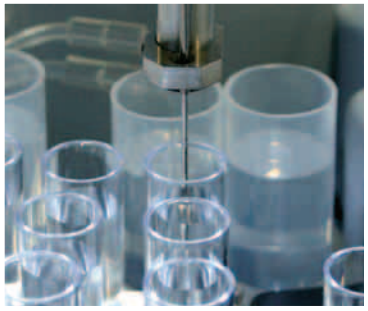
SKALAR

your partner in chemistry automation

The San^{++} continuous flow analyzer



Applications

Over the years Skalar has been working and developing applications for a variety of industries. Our comprehensive applications library provides a large selection of documentation and standardization references. Skalar applications are approved and/or conforming methods by regulatory agencies such as ISO, EPA, Standard Methods, EBC, ASBC, AOAC, Coresta. Each method has been successfully integrated into many production processes and quality assurance departments. Please contact Skalar for detailed information on any application or for more extensive analyzer information.

Water

The San^{++} is widely used for environmental analysis, such as surface water, ground water, waste water, drinking water and seawater. Laboratories processing hundreds of samples per day have successfully integrated the analyzer for nutrients, such as Ammonia, Nitrate, Nitrite and Phosphate. In-line digestion and/or in-line distillation is available for complex Total Phosphate, Total Nitrogen, Total Cyanide and Total Phenol analysis.

Soil, Plant and Fertilizer

Soil and Plant analysis is performed by many laboratories worldwide. The quality of soil and the availability of nutrients directly relate to a successful crop yield. Ammonia, Nitrate, Phosphate, Potassium, Total Nitrogen, Total Phosphorus and Urea are commonly analyzed parameters. These can accurately be automated on the Skalar San^{++} analyzer. In fertilizer production, the accuracy of analytical data is very important as it is used to precisely balance the raw materials used in the production process. The San^{++} has proven to provide the high accuracy required for fertilizer production and also assures fast turnaround times, allowing an immediate control of the process.

Beer and Malt

Skalar offers full automation for various parameters in the analysis of Beer and Malt. Applications such as Bitterness, ß-Glucan, Total Sulfur Dioxide, and Free Amino Nitrogen in beer, as well as the enzyme determinations in malt, such as Diastatic Power and Alpha Amylase are all easily automated. This results in a higher sample throughput with reduced analysis time. A faster and more accurate quality control feedback provides optimum production control which helps to assure a high quality of the raw and final product. Over the years a large library of specific methods has been developed complying with world-wide guidelines such as ASBC, EBC and Mebak.

Tobacco

In the tobacco industry, the San^{++} is a key element for process and quality control. It is used to analyze raw materials as well as the final product. Typical applications are Ammonia, Chloride, Nitrate, Total Reducing Sugars and Nicotine content. The modular concept of the San^{++} analyzer provides a design that is unique to every laboratories requirements. Accurate, reliable and reproducible analytical results are achieved by implementation of international standardized testing methods according to Coresta, AOAC, ISO and local regulations.

Other fields of applications in daily routine operation for various industries:

Food - Beverages - Pharmaceuticals - Wine - Mining - Metallurgical Industry - Detergents

Automated Wet Chemistry Analysis

Sampling **Chemistry Section** **Data Handling**

The modular concept of the new generation of Skalar San^{++} analyzers allows them to be configured to meet the requirements of today's laboratory. The system incorporates the latest technologies, making it the most reliable continuous flow analyzer and the world leader in automated wet chemistry analysis.

The San^{++} provides an extended range of auto samplers. Based on sample workload a sampler can be selected that fits the need for each individual laboratory.

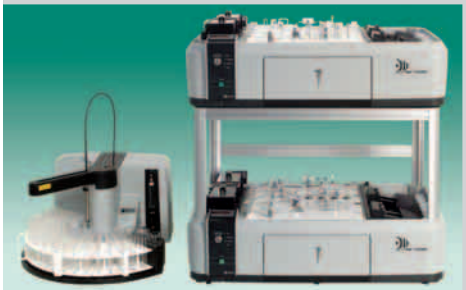
Skalar has been constantly developing and maintaining chemistry applications that comply with the methods described by many regulatory agencies. Continually updating and fine-tuning the Skalar chemistries throughout the years has resulted in an analyzer with the highest accuracy and precision of analysis results available.

