ZEEnit

Quality is the difference

More than 150 years of experience in the field of Optical Spectroscopy

Analytik Jena has a long tradition in developing high quality and precision analytical systems which dates back to the inventions made by Ernst Abbe and Carl Zeiss. Today Analytik Jena is a leading manufacturer of high performance analytical instruments and one of the most innovative companies.

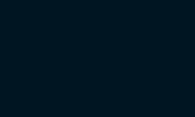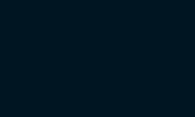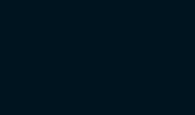|	
1874	First spectrometer
1924	First Pulfrich photometer – the basis for the development of spectrophotometry in Jena
1937	First flame photometer – Carl Zeiss establishes the methodology of flame photometry
1963	SPEKOL and SPECORD update the tradition of Pulfrich photometers in Jena
1969	Prototype of the first commercial flame AAS
1971	Launching of the first AAS 1 of Carl Zeiss Jena
1982	First simultaneously measuring UV/Vis spectrometer with MCS
1993	Introduction of the first Zeiss-AAS graphite system with transverse-heated graphite furnace
2000	AAS ZEEnit, the first transverse-heated Zeeman graphite furnace AAS instrument with variable magnetic field and 3field mode
2003	First high speed photometer with 50 cell changer and Diode Array Detector
2004	Analytik Jena AG presents the first High-Resolution Continuum Source AAS (HR-CS AAS) worldwide, a revolution in Atomic Absorption
2006	HR-CS AAS for graphite furnace technology

Made in Germany

Technology
Quality
Innovation

analytikjena

Recent technologies translated into a family of instruments that sets new standards

Decades of experience in the development of spectrometers, plus the most recent findings made in electronics, magnetic field technology and furnace design, have gone into the ZEEnit series. The ZEEnit 700 P completes yet another milestone in spectrometer development at Analytik Jena: A system that combines excellent analytical performance with a high degree of user friendliness.

Dual atomizer concept

A design that is impressive because of its functionality. Change of techniques without any mechanical movement, conversion or readjustment – immediately ready for use.

Transverse-heated graphite furnace

The future-oriented furnace heating concept, which can cope with a variety of samples, including complex matrices and refractory elements.

Third-generation magnetic field technology

Maximum sensitivity and optimum matching to the analytical problem thanks to the variable magnetic field strength up to 1.0 Tesla and the use of two different correction modes. Expansion of the linear working range by means of the 3field technique, and a dynamic mode for automatic adaptation to varied element contents – the ZEEnit opens up unparalleled capabilities in Zeeman graphite furnace AAS.

Automation has never been more convincing

Flexibility and efficiency, musts in fully automatic sample preparation, are provided by AS 51/52 and MPE 60 z, intelligent autosamplers for more than just automatic dosing. Functions such as intelligent dilution and preconcentration, automatic dosing of modifiers, and automatic depth adjustment, combined with high dosing precision, make overnight operation a mere routine and guarantee profitable sample throughputs.

ZEEnit *Plus*

The new ZEEnit series includes the ZEEnit 650 P, a Zeeman AAS for graphite furnace and hydride technology and the ZEEnit 700 P, a compact tandem spectrometer for flame mode, hydride and graphite furnace technology. Both devices are able to analyze liquid and solid samples in one and the same system.
Both systems combine intelligent design with optimum functionality and convincing performance features:

