



Nitrogen

Nitrogen Measurements: Ammonium · Nitrate · Nitrite

Wastewater treatment processes are concerned with controlling the energy efficient removal of pollutants in the smallest possible space in the shortest possible time.

Required are:

- detailed knowledge of the underlying process
- highest possible transparency of the process steps through corresponding measuring methods

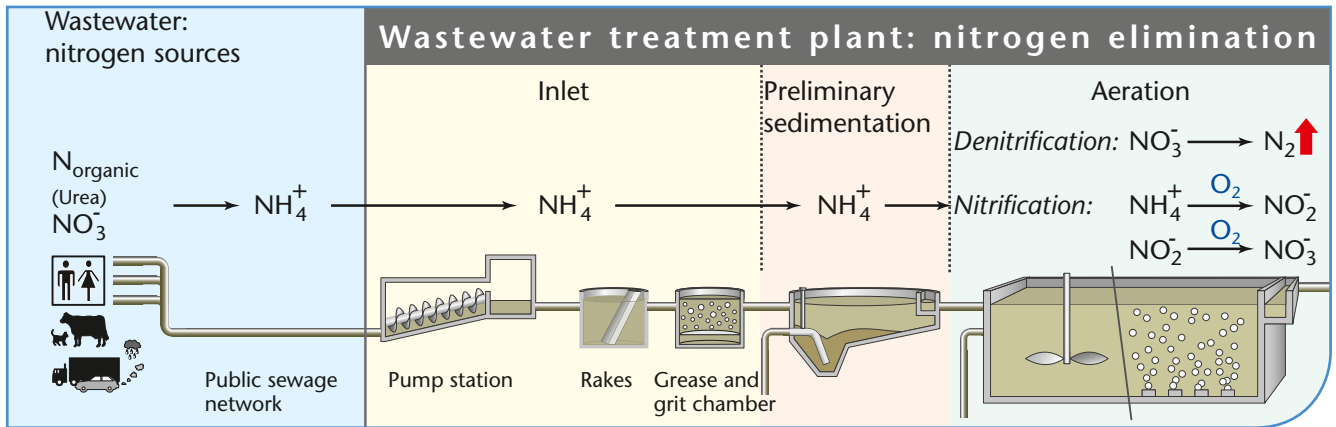
The efficient control of Nitrogen in wastewater systems is possible by making those measurements directly in the wastewater process. This not only ensures purification but above all guarantees economic operation of the entire plant.

Purification processes for the removal of nitrogen from wastewater

Nitrogen is found in a large variety of compounds and forms and is considered to be the ultimate “quick-change artist”. In municipal wastewater it is mainly encountered as a waste product in the form of urea, which is already converted in part to ammonium nitrogen by ammonification.

In the aeration basin, the initial step of nitrification consists in oxidizing the nitrogen present in wastewater via nitrite to nitrate, for which oxygen is required. During subsequent denitrification the nitrate (NO_3^-) is further converted to elemental nitrogen N_2 under the absence of oxygen. This nitrogen in gas form is harmlessly released into the environment.

Due to the various framework conditions and different biologically active groups of microorganisms, both methods are conducted in two fundamentally separate processes. The temporal and spatial sequence can be adapted to local conditions.

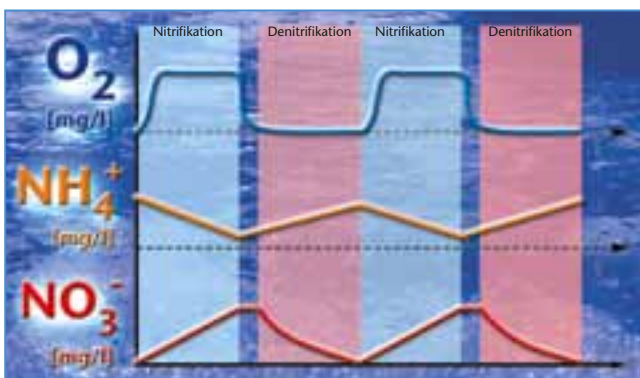


Measuring method for tracing nitrogen elimination

In addition to oxygen, measurements of ammonium and nitrate relevant for the nitrification and denitrification are determined in modern wastewater treatment plants. The immediately available parameters allow the control to be directly optimized. This guarantees efficient wastewater purifications. This results in reduced energy costs. Since nitrite is only present in very low concentrations under normal nitrification (about 0.1 mg/L), it is usually regarded as a minor measurement parameter in wastewater treatment plants. However, the nitrite-oxidizing organisms are inhibited by unfavorable conditions or toxic substances, which can cause elevated nitrite concentrations in the effluent. Since nitrite acts as a powerful fish poison, higher nitrite concentrations may not be discharged into natural waters. The measurement of nitrite as monitoring parameter using an appropriate online measurement technology is therefore also useful in treatment plants.

The following example of intermittent procedure illustrates the advantage of direct measurement of selected parameters.

Nitrification and denitrification are conducted in succession in the same basin. In the nitrification phase ammonium is oxidized using oxygen to form nitrate. The nitrate content increases accordingly. In the denitrification phase nitrate is reduced to form gaseous nitrogen; ammonium is formed from residual organic nitrogen. Ammonium and nitrate curves display opposite behavior.



Example: intermittent nitrification/denitrification

Correlation between the individual procedure measurements of dissolved oxygen, ammonium and nitrate

In order to minimize energy consumption in the aeration basin, a preferably efficient and low O₂ input should be targeted for complete nitrogen oxidation. Furthermore, the optimum efficiency of denitrification stages with anaerobic or anoxic conditions must be ensured. For optimum growth of nitric bacteria, higher concentrations of dissolved oxygen are generally required than for the pure decomposition of organic carbon compounds. The online measurement of the selected parameter of ammonium, which provides the possibility of NH₄-N controlled operation, makes the nitrification process transparent and offers significantly higher potential for energy saving of certainty than in pure O₂ controlled operation. A combined measurement of NH₄-N and O₂ is suitable for plant operation, as this prevents the formation of bulking sludge in the lower range and limits the oxygen input should interferences occur in NH₄-N decomposition (e.g. caused by a disturbed nutrient ratio of carbon : nitrogen : phosphate). This can create significant savings potentials.

