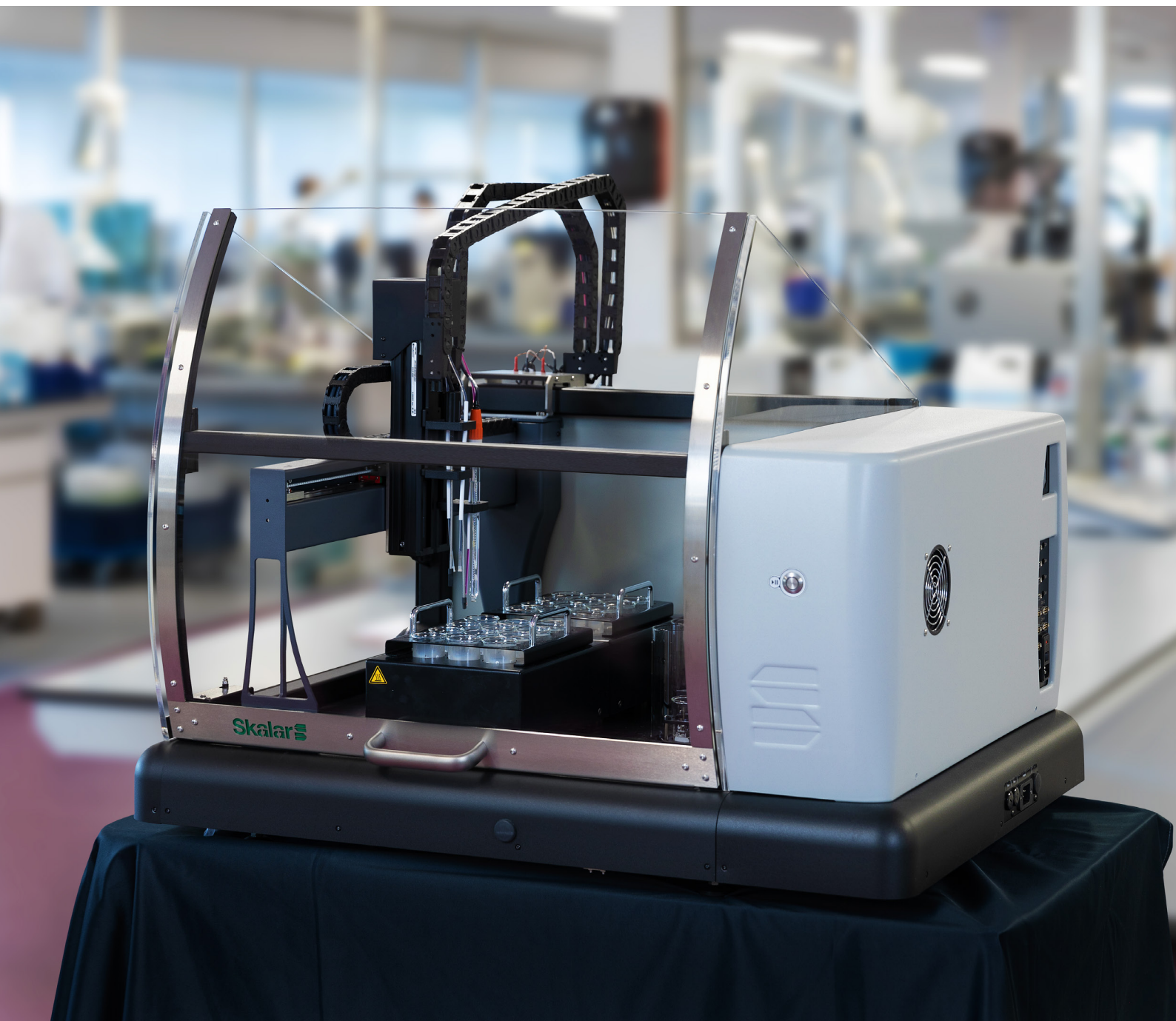


Skalar



Robotic analyzers

your partner in chemistry automation



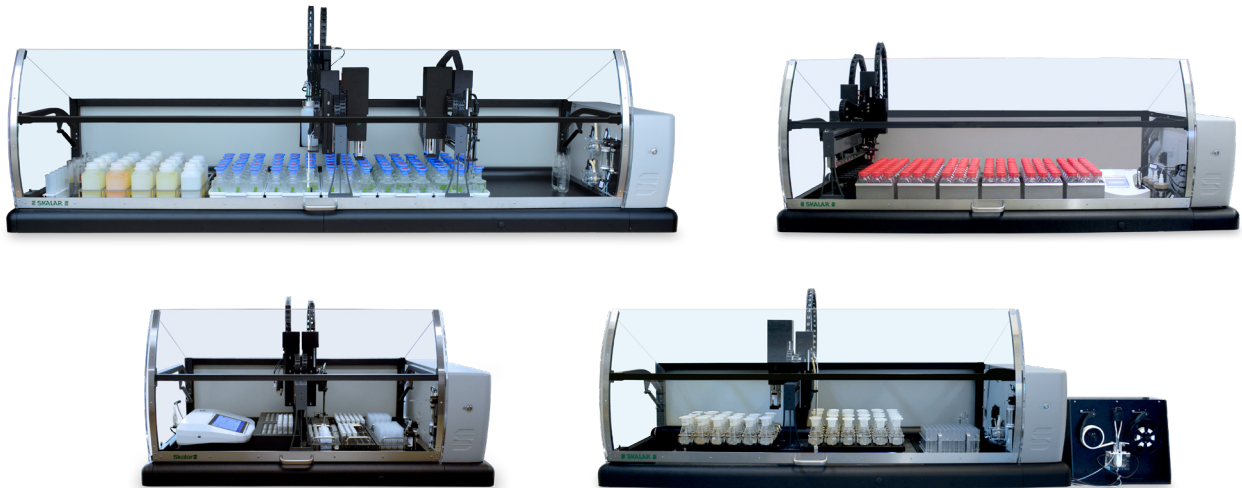
SP2000 Series

Robotic Analyzers



AMERTEK
LRN048-M0750-A02
2.33 VDC
0.08526 mm / STEP
3226

The SP2000 Series Robotic Analyzers



Skalar's sophisticated SP2000 robotic platform offers dedicated and flexible automation solutions for routine analytical testing.

The SP2000 analyzers automate all manual handling steps in the procedure of an application such as sample dilution, capping / de-capping, liquid handling, mixing, addition of reagents etc. Skalar has automated the following applications:

- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD) according to ISO 6060
- Test kit applications including ST-COD according to ISO 15705
- pH, Conductivity (EC), Alkalinity, Acidity, Hardness
- Carbonate / Bicarbonate and other titrations
- Turbidity and True Color/Apparent Color/UV
- Ion Selective Electrode (ISE) measurements
- Particle size distribution analysis in soil
- Bitterness and other parameters in beer/wort

And others

The SP2000 platform is designed to fit the exact requirements of a laboratory. Each configuration is set up by choosing the application, level of automation, sample capacity, sample throughput, probes / meters, racks, sample / reagent containers etc. The analyzers are fitted with protective front and side covers to comply with applicable CE regulations.

All analyzers are controlled by RoboticAccess, a state of the art software package which has many user-definable operations, pre-defined procedure application files and includes extensive QC features which are required for today's modern laboratory.

Biochemical Oxygen Demand (BOD)



The SP2000 automates BOD analysis in accordance with (inter)national regulations as well as customer specific methods.

BOD analysis is one of the most common applications for water laboratories. Therefore, Skalar developed the most flexible Robotic BOD platform available today. Besides the modern design and latest technology innovations, it can be configured for 18 up to 144 BOD bottles.