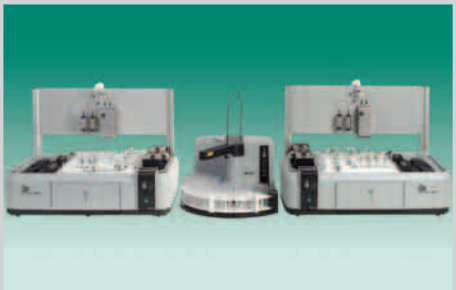
The flexibility and versatility of the chemistry assembly provides automated procedures which are only possible with the San^{++}. The chemistries can be configured with in-line dialysis, in-line digestion and distillation steps for complex applications. The San^{++} concept minimizes sample preparation with the capability of handling a wide variety of sample matrices.

State of the art detection, supported by the latest in software development, combine perfectly to make the analyzer the most sophisticated, but easy to use, fully automated system available.

Depending on the application a throughput between 20 and 140 analyses per hour can easily be achieved, resulting in the most accurate and cost effective means of analyzing the largest range of sample types. Daily workloads of 500 samples are easily automated, analyzing up to 16 parameters per sample simultaneously.

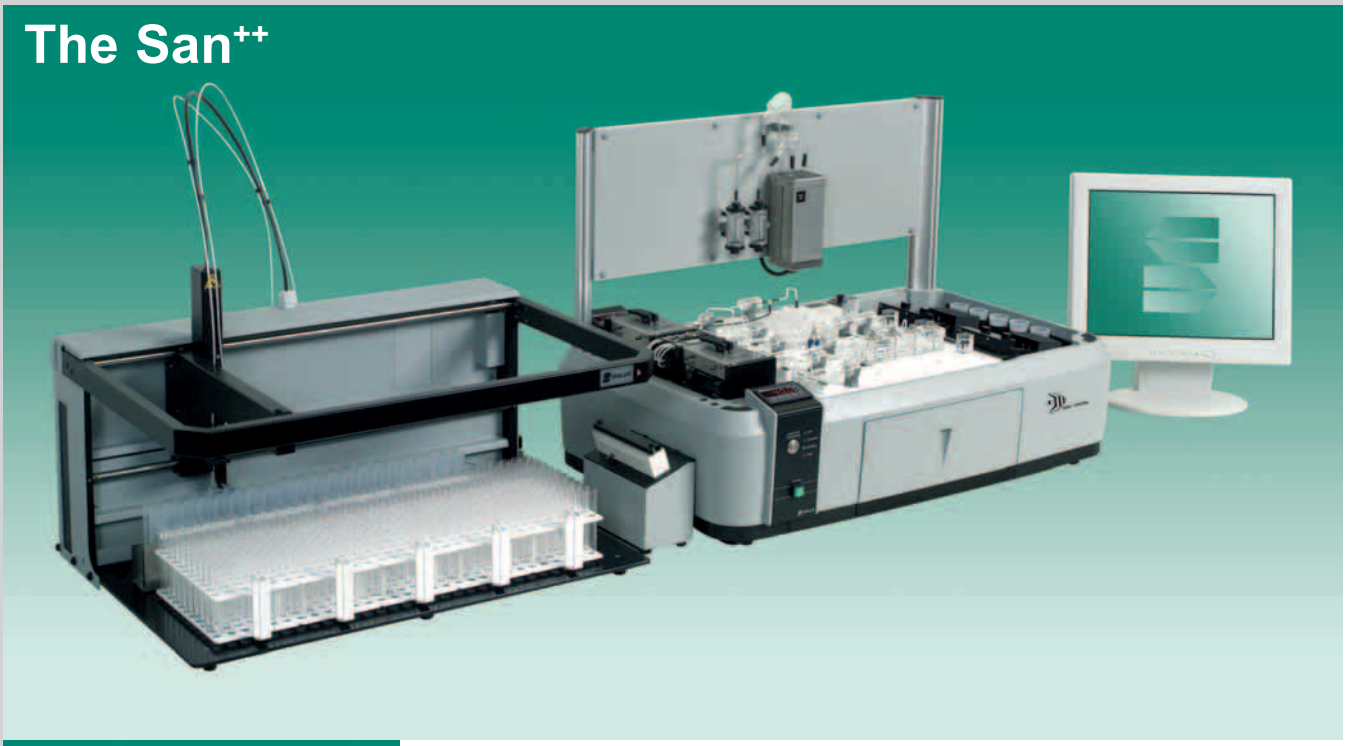
All Skalar systems are designed and manufactured according stringent quality control conditions in an ISO 9001 environment. The flow analysis technology used in the Skalar San^{++} is the most proven and reliable technology available for automated wet chemistry analysis.





