



Stationary water quality monitoring with nitrate probe SPS-NO3

- Robust, low maintenance single parameter sonde (SPS) made of 1.4571 stainless steel for the measurement of nitrate (NO_3^- , $\text{NO}_3\text{-N}$)
- Slim design (\varnothing 48.3 mm) for observation wells starting from 3" diameter
- High measuring accuracy, drift-free, only annual verification of the calibration needed
- Available in different measuring ranges up to max. 0... 266 mg/L NO_3^-
- Output: RS 485 (SHWP, Modbus RTU) for the connection with SEBA data logger

Nitrate probe SPS-NO3

The problem: increasing nitrate pollution in natural water resources

Drinking water supply in Germany and many other countries is largely covered by groundwater resources. But groundwater is increasingly polluted with nitrate. One reason is the extensive practice of nitrogen fertilization in agriculture. In addition to mineral fertilizers, substrates such as liquid manure from livestock farms or biogas plants are used for the crops. Left-over nitrogen components, which aren't degraded by plants at the soil layer usually percolate into groundwater as nitrate. Accordingly, more and more often the maximum permissible threshold of 50 mg/L nitrate concentration for drinking water in the EU is being exceeded. As there is a lack of high-resolution measurements of nitrate concentrations, there has been a lack of data about the precise dynamics and trends of nitrate and nutrient loads in groundwater and surface water. For example, routine single

laboratory analyses indicate that concentrations peak after events such as heavy rain are incomplete and only identified by coincidence:

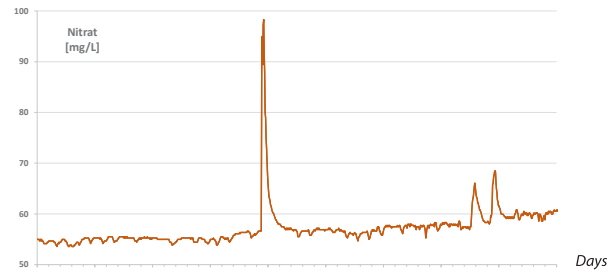


Figure 1: Nitrate hydrograph with peaks after rainfall events [mg/L]

The solution: stationary, innovative field measurement technology for nitrate monitoring in water

Formerly, permanent measurements of the nitrate concentration with common ion-selective electrodes (ISE) are associated with high maintenance and calibration costs, to guarantee reliable measurement results. In contrast the optical and low

maintenance single parameter probe type SPS-NO3 opens up new possibilities for environmental authorities and water suppliers: stationary and energy self-sufficient monitoring of nitrate pollution in groundwater or surface water.

Measuring principle:

By usage of a xenon lamp and a photodiode, a differentiated optical measurement of the absorbed light at wavelengths of 212 nm, 254 nm and 360 nm is carried out in the water (Fig. 2). The SPS-NO3 immediately computes the nitrate concentration

with high precision and long-term stability. Organic compounds and turbidity in the water are automatically compensated and therefore have little or no influence on the measurement accuracy.

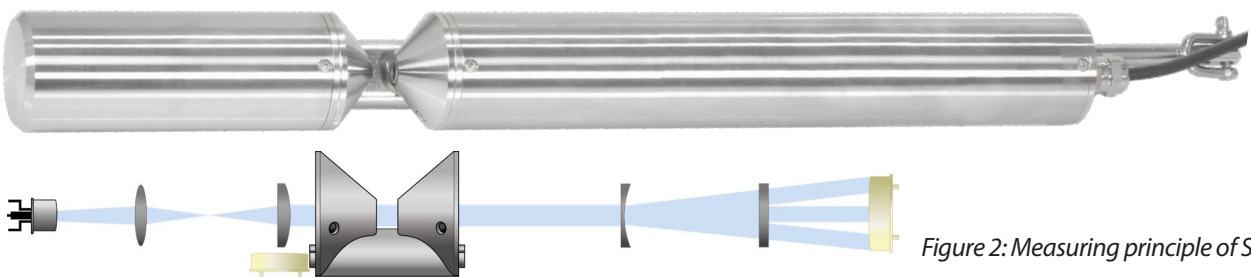


Figure 2: Measuring principle of SPS-NO3

Optimized measuring ranges:

The factory settings of available path lengths of the SPS-NO3 enable an optimal selection of measuring ranges for the expected nitrate concentrations in groundwater or surface water. As a standard, three path lengths with different measuring ranges of a maximum of 0-266 mg/L NO_3^- are available. The typical path lengths for the measurements are 1 mm, 2 mm and 5 mm.