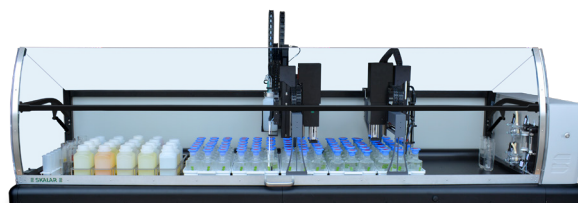
Each laboratory can customize this SP2000 BOD platform to fit their exact laboratory requirements with respect to sample throughput, level of automation, sample capacity etc.

A smart automation example is our SP2000 BOD analyzer extended with automatic pH setting of the original sample, sample pipetting and sample aeration.

The original sample is pH adjusted and aliquots are automatically pipetted into the BOD bottles prior to the BOD analysis procedure. The BOD analysis procedure is executed and, if necessary, the sample can be automatically aerated before dissolved oxygen measurement. Depending on the preferences of the user the aeration and mixing of the original sample itself can also be performed.

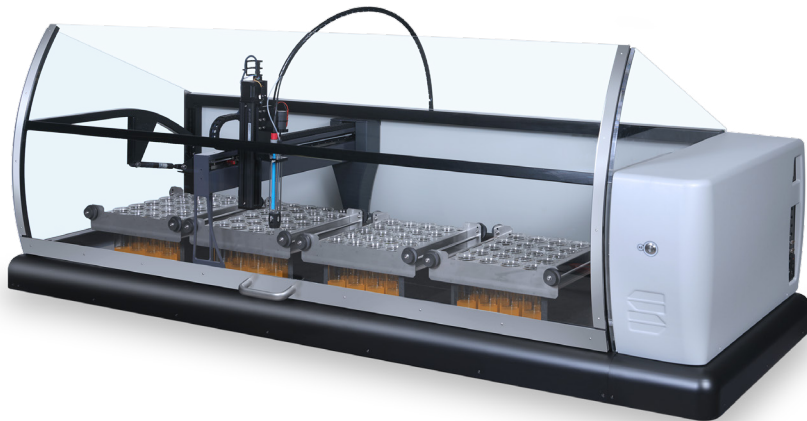
The SP2000 BOD analyzer automates:

- Bottle capping and de-capping
- pH measurement and adjustment of original sample
- Sample pipetting
- Addition of Nitrification inhibitor (ATU)
- Addition of Seed
- Addition of dilution water
- Sample mixing
- Sample aerating
- Measurement of Dissolved Oxygen value DO1 and final DO2 value
- Probe / stirrer rinsing between each measurement
- Calculation of BOD value according to EPA 405.1, ISO 5815-1, EN-1899-1/2, Standard Methods 5210 B, DIN 38409 H41/ H44 etc.



SP2000 BOD in combination with pH adjustment and sample pipetting

Chemical Oxygen Demand (COD)



The SP2000 analyzers can be configured to automate COD using the sealed tube COD method (ST-COD) according to ISO 15705/EPA 410.4 or with the classical titration method according to ISO 6060.

The chemical oxygen demand (COD) test is a commonly used method for indirect measurement of the amount of organic compounds in water. This makes the COD value an important parameter for evaluating water quality.

ST-COD – ISO 15705

The ST-COD method is based on exactly the same reaction as described in the classical method, but instead of titration, a photometric detection is used, which saves a lot of time. Another advantage of the ST-COD method is the use of tubes containing ready-to-use reagents, which minimizes the handling of toxic and hazardous reagents.

The ST-COD application can be combined with pH and Conductivity (EC) measurement for further automatic sample preparation procedures prior to the test kit analysis. With the EC value of the sample, the software can automatically select the most optimal test kit measurement range for COD analysis of the sample. Sample dilution and pH adjustment of the original sample before analysis is also possible.

COD – ISO 6060

After digestion, the interchangeable racks with the digested samples are placed onto the SP2000. This saves time and avoids sample handling with dangerous reagents. The samples are cooled and are automatically titrated with iron ammonium-sulfate to determine the excess of oxidizing agent. The software calculates and stores the COD data of each sample.

