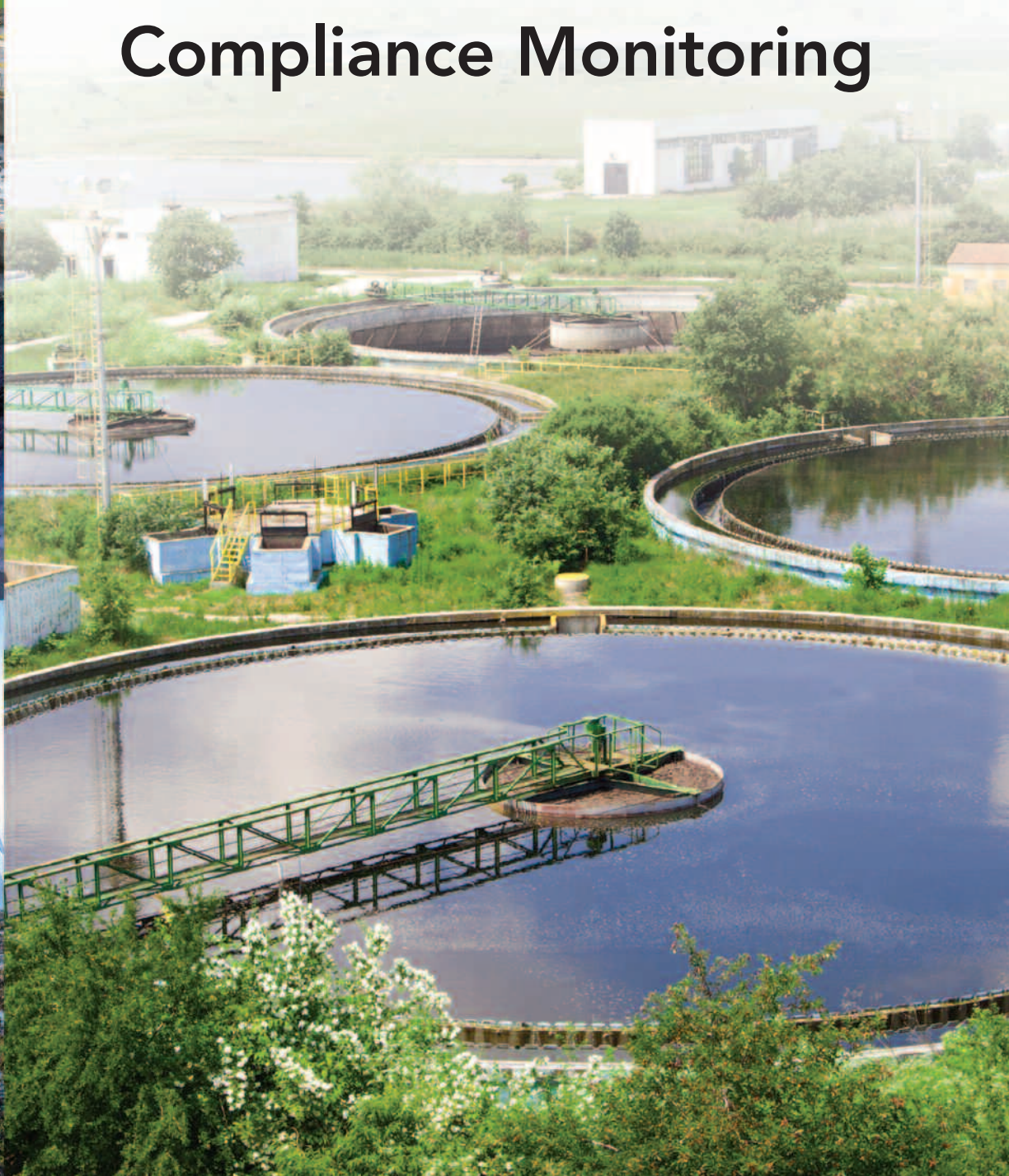




Automated Analysis for Wastewater Compliance Monitoring





Water Testing Equipment from SEAL

All around the world, SEAL Analytical analyzer and sample preparation products prepare and measure all types of water quickly, accurately and automatically. Analysis of water samples for regulatory compliance testing is a very important job that requires various pre-treatment steps and holding times for each sample. Because of this SEAL understands that your lab's need can vary test to test and sample to sample.

