

NEULOG NITRATE LOGGER SENSOR GUIDE



NeuLog nitrate logger sensor NUL-241 Part# NL-2410

The NeuLog nitrate ion sensor can be used for any science experiment which utilizes nitrate concentration readings such as in the fields of Environmental Science, Ecology, Chemistry, Biology, etc.

Among hundreds of possible experimental subjects that can be studied with the NUL-241 sensor are: chemical reactions, water quality, environmental health, small animal behavior, ecological studies, and many more.

The nitrate sensor's measurement units are:

- Milligrams per liter (mg/L): SI measurement unit for density of a solid dissolved in a liquid.
- Parts per million (ppm): The total amount of a specific molecule (nitrate for example) per million molecules in a sample.

Nitrate sensor usage:

The nitrate sensor's electrode uses a PermaFil (non-refillable), ion-selective electrode. The reference chamber is gel filled and sealed; therefore, no reference filling solution is required.

Usage guide:

Concentration range	1M to 7×10^{-6} M 0.1 to 14,000 ppm as N
pH range	2.5 to 11 pH
Temperature range	0 to 50°C
Minimum sample size	3mL in a 50 mL beaker
Reproducibility	±4%
Electrode resistance	1 to 4 megaohms

Equipment required:

- Wash bottle with distilled or deionized water
- Several clean beakers
- 1 mL, 10 mL and 50 mL pipettes (a 50 ml graduated cylinder can also be used).

Technical notes:

- All standard solutions should be prepared fresh.
- The standard solutions should be at the same temperature as the sample.
- Use ISA in all solutions (also recommended for the measured sample).

Note: ISA is added to all solutions to ensure the samples and standard solutions have the same ionic strength; the ratio is 1:50.

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Electrode preparation:

1. Remove the protective cap encasing the nitrate probe's electrode. **CAUTION: Do not touch the PVC membrane at the end of the probe with your fingers.**
2. Rinse the electrode with deionized water and blot dry. Be sure not to rub as this will harm the sensor.
3. Soak the electrode in deionized water for 10 minutes, then in a diluted nitrate standard solution (0.0001 M or 1 ppm) for two hours until ready for use.
4. For preparing the 1 ppm standard solution, mix one drop of the 1000 ppm standard solution with 20 drops of ISA and add deionized water up to a total of 40 ml solution (assuming one drop equals 0.04 ml). It is also possible to use a micropipette if available.

Offsetting the sensor:

Be sure to offset the nitrate sensor once daily during periods of regular usage.

1. Prepare the electrode as described in the "Electrode preparation" guide above. If you have already prepared the electrode in the last three days and stored it as described in the "Electrode storage" section then you do not have to repeat it before offsetting the sensor.
2. Prepare the offsetting solution: Mix 1 ml of the ISA solution with 0.5 ml of the 1000 ppm standard solution. Add deionized water up to a total of 50 ml. You will get a 10 ppm solution.
3. Rinse the electrode with deionized water, blot dry and place in the beaker.
4. After a stable reading has been reached, press the "Start/Stop" button located on the sensor's faceplate for 4 seconds.

5. Rinse the electrode once more with deionized water and blot dry.
6. The nitrate sensor is now ready for use.

Electrode storage:

Short term (overnight or weekend):

Rinse the electrode thoroughly with deionized water and place the tip in a diluted standard solution (around 10 ppm) between measurements.

Long term:

Rinse the electrode thoroughly with deionized water and blot dry. Attach the hard plastic protective electrode cap again to protect the sensing element. Follow procedures in the "Electrode preparation" section when using the electrode again.

Included with the sensor:

- NeuLog General Guide
- NeuLog nitrate (NO_3^-) sensor electrode.
- Nitrate (NO_3^-) Ionic Strength Adjuster (ISA)
- Nitrate (NO_3^-) 1000 ppm standard

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Sensor's specifications		
	mg/L	ppm
Range and operation modes	0.1 to 14,000	0.1 to 14,000
ADC resolution	15 bit	
Resolution	0.1 at 0.1 to 1,000 mg/L 98 at 1,000 to 14,000 mg/L	0.1 at 0.1 to 1,000 ppm 98 at 1,000 to 14,000 ppm
Max sample rate (S/sec)	100	

Experiment Duration: 1 second to 31 days.

Sensor's features:

- Fully digital data
- Rugged plastic ergonomic case
- PermaFil ion selective electrode
- Nitrate probe connected to the sensor's body by a flexible rubber-coated wire
- Protective hard-plastic storage cap
- Push button switch for Start/Stop experiments in off line mode
- LED indicator of experiment status (blinks while collecting data)

Note: NeuLog products are intended for educational use.

Videos and experiment examples:

- Videos, literature and other probes can be found at www.NeuLog.com.
- In order to access the nitrate sensor's page, choose "Products" on the main menu and then "Nitrate logger sensor".
- In order to access the nitrate sensor's experiments, choose "Example Labs":
 - Ammonium and Nitrate in an Aquarium (B-45)

Technical background:

The philosophy behind NeuLog's plug and play technology is based on each sensor's ability to store its own data due to an internal flash memory chip and micro-controller in each plastic NeuLog body. This technology allows the sensor to collect and then store the digital data in the correct scientific units ($^{\circ}\text{C}$, $^{\circ}\text{F}$, Lux, %, ppm, for example).

The sensor is pre-calibrated at the factory. The built-in software in the logger can be upgraded for free at any time using the provided firmware update.

The nitrate sensor uses a permanently filled ion selective electrode to accurately measure the amount of nitrate ion in a solution.

The Ionic Strength Adjustor (ISA) is used to standardize the strength of the ions in various solutions to give the most accurate readings.

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Maintenance and storage:

Before use, please review the “Nitrate sensor usage”, “Electrode preparation”, “Electrode storage” and “Offsetting the sensor” sections of this document to ensure the proper storage and longevity of the NeuLog nitrate ion sensor.

- Never submerge the NeuLog plastic body in any liquid
- Do not allow liquid into the nitrate sensor’s body
- After use, gently wipe away any foreign material from the nitrate sensor
- Store in a box at room temperature out of direct sunlight.

Warranty:

We promise to deliver our sensor free of defects in materials and workmanship. The warranty is for a period of 3 years from the date of purchase and does not cover damage of the product caused by improper use, abuse, or incorrect storage. Sensors with a shelf life such as ion selective probes have a warranty of 1 year. Should you need to act upon the warranty, please contact your distributor. Your sensor will be repaired or replaced.

Thank you for using NeuLog!

NeuLog

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