# DISCRETE ANALYZERS

## Designed by chemists for chemists.

*Ideal for environmental laboratories requiring high levels of automation, a wide range of chemistries and limits of detection that ensure compliance with regulatory requirements.*

# INTELLIGENT DESIGN FOR AUTOMATED ENVIRONMENTAL ANALYSIS

Selecting an analyzer to automate your methods is less about choosing an analyzer with the latest robotics and more about how the analyzer design contributes to analysis that is equal or superior to the methods it replaces.

Analyzing environmental samples is more demanding than analyzing other sample types and requires a higher priority on very low detection levels, precision and reproducible results. These priorities can only be achieved when an analyzer:

▶ *Exactly mimics the traditional wet chemistry methods it replaces*

▶ *Delivers "equivalency" to approved EPA methods*

▶ *Uses approved spectrophotometric measurement technology*

▶ *Includes the accepted and optimum EPA cuvette path length of 10mm*

▶ *Uses optically pure detection technology*

▶ *Delivers precision, reproducibility, and method detection limits equal to or superior to the promulgated methods*

▶ *Protects the measurement from signal interference*

▶ *Protects samples from cross contamination and carry-over*

▶ *Brings the chemical reaction to full completion and steady state*

Combine the right design elements with robotics for automation and you have an analyzer that not only automates your wet chemistry, it:

▶ *Gives you high speed, high quality data at a low cost*

▶ *Increases daily volume of samples and range of analytes to be analyzed*

▶ *Significantly reduces cost per test, consuming only microliters of reagents and samples*

▶ *Reduces waste disposal costs*

▶ *Reduces staff contact with hazardous chemicals*

▶ *Substantially reduces the laboratory's overall operating costs*

# HOW DOES A DISCRETE ANALYZER WORK?

A Discrete Analyzer completely automates your manual wet chemistry methods, mimicking the operation of a laboratory chemist and adding the ability to measure multiple analytes simultaneously.

**A Discrete Analyzer will:**

▶ *Automatically and precisely add sample aliquots and reagent to a miniaturized test tube*

▶ *Mix*

▶ *Wait for the reaction to complete*

▶ *Measure the analyte*

▶ *Record every step, providing an audit trail*

**It should also:**

▶ *Automatically prepare a calibration from a top standard*

▶ *Predilute samples*

▶ *Autodilute out-of-range samples*

▶ *Autospike samples and report recovery*

▶ *Perform sample blanking*

▶ *Automatically insert and run Quality Control (QC) checks*

▶ *Link easily with LIMS*

Colorimetric methods can be automated with a Discrete Analyzer and with no flow, baseline, peak shapes, pump tubes to monitor, hardware changes or shutdown procedures, your laboratory will achieve true "walk-away" analysis. After a run is finished the Discrete Analyzer even washes itself out and enters standby mode.

With miniaturized components the Discrete Analyzer needs to use only microliter amounts of reagents and samples, significantly reducing your reagent consumption and associated chemical waste.

SEAL Discrete Analyzers will reduce time and errors often associated with manual methods, generate lower cost per test and reduce overall laboratory operating costs and efficiency.

SEAL Discrete Analyzers are compact, bench top analyzers that don't require a fume hood, glassware, pressurization, cylinder gas or cooling water, making them the most popular and versatile analyzers for environmental labs.
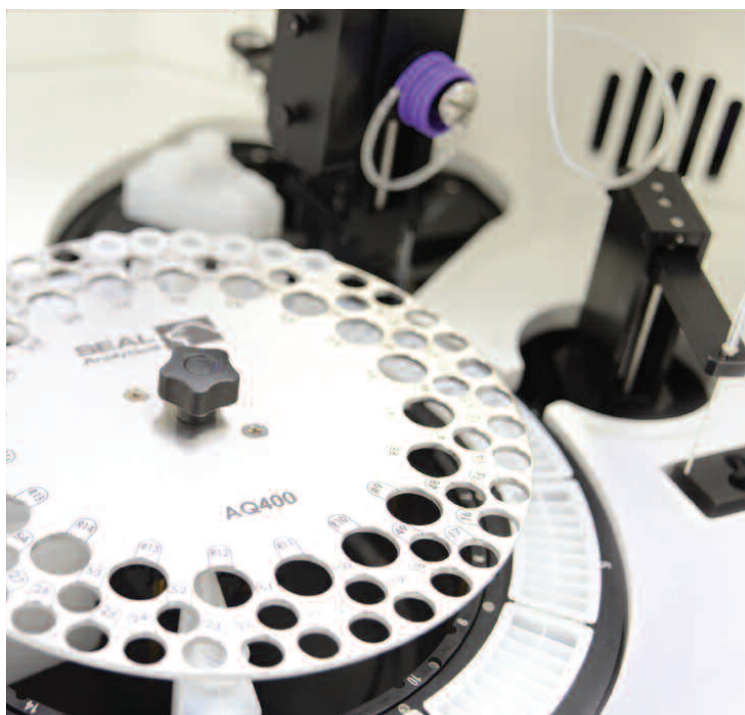
*The EPA has determined that the use of discrete analyzers, in environmental testing, produces equivalent results to those methods approved and listed in 40 CFR, Part 136 and 141.*

