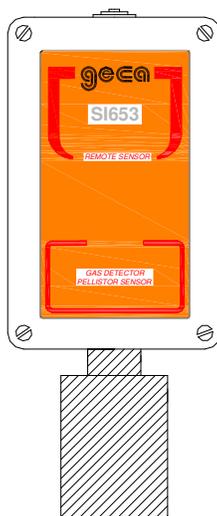


**SI653K****Flammable Gas Detector with 4÷20mA output**

Please read and keep this manual

Model	Calibrated for
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SI653KM	Methane
SI653KG	LPG

Technical specifications

Power supply	12÷24Vdc(-10/+15%) 3W
Sensor Type	Catalytic Pellistor
Outputs	4 ÷ 20 mA Linear
Load resistor	50 ohm / 12Vdc (-10%) - 500 ohm / 24Vdc (-10%)
Standard Range	0 ÷ 20 % LEL
Limits	20 % LEL
Average Life in fresh air	5 years
Response Time	T ₉₀ < 60 seconds
Repeatability	≤ 5% signal
Accuracy	± 2% LEL
Linearity	up to 60% LEL
Long time drift in fresh air	< ± 5 % LEL year
Storage Temperature and Humidity	-20 ÷ + 55 °C / 5 ÷ 95 % RH non condensed
Operation Temperature and Humidity	-10 ÷ + 50 °C / 10÷90 % RH non condensed
Operation Pressure	Atmospheric±10%
Size	190 x 105 x 83 mm
IP Code	IP65

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GENERAL INFORMATION

The models series SI653K, is a three-wire 4÷20mA linear transmitters able to detect combustible gases employing a catalytic sensor calibrated up to 20% LEL to Methane or LPG.

The instrument comprises of a thermoplastic terminal box which contains the electronic circuit, the connecting terminals and the sensor placed in its housing on the cover.

The SI653K are normally connected to the GECA gas detecting central systems for heating plants.

OPERATIONAL DESCRIPTION

The catalytic sensor is practically insensitive to humidity and temperature variations. The sensor being designed to detect flammable gases and the calibration is carried out with the specific gas to be detected. Anyway, it can contemporaneously detect any other flammable gas that should be present in the same environment.

When powered, the sensor needs a time of preliminary heating of about 30 seconds.

After this period, the sensor is able to detect gas even if it attains the optimum stability conditions after about 48 hours continual functioning.

Therefore, after that time we advise to check in clean air the "4mA" output. If is necessary "4mA calibration" can be carried out as explained on page 3. This calibration is necessary to adjust the sensor to the environment conditions.

Faults: In case of sensor damage, the "S" output falls down to 0mA (FAULT). The signal is then indicated as a damage situation.

All this happens also when an interruption to the connection wires between the sensor and the detector occur.

Average life: The sensitive element used in this detector has an excellent stability in time. In fresh air and in normal working condition the sensor's life is about 5 years from the date of installation.

Periodical testing: we advise to carry out working tests every 6-12 months. After 2 year, we advise to proceed to the recalibration of the circuit with Gas/Air mixture as explained on page 3.

Attention: please note that in polluted environments, where vapours of flammable agents, especially solvents, might be present, the periodical testing and recalibrations should be carried out at shorter time intervals. In polluted environments, the sensor's life can be reduced.

INSTALLATION

The detector must be accurately installed according to all the national dispositions in force on the safety of the plants and installation of electric devices in areas with danger of explosion.

Positioning: the SI653K must be installed in vertical position and the sensor must be downward.

Electric connections: are to be carried out using the three-pole terminal (See special instructions enclosed with the gas detectors). It is not necessary to use shielded cables.

The transmitters can be placed at a max. distance of 100 meters from the gas detector when 3x1.5mm² cables are used, and 200 meters with 3x2.5 mm² cables.

WARNING

Calibration is carried out with gas. Absolutely trimmer P3 must not be tampered with. The calibration routine is to be carried out by trained or authorised personnel only. As an alternative, it is advised to check the calibration without operating on the trimmers, and in case the values are not the required ones please apply to our Laboratory.

Warning: some substances cause a permanent reduction in sensitivity. Avoid contacts of the sensor with vapours of Silicone compounds, Tetra-ethyl Lead (petrol antiknock additive) and Phosphate esters, since they can reduce irretrievably its sensitivity. Some substances produce a temporary loss of sensitivity. This "inhibitors" include Hydrogen sulphides, Chlorine, Chlorinated hydrocarbons and halogenated compounds. The sensitivity is recovered after a short period of running in clear air.

Very Important: the catalytic sensor used will operate only in presence of Oxygen. Do not use pure gases or a lighter directly on the sensor since they could damage it irretrievably.

THE MODELS

Model SI653KG (LPG) is able to detect combustible gases up to 20% LEL. LPG is a gas heavier than air and consists of a mixture of 20-30% Propane (C₃H₈) and 80-70% Butane (C₄H₁₀).

Propane density as to air is 1.56 while Butane is 2. The LEL (Lower Explosivity Limit) is 1.7%volume for Propane and 1,4%volume for Butane. Standard calibration to LPG is carried out with Butane gas.

Model SI653KM (Methane CH₄) is able to detect Methane up to 20% LEL. Methane is a gas lighter than air. Its density as to air is 0.55, and its LEL 4.4%volume.

Tables "A" and "B", on page 3, shows the correspondence between mA output signal and % LEL.

CALIBRATION

Note: The calibration routine is to be carried out by trained or authorised personnel only. As an alternative, it is advised to check the calibration without operating on the trimmers, and in case the values are not the required ones please apply to our Laboratory.

