



CARBON / SULFUR ANALYZER

ELEMENTRAC CS-r

**For the safe, precise and reliable elemental analysis of carbon (C) and sulfur (S) in predominantly organic matrices such as soils, waste, wood, oil, coal and coke, ELTRA offers the combustion analyzer ELEMENTRAC CS-r with IR detection.**

The CS-r with up to 4 infrared cells is designed for carbon and sulfur measurement over a very wide concentration range. It uses a horizontal resistance furnace with ceramic tube, which operates in a range from 600 °C to 1550 °C.

The CS-r elemental analyzer meets or exceeds the requirements of all common ASTM, DIN, EN or ISO standards for elemental analysis.



## **CARBON / SULFUR ANALYZER ELEMENTRAC CS- R**

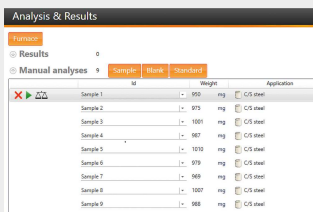
- | Fast, simultaneous measurement of carbon and sulfur
- | High sample weight possible
- | Optimized (low blank) sample port
- | IR path made of solid gold for extended lifetime
- | Wide measuring range from 20 ppm to 100%

## CARBON / SULFUR ANALYZER ELEMENTRAC CS-R

# OPERATION AND ANALYSIS PROCESS

The ELEMENTRAC CS-r analyzer determines the elements carbon and sulfur by combustion of the sample in an oxygen stream and subsequent measurement of the combustion gases CO<sub>2</sub>, SO<sub>2</sub> and H<sub>2</sub>O in selective infrared measuring cells. A high sample weight of up to 500 mg ensures excellent reproducibility of the elemental analysis results, even for heterogeneous samples.

The high combustion temperatures and electronic monitoring of the oxygen flow allow complete oxidation of the sample and help to avoid too low results even with challenging materials like cement. Regardless of the selected configuration (carbon – sulfur - carbon and sulfur), operation is identical in all analyzer versions.



### Step 1: Logging the sample into the ELEMENTS software

The sample ID is logged into the software and the weight is automatically transferred (see step 2).



### Step 2: Weighing and adding of accelerators

Volumes of 50 mg to 500 mg are typical for elemental analysis of carbon and sulfur. The sample is directly applied to a carrier (ceramic or Inconel boat) and analyzed without addition of accelerators.



### Step 3: Analysis

The sample is placed in front of the furnace opening and the measurement is started in the software. Subsequently, the shutter opens, and the material can be introduced into the hot furnace. At the same time, the ELEMENTS software continuously records measured values during combustion. Closing the furnace during the measurement is optional and can improve reproducibility.



### Step 4: Data output and export

60 to 240 seconds after the analysis has started, the measured carbon and sulfur concentrations are available for export as a report or via LIMS. Depending on the selected configuration, carbon and sulfur values are available for the individual sample.

CARBON / SULFUR ANALYZER ELEMENTRAC CS-R  
**SOLUTIONS & OPTIONS IN DETAIL**

The ELEMENTRAC CS-r analyzer comes with various solutions for reliable and precise carbon and sulfur analysis.

**Included: Two Anhydron Columns**

For reliable carbon and sulfur analysis, the combustion gases must be freed from water vapor prior to IR detection. The CS-r elemental analyzer is equipped with two drying columns filled with magnesium perchlorate to reliably prevent absorption effects in large sample volumes. In the case of TOC analysis, a chemical tube can also be used as a halogen trap to reliably absorb acid residues and halogens.



**Included: Low blank sample port**

The ELEMENTRAC CS-r and CHS-r analyzer series ensures safe and precise elemental analysis even of samples with low carbon content in the resistance furnace. Due to the optimized geometry of the sample port with reduced diameter, as well as an oxygen purge at the sample inlet, the CO<sub>2</sub> blank value of the atmosphere during sample introduction is drastically reduced, thus enabling reliable carbon analysis in the low measuring range.



**Option: Second Furnace (ELTRA Dual Furnace Concept)**

The CS-r elemental analyzer can be connected in any configuration to an additional furnace without detectors. This principle, known from the ELEMENTRAC CS-d, allows fast fractionated analysis by applying different temperatures and provides



safety for high sample throughput.