- *Plus* 8 lamp changer for maximum automation and sample throughput
- *Plus* Single and double beam available
- *Plus* D2 background correction and Zeeman third generation background correction
- *Plus* Integrated RFID Tool for working with coded lamps
- *Plus* Integrated super lamp power supply for best analytical performance
- *Plus* Integrated High-end Vision Tool for best observation and control of sample injection and sample drying in the graphite tube
- *Plus* Direct analysis of solid samples
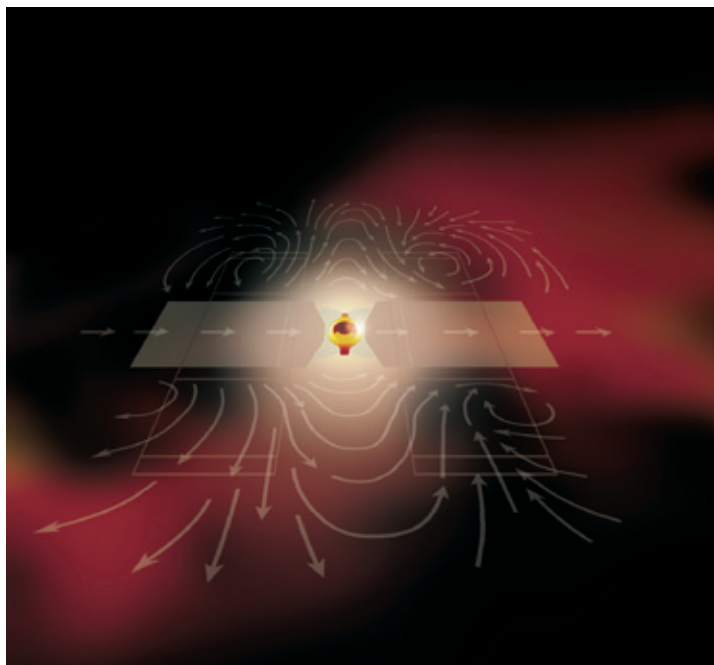
A match for every requirement

Variable sample feeding techniques

This is unique: Smooth feeding of liquids and solids (direct analysis), and fast change between both techniques.

ASpect LS data analysis and control software

A convincing software concept that is not only efficient for laboratory routine but also gives the user every freedom for method development and optimization. Analytical quality assurance and validation feature greatly in this product.

Long high-performance life guaranteed for 10 years

Quartz coated optics and encapsulation guard against corrosive laboratory atmospheres and extend the life span – an advantage we pass on to our customers: A long-term warranty of ten years is standard for our atomic absorption spectrometers!

Thoroughly studied burner-atomizer system

A burner-nebulizer-system optimized over many AAS generations and a mature mixing chamber concept ensures stable operation and high repeatability in the flame mode.

Designed-in safety

Safe operation is a top priority especially in flame AAS. With a multitude of sensors, all safety-relevant parameters are constantly monitored and controlled. All functions, from flame ignition to switching types of gas and to safe quenching, are PC controlled and fully automated.

high end optical components · analytikjena · 10 Years · long-term warranty

◄ *ZEEnit 700 P with hydride system and AS 52 s*

State-of-the-art technology for higher accuracy and precision

A unique furnace design

The transverse-heated graphite furnace is a must where optimum atomization conditions and high sample throughput are required simultaneously. This clearly superior concept has, for a number of years, been successfully employed in all Analytik Jena graphite furnace AAS systems. It guarantees uniform temperature all along the optical axis throughout the tube and eliminates memory and condensation effects that occur at the cooler tube ends of conventional, longitudinally heated graphite tubes. Lower atomizing temperatures prolong tube life. Problem-free analysis of low-volatility elements (e.g., vanadium, molybdenum), and the direct analysis of solid samples are possible.

Sensorless adaptive temperature control (STC) completely monitors the function of the graphite tube and compares important actual furnace parameters with the settings. Deviations of the tube resistance caused by chemical corrosion and ageing of the graphite material are immediately corrected, and the correct temperature is readjusted. The temperature inside the graphite tube is monitored and recalibrated by a unique emission-independent, pyrometric quotient method. A formation routine optimally prepares new tubes for the analyses and checks the overall status of the furnace. This is the only way to ensure that your measurements stay comparable over long times.

The resulting benefits for your daily routine speak for themselves:

Marked improvement in accuracy

Transverse-heated graphite tubes considerably diminish many chemical interferences and therefore matrix effects. As a consequence, your analyses are almost memory-free.

Cost-efficient analyses

To save operating costs, you can choose between two types of tubes:
The platform tube allows you to determine all elements with just one tube – no need to change tubes during a multielement routine. For simple applications, the low-cost wall tube is the best choice.

