

**analytikjena**

# **multi EA<sup>®</sup> 2000**

Quality is the difference



## Systems from Analytik Jena - the pacesetter in elemental analysis

Modern techniques for sum parameter and elemental analysis are increasingly applied in environmental monitoring, as well as in process and quality control. The challenge facing modern analytical systems lies in reliable automation for different measuring cycles for an extensive range of samples. Analytik Jena AG is the leader in the development of reliable sum parameter and elemental systems designed to satisfy the diverse modern demands posed in today's age.

With this aim in mind, Analytik Jena developed a flexible future-oriented series of instruments: the multi EA® series. Automation and reliability are combined in unmatched quality thanks to patented innovative solutions.

A system has been created to cope with the most diverse sample matrices. On the basis of the experienced gained in this field over decades, Analytik Jena AG has developed into a worldwide leading provider. You profit from this extensive experience with the multi EA® series.

The long tradition of analytical instrument manufacture in the Ilmenau region dates back to the early 19<sup>th</sup> century. Analytik Jena has continued this tradition since 1990 and produces high performance analytical instruments for TOC, AOX and elemental analysis.

1945 Manufacture of the first instruments, representing the start of today's titration technique and elemental analysis



1952 Electrolytic unit for coulometric measurement mass analysis



1982 Launch of the first nitrogen and chloride titrator



1991 First simultaneous elemental analyzer and special TOC/TN and AOX/TOX analyzers  
multi X® – first AOX/TOX analyzer with automatic sampler



1994 multi N/C® – first simultaneous TOC/TN analyzer worldwide



2002 Double furnace – first innovative concept for combustion analysis of the most diverse matrices

2003 multi EA® 3100 – flame sensor technology for intelligent elemental analysis





multi EA 2000

power



ACHTUNG-ATTENTION  
Bei Arbeit mit Gasdrucksystem  
muss eine 100%ige Ventile  
sicherstellung sein.  
ACHTUNG  
Diese Gasdrucksysteme  
müssen mit  
ATTENTION  
Arbeiten die für die  
Sicherheit notwendig sind.

pump O<sub>2</sub> Air/O<sub>2</sub>



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## C, S and Cl analytics on the highest level

### The multi EA<sup>®</sup> series – elemental analyzers for every application

With the EA<sup>®</sup> series, Analytik Jena has developed a family of elemental analyzers to fulfil the demands of modern analytical technology in the determination of carbon, nitrogen, sulfur and total chlorine in the most varied of sample matrices.

The EA<sup>®</sup> series offers an enormous range of configuration options. The wide selection of different modules for detection, sample introduction and sample digestion opens up an almost universal range of applications.

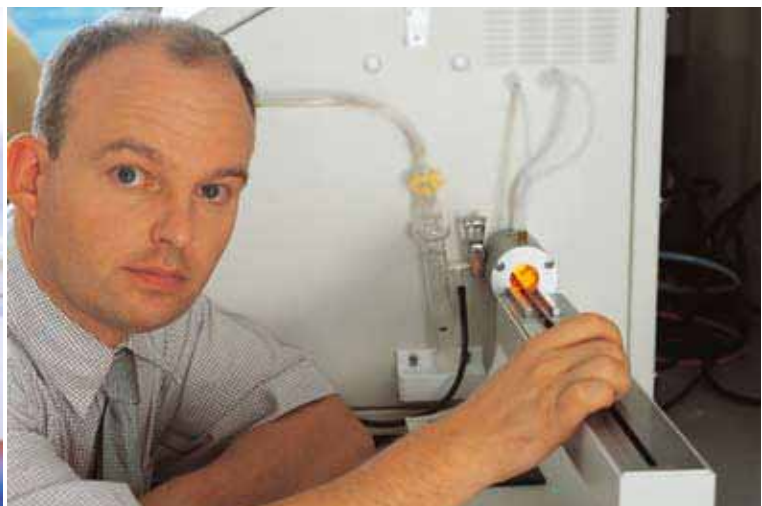
### multi EA<sup>®</sup> 2000 – Multi-matrix C, S, Cl Analyzer

The multi EA<sup>®</sup> 2000 represents the new generation of elemental analyzers for the determination of C, S and Cl in solid samples. The system is especially suited for the analysis of organic and inorganic solids, such as soil samples, sediments, construction materials, polymers, waste, catalyzers, minerals and fertilizers.

Previously outstanding variability combined in a single instrument opens new horizons in elemental analysis. The concept offers the most conceivably simple operation and at the same time satisfies the highest demands for the quality of analytical results.