Direct measuring procedures for determining ammonium and nitrate

The dynamics of the controllable process and the used measuring system are of great importance for the measuring and control technology. Here applies: the faster the control process and disturbance variables, the shorter recognition times are expected from the measuring system.



See page 43 for various measuring systems and applications.

In-situ ISE sensors






These control engineering demands led to the development of in-situ ISE (ion-selective) measuring techniques, which are capable of directly recording the respective selected parameter ammonium and nitrate during the process both quickly and without sample preparation.

In-situ UV-VIS and UV sensors

In-situ UV-VIS spectrometric sensors represent a precise measuring technique with long-term stability, which permit quasi-continuous recording of the selected parameter NO_3 and NO_2 in the smallest measuring cycles of minutes. The disturbance variables for optical measuring, such as turbidity/suspended solids, are eliminated by spectral recording. Thanks to integrated ultrasonic cleaning, a very long maintenance-free operation is possible.

Analyzers

Depending on measurements and applications, analyzer systems require standard and reagent solutions as well as sample preparation. Measuring intervals and automatic cleaning cycles are adjustable. These instruments automatically and recurrently compare measurements against reference standards and deliver high precision measurement values.

WTW Measuring Systems for Nitrogen									
● recommended by WTW ○ suitable ○ conditionally applicable									
System	Ammonium			Ammonium and Nitrate	Nitrate		*Measurement in aeration basin		
	IQ SENSOR NET AmmoLyt® Plus 700 IQ		TresCon® Module OA 110 for mounting in TresCor® system	IQ SENSOR NET VARION® Plus 700 IQ	IQ SENSOR NET NitraLyt® Plus 700 IQ	TresCon® Module ON 210/OS 210 for mounting in TresCor® system	Nitrate and Nitrite		
							NEW		
Sensor/Module	IQ SENSOR NET AmmoLyt® Plus 700 IQ	TresCon® Module OA 110 for mounting in TresCor® system		IQ SENSOR NET VARION® Plus 700 IQ	IQ SENSOR NET NitraLyt® Plus 700 IQ	TresCon® Module ON 210/OS 210 for mounting in TresCor® system	IQ SENSOR NET NitraVis® 700 IQ (NI)		
Measured Variable	NH ₄	NH ₄		NH ₄ and NO ₃	NO ₃	NO _x	NO ₂ and NO ₃		
Inlet (determination of load)	●	○		●	●	○	●		
Aeration (regulation and control)	●	●		●	●	●	●		
Effluent (monitoring)	○	●		○	○	●	●		
Autom. Cleaning	compressed air	cleaning solution		compressed air	compressed air	cleaning solution	Ultrasonic (compressed air)		
Cleaning Cycles	variable	automatic 6/12/24 h		variable	variable	automatic 6/12/24 h	prior to each measurement		
Measuring	in-situ	after sample preparation*		in-situ	in-situ	after sample preparation*	in-situ		
Sample Preparation	none	PurCon®/PurCon® Insitu*		none	none	PurCon®/PurCon® Insitu*	none		
Measuring Interval	continuous	adjustable		continuous	continuous	adjustable	adjustable		
Response Time	quick	medium		quick	quick	medium	quick		
Measuring Method	ISE (ion-selective)	gas-sensitive		ISE (ion-selective)	ISE (ion-selective)	photometric	UV-VIS and UV spectrometric		
Accuracy	good	high		good	good	high	high		
Cross Sensitivity	yes/potassium, compensation	none		yes, automatic compensation	yes/chloride, compensation	low	autom. compensated (spectrum)		
Calibration	factory calibration	automatic 6/12/24 h		factory calibration	factory calibration	automatic 6/12/24 h	not necessary		
Investment Costs	low	medium		low	low	medium	medium		
Additional Costs	—	sample preparation/pump may be required		—	—	sample preparation/pump may be required	—		
Operational Costs	low	medium		low	low	low	none		
Consumables	electrodes	calibration standard/reagent cleaning solution/E pack		electrodes	electrodes	calibration standard cleaning solution/E pack	none		

Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/Suspended Solids

Nitrogen

Carbon: COD/TOC/DOC/BOD/SAC

Phosphate

Sludge level

Improve your plant process values – invest and save

WTW ISE sensors

- As easy as measuring pH
- The original – reliable results through established technology
- No chemicals used

Measurement methods of ISE sensors

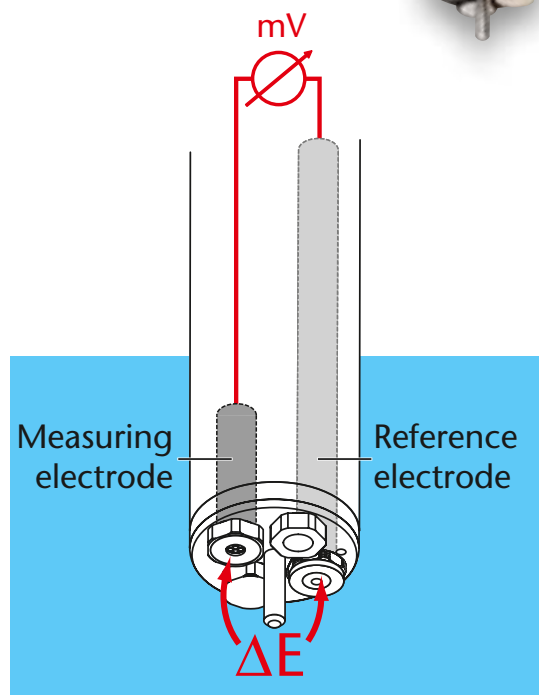
Ion-selective (ISE) on-line measurements of ammonium and nitrate have been applied for several years in the analytics of modern sewage systems.

WTW has provided ISE measurements of ammonium and nitrate in addition to the traditional wet chemical measurement using analyzers for more than the past 10 years.

Same as the pH measuring, the ISE measuring is based on the selectivity of membranes towards special material and is accordingly easy with the handling.