We aim to help alleviate the stress from your testing procedures by increasing your laboratory's ability to be both precise and flexible while automating your processes.

▶ **Sample Receiving / Sample Preparation**

One of the most time consuming parts of water testing is the manual handling at sample receiving. SEAL has many robotic options to solve this problem including filtering systems and pH testing and adjustment systems.

▶ **Sample Clean-up**

Dialysis and sample blanking can be used to remove interferences from samples – especially wastewater. Gas diffusion is available for tests that allow it as an alternate to distillation.

▶ **Sample Digestion**

SEAL has many different ways to automate the sample digestion process depending on your lab's needs. We have block digestion systems for TKN that automate the heating processes. The use of our TKN block eliminates the need for distillation of TKN when used with an automated analyzer. Inline sample digestion is also available on our flow systems.

▶ **Sample Testing**

SEAL offers a variety of systems to fit your lab's specific testing needs. From inline sample preparation to automated testing for pH through to high throughput flow analyzers for testing 100's or 1000's of samples per day or discrete analyzers that can test multiple nutrients without intervention – SEAL has a solution for your lab's needs.

▶ **Data Handling and LIMS Communication**

SEAL is known for its easy to use and simplistic yet powerful software. Common steps in the software and data handling process are automated as routines so that daily interaction with the software and your data handling/management system can be minimized.

Fully Automated Water Testing

COMMON TESTS	Segmented Flow Analyzer	Discrete Analyzer	Robotic Systems	Digestion Systems
Phosphorus (TP)	●	●		●
Phosphate	●	●		
Ammonia	●	●	●	
Total Kjeldahl Nitrogen (TKN)	●	●	●	●
Total Nitrogen (TN)	●	●		●
Nitrate+Nitrite	●	●		
Nitrite	●	●		
Alkalinity	●	●	●	
Chloride	●	●		
Silicate	●	●		
Sulfide	●	●		
Sulfate	●	●		
Hardness	●	●	●	
Iron	●	●		
Chlorine	●	●		
Fluoride	●	●	●	
Biochemical Oxygen Demand			●	
Chemical Oxygen Demand	●	●	●	
PHYSICAL TESTS	Segmented Flow Analyzer	Discrete Analyzer	Robotic Systems	Digestion Systems
Temperature			●	
Conductivity / Soluble Salts			●	
pH			●	
Color	●	●	●	
Turbidity			●	
Weight			●	
COMMON PROCESSES	Segmented Flow Analyzer	Discrete Analyzer	Robotic Systems	Digestion Systems
Dilution	●	●	●	●
Filtering	●		●	
Autocalibration	●	●	●	●
Automatic QC insertion	●	●	●	●
Trace Metals digestion				●
Persulfate digestion	●		●	●
Kjeldahl digestion				●
Gas diffusion	●			
Distillation	●			

SAMPLE PREPARATION PRODUCTS

Filtration

SEAL offers stand-alone filtration robots for high capacity applications. Filtration can also be added to any of our MiniLab robotics systems. SEAL segmented flow analyzers can also filter via dialysis – see Segmented Flow section for more information.



Digestion Systems

Digestion of wastewater samples for testing of Phosphorous and Nitrogen are common. Depending on automation and temperature needed SEAL has multiple systems to fit your lab's needs.



DEENA 3

Fully automated digestion of TP including chemical addition



BD50

TKN/TP digestion with automated heating steps



SmartBlock II

Simple economical digestion for TP

pH Testing and Neutralization

SEAL's MiniLab robotic handling system can easily perform your pH measurements. The system will automatically calibrate from your provided set of standards and then test the samples along with quality checks as set-up in the software. As with all MiniLab systems, additional parameters can be added and system size can vary depending on your laboratory's needs.

