



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 manual methods it replaces.

Analyzing environmental and water 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 manual methods*
- ▶ *Uses approved spectrophotometric measurement technology*
- ▶ *Includes the accepted and optimum EPA cuvette path length of 10mm*
- ▶ *Uses optical 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 and*
- ▶ *Substantially reduces the laboratory's overall operating costs*

SEAL
Analytical



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 miniaturised test tube
- ▶ Mix
- ▶ Wait for the reaction to complete
- ▶ Measure the analyte and
- ▶ Record every step, providing an audit trail

It should also:

- ▶ Automatically prepare 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.

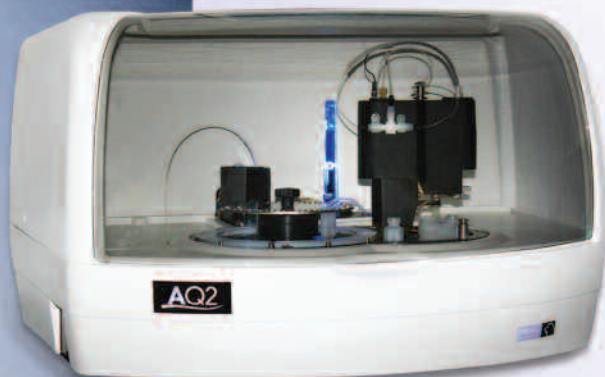
SEAL Discrete Analyzers are compact, bench top analyzers that don't require a fume hood, glassware, pressurization, cylinder gas or cooling water, making them the most popular and versatile analyzers for environmental labs.



AQ400



AQ1



AQ2

The EPA has determined that the use of discrete analyzers, in environmental testing, produce 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.



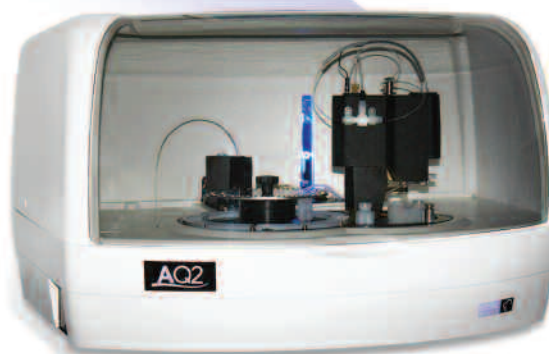
NO CROSS CONTAMINATION
the only discrete analyzer with integrated probe washer. Eliminates cross contamination between reagents and samples. Keeps the probe free of reagents, oil and grease. Ideal for wastewater.

COMPACT DESIGN
enclosed bench-top design eliminates need for fume hood and allows quick visual checks and easy access to all components.

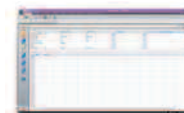


INTEGRATED OPTICALLY PURE HELLMMA QUARTZ CUVETTE
10 mm pathlength for maximum sensitivity and lower detection levels. Quartz glass is superior to styrene for sample analysis ensuring highest precision.

USEPA, ASTM, ISO APPROVED METHODS
also complies with other international regulatory methods



COLORIMETRIC ANALYSIS
on demand sample analysis



LIMS READY
customizable output for easy integration

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

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

COMPLETE REACTION
constant heating and programable reaction time secures a highly controlled reaction condition. Chemical reactions brought to completion, precisely emulating manual methods.

SIMPLIFIED WASTE DISPOSAL
segregated chemical waste and wash water minimizes waste disposal costs. Easy to access.



REAGENT WEDGES
with on-board cooling, built-in level sensor to verify reagent volume and only reagent required per test.



DISPOSABLE REACTION WELLS
inexpensive, eliminates carry-over and reduces cost per test.

UP TO 7 CHEMISTRY PARAMETERS ON A SINGLE SAMPLE
with any analyte in any order and without operator intervention.



INTEGRATED CADMIUM COIL
for flexibility in nitrate+nitrite testing. Software automatically switches the coil inline. All 3 x EPA approved nitrate+nitrite chemistry options available. In-situ regeneration.

USES ONLY μ l REAGENT & SAMPLE PER TEST
miniaturized components, reduce reagent and sample consumption resulting in less waste and lower costs per test.



MINIMAL MOVING PARTS
for less maintenance and a more robust analyzer

LOWER DETECTION LEVELS
critical for environmental applications and only possible with the right combination of mixing techniques, longer path lengths and optically pure glass components.