- Path length 1 mm: 0...222 mg/L NO_3^-
- Path length 2 mm: 0...111 mg/L NO_3^-
- Path length 5 mm: 0...44 mg/L NO_3^-

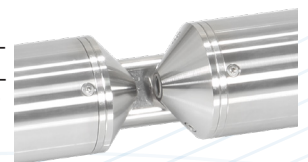


Figure 3: Measuring path of SPS-NO3

Accessories:

An optional cleaning module with wiper ensures that the measuring window is kept clean from unwanted deposits. The wiper control can be configured using the operating software SEBAConfig.



Figure 4: Wiper cleaning module

The perfect, self-sufficient SEBA water quality station with SPS-NO3:



The protective housing concept

The robust aluminum protective housing „Alpha“ is impact-resistant, functional and offers sufficient space for a data logger, remote data transmission and self-sufficient energy supply. A tilting mechanism enables the operator simply to fold away the **protective housing** in order to easily pull-out the **nitrate probe SPS-NO3** and other probes for maintenance or control purposes.

The logger and data transmission concept

The core of the SEBA water quality station is the low-power data logger **UnilogCom**. A powerful 32-bit microcontroller ensures that the **UnilogCom** can be used anywhere. The **UnilogCom** comes with a 16 MB ring buffer, space for over 1,120,000 measurement data, 32 input channels for connecting external sensors and an individually programmable wiper control for the **SPS-NO3**. An integrated **4G modem** (LTE) provides routine or event-controlled data transmission (e.g. when limit values are exceeded) to any FTP server or to the **SEBA-Hydrocenter** web portal. In addition, alarm messages can be sent to up to 8 recipients via SMS.

The operating concept

Via USB interface cable it is easy to handle with a notebook or tablet (Windows). Alternatively, the data logger can be intuitively configured and read out via **Bluetooth®** using the **SEBA BlueCon2** with a smartphone, tablet (Android) or iPhone, iPad (iOS).

The power supply concept

The SEBA water quality station can be operated independently with a rechargeable battery. Depending on measurement and transmission interval a run-time of up to 6 months can be achieved. For longer run-times it is easy to upgrade the battery operation using a **12 V solar panel**.

The modular sensor concept

In addition to the **SPS-NO3**, other SEBA probes such as the multi-parameter probe **MPS-D8** (e.g. pH, redox potential, oxygen concentration, conductivity, turbidity) or the SEBA pressure / temperature probe **DS(T) 22** can be connected in a modular way to the SEBA data logger **UnilogCom**.

Advantages

- **High measurement accuracy, drift-free, minimal calibration effort:**
The SPS-NO3 usually needs to be checked only once a year.
- **Low operating costs:** no consumption of reagents or replacement of used electrodes.
- The slim design of the SPS-NO3 allows installation in 3" pipe diameters.
- **Connectivity to SEBA data logger:** A Modbus converter or a ModBus interface as factory setting enables the SPS-NO3 being connected to all SEBA data logger of the newest generation (e.g. UnilogCom, NetlogCom).

Technical data

Nitrate probe		
Metrology:	Lightsource	Xenon-flashlight
	Detector	4 photo diodes + filter
Measurement principle:	Attenuation	
Optical path:	1 mm, 2 mm, 5 mm	
Parameter:	NO ₃ ⁻ , NO ₃ -N	
Measurement range:	path length 1 mm: 0...222 mg/l NO ₃ ⁻ ; path length 2 mm: 0...111 mg/l NO ₃ ⁻ ; path length 5 mm: 0...44 mg/l NO ₃ ⁻ ; <i>further measurement ranges/path lengths on request</i>	
Measurement accuracy:	path length 1 mm: ± 5 % + 4.4 mg/l NO ₃ ⁻ ; path length 2 mm: ± 5 % + 2.2 mg/l NO ₃ ⁻ ; path length 5 mm: ± 5 % + 0.88 mg/l NO ₃ ⁻ ; <i>* under laboratory conditions; Related to a nitrate standard solution; General: ± (5 % + 2-fold detection limit)</i>	
Turbidity compensation:	Yes	
Reaction Time T100:	20 s	
Measurement interval:	≥ 30 s	
Housing:	Stainless steel (1.4571/1.4404) or Titanium 3.7035	
Dimensions:	approx. 470 x 48 mm (10 mm pathway)	
Weight:	VA	ca. 3 kg
	TI	ca. 2 kg
Interface:	Digital	Ethernet (TCP/IP) RS 485 (Modbus RTU)
Power consumption:	less or equal to 8 W	
Power supply:	12...24 VDC (± 10 %)	
Calibration / maintenance interval:	12 month	
Maximum pressure:	With cable 0 - 3 bar	
Operating temperature:	+2 °C ... +40 °C	
Protection class:	IP 68	
Accessories:	Cleaning module with Anti Fouling Wiper Wiper blades for cleaning module	

Multiparameter sensor D8/K16

See leaflet water quality monitoring

SEBA data logger

See leaflet UnilogCom

See leaflet NetlogCom

The right is reserved to change or amend the foregoing technical specification without prior notice

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