A tension ΔE is caused due to the selectivity between the work and reference electrode. This tension can be read as measuring value by using a transformer.

WTW ISE electrodes are characterized by highest stability. When used in typical applications they are calibration-free for their entire lifetime. The continuous measurement of ammonium and nitrate that works without sample preparations using ISE electrodes enables an optimization of the plant in respect to the cleaning performance and energy consumption.



$$\Delta E = E_{(ISE)} - E_{(Ref)}$$



NEW

ISE and Spectral Sensors

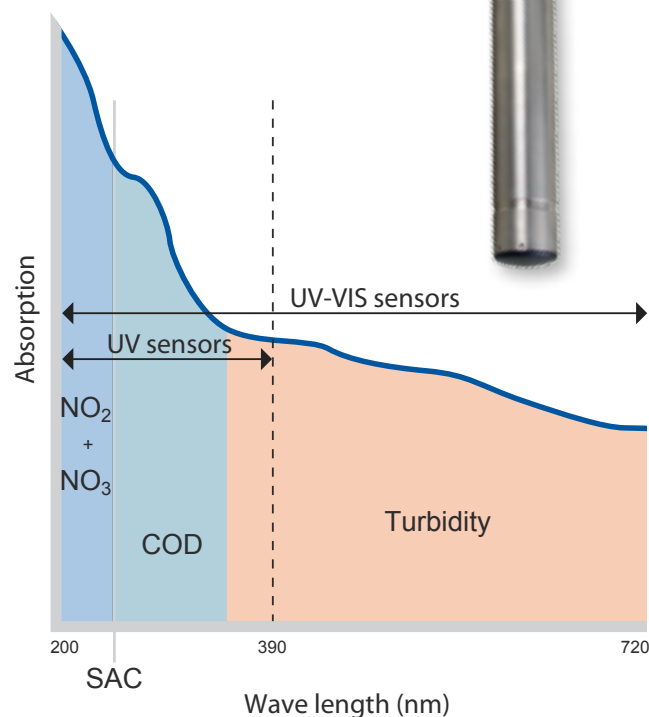
WTW Spectral sensors

- In-situ sensors
- Precise optical measurement
- No chemicals or consumables

Measuring principle of the spectral on-line sensors for nitrate, nitrite and COD

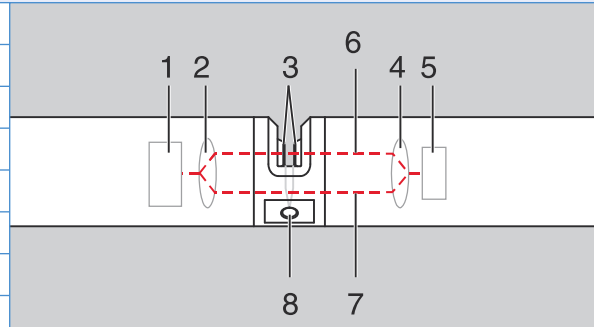
The spectral measurement of nitrate and nitrite by WTW is based on the principle of an absorption measurement; nitrate and nitrite ions absorb light in the UV range. The absorption measurement of 256 wavelengths over a wide wavelength range is the so-called absorption spectrum. From the high information content of the measured spectrum, the measured values are calculated using evaluation models. The evaluation models are based on methods and characteristics, which were obtained from a variety of measurements and long-term analyses. By using the entire information content of the spectrum, it is possible to determine the parameters, several parameters at a time and simultaneously eliminate cross-sensitivities of individual parameters and interference effects such as turbidity.

- By using UV-VIS sensors (wavelength range of 200 - 720 nm), nitrate and carbon parameters (COD, BOD, TOC, SAC) and TSS can be measured.
- In order to distinguish nitrate and nitrite, UV sensors (wavelength range of 200-390 nm) are required. These sensors can also determine carbon parameters (COD, BOD, TOC, SAC).



Measuring principle UV-V I S

- | | |
|---|---|
| 1 | Light source |
| 2 | Sender of the optical system |
| 3 | Measuring gap between the measurement windows |
| 4 | Receiver of the optical system |
| 5 | Detector |
| 6 | Measuring beam |
| 7 | Reference beam |
| 8 | Connector for the optional compressed air cleaning system |



Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/
Suspended Solids

Nitrogen

Carbon: COD/TOC/
DOC/BOD/SAC

Phosphate

Sludge level

VARiON®Plus 700 IQ



- In-situ combination sensor for ammonium and nitrate
- 2 compensated parameters simultaneous
- Economic, cost-effective
- Calibration-free, long stability

Ammonium and Nitrate ion-selective with automatic compensation of interferences

Ion-selective measurements directly in process – reliable 24 hours a day

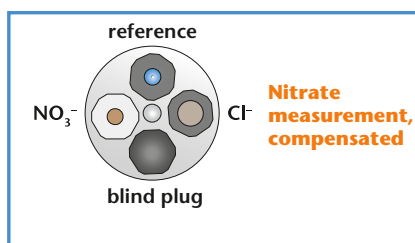
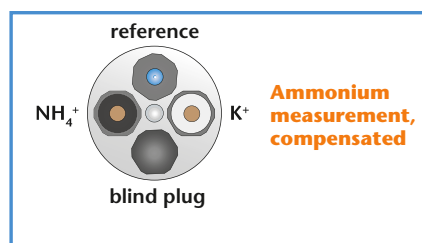
The highly variable ionic sensor VARiON®Plus allows:

- The continuous measurement of ammonium – with online compensation of potassium ion interference by using potassium ISE.
- The new electrode VARiON®Plus NO₃ enables the measuring of nitrate without chloride compensation electrode.
- You can measure ammonium and nitrate using one sensor with perfect gradient display.

For measurement, simply insert the suitable electrode into the sensor, everything else is working automatically. The display shows the already compensated values. The potassium measuring value can be displayed optionally. These values are available via the 0/4–20 mA analog outputs or via the digital output PROFIBUS or Modbus.



Possible configurations



IQ-LabLink

With the initial installation of VARiON®Plus the dependency of the used electrode reference values for ammonium, nitrate, chloride and potassium is determined by a photometric system and can be adapted with VARiON®Plus.

