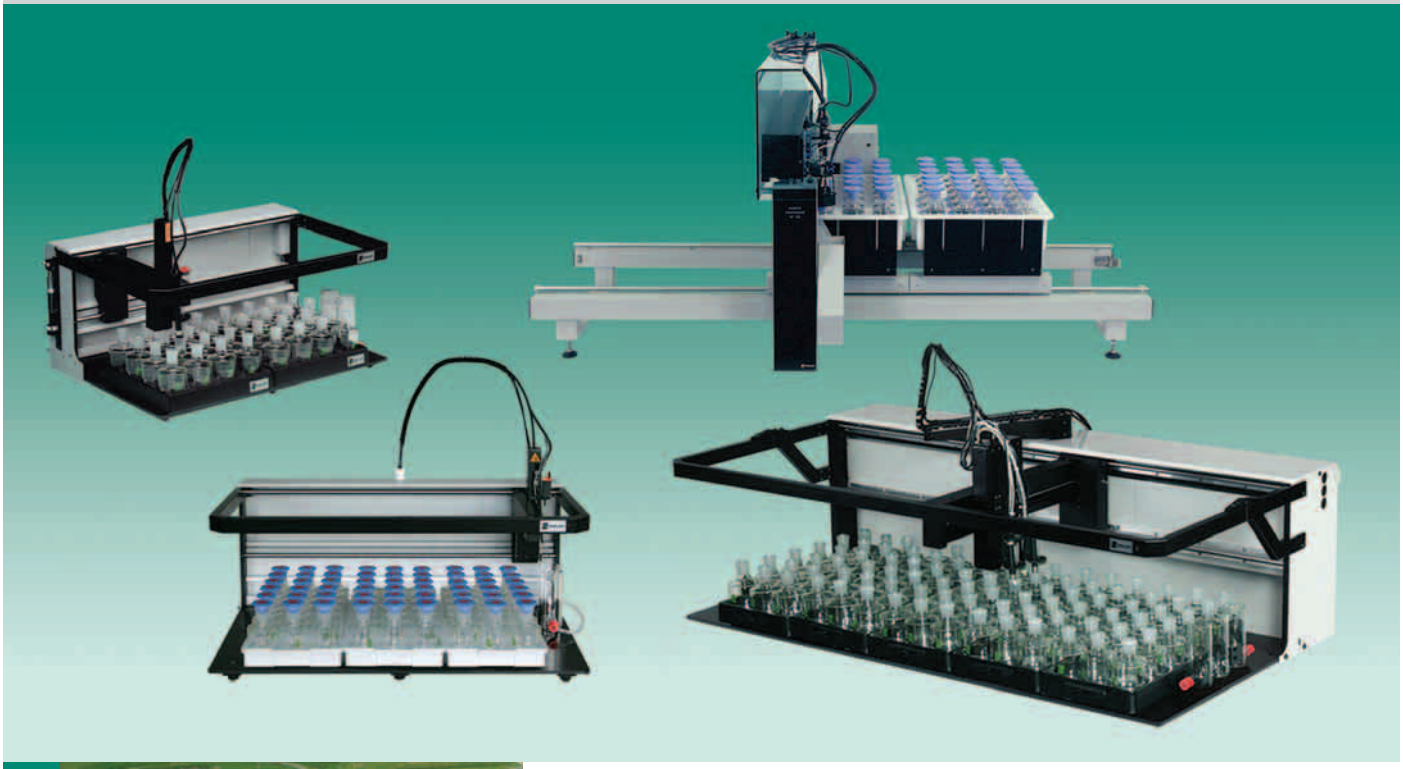
SKALAR

your partner in chemistry automation

SP series
Robotic Analyzers

Introducing Skalar's Robotic Analyzers



Skalar's Robotic Analyzers offer a flexible and affordable automation solution to all routine analytical laboratories. Automation is available for BOD, COD, pH, Conductivity (EC), Alkalinity, Carbonate/Bicarbonate, Turbidity, Color, Ion Selective Electrodes (ISE) applications, Clay fraction analysis and custom-made applications.

