Potentiostatic Electrolysis Method Sensor: ES

Stationary sensor Example: ESF-A24R 

Stationary sensor Example: ES-23 series 

Portable sensor Example: ESR-A1 series 

1. Brief description

This sensor electrolyzes detectable gas using an electrode with the potential kept constant to allow a current to be generated, and then measures the current to determine the gas concentration. It is the gas sensor most suitable for detecting toxic gases. You can specify a particular potential to detect a particular gas.

Category	Detectable gas
Electrochemical	Toxic

2. Structure and principles

[Structure]

The sensor is structured with an electrode (action electrode) —a gas-permeable film with a catalyst (e.g., gold or platinum) placed over it—along with reference and counter electrodes; these electrodes are housed in a plastic container filled with an electrolytic solution.

[Principles]

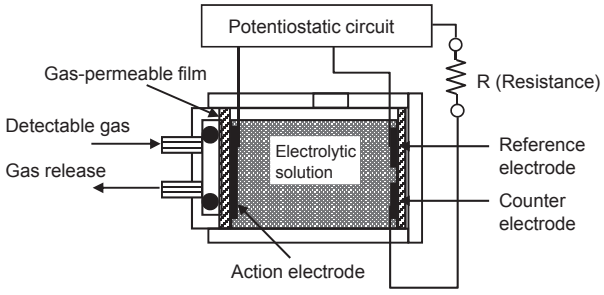
The sensor uses a potentiostatic circuit to keep the potential between the action and reference electrodes constant. The action electrode directly electrolyzes detectable gas. If the detectable gas is H_2S, the following reactions occur:

Action electrode: $H_2S + 4H_2O \rightarrow H_2SO_4 + 8H^+ + 8e^-$

Counter electrode: $2O_2 + 8H^+ + 8e^- \rightarrow 4H_2O$

The current generated by the reactions is proportional to the gas concentration. By measuring the current that flows between the action and counter electrodes, the sensor determines the gas concentration.

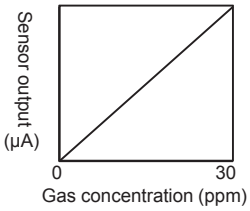
[Structure]



3. Features (of the sensor ES-237iF (H_2S sensor) as an example)

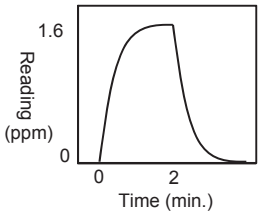
○Output characteristics

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 response curve is as shown in the right figure.
The sensor makes gas react based on catalysis reaction to determine the current value. Since H_2S does not alter the electrode catalyst, the sensor excels in accuracy and reproducibility.

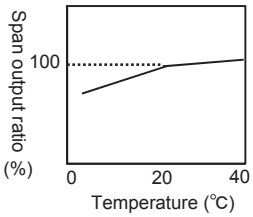


○Aging characteristics

For approximately two years, the sensor keeps its sensitivity at a level approximately 80% of the original level. Since humidity slightly affects the sensitivity, the reading may vary depending on the season.

○ Temperature characteristics

With almost stable readings at high temperatures, the sensor is likely to decrease its sensitivity with a decrease in temperature. Even at 0℃, the sensor maintains its sensitivity at a level not lower than 80%. By performing temperature corrections, it minimizes reading fluctuations.



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

Detectable gas	Molecular formula	Model #	Detection range
Carbon monoxide/ Hydrogen sulfide	CO/H_2S	ESR-A1DP	CO:0-500ppm H_2S:0-30ppm
Carbon monoxide (Reduce H_2 interference)	CO	ESR-A1CP	0-500ppm
Hydrogen sulfide	H_2S	ESF-A24R	0-100ppm
Carbon monoxide	CO	ES-23	0-75/150/300ppm
Hydrogen sulfide	H_2S	ES-1827iF	0-3 ppm

5. Products of this type (examples)

○Stationary products

... SD-3EC, SD-3DEC, GD-84D-EX, EC-600, GD-70D, SD-1EC

○Portable products

... CO-04, CX-04, HS-04, GX-3R, GX-3R Pro, CO-FL1, GX-2012, GX-8000

GD-84D-EX