EN

TON as N, Total Oxidized Nitrogen (Vanadium Chloride reduction)

❶ Reagent R1: 984350
❷ Reagent R2: 984351

INTENDED USE
For determination of the Total Oxidized Nitrogen (sum of nitrate and nitrite) and nitrate by calculation in drinking, ground, surface, waste and saline water on Thermo Scientific™ Aquakem™ or Gallery™ analyzers.

METHOD
Colorimetric Vanadium chloride method.

PRINCIPLE OF THE PROCEDURE
Nitrate is reduced to nitrite by vanadium chloride. 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
R1 and R2 reagents need to be ordered separately.
For this method, both R1 and R2 are needed.

Reagents		Barcode id
984350 R1	4 x 10 ml	760
984351 R2	4 x 10 ml	761

Empty reagent vials for working solution, intended for 1-reagent method, are included in each reagent kit.

Reagent composition

R1	VCl_3
	HCl
R2	Sulfanilamide
	NEDD
	HCl

Precautions
Reagents are hazardous.
See separate sheet inside the kit for Hazardous- and Precautions-phrases:
R1: H290, H302, H314, P280, P301 + P312, P303 + P361 + P353, P305 + P351 + P338.
R2: 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
Reagents must be thawed in room temperature. Do not heat.
- Reagents can be used separately (2-reagent method ready to use reagents) or
- reagents can be mixed together before analysis (1-reagent method).

For 1-reagent method, mix working solution into the empty reagent vial included in the kit. Mixing ratio is given in the table below.

Application	Mixing ratio
TON (surface and waste water)	R1:R2 2:1
TON (saline water)	R1:R2 1:1

Note: Check that there are no bubbles on the surface of working solution when you insert the vial in the analyzer.

Storage and Stability
Note: Reagents are shipped at 2-8 °C and they should be put to a freezer (-20 °C) upon arrival!
Reagents in unopened vials are stable at -20 °C until the expiry date printed on the label.
See the Application Note for the reagent on-board stability.

Mixed working solutions are stable for 7 days after mixing. Recap vials immediately after use and store them at 2-8 °C.

SAMPLES

Sample type
Drinking, ground, surface, waste and saline water.

Sample preparation
Sample material should be homogenous and representative.

TEST PROCEDURE
See separate application notes.
Applications are available for both Aquakem or Gallery analyzers.

1-reagent method is intended for all water types. See Preperation table for reagent R1 and R2 mixing ratios.

For saline waters, 1-reagent method with higher incubation temperature (+45 °C), enabeling shorter incubation time, is also available.

With 1-reagent method, stability of the working solution is 7 days.

2-reagent method is intended for all water types and it enables reagent vial lot traceability by inserting the vials using the barcode.

Note: These methods generally requires exceptionally long incubation time.

Materials required but not provided
Deionized water (aseptic and free of heavy metals) and general laboratory equipment.

Standard solutions available:
984722 Nitrite (as NO_2) Std, 1000 mg/l
984723 Nitrite (as N) Std, 1000 mg/l
984724 Nitrate (as NO_3) 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.

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.

LIMITATIONS OF THE PROCEDURE

Interference
No interferences observed.

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

MEASURING RANGE

Analyzer	Range as Nitrogen (N)	Extended measuring range
Gallery/ Aquakem	TON-V High (surface and waste water) * – 5 mg/l N	Up to 50 mg/l N
Gallery/ Aquakem	TON-V SW (saline water) *- 100 µg/l N	Up to 500 µg/l N
Gallery/ Aquakem	TON-V Low (drinking and ground water) *-400 µg/l N	N/A

Quantitation Limit
The quantitation limit is the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy.

Thermo SCIENTIFIC

The quantitation limit can be estimated for example by multiplying 5 to 10 times the SD of a blank sample.

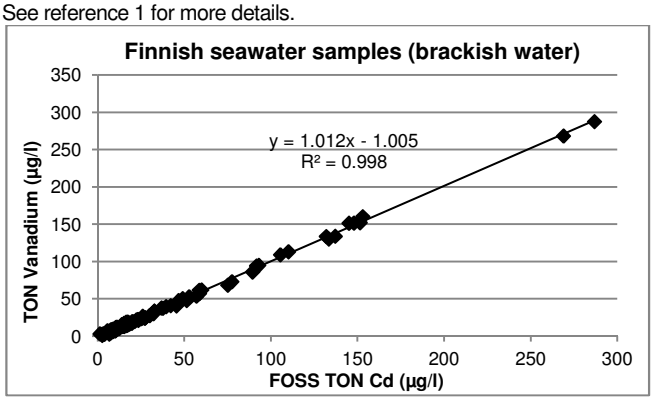
Method Detection Limit (MDL)
The minimum concentration of an analyte that can be identified, measured and reported with 99% confidence that the analyte concentration is greater than zero.