www.epa.gov

# The right technology to completely replace your manual methods and deliver superior results.

**NO CROSS CONTAMINATION**
*The only discrete analyzer with integrated probe washer. Eliminates cross contamination between reagents and samples. Keeps the probe free of reagents, oil and grease. Ideal for wastewater.*

**COMPACT DESIGN**
*Compact, enclosed, bench-top design allows for easy visual checks during operation and does not require a fume hood.*

**INTEGRATED OPTICALLY PURE HELLMA CUVETTE**
*10 mm pathlength or longer for maximum sensitivity and lower detection levels. Glass is superior to styrene for sample analysis ensuring highest precision.*

**USEPA, ASTM, ISO APPROVED METHODS**
*Also complies with other international regulatory methods.*

**COMPLETE REACTION**
*Constant heating and programmable reaction time for a highly controlled reaction. This means the reaction is brought to completion increasing precision and accuracy of test results.*

**MULTIPLE METHODS**
*Up to 14 chemistry parameters on a single sample in any order and without operation intervention.*

**EFFECTIVE SAMPLE & REAGENT MIXING**
*Reproducible results thanks to sample and reagent mixing that approximates manual mixing in a flask.*

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

**DISPOSABLE REACTION WELLS**
*Inexpensive, disposable wells that reduce carryover and cost per test.*

**REAGENT WEDGES**
*With onboard cooling; built-in level sensor to verify reagent volume required for each test.*

**LOWER DETECTION LEVELS**
*Critical for environmental applications, lowest possible detection levels are a priority. This is made possible with the right combination of mixing technique, longer path length, optically pure detection, accurate dispensing and completion of chemical reaction.*
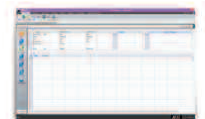
**LIMS READY**
*Customizable output for easy integration.*

**FAST, ON-DEMAND ANALYSIS**
*Easy, rapid colorimetric testing with minimal start-up time.*

**REDUCED REAGENT CONSUMPTION & WASTE GENERATION**
*Uses only µL dispenses of reagents and samples to greatly reduced the amount of chemical used and waste generated with each test.*

**REMOVABLE SAMPLE TRAY**
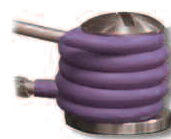*Allows pre-loading of sample. Interchangeable for optional larger vial.*

**MINIMAL MOVING PARTS**
*Less maintenance and a more robust analyzer.*

**INTEGRATED CADMIUM COIL**
*Allows flexibility in nitrate + nitrite testing. Software automatically switches the coil inline. All 4 x EPA approved nitrate + nitrite chemistry options available. In-situ regeneration.*