The SP2000 ST-COD analyzer automates:

- Sample tube pick up
- Sample tube capping and de-capping
- Pipetting of the sample
- Sample mixing
- Sample positioning in heating reactor
- Photometric measurement COD concentration



Automated COD method – ISO 6060

Photometric test kit automation for water applications

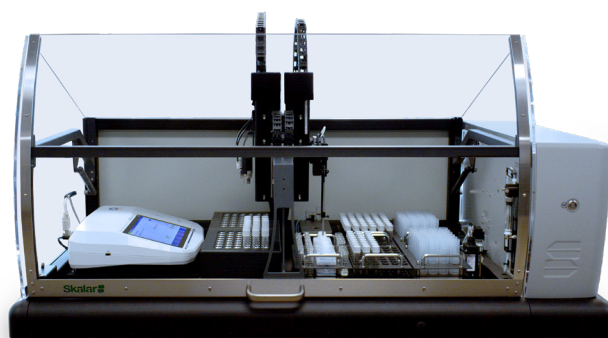
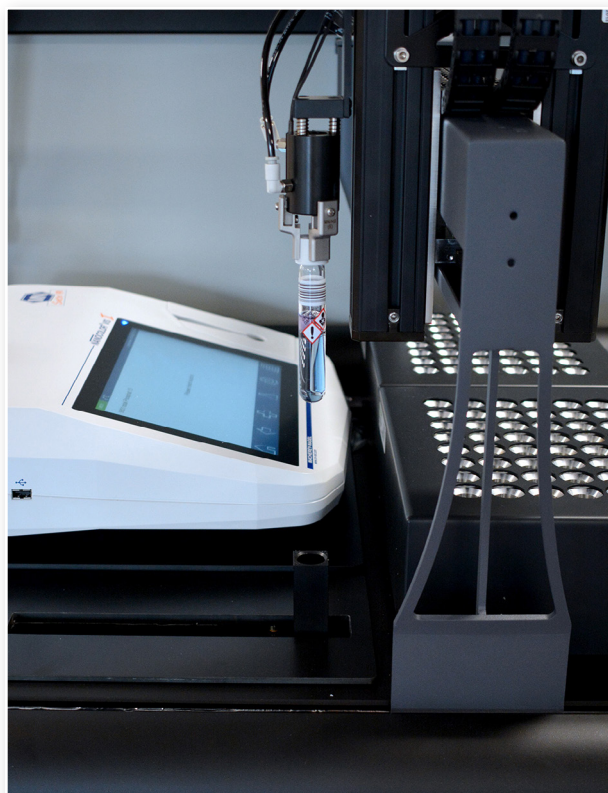
The SP2000 analyzer offers complete automation of ready-to-use test kit applications such as the ST-COD, Total Phosphate, Total Nitrogen, Ammonium, Nitrate, Nitrite, Sulfide and Phenol index.

The analyzer automates all the necessary manual handling steps of the photometric test kit procedure such as sample pipetting, tube (de)-capping, addition of reagents, mixing, heating, cooling and measurement.

The SP2000 platform can be built with 48 up to 288 tubes in one batch. The parameters can be analyzed sequential per sample or simultaneous per parameter. The test kit application can be combined with pH and Conductivity (EC) measurement for further automatic sample preparation procedures prior to the test kit analysis.

With the EC value of the sample, the software can automatically select the most optimal measurement range for the COD analysis of the sample. Sample dilution and pH adjustment of the original sample before analysis is also possible. Qualifying the sample prior to analysis can yield significant cost savings as it prevents using incorrect measurement ranges and therefore avoids wasting test kit reagents and consumables.

The SP2000 can handle test kits and photometers from different manufacturers.



Particle size distribution analysis in soil - ISO 11277



The capacity of soil to transport pollution can be influenced by a number of factors such as absorption, the ability to shrink or swell, water retention and permeability.