### Advantages at a glance:

- **Multi-element:** Carbon, sulfur and chlorine determination in a single instrument
- **Multi-range:** Extended chlorine measuring range up into the percent range with a low-maintenance innovative combination electrode, unprecedented additional measuring range for C and S determination from the ppm through to the percent range
- **Multi-application:** An analyzer for elemental analysis, as well as for TOC and TIC determination
- **Multi-matrix:** Thanks to optimal adaptation of the combustion temperature to the sample matrix
- **Multi-safety:** Self Check System (SCS) for trouble-free operation, simple operation with minimal maintenance, tray recognition in automatic mode efficiently prevents faults while the autosampler is in operation
- **Multi-modular:** Freely selectable modular configuration of the analyzer
- **Multi-conform:** Conformity with a multitude of common international and national standards



### **Soot-free oxidation thanks to flame sensor controlled oxidation**

Controlled combustion in excess oxygen is the key to complete and safe oxidation of the sample and is therefore the basis for precise and reliable measurement results. The optional flame sensor technology ensures the complete oxidation of the sample in excess oxygen.

### **Easy to use**

Preset standard methods for various applications enormously simplify work and save valuable measuring time. The parameters for oxidation, sample introduction and detection are optimally adapted to the respective task with a few mouse clicks, so even the most difficult sample matrices can be processed effortlessly.

### **Optimal operational reliability with the Self Check System (SCS)**

The multi EA<sup>®</sup> 2000 comes equipped with a Self Check System (SCS) as standard for optimal operational reliability with the minimum operating effort. The system autonomously checks all the relevant parameters guaranteeing trouble-free, fully automated operation.

### **Unrivalled additional measuring range with multi-channel (MC) NDIR detectors**

The multi-channel (MC) NDIR detectors contain several measurement channels, as well as a reference channel. Dynamic measuring range adaptation facilitates evaluation with the optimal measurement channel and therefore provides constant measurement from the low ppm through to the percent range. The reference channel serves to compensate drift and guarantees uncomplicated measurement.

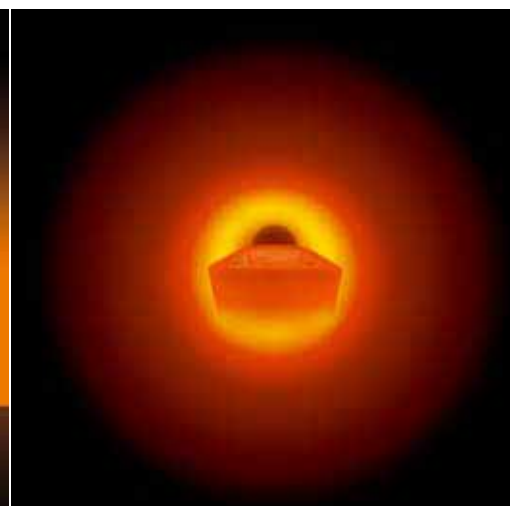
### **Multi-matrix: Optimal adaptation of the combustion temperature**

Different materials require different combustion temperatures. The multi EA<sup>®</sup> 2000 allows furnace temperatures up to 1500 °C to be set, and combustion temperatures up to 1800 °C can be achieved with the aid of sample additives. Extensive libraries and application notes simplify your method development.

### **Multi-application: Diverse configurations**

The multi EA<sup>®</sup> 2000 measures both the total element content of carbon, sulfur and chlorine in various matrices, as well as the environmentally relevant parameters TOC and TIC in solids. The system is deployed for environmental monitoring, as well as in process and product control. The additional pyrolysis function can also be used to determine BOC (Biodegradable organic carbon), a parameter of relevance to waste, and distinguished from inert carbon. Stepwise combustion with additional pre-furnace opens up new possibilities for controlled combustion.

multi EA<sup>®</sup> 2000 with chlorine module ►

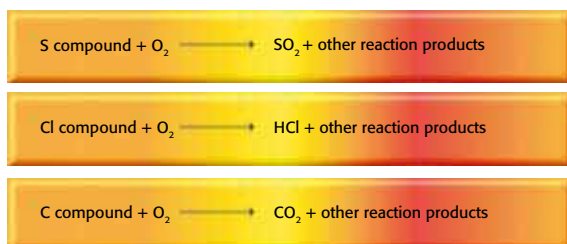


## Efficient, modular and automated

### Complete sample digestion

The multi EA® 2000 allows samples to be fully digested up to a temperature of 1500 °C in a stream of oxygen. Special chemical additives raise the actual achievable combustion temperature up to 1800 °C. An extensive applications database is available to you providing the method parameters for a wide range of matrices to be investigated.