Range of Auto Samplers

The San++



SA 1100/50

This random access carousel sampler is easy to use and quick to set up for complete automation. The unit holds up to 100 sample positions and an alternative cup plate is available with dedicated positions for calibration solutions. Priority samples can easily be inserted into the work list during the analysis. The sampler is fully controlled by the software and can be equipped with a soft keypad to allow both PC and manual control (SA1150). During operation, status indication of the sampler is provided by LED indication. The end of the analysis is indicated by audiovisual alarms.

SA 1050

This computer controlled random access sampler with its 140 sample positions is perfectly suited for laboratories with medium sized sample batches. The sampler is configured with four racks of 35 positions with a sample volume capacity of up to 12 ml. Standards, blanks, and other internal check solutions are housed in 11 separate reservoirs. An optional integrated dilution station adds to the functionality of the sampler allowing the automatic preparation of working standards and pre & post dilutions for known and unknown over-range samples. A dual needle configuration is available when simultaneous pick up of two samples is required.

SA 1074

With all the features of the above mentioned SA 1050, the SA 1074 accommodates an increased number of samples, with up to four needles to allow the simultaneous pick-up of samples with different matrices. A total number of 300 samples divided over five removable racks of 60 positions can be analyzed in one batch. Working standards, blanks, and internal check solutions are housed in a separate tray, which holds up to 40 vials. Automatic preparation of working standards and sample dilution makes the sampler a versatile tool to automate large sample batches and increase the laboratories capacity and flexibility. Additionally, this sampler can be customized to fit any sample rack and can also be equipped with an automatic bar code reader and sample stirrer.

The San^{++} Chemistry Section

The San^{++} chemistry section is based on an integrated concept consisting of a peristaltic pump unit, a segmentation injector with separate air compressor, chemistry application manifolds with waste receptacles and data collection with digital detection. The chemistry application manifolds include all the required components to completely automate the analysis, such as in-line heaters, dialyzers, digesters and distillation units. All parts are integrated into separate sections in the chemistry unit. The well-proven, compact, modular design is easily accessible for adjustments and maintenance.

Sample introduction

The analyzer is equipped with a robust peristaltic pump, consisting of up to 32 pump tube positions. For quick start-up and shut-down, the pump decks can be opened or closed in one movement, thus activating all the pump tubes at one time. The multi-speed pump has three settings. The high speed setting is used for a fast start up and rinse procedures. The stand-by mode is used when the system is ready but waiting for samples and the last setting is the operating mode. The pump unit consists of a separate integrated air-injection system, providing reproducible and accurate segmentation. 3-cuff pump-tubes are used to reduce maintenance and double the lifetime of the tubes.

