



Fast, safe, and easy nutrient analysis

Thermo Scientific Gallery and Gallery Plus discrete analyzers – for complete and simultaneous nutrient analysis of drinking water, wastewater, and soil samples

Nutrient analysis: Protecting public health and the environment

The importance of accurate nutrient analysis

Determining nutrient levels in drinking water, wastewater, and soil samples is critical for protecting aquatic habitats and maintaining clean and safe drinking water supplies. Utility companies and environmental laboratories must regularly measure elemental phosphorus and nitrogen in sewage water, along with a range of other pollution indicators, to

ensure discharge streams are compliant with regulatory standards. Wastewater nutrient analysis can also be used for the assessment of population-level infection, including SARS-CoV-2 surveillance, by providing important biomarker indications for population size.

Environmental issues:

- Algal blooms
- Oxygen depletion
- Toxin build-up

Health problems:

- Blood disorders
- Birth defects
- Thyroid issues

The limitations of traditional wet chemistry methods

Traditional wet chemistry techniques, including titrations, flow injection analysis, and other colorimetric techniques, have been used for many years to undertake nutrient analysis of drinking water, wastewater, and soil samples. However, these approaches are slow, labor-intensive and often unreliable, involving hazardous reagents that add substantial costs for waste disposal.



Time-consuming

Tests are sequential and involve complex manual methods, resulting in lengthy workflows.



Labor-intensive

Wet chemistry methods require highly-skilled technicians to operate equipment, perform analyses, and regularly maintain instruments.



Unreliable

Multiple manual steps can add significant sources of error, reducing overall measurement accuracy.



Wasteful

Workflows require large quantities of reagents and produce high-volume waste streams, increasing the testing cost-per-sample.

Automated, high-throughput nutrient analysis for cost-effective results

Laboratories require accurate, efficient, and easy-to-use techniques for nutrient analysis. The Thermo Scientific™ Gallery™ and Gallery™ Plus discrete analyzers are an integrated, automated platform for nutrient analysis that provide a faster, safer, and more reliable replacement to traditional wet chemistry methods for the measurement of:

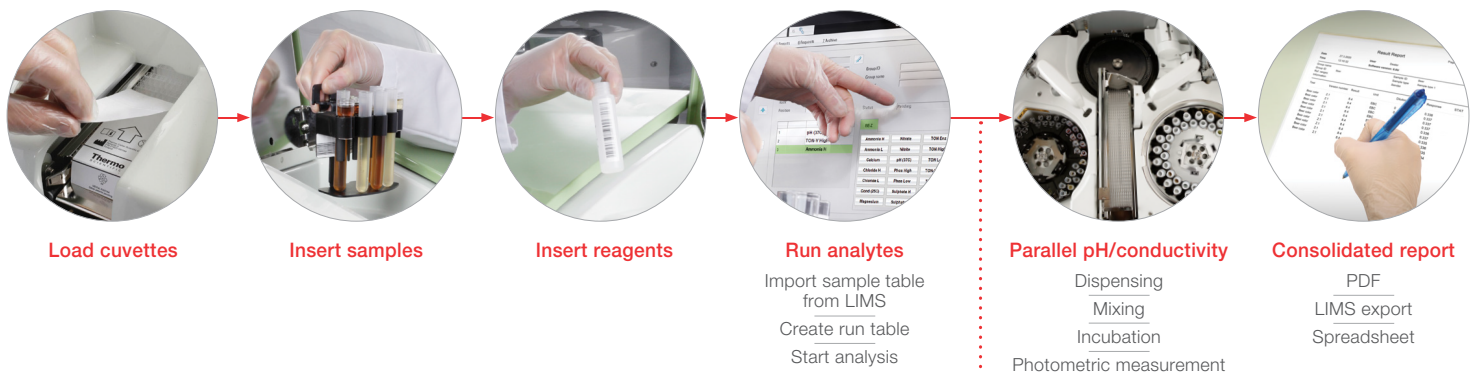
- Orthophosphate
- Total phosphorous (TP)
- Ammonia
- Nitrates
- Nitrites
- Total oxidized nitrogen (TON)
- Total Kjeldahl nitrogen (TKN)

The Gallery and Gallery Plus discrete analyzers allow nutrient determinations to be run in parallel with both photometric and electrochemical measurement techniques, including pH, conductivity, hexavalent chromium, chloride, and sulfate analyses. By enabling high-throughput measurement of over 20 parameters simultaneously, the analyzers streamline workflows to reduce total run times and increase analytical efficiency. The unique low-volume cuvette design and precision liquid-handling capabilities

also accommodate microliter sample and reagent volumes, helping laboratories minimize reagent use and waste to reduce cost-per-analysis.

