

SPECTRO ARCOS 165

High Resolution ICP-OES Spectrometer for Routine Elemental Analysis Requirements in Environmental Protection, Academia and Industry



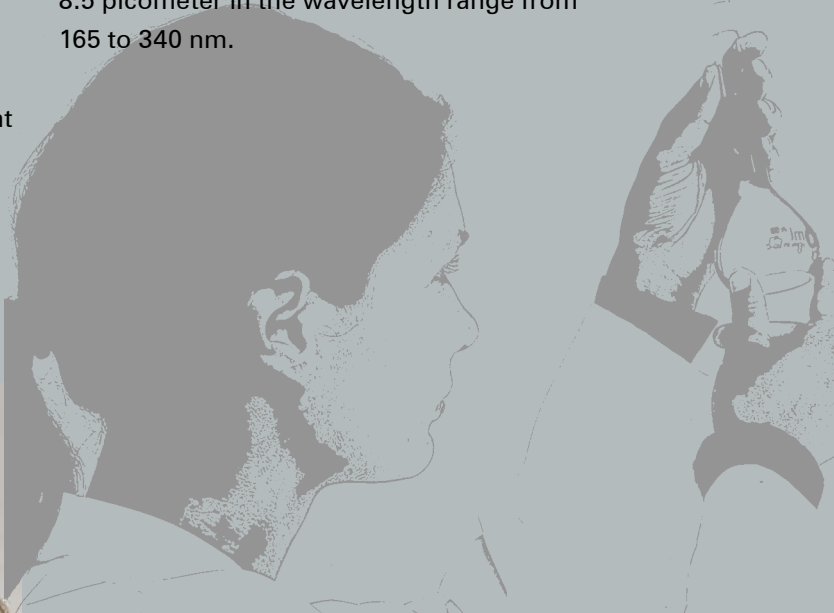


Cutting edge technology for routine analytical tasks

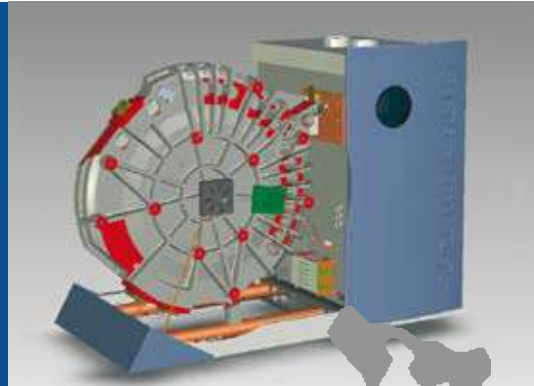
ICP-OES spectrometers represent a fast and uncomplicated analytical solution and are therefore widely utilized for routine elemental analytical tasks. However, conventional instruments designed for this purpose often reach their limits when the requirements become more demanding, - are unable to grow with the growing needs of the laboratory or changes in legislation. The SPECTRO ARCOS 165 does not have such limitations. The instrument offers the optimum in capability and flexibility as an economic solution and thus, offers the maximum in efficiency for operations where it counts the most.

The SPECTRO ARCOS 165 is different from conventional ICP spectrometers. The prominent left side of the instrument houses the unique optical system – a major development with unbeatable resolution, accuracy and stability.

The compact instrument fits on every ordinary lab bench enabling it to be easily integrated into existing laboratories. Housing and fluid paths are fitted with a chemical resistant coating. The entire sample introduction area is protected against damage from leaking sample fluids. All components and connections are accessible – without moving the instrument – from the front and sides, simplifying maintenance. The SPECTRO ARCOS can be outfitted with an interface for either axial or radial plasma observation. The CCD optic system in Paschen-Runge mount delivers a matchless resolution of 8.5 picometer in the wavelength range from 165 to 340 nm.



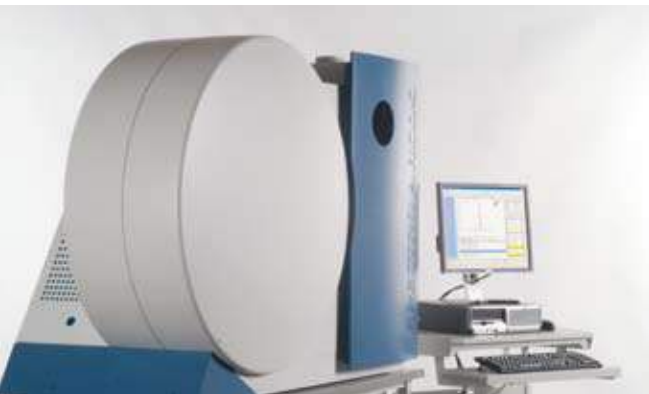
With its unique construction and the unrivalled UV-PLUS concept, the novel optic system simultaneously records the entire relevant spectrum from 165-770 nm in the first order.