Chemistry Manifolds

The SA 5000 chemistry unit can be configured with up to five chemistry manifolds. The SA 3000 chemistry unit can be equipped with 3 chemistry manifolds. This provides the solution for fast reaction applications as well as the automation of more complex processes that take minutes instead of seconds to react. The San^{++} is ideal for manipulations where sample clean up is necessary. The use of in-line dialysis removes interferences of particulates and interferences due to the background color of the sample. To reduce operator time, the most complex procedures are successfully integrated to minimize sample preparation. Some of the available procedures are in-line heating with the use of highly accurate reactors and in-line distillation for example in total cyanide analysis. In-line UV-digestion is used for Total Nitrogen and Total Phosphorus analysis and in-line solvent extraction for applications such as Anionic Surfactants. The chemistry manifold assures excellent visibility of the analytical process and confidence of analysis.

Range of Detectors

The high-resolution digital photometric detectors are integrated into an easy accessible, separate compartment of the SA3000/5000 chemistry unit. Each detector consists of an optical detection head with up to two filters and flow cells. The detector can handle both the de-bubbled as well as the bubble-gating (bubble-through flow cell) technique. The high-resolution detection results in an optimal signal-to-noise ratio assuring lower detection limits and a wider dynamic range. In cases where samples cause background interferences, Skalar can offer true optical matrix correction for compensation. This matrix correction is accomplished when the light beam is optically split after passing the flow cell and measured at two different wavelengths. The final result is automatically corrected for the interfering background and recorded. This method of detection is particularly beneficial when the matrices of samples vary, for example acid digests. For samples which have different refraction indices, for example high saline samples, Skalar has developed the unique 'turbo matrix correction detector' to avoid interferences which results in a stable signal and low detection limits.

In addition to photometric detection a wide range of other detectors can be connected to the Skalar San^{++} analyzer such as Infrared (IR) detectors, UV detectors, flame photometers, Ion Selective Electrodes (ISE), fluorimeters and amperometric detectors.

FlowAccess™ Software

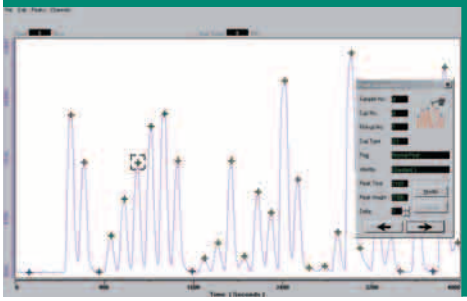
The San++ is controlled by Skalar's FlowAccess™ Software. This multi-tasking data acquisition and instrument control software has been designed from decades of experience in flow analysis. This has resulted in an easy to operate and versatile tool enabling full analyzer control. The accurate data processing, reporting and integration into LIMS networks perfectly fits into the routine laboratory environment.

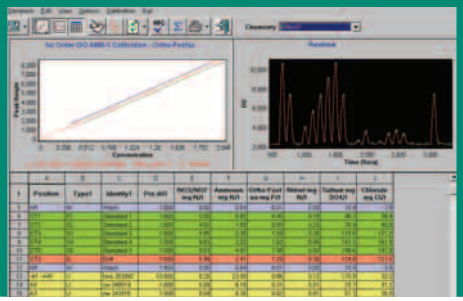
Various access levels can be defined to prevent unauthorized entry. The raw data files are stored separately so they can never be compromised during data handling. The main control screen shows schematically a presentation of the San++ analyzer, including displays of samplers, chemistry units, applications and detectors. This quick recognition makes it easy for daily routine operations. The software is designed to provide instant access to all parts of the analyzer.

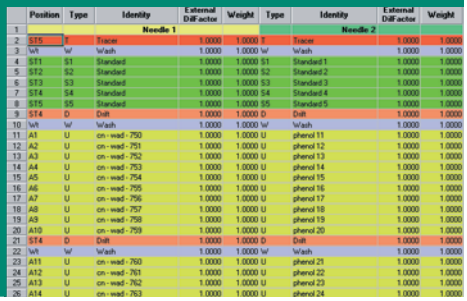
Prior to analysis, a sample table is either made by a "worksheet" layout or directly imported from LIMS. During the analysis the results are displayed and calculated in real-time. Up to 16 parameters can be measured simultaneously and displayed in real-time as a split screen or a layered screen. A multiple screen view shows the results, calibration curve and real-time peaks allowing easy interpretation of the run. Integrated quality control features assure accurate results and compliance with required regulations. These include Good Laboratory Practice features (GLP/CLP), full statistical support and quality control such as calibration and method validation. Various calculations are made on correlation, detection limit and determination limit. Analysis results can be exported to LIMS or downloaded in MS Excel® format, plus customized print reports can be generated.

