®

AVA-UNIT

Sensorex
SX-900 Series
User Manual
VERSION 1.30

GAS SENSOR

GAS:_____ CALIBR:_____

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Warnings and Cautionary Statements

CAUTION: For maximum safety and performance, please read and follow the procedures and conditions outlined below.

- Oxygen deficient atmospheres may cause combustible gas readings of catalytic LEL sensors to be lower than actual concentrations.
- Oxygen enriched atmospheres may cause combustible gas readings of catalytic LEL sensors to be higher than actual concentrations.
- Sensor element will be destroyed if it gets contact with liquid, so the sensor must always be covered e.g. when washing surroundings.
- Readings of the sensor can essentially change if there are any disturbing gases on the surrounding air.
- Black sensor cover must always point down when installing the sensor.
- Gas detection instruments are potential life-saving devices. Recognizing this fact we recommend performing the calibration at least once a year.
- Sensor should be installed minimum of 50cm away from Silicone seam.
- Silicone compound vapours may affect the catalytic gas sensor and cause readings of gas to be lower than actual gas concentration. It is not recommended to install the sensor before concerning agents have dried (3-5 weeks after agent has used). However, if the sensor must be installed at that time, make sure the protection sticker is on its place (see picture below). If there is no sticker, cover the hole of the black sensor cover. Protection sticker or self made cover should not be removed before the agent is dried and any vapours aren't being formed anymore.
- Remember to remove the protection sticker before taking the sensor for normal use (see picture below), however not until possible construction dusts and vapours like silicone are vanished.

Protection Sticker

Content:

1. Introduction

SX 900 series sensors are modern microprocessor based 4-20mA transmitters for combustible gas and ethylene measurements. Controller automatically calibrates the bottom end of the measuring range, so that slow changes in background concentrations as well as measuring errors due to zero drift of the measuring element are automatically corrected over certain period of time. LED lights on the sensor cover inform the user of the operational status of the transmitter during both normal operation and calibration. SX 900 series sensors belong to next generation gas detectors which have been developed with the many years of experience by Sensorex Oy.

SX 900 series sensors can easily be connected directly to existing building-control automation or a control unit which has 4-20mA signal input. Naturally, Sensorex' SX500DRV for the alarm and display or AVA-UNIT as a multi-channel central unit, are highly recommended.

2. Technical details

Operating voltage:	17-28VDC or 15-24VAC
Power consumption:	approx.2W
Sensor element:	Catalytic
Output signal:	4-20mA linear (standard)
Standard measuring ranges:	SX 917 0-50%LEL
	SX 912 0-1500, 2000ppm
Operating temperature:	$-20^{o}C...+55^{o}C$
Operating humidity:	0-99% RH (non-condensing)
Life expectancy:	Normal environments approx. 5 years
Responce time T_{90}:	< 10 seconds
Cross sensitivity:	Flammable Hydrocarbons
IP classification:	IP54
Sensor cable:	3-wire lead
Cable lead through:	PG9
Cable:	e.g.. $3x0,5mm^{2}$
Wall installation:	Black sensor cover must point down
Service:	In dusty conditions sensor cover and element must be cleaned as per requirement. We recommend checking the calibration and, if needed, calibrating the sensor at least once a year.

3. Measuring ranges

Sensor type	Gas	Range
SX-917	Combustible gases	0-50%LEL *
SX-912	Ethylene	0-1500, 2000ppm

* These are standard ranges. Sensor is also provided with other ranges or calibrated with %LEL ranges for alcohols and solvents.

