

# Quality Is the Difference

## multi EA<sup>®</sup> 4000

Elemental Analysis



## Systems from Analytik Jena – The Pacesetter in Elemental Analysis

The challenge modern analytical systems for elemental analysis face lies in reliable automation for an extensive range of samples. The multi EA<sup>®</sup> series by Analytik Jena combines automation and reliability in unmatched quality thanks to patented innovative solutions. It is a system created to cope with the most diverse sample matrices.

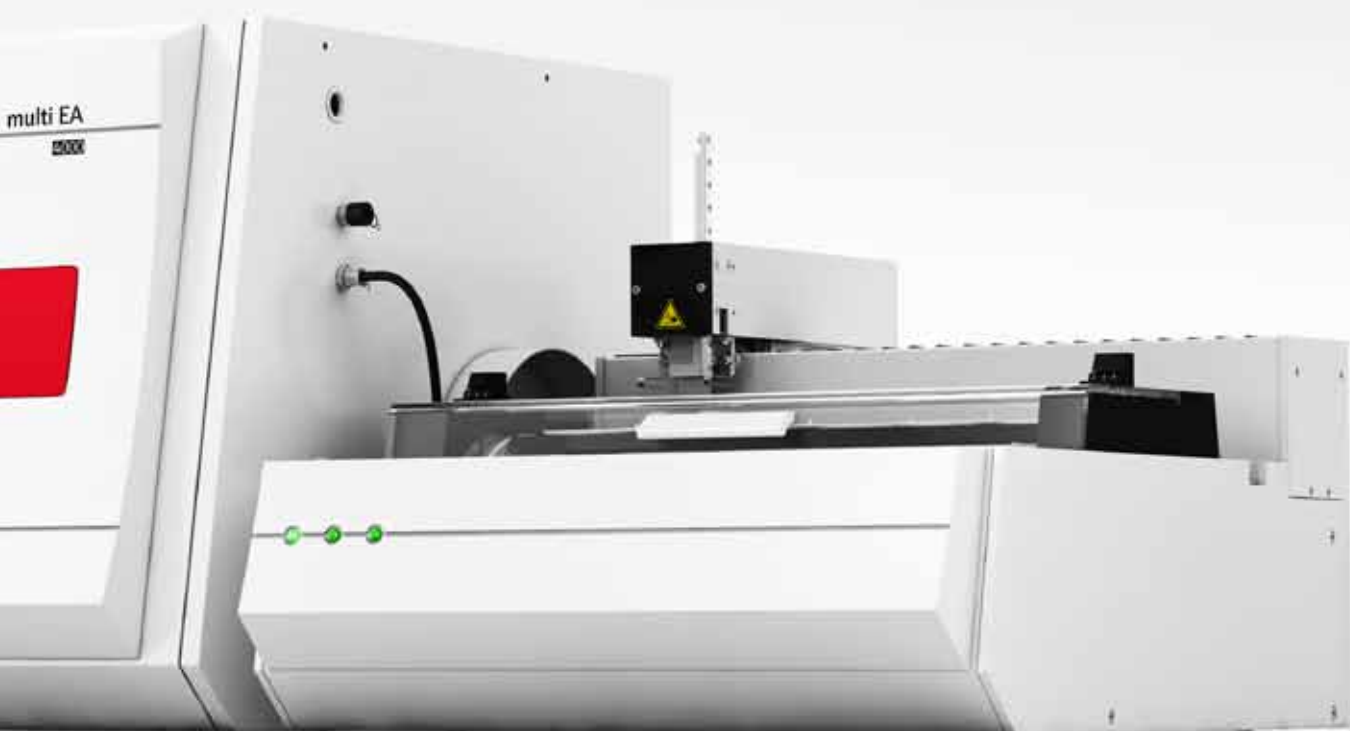
### multi EA<sup>®</sup> 4000 – True macro elemental analysis

- **HTC technology**, easy decomposition of most difficult matrices
- **High-temperature oxidation** – sample decomposition at temperatures of up to 1,500 °C (1,800 °C)
- **Flame sensor technology** for matrix-optimized sample decomposition



**multi EA<sup>®</sup> 4000**

Quality Is the Difference



## multi<sup>®</sup> EA 4000 – Investigates the Case of Solids Analysis

Case closed – the ideal solids analyzer has been found: multi EA<sup>®</sup> 4000! Determining carbon, sulfur and chlorine from solid samples is not a problem! Its ease of use, analysis flexibility and particularly excellent instrument stability and precision are exceedingly convincing.