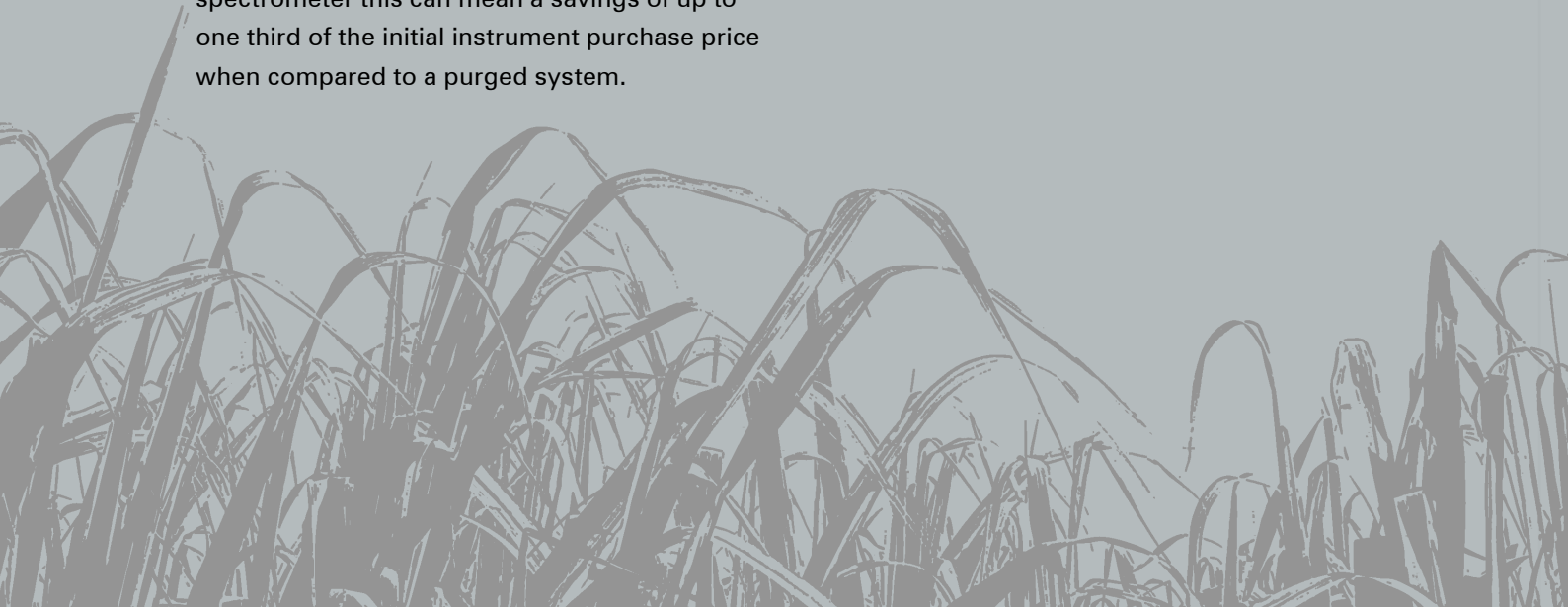
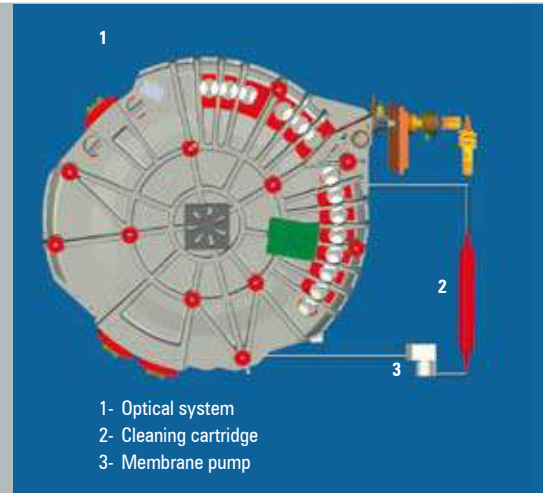
Optical System Brilliantly constructed and analytically superior: The advanced SPECTRO ARCOS optical system in optimized Paschen-Runge mount (ORCA) and Aluminium half-shell technology represents a milestone in ICP analysis. It combines compact dimensions and simple robust construction with a best-of-class resolution of 8.5 picometer in the important range of 165 to 340 nm and 15 picometer for higher wavelengths. With the constant resolution, only achievable with Paschen-Runge systems, it is easier to process line-rich spectra resulting in improved measurement accuracy.