4. Dimensions

Regular

Duct version
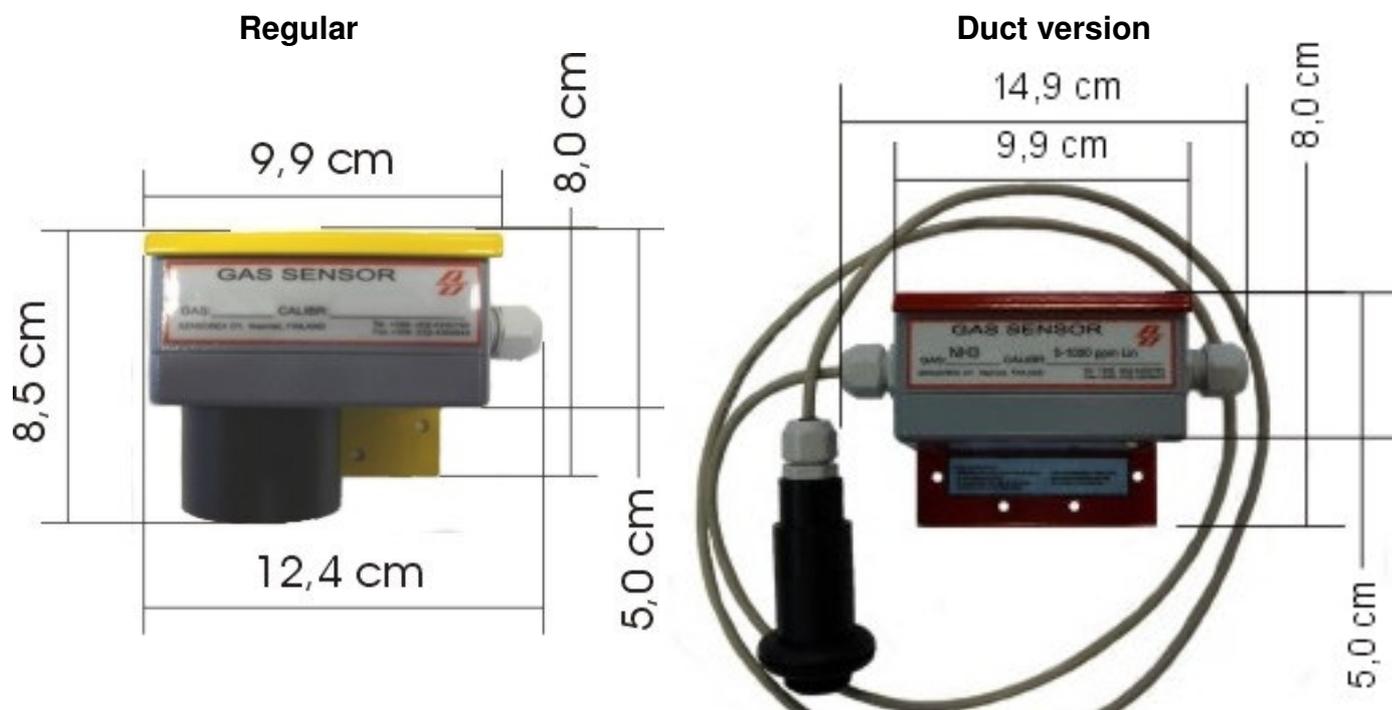
5. Installation

Sensor should be installed at or near the location of a possible leak or the source of emissions. Installation height depends on the density of the gas being monitored. If the gas is lighter than air (E.g. Methane, Hydrogen), the sensor should be installed above the possible leak taking into consideration the need of afterward maintenance. If the gas is heavier than air (E.g. Propane, Butane), the sensor should be installed near the floor approx. 30cm height. When the density of gas is almost the same or same as air, sensor should be installed on the height of human breathing approx. 1,50-1,80 meters. SX-912 ethylene sensor is mainly used in banana ripening rooms, where it is usually installed on the second level in a place where the air flow is not so brisk and fans in the sealing do not blow straight into the sensor.

Sensor is installed to the wall with the mounting bracket which comes along, so that the black sensor cover must always point down.

**Picture 1.** A mounting bracket with four holes for wall installation.

Picture 1.