The multi EA<sup>®</sup> 4000 offers true macro elemental analysis! Precise – Reliable – Easy to Operate. The parameters TS, TC, TX, TOC, TIC, EC and BOC are determined quickly and easily in organic and inorganic solids. The multi EA<sup>®</sup> 4000 analyzes solids in the twinkling of an eye, e. g., soil samples, sediments, construction materials, combustibles, ashes, polymers, waste, catalysts, minerals and fertilizers.

Waste analysis is one of the specialties of the multi EA<sup>®</sup> 4000. Its unique combination of analyzable elements and parameters makes it simply unbeatable for applications in this field! The modular design of the device also makes it possible to expand the application options from a one-element analyzer to a fully automated multi-element analyzer. Convenient, flexible and customized to meet your needs!

The multi EA<sup>®</sup> 4000 captivates with its consistent robust design. The selected resistant materials are an advantage when analyzing aggressive samples. Maintenance effort is reduced to a minimum while the operating time of the unit is at maximum. Low operating costs and an absolutely reliable analyzing and measuring technique ensure each process step is as effective and efficient as possible.

The multi EA<sup>®</sup> 4000 is the ideal partner for your solids analysis, offering ease of use, flexibility, and enhanced analysis precision and reliability, combined with minimal operating costs. See for yourself and discover the exciting future of macro elemental analysis!

### Advantages of rapid high-temperature oxidation

- High decomposition temperature of up to 1,500 °C (1,800 °C) ensures even the most difficult compounds are decomposed – higher application variety
- Use of robust and virtually wear-free ceramic combustion tubes instead of cost-intensive and quickly worn-out quartz combustion tubes
- Especially well-suited for aggressive and saline samples that cause a high degree of wear with traditional systems
- Minimal chemical consumption – no catalysts needed
- No complex reduction and separation of the oxidation products (chromatographic or via adsorption columns) required – due to the use of selective detectors for CO<sub>2</sub>, SO<sub>2</sub> and HCl
- Significantly improved sensitivity coupled with a highly dynamic measuring range – by using special detectors
- Significantly reduced maintenance effort due to straightforward technology and chemistry
- No searching for leaks – an „open“ gas line system and no troublesome valves
- No auxiliary gas required for C and S analysis
- Guaranteed fast analyses – approx. 5 times shorter analysis times than traditional elemental analyzers
- High sample throughput
- High sample weights in the gram range – in contrast to traditional weights in the lower milligram range
- Significantly reduced operating costs

### Highlights of the macro elemental analyzer

- HTC technology for high temperature decomposition of even the most difficult matrices
- Catalyst-free ceramic combustion tubes for robustness, less wear, and lower operating costs
- Long-life heating elements ensure max. operating time
- Use of highly resistant materials – especially well-suited to analyze aggressive samples
- Simultaneous C and S analysis, also with extreme different element contents
- Fully automated determination of TOC and TIC from a single sample in only one analysis step
- Easy chlorine determination up to the weight percent range
- Unique combination of elements: C, S and Cl – especially interesting for waste analyses
- Optional flame sensor technology for matrix-optimized sample decomposition during chlorine analysis
- Self Check System (SCS) for optimal operating safety
- Intuitive software navigation for foolproof operation and perfect measurement results
- Easy to use – preset standard methods for various applications greatly simplify work and save valuable measuring time



## C, S and Cl – A Clear Case for the Macro Analyzer

A special wide range NDIR detector allows simultaneous determination of carbon and sulfur within a dynamic measuring range from ppm till weight percent while maintaining high linearity.