- New ICP standard for routine analytical tasks
- Axial or radial plasma observation
- Sample introduction system with automatic positioning
- Stable plasma conditions due to the robust free-running generator
- Unique optical system with excellent resolution
- Low maintenance UV system with minimal operating cost





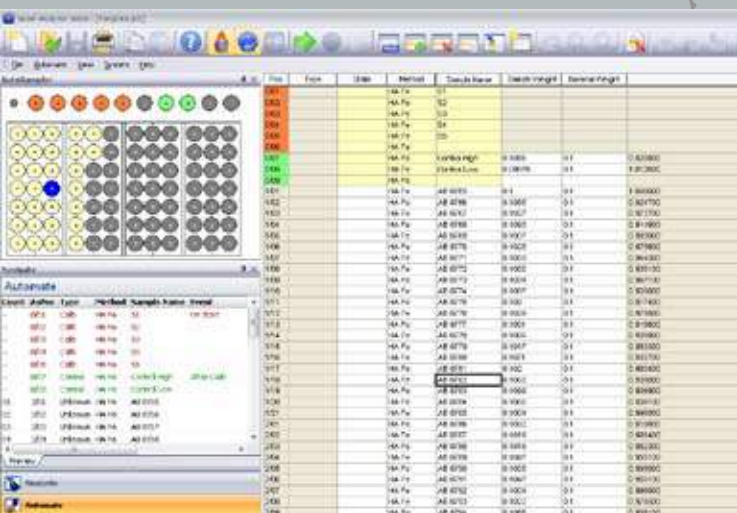
UV-PLUS In this method, the optical system chamber is filled once with argon. The argon is circulated with a small membrane pump through a cleaning device; ensuring excellent long-term stability. Neither purge gas nor operation of a vacuum pump is required for the UV-PLUS. Except for replacement of the cleaning cartridge every ten to fifteen months, the UV-PLUS system is completely maintenance-free. In addition to providing exceptional transparency in the wavelength range between 165 and 180 nm, the system dramatically reduces operating costs. Over the lifetime of the spectrometer this can mean a savings of up to one third of the initial instrument purchase price when compared to a purged system.

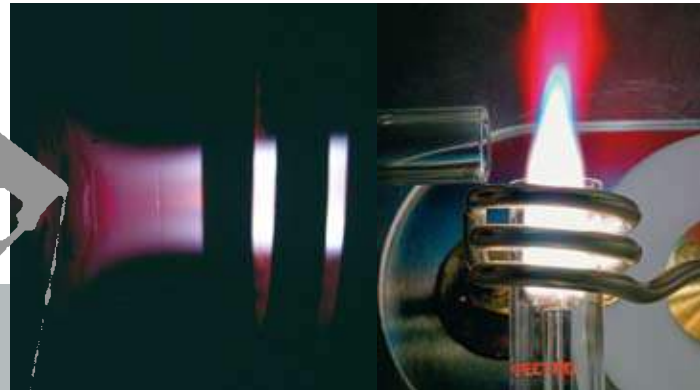
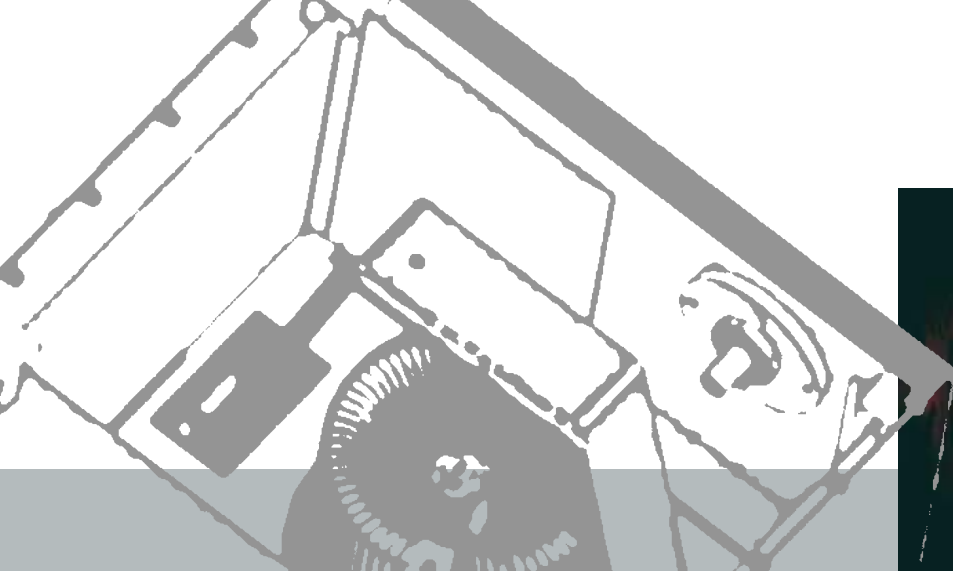