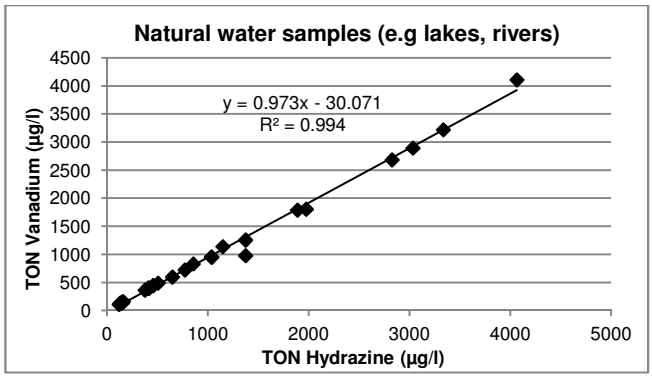
Application	Sample	n	Average (µg/l N)	SD	MDL (µg/l N)
TON-V SW	Saline water	7	2.35	0.215	0.68 *

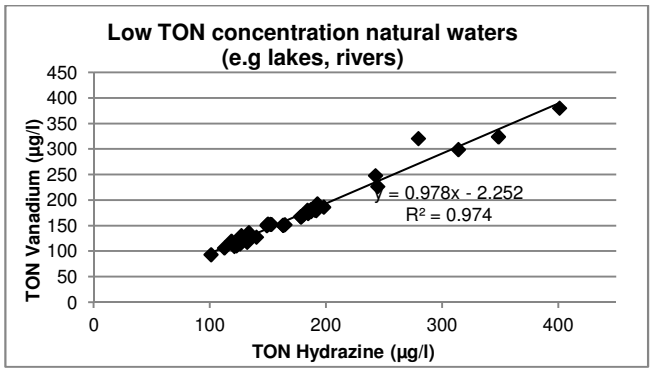
MDL was determined using 1-reagent method with Gallery analyzer.

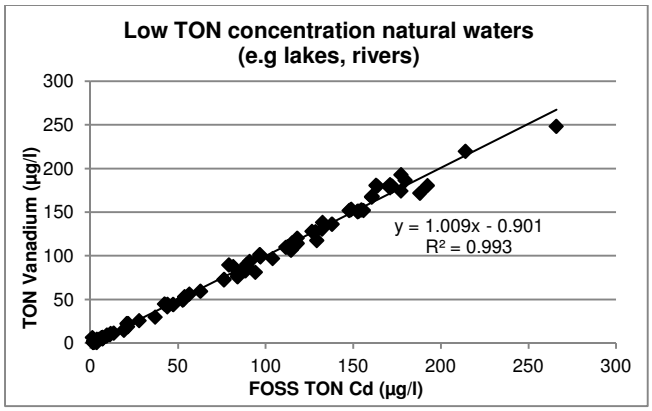
*MDL = 3.14 x SD (low level sample, n = 7)

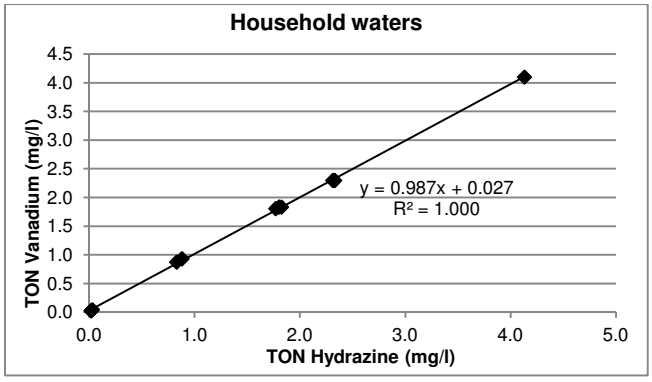
Method Comparison
See reference 1 for more details.











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) Automated Nitrate (TON) Assay Method Using Vanadium as Reductant - Correlation to Cadmium and Hydrazine Reductant Methods in Sea, Natural and Waste Waters, January 2013, http://www.envirotech-online.com/search/articles/

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
Thermo Fisher Scientific Oy
Ratastie 2, P.O. Box 100, FI-01621 Vantaa, Finland
Tel. +358 10 329200

CONTACT INFORMATION
www.thermoscientific.com
e-mail: system.support.fi@thermofisher.com

Date of revision (yyyy-mm-dd)
2015-05-20

Changes from previous version
Precautions updated..
General updates.