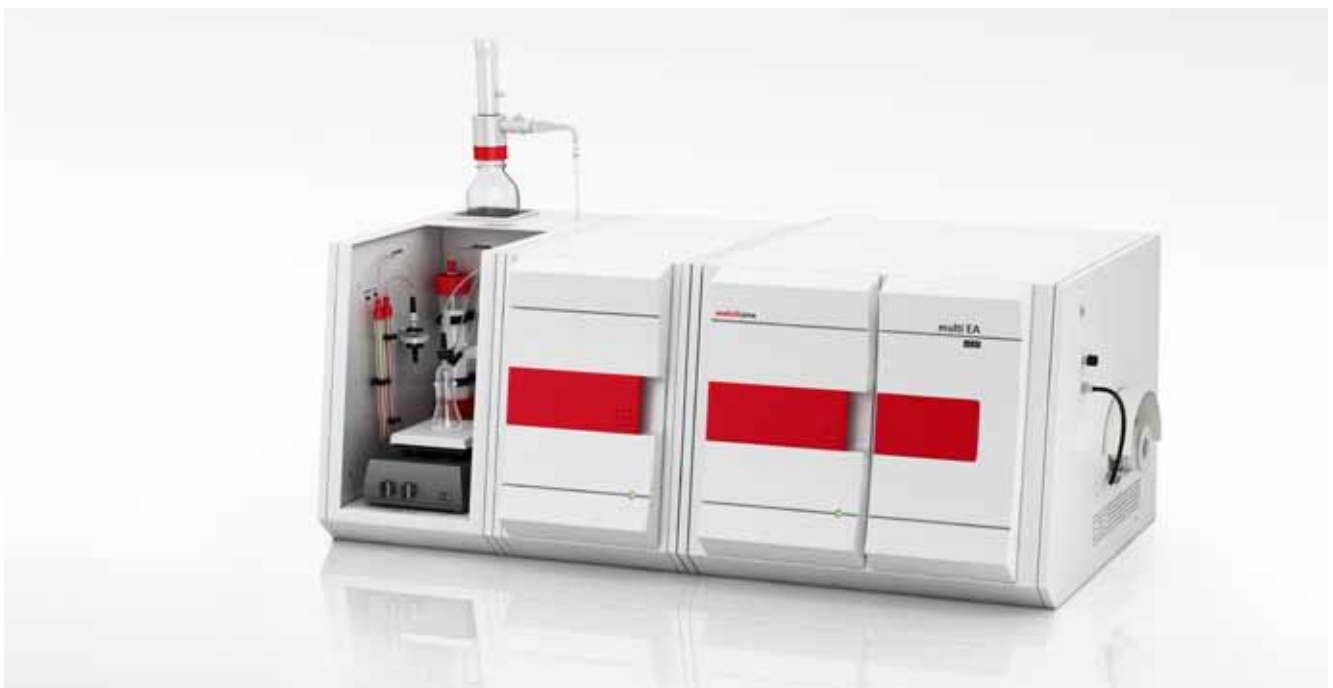
And it can do so much more! The flexible measuring range allows to determine extremely different element contents of sulfur and carbon from only one single sample. Highly resistant materials, a special optics arrangement and effective gas purification provide a resilient C/S detector that guarantees for extremely low-maintenance and high long-term stability. Even the most difficult applications such as direct TOC determination are easily handled by the robust detection system!

### VITA® Flow Management System

Ultimate precision – the integrated VITA® Flow Management System guarantees reliable NDIR signal evaluation and stable measurement results. The signal is logged regardless of fluctuations in the measuring gas flow so that the evaluation yields reliable results. At the same time, the system registers the flow of the measuring gas and compensates fluctuations by computerized standardization of the NDIR signal to a constant flow rate.

#### VITA® Flow Management System – Your Benefits

- High reproducibility of the results
- Clear matrix independence
- High long-term stability of the calibration
- Easier calibration
- Electronic flow control of the system



### Simplifying chlorine analysis

Why two systems, if one is enough?

Use the multi EA<sup>®</sup> 4000 to determine chlorine easily and efficiently! Forget complex decomposition procedures in a Wickbold apparatus or calorimetric bomb and subsequent detection with additional analysis systems. The reliable total chlorine determination is done in the shortest time possible in a single analysis step! Extremely high sample weights allow reasonable analyses of sample materials which are inhomogeneous such as waste and derived fuels.