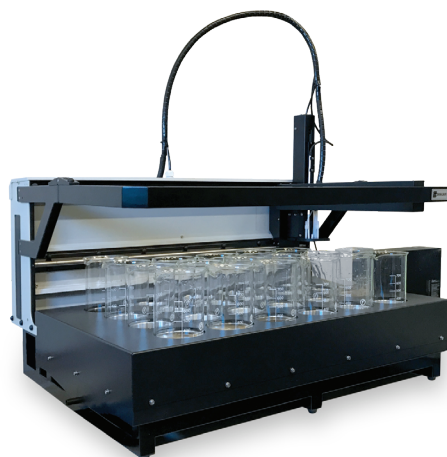
Most of these factors are independently correlated with the particle size of the soil. Especially the clay fraction, the smallest fraction (0-2 micron), is important in assessing soil quality.

The analysis is carried-out in 3 steps:

- Weighing the sample
- Removal of Organic Matter and Carbonates
- Determination of the clay fraction

The analysis requires very precise timing steps, tasks which are much more easily performed by an analyzer rather than a human operator. Therefore, Skalar developed two automation solutions. One SP2000 analyzer automates the sample preparation step, including the removal of organic matter and carbonates, while the other handles the determination of the clay fraction.

Both systems together offering an economical and “walk away” automation concept for the lengthy particle size distribution analysis procedure, which laboratories will find highly beneficial.



The SP50 sample preparation analyzer



Features

- 35-105 positions for sedimentation cylinders (1000 ml)
- 35-105 positions for evaporation dishes or vials
- Determination of up to 5 different soil fractions from 1 sample
- Automatic temperature correction for the sample pick-up depths
- Automatic addition of Sodium pyrophosphate solution
- Automatic addition of water
- Automatic decanting
- Calibration of the individual cylinder volumes
- Adjustable stirrer speed

pH / Conductivity / Alkalinity / Turbidity Color / Titrations / ISE in water



The SP2000 robot offers water laboratories a complete “walk-away” concept.

The typical parameters for water quality control such as dissolved oxygen, alkalinity, pH, conductivity, True Color/ Apparent Color/UV including filtration, turbidity can be fully automated.

Original sample collection bottles can be placed directly on the robot, avoiding any need for manual sample transfer. An integrated barcode scanner reads the barcode on the sample collection bottle. The sample ID, including the parameters to be analyzed, become visible in the sample table. The SP2000 automatically starts the analysis on this sample according to the data shown in the sample table. The results are directly visible after analysis.

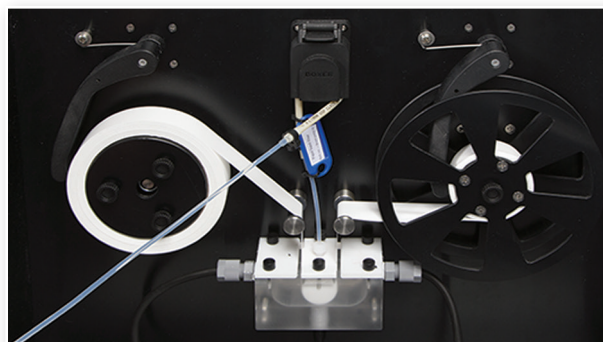
A dual titrator can be included for a higher sample throughput and a paper band filter can be integrated, allowing analysis of particle laden water samples. The analyzer is compatible with numerous current models of meters & probes from a variety of manufacturers. This configuration is expandable with fluoride, hardness and many other parameters.

Features:

- Automatic barcode scanning for sample ID check and to gain the analysis parameters
- Automatic capping and de-capping
- In-line sample filtration (clean samples) or external via paperband filter allowing analysis of particle laden water samples
- Automatic stirring
- Automatic rinsing of probe, stirrer, draining needle, filters and flow through cells
- Result calculation
- Dual titrator, for higher sample throughput
- Unattended overnight analysis



Barcode scanning – sample ID & analysis parameters



Paperband filter – for particle laden water samples



Dual titrator – higher sample throughput

Bitterness analysis in Beer and Wort

Beer and wort analyses are essential to control brewing quality during beer production. An important analysis is bitterness.

