SEMICONDUCTOR SENSOR FOR AMMONIA DETECTION

EV-SGS10/20-A ATEX

EN

TECHNICAL INSTRUCTIONS FOR INSTALLING, STARTUP AND MANTEINANCE

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EDS®
ELECTRONIC DETECTION SYSTEMS

EV-SGS10/20-A

Semiconductor Sensor for Ammonia Detection

Technical Instructions

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1 - WARNINGS

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

1.2 - Cautions to be used with Semiconductor Gas Sensor

1.2.1 - 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, expecially 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 senosr'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
The catalytic sensor requires the presence of a certain amount of oxigen in its working environment to guarantee the combustion reaction of the gas on the sensor's surface. It can not operate properly in an environment with low or zero oxigen level

1.2.2 - 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 silocone 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 gas of Ammonia has lower density than air, therefore the detector has to be installed 50 cm below the ceiling 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 Ammonia concentration as shown in fig.1 - 2.

5.2 - The COM1-NA/NC1 COM2-NA/NC2 terminals (terminal blocks 4,5,6 and 7, only for EV-SGC20-A/A1, 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. 5). 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. 5). 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 8 (see fig. 3).

5.4 - If the corresponding option is mounted the 4-20m output available is on the terminal board on the 9 and 10 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 11 and 12 terminal blocks (IDA and IDB in fig. 3).

6 - SETUP

6.1 - The alarm thresholds are factory preset to 5.00 ppm and to 1.000

ppm of NH3 in air and are fully adjustable using TR1 and TR2 trimmers of the upper circuit (fig. 3) and measuring on the TP1 and TP2 test points with the following operations:

• connect a 10 V full scale voltmeter between TP1 (+) and the negative power supply terminal (-)
• adjust the TR1 trimmer to read the desired voltage, refering to the fig. 2 diagram, on the voltmeter (ex: if a 2.000 ppm threshold is needed you have to adjust TR1 to read 1,4 V on the voltmeter - for EV/SGS/10-20/A)
• use the same procedure if you need to modify the second threshold using the TR2 trimmer and the TP2 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 mounth (for ex. ligther gas, alcohol, petrol vapours). The gas sample should be keept 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 (Ammonia)-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. 1-2).
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 EV-SG10/20A 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 disappeard, maintains an output offset. To do this readjustment you have to:
• take the power off for 30 seconds
• insert the JP1 jumper of the lower circuit (see fig. 4)
• repower the device. The led will blink 3 times
• wait for 5 minutes.
• adjust the TR1 trimmer (fig. 4) of the lower circuit until the output signal, that can be checked with a multimeter on the OUT terminal block (fig. 3), 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 JP1 (fig.4) 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 TR1 trimmer, it means that the sensor have undergoed a large drift. Therefore it needs the following set up procedure:
• insert the JP1 jumper of the lower circuit
• power the device for at least 4 hours
• after this time read the signal on TP4 in the absence of ammonia gas (normally 0.2 - 0.9V)
• regulate P2 the signal on TP3 to TP4+0.2V value (ex. if TP4=0.3V, regulate P2 to TP3=0.3+0.2=0.5V)
• 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.

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. 3).

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-SGC10-A: microcontrolled, has an analog 0-5V output, a 4-20mA analog output and OC fault output
EV-SGC20-A: microcontrolled, has an analog 0-5V output, a 4-20mA analog output, OC fault output and 2 relay outputs each with its preset threshold.
EV-SGC10-A1: microcontrolled, has an analog 0-5V output, a 4-20mA analog output and OC fault output
EV-SGC20-A1: microcontrolled, has an analog 0-5V output, a 4-20mA analog output, OC fault output and 2 relay outputs each with its preset threshold.

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Filter
(breathing element)