Thanks to the variable gas flow management and the optimized wide range coulometer, chlorine analyses are possible from the low ppm range to the weight percent range. The coulometric detection system utilizes a unique patented combination electrode. Special feature: the electrode is based on the latest ceramic technology and does not use internal electrolytes, membranes, or diaphragms. It is immediately ready for use and extremely low-maintenance. Conventional glass electrode systems are now a thing of the past.

The lightproof measuring cell is equipped with an automatic stirring function and a self-cleaning generator anode to generate silver ions. The integrated cooling of the coulometer cell minimizes electrolyte evaporation while in continuous operating mode and guarantees stable results. Advantage: compared with traditional electrolytes, the special electrolyte has a significantly increased chloride absorption capacity. This results in long-term stability, which allows for uninterrupted routine analyses even with extremely high chloride loads and without bothersome electrolyte changes!

### Extremely comfortable TOC and TIC analyses

TOC and TIC analyses are quicker and easier than ever before! Easily determine the TOC and TIC parameters from one single sample in only one analysis step! Fully automatically, quickly and in compliance with standards. Complex manual sample preparations for direct TOC determination are no longer required.

Another unique feature is the fully automatic determination of TOC based on the differential method. In combination with the FPG 48 solid sampler, the automatic TIC solids module enables the automatic determination of TOC in solid samples such as soil, waste and many other materials.



## Sample Handling – 48 “Rounds” in One Magazine

A high sample weight of up to 3 g yields reliable results with just one single measurement. Inhomogeneous samples are analyzed with ease. Sample preparation and number of repeat measurements are reduced significantly.

### Automatic solid sampler

The fully automated solid sampler of the multi EA® 4000 offers an enormous capacity for up to 48 sample boats to be transferred into the combustion furnace. The multi EA® 4000 with its high sample throughput is simply ideal for the automated C, S and Cl analysis as well as the automated determination of TOC and TIC.

Another advantage: by setting different waiting positions and feed speeds, samples of one and the same run can be analyzed matrix optimized. This means matrices requiring a special temperature program or gradient are processed easily and automatically.

### Easy sample feed with gas lock

Effortless sample feed! An open gas lock replaces problematic sample ports that require opening and closing for sample introduction. It is completely maintenance-free, which makes contamination and wear impossible. Convenient!

### Cookbook – individual “recipes” for every sample

A method cookbook is included to ensure that the analysis of your sample is carried out optimally and reliably. Simply select the suitable analysis parameters and wait for the result. Done!

#### Sample Feed System – Your Benefits

- Robust and reliable for high sample throughput
- Sample feed with variable speeds
- Sample feed with variable waiting positions
- Optimal combustion for every sample
- Several methods possible in one analysis cycle
- Sample boats always „reloadable“ during operation





# Sample Decomposition – Focus on Special Features

The combination of advanced hardware components and software functions allows for reliable analyses, even under toughest conditions.

## HTC (High Temperature Ceramic) Technology

Thanks to HTC technology samples can be fully decomposed up to a temperature of 1,500 °C in a stream of oxygen and without the use of catalysts. And there's more! For especially complex matrices, the combustion temperature can be temporarily increased up to 1,800 °C. With these conditions of high temperature combustion, even thermally stable compounds, such as sulfates and carbides, are fully oxidized.

## Pyrolysis function for special applications

Special applications require special functions! For example, the analysis of solid waste requires the specific pyrolysis of samples. The advantage: it is possible to distinguish between the environmentally relevant BOC (Biodegradable Organic Carbon) and the residual carbon (RC), e. g. what is important for graphite residues and soot particle residues in waste samples.

Pyrolysis is an additional function of the multi EA® 4000. It takes place at e. g. 850 °C in an inert gas atmosphere where the BOC fraction of the sample is removed first. In the second step, the remaining sample is oxidized in an oxygen atmosphere and the RC is measured directly. The BOC is calculated from the difference between TOC and RC content. Another example of the application of the pyrolysis function is the reliable determination of the active carbon concentration.