AUTOMATION INCLUDES

- ▶ pH probe calibration
- ▶ Stirring
- ▶ pH measurement
- ▶ Addition of reagent
(to bring sample to requested pH level)



ANALYSIS BY PROBE

Biochemical Oxygen Demand (BOD)

Often a tedious and repetitive process, Biochemical (also known as Biological) Oxygen Demand (BOD) automation is a necessity in modern environmental labs. SEAL Analytical offers cost-effective, regulation-compliant, custom solutions for labs with various throughputs and automation requirements.

The MiniLab Robotics BOD Series ranges from compact models with 12 bottle capacity to larger custom models handling thousands of bottles per day. The robotic arms can be customized to handle multiple steps in the BOD procedure. With a sturdy frame, encoded motors, and intelligent programming, the MiniLab will maintain alignment and accurately carryout the specified automation solution.

The SEAL BOD software is fully customizable. This ensures your laboratory needs and regional regulations can be met.

Suitable for EPA 405.1, ISO 5815-1, Standard Methods 5210 B, DIN 38 409-H51 etc.



Multi-Parameter

SEAL has many options for automating your wastewater testing lab. The multi-parameter MiniLab robotic system can be configured to prepare and automate a range of analytical parameters – all in one system.

Ideal for water and wastewater applications, systems range from a simple single parameter unit, such as pH, to a multi probe unit designed to measure many parameters. These can include sample preparation features such as sample splitting and filtration. The MiniLab is compatible with many probe types and titration systems.

The MiniLab is true automation – designed to meet your laboratory needs.

AUTOMATION OPTIONS INCLUDE

- ▶ Capping/decapping
- ▶ Sample splitting
- ▶ In line filtration
- ▶ Measurement of pH, conductivity, alkalinity, hardness, turbidity, color, etc.
- ▶ Auto dilution and stirring
- ▶ Heating and weighing
- ▶ Automated titration



Automate your process with single or multiple probes testing simultaneously.

Automating one or more of the following parameters:

Alkalinity

pH

Conductivity

Turbidity

Color

Hardness

COD



SEGMENTED FLOW ANALYZERS

Ideal for laboratories requiring high throughput, high reproducibility and low detection limits, SEAL's segmented flow analyzers (SFA) are state of the art nutrient analyzers. Systems are customizable to fit all workloads and method needs. Perfectly suited for standard chemistries as well as inline sample preparation including dialysis and UV digestion.

Techniques

► Total Automation

SEAL SFA systems are capable of full digital control of heaters, distillation, digestion, air injection and reagents. The AA500 and QuAAtro have total automation including automatic start-up and shut-down for true set and leave operation.

► Multi-Test Chemistry Manifolds

SEAL SFA systems can include multi-test chemistry manifolds. These allow flexibility in your testing so that each channel is not dedicated to one chemistry and what you test on the system can vary from one run to the next.

► Dialysis

Dialyzers can remove interference from sample color and extend the analytical range. The sample is passed over a dialyzer membrane and the analyte of interest is passed into a carrier solution eliminating background color and interference.

► In-Line UV Digestion

SEAL segmented flow analyzers can perform UV assisted persulfate digestion automatically within the chemistry module. This digestion is suitable for TN or TP and a multi-test option is available for TP and TN to be run in series.

► Ion-Exchange

For the measurement of sulfate an in-line ion exchange column removes interfering cations.

Typical System Configurations



High-Capacity Nutrient Analyzer

▶ **QuAAtro39 – 2-channel with multi-test manifolds**

Example Parameters: NH₄, NO₃, PO₄, NO₂ **Sampling Rate:** 90 - 100/h

Typical workload: 200 samples per day. Analyze for NH₄ and PO₄ in the morning, change reagents to analyze NO₂ and NO₃ in the afternoon.