Under these conditions of high temperature combustion, even thermally stable compounds, such as BaCO<sub>3</sub>, are fully digested and oxidized. The reaction products SO<sub>2</sub> and CO<sub>2</sub> are sensitively measured with MC-NDIR detectors.



▲ The principle of complete oxidation with high temperature combustion

### TOC and TIC analytics

TOC analysis (Total Organic Carbon) of solid samples uses a TIC module (Total Inorganic Carbon), which breaks down the carbonate in the sample into CO<sub>2</sub> with the aid of a wet chemical reaction with phosphoric acid.

The TOC can therefore be determined using the difference method (TOC = TC-TIC) or via the direct method, where solid samples are acidified directly on the sample tray to separate out the TIC.

### Advantages of oxidative combustion over conventional C, S, N, OH analyzers:

- No complex reduction of the oxidation products required
- Minimal consumption of chemicals
- Significantly reduced amount of maintenance work
- Substantially more robust system, without complex valve technology
- Use of selective detectors in place of unselective thermal conductivity detectors
- Significantly improved sensitivity
- Unique high sample volume
- No auxiliary gas for C and S analytics required

### Pyrolysis function for special applications

Some applications, e. g. the analysis of solid waste, require the specific pyrolysis of samples in an inert gas atmosphere. This way, the environmentally relevant BOC (Biodegradable Organic Carbon) and residual carbon (RC), e. g. graphite and soot particle residues in waste samples, can be distinguished.

Differentiation between these forms of carbon was previously impossible.

Pyrolysis of the sample takes place at approx. 850 °C in an inert gas atmosphere. This removes the BOC fraction of the sample so that the RC ultimately remains in the sample. In the second step, the remaining sample is oxidized in an oxygen atmosphere and the RC is measured directly. The BOC is determined by subtraction (BOC = TC - RC).

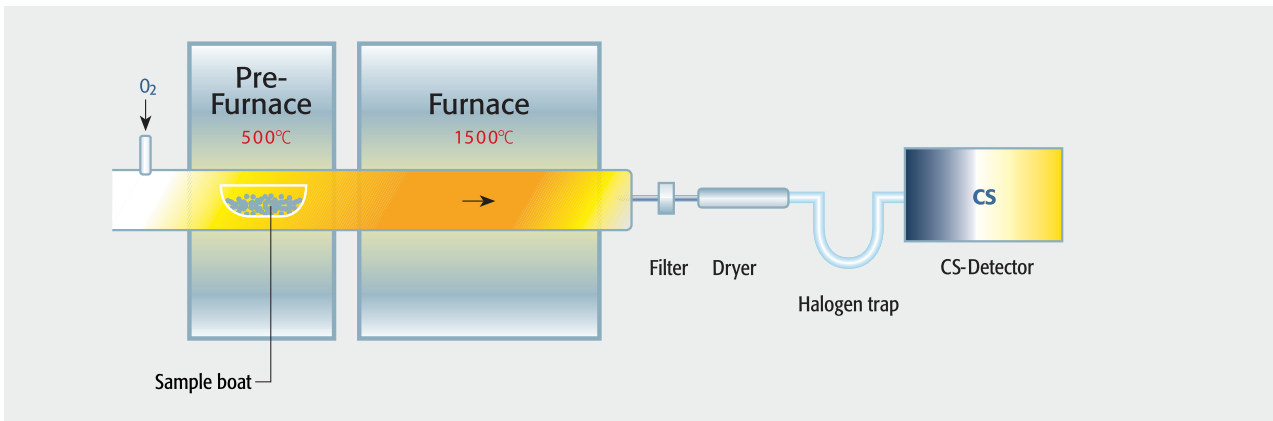
Another example for the application of the pyrolysis function is the determination of active carbon, which is added to foundry sands for surface enhancement. The concentration of active carbon also can be distinguished from residual carbon with the aid of the pyrolysis function.

