(KDS-1021) OXYGEN GAS SENSOR

(0 ~ 100%)

Figure 1. The oxygen gas sensor

Short description

The Oxygen Gas Sensor measures the gaseous oxygen concentration in the range of 0 to 100%. It uses an electrochemical cell which contains a lead anode. The anode and cathode are immersed in an electrolyte. When oxygen molecules enter the cell, they get electrochemically reduced at the cathode. This electrochemical reaction generates a current that is proportional to the partial pressure of oxygen in the gas mixture. The current is measured across a resistance to generate a small voltage output. The voltage output is amplified to the 0 ~ 5V output range.

The sensor is equipped with a ScienceCube plug and can be connected to the following Science Cube interfaces Lite, Lite II and Pro through the Measuring console.

NOTE: This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

Examples of experiments

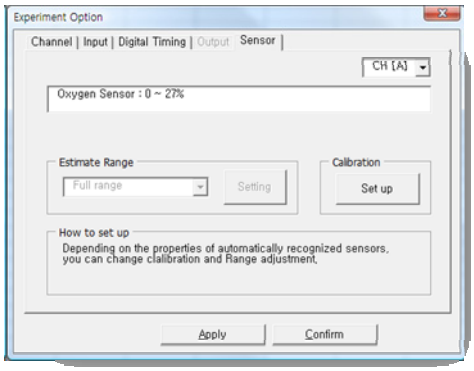
The Oxygen Gas Sensor can be used to monitor gaseous oxygen in a variety of biology and chemistry experiments such as:

- Monitoring human respiration.
- Monitoring changes in oxygen concentration during photosynthesis and respiration of plants.
- Monitoring respiration of animals, insects, or germinating seeds.
- Monitoring oxidation of metals such as iron.
- Monitoring consumption of oxygen by yeast during respiration of sugars.

Calibration

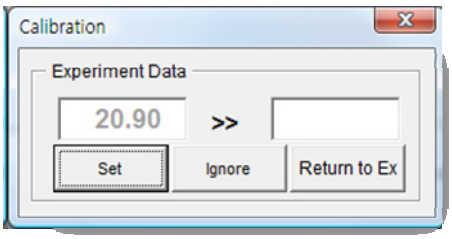
The output of the Oxygen Gas Sensor is linear with respect to the O_2 concentration.

To collect data you can: Calibrate the Oxygen Gas sensor. The calibration can be performed in the ScienceCube for Excel.



Perform a 1-point calibration at 20.9% oxygen. For the first point connect a sensor to the interface and keep it in air. Read the value in the calibration set meter on the screen.

Set a value of 20.9 (% O_2).



Atmospheric Considerations

Because the % of oxygen varies with the amount of water vapor in the atmosphere, you may want to adjust your atmospheric oxygen calibration value to improve accuracy when using the Oxygen Gas Sensor. The accepted value of 20.9% for atmospheric oxygen levels is calculated in dry air (0% humidity). If you know the relative humidity of the location at which you are calibrating, you can substitute one of the values below in place of 20.9%.

Relative Humidity	0%	25 %	50%	75%	100%
Oxygen in % by volume	20.9	20.7	20.5	20.3	20.1

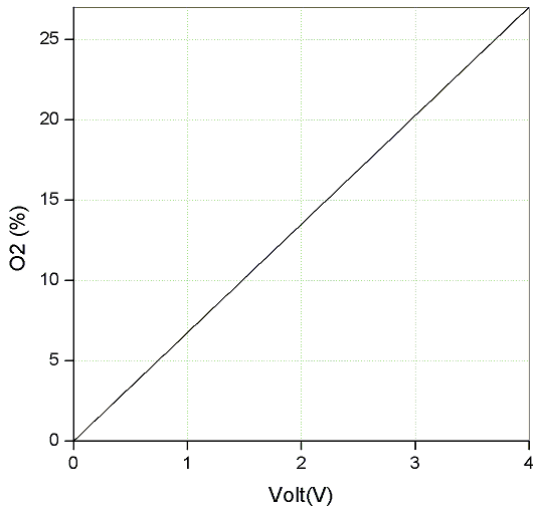


Figure 2.

Default calibration graph of the Oxygen Gas Sensor.

% O_2 = 25 * V_{out} (V)

Additional tips

- **Very important**: Do *not* place the sensor into any liquid. The sensor is intended only for measuring *gaseous*, not aqueous, O_2 concentration.
- Even though the sensor responds rather quickly to changes in O_2 concentration, remember that gas has to diffuse into the electrochemical cell located at the top of the sensor shaft before any changes in concentration can be detected. Since diffusion of gases is a fairly slow process, there can be some delay in readings.
- The sensor element has an expected operating life of about 6 years in open air.

Cautions while dealing with sensor

1. Cautions while designing
   - Consider using a dehumidification device at the sensor mouth.
   - Consider that the temperature while use is about 5 ~ 40℃.
   - Consider normal pressure condition.
   - Design to enable quick exchange in case of any malfunction.
   - Let the sensing part head toward the bottom.

2. Caution while dealing with the equipment
   - The appropriate temperature for keeping the sensor is -20 ~ 60℃. Do not leave the sensor in other conditions.
   - The sensor should be kept in the horizontal direction. Do not let the sensing part head upside since this may extract the precipitates to damage the sensor.
   - The sensing part should go through aging after sufficient drying time if it is exposed to water.
   - Never dismantle the sensor.

3. Generally, the sensor has the same organization as batteries, and the electrolyte also has similar danger. Heavy metal is contained in the interior of the sensor, and also chemical compounds through reaction. The cautions while treating is clarified as the following:

- The electrolyte of the sensor shows weak acidity. Clean with water immediately when directly exposed to skin including hands. Follow the doctor's instruction if there is any skin problem occurring. If exposed to sensitive part such as eyes, clean with 5% saline solution of clean water right away and follow the doctor's instruction.
- Take the clothing off immediately when exposed to the electrolyte to prevent contact with skin and wash with neutral detergent.
- If accidentally taken by a person, force to vomit immediately and give plenty of saline solution or milk. Then take the follow-up measures with doctor's instruction.
- The sensor contains heavy metal elements so please be careful while handling.

Technical data

Oxygen concentration range : 0 ~ 100 Vol.% O_2 Gas

Output voltage range : 0 ~ 4 V in air at 25℃, sea level (standard) other range optional.

Resolution : 0.03% (12 bit)

Gas Sampling Mode : Diffusion through solid membrane

Linearity(R) : 0.9999(R) of full scale at constant temperature and pressure

Response Time(90%) : 30 Seconds

Humidity : 0 ~ 95% RH, non condensing

Operation Temperature Range : 0 ~ 50℃

Storage Temperature Range : -20 ~ 60 ℃

Warranty Life : 2 year (Oxygen Cell)

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