As fully-automated platforms, the Gallery and Gallery Plus discrete analyzers ensure every test is performed according to precise, predefined workflows. These workflows require no user intervention once the pre-mixed, ready-to-use reagents are loaded into the instrument. Automation not only improves the reliability and sensitivity of results compared with manual wet chemistry techniques, it also boosts laboratory productivity by freeing staff to walk away and work on other tasks. By eliminating the need to handle hazardous reagents, the Gallery systems' automated workflows also better protect the health and safety of laboratory teams. Each test is validated to fulfill the United States Environmental Protection Agency (U.S. EPA) and international regulatory requirements for environmental and drinking water analysis, supporting consistently compliant results.

Gallery discrete analyzer workflow



View video

The Gallery and Gallery Plus discrete analyzers have a simplified workflow with full automation. Samples and reagents are inserted, the analysis protocol is imported, and the technician can walk away while the discrete analyzer runs the tests and generates reports.

Walk away from Gallery Plus discrete analyzer



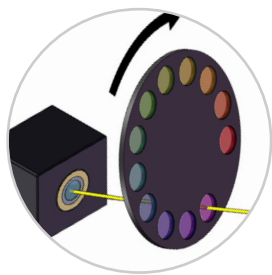
Combining simple operation with advanced technology

Automate labor-intensive and time-consuming multi-parameter wet chemical analysis with a single instrument



Unique disposable Thermo Scientific™ DECACELL™ cuvettes

- 10 independent DECACELL cuvettes are mounted together for discrete analysis
- Reduced sample and reagent volumes (just 2–240 µL) for low waste generation and a reduced cost-per-analysis



Wide range of filters

- 12 different filters available, delivering up to 20 different chemical parameters-per-sample
- Wide wavelength coverage: 340–880 nm



High-throughput analyzer

- Perform simultaneous photometric and electrochemical measurement techniques, including pH and conductivity
- Up to 350 photometric tests per hour
- Up to 67 ECM tests per hour



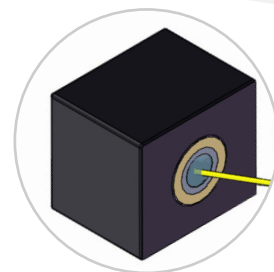
Automatic analysis

- Automated calibration and validation from a single stock standard
- Automatic dilution for over-range samples
- Automatic start-up and shutdown for ease-of-use



Gallery discrete analyzer

The Gallery discrete analyzer includes a combined sample and reagent disk for a maximum capacity of 90 samples and 30 reagents, with the ability to run up to 200 tests per hour.



Xenon source lamp

- Long-life materials
- Energy-efficient design for cost savings
- Sensitive to the parts per billion (ppb) level



Gallery Plus discrete analyzer

The Gallery Plus discrete analyzer can accommodate 108 samples and 42 reagents in separate sample and reagent disks, with the capability to run up to 350 tests per hour.



Ready-to-use reagent kits

- Improves safety by simplifying reagent handling, avoiding exposure to highly corrosive and hazardous chemicals
- More than 40 different chemistries to choose from
- Only μL of consumption per test for low cost and wastage
- Bar-coded reagent vials include lot, expiration data, and vial size data for:
 - Easy and reliable identification
 - Real-time reagent monitoring



Improved traceability

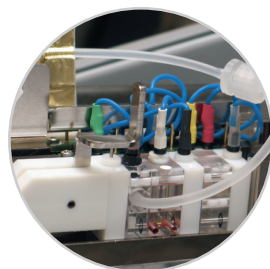
- Bi-directional LIMS connection for easy and secure data transfer
- Easy sample table import and workflow-based operation, for all user levels
- Built-in barcode readers for samples and reagents

Robust analyzer

- Minimal moving parts means less maintenance
- Automated mixing that delivers proven, reproducible results
- Calibration curve stability

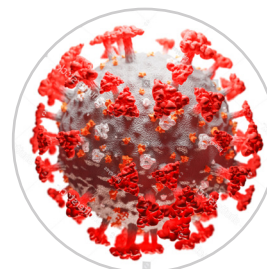
Flexible design

- Existing methods can be modified
- Up to four different reagents can be added to a method
- Easy-to-implement Alternate Test Protocol (ATP) and new methods
- Variable incubation temperature from 25–60 °C