SOFTWARE FEATURES

- Real time graphics display of multiple analysis channels, peak detection and editing
- Real time results calculation and presentation
- Import of ASCII or Excel® format tables downloaded e.g. from LIMS
- Integrated CLP protocols and calibration statistics
- Password protection with definable user levels
- 21 CFR Part 11 compliant
- User definable formulas for real time calculations with analysis data
- Controls up to 16 analysis channels simultaneously
- Complete raw data storage from each analysis channel for diagnosis and post validation







Options and Accessories

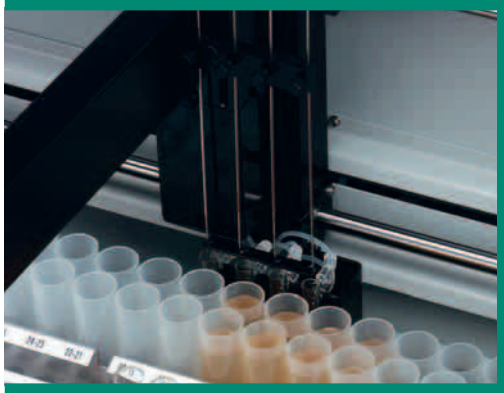
A number of options and accessories for the San^{++} analyzer are available. They allow the analyzer to be completely customized in order to meet the requirements and high standards of today's modern laboratories. Whether there is a demand for fast throughput, increased sample batches, extended analytical range or the integration of complex sample preparation steps, the San^{++} analyzer offers a unique solution towards automated wet chemistry analysis. Options can be offered allowing this modular system to grow with increasing laboratory requirements. If the requirements change in the future, the analyzer can be expanded, without compromises. Options and accessories include for example automatic start-up and shut-down, preparation of working standards, multi sample pick-up, automatic dilution and leak detection.

Unattended and extended hours of operation

The San^{++} offers the most versatile option for reagent manipulation, from manual reagent switching valves to fully computer-controlled valves for complete automation for unattended and extended hours of operation. This avoids manual manipulation of reagent-lines and eliminates possible operator error. The computer controlled valves allow the analyzer to automatically start-up and shut-down, including programmable rinse cycles without operator intervention. This effectively extends the operation time of the analyzer and increases sample throughput.

Multiple sample pick-up and sample mixing

When samples from two different matrices have to be analyzed in one analysis run, the auto samplers can be equipped with multiple sample needles. This allows for example the analysis of soil extracts and plant digests to take place simultaneously, or similarly when samples are preserved differently, such as Total Cyanide (alkaline) and Total Phenols (acidic). When solids in samples are likely to settle and are of significance to the analysis, a unique sample-mixing device can be added to the auto samplers for homogenous and reproducible sampling.



Automatic dilutions & preparation of working standards

To extend the analytical range of the application, a built-in dilution station can be added into the auto samplers. If the concentration of the sample falls outside the calibration curve, the sample is automatically diluted to fit within the calibrated range and re-analyzed without operator intervention (post-dilutions). Samples can also be pre-diluted prior to analysis when concentrations are known to be over-range. Furthermore, the dilution station can prepare working standards automatically from a standard stock solution. The dilution station reduces manual sample preparation and contributes to the accuracy and flexibility of the method.

Integrated Leak Detectors

To protect the analyzer and the environment, the San^{++} is equipped with a three-position leak detection system. This enables the unit to continuously monitor for spillages and allows for fast intervention. The software allows the operator to program the action that the analyzer should take in the unlikely event that a leak occurs.

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