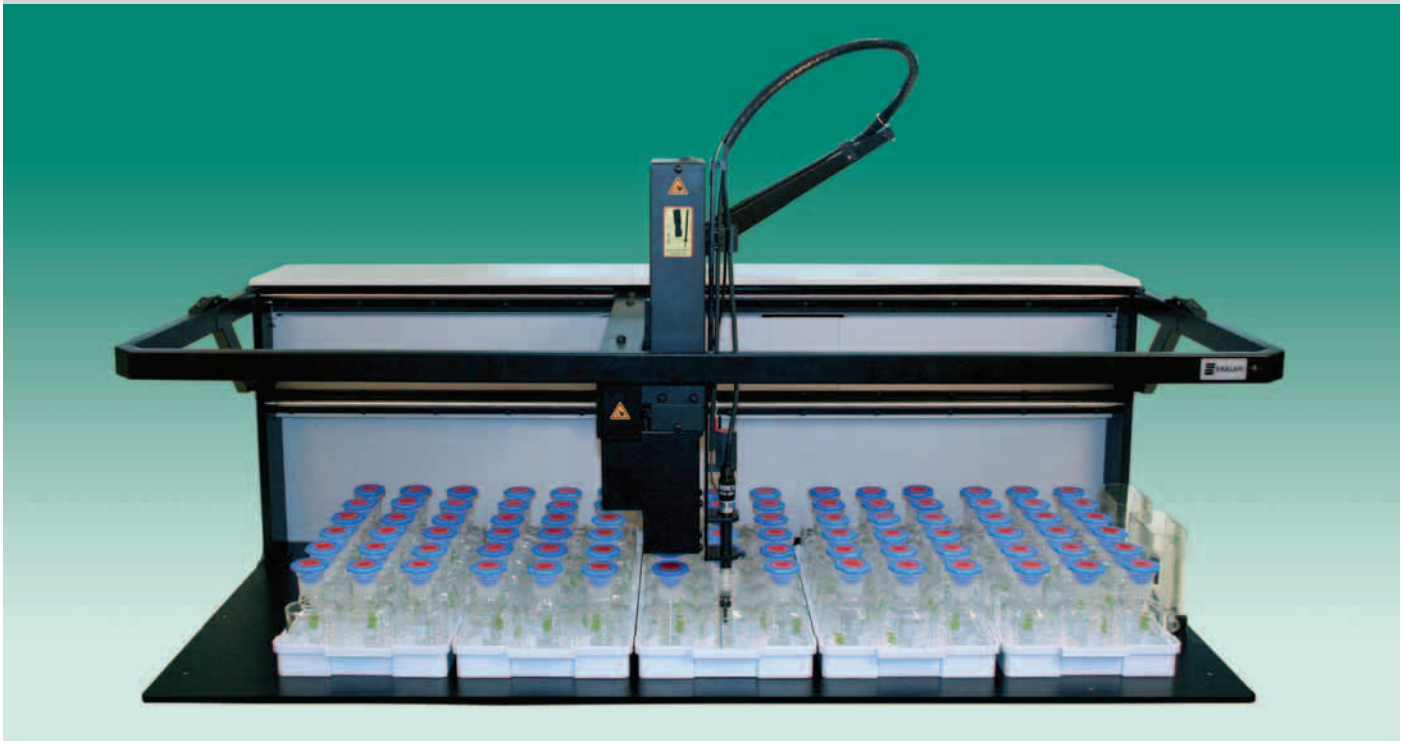
The analyzers are based on flexible platforms on which various kinds of liquid handling procedures can be automated. As an example, the system can be configured with a pipetting station that can dilute the original sample to different sized vials, which can be offered to different instruments for analysis.

The line of Robotic Analyzers consists of four different automation models, each offering their own specific advantages, but all providing 'hands-free', 'walk-away' automation. They range from small sized low-cost units to automate small sample batches through to the larger units that can analyze over a thousand samples per day.

The design of the Robotic Analyzers allows the instruments to meet your exact requirements resulting in increased productivity and accuracy of results, while reducing the sample turn-around time, eliminating errors and operator / sample interaction.

The analyzers are supplied with software for data handling and instrument control. The versatility and flexibility of the analyzers and the software allows an easy integration into any laboratory environment.

Biochemical Oxygen Demand (BOD)

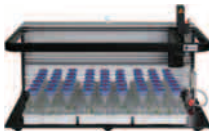


The BOD analysis is one of the most common applications for water laboratories. All Skalar Robotic Analyzers can provide the automation for BOD. Various possibilities are available based on the sample load, budget and the level of automation. From 32 up to 120 BOD bottles can be set as uninterrupted sample batches. Sample trays can be added during analysis runs to handle any required sample load.