The measurement data is required for ensuring a precise matrix adjustment.

For enhancing the data transfer between the laboratory spectrophotometers photoLab® 6100/6600 and



VARiON®Plus, a USB memory stick in combination with the IQ-LabLink function can be used for the MIQ/TC 2020 XT to automatically read the data and store it on the VARiON®Plus.

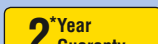
- Safe, simple and fast data transfer
- Automatic verification check of data

Technical Data VARiON®Plus

Maximum Configuration	Common reference electrode, two measuring electrodes, one compensation electrode	
	Ammonium Measurement	Nitrate Measurement
Integrable Electrodes:		
Reference Electrode	VARiON®Plus Ref	
Measuring Electrode	VARiON®Plus NH ₄	VARiON®Plus NO ₃
Compensation Electrode	VARiON®Plus K	VARiON®Plus Cl
Measuring Ranges / Resolution	NH ₄ -N: 1 ... 1,000 mg/l / 1 mg/l; 0.1 ... 100 mg/l / 0.1 mg/l NH ₄ ⁺ : 1 ... 1,290 mg/l / 1 mg/l; 0.1 ... 129.0 mg/l / 0.1 mg/l K ⁺ : 1 ... 1,000 mg/l / 1 mg/l	NO ₃ -N: 1 ... 1,000 mg/l / 1 mg/l; 0.1 ... 100 mg/l / 0.1 mg/l NO ₃ ⁻ : 5 ... 4,500 mg/l / 1 mg/l; 0.5 ... 450.0 mg/l / 0.1 mg/l Cl ⁻ : 1 ... 1,000 mg/l / 1 mg/l
Compensation Ranges		
Temperature Measurement and Compensation	Integrated NTC thermistor, Range 32 °F ... 104 °F (0 °C ... +40 °C), Accuracy ±0.5 K, Resolution 0.1 K, t ₉₅ <20 s	
Calibration Procedures	2-point-calibration with multiple standard solutions, calibration against any reference value	
Ambient Conditions	Operating temperature: 32 °F ... 104 °F (0 °C ... +40 °C), storing temperature: 32 °F ... 104 °F (0 °C ... +40 °C)	
pH Range	pH 4 ... pH 8.5	pH 4 ... pH 11
Measuring Accuracy in laboratory standard solutions	±5 % of measured value ±0.2 mg/l in standard solutions	
Working Life (typically)	All electrodes: 18 months (in typical application - sewage plants)	
Mechanical	Sensor body: V4A stainless steel 1.4571 Protective cup: POM Temperature sensor: V4A stainless steel 1.4571 Protection rating: IP 68 (0.2 bar, with installed electrodes) Electrode connector: POM	
Max. Pressure	Maximum 0.2 bar (incl. SACIQ sensor connection cable, with installed electrodes)	
Power Consumption	0.2 watts	
Dimensions	14.45 x 1.57 in. (367 x 40 mm, length x diameter), incl. SACIQ sensor connection cable	
Weight	Approx. 1.76 lb (800 g, without electrodes, without SACIQ sensor connection cable)	
Guaranty	VARiON®Plus 700 IQ: 2 years for defects of quality	

Ordering Information

VARiON®Plus SETs	Consisting of probe, reference electrode, measurement and compensation electrodes	Order No.
VARiON®Plus A comp SET	Ammonium measurement, compensated	107 060
VARiON®Plus N comp SET	Nitrate measurement, compensated	107 062
VARiON®Plus AN/A comp SET	Ammonium measurement, compensated, plus nitrate measurement	107 066
VARiON®Plus AN/N comp SET	Nitrate measurement, compensated, plus ammonium measurement	107 068
Standard Solutions	for VARiON®Plus, AmmoLyt®Plus, NitaLyt®Plus	Order No.
VARiON®Plus/ES-1	Combined standard 1 (low concentration), 1000 ml	107 050
VARiON®Plus/ES-2	Combined standard 2 (high concentration), 1000 ml	107 052
Accessories	For automatic cleaning. Recommended for permanent operation.	Order No.
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air controlled directly via the IQ SENSOR NET bus	480 018
DIQ/CHV	Valve module for automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007
CH	Cleaning head	900 107



* on armature

AmmoLyt® Plus



- In-situ ammonium sensor with potassium compensation
- Economic, cost-effective
- Calibration-free, long term stable
- Short response time

Ammonium Measurement directly in the Medium – without Sample Preparation

The continuous measuring of O_2 and NH_4 can result in significant savings through:

- energy-optimized operation due to demand-oriented regulation of aerator aggregates,
- adherence to critical values or reduction of wastewater charges.
- The potassium measuring value can be displayed optionally.

The low investment costs for the system can thus be amortized after a short period.



IQ-LabLink

With the initial installation of AmmoLyt®Plus the dependency of the used electrode reference values for ammonium or potassium is determined by a photometric system and can be adapted with AmmoLyt®Plus.

The measurement data is required for ensuring a precise matrix adjustment.

For enhancing the data transfer between the laboratory spectrophotometers photoLab® 6100/6600 and AmmoLyt®Plus, a USB memory stick in combination with the IQ-LabLink function can be used for the MIQ/TC 2020 XT to automatically read the data and store it on AmmoLyt®Plus.