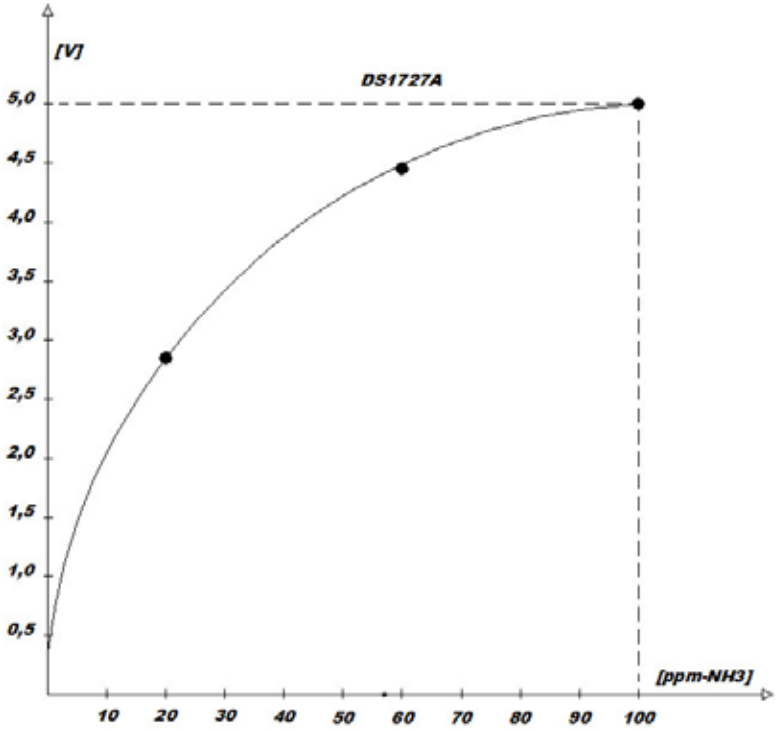

Fig. 1

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TERMINAL BLOCK WIRING DIAGRAM - ELECTRICAL CONNECTIONS

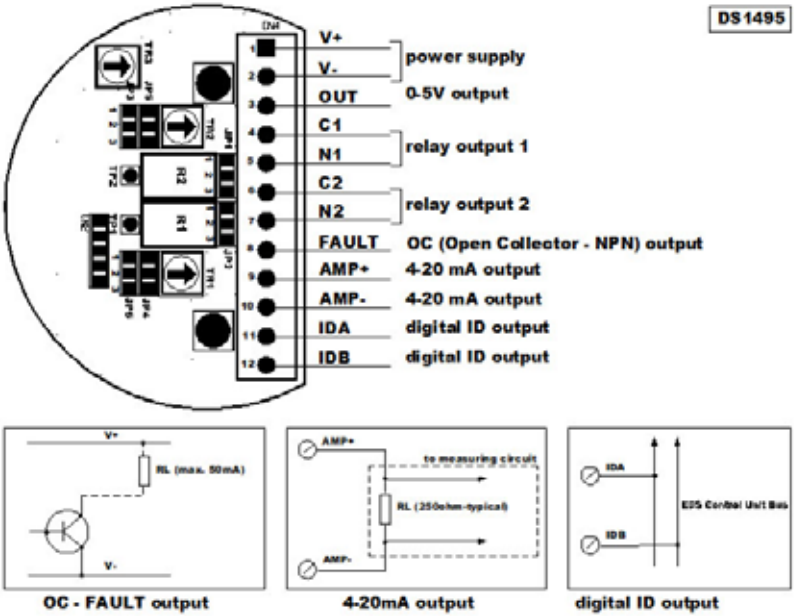

Fig. 2

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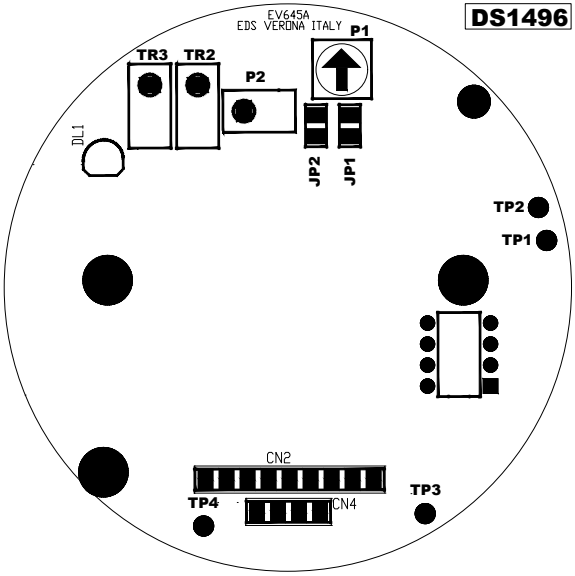

Fig. 3

OUTPUT RELAY CONFIGURATION TABLE

RELAY	JUMPER	POSITION	OUTPUT
R1	JP1	1-2	NA*
		2-3	NC*
	JP3	1-2	Normally not energized
	JP5	2-3	
	JP3	2-3	Normally energized
	JP5	1-2	
R2	JP2	1-2	NA*
		2-3	NC*
	JP4	1-2	Normally not energized
	JP6	2-3	
	JP4	2-3	Normally energized
	JP6	1-2	

