SEAL Analytical

Automation for Soil and Fertilizer Analysis

The high precision and robust design of SEAL analyzers and robotic systems make them a clear choice for soil and fertilizer handling and analysis. Leading soil analysis laboratories worldwide use SEAL systems for various steps in the testing process.

Soils Analysis Equipment from SEAL

Analyzing soil quality is important for maximizing crop yield in agricultural application and for assessment of inferences in natural terrestrial ecosystems. SEAL understands growing plants, and therefore soil testing, is seasonal. Sample thoughput during some seasons can be very high and can create a burden on lab staff when manual processes are in place. SEAL offers reliable automation solutions to help increase productivity and flexibility for all steps in the soil and fertilizer analysis process.

We aim to help alleviate the added stress from the greatly varying sample load and increase your laboratories ability to automate highly manual processes.

Sample Receiving / Sample Preparation

One of the most time consuming parts of processing soil samples is the manual handling at sample receiving. SEAL has many robotic options to solve this problem including weighting robots and filtering systems.

Sample Digestion and Extraction

SEAL has available many different ways to automate the sample digestion and extraction process depending on your lab's needs. We have robotic systems that can dispense various extraction solutions and agitate the sample. We also have automate block digestion systems that can heat with dispensing of extraction solution if heat is needed. Inline sample digestion is also available in our flow analyzers.

Sample Testing

SEAL offers a variety of systems to fit your labs specific testing needs. SEAL offered detection techniques include colorimetric, turbidimetric, flame photometer, titration, amperometric, fluorometric, probe techniques (example: pH or conductivity) and more.

Data Handling and LIMS Communication

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

Fully Automated Soils Testing

COMMON TESTS

PHOSPHORUS:	Segmented Flow Analyzer	Discrete Analyzer	Robotic Systems	Digestion Systems
▶ TP	●	●		●
▶ oPhosphate	●	●		
NITROGEN:				
▶ Ammonia	●	●		
▶ TKN	●	●		●
▶ TN	●	●		●
▶ Nitrate	●	●		
Potassium	●			
Sulfate		●		
Soluble Salts / Conductivity			●	
pH			●	
Boron	●			
Calcium	●			
Magniesium	●			
Iron	●	●		
Organic Matter			●	

COMMON PROCESSES

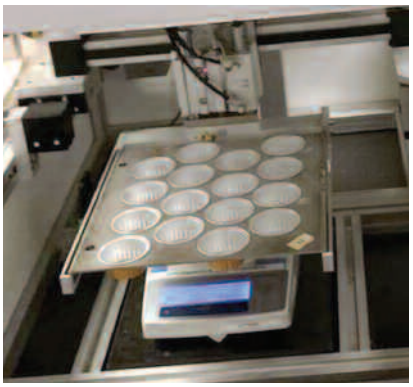
	Segmented Flow Analyzer	Discrete Analyzer	Robotic Systems	Digestion Systems
Inline Digestion	●			
Addition of Extractant			●	●
Dilution	●	●	●	●
Filtering	●		●	
Weighing			●	
Titration			●	

SAMPLE PREPARATION PRODUCTS

Filtration

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

Weighing



Weighing of samples before drying to assess dryness or after ashing can be done with SEAL robotic systems or inline with various other steps on our MiniLab robotic system.

Digestion Systems

Digestion of soil 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 TN/TP including chemical addition

BD50
TKN digestion with automated heating steps

SmartBlock II
Simple economical digestion for TN/TP

ANALYSIS BY PROBE

Multi-Parameter

SEAL has many options for automating your soils 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 soil 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 current meters, 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**

Automating one or more of the following parameters:

