Membrane-Separated Electrode Method Sensor: ES-K

Stationary sensor
Example: ES-K2 series

Category	Detectable gas
Electrochemical	Toxic

1. Brief description

Based on the principles of the potentiostatic electrolysis-based sensor, this sensor is structured with a gas-permeable film (separating membrane) and an action electrode completely separated from each other. It is a toxic gas sensor with an excellent selectivity.

2. Structure and principles

[Structure]

The sensor is structured with an action electrode—a metal electrode with a gas-permeable film placed over it—along with reference and counter electrodes; these electrodes are housed in a plastic container filled with an electrolytic solution. Between the action electrode and the film is a very thin layer of an electrolytic solution.

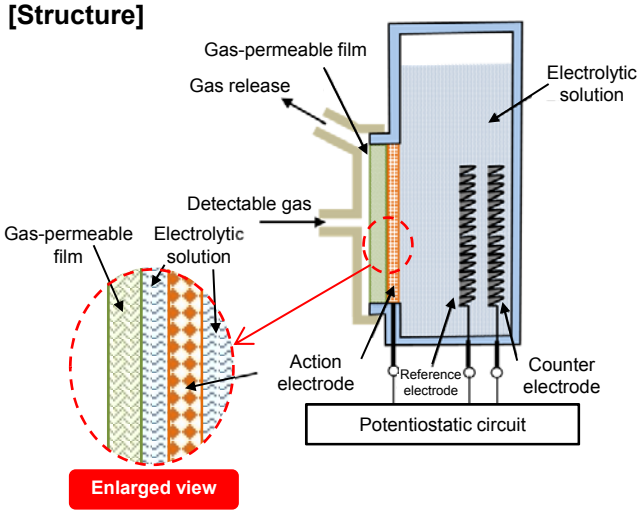
[Principles]

A detectable gas passes through the gas-permeable film and reacts with ions in the electrolytic solution, which produces halogen. If the detectable gas is Cl_2, the following reaction occurs:

$$Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$$

The I_2 generated by this reaction is reduced at the action electrode, causing a current to pass through the circuit. Since this current is proportional to the gas concentration, the sensor measures the current value to determine the gas concentration. Detectable gas reacts with the electrolytic solution before it reacts with the action electrode and therefore no interference occurs with gases that do not react with the electrolytic solution; this provides the sensor with an excellent selectivity.

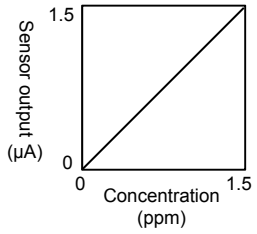
[Structure]



3. Features (of the sensor ES-K233 (Cl_2 sensor) as an example)

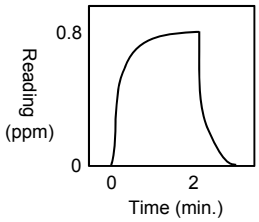
○ Output characteristics

The gas concentration is proportional to the current value. The sensor outputs the current value without any change and the gas concentration is, therefore, proportional to the sensor output.



○ Responsiveness

The sensor responds quickly. Since the electrodes or electrolytic solution is rarely corroded by Cl_2, the sensor excels in accuracy and reproducibility.

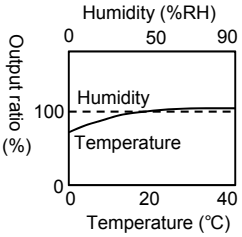


○ Aging characteristics

The sensor does not degrade in performance over time with almost no changes in output. If, however, the gas-permeable film is degraded in gas permeability due to a foreign matter adhering to it, this may lead to reduced output.

○ Temperature and humidity characteristics

High temperatures have almost no effect on the output while low temperatures are likely to reduce the output. Even at 0℃, the sensor maintains its sensitivity at a level not lower than 80%. By performing temperature corrections, it minimizes reading fluctuations. The output is not affected by humidity.



4. Detectable gas, molecular formula, model, and detection range (examples)

Detectable gas	Molecular formula	Model #	Detection range
Chlorine	Cl_2	ES-K233	0-1.5 ppm
Hydrogen fluoride	HF		0-9 ppm
Fluorine	F_2		0-3 ppm
Chlorine trifluoride	ClF_3	ESK-233C	0-1 ppm
Ozone	O_3	ES-K239C	

5. Products of this type (examples)

○ Stationary products

... GD-70D

○ Portable products

... SC-8000, TP-70D

SC-8000