Optional electrochemical measurement (ECM) module

- Integrated parallel pH and conductivity measurements:
 - pH range: 2–12
 - Conductivity range: 20–112 $\mu\text{S}/\text{cm}$



Streamline SARS-CoV-2 wastewater surveillance

- High-throughput testing for chemical and biomarkers
- Saves time by automating colorimetric and enzymatic measurements of multiple analytes simultaneously
- Ready-to-use reagents simplify workflows for enhanced speed, safety, and accuracy
- Follows internationally approved DIN, ISO, and U.S. EPA standard methods for regulatory confidence

Overcoming total oxidizable nitrogen (TON) measurement challenges

Measurement of TON is required for the accurate determination of nitrate concentration in drinking water and wastewater. TON measurement methods based on cadmium reduction coils have been used by laboratories for many years. However, these approaches have several limitations. Cadmium is a carcinogenic heavy metal, and the coil used in TON analyses must be replaced every few measurements to reduce the risk of harmful exposure.

Regeneration of the column also requires the handling of additional hazardous chemicals, producing waste that must be carefully disposed of at significant cost to laboratories. These processes, as well as downstream analyses using flow injection or colorimetric analyzers, involve time-consuming, manual steps that are also a source of measurement inaccuracies.

Limitations of traditional cadmium reduction coil methods



Carcinogenic health risk



Costly waste disposal



Time-consuming, manual methods



Safer enzymatic methods for TON measurement

The Gallery and Gallery Plus discrete analyzers support new National Environmental Laboratories Accreditation Conference (NELAC) and EPA-approved enzymatic reduction methods for safer TON measurements. These methods use nitrate reductase to convert nitrate to nitrite, before Griess reagents are used to produce an intensely colored compound that can be quantified by spectrophotometry.

The Gallery and Gallery Plus systems automate the entire process, delivering high-throughput results without pH adjustment of

preserved samples or time-consuming cadmium packing or regeneration steps. Convenient, ready-to-use reagents eliminate the need to handle hazardous chemicals, improving safety, and removing a source of experimental error. The improved reproducibility afforded by the fully-automated platforms ensures robust measurements even when working with challenging matrices, such as saline, in compliance with 40 CFR Part 141.23, 40 CFR Part 141, and NECi-N07-0003 regulatory standards. This greener enzymatic method also removes costs associated with hazardous waste disposal, further reducing costs-per-analysis.

Advantages of enzymatic TON method



Green chemistry



**No sample preservation
or pH adjustment**



Cost saving



Nutrient analysis and much more

Optional integrated ECM module: For parallel pH and conductivity testing

Electrochemical pH and conductivity measurements provide crucial insight for a wide range of environmental and industrial testing applications. The Gallery and Gallery Plus discrete analyzers support an optional electrochemical measurement (ECM) module that is available as an integrated add-on. The ECM

module simply slots into place to provide simultaneous pH and conductivity testing in parallel to the full range of photometric measurements. The ECM module's two electrodes work in series to enable up to 67 electrochemical tests to be completed per hour, alongside up to 350 photometric tests.



Water

Measure pH to:

- Protect equipment from acid corrosion
- Detect viral activity

Measure conductivity to:

- Quantify total dissolved solids
- Protect against scale build-up
- Ensure environmental discharge standards are met
- Create detailed inorganic profiles for regulatory compliance



Soil

Measure pH to:

- Determine soil reaction (i.e., soil acidity/alkalinity) to optimize crop yields
- Assess microbial activity

Measure conductivity to:

- Determine soil salinity
- Assess nutrient mobility

The high sensitivity and versatility of the ECM module allows testing of a wide variety of samples and matrices. pH and conductivity measurements are automatically verified using National Institute of Standards and Technology (NIST) traceable standards and comply with the latest regional and international regulatory standards.



[View brochure](#)

Using the Gallery or Gallery Plus discrete analyzers with the built-in ECM module to perform parallel, automated electrochemical measurement of pH and conductivity, laboratories can save time, increase throughput, and decrease the cost-per-analysis.



[View smart note](#)

By integrating the ECM module into the standard photometric workflows offered by the Gallery and Gallery Plus discrete analyzers, laboratories can access all the measurements they need for comprehensive drinking water, wastewater, and soil analysis in a single, easy-to-use system. Watch our video demonstration to see how the ECM module streamlines multi-parameter testing workflows to deliver rapid, actionable insight.