## Flame sensor to determine chlorine

Complete combustion through intelligent process control! First, the sample is pyrolyzed within inert gas. Then the pyrolysis products are combusted in a pure oxygen stream. This is when the actual oxidation process takes place. The control of the formed flame by the flame sensor is the key to complete combustion and the elimination of sooting. It ensures measurement results with the highest precision! The flame sensor is an optional accessory for the automated chlorine determination.



# Software Solutions – For Reliable Analyses

User-friendly concepts provide simple operation and guarantee reliable results.

## Self Check System (SCS)

Trust is good, control is better! The multi EA<sup>®</sup> 4000 comes equipped with a Self Check System (SCS). The system automatically checks all the relevant parameters such as flows and temperatures and guarantees trouble-free, fully automated operation.

The SCS offers many more benefits! You save operating costs but are still ready to measure in the blink of an eye due to the automated gas switch-off and a low standby temperature at the end of an analysis sequence.

### SCS – Your Benefits

- Software control of the combustion temperature eliminates incomplete sample decomposition
- Electronic control of the wide range NDIR detector
- Electronic control of the wide range coulometer
- Electronic flow control

## multiWin<sup>®</sup> software

The multiWin<sup>®</sup> software is your personal assistant and consultant! From system start to shutdown – the software guides you through all of the relevant menu items. Self-explanatory and simple. It monitors and controls all relevant system parameters for you. Safe and reliable. It immediately points out system configuration errors and suggests the input of suitable parameters. Unusable results are avoided right from the start. The software checks the system performance and the analysis quality. Quickly and precisely. It delivers a clear presentation of the measurement results in individual analysis reports, and much more.

The modern multiWin<sup>®</sup> software features commonly used standard methods for routine applications. Additional diverse method packages for special application fields are available upon request.



## multi EA<sup>®</sup> 4000 – Truly Versatile

The multi EA<sup>®</sup> 4000 is the ideal partner for your solids analysis applications. Including flame sensor, pyrolysis function and multiWin<sup>®</sup> software it provides unmatched versatility in numerous application fields.

The modular design of the multi EA<sup>®</sup> 4000 makes it a truly versatile analyzer. It measures both the total element content of carbon, sulfur, and chlorine in various matrices, as well as the environmentally relevant TOC and TIC parameters in solids.

The flame sensor technology makes it possible to analyze chlorine in organic solids such as paraffin, waxes and polymers automated as well.

The additional pyrolysis function can also be used to determine BOC (Biodegradable Organic Carbon), a parameter of relevance to waste, and to distinguish it from inert carbon. Inorganic solid analyses are carried out simply and reliably due to the high combustion temperature of up to 1,800 °C

Field/ Industry	Type of sample
Food & Agriculture	TC/TOC/TIC analysis of soil and sediments C/S analysis of fertilizers C/S/Cl analysis of plant material, died vegetables, C/S/Cl analysis of wood and straw
Academia & Research	TOC (surface layer) on metal foil OC/EC (surface layers) on Si-wafers and powder Cl analysis of organometallic catalysts (liquids)
Geology, Mining & Metals	C/S/Cl in oil shale C/S analysis of sediments, minerals, coal, ore TOC/TIC analysis of soil, sediments, minerals
Environment	TC/TOC/TIC/BOC analysis of soil, sediments, waste, landfill materials Cl analysis of waste materials (e.g. used oil, polymers, transformer materials) TOF (requires IC system) analysis of packing materials (card board, plywood)
Oil & Gas	C/S/Cl analysis for highly viscose materials (VGO, HCR Feed, mineral oil, residues) S/Cl analysis of bitumen, asphalt and tar (roadworks materials) C/S/Cl (org. bound surface layer) analysis of used and regenerated catalysts
Chemistry & Polymers	S analysis of polymers and tires C/S analysis of glass, cement, gypsum, clay Cl analysis of secondary derived fuels, waste (cement industry)
Energy & Power Plants	C/S analysis of fossil combustibles (oil, coal, coke) S/Cl analysis of secondary derived fuels ( municipal waste, bio mass) TOC/TIC/EC analysis of ash, slag and related
Pharma	C/S/Cl analysis of charcoal

#### Headquarters

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