- Safe, simple and fast data transfer
- Automatic verification check of data



Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/
Suspended Solids

Nitrogen

Carbon: COD/TOC/
DOC/BOD/SAC

Phosphate

Sludge level

Technical Data AmmoLyt®Plus

Appropriate Electrode	Reference electrode VARiON®Plus Ref, Measuring electrode VARiON®Plus NO ₃ , Compensation electrode VARiON®Plus CI	
Measuring Ranges/Resolution	NH ₄ -N: 1 ... 1000 mg/l / 1 mg/l; 0.1 ... 100 mg/l / 0.1 mg/l NH ₄ ⁺ : 1 ... 1290 mg/l / 1 mg/l; 0.1 ... 129.0 mg/l / 0.1 mg/l	
Compensation Range:	K ⁺ : 1 ... 1000 mg/l / 1 mg/l	
Temp. Measurement and Compensation	Integrated NTC thermistor Range: 32 ... 104 °F (0 ... +40 °C), Accuracy ±0.5 K, resolution 0.1 K, t ₉₅ <20 s	
Calibration Procedures	Matrix adjustment against any reference value, 2-point-calibration possible with multiple standard solution	
Ambient Conditions	Integrated NTC thermistor Range: 32 ... 104 °F (0 ... +40 °C), Accuracy ±0.5 K, resolution 0.1 K	
pH Range	pH 4 ... pH 8.5	
Measuring Accuracy in laboratory standard solutions	±5 % of measured value ±0.2 mg/l in standard solutions	
Working Life (typically)	All electrodes: 18 months (in typical application - sewage plants)	
Mechanical	Sensor body: V4A Stainless Steel 1.4571 Protective cap: POM, Temp. sensor: V4A Stainless Steel 1.4571 Protection rating: IP 68 (0.2 bar, with installed electrodes) Electrode connector: POM	
Max. Pressure	Maximum 0.2 bar (incl. SACIQ sensor connection cable; with installed electrodes)	
Power Consumption	0.2 watts	
Dimensions	15.43 x 1.57 in. (392 x 40 mm, length x diameter), incl. sensor connection cable SACIQ	
Weight	Approx. 1.48 lb (670 g, without electrode, without sensor connection cable)	
Guaranty	AmmoLyt®Plus 700 IQ: 2 years for defects of quality	

Ordering Information

AmmoLyt®Plus-System		Order No.
AmmoLyt®Plus 700 IQ	Robust digital armature for ion-selective electrodes (VARiON®Plus Ref/VARiON®Plus NH ₄ /VARiON®Plus K; not included in the delivery set)	107 080
VARiON®Plus Ref	Reference electrode for VARiON®Plus 700 IQ/AmmoLyt®Plus 700 IQ/NitraLyt®Plus 700 IQ	107 042
VARiON®Plus NH ₄	Ammonium electrode	107 044
VARiON®Plus K	Electrode for dynamic potassium compensation with ammonium measuring	107 046
CH	Cleaning head	900 107
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air controlled directly via the IQ SENSOR NET bus	480 018
DIQ/CHV	Valve module for automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007

IP 68



cETLUS

2*Year
Guaranty

* on armature

Standard Solutions see brochure "Product Details"



TresCon® OA 110

- Continuous measurements
- Automatic calibration
- Short response time

Online ammonium measurement

- Continuous ammonium value monitoring in sewage plant effluent
- Analysis of the ammonium-nitrogen pollution in surface waters
- Monitoring water treatment plants



Measuring Principle

The continuous determination of ammonium in the OA 110 module is carried out according to the potentiometric measuring principle with a gas-sensitive NH_3 electrode. Sodium hydroxide is added to the thermostatted sample to convert the ammonium dissolved in the medium into undissociated ammonia gas. The gaseous ammonia alters the pH registered by the measuring electrode; the alteration is a direct measure of the ammonium concentration in the sample.

Technical Data OA 110

	Standard 1	Standard 2*
Measuring Ranges	$\text{NH}_4\text{-N}$: 0.1 ... 1000 mg/l; 0.01 ... 71.00 mmol/l $\text{NH}_4\text{+}$: 0.1 ... 1280 mg/l; 0.01 ... 71.00 mmol/l	$\text{NH}_4\text{-N}$: 0.05 ... 10 mg/l; 0.005 ... 0.71 mmol/l* $\text{NH}_4\text{+}$: 0.05 ... 12.8 mg/l; 0.005 ... 0.71 mmol/l*
Resolution (Display)	Range: 0.10 ... 10 mg/l: 0.01 mg/l 10.0 ... 100 mg/l: 0.1 mg/l 100 ... 1000/1280 mg/l: 1 mg/l	Range: 0.05 ... 10 mg/l: 0.01 mg/l*
Accuracy	$\pm 5\%$ of the measured value ± 0.2 mg/l at <1 mg/l $\text{NH}_4\text{-N}$ $\pm 5\%$ of the measured value ± 0.1 mg/l at 1.0 ... 100 mg/l $\text{NH}_4\text{-N}$	$\pm 5\%$ of the measured value ± 0.05 mg/l at <1 mg/l $\text{NH}_4\text{-N}$ * $\pm 5\%$ of the measured value ± 0.1 mg/l at 1.0 ... 10 mg/l $\text{NH}_4\text{-N}$ *
Coefficient of Variation of Method	Range: 0.10 ... 10 mg/l: 3 % 10.0 ... 100 mg/l: 4 % 100 ... 1000/1280 mg/l: 5 % (values for calibration with suitable standard solutions)	
Response time	<3 min (after alternation in concentration at module input)	
Measuring Interval	Continuous Mode and 10, 15, 20, 25, 30 min interval selectable, AutoAdapt, Interval-Program	
Calibration	Automatic 2-point calibration (AutoCal) with two standard solutions	
Sample input	Approx. 0.3 l/h, solids content <50 mg/l	
Consumption	Reagent, 10 l: 14/30/50 days at measuring intervals cont./20/30 min Standard solutions A/B, 1.5 l: 60 days with 24 Std. calibration interval Cleaning solution 1.5 l: 60 days with 24 Std. cleaning interval	
Maintenance Interval	Every 6 months	
Guaranty	2 years for defects of quality	

Ordering Information

		Order No.
OA 110	Separate TresCon® analyzer module for ammonium-nitrogen for extension of an existing TresCon® system (requires 1 measuring place)	820 008
TresCon® A 111	TresCon®-basic instrument with analysis module OA 110 for ammonium-nitrogen (wall mounting, space for 2 further modules)	8A-10030
TCU/A111	TresCon® Uno ammonium: single parameter system ammonium with analysis module OA 110 for ammonium-nitrogen	820 101



Accessories and consumables see brochure "Product Details"