Detector and Readout System The SPECTRO ARCOS records the spectrum with 29 linear CCD detectors aligned to cover the entire wavelength range relevant to ICP-OES from 165 to 770 nm. An important difference from other detectors used in ICP analysis is that the CCD arrays in the SPECTRO ARCOS require no special minus temperature cooling. Instead, they are thermally stabilized to +15°C together with the complete optical system; a technically simple and robust solution, making them independent from environmental temperature influences. A high-speed readout system is responsible for signal processing. For each pixel, the integration time is automatically adjusted to the signal height. The very high readout speed and the large dynamic range of up to eight orders of magnitude prevent blooming effects. The determination of trace contents in the presence of major components – typical for many applications – can be handled without the need for additional dilution.

A wide range of accessories is available for the SPECTRO ARCOS. This includes alternative sample introduction systems such as an ultrasonic nebulizer, autosampler and automatic dilution system. Additionally, factory calibrated, compliant "Plug and Analyze" method packages for typical industrial and environmental applications are available.

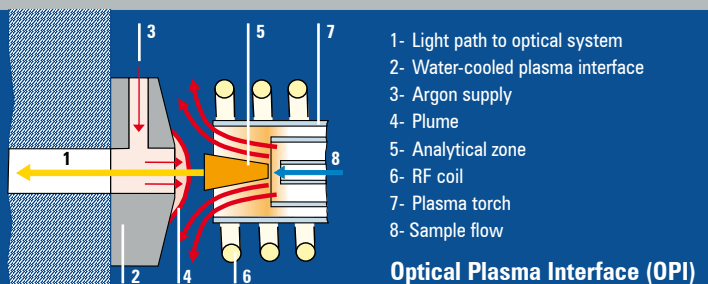
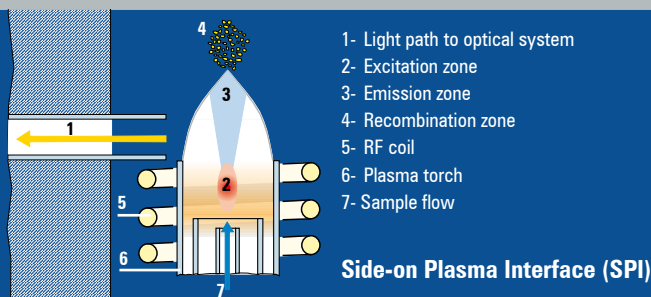




Excitation A generator with air-cooling, a 5 kW ceramic tube and a solid-state power supply provide the SPECTRO ARCOS with absolutely stable plasma conditions and a long life time. A free-running oscillator with a resonance frequency of 27.12 MHz and a power output of 0.7 to 1.7 kW is employed. Free-running generators are, due to their design, extremely robust; they require neither complex electronics nor moveable parts. In fact, they can independently adjust their resonance frequency in set ranges, whereby the effective plasma power remains constant even for strongly varying loads. With their higher bandwidth, 27.12 MHz oscillators are clearly in a better position for this than those with 40.68 MHz. A cost saving standby mode with lower power and argon consumption is available.

Plasma Interface Axial plasma observation with the Optical Plasma Interface (OPI) is the right solution for the analysis of traces. Detection limits are improved by up to a factor of 10 compared to radial observation. Unlike conventional systems with "gas jet" or extended plasma torch, the OPI pierces through the interfering recombination zone, deflects it from the optical path, and eliminates the matrix effects that occur in the cooler zones of the plasma. Without an OPI, fluctuating plasma characteristics resulting from varying matrices, as in environmental applications, can lead to problematic effects such as deterioration of recoveries. Radial plasma observation with the Side-on Plasma Interface (SPI) is employed when detection limits are of less importance and accuracy and precision at higher concentrations become the focus. This technique features an excellent precision and a superior tolerance for high saline and organic fractions.

The ICAL logic system continuously monitors the operating state of the SPECTRO ARCOS. If changes are detected, a normalization that consists of the automatic or manual measurement of a single ICAL sample is started ensuring that the instrument is always in an optimal state of operation.