### Pre-furnace for specific sample oxidation

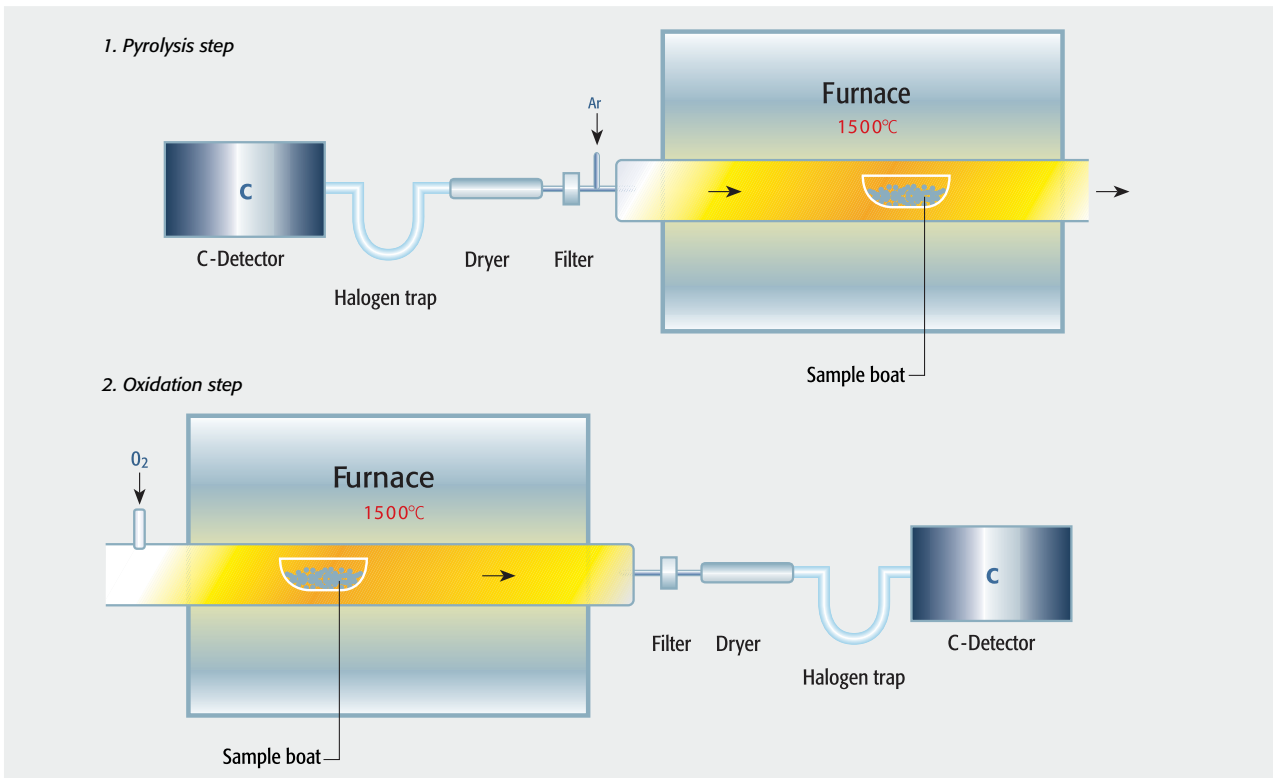
A separate pre-furnace facilitates the specific oxidation of the sample in two phases. In the first phase the samples are combusted at a temperature of up to 500 °C at which the most organic hydrocarbon compounds are oxidized. In the second step, the sample is combusted in the high temperature furnace at a temperature of up to 1500 °C at which the inorganic hydrocarbon compounds also oxidize. In this way, various binding forms can be distinguished, for example organic carbon and graphite.

### Automated solid analysis

An autosampler is available for automated C, S and Cl analysis to transport the sample boat fully automatically into the combustion furnace. It can be also used for both TC and TOC automated determination. The optional optical boat recognition function is available to assure a trouble-free operation. The autosampler identifies the correct position of the boat with an optical sensor and stops the next sample insertion automatically in the case of a fault.



▲ Flow diagram for the multi EA® 2000 CS with pre-furnace



▲ Flow diagrams for the multi EA® 2000 with pyrolysis function

## Easy to use

### Easy to use: HTC (High Temperature Ceramic) technology without a catalyst

The extraordinary robustness of a catalyst-free ceramic combustion tube permits far higher combustion temperatures than those with a quartz glass combustion tube, and their rate of wear is significantly reduced. This saves frequent replacement of combustion tubes and contributes to cost reduction.

### Easy to use: Sample insertion via a gas lock

An open gas lock replaces possibly problematic sample portals that require opening and closing for sample insertion. The combustion process and potential contamination can be observed, and there is nonmaintenance of a sample door.

### Easy to use: Simultaneous carbon and sulfur analysis

Carbon and sulfur analysis take place simultaneously over an unrivaled dynamic measuring range. The element contents are determined with high selectivity using zero-maintenance MC-NDIR detectors.

### Easy to use: Maximum sample weight for optimal measurement results

Highly reproducible measurement results are achieved with large sample weights. The multi EA<sup>®</sup> 2000 is equipped with ceramic trays in which up to 3 g of a sample can be weighed. This achieves superior reproducibility and lowers the number of repeat measurements.