## Designed by chemists for chemists.

# SEAL Analytical

| | AQ300 | AQ400 | AQ700 |
|---|---|---|---|
| **TEST/CHEMISTRIES** | | | |
| Simultaneous Chemistries | 1-14 | 1-14 | 1-20 |
| Tests Programmable Per Sample | YES | YES | YES |
| Test Capacity | 180 | 216 | 864 |
| Cadmium Coil | Integrated | Integrated | Integrated |
| Standalone Spectrophotometer | NO | YES | NO |
| Total Volume Per Test | 500-700 µL (sample & reagent) | 500-700 µL (sample & reagent) | 500-700 µL (sample & reagent) |
| **SAMPLES** | | | |
| Sampling Rate | Subject to chemistry | Subject to chemistry | Subject to chemistry |
| Sample Blanking | YES | YES | YES |
| Add Samples After Run Commenced | YES | YES | YES |
| Sample Trays (removable) | 57 and 97 positions | 80 and 120 positions | 40 and 106 positions (4 trays on board) |
| Sample Capacity | 57 or 97 samples | 80 or 120 samples | 160 or 424 samples |
| Sample Consumption | 2-500 µL | 2-500 µL | 2-500 µL |
| Sample Cups Sizes | 1.2mL, 2 mL | 1.2mL, 2 mL, 5 mL | 2 mL, 5 mL, 12mL |
| Sampling Arms | 1 | 2 | 3 |
| **Reagents** | | | |
| Reagent Capacity | 18 | 26 | 24 |
| Reagent Cooling | YES | YES | YES |
| Reagent Volume | 10-500 µL | 10-500 µL | 10-500 µL |
| Reagent Wells | Disposable | Disposable | Disposable |
| Reagent Monitoring | Automatic | Automatic | Automatic |
| Reagent Level Sensing | Optional | YES | YES |
| **OPERATION** | | | |
| Auto Start-up & Shut-down | YES | YES | YES |
| Auto-dilution | YES | YES | YES |
| Automated Spike Preparation | YES | YES | YES |
| Automated Standard Preparation | YES | YES | YES |
| Segregated Wash Waste | YES | YES | YES |
| **TECHNOLOGY** | | | |
| Wash Stations | 3 | 3 | 4 |
| Integrated sampling probe washer | YES | YES | YES |
| Cuvette Path Length | 10mm | 10-20mm | 10mm |
| Optically Pure Cuvette | Quartz Cuvette | Quartz Cuvette | Quartz Cuvette |
| Cuvette Cleaning | Automatic | Automatic | Automatic |
| Barcode Reader | Yes (External Handheld) | Yes (External Handheld) | YES (sample & reagent) |
| Simplified Access for Maintenance | YES | YES | YES |
| Detector | Stationary measurement cell | Stationary measurement cell | Stationary measurement cell |
| Filter Wheel | 9 filter positions, 350-880nm | 9 filter positions, 350-880nm | 9 filter positions, 350-880nm |
| Lamp | Quartz Tungsten -Halogen | Quartz Tungsten -Halogen | Quartz Tungsten -Halogen |
| **SOFTWARE** | | | |
| Data Output | LIMS compatible. Export in .csv | LIMS compatible. Export in .csv | LIMS compatible. Export in .csv |
| Software Updates | Free w\Support Contract | Free w\Support Contract | Free w\Support Contract |
| Requirements | Windows version 7 or later | Windows version 7 or later | Windows version 7 or later |
| **SPECIFICATIONS** | | | |
| Bench-top Analyzer | YES | YES | YES |
| Dimensions (cm) | 57 W x 45 H x46 D | 69 W x 54 H x 61 D | 120 W x 90 H x 90 D |
| Weight | 85 lbs | 95 lbs | 300 lbs |
| Power Requirements | 110 60HZ or 220-240V 50 HZ. Configurable | 110 60HZ or 220-240V 50 HZ. Configurable | 110 60HZ or 220-240V 50 HZ. Configurable |

# APPROVED METHODS

Table of most common methods run on the SEAL discrete analyzers, with common ranges. The listed detection limits are easily achievable – some laboratories report lower.

SEAL applications group is continually optimizing and developing new methods. Don't see a method you require? Contact SEAL.