Time-saving and amazingly easy

The transverse-heated tube design makes tube change and adjusting the sampler pipetting tip easier than ever before.

STPF

Thanks to the consistent implementation of the "Stabilized Temperature Platform Furnace" (STPF) concept, atomization interferences are reduced to a minimum. This directly improves the accuracy of the analytical data. The ZEEnit thus meets all requirements for interference-free graphite furnace analyses. This considerably increases efficiency, and saves time.

Left to right:

▶ Graphite tube change without adjustment

▶ SSA 600

▶ Solid sample carrier

▶ Liquid dosing unit
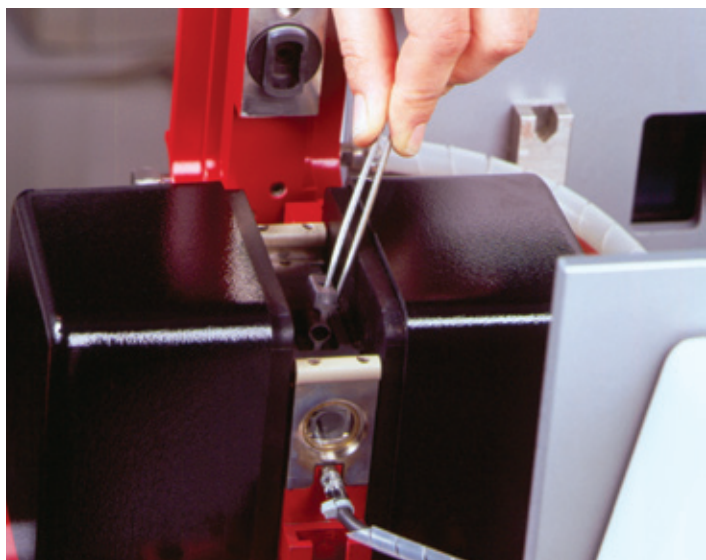
Flexible analysis for all kinds of samples

The ZEEnit is the only system worldwide that permits the direct feeding of both liquid and solid samples using the solidAA® technology. The dream of smoothly changing between liquid and solid techniques has come true. With its built-in Zeeman system, the ZEEnit of Analytik Jena excel with the exacting demands the direct analysis of solids places on background correction and on the graphite furnace.

Two different feeding systems for solid samples are available:

SSA 6 z – manual solid sampler
Manual module for the reproducible insertion and removal of the sample carrier. Even with external manual weighing, automatic data transfer is made via the ASpect LS software.

SSA 600 – automatic solid sampler with integrated microbalance
This system allows routine solid AAS. Not only transport of the loaded sample carrier into the furnace but also weighing with the fully integrated microbalance is completely automated.

Liquid dosing unit for versatile applications
With the new liquid dosing module, solid sampling becomes even easier. A liquid calibration out of one or more stock solutions now is done automatically by the sampler. The modifier is also automatically pipetted to each solid or liquid sample.

A specially optimized sample carrier can be used for many kinds of solids – from powders to granulates. The carrier geometry ensures optimum atomizing conditions in the solid tube and reliable transfer processes in sample feeding.

The analytical advantages
- Analysis of the unadulterated original samples
- No time-consuming sample digestion
- No dilution effect with substances harmful to health or the environment
- Minimized risk of contamination
- High sensitivity
- Genuine microvolume method (sample volumes in the order of µg or mg)
- Detection limits in the pg and fg ranges

The economic benefits
- Speed
- Reduced costs
- Flexibility
- Efficiency
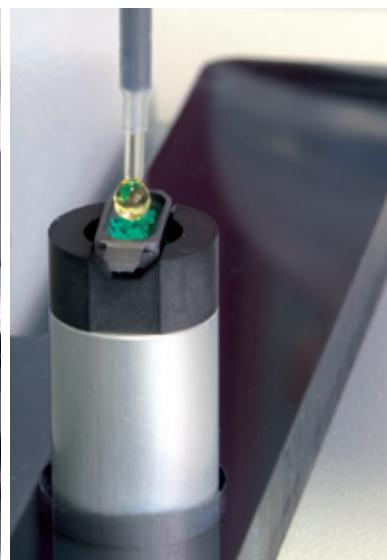
User-oriented:
New standards of operating convenience

The „Dual-Atomizer" concept, an important component of the new design concept, guarantees a fast and unproblematic change from flame mode to graphite technology. Completely without readjustment or complicated change of autosampler – one click in the software does it all. That means fastest operational readiness and simple handling for the user.

