

EN

TON (Total Oxidized Nitrogen) as N and Nitrate by calculation (TON-Nitrite)

① Reagent R1: 984369
② Reagent R2: 984370, 984652 (Aquakem only)
③ Reagent R3: 984371, 984372 (Large)

INTENDED USE

For determination of total oxidized nitrogen, nitrate by calculation, in drinking, ground, surface and waste water on Thermo Scientific™ Aquakem™ or Gallery™ analyzers.

METHOD

Colorimetric Hydrazine method.

PRINCIPLE OF THE PROCEDURE

Nitrate is reduced to nitrite by hydrazine under alkaline conditions. The total nitrite ions are then reacted with sulphanilamide and N-1-naphthylethylenediamine dihydrochloride under acidic conditions to form a pink azo-dye. The absorbance is measured at 540 nm and is related to the TON concentration by means of a calibration curve.

REAGENT INFORMATION

All reagents need to be ordered separately.
For this method, all R1, R2 and R3 are needed.
For Nitrite, R3 only is needed.

Ready-to-use reagents		Barcode id
984369 TON R1	125 ml	A06
984370 TON R2	4 x 20 ml	A07
984652 TON R2 XL	6 x 60 ml	A07
984371 TON R3	4 x 20 ml	A08
984372 TON R3 L	20 x 20 ml	A08

Note: Use a fresh TON R1 aliquot daily.

Pour the daily need to the 20 ml vial included in the reagent delivery and keep the 125 ml vial refrigerated when opened.

Note: 60 ml vials are intended for Aquakem analyzers only.

Concentrations

R1	Sodium hydroxide	0.8 %
R2	Hydrazine	≤ 0.1 %
	Copper sulfate	≤ 0.1 %
	Zink sulfate	≤ 0.1 %
R3	Phosphoric acid	9 %
	Sulfanilamide	≤ 1 %
	NEDD	≤ 0.1 %

Precautions

TON R1 and TON R3 are hazardous.

See separate sheet inside the kit for Hazardous- and Precautions-phrases:

R1: H290, H315, H319, P280, P302 + P352, P305 + P351 + P338.

R3: H290, P234, P390.

Exercise the normal precautions required for handling all laboratory reagents.

The products has to be disposed of as laboratory chemical in accordance with local regulations.

Reagent preparation

The reagents are ready-to-use.

Note: Check that there are no bubbles on the surface of reagent when you insert vials in the analyzer.

Storage and Stability

Reagents in unopened vials are stable at 2...8 °C until the expiry date printed on the label.

Refer to reagent definitions in the factory delivered analyzer for the on-board stability.

Note: TON R3 may turn pink in time if same vial is used for several days. Color may affect to the sensitivity of the method and therefore it is recommended to run qc-samples regularly. Also an additional water wash before dispensing the reagent may be used.

SAMPLES

Sample type

Drinking, ground, surface and waste water.

Sample preparation

Sample material should be homogenous and representative.

TEST PROCEDURE

See a separate Application note for Aquakem or Gallery analyzer. Application note is suggestive and should be tailored to sample matrix and concentration in use.

Materials required but not provided

Deionized water (aseptic and free of heavy metals) and general laboratory equipment.

Standard solutions available:

984722 Nitrite (as NO₂) Std, 1000 mg/l

984723 Nitrite (as N) Std, 1000 mg/l

984724 Nitrate (as NO₃) Std, 1000 mg/l

984725 Nitrate (as N) Std, 1000 mg/l

Calibration

Calibration is linear or polynomial/2nd order depending on the range selected. Both can be used.

For Aquakem Application TON Hydrazine, 100 mg/l as N calibration standard was used.

For Gallery Application TON Low, a 2000 µg/l as N calibration standard was used.

For Gallery Application TON High, a 20 mg/l as N calibration standard was used.

Quality Control

Use quality control samples at least once a day. Run the quality control sample always after each calibration, and before the daily sample load to verify the reagent on board stability and every time a new reagent vial is used. It is also recommended to use two levels of controls. The control intervals and limits must be adapted to the individual laboratory requirements. The results of the quality control sample(s) should fall within the limits pre-set by the laboratory.

CALCULATION OF RESULTS

The results are calculated automatically by the analyzer using a calibration curve.

Lot dependent calibration curve can be found from Certificate of Analysis. Please see section Additional Material for instructions.

Nitrate (as N) value can be obtained by calculating

TON (as N) – Nitrite (as N).

Automatic calculated test for Nitrate can be programmed for Gallery and Aquakem analyzers.

LIMITATIONS OF THE PROCEDURE

Interference

Salty samples precipitate.

PERFORMANCE CHARACTERISTICS

The results obtained in individual laboratories may differ from the performance data given.

MEASURING RANGE

Analyzer	Name of the application and range as Nitrogen (N)	Extended measuring range
Aquakem	TON * – 10 mg/l N	Up to 50 mg/l N
Gallery	TON Low * - 500 µg/l N	Up to 2500 µg/l N
Gallery	TON High * - 5 mg/l N	Up to 25 mg/l N

Quantitation Limit

The quantitation limit is the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy. The quantitation limit can be estimated for example by multiplying 5 to 10 times the SD of a blank sample.

Method Detection Limit (MDL)

The minimum concentration of an analyte that can be identified, measured and reported with 99% confidence that the analyte concentration is greater than zero.

Application	Sample	n	Average (µg/l N)	SD	MDL (µg/l N)
TON Low	blank	7	1.2	0.197	0.6 *
	blank	50	3.4	2.700	11.5 **

MDL was determined using Gallery analyzer.

*MDL = 3.14 x SD (blank sample, n = 7)

**MDL = 3 x SD + average (blank sample, 5 batches, n = 50)

Precision**Gallery analyzer**

	Lake Water (µg/l N)		Pond Water (µg/l N)		Tap Water (µg/l N)	
	N	50	N	50	N	50
	Mean	61	Mean	292	Mean	404
	SD	CV %	SD	CV %	SD	CV %
Within run	1.557	2.6 %	5.531	1.9 %	7.968	2.0 %
Between run	4.581	7.5 %	13.071	4.5 %	4.779	1.2 %
Total	4.838	7.9 %	14.193	4.9 %	9.291	2.3 %

OTHER REMARKS

The results obtained in individual laboratories may differ from the given performance data due to e.g. sample matrix, concentrations or analysis environment. Each laboratory is responsible to verify the method to prove the analysis performance.

WASTE MANAGEMENT

Please refer to local legal requirements. It is recommended to empty the analyzer cuvette waste bin and waste water daily. Emptying should be done immediately after the analysis when using hazardous reagents/solutions.

Note: If using reagents/solutions that react with each other, cuvette waste bin and waste water should be emptied and washed between use of these reagents.

BIBLIOGRAPHY

- 1) ISBN 0117515930
- 2) EPA Method 353.1
- 3) SM 4500-NO3- H
- 4) ISO 15923-1

ADDITIONAL MATERIAL

Certificate of analysis and SDS are available at www.e-labeling.eu/TSF

Applications for Gallery and Aquakem automated analyzers are available upon request from the local sales representative. Information in the Application note can change without prior notice.

MANUFACTURER

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CONTACT INFORMATION

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Changes from previous version

Precautions and Storage and Stability updated.
General updates.