Skalar has automated the analysis of bitterness compounds such as iso- α -acids in beer and wort according to international methods.

The automated procedure includes automatic degassing of the samples, dilution of samples, de-capping and capping of the sample tube, addition of hydrochloric acid and iso-octane, mixing of the sample and its measurement.

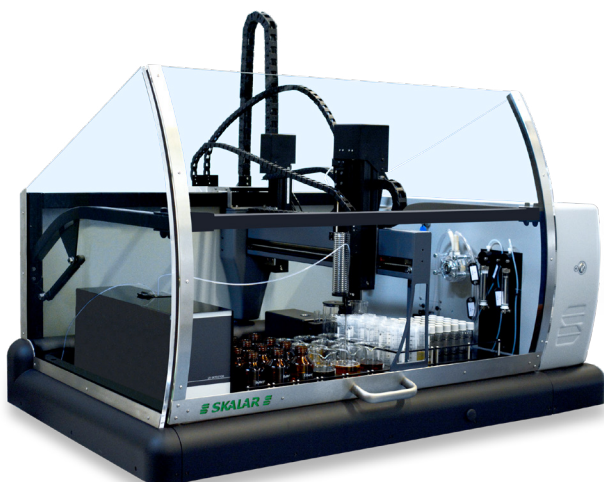
The instrument can be loaded with 9 up to 15 beer samples in 250 ml beakers. Up to 16 sample tube positions are available. The robot includes two shakers for mixing the sample tubes to obtain complete extraction. The complete analysis platform is enclosed by a protective cover for safety.

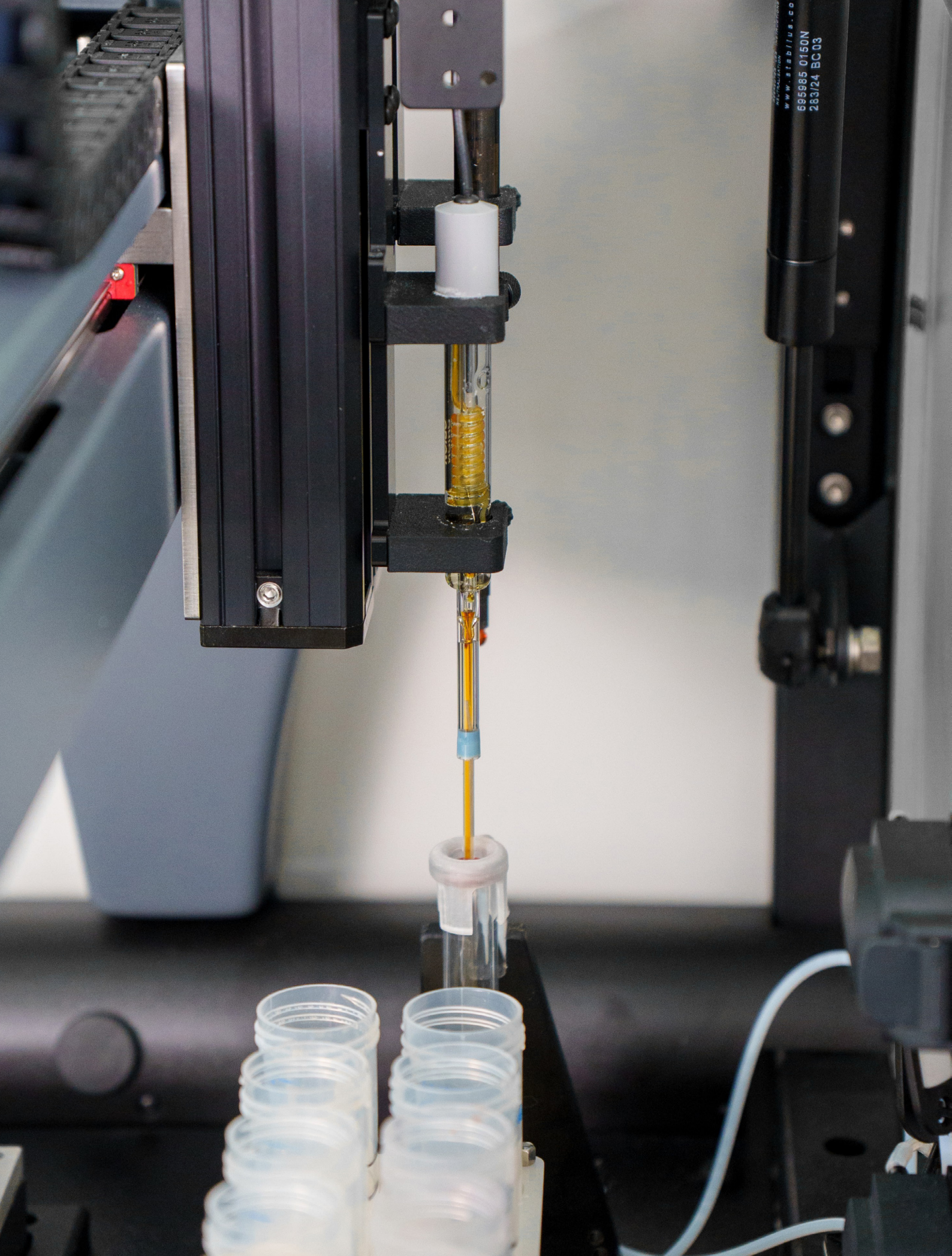
The analyzer is controlled by RoboticAccess, a user-friendly data handling software package, including a pre-set application procedure for Bitterness, user definable sample table set up and extensive QC features.