Very Important note: Use sample gas bottles with a mixture between 18%LEL and 50%LEL Gas in Air 20.9% Oxygen. The catalytic sensors don't work without oxygen.

Remove the sensor's cover. The calibration should be carried out with two alternative methods.

The 1st solution allows measuring mA signal. Insert in series to the terminal "S" a multimeter (range 20mA) (Fig. 1). Keep into consideration that when the wire is disconnected, the gas detector indicates a "FAULT" situation.

The 2nd solution allows measuring mV signal corresponding to 4÷20mA signal. Connect the multimeter test leads (range 200mV) to the pads TP1(+) and TP2(-) (TEST). To convert mA to mV value is enough multiply mA value by 10.

"**4mA calibration**" checks that in clean air the multimeter indicates 4mA ($\pm 0,1$). If necessary turn the **P1 potentiometer** as long as the required value is not reached.

"**SPAN calibration**" to verify or/and calibrate an instrument use a sample bottle with the specific gas/air mixture which it has been calibrated. Connect the sample gas bottle (Fig.2) to the flow meter, set the flow meter on a 0,15÷0,3 l/min flow rate, wait for 3 minutes and check that the multimeter value results from:

$$mA = \frac{16 \times (\%v/v \text{ gas bottle})}{\%v/v \text{ detector Full Scale}} + 4$$

$$mV = mA \times 10$$

Example: to verify a detector mod. SI653G calibrated for Butane, if the test label on the sample gas bottle shows 0,29%v/v (=19,5%LEL), the detector full scale is 1,4%v/v, the result is: **7.31** (Tolerance $\pm 0,2mA$). If necessary turn the P2 potentiometer as long as the required value is not reached.

$$mA = \frac{16 \times 0,29}{1,4} + 4 = 7,31$$

$$mV = 7,31 \times 10 = 73,1 (73)$$

Tab. A – SI653KG LPG

Output (mA)	% LEL	% volume
4	0	0
5.6	10	0,14
7.2	20	0,28
8.8	30	0.42
12	50	0,85
20	100	1,4

Tab. B – SI653KM Methane

Output (mA)	% LEL	% volume
4	0	0
5.6	10	0.44
7.2	20	0.88
8.8	30	1.32
12	50	2.4
20	100	4.4

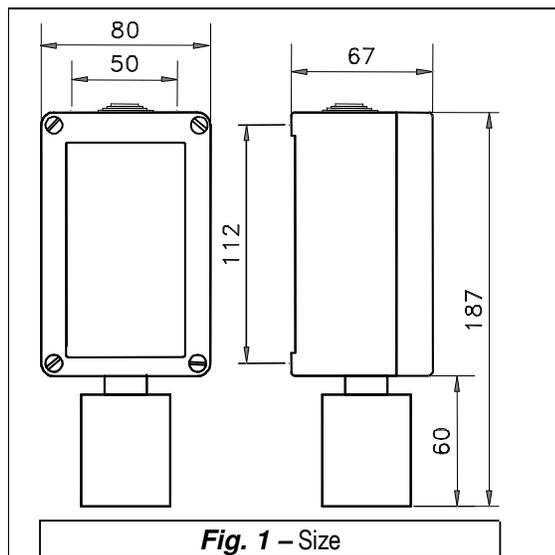


Fig. 1 – Size

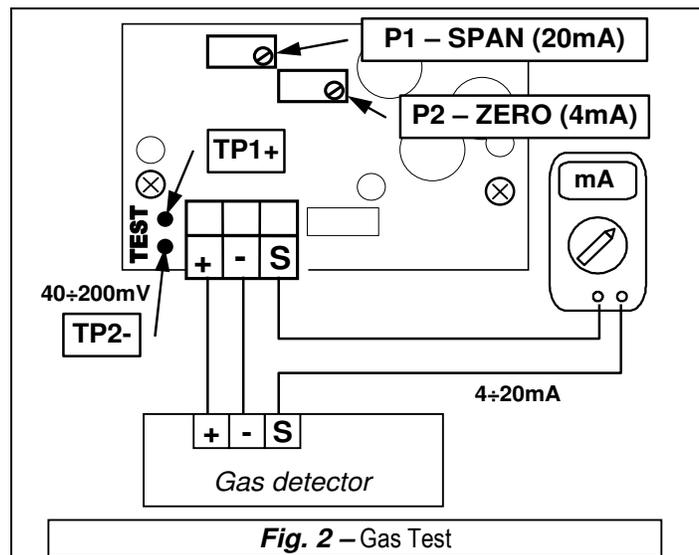


Fig. 2 – Gas Test

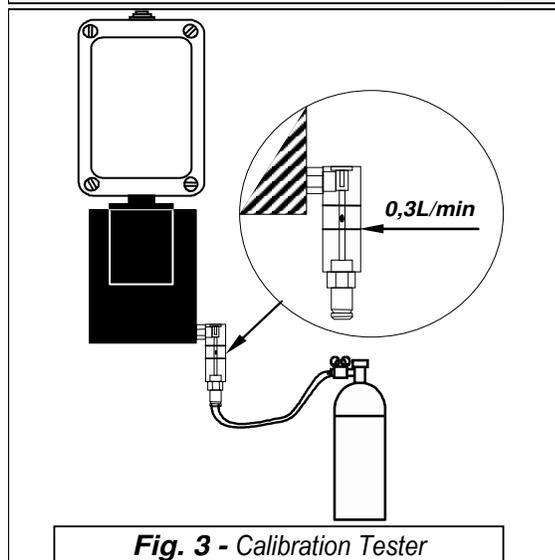


Fig. 3 - Calibration Tester