Picture 2. Sensor installed to its enclosure. Note that black sensor cover must always point down.
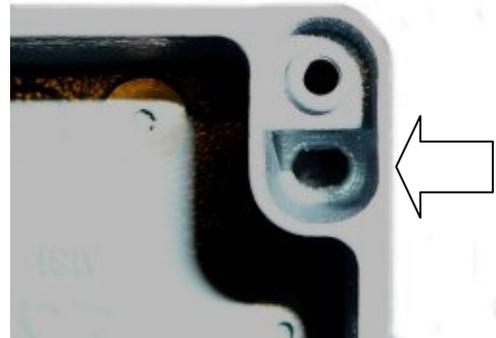
Picture 2.

If there is a need to install the sensor into a sealing, mounting bracket of the sensor must be taken off and installation should be done with the two holes in the bottom of the enclosure.
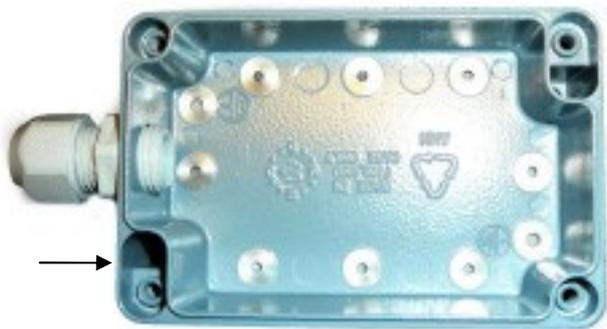
Enclosure bottom   **Installation hole**

NOTE!! *It is not allowed in any circumstances to drill extra holes to the enclosure bottom for the installation. Moisture and water can get inside the enclosure and damage the electronics of the sensor.*

6. Installation of Duct version

Duct version of the sensor includes the same mounting bracket and enclosure as normal one without the black sensor cover. The sensing element itself is inside the adapter which is delivered with 1,5 meter (standard) cable and is intended to be installed to a duct with a rubber gasket, also delivered with the sensor.

Drill a 34mm hole to the duct in a place where the monitoring is wanted. For correct measurement, the hole should be drilled on the top of the duct. This also prevents the possibly condensing water from flowing into the sensor element. Install the rubber gasket to the hole.

34mm hole + rubber gasket

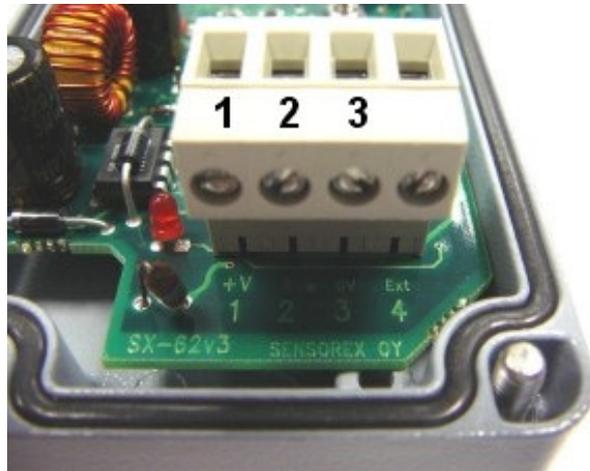Then place the sensor element to the duct through the gasket

Here is a picture of installed sensor in a duct.

7. Connection

For sensor wiring we recommend using 3x0,5mm^2 cable or alternatively Jamak 2x2+1x0,5.

SX-900 series wiring (see. Picture 3.):

1 = +24 VDC
2 = 4-20mA signal
3 = 0 VDC
4 = Not in use

Picture 3.

NOTE！Voltages that can be used to power the sensor: 17-28 Vdc or 15-24 Vac.

When using AC voltage for sensor power, read the text below:

Note the AC voltage peak value, which is approx. 1,4 x effective (RMS) value 24 V.

To calculate the transformer's output voltage you have to notice its power (VA). 100VA 24V transformer's voltage is 24V only with 100VA load. The load of one sensor is < 3VA, so the transformer is almost on zero load and its output voltage can be calculated by adding its nominal voltage by 10-20%, depending on transformer.