### Easy to use: Electronically linked analysis balance

Sample weights can be automatically entered into sample tables by electronic linking of the analysis scales, and the painstaking task of manual entry of weights becomes obsolete.

### Easy to use: Simple chlorine analysis

Trace analysis of chlorine is highly dependent on the stability of the coulometer.

A coulometric detector with combination electrode is optionally available for chlorine analyses from low to high concentration range. The combination electrode requires very little maintenance and works without inner electrolyte, membrane or diaphragm. It replaces the classical glass electrode system, is immediately ready for operation and saves the maintenance work otherwise required. The light-protected measurement cell is equipped with both a stirring function, as well as a self-cleaning anode for generating silver ions. A special electrolyte has a significantly higher capacity as compared with classical electrolytes and thereby avoids the otherwise commonly occurring flocculation of silver chloride.

A software-controlled gas split allows chloride determination in solids right through to the percent range.

### Easy to use: Thanks to the Self Check System (SCS)

The multi EA<sup>®</sup> 2000 comes equipped with the Self Check System (SCS) ensuring straightforward and fully automatic operation. The SCS checks and monitors all relevant parameters affecting measuring results, as well as instrument and operating safety:

- Software control of the combustion temperature averts incomplete sample digestion
- Electronic control of the MC-NDIR
- Electronic control of the chlorine measurement cell
- Optional automatic optical tray recognition for trouble-free autosampler operation



# Multifaceted applications to satisfy all expectations

The matchless versatility of the multi EA® 2000, with its modular structure opens up manifold applications.

Thanks to optional flame sensor technology chlorine determination in organic solids such as paraffins, waxes or polymers is mastered without restrictions. Inorganic solid analyses are simple and trouble-free thanks to the high combustion temperature up to 1800 °C.

Sample	Carbon (%)	Sulfur (%)	Chlorine (%)
Plastic waste / granulate	-	-	1.79
Natural gypsum	0.30	20.74	-
Sediments	0.66	0.14	-
Slate	1.46	0.02	-
Ash/slag	5.20	0.26	-
Waste oil 1	-	-	0.49

Sample	Carbon (%)	Sulfur (%)	Chlorine (%)
Cement	-	1.65	-
Charcoal	52.7	0.09	-
Faecal sludge	41.43	-	0.06
Ceramic material	0.45	-	-

## Versatile sample analysis

- Polymers
- Foundry sand
- Catalyzers
- Metals
- Glass
- Oils
- Cement
- Soils
- Wood
- Fertilizers
- and much more



## Technical service & Application support

### Premium quality from Analytik Jena

Our high-precision analytical systems, based on Carl Zeiss technology and produced according to a stringent quality management system, guarantee the premium quality our customers are used to obtain from us.

Before our high-performance instruments are delivered, all technical parameters are tested, the results recorded and entered in a test certificate. Only those instruments that have passed the complete range of tests, as confirmed by the inspector's signature, will be delivered.

### Reliability and certainty

Well-deliberated design concepts, the expertise of our staff, individual application consulting and comprehensive customer service ensure the certainty and reliability of your results. All service operations and safety tests are recorded in the device logbook. Software updated at regular intervals satisfies the requirements of the FDA for conformity to 21 CFR Part 11 and guarantees the safe and

reliable electronic documentation of your data.

Our prompt delivery of parts and consumables allows you to work without losing time.

### We take time for you

While installing the device, our specialists will intensively train your personnel in operating it, demonstrate the analytical performance of the device and record the obtained results. Our application specialists also provide comprehensive qualification of your personnel enabling them to solve specific analytical problems.



### Technical service

Our world-wide service network guarantees nearness to our customers, thus ensuring quick response times, short travel times and low costs for you.

With comprehensive solutions, such as:

- Continuous quality control by our service engineers
- Individual maintenance and service contracts
- Full-time advisory phone service via our hotline
- Documentation of performed service operations and safety tests in a logbook
- Continuous software update service
- Factory-trained staff employed by our subsidiaries and sales representatives

we provide total service support.

### Application support

A strong team of application specialists is available to you at any time to assist you in your everyday laboratory work.

With our services and staff giving you advice around the globe, we ensure optimum customer care and support at any time:

- Individual advice on specific questions of application
- Development of analytical method packages
- Validation of analytical systems
- Individual hands-on user training in specific applications
- Organization of user workshops
- Preparation of application newsletters

Our well-trained, globally active staff ensures optimum customer care and support at any time, as we are keenly aware that this, together with product quality, is the key to customer satisfaction.





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Subject to changes in design and scope of deliver-  
yas well as further technical development!