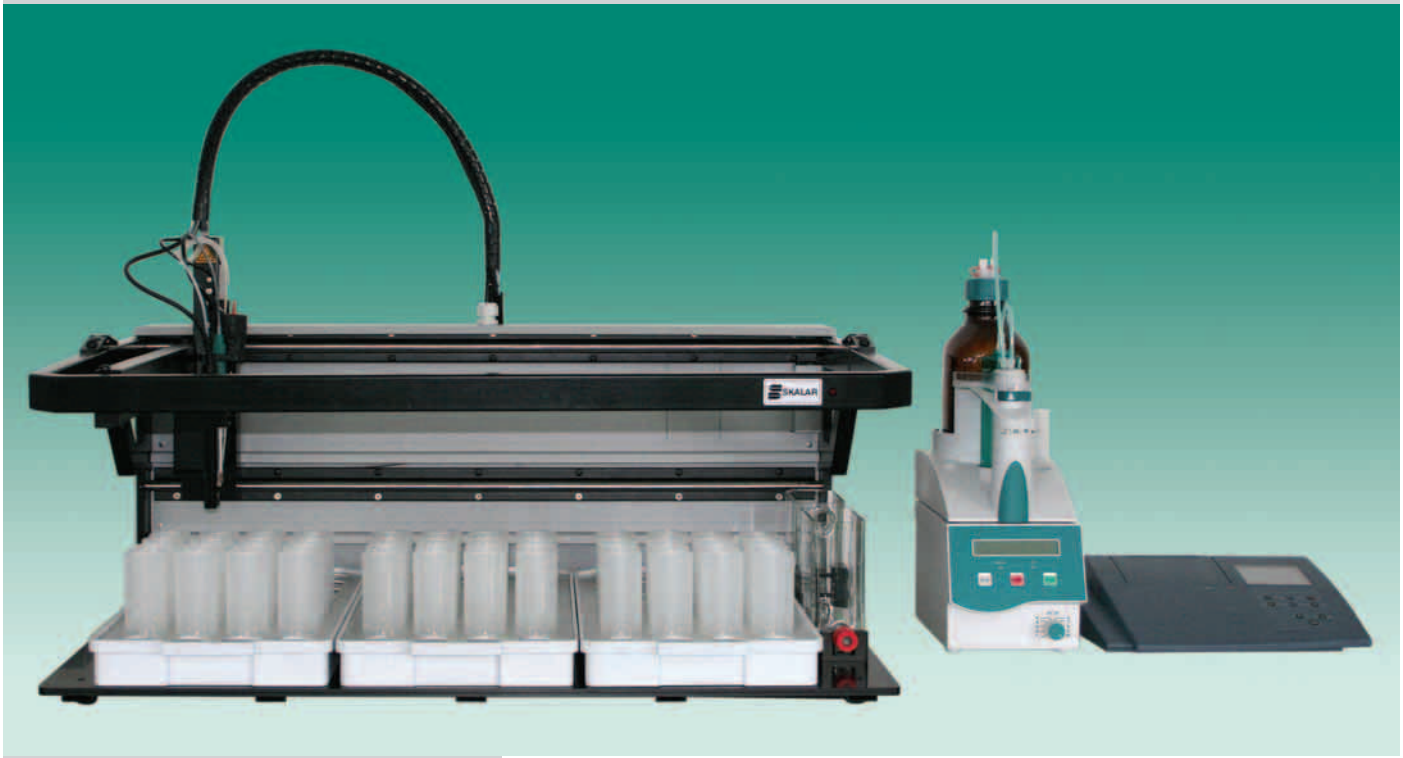
The analyzers can hold all available standard BOD bottles, and a wide range of sample trays are provided for various incubators. The automation of the labor-intensive BOD application can save up to 85% of operator time and provides the required consistency for the application.

Steps of Automation

- Addition of nitrification inhibitor / seed
- Addition of dilution water
- Sample homogenization
- Reading of Initial Dissolved Oxygen value (DO1)
- Probe rinsing between each reading
- Reading of Final Dissolved Oxygen value (DO2) after incubation
- Calculation of BOD according required regulations

Comparison BOD Analyzers	 SP10 Analyzer	 SP50 Analyzer	 SP1000 Analyzer	 SP100 Analyzer
Sample capacity	32 bottles (2 x 16)	54 bottles (3 x 18)	90 bottles (5 x 18)	120 bottles (6 x 20)
Probes	1	Up to 2	Up to 4	Up to 5
Auto capping/decapping	-	-	Dual	Single
Sample pipetting station	-	-	Option	Option
Muliple parameters	Yes	Yes	Yes	Yes
Barcode reader	Option	Option	Option	Option

pH / Conductivity, Alkalinity, Turbidity & Titrations



Applications

- Alkalinity
- Dissolved Oxygen
- Conductivity
- Color
- pH
- Hardness
- Turbidity
- Titrations
- Ion Selective Electrode (ISE)