Designed by chemists **for chemists.**



AQ1

*Ideal for smaller workloads.
Smallest footprint. Economical.*

AQ2

*Most popular bench-top analyzer
for environmental laboratories.*

AQ400

*Highest speed and capacity.
Lower detection levels.*

TESTS / CHEMISTRIES

Simultaneous Chemistries	1 - 7	1 - 7	1 - 7
Tests Programmable Per Sample	YES	YES	YES
Test Capacity	180	180	216
Cadmium Coil	Integrated	Integrated	Integrated
Standalone Spectrophotometer	NO	NO	YES
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)	60 and 80 positions	57 and 100 positions	80 and 120 positions
Sample Consumption	2 – 500ul	2 – 500ul	2 – 500ul
Sample Cup Sizes	1.2ml, 2ml	1.2ml, 2ml	1.2ml, 2ml, 5ml
Sampling Arms	1	2	2

REAGENTS

Reagent Capacity	20	15	26
Reagent Cooling	YES	YES	YES
Reagent Volume	10-500 µL	10-500 µL	10-500 µL
Reagent Wells	Disposable	Disposable	Disposable
Reagent Monitoring	Expiration	Automatic	Automatic

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	3
Integrated sampling probe washer	Yes	Yes	Yes
Cuvette Path Length	10mm	10mm	10mm – longer cuvettes in design
Optically Pure Cuvette	Integrated Hellma Quartz Cuvette	Integrated Hellma Quartz Cuvette	Integrated Hellma Quartz Cuvette
Cuvette Cleaning	Automatic	Automatic	Automatic
Simplified Access For Maintenance	YES	YES	YES
Detector	Stationary measurement cell	Stationary measurement cell	Stationary measurement cell
Filter Wheel	7 filter positions, 405-880nm	7 filter positions, 405-880nm	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	Free	Free
Requirements	Windows version XP or later	Windows version XP or later	Windows version 7 or later

SPECIFICATIONS

Bench-top Analyzer	YES	YES	YES
Dimensions (cm)	43W X 51H X 61D	68W x 41H x 55D	69W x 54 H x 61D
Weight	62 lbs (28 kg)	88 lbs (40 kg)	94 lbs (43 kg)
Power Requirements	110V 60HZ or 220-240V 50 HZ.	110V 60HZ or 220-240V 50 HZ. Configurable.	110V 60HZ or 220-240V 50 HZ. Configurable.

*AQ2 runs twice the speed of the AQ1 **AQ400 runs 10-30% faster than AQ2 depending on chemistry

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		λ
				LOW (mg/L)	HIGH	
ALKALINITY	Methyl Orange	EPA 310.2 (1974)	6.5 mg CaCO ₃ /L	10 to 100	50 to 500	520 nm
AMMONIA	Hypochlorite and Nitroprusside with Phenate or Salicylate	EPA 350.1 version 2 (1993) Std. Methods 4500-NH ₃ G ISO/DIS 15923-1	0.004 mg N/L	0.02 to 2	0.2 to 10	660 nm
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	480 nm
CHROMIUM	Diphenylcarbazide	Std. Methods 4500-NH ₃ G (19th, 20th)	0.0005 mg/L	0.01 to 0.5	0.3 to 5	546 nm
COLOR	Platinum-Cobalt Standard	Std. Methods 2120 B (18th, 19th, 20th)	2 Color Units	5 to 150	N/A	450 nm
CYANIDE	Chloromide-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	578 nm
HARDNESS	Calmagite Indicator	EPA 130.1 (1971)	11 mg CaCO ₃ /L	25 to 400	N/A	480 nm
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	660 nm
NITRATE + NITRITE	Sulfanilamide and NEDD Reduction by Cadmium, Vanadium, or Hydrazine	EPA 353.2, version 2 (1993) EPA 353.1 (1978) Std. Methods 4500-NO ₃ F H (18th, 19th, 20th) ISO/DIS 15923-1	0.003 mg N/L	0.012 to 2.0	0.25 to 15	520 nm
NITRITE	Sulfanilamide and NEDD	EPA 353.2, version 2 (1993) Std. Methods 4500-NO ₂ B (18th, 19th, 20th) ISO/DIS 15923-1	0.0005 mg N/L	0.002 to 0.2	0.015 to 1.2	520 nm
PHENOLICS	Alkaline Ferricyanide and 4-Aminoantipyrine	EPA 420.4, version 1 (1993)	0.0025 mg/L	0.005 to 0.25	N/A	505 nm
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	0.01 to 1.0	0.125 to 12.5	660 nm 880 nm
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	660 nm 880 nm
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	880 nm
SILICA	Acidic Molybdate	Std. Methods 4500-SiO ₂ C D (20th) ISO/DIS 15923-1	0.018 mg/L	0.1 to 10	0.25 to 25	405 nm 660 nm
SULFATE	Barium Chloride Turbidimetric	ASTM D516-90, 02 ISO/DIS 15923-1	0.5 mg/L	5 to 40	4 to 200	405 nm 520 nm

Analysis according to Standard Methods, EPA, ASTM, ISO and other international standards.

