</td>
<td>normally attratto normally energized</td>
</tr>
<tr>
<td></td>
<td>JP3</td>
<td>2-3</td>
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</tr>
<tr>
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<td></td>
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<tr>
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<td>NC*</td>
</tr>
<tr>
<td></td>
<td>JP5</td>
<td>1-2</td>
<td>normally non attratto normally de-energized</td>
</tr>
<tr>
<td></td>
<td>JP6</td>
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</tr>
<tr>
<td></td>
<td>JP6</td>
<td>1-2</td>
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</tbody>
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* - the relays contact information is related to the de-energized condition

Fig. 4