Among the basic conditions for smooth operation in trace analysis are regular maintenance and cleaning of the furnace parts. The furnace slides out of the sample compartment to a defined parking position, which provides the necessary access for cleaning and maintenance.

Completely automated optimization of the parameters

Great emphasis is placed on innovative functionality when developing devices. Fully automatic routines optimize the analysis process and thus also guarantee the optimum conditions at high sample throughput and therefore the maximum reliability of the results.

Pyrolysis and atomization temperatures are changed using the „Optimization of the furnace parameters" software function and adapted to the respective application. At the same time, an integrated camera, the „Furnace Vision Tool" monitors the deposition of droplets and the drying phase in the graphite tube. Information in unique full-color image quality provides detailed monitoring and effective correction.

In the new ZEEnit family all lamp data are automatically read and recorded using a RFID tool for highest operator convinience.
The lamp is identified during initialization, the operating parameters are set and the running times are monitored.
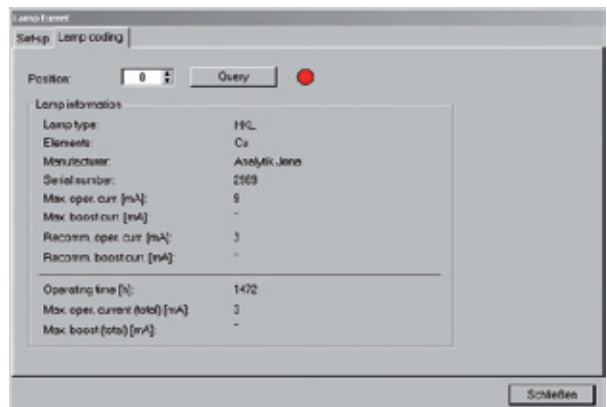
🔺 *Display of coded lamp parameters*

🔻 *Sequences of the integrated camera in the graphite furnace*

▲ *ZEEnit 650 P and SSA 600*

▲ *Graphite furnace in service position*

The ZEEnit 700 P offers solutions for fast, automated routine operation, whether absorption or emission. To achieve optimum results, fuel composition and burner height can be automatically adjusted to the respective sample. The fully automated Total Flow Gasbox, which is integrated in all ZEEnit systems, ensures the settings and monitoring of all gas parameters.

Thanks to automatic height adjustment, the burner head is always at a perfect position. Even for changing requirements and measurements of different elements in one sequence the condi-tions are always kept at an optimum by the efficient optimization routine.

Accessories

Accessories such as the Segmented Flow Star (SFS) or the Scraper help you face the challenges of complex matrices in flame analysis. The SFS is capable of dosing minuscule sample volumes by time-controlled flow injection. Thanks to continuous system rinsing, it extends the stable working time with samples of high matrix or salt contents. The Scraper facilitates work with the nitrous oxide flame. It automatically removes graphite deposits from the burner slot, ensuring continuous operation and minimizing manual cleaning chores.
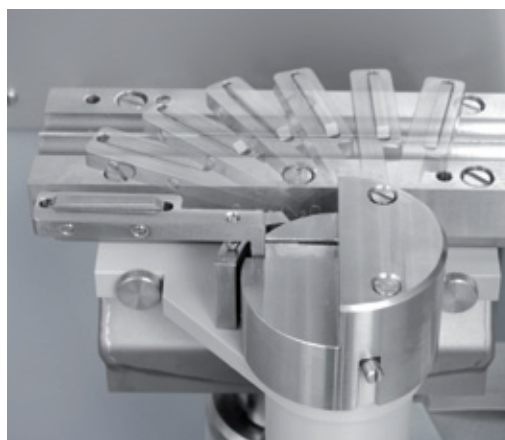
Left to right:

◀ *Coded HCL*

◀ *SFS 6 Injection Module*

◀ *Scraper – the automatic cleaning module*

9

For maximum efficiency and high sample throughput

▲ *MPE 60 z*

The automation concept

AS 51 s and AS 52 s make your routine analyses of standards and samples almost fully automatic. Integrated in the overall concept of the instrument, either sampler can be simply installed directly into the sample compartment. This saves space and minimizes tubing lengths – the best way to prevent contamination in case of real samples.