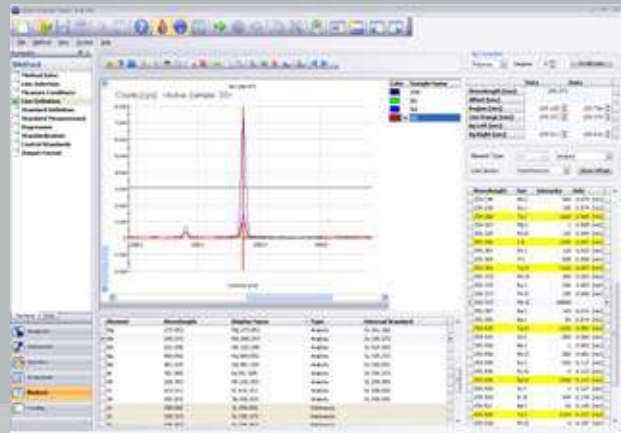
SPECTRO

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Sample Introduction System The sample inlet, using a four channel peristaltic pump, is located on the right side of the instrument. This guarantees a very short sample pathway and rapid flush times. Total analysis time for a sample with three repeat measurements can be reduced to less than two minutes and even further optimized with computer controlled monitoring of the flush procedure and autosampler movements. The sample introduction chamber can be outfitted with a range of sample introduction systems. The nebulizer chamber and torch can be easily locked into place on the ergonomically designed mounts. The flow rates for the coolant, auxiliary, nebulizer gas are completely software-controlled and can be individually optimized and stored with the method. An auto-optimization function is available to set these parameters if desired. This enables even beginners to use the instrument with optimal conditions.

Software The SMART ANALYZER VISION software package allows the operator to quickly and intuitively use the instrument functions. It fulfils all of the requirements in today's laboratories and allows easy LIMS integration. Simple and even very complex automation tasks can be conducted with little effort using the automation module. A control logic, compliant to national and international environmental norms, is included. The software offers fully novel possibilities with its comprehensive functions for new evaluation of stored measurement results with modified parameters: spectra can be reprocessed at a later point in time and the quantitative results newly calculated with, for example, other line parameters and/or a different line selection.



Technical Specifications

Polychromator

- Thermally stabilized to $+15^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$
- Circular design, Paschen-Runge mounting
- Focal length 750 mm
- Holographic master grating, Grating material Zerodur
- Wavelength range: 165-770 nm, full 1st order wavelength coverage

Detector

- 29 linear CCD arrays, 3648 pixels per array
- Pixel resolution: 165-340 nm 3 pm, > 340 nm 6 pm
- Thermally stabilized optical system
- Parallel readout architecture
- Dynamic range up to 8 orders of magnitude
- Shortest integration time: 1 ms
- TCP/IP interface to data processing system

UV System

- UV-PLUS system
- Gas filled (Argon), no consumable purge gas required
- Easy to maintain entrance optics
- Automatic gas purifying system
- Lifetime of purifying cartridge: 10-15 months

RF-Generator

- Free running type, Frequency: 27.12 MHz
- RF power output: 0.7 to 1.7 kW
- Power efficiency: >70%, power stability <0.1% variation
- Automatic plasma ignition
- Stand-by mode (low power, low argon consumption)
- Fully computer controlled



- Air cooled (no external cooling required)
- Solid state power supply fully integrated in cabinet

Dimensions and Weight

- Spectrometer (HxWxD) 1074 x 1610 x 753 mm, (42.3 x 63.4 x 29.7 inch)
- Footprint (WxD) 1367 x 692 mm, (53.8 x 27.3 inch)
- approx. 250 kg (approx. 551 lbs)

Environmental Conditions

- Room temperature: 15-35°C (59-95°F)
- Relative Humidity: <80% non-condensing
- Atmosphere: free of corrosive vapors and high dust pollution

Exhaust System Requirements

- Torch box: 1 x 110-180 m³ per h (65-106 cft/min)
- Generator: 1 x 250-300 m³ per h (150-175 cft/min)

Argon Supply Requirements

- Grade: ≥ 4.6 (99.996%), pressure: 7.5 bar (109 psi)

OPI Cooling (EOP only)

- Entrance temperature: 5-25°C (41-77°F)
- Flow rate: 1.5-2.5 l/min (0.4-0.7 gal/min)
- Water pressure: 1-5 bar (14.5-72.5 psi)

Electrical Requirements

- 230 VAC $\pm 5\%$, 50/60 Hz
- approx. 4.5 KVA power consumption
- 30-32 A instrument required line protection (slow blow fuse)

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