[View video](#)

Regulatory compliance with confidence

All Gallery and Gallery Plus system methods for the analysis of nutrients and supporting photometric and electrochemical measurements are compliant with EPA, NELAC, and recognized international standards. Thanks to the discrete analyzers' automated calibration functionality, robust analytical performance,

ready-to-use buffers, and NIST-traceable standards, laboratories can be confident their tests comply with the latest regulatory requirements, and industrial organizations assured that wastewater streams meet permissible nutrient levels.

Gallery discrete analyzer – U.S. EPA and international reference methods

Regulatory methods	Analytes
EPA 310.2 ISBN 0117516015 SMWW 2320 B	Alkalinity*
SM 3500-AI B	Aluminium*
EPA 350.1 ISO 7150 ISO 15923-1 DIN 38406 ISBN 0117516139	Ammonia
ISBN 0117515833	Boron*
EPA 410.4	COD*
EPA 325.2 EN ISO 15682 ISO 15923-1 ISBN 0117516260 SM 4500-CI-E	Chloride
EPA 330.5 SM4500-CI G	Chlorine*
EPA 120.1	Conductivity
SM 3500-Cu C	Copper
ASTM D2036-09(B)	Cyanide
EPA 335.4	Cyanide (Total)
EPA 340.3 SM 3500-F D	Fluoride
EPA 130.1	Hardness (Total)

Regulatory methods	Analytes
ISO 11083 DIN EN ISO 23913:2009 ASTM D1687-12(A) SM 3500 Cr-B SW 7196 A	Hexavalent chromium
ISO 6332-1988 SM 3500 F-B	Iron
SM 3500-Fe B	Iron (Ferrous), Iron (Total)
ASTM D7781-14 (NECi) Nitrate Reductase method for drinking water (USGS I-2547-11 (USGS I-2548-11 (NECi) Method N07-0003	Nitrate (TON ENz)
EPA 353.1 ISO 15923-1 ISBN 0117515930 SM 4500-NO3 H	Nitrate (TON Hyd)
NEMI (Nitrate via manual Vanadium (III) reduction)	Nitrate (TON Vanadium)
EPA 354.1 ISO 13395:1996 ISO 15923-1 DIN EN 26777 ISBN 0117515930 SM 4500 NO2-B	Nitrite
EPA 150.2	pH

Regulatory methods	Analytes
EPA 420.1 ISBN 0117516171	Phenols (Total)
EPA 365.1 EN ISO 6878 ISO 15923-1 ISBN 0117515825 SM 4500 P-E	Phosphate
EPA 365.4 ISBN 0117518883	Phosphorus (Total)
EPA 370.1 ISO 15923-1 SM 4500 SiO2-C USGS I-2700-85	Silica
EPA 375.4 ISO 15923-1 DIN 38405-D 5-2 ASTM D516-11 ISBN 0117533406 SM 4500 SO4-E	Sulfate
EPA 376.2 ISBN 011751718 SM 4500-S2 D HMSO SCA Blue Book	Sulfide*
SMWW 4500-CN-M	Thiocyanate*
EPA 351.2 ASTM D3590-11 (B) ISBN 0117521299 SMWW 4500-N(Org)	Total Kjeldahl Nitrogen (TKN)

* third party reagent

Improving throughput, reducing costs, and keeping staff safe with fully-automated workflows

The Gallery and Gallery Plus discrete analyzers provide an easy-to-use, automated solution for high-throughput nutrient analysis, helping laboratories access time and cost savings by simplifying workflows.

Fast

- Up to 350 photometric tests hour
- Up to 67 ECM tests per hour
- Parallel photometric and ECM testing

Safe

- Ready-to-use reagents – only few uL per tests
- Operators are not exposed to the harsh chemical preparation
- Green enzymatic method for TON

Easy

- Walkaway solution
- Suitable for all user levels
- Automated liquid handling



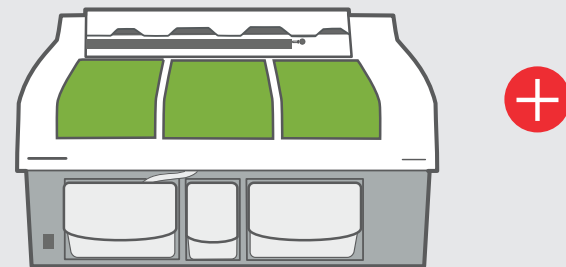
Samples for nutrient analysis



Ready-to-use reagents and standards



Single instrument





Single operator



Fast multiparameter analysis



Productivity



Profitability



 Learn more at [thermofisher.com/discreteanalysis](https://www.thermofisher.com/discreteanalysis)