| ANALYTE | METHOD | EQUIVALENCE | DETECTION LIMIT | WORKING RANGES LOW (mg/L) | HIGH |
|---|---|---|---|---|---|
| ALKALINITY | Methyl Orange | EPA 310.2 (1974) | 6.5 mg $CaCO_3$/L | 10 to 100 | 50 to 500 |
| AMMONIA | Hypochlorite and Nitroprusside with Phenate or Salicylate | EPA 350.1 version 2 (1993) Std. Methods 4500-$NH_3$ G ISO/DIS 15923-1 | 0.002 mg N/L | 0.02 to 2 | 0.2 to 10 |
| CHLORIDE | Mercuric Thiocyanate | Std. Methods 4500-Cl- E (19th, 20th) ISO/DIS 15923-1 | 0.3 mg/L | 2.0 to 100 | 5.0 to 200 |
| CHROMIUM | Diphenylcarbizide | Std. Methods 4500-$NH_3$ G (19th, 20th) | 0.0005 mg/L | 0.01 to 0.5 | 0.3 to 5 |
| COLOR | Platinum-Cobalt Standard | Std. Methods 2120 B (18th,19th, 20th) | 2 Color Units | 5 to 150 | N/A |
| CYANIDE | Chloramine-T with Pyridine Barbituric Acid | EPA 335.4, version 1 (1993) Std. Methods 4500-CN E H (18th, 19th, 20th) | 0.0004 mg/L | 0.002 to 0.3 | 0.003 to 0.25 |
| HARDNESS | Calmagite Indicator | EPA 130.1 (1971) | 11 mg $CaCO_3$/L | 25 to 400 | N/A |
| NITROGEN, TKN | Hypochlorite and Nitroprusside with Salicylate | EPA 351.2, version 2 (1993) | 0.03 mg N/L | 0.1 to 4.0 | 0.5 to 25 |
| NITRATE + NITRITE | Sulfanilamide and NEDD Reduction by Cadmium, Vanadium, or Hydrazine | EPA 353.2, version 2 (1993) EPA 353.1 (1978) Std. Methods 4500-NO3 F H (18th,19th, 20th) ISO/DIS 15923-1 | 0.003 mg N/L | 0.012 to 2.0 | 0.25 to 15 |
| NITRITE | Sulfanilamide and NEDD | EPA 353.2, version 2 (1993) Std. Methods 4500-NO2 B (18th, 19th, 20th) ISO/DIS 15923-1 | 0.0005 mg N/L | 0.002 to 0.2 | 0.015 to 1.2 |
| PHENOLICS | Alkaline Ferricyanide and 4-Aminoantipyrine | EPA 420.4, version 1 (1993) | 0.0025 mg/L | 0.005 to 0.25 | N/A |
| PHOSPHATE, ORTHO | Acidic Molybdate/ Antimony with Ascorbic Acid | EPA 365.1, version 2 (1993) Std. Methods 4500-P F (18th, 19th, 20th) ISO/DIS 15923-1 | 0.0006 mg P/L | 0.003 to 0.3 | 0.125 to 12.5 |
| PHOSPHOROUS, TOTAL (TP) | Acidic Molybdate/ Antimony with Ascorbic Acid | EPA 365.1, version 2 (1993) Std. Methods 4500-P B,F (18th, 19th, 20th) | 0.003 mg P/L | 0.01 to 1.0 | 0.05 to 5.0 |
| PHOSPHOROUS, TOTAL (TKP) | Acidic Molybdate/ Antimony with Ascorbic Acid | EPA 365.4 (1983 | 0.007 mg P/L | 0.04 to 3.2 | N/A |
| SILICA | Acidic Molybdate | Std. Methods 4500-SiO2 C D (20th) ISO/DIS 15923-1 | 0.018 mg/L | 0.1 to 10 | 0.25 to 25 |
| SULFATE | Barium Chloride Turbidimetric | ASTM D516-90, 02 ISO/DIS 15923-1 | 0.5 mg/L | 5 to 40 | 4 to 200 |

**Analysis according to Standard Methods, EPA, ASTM, ISO and other international standards.**
**The wavelengths supplied are per the relevant regulatory requirements.**