Features

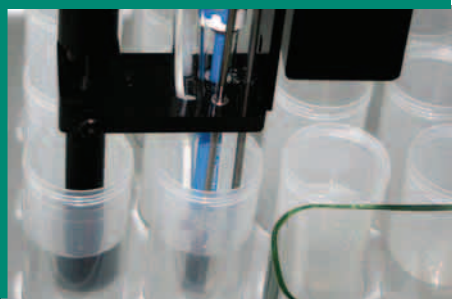
- Combinations for multiple applications
- Sequential or simultaneous analysis
- Barcode reader for sample identification
- Standard commercially available meters and probes used
- Flexible running sequence of individual parameters
- Rinse and Calibration procedures

The Robotic Analyzers can handle the automation of a wide range of parameters combined into one system for sequential and simultaneous analysis.

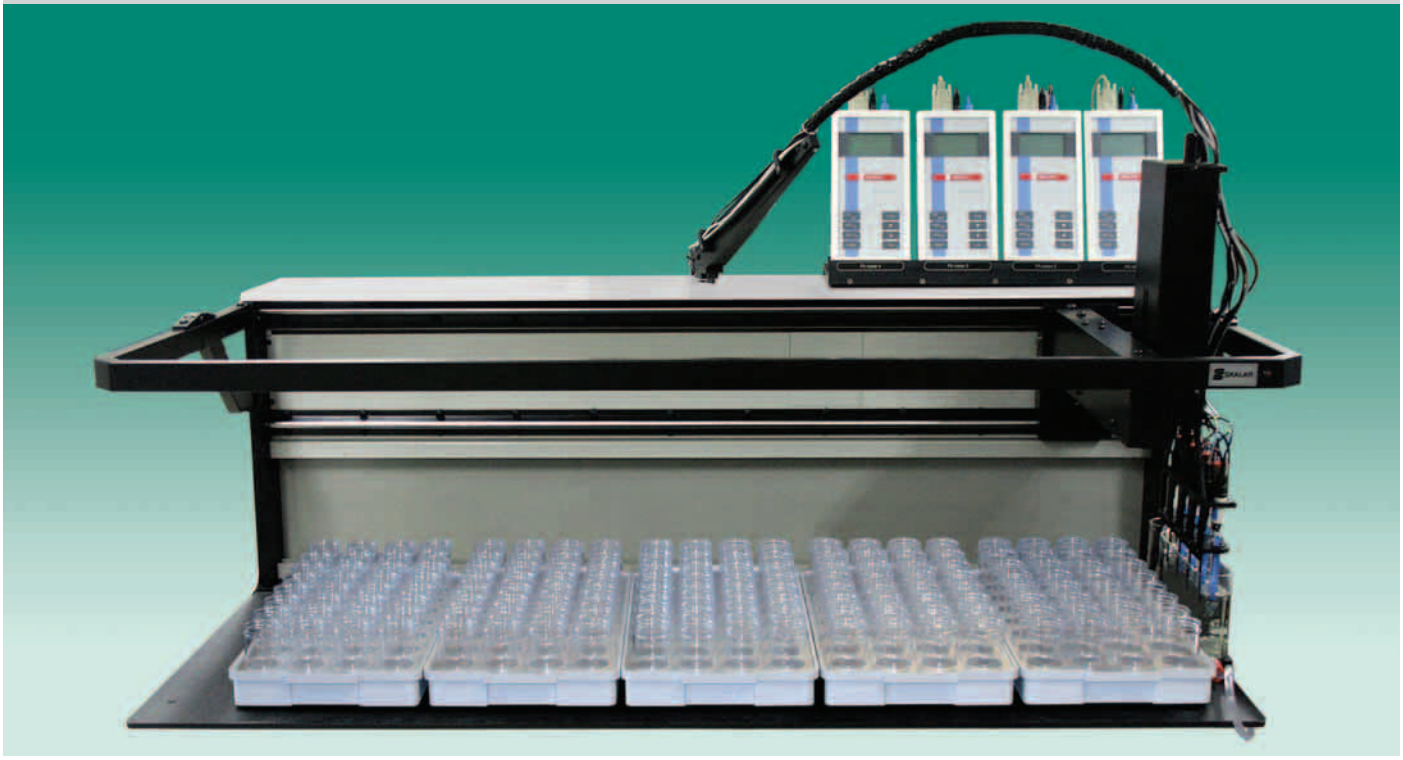
Custom-made configurations are available to meet the requirements of any laboratory. This includes the choice of various applications, the running sequence and the integration of a variety of sample racks and sample beakers. For instance, when the system is configured for four applications (e.g. pH, Alkalinity, Turbidity and Color), it can be user-defined whether the applications are required to run parallel or sequentially. The system also allows the selection of the analysis performed on each individual sample.