Fig. 4

* - The relay contacts refer to the condition of the relay when it is normally not energized

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MARKING - VALIDITY - USAGE WARNINGS

12- VALIDITY

12.1 - These instructions are valid for the following EDS detectors, when used in potentially explosive atomosphere environments, regarding to the ATEX directive ATEX 94/9/CE - EN 50014 - EN 13463-1

marking :  **II 2G EEx d II C T6**

Zone	Category	Protecion
Zone 1	2G	IP65 version EEx d
Zone 2	2G	IP65 version EEx d

2G - Gas

T6 - Max Temperature 85° C

EEx d - Explosion proof box

II C - Dust

12.2 - The Gas detectors for explosive atmosphere zones, on purpouse to satisfy the requirements of the official standards relative to explosion dangerous environments.

An unproper usage, wrong and unproper wiring and fixing, removal of any protection, lack of inspections and maintenance or even a small marginal modification, can compromise the security and reliability of the device, causing seroius damages to people and/or things.

Carefully follow the standars regarding connecting and using of electrical equipent in zones with potentially explosive atmopheres.

The device has to be moved, installed, started up, monitored, inspected, maintained and repaired only by trained and qualified personnel with a perfect knowledge of those standards and without the presence of an explosive atmophere.

We reccomend to follow all the enclosed instructions carefully, the installation instructions, all the security regulations in force and all the standards applicable for a correct installation.

Eventual specially produced components or varied components may differ in the details from those hereby descripted and could require additional information.

ELECTRONIC DETECTION SYSTEMS

Semiconductor Sensor for Ammonia Detection
EV-SGS10-A EV-SGS20-A

TECHNICAL INFORMATION

APPLICATIONS
- Detection of general ammonia vapor leaks
- Industrial pollution monitoring
- Refrigeration plant control
- Process control

PERFORMANCE
- Microprocessor-controlled electronics
- Long lifespan
- High sensitivity
- Rapid response
- Automatic reset upon gas disappearance
- High chemical resistance
- High mechanical resistance

The NH3 Ammonia detection probes EV-SGS10-A and EV-SGS20-A are designed for use in industrial environments and in all locations where an ammonia leak or abnormal concentration could pose a hazard to people and property. The onboard electronics, controlled by a microprocessor, ensure that parameters are constantly maintained at optimal levels. Periodically, the system performs control and self-regulation of the measurement zero point. Additionally, a special supervision circuit monitors the status of the catalytic sensor and associated electronics.

In the event of a malfunction, a Fault output is activated. The sensitive element used in these probes is a semiconductor sensor. When the sensor comes into contact with the combustible gas, its electrical conductivity changes. This process generates a signal proportional to the gas concentration. The advantages of this type of sensor include high sensitivity, long life, and the ability to withstand prolonged exposure to high gas concentrations without altering the physical characteristics of the device.

The probes are housed in a corrosion-proof light alloy case and have a CESI and ATEX certified explosion-proof design. Inside, the sensor and its associated electronics are installed.

The EV-SGS10-A probe features microcontroller-based self-regulation and a 0-5V analog output.

The EV-SGS20-A probe features microcontroller-based self-regulation, a 0-5V analog output, plus 2 relay outputs with 2 pre-set thresholds and a Fault output.

Optional accessories include the 4-20mA interface (US-420) and the Digital Address (IDP-04), which can be installed directly on the device.

TECHNICAL DATA

- Dissipated power: 1W max
- Measurement range: 100 - 1,000 ppm NH3
- Analog output: 0-5 V (model EV-SGS10-A)
- Analog output: 0-5 V and output with 2 relays associated with 2 intervention thresholds (model EV-SGS20-A)
- Temperature: -10 to +50 °C
- Humidity: 0 - 95%
- Pressure limit: ambient (+/-20%)
- Response time: approximately 2 - 5 sec.
- Stabilization time: 3 minutes
- Vibration resistance: 250 Hz/mm
- Shock resistance: 100g
- Housing: explosion-proof design in light alloy
- Protection: II 2G EEx d II C T6
- Design: IP65
- Certification: CESI EX - 96.108 X/N - ATEX TUV 05 ATEX 2907 X
- Construction standards: EN50014 - EN50018 - EN50020 - EN50054 - EN50057 - CEI 64/2
- Connection: 3/4" - UNI 6125 - ISO R7 - BS 21

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