Calculation examples:

10VA 24V   Vout = 24V x 1,4 = **33,6V** (peak)

100VA 24V Vout = 24V x 1,1(+10%) = 26,4V. This is the effective value (RMS) which has
   to be multiplied by 1,4. 26,4V x 1,4 = **37V** (peak)

SX-900 sensors are designed for max. 28V, but sensor's safety tolerance can handle voltages up to 35 V. Therefore 10VA 24V transformer is still inside the tolerance, but 100VA 24V transformer is not and will destroy the sensor.

We recommend using regulated power supplies to avoid any overvoltage problems.

8. Operation

When power (17-28Vdc or 15-24Vac) is connected to the sensor, it goes into "warm-up mode" for approx. 1 minute. For that time the green LED is lit continuously and output signal is constant 4mA. After this mode sensor goes into normal monitoring mode and the green LED starts to blink.

Blinking green LED informs that sensor is in operation and works properly. It also tells approx. value of the sensor's output signal.
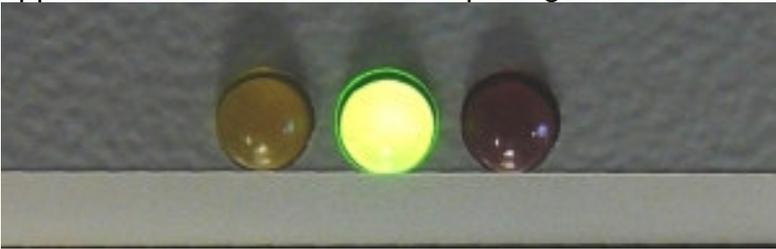
E.g. Output signal 12mA = 11 short + one long blink.
              8mA =   7 short + one long blink.

When a sensor is utilised for the first time, it may show some readings even if there's not any gas present. This is because the conditions on the site can differ significantly from those in our laboratory and affect to the sensor. These condition variables include temperature, humidity, air flow etc. SX900 sensors are programmed to adapt into new environments so that when installed and powered, the sensor automatically begins to search the zero point. This is a rather slow process; it can take anything from a few days to a month. If, however, there is a need to do this faster, then zero calibration has to be performed (See section Zero Calibration). Do not perform the zero calibration until the sensor has been powered for at least two hours.

If, for some reason, the sensor has gone into fault mode, the green LED stops blinking and red LED is lit continuously. The output signal of the sensor is 2mA in fault mode. When fault mode occurs, try switching the power off and then back on. If this doesn't help, please contact Sensorex.

9. Zero Calibration

If the sensor continuously shows readings although the air is supposed to be clean or if you want to speed up the adapting process, you can perform the zero calibration. Sometimes the zero calibration is also required before the calibration.

NOTE!! Zero calibration must be performed in pure air.
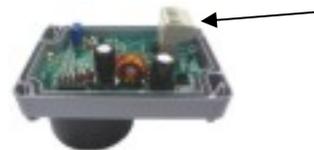
For the zero calibration you need a calibration adapter.

1. **Detach the sensor from its enclosure.**

2. **Fit the calibration adapter into the sensor cover.**

3. **Turn the adapter until yellow and red LEDs start blinking alternately.**

4. **Switch off the power (by detaching connector), and then back on again.**

5. **Wait until the blinking of the LEDs has stopped, green LED is lit and after that for further 30 seconds.**

6. **Remove the calibration adapter.**

7. **Zero calibration has now been performed.**

10. Checking & Calibration

NOTE !! We recommend that our sensors should be checked with gas and, if necessary, calibrated at least once a year.

For sensor checking you can use any known gas concentration which is inside the sensor's measuring range. For calibration you always have to use a concentration which is half of the sensor's measuring range.

Output signal of a linear sensor in a known gas concentration can be calculated from the formula below.