Additionally, more parameters can be added to this bitterness Robotic Analyzer such as Color, Free Amino Nitrogen (FAN), Beta (β) glucan, SO₂, Polyphenolen, Anthocyanogen, Thiobarbituric Acid Value (TBZ) and others.

The SP2000 beer analyzer automates:

- Degassing of the samples
- Capping and de-capping of the sample tube
- Sample dilution
- Addition of reagents
- Mixing and measurement of the absorbance
- Data handling and result calculation





Automation of Soil - pH

The soil-pH gives information about how to improve the quality of the soil, which will result in increased crop quantities and cost reduction.

Our SP2000 platform is perfectly suited for processing large quantities of soil samples every day. The system adds the required extractant to the sample, stirs, waits for a predefined time and determines the pH automatically. Any variables within these stages, such as the pre-stirring time and the stabilization criteria can be adapted at any time to accommodate all sample types and norms in one run. The analyzer has a capacity of up to 576 containers (50 ml).

The SP2000 pH- soil analyzer automates:

- pH probe calibration
- Addition of extraction solution
- Sample stirring
- Pre-defined sample settling times
- Measurement of pH
- Result calculation



Software

The Robotics software is a flexible and multitasking program for controlling the robotic analyzers. While analyzing the samples, already obtained results are processed and new analyses can be prepared and scheduled.

Runs can be easily started by selecting the required application file and simply creating a user defined sample table by dragging the racks to the analyzer. An application file contains the instructions for the analyzer to perform the analysis. The BOD application for example includes procedures for the automated BOD sequence such as bottle decapping, addition of ATU and / or seed, addition of dilution water, sample mixing and Oxygen measurement. These pre-defined application files meet (inter)national regulations or user defined requirements.

When the sample table is completed and the analysis sequence is defined, the run can be started or scheduled for another start time.

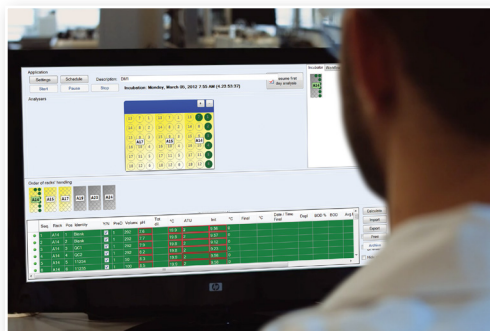
The status of the running analysis can be followed on the screen and the results are displayed in real-time. During the run, it is possible to add priority samples and exclude samples from measurement.