* around calibration standard

NitraLyt® Plus

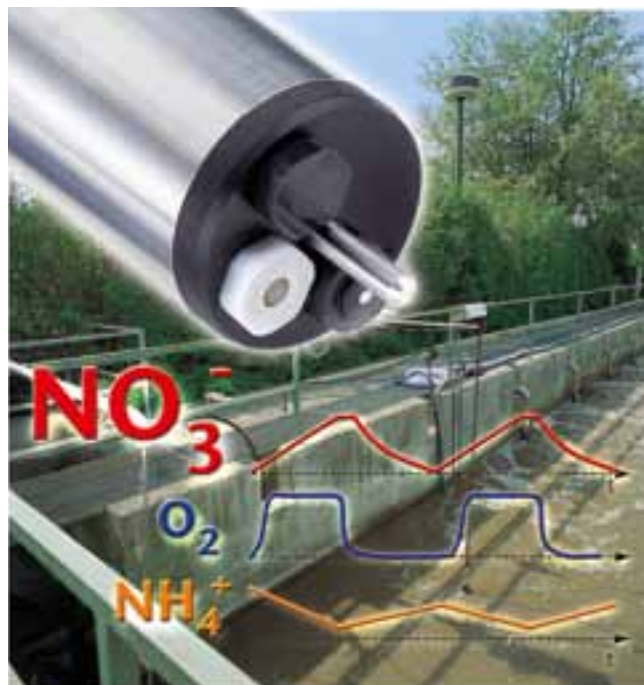


- In-situ nitrate sensor with optional chloride compensation
- Economic, cost-effective
- Calibration-free, long term stable
- Short response time

Nitrogen Elimination Process – monitored, optimized, cost effective

The optimization of nitrification/denitrification during wastewater treatment is simplified even further by the new NitraLyt® Plus system:

- Nitrate is also directly measurable during the process in addition to oxygen and ammonium.
- Measured values are promptly available and can be used directly to control the process.
- Low investment and maintenance costs (automatic compressed air cleaning system).



Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/
Suspended Solids

Nitrogen

Carbon: COD/TOC/
DOC/BOD/SAC

Phosphate

Sludge level

IQ-LabLink

With the initial installation of NitraLyt®Plus the dependency of the used electrode reference values for nitrate and chloride is determined by a photometric system and can be adapted with NitraLyt®Plus.

The measurement data is required for ensuring a precise matrix adjustment.

For enhancing the data transfer between the laboratory spectrophotometers photoLab® 6100/6600 and NitraLyt®Plus, a USB memory stick in combination with the IQ-LabLink function can be used for the MIQ/TC 2020 XT to automatically read the data and store it on NitraLyt®Plus.

- Safe, simple and fast data transfer
- Automatic verification check of data



Technical Data NitraLyt®Plus		
Appropriate Electrodes	Reference electrode VARiON®Plus Ref, Measuring electrode VARiON®Plus NO ₃ , Compensation electrode VARiON®Plus Cl	
Measuring Ranges/ Resolution	NO ₃ -N: 1 ... 1000 mg/l / 1 mg/l; 0.1 ... 100.0 mg/l / 0.1 mg/l	
	NO ₃ -I: 5 ... 4500 mg/l / 5 mg/l; 0.5 ... 450.0 mg/l / 0.5 mg/l	
	Cl ⁻ : 1 ... 1000 mg/l / 1 mg/l	
Temp. Measurement and Compensation	Integrated NTC thermistor Range: 32 ... 104 °F (0 °C ... +40 °C), Accuracy ±0.5 K, resolution 0.1 K, t ₉₅ <20 s	
Calibration Procedures	Matrix adjustment against any reference value, 2-point-calibration possible with multiple standard solution	
Ambient Conditions	Operating temperature: 32 °F ... 104 °F (0 °C ... +40 °C), storing temperature: 32 °F ... 104 °F (0 °C ... +40 °C)	
pH Range	pH 4 ... pH 11	
Measuring Accuracy in laboratory standard solutions	±5 % of measured value ±0.2 mg/l in standard solutions	
Working Life (typically)	All electrodes: 18 months (in typical application - sewage plants)	
Mechanical	Sensor body: V4A Stainless Steel 1.4571 Protective cap: POM, Temp. sensor: V4A Stainless Steel 1.4571 Protection rating: IP 68 (0.2 bar, with installed electrodes) Electrode connector: POM	
Max. Pressure	Maximum 0.2 bar (incl. SACIQ sensor connection cable; with installed electrodes)	
Power Consumption	0.2 watts	
Dimensions	15.43 x 1.57 in. (392 x 40 mm, length x diameter), incl. sensor connection cable SACIQ	
Weight	Approx. 1.48 lb (670 g, without electrode, without sensor connection cable)	
Guaranty	NitraLyt®Plus 700 IQ: 2 years for defects of quality	
Ordering Information		
NitraLyt®Plus-System		Order No.
NitraLyt®Plus 700 IQ	Robust digital armature for ionselective electrodes (VARiON®Plus Ref/VARiON®Plus NO ₃ /VARiON®Plus Cl; not included in the delivery set)	107 080
VARiON®Plus Ref	Reference electrode for VARiON®Plus 700 IQ/AmmoLyt®Plus 700 IQ/NitraLyt®Plus 700 IQ	107 042
VARiON®Plus NO ₃	Nitrate electrode for measuring nitrate with dynamic Cl compensation	107 045
VARiON®Plus Cl	Electrode for dynamic Cl compensation of the nitrate measurement	107 047
CH	Cleaning head	900 107
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air controlled directly via the IQ SENSOR NET bus	480 018
DIQ/CHV	Valve module for automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007
<div><div><div>IP 68</div><div>CE</div><div>CETLUS</div><div><div>2*Year</div><div>Guaranty</div><div><small>* on armatures</small></div></div></div><div>Standard solutions see brochure "Product Details"</div></div>		

NEW

Nitrate/Nitrite Measurement

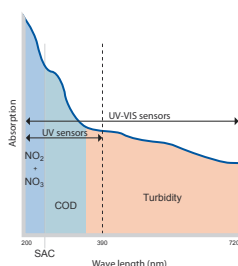
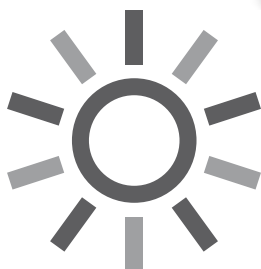
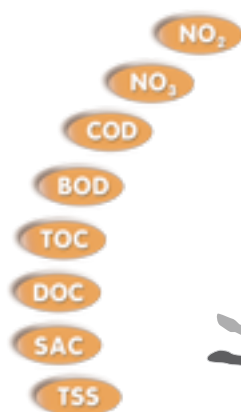
NitraVis®/NiCaVis®



- High measurement reliability
- Low operating costs
- Simple handling
- Maximum durability

Optical in-situ measurement of nitrate, nitrite, carbon parameters and suspended solids (optional)

The chemical-free spectral measurement allows a precise determination of the measurement parameters for nitrate, nitrite, carbon parameters (COD, BOD, TOC, SAC) and TSS.