To prolong the service life of the samplers, all parts possibly contacted by acids or solvents are made of corrosion-resistant materials. Varied, freely selectable rinsing routines markedly reduce the risk of carry-over and contamination.

The intelligent dilution function of the AS 52 s makes manual dilution, a time-consuming and error-prone process, unnecessary. Automatically, it dilutes your samples down to a factor of 1:625. Therefore, sample lots with greatly varying element contents can be processed without interruption.

More than only a sampler

With the MPE 60 z, the autosampler for graphite furnace AAS of liquid samples, automated sample preparation and analysis are easy:

- Automatic generation of reference curves from one or several stock solutions (up to ten points)
- Dosing of extremely small sample volumes with excellent repeatability
- Automatic sample dilution and enrichment by a specified factor
- Intelligent automatic dilution of samples exceeding the calibration range; clean control limits to avoid contamination
- Automatic enrichment of samples below the calibration range
- Unique automatic correction of the immersion depth for every vessel containing sample or other liquid
- Robust, low-noise operation
- Fast, easy adjustment

Its many functions and the automatic running of optimizing routines make the MPE 60 z an intelligent sample preparation station.

If concentrations exceed the calibration range, an automatic clean control prevents contamination of the subsequent samples. All these functions are completely integrated in the autosampler, so no costly, space-consuming extras are required.

▲ *AS 52 s*

▲ *Hydride system*

With a simple lock mechanism, changing burner heads is just as easy as attaching the sample cell unit for hydride technology.

The determination of mercury and the hydride-forming elements down to the lowest concentration ranges has always been a special challenge. The ZEEnit takes up that challenge with a diversity of solutions. Combination with the hydride systems can be implemented in two ways.

- The traditional way: Atomization in the electronically heated quartz cell.

- The future-oriented way: Hydride formation coupled with Electrothermal Atomization.

HydrEA technique

Coupling the hydride and graphite furnace techniques opens up new prospects for the determination of hydride-forming elements (e.g., As, Se, Sb). As these elements can be preconcentrated in the graphite tube, the detection sensitivity increases, cross-over effects and contamination problems are minimized and matrix influences are reduced – the appropriate response to the demand for ever lower detection limits.

♥ *Sample tray*

Third generation Zeeman magnetic field technology

In addition to efficient deuterium background correction, Zeeman technology is a must for many applications. In other commercially available Zeeman systems, the magnetic field has a fixed strength. The ZEEnit allows the user to vary the magnetic field strength.

The advantages are obvious:

Optimum sensitivity

This is the only way to exploit the benefits of the Zeeman system for all elements. Varied according to the Zeeman factor, the magnetic field strength guarantees optimum sensitivity in every case.

Flexibility with varying concentrations

To ensure fully automatic routine work despite varying concentrations, the dynamic mode combines the 2field and 3field techniques. Two absorbances are measured within a measurement cycle, and two calibration curves established (Fig. 3). Depending on the concentration, either the high- or low-sensitivity calibration curve is used for data analysis. Large batches of samples with varied contents can thus be processed fully automatically.
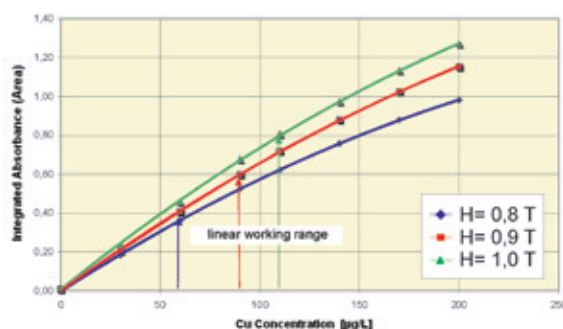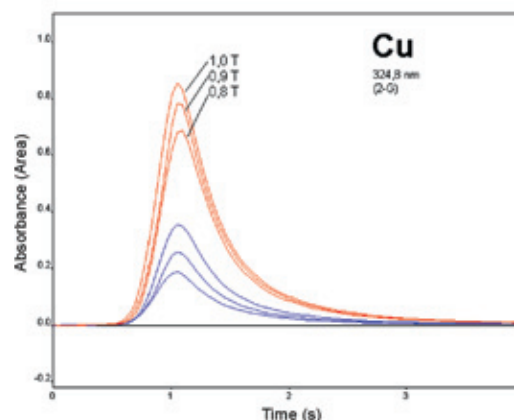