# AQ SOFTWARE

- ▶ User friendly, intuitive, highly flexible software streamlines run set up
- ▶ Continuous in-house development incorporates user requested features
- ▶ Controls all analytical procedures from working standard dilution to sample analysis, cuvette washing and system QC
- ▶ Automated system quality control with built in QCPro™ Data Quality Assurance System
- ▶ User can specify QC types, limits and corrective actions upon QA failure
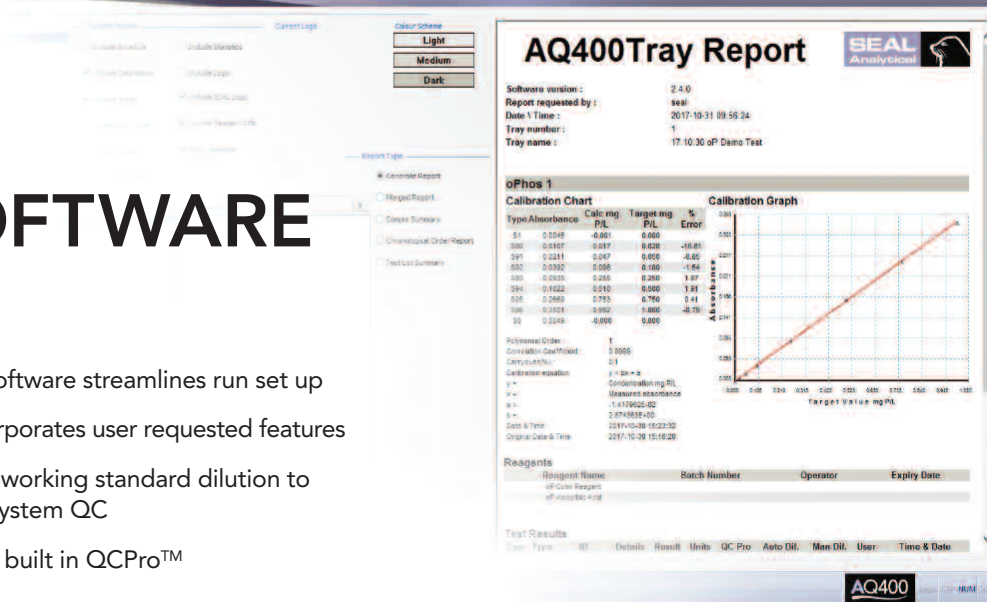
## FEATURES

- ▶ Real-time monitoring of reagents
- ▶ Provides an audit trail of all sample analysis
- ▶ Prepares working standards from a stock solution
- ▶ Prepares spike samples and calculates recoveries
- ▶ Automatic rerun of over-range samples. Diluted over-range samples will be batched with associated QC needed from reportability
- ▶ Data exportable to LIMS or worksheets
- ▶ Assigns tests in the highest order of efficiency
- ▶ Automatically performs system calibration and general maintenance
- ▶ Easily monitor run status with color coding to visually indicate regent, sample and test status
- ▶ Quickly run multiple tests in any order
- ▶ Predicts when analysis will be completed for better task planning
- ▶ Continuously monitors analyzer status and temperature of reaction ring

## GLOBAL SUPPORT

All technical support is provided by our SEAL Technical Centers' in-house qualified analytical chemists. We do not outsource our method development, technical support or training staff.

▶ ***As a market leader***, *SEAL has over 1,000 applications available and under continual development. Markets include water, wastewater, soil, plant, fertilizer, food and beverage. Please contact us for your specific application.*

**SEAL Analytical**

**www.seal-analytical.com**

# Colorimetric Nutrient Analyzers

## DISCRETE ANALYZERS

**AQ300**  **AQ400**  **AQ700**

## SEGMENTED FLOW ANALYZERS

**AA100**  **AA500**  **QuAAtro39**

# 50 Years of Experience in Environmental Analysis Built into Every Analyzer

50 years' experience in designing, developing and manufacturing automated wet chemistry analyzers specifically for very low detection levels in environmental applications has helped SEAL to apply the most useful, easy to use features into the SEAL range of Discrete and Segmented Flow analyzers. The SEAL analyzers are widely acknowledged as the best for environmental analysis, giving you everything you need to achieve equal or superior results to the manual and approved laboratory methods the SEAL analyzer replaces.

# Digestion Systems

## FOR METALS AND TKN, TP DIGESTION

**BD50**  **DEENA**

SEAL Analyzers are monitoring environmental samples in every corner of the globe. They are manufactured in the USA, Germany and the Netherlands. Engineering and chemistry support is provided from SEAL global facilities in USA, Germany, UK, the Netherlands and China along with a worldwide network of specialist distributors.

## COMPREHENSIVE SUPPORT

We offer comprehensive applications, technical service and software support.

### INCLUDING

▶ A choice of preventative maintenance and service contracts to meet your specific requirements

▶ In-house and online training

▶ Guaranteed availability of genuine consumables and spare parts

▶ Adaptation of methods to specific requirements such as matrix, range or detection limit

▶ Continuous in-house development of software to incorporate new customer requested features

## Robotic Handling Systems

SEAL Robotic MiniLab systems for automating sample pretreatment in the laboratory — improving your sample handling efficiency. Typical applications include BOD, pH, COD, Alkalinity, and conductivity measurements with options such as decapping/capping, sample splitting, and filtration. Call us about your laboratory needs and we will design a robot to suit you.

**SEAL MiniLab**

## SEAL Analytical

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