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Let's Solve Water

Technical note
YSI • XA00360

Successful deployments with the EXO Ammonium ISE

Ammonium ISEs for freshwater monitoring

Ammonium and ammonia are important to monitor because they can indicate industrial, agricultural, and wastewater runoff, and high concentrations can enhance the growth of algae and macrophytes and are potentially toxic to aquatic organisms. Ammonium Ion Selective Electrodes (ISEs), such as those compatible with the YSI EXO Multiparameter Sonde, can measure ammonium directly in the water column using proven electrochemical techniques that specifically measure ammonium (NH_4^+) ions.

EXO Ammonium ISE

The EXO Ammonium ISE uses a silver/silver chloride wire electrode in a custom reference solution to measure the potential across a membrane that depends on the relative concentration of ammonium ions in the water. The sensor is ideal for freshwater (<1500 µS/cm) because ionic species in saltwater can interfere with the measurements. Ammonia is a calculated parameter and is dependent on temperature, salinity, and pH. The sensor references live measurements from the EXO Conductivity/Temperature and pH sensor for the most accurate ammonia data. This makes the Ammonium ISE a valuable tool for monitoring ammonium and ammonia in freshwater environments, especially those impacted by combined sewer overflows.

Historically, the EXO Ammonium ISE has been promoted for spot sampling only due to its tendency to drift; however, recent deployment studies have shown that the Ammonium ISE can be a powerful tool for continuous monitoring given the right conditions and by following a few key tips for success.

What you'll need

- EXO Multiparameter Sonde
- EXO Ammonium Ion Selective Electrode
- EXO Conductivity & Temperature Sensor
- EXO Central Wiper (optional)
- Ammonium calibration standard

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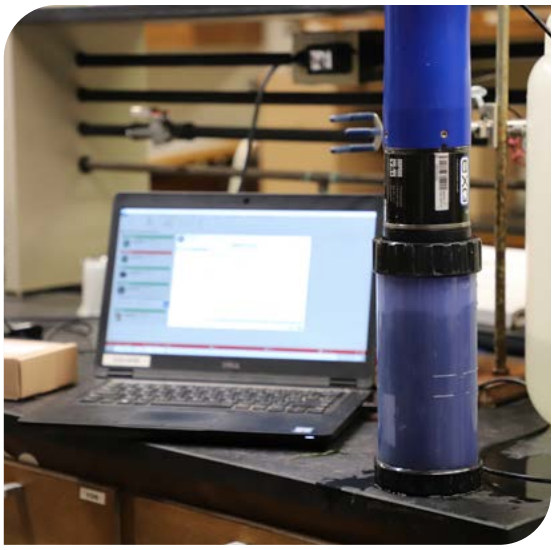
Methods to obtain stable, accurate, reliable data with minimal drift using the Ammonium ISE for freshwater deployments.

- Perform sensor calibrations in the lab or office and swap calibrated sensors with field-deployed sensors. Lab-based calibrations allow for more controlled and reproducible conditions, such as stable temperatures and decreased contamination issues.
- Use good lab techniques during calibrations, such as using a clean sonde guard and calibration cup, removing field wiper brushes, rinsing the sonde and sensors with deionized water and drying with lint-free wipes, and triple rinses in calibration standard.
- Pre-soak the Ammonium ISE tip overnight in 100 mg/L ammonium standard, or the standard closest in value to the site, before calibrating and deploying. Soaking improves the sensor performance and increases the life of the module by removing contaminating ions and reconditioning the membrane.
- Replace the ISE module every 6 months at minimum, or as needed. The study had success with 6-month replacements, but more frequent replacements (every few weeks) may be necessary for the best data. The sensor body does not need to be replaced.
- Calibrate sensor multiples together in a batch on one sonde. Multi-sensor calibrations ensure the data are comparable between all deployed sondes and adhere to the same quality standards.
- Use the Wiper Guard for the Ammonium ISE (599864) in high-fouling deployments with a Central Wiper to protect the sensitive membrane from the bristles. Note that the guard may cause the wiper bristles to splay more quickly.
- Regularly maintain the deployment site and clean heavy fouling from the sonde and sensors.
- Perform post-calibration and post-deployment checks to measure possible sensor measurement drift against a known and traceable standard.
- Optionally, to further improve sensor accuracy, apply a site-specific offset to the data. Collect grab samples from the deployment site, measure the ammonium concentration using lab analysis or a photometer, and use the reference data to calculate an offset value to apply to the deployment data.



Calibrate sensors in the lab or office using clean equipment for more consistent results.

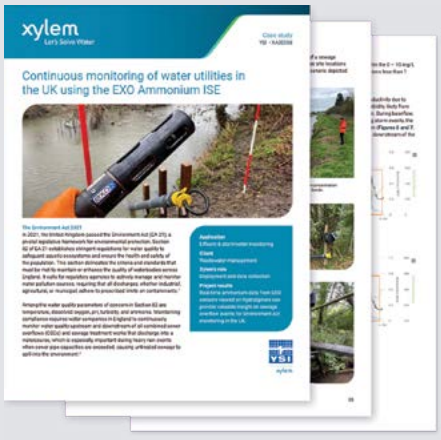
The EXO Central Wiper reduces fouling on the sensor faces, while the Ammonium ISE wiper guards protect the ISE membranes.

Replace the ISE module every 6 months, or as needed.

Benefits of the EXO Ammonium ISE

- Uses a direct electrochemical measurement of ammonium ions
- Up to 6-month consumable module life; sensor body can last for years
- Low cost
- Low power consumption
- High stability over deployments
- Highly accurate at low measurement range (0-2 mg/L), with full range up to 200 mg/L
- Utilizes the EXO Sonde platform with field-tested EXO Sensor features:
    - Rugged titanium build
    - Wet-mate connector
    - Smart Sensor with SmartQC
    - Powerful Anti-fouling with the Central Wiper
    - Up to 7-sensor payload
    - Automatic sensor recognition
    - Universal sensor ports
    - 3-year sonde warranty

Refer to the Continuous Monitoring of Water Utilities in the UK using the EXO Ammonium ISE Case Study for more information on successfully monitoring combined sewer overflows and water utilities using the EXO Sonde connected to HydroSphere for real-time data. Long-term monitoring applications of the EXO Ammonium ISE can provide the data required for water management compliance outlined in the UK Environment Act 2021 and other regulatory standards.



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