Fig. 2: Higher sensitivity through an increase of the magnetic field strength
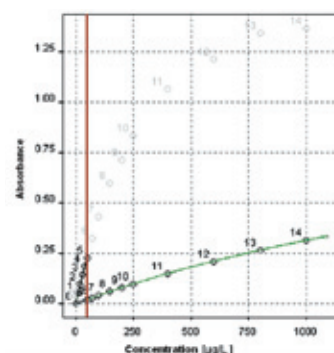
Fig. 3: Application of the dynamic mode for Pb calibration from 10 to 1000 µg/L

Fig. 1: Expansion of the linear working range

Wide dynamic measuring range

Added to the conventional 2field mode (magnetic field on or off), the unique 3field mode (magnetic field off, medium, or maximum) provides the user with unparalleled analytical capabilities. The use of the variable magnetic field in the special data extraction mode makes it possible to calibrate over more than two concentration decades in Zeeman GF AAS. The measuring range and the linearity are considerably expanded towards higher element concentrations. High-factor dilutions are no longer required. Problems caused by diluent contamination and error sources in sample preparation can be avoided. This saves time and facilitates routine with higher element contents also.

Clearly structured and flexible – just how modern software should be

ASpect offers both routine operation and multifarious development and optimization facilities. It allows comprehensive control, monitoring and recording of all processes run in the spectrometer and its accessories.

Advanced user-friendliness

Simple, routine handling on one hand, great flexibility on the other – ASpect meets both requirements with perfection. The clearly laid-out user interface makes method development on the screen fast and simple. Ready-to-use cookbook programs facilitate getting into method development. With automatic optimizing routines, the user can easily test the limits of the system's capabilities.

Automated optimization

The comprehensive external PC software ensures the highest degree of automation for all techniques. The automatic optimizing routine simplifies the adaptation of methods to an unknown matrix. All parameters and functions are automatically monitored and controlled. The software automatically optimizes and adapts flame and graphite tube parameters, such as Zeeman magnetic field strength in the 2field or 3field mode, atomizing and pyrolysis temperature, roll-over effect, and control of the 3field mode.

Data postprocessing the easy way

To postprocess measured data by external programs, ASpect® offers diverse export routines in compatible data formats. Linking into networks or data transfer into LIMS system is not a problem either.
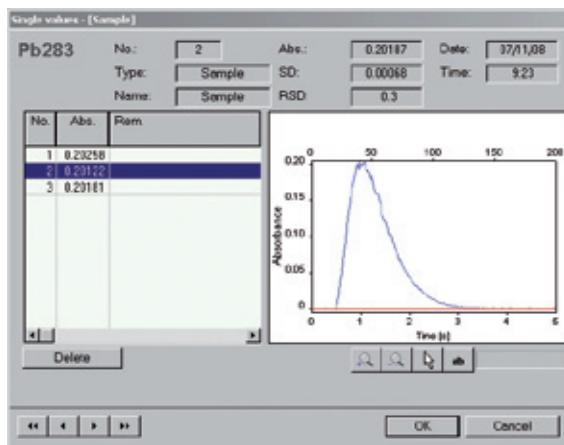
🔺 Display of measured data
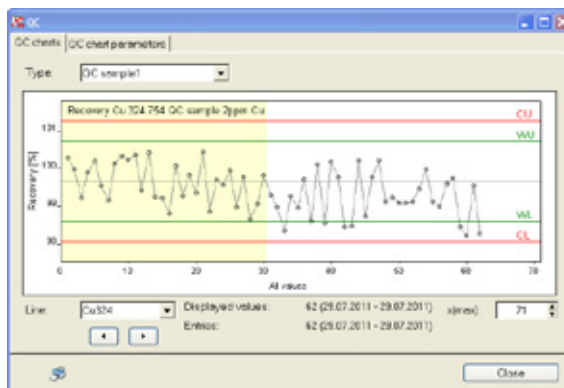
🔺 Quality assurance control chart

