

## Common Issues in Utilizing 7-Series Sensors and Smart Modules

This document covers common issues that users might encounter when utilizing SemeaTech 7-series electrochemical gas sensors and modules.

- **Understanding Low ppb Outputs from the 7 Smart Module**

When the 7 Smart module operates in a normal environment without the presence of the target gas (or when the target gas concentration is below the detection limit), it will generate random output data between 1 to 8 ppb. This behavior helps differentiate normal operation from fault states, ensuring the module is functioning correctly. If communication fails, the module will output 0 ppb. Therefore, if you observe a "0 ppb" reading, please verify the communication connection between the host computer and the sensor module.

- **Baseline Temperature Effects**

Electrochemical gas sensors typically exhibit an increase in output as the temperature rises. When multiple sensors of the same module and part number are placed together and exposed to the target gas under identical environmental conditions, some may show output fluctuations, with these changes closely correlating with ambient temperature.

On the other hand, the baseline of electrochemical gas sensors also fluctuates within a specific range due to temperature variations. For instance, the baseline of the 7NH3-100S sensor can vary by up to 2 ppm (2,000 ppb) across a temperature range of -40°C to 50°C. In sensors with large detection ranges, small baseline fluctuations in the tens to hundreds of ppb are generally negligible in practical applications. Therefore, the 7 Smart module does not include temperature compensation for baseline adjustments. However, if baseline temperature compensation is required, we strongly recommend that users test the sensor, obtain a 'baseline versus temperature' curve, and develop software to implement compensation within the instrument.

- **Sensor Selection for Air Quality Monitoring (AQM)**

For AQM applications, it is crucial to maintain consistent repeatability of sensor output under identical environmental conditions. However, achieving this with standard 3-electrode 7-series sensors can be challenging in many cases. To meet the demands for high repeatability, we recommend using 4-electrode AQM sensors. The 4th electrode, known as the auxiliary electrode, is a low-sensitivity sensing electrode designed to correct baseline drift in the primary sensing electrode. By combining the outputs from both the sensing and auxiliary electrodes, the overall performance of the sensor is significantly enhanced. For example, replacing the 7NH3-100 sensor with the 7E4-NH3-10 sensor results in better accuracy, higher resolution, a more stable baseline, and improved repeatability.

- **Other Technical Issues and Documents**

SemeaTech, a leader in the gas detection industry, brings extensive expertise in the design, manufacturing, and testing of electrochemical sensors. To assist users in optimizing the operation of our products, we have curated a comprehensive collection of technical documents and application

notes, available on our official website. These resources provide in-depth insights into sensor performance, practical usage tips, and analyses of common issues. Users facing technical challenges with our sensors can consult these articles to enhance their product designs. We regularly update these technical documents based on ongoing communications with our customers.

For more information, please click the following links to view more documents:

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