Depending on the application, calibration of the instrumentation can be performed automatically to ensure an accurate performance. Quality control checks and standards can be placed in between samples and probes can be re-calibrated automatically.

This flexible design of the Robotic Analyzers allows combinations of various applications in one economical system.



Automation for Soil Analysis

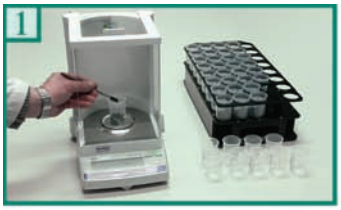


The soil-pH influences the availability of minerals for the plant. Each plant has a certain pH at which it is optimally grown and produced. The pH analysis is the most common parameter carried out on soil samples. Specialized laboratories analyze the soil and provide farmers with the required information. Based on the analysis results, the best method can be selected to improve the soil quality resulting in increased crop quantities and cost reduction.

The Robotic Analyzer can be configured for measurement of soil-pH in water extracts as well as in KCl, $CaCl_2$ or other extracts. The procedure includes the automatic calibration of the probe and addition of water, KCl or $CaCl_2$ solution for extraction. Depending on the prescribed procedure, the samples are left to settle for a pre-defined time and / or stirred before the measurement continues. A multiple probe configuration is available to increase sample throughput.

The SP10 and SP50 provide an economical solution for small sample loads. The SP100 and SP1000 models can be configured with up to four probes for larger sample batches. Parameters, such as conductivity (EC), can be added.

Example of the analysis sequence for pH in soil

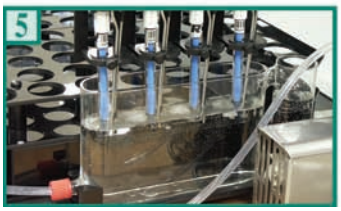


Measure or weigh samples and placed in the racks

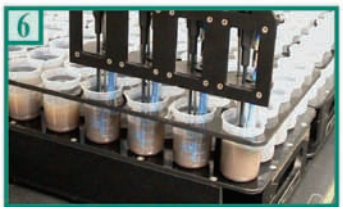
Place racks on the analyzer

Fill in the work list and start the analyzer

Extraction solution added, stirs samples in sets of four



Probe rinsing between each operation



Samples stirred again after a pre-defined settling period

Measurement of pH value

Sample concentrations calculated and stored

Clay Fraction Analysis

Classification of soil is important for environmental control and construction purposes. Soil classification is based on several factors such as absorption, the ability to shrink or swell, water retention and permeability. Most of these factors independently correlate with the particle size (clay fraction) of the soil. The clay fraction is measured according to for instance ISO 11277 and allows the soil to be categorized within stated classes.

The procedure to determine the clay fraction of soil is divided into four steps: Weighing the sample, removal of organic matter, removal of carbonates and the determination of the clay fraction. This last step is automated on the SP1000 Robotic Analyzer. The automation of this step is of particular interest because of the precise timing involved in the procedure. The sample is transferred into a volumetric cylinder of 1000 ml, which is placed onto the analyzer. Sodium pyrophosphate and distilled water are added automatically.

The sample is homogenized during a preset time interval. After a settling period (up to 8 hours) a portion of the suspension is taken at a pre-defined depth from the cylinder. This portion is transferred to an evaporation dish located on the SP1000 analyzer.

After drying, the remainder of the sample is weighed and the clay fraction is calculated by the software. This procedure can also be performed unattended allowing for overnight operation. The Skalar SP1000 offers an economical and 'walk-away' automation for the lengthy time-critical clay fraction analysis.

Chemical Oxygen Demand (COD)

COD is commonly determined to measure the amount of organic compounds and organic pollutants in surface water and wastewater.

COD is measured according to ISO 6060 amongst others. This includes a two-hour digestion with sulfuric acid, an oxidizing agent and a catalyst. After refluxing, the samples are cooled and are automatically titrated with iron-ammonium-sulfate to determine the excess of oxidizing agent.