For example, SX-917 sensor calibrated 0-50% LEL CH4, checking gas 30% LEL CH4

Formula: $\left(\dfrac{16 * GasConcentration}{\text{Sensor measuring range}} \right) + 4\text{mA}$

In this case: $\left(\dfrac{16 * 30}{50} \right) + 4\text{mA} = 13,6\text{mA}$

Output signal of a logarithmic sensor in a known gas concentration should be checked from the calibration certificate delivered with the sensor.

For checking and calibration of the sensor you will need a calibration adapter, a Gas-In nipple and a bottle of calibration gas. If you only have pure gas available, you can mix the calibration gas by yourself with the help of the Sensorex Calibration Kit.

Calibration adapter:

Gas-In nipple:

Calibration Kit:

10.1 Checking:

1. **Fit the calibration adapter into the sensor cover so that the mark in the adapter is on the other side than sensor LEDs. The green LED should keep blinking.**

2. **Set the Gas-In nipple to the hole of the adapter.**

3. **Attach a hose between calibration gas cylinder's valve and Gas-In nipple.**

4. **Open the valve and set the flow rate to 0,5-1,0 litre/minute.**

5. **Check the result by measuring the sensor output signal or checking from possible monitor value after the reading is stable.**

6. **If the signal or reading differs too much from the expected, you have to calibrate the sensor.**

If you are using Sensorex Calibration Kit for checking, then

2. Set the calibration bag and valve to the hole of the adapter.

4. Open the valve of the bag and let the gas flow into the sensor by squeezing the bag gently.

10.2 Calibration:

NOTE ! SX-900 series sensors must always be calibrated with a gas concentration which is half of the sensor's measuring range. For example, SX-917 sensor calibrated for 0-50% LEL CH4, the concentration of calibration gas has to be 25% LEL CH4.

1. **Fit the calibration adapter into the sensor cover so that the mark in the adapter is on the other side than sensor LEDs.**

2. **Set the Gas-In nipple to the hole of the adapter.**

3. **Attach a hose between calibration gas cylinder's valve and the Gas-In nipple.**

4. **Turn the adapter until red & yellow LEDs start blinking alternately.**

5. **Open the valve and set the flow rate to 0,5-1,0 litre/minute.**

6. **Wait until the blinking of the LEDs stops and after that, further 30 seconds.**
    - **If green LED is lit, calibration was successful**
    - **If red LED is lit, calibration failed. Try zero calibration and repeat calibration. If it still fails, please contact Sensorex.**

7. **After successful calibration, first remove the adapter and then close the valve.**

If you are using Sensorex Calibration Kit for the calibration, the procedure is quite similar. Note parts 2, 5 and 7 as described below.

Prepare the calibration gas concentration as mentioned in the manual of the Kit.

2. Set the calibration bag and valve to the hole of the adapter.

5. Open the valve of the bag and gently squeeze the bag in order to get a steady gas flow.

7. After successful calibration, first remove the adapter (+ calibration bag + valve) and then close the valve.

11. Warranty Terms

These warranty terms apply to all fixed products made by Sensorex Oy.

1. Warranty Time

This warranty for Sensorex products is valid 24 months from the date of purchase by the consumer. Sensor elements, IR-sensors and pumps are not included. Warranty times for them are valid 12 months.

2. To obtain warranty service

Warranty service is available in the Sensorex premises. Any cost of the transportation of the product to and from Sensorex will be borne by the customer.

3. Limitations

Warranty repair service is excluded if damage or defects have been caused by:

- Improper use, excessive use, handling or operation of the product as referred to in the user manuals and/or relevant user documents, including without limitation, incorrect storage, dropping, excessive shocks, corrosions, dirt or water damages.
- Repairs or modifications carried out at a service other than Sensorex Oy or service centre not authorized by Sensorex.
- Inadequate packaging of the product when returning it to the Sensorex.
- Accidents or disasters or any cause beyond the control of Sensorex, including but not limited to lighting, water and fire.