▶ **QuAAtro39 – 4-channel**

Example Parameters: NH₄, NO₃, PO₄, NO₂ **Sampling Rate:** 90 - 100/h

Typical workload: 400 or more samples per day. Analyze all four parameters in parallel.



Flexible Analyzer for Varying Workloads

▶ **AA500 – 2-channel with multi-test manifolds**

Example Parameters: NH₄, NO₃, PO₄, NO₂ **Sampling Rate:** 50 - 70/h

Typical workload: 100 samples per day. Analyze for NH₄ and PO₄ in the morning, change reagents to analyze NO₂ and NO₃ in the afternoon.

▶ **AA500 – 3-channel**

Example Parameters: Total N, NO₃, NH₄, PO₄, K **Sampling Rate:** 40/h for Total N, 50/h for others

Typical workload: 60 samples per day. Analyze for Total N and NO₃ in the morning and the other parameters in the afternoon.



Economical Analyzer for Small Laboratories

▶ **AA100 – 1-channel or 2-channel**

Available Parameters: NO₂, NO₃, NH₄, PO₄, Cl⁻ **Sampling Rate:** 30 - 40/h

Typical workload: 60 samples per day for two parameters.

The QuAAtro39 and AA500 have automatic startup and shutdown features for unattended operation. With multi-test manifolds, the above systems can be expanded to analyze Alkalinity, Silicate, Chloride, TKN or TP at no extra cost with no need to change hardware between tests – just add reagents!

Multi-Test Methods

Specially developed for wastewater analysis, SEAL multi-test methods enable you to measure several different parameters with one analytical cartridge or manifold. When changing from one test to another only the reagents and the filter need to be changed. Multi-test methods are ideal for laboratories with small to medium workloads, or where some tests are required only occasionally, as there is no need to invest in a separate manifold for each chemistry.

PARAMETER	EPA	LOW RANGES	HIGH RANGES
Alkalinity	310.2	0-80 mg/L as CaCO ₃	0-500 mg/L as CaCO ₃
Ammonia	350.1	0-1.5 mg/L as N	0-12 mg/L as N
Chloride	325.2	0-7 mg/L	0-100 mg/L
Nitrate	353.2	0-0.25 mg/L as N	0-2 mg/L as N
Nitrite	353.2	0-0.2 mg/L as N	0-1.8 mg/L as N
Phosphate	365.1	0-1 mg/L as P	0-10 mg/L as P
Silicate		0-5 mg/L as SiO ₂	0-30 mg/L as SiO ₂
Total Nitrogen (acid digests)	351.2	0-0.5 mg/L as N	0-4 mg/L as N
Total Phosphorus (acid digests)	365.4	0-1.5 mg/L as P	0-5 mg/L as P

DISCRETE ANALYZERS

SEAL Discrete nutrient analyzers are fully automated and flexible. True walk away operation with automatic standard preparation, automatic pre and post dilution and automatic spiking capabilities. Ideal for laboratories requiring high levels of automation and a wide range of chemistries.



HIGHLY AUTOMATED WASTEWATER TESTING

► Multiple Methods

Multiple chemistry parameters on a single sample in any order and without operation intervention. SEAL provides method procedures specific to wastewater applications.

► No Cross Contamination

The only discrete analyzer with integrated probe washer. Eliminates cross contamination between reagents and samples.

► Integrated Cadmium Coil

Allows flexibility in nitrate+nitrite testing. Software automatically switches the coil inline. In-situ regeneration.

► Simplified Waste Disposal

Segregated chemical and wash waste minimizes hazardous waste disposal costs. Easy to access and outside of instrument.

► Compact Design

The compact, enclosed, bench-top design allows for easy visual checks during operation and does not require a fume hood.

METHODS

Ammonia

Chloride

Hardness

Hexavalent Chromium

Iron

Nitrate-Nitrite

Nitrite

Total Nitrogen

Phenol

Phosphate

Total Phosphorous

Silicate

Sulfate

TKN

and more!



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