Results can be printed in user defined print reports and exported to Excel or LIMS and as a text file. Completed runs can be archived as well as backed up and restored later.

Integrated Quality Control features assure accurate results and full compliance with required regulations. QC samples can be analyzed and Quality control charts together with other valuable statistical information can be created. Also CLP protocols can be included, which allow automatic actions of the Robot analyzer itself if QC and CLP limits are exceeded. This guarantees the production of highly accurate results and automatic quality control of the Robotic analyzer's performance.

Features:

- Definable levels to prevent unauthorized access
- Scheduler for a delayed start time
- Pre-defined applications, such as BOD, COD, pH, Alkalinity, Turbidity, ISE and many more
- Customized applications can be integrated
- Easy addition / deletion of samples during a run
- Possibility of exporting results during analysis
- Results export as text or to Excel / LIMS
- User defined print reports
- Possibility of using Quality samples and creating Quality Control Charts



Position in Rack	Identity	Yes/No	pH_LYN	EC_YN	pH	T °C	EC µS/cm	T °C	Initial Date / Time	Error Flag
13	NaOH	✓	✓	✓	8.5	22.7			6/14/2016 1:44 PM	
14	NaOH	✓	✓	✓	8.5	22.7			6/14/2016 1:45 PM	
15	NaOH	✓	✓	✓	8.44	22.7			6/14/2016 1:45 PM	
16	NaOH	✓	✓	✓	8.47	22.7			6/14/2016 1:45 PM	
17	NaOH	✓	✓	✓	8.48	22.7			6/14/2016 1:45 PM	
18	NaOH	✓	✓	✓	8.41	22.7			6/14/2016 1:47 PM	
19	NaOH	✓	✓	✓	8.43	22.7			6/14/2016 1:47 PM	
20	NaOH	✓	✓	✓					6/14/2016 1:45 PM	
21	Buffer 10	✓	✓	✓						
22	Buffer 10	✓	✓	✓						
23	Buffer 4	✓	✓	✓						
24	Buffer 4	✓	✓	✓						
25	Buffer 4	✓	✓	✓						
26	Buffer 4	✓	✓	✓						
27	Buffer 4	✓	✓	✓						
28		✓	✓	✓						

The SP2000 robotic automation platforms

Our innovative and flexible SP2000 robotic analyzers offer automation solutions in many ways. The SP2000 platform can be used for either automatic sample preparation or automatic sample analysis or both, integration of the sample preparation on the analytical platform.

SP2000 AUTOMATED ANALYSES PARAMETERS	APPLICATION AREAS		
	BEER & MALT	SOIL, PLANT & FERTILIZER	WATER
Alkalinity			X
Ammonia			X
Anthocyanogen	X		
Beta (β)-Glucan	X		
Biochemical Oxygen Demand			X
Bitterness	X		
Calcium			X
Carbonate			X
Carbonate / Bicarbonate			X
Chemical Oxygen Demand			X
Chloride			X
Clay Fraction		X	
True Color/ Apparent Color/UV	X		X
Conductivity		X	X
Fluoride			X
Free Amino Nitrogen	X		
Hardness			X
Iron	X		
Magnesium			X
Oxygen Dissolved			X
Particle Size Distribution		X	
Permanganate Value			X
pH		X	X
Polyphenols	X		
Sulphur Dioxide	X		
Test kit Ammonia			X
Test kit Chloride			X
Test kit COD			X
Test kit Nitrate			X
Test kit Nitrite			X
Test kit Ortho Phosphate			X
Test kit Phenol Index			X
Test kit Sulphate			X
Test kit Total Nitrogen			X
Test kit Total Phosphate			X
Thiobarbituric Acid Value	X		
Turbidity			X

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