Two spectral types of sensors for different measurement parameters:

- | | |
|---|---|
| <ul style="list-style-type: none"> • UV-VIS sensors (Wavelength range 200-720 nm): • Nitrate • Carbon parameters • TSS | <ul style="list-style-type: none"> • UV sensors (Wavelength range 200-390 nm): • Nitrate • Nitrite • Carbon parameters |
|---|---|



High measuring reliability

- Wide dynamic range and high measurement accuracy. Automatic adjustment of the number of flashes to the current sample matrix, similar to an exposure measurement in cameras, ensure optimized recording level of the detector.
- Excellent measurement repeatability and zero point and long-term stability. 100% symmetrical optics, measurement and reference channel are identical in design, which enables optimal referencing.
- Evaluating the entire measured spectrum from 200 to provide recognition of interferences; calculate these automatically or apply these for compensation.

Simple to use

- Due to the built-in ultrasonic cleaning system, a very long maintenance-free operation is possible. Accumulation of dirt and biofilm formation is gently but very effectively prevented.

Maximum durability

- High-tech materials such as titanium and peek ensure an easy use in almost all media, even corrosive media.

Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/
Suspended Solids

Nitrogen

Carbon: COD/TOC/
DOC/BOD/SAC

Phosphate

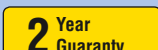
Sludge level

Technical Data NitraVis®/NiCaVis®

Measuring Principle	Spectral Measurement in the UV-VIS Range (200 - 720 nm) / UV range of 200 - 390 nm						
Applications	Municipal wastewater: inlet, aeration, outlet						
Measuring Range Nitrate Standard	NO ₃ -N:	NitraVis® 701 IQ 0.1 ... 100.0 mg/l inlet, aeration	NitraVis® 705 IQ 0.01 ... 25.00 mg/l outlet	NO ₃ -N: — NO ₂ -N: COD 0.1 ... 800.00 mg/l Municipal wastewater: outlet	NiCaVis® 705 IQ 0.01 ... 25.00 mg/l —	NiCaVis® 701 IQ NI 0.1 ... 100 mg/l 0.1 ... 25 mg/l 0.5 ... 4000.0 mg/l inlet, aeration, outlet	NiCaVis® 705 IQ NI 0.01 ... 25 mg/l 0.01 ... 5 mg/l 0.1 ... 800 mg/l outlet
Measuring Range Suspended Solids (Option)	TSS:	0 ... 10.00 g/l inlet, aeration	0 ... 900.0 mg/l outlet	TSS:	—	—	—
Materials	Housing: Titan 3.7035, PEEK Window: Sapphire glass						
Pressure Resistance	≤1 bar						
Ambient Conditions	Operating Temperature: 32 °F ... 113 °F (0 °C ... +45 °C) Storage temperature: 14 °F ... 122 °F (-10 °C ... +50 °C)						
Flow velocity	≤3 m/s						
pH range	pH 4 ... pH 12						
Dimensions	31.57 x 2.36 in. (802 x 59.9 mm; length x diameter)						
Weight	Approx. 8.82 lb (4 kg)						
Guaranty	2 years for defects of quality						

Ordering Information

UV-VIS sensors NitraVis®	Supplied with multifunctional slide and Shock-Absorption-Rings, without connection cable (SACIQ order separately)	Order No.
NitraVis® 701 IQ	Optical nitrate sensor, with spectral processing of the UV-VIS range, for in-situ measurement in inlet / BNR part of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 044
NitraVis® 701 IQ TS Double sensor	Optical nitrate/TSS sensor, with spectral processing of the UV-VIS range, for in-situ measurement in inlet / BNR part of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 045
NitraVis® 705 IQ	Optical nitrate, with spectral processing of the UV-VIS range, for in-situ measurement in the effluent of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 046
NitraVis® 705 IQ TS Double sensor	Optical nitrate/TSS, with spectral processing of the UV-VIS range, for in-situ measurement in the effluent of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 047
UV-VIS sensors NiCaVis®	Supplied with multifunctional slide and Shock-Absorption-Rings, without connection cable (SACIQ order separately)	Order No.
NiCaVis® 705 IQ Double sensor	Optical nitrate and COD/TOC/DOC/BOD/SAC probe, with spectral processing of the UV/VIS range, for in-situ measurement in effluent of municipal wastewater treatment plants, with integrated ultrasonic cleaning.	481 052
UV sensors NiCaVis®	Delivery set: sensor, shock-absorption-rings, calibration feed, manual	Order No.
NiCaVis 701 IQ NI	UV sensor for the measurement of nitrate, nitrite, CODtotal, CODsoluble, TOC, BOD, DOC, SACTotal, SACsoluble and UVT254 in inlet, BNR part and effluent of municipal wastewater treatment plants.	481 054
NiCaVis 705 IQ NI	UV sensor for the measurement of nitrate, nitrite, CODtotal, CODsoluble, TOC, BOD, DOC, SACTotal, SACsoluble and UVT254 in the effluent of municipal wastewater treatment plants.	481 055
Accessories	for additional compressed air cleaning system (optional)	Order No.
Cleaning Air Box	Cleaning air box with compressor, 230 VAC with air-filter	480 019
MIQ/CHV PLUS	Valve module for automatic cleaning by compressed air; controlled directly via the IQ SENSOR NET Bus	480 018
DIQ/CHV	Valve module for the automatic compressed air cleaning for System 182; accessible by means of an DIQ/S 182 relay	472 007
SET/AP	Compressed air cleaning set: 15 m compressed air tubing incl. fittings, additional modules and components, must be ordered separately	481 075