Alkalinity

pH

Conductivity

Turbidity

Color

Hardness

pH in Soil

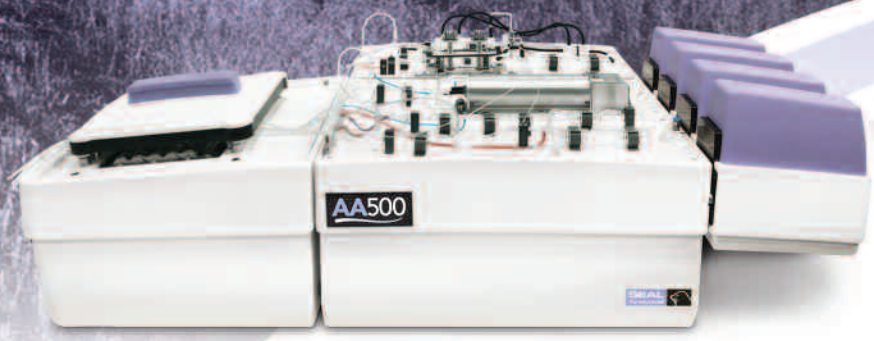
SEAL's MiniLab robotic handling system can easily perform your pH measurements. The MiniLab will dispense requested volumes of extractant into the vial, stir and leave for a designated time. The system will automatically calibrate from your provided set of standards and then test the samples along with 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 laboratories' needs.

AUTOMATION INCLUDES

- **pH probe calibration**
- **Addition of extraction solution**
- **Stirring**
- **pH measurement**

SEAL robotics can automate your process with single or multiple probes testing simultaneously.

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. Alternative detectors such as Flame Photometers are available.

Techniques

Total Automation

SEAL SFA systems are capable of full digital control of heaters, distillation, digestion, air injection and reagents. The AA500 and QuAAtro are capable of 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 or extraction solution plus 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 interferences from extraction solutions.

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.

Flame Photometer

SEAL segmented flow systems can utilize flame photometers for testing of potassium or sodium. Multi-test manifolds are available so that potassium and sodium can be run in series.

Suitable for the following extractions:

Olsen P

KCL

Bray

Morgan

Malich

and more!

Typical System Configurations

High-Capacity Nutrient Analyzer

QuAAtro39 – 2-channel with multitest manifolds and flame photometer

Example Parameters: NH_4, NO_3, PO_4, K **Sampling Rate:** 90 - 100/h

Typical workload: 200 samples per day. Analyze for NH_4 and K in the morning, change reagents to analyze NO_2 and NO_3 in the afternoon.

QuAAtro39 – 4-channel with flame photometer

Example Parameters: NH_4, K, NO_3, PO_4 **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 multitest cartridges and flame photometer

Example Parameters: NH_4, NO_3, PO_4, NO_2 **Sampling Rate:** 50 - 70/h

Typical workload: 100 samples per day. Analyze for NH_4 and PO_4 in the morning, change reagents to analyze NO_2 and NO_3 in the afternoon.

AA500 – 3-channel with flame photometer

Example Parameters: Total N, NO_3, NH_4, PO_4, K **Sampling Rate:** 40/h for Total N, 50/h for others

Typical workload: 60 samples per day. Analyze for Total N and NO_3 in the morning and the other parameters in the afternoon.

Economical Analyzer for Small Laboratories

AA100 – 1-channel or 2-channel

Available Parameters: NO_2, NO_3, NH_4, PO_4, Cl^-, Ca **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 multitest manifolds, the above systems can be expanded to analyze Ca, NO_2, Cl^- or Na at low extra cost with no need to change hardware between tests.

Multi-Test Methods

Specially developed for soil and plant 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	LOW RANGES	HIGH RANGES
Ammonia	0-0.65 mg/L as N	0-100 mg/L as N
Boron	0-1 mg/L as B	0-50 mg/L as B
Calcium	—	0-135 mg/L as Ca
Chloride	0-9 mg/L as Cl	0-650 mg/L as Cl
Nitrate	0-0.3 mg/L as N	0-20 mg/L as N
Nitrate	0-0.25 mg/L as N	0-20 mg/L as N
Nitrogen, total Kjeldahl	0-1.5 mg/L as N	0-100 mg/L as N
Phosphate	0-1.5 mg/L as P	0-100 mg/L as P
Phosphorus, total Kjeldahl	0-2 mg/L as P	0-100 mg/L as P
Potassium	0-10 mg/L as K	0-700 mg/L as K

DISCRETE ANALYZERS

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

HIGHLY AUTOMATED SOILS TESTING

Multiple Methods

Multiple chemistry parameters on a single sample in any order and without operation intervention. SEAL provides method procedures specific to agricultural 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	**Nitrate**	**Phosphorous**	**Chloride**
TKN	**Nitrite**	**Silicate**	**Iron**
Total Nitrogen	**Phosphate**	**Sulfate**	**Hardness**

and more!

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