Software Designed for Environmental Laboratories

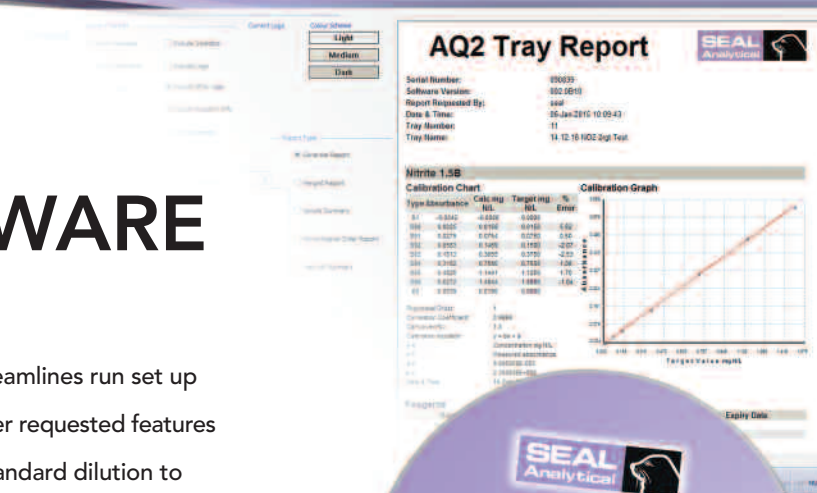
AQ SOFTWARE

- ▶ 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
- ▶ Controls auto-dilution of over-range solutions
- ▶ Data exportable to LIMS or worksheets
- ▶ Assigns tests in the highest order of efficiency
- ▶ Automatically performs system calibration and general maintenance
- ▶ Color coding to visually indicate reagent sample and test status, making it easy to operate and monitor run processes
- ▶ 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
- ▶ Free software updates

- ▶ **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.



GLOBAL SUPPORT

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



www.seal-analytical.com

Colorimetric Nutrient Analyzers

DISCRETE ANALYZERS



AQ1



AQ2



AQ400

SEGMENTED FLOW ANALYZERS



AA1



AA3



QUATRO 39

50 Years 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.

FOR YOUR SAMPLE PREPARATION — BLOCK DIGESTION : TKN, METALS

SEAL's enhanced computer controlled **BD50** digestion block is ideal for speeding up the acid digestion process for soils, water samples and food products. It is especially suited to Total Kjeldahl Nitrogen and Phosphorous methods. The solid aluminium heating grid delivers even heating across the whole block and ensures reproducible results. *Please see our detailed brochure for further information.*



THOMAS CAIN (a SEAL Analytical brand) manufactures automated sample preparation and digestion systems for the analysis of trace metals for environmental laboratories. From the **SmartBlock** – a simple manual digestion block – to the **DEENA** acid digestion system, that fully automates the sample preparation and digestion for EPA and other laboratory methods.



www.seal-analytical.com

SEAL Analytical is a global company with offices worldwide - contact us at:

SEAL Analytical, Inc.
Mequon Technology Center
10520-C Baehr Rd.
Mequon, WI 53092
United States
Tel: +1 (262) 241 7900
Fax: +1 (262) 241 7970
sales@seal-us.com

SEAL Analytical Ltd.
Unit 3 Tailsman Business Centre
Duncan Road
Park Gate
Southampton, SO31 7GA
United Kingdom
Tel: +44 (0) 1489 864 400
Fax: +44 (0) 1489 880 531
sales@seal-us.com

SEAL Analytical GmbH
Werkstrasse 5
D-22844 Norderstedt
Germany
Tel: +49 (0)40 60 9292 9-00
Fax: +49 (0)40 60 9292 9-02
info.germany@seal-analytical.com

SEAL Analytical Shanghai
Room 413, 12th Building,
No. 128 Xiangyin Road,
Shanghai, 200433
China
Tel: +86 21 3362 5002
Fax: +86 21 3362 5002

SEAL Analyzers are monitoring environmental samples in every corner of the globe. They are manufactured in the USA. Engineering and chemistry support is provided from SEAL global facilities in USA, Germany, England 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