Conforming to standards and rigorous requirements

Quality Control and GLP

In view of today's statutory and in-house requirements, comprehensive quality assurance is a prime consideration implemented in the AAS software. According to GLP, all analytical data must be accessible and their accuracy ascertained and documented. Compliance with these requirements can be assured by a variety of measures for the fully automatic monitoring of the precision and accuracy of measurements:

- Keeping different control charts for statistical quality control
- Various responses when error limits are exceeded or warning levels reached
- Automatic instrument functionality test
- Data recording and printout conforming to GLP

Self Check System (SCS)
- Maximum operating safety
- High user safety through safety valve technology and optimal measuring conditions and high operating safety through automatic control of gas flows and safety valve technology
- High operating safety of the furnace through fully automated furnace system control
- High system service life through automatic temperature monitoring
- Electrical operating safety

- Gas pressure safety through software controlled monitoring of the optimal pressures of the gases
- Ensuring smooth non-stop operation through automatic control of liquid quantities and safety functions

FDA 21 CFR Part 11

Conformity to FDA 21 CFR Part 11 is a must for modern analysis software. The functions integrated in ASpect LS ensure data security as well as the reliability, lucidity and traceability of all actions throughout the measuring time. All processes are presented in easily comprehensible terms and with a clear layout. Comprehensive user management, an electronic signature facility and the Audit Trail satisfy the requirements of FDA 21 CFR Part 11.

In the User Management function you can define the access rights of individual users. Passwords with specified runtimes guarantee data security.

In the Audit Trail, all actions and accesses during the run of a measurement are lucidly recorded. Together with the electronic signature, this allows every result to be traced back and prevents manipulations.
Convincing at every audit!
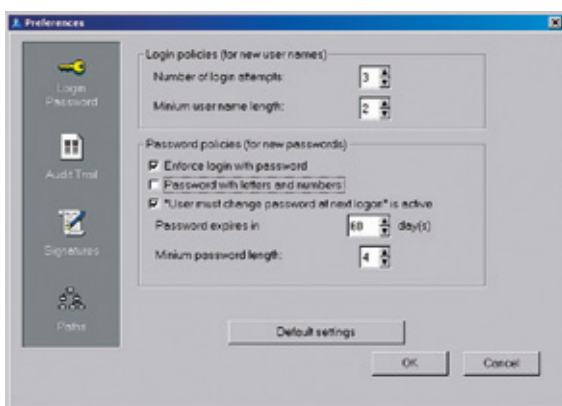
🔺 *User Management*
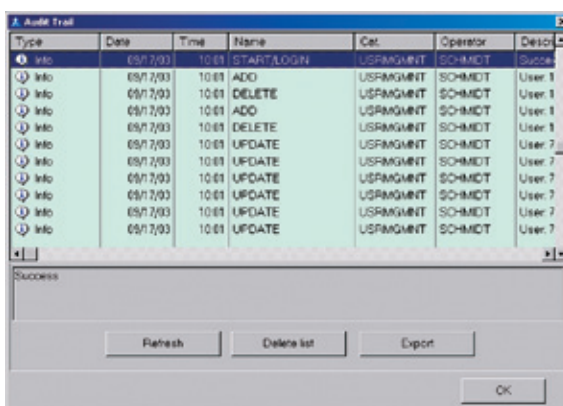
🔺 *Audit Trail*

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TIC

Subject to changes in design and scope of delivery as well
as furhter technical development!