TresCon® ON 210/OS 210

- Reagent-free measuring method
- 4-beam measuring method for optimal background compensation
- Simultaneous nitrate and SAC determination (OS 210)

Nitrate/SAC measurement

- Regulating nitrate degradation in denitrification
- Continuous monitoring of nitrate effluent values
- Organic pollution SAC (OS 210)



Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/
Suspended Solids

Nitrogen

Carbon: COD/TOC/
DOC/BOD/SAC

Phosphate

Sludge level

Measuring Principle Nitrate

The ability of nitrate ions to absorb UV light of certain wavelengths is used for measuring the nitrate. The ultraviolet light from a pulsed photoflash lamp passes through a flow-thru measuring cuvette where it is partially absorbed by the nitrate ions present in the sample flow. The intensity of the attenuated light is measured at a measuring wavelength and at a reference wavelength and evaluated electronically. The 4-beam measuring method used ensures a high degree of long-term stability and absolute accuracy; interfering background influences are efficiently compensated.

SAC measuring principle

Absorption measurement of aqueous sample in UV range. The SAC (spectral absorption coefficient), measured with a wavelength of 254 nm, represents the organic water pollution.

Technical Data ON 210/OS 210

Measuring Range	NO ₃ -N: 0.1 - 60 mg/l	0 - 4000 mmol/l
	NO ₃ : 0.1 - 250 mg/l	0 - 4000 mmol/l
	SAC: 0.1 - 200m ⁻¹	
Resolution (Display)	Nitrate: Range: 0.1 ... 100 mg/l : 0.1 mg/l 100 ... 250 mg/l : 1 mg/l SAC: 0.1 m ⁻¹ (only OS 210)	
Accuracy	±2 % of the measured value ±0.4 mg/l	
Coefficient of variation for method	2 %	
Response Time	30 s (after alteration in concentration at module input)	
Measuring interval	Continuous mode and 5, 10, 15, 20, 25, 30 min intervals selectable, AutoAdapt, Interval-Program	
Calibration	Automatic zero balance, works calibration	
Sample Flow Rate	0.5 l/hr approx., suspended solids content <50 mg/L	
Consumption	Distilled water, 10 l:	130 days with 24 h interval for zero balance
	Cleaning solution, 1.5 l:	120 days with 24 h cleaning interval
Maintenance Interval	Every 6 months	
Guaranty	2 years for defects of quality	

Ordering Information

Separate TresCon® analyzer module for nitrate (+ SAC) for extension of an existing TresCon® system (requires 1 measuring place)		Order No.
ON 210	Nitrate	820 007
OS 210	Nitrate + SAC	820 010
TresCon® basic instrument with analysis module ON 210 (nitrate) or OS 210 (nitrate + SAC) (wall mounting, space for 2 further modules)		Order No.
TresCon® N 211	Nitrate	8A-20030
TresCon® S 211	Nitrate + SAC	8A-70030
TresCon® Uno single parameter system nitrate or nitrate + SAC with analysis module ON 210 or OS 210		Order No.
TCU/N211	TresCon® Uno nitrate	820 102
TCU/S211	TresCon® Uno nitrate + SAC	820 107

IP 54


2 Year
Guaranty

Accessories and consumables see brochure "Product Details"



TresCon® ON 510

- Continuous background compensation
- Reliable and accurate – 2-beam reference photometer
- Can be used in weakly polluted water without sample preparation

On-line nitrite measurement

- Observation of the nitrification process
- Monitoring nitrite effluent values
- Measurement checks in drinking water treatment
- Monitoring nitrite pollution in natural waters
- Monitoring of critical values in fish farming



Measuring Principle

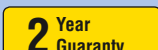
The measuring principle of the NO₂ analyzer module is based on the azo dye method. A reagent reacts with nitrite to color the sample solution pink. The intensity of the pink color is proportional to the nitrite concentration in the sample and is measured by a double-beam reference photometer. An additional manual correction facility allows the system to be adapted to plant-specific characteristics so that a high degree of measuring accuracy can be achieved even with strongly colored samples.

Technical Data ON 510

Measuring Range	NO ₂ -N: 0.005 - 1.200 mg/l 0.40 - 90 µmol/l NO ₂ : 0.020 - 4.000 mg/l 0.40 - 90 µmol/l
Resolution (Display)	Range: 0.005 ... 1.200 mg/l : 0.001 mg/l 0.020 ... 4.000 mg/l : 0.001 mg/l 0.40 ... 90.00 µmol/l : 0.1 µmol/l
Accuracy	±2% of the measured value ±0.05 mg/l NO ₂ -N
Coefficient of variation for method	1 %
Response Time	<5 min to measured value (after alteration in concentration at module input)
Measuring interval	5, 10, 15, and 20 min intervals selectable, AutoAdapt, Interval-Program
Calibration	Automatic 2-point calibration, time and interval selectable
Background Correction	Continuous background compensation based on new WTW algorithm
Sample input	Approx. 0.06 l/h, solid content <50 mg/l
Consumption	Reagent, 1 l: 20/40/80 days with 5/10/20 min measuring interval Standard B, 1 l: 80 days with 24 h calibration interval Cleaning solution, 1.5 l: 45 days with 24 h cleaning interval
Maintenance Interval	Every 6 months
Guaranty	2 years for defects of quality

Ordering Information

Model		Order No.
ON 510	Separate TresCon® analyzer module for nitrite for extension of an existing TresCon® system (requires 1 measuring place)	820 009
TresCon® N 511	TresCon® basic instrument with analysis module ON 510 for nitrite (wall mounting, space for 2 further modules)	8A-30030
TCU/NS11	TresCon® Uno single parameter system nitrite with analysis module ON 510	820 103



Accessories and consumables see brochure "Product Details"