The SP1000 analyzer in combination with the SP5000 digester automates the labor intensive COD analysis. After digestion the operator places the interchangeable sample racks onto the SP1000. The samples will remain in the same vials from digestion to titration. In addition, the SP1000 can be equipped with two titrators for range expansion, without changing the burette. This set-up allows for unattended operation.

A dual titrator set up can also be used for increased sample throughput. The software stores all calculated data.

Robotic Analyzer Software

Determination of Biological oxygen demand

	Pos	Predil	Volume	Totdil	DO ON	DO OFF	BOD _	Err	%_	YN_	Identity	Result
◆	1	1.0		1.0	8.93	8.43	0.40			Y	Blank	0.38
	2	1.0		1.0	8.71	8.35	0.36			Y	Blank	
	3	1.0	279.0	1.0	8.69	6.23	2.46	<	28.3	Y	Sample1	
	4	1.0	279.0	1.0	4.79	2.30	2.49		52.0	Y	Sample1	2.00
	5	50.0	279.0	50.0	3.15	1.20	97.50		61.9	Y	Sample2	100.00
	6	100.0	40.0	697.5	5.88	3.96	1112.15		32.7	Y	Sample3	1280.00
	7	100.0	100.0	279.0	7.74	2.68	1343.72		65.4	Y	Sample3	
	8	100.0	100.0	279.0	8.28	3.06	1388.36		63.0	Y	Sample3	
	9	1.0	3.0	93.0	6.69	5.50	75.71	<	17.8	Y	Sample4	
	10	10.0	30.0	93.0	7.69	5.62	160.97	<	26.9	Y	Sample5	
	11	25.0	60.0	116.3	9.02	6.02	314.08		33.3	Y	Sample5	310.00
	12	250.0	1.0	69750.0	8.75	7.75	43340.02	<	11.4	Y	Sample6	
	13	20.0	150.0	37.2	3.06	1.96	34.38		35.9	Y	Sample7	70.00
	14	20.0	150.0	37.2	6.23	4.23	67.86		32.1	Y	Sample7	
	15	20.0	150.0	37.2	7.90	5.20	93.90		34.2	Y	Sample7	
	16	1.0	279.0	1.0	8.46	8.02	0.44	**	5.2	Y	Sample8	
	17	1.0	279.0	1.0	2.45	1.55	0.90	**	36.7	Y	Sample9	
	18	1.0	279.0	1.0	8.73	1.01	7.72	>	88.4	Y	Sample10	
	19	1.0	279.0	1.0	9.89	3.96	5.93		60.0	Y	Sample11	6.00
	20	1.0	279.0	1.0	7.56	2.68	4.88		64.6	Y	Sample12	5.00
	21	1.0	279.0	1.0	8.20	3.06	5.14		62.7	Y	Sample13	5.00
	22	1.0	279.0	1.0	7.80	5.56	2.24	<	28.7	Y	Sample14	
	23	1.0	279.0	1.0	5.22	5.62	0.40	**	7.7	Y	Sample15	
	24	1.0	279.0	1.0	5.98	6.02	-0.04	**	-0.7	Y	Sample16	
	25	1.0	279.0	1.0	6.24	1.96	4.28		68.6	Y	Sample17	4.00
	26	1.0	279.0	1.0	6.67	1.23	5.44	>	81.6	Y	Sample18	
	27	1.0		1.0	7.13	6.98	0.15			Y	unsblnk	0.20

The Robotic Analyzers have been developed as a flexible automation solution to incorporate a wide variety of applications for single or multi-parameter requirements.

The software is designed as a modular data acquisition and instrument control system. For each Robotic Analyzer, the specific applications of the analyzer are pre-set in the software.

Simply creating a sample table and selecting a required application can start an analysis run. Calibration procedures are fully integrated if required before starting the analysis. Several access levels are available to prevent unauthorized data modification and operation.

During the analysis run, the results are displayed in real-time and calculated according to local and international regulations. Result display and calculations can be customized to meet each specific laboratory requirements. The sample table can be modified in case priority samples have to be analyzed.

The software consists of an analysis scheduler, including pre-set start-up and shutdown procedures including time intervals when required.

The Skalar Robotic Analyzer software compliments the range of Robotic Analyzers and meets the individual requirements of the busy modern laboratories.

Software Features

- Full analyzer control
- LIMS compliant
- Real-time result display
- User definable print and export options
- Storage of raw and calculated data according to Good Laboratory Practice (GLP)
- Optional barcode reader for sample ID's
- Integration of customized applications
- Addition of samples during the run
- Automatic start-up and shutdown procedures

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