### Option: Monitor Holder

To make the most of available laboratory space, the ELEMENTRAC CS-r analyzer offers various operating options:

- | External monitor and keyboard
- | Monitor holder, wireless keyboard
- | Operation via touchscreen



### Option: TIC Module

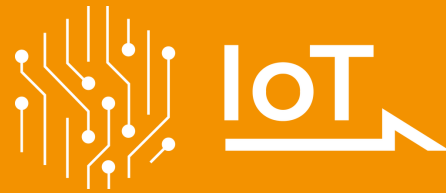
Depending on the sample, carbon can also be present in the two different fractions TOC (Total Organic Carbon) or TIC (Total Inorganic Carbon). The CS-r elemental analyzer can be combined with ELTRA's TIC module to determine the TIC content via acidification. This combination enables reliable, direct TIC analysis in soils, building materials and other products in compliance with DIN EN 15936.



IOT - INTERNET OF THINGS

## THE PLATFORM FOR REMOTE ACCESS TO YOUR DEVICES

All ELTRA analyzers seamlessly integrate with the Verder Scientific IoT platform, providing enhanced functionality, seamless connectivity, and additional benefits:



- | **Real-time Monitoring:** Gain insight into the status of your machines at any time thanks to immediate access to important data.
- | **Live Notifications:** Stay up to date on the status of your devices with instant notifications.
- | **Effortless Backup:** Whether you need to back up a single device or an entire fleet, back up your data effortlessly and minimize downtime.
- | **Automatic Software Updates:** Verder Scientific IoT keeps your device software up to date, optimizing performance and reliability.
- | **Access to Analyses Data:** ELTRA analyzers offer remote access to analysis data. This allows you to conveniently access important data while on the move.
- | **Autoloader Efficiency:** Get the most out of remote analysis preparation with our autoloader feature, which ensures uninterrupted operation and increased productivity for all instruments equipped with it.

Experience the power of the Verder Scientific IoT platform today and unlock the full potential of your ELTRA analyzers!



**FREE SOFTWARE  
DOWNLOAD**

## CARBON / SULFUR ANALYZER ELEMENTRAC CS-R ELEMENTS SOFTWARE

**The comprehensive Windows-based ELEMENTS software is an essential part of all ELEMENTRAC generation elemental analyzers.**

A central window (analysis and results) is the starting point from which all functionalities required for the daily routine are easily accessible. From here it is possible to group and export analyzed samples, or register and analyze new ones. The user may call up various subordinate functionalities like application settings, calibration, diagnosis, or status.



## CARBON / SULFUR ANALYZER ELEMENTRAC CS-R TYPICAL SAMPLE MATERIALS

biomass, building materials, coal/ coke, fuels, oil, ores, plant materials, plastics, rubber, soil, soot, tobacco, waste,  
...



*coal*



*soil*



*plastic*

## CARBON / SULFUR ANALYZER ELEMENTRAC CS-R

### FUNCTIONAL PRINCIPLE

In the elemental analyzer CS-r the sample is burnt in an oxygen atmosphere at temperatures up to 1,550 °C. The furnace temperature can be freely selected in steps of 1 °C. The combustion gasses ( $\text{CO}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{SO}_2$ ) coming from the furnace and pass through a dust filter. After the water vapor is chemically absorbed, the dried  $\text{CO}_2$  and  $\text{SO}_2$  gas is detected in the additional infrared cells. Depending on the configuration, it is possible to combine up to four (for C, S analyzers) infrared cells with different sensitivities.



CARBON / SULFUR ANALYZER ELEMENTRAC CS-R

## TECHNICAL DATA

|                               |                                                                                                                                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Measured elements</b>      | carbon, sulfur                                                                                                                              |
| <b>Samples</b>                | organic                                                                                                                                     |
| <b>Furnace alignment</b>      | horizontal (resistance furnace)                                                                                                             |
| <b>Sample carrier</b>         | ceramic boats                                                                                                                               |
| <b>Field of application</b>   | agriculture, biology, chemistry / plastics, coal / power plant, construction materials, environment / recycling, medicine / pharmaceuticals |
| <b>Furnace</b>                | resistance furnace (ceramic tube), adjustable up to 1550 °C (steps of 1 °C)                                                                 |
| <b>Detection method</b>       | solid state infrared absorption                                                                                                             |
| <b>Number of IR cells</b>     | 1 - 4                                                                                                                                       |
| <b>Material of IR path</b>    | gold                                                                                                                                        |
| <b>Typical analysis time</b>  | 60 - 180 s                                                                                                                                  |
| <b>Chemicals required</b>     | magnesium perchlorate, sodium hydroxide                                                                                                     |
| <b>Gas required</b>           | oxygen 99.5 % pure (2 - 4 bar / 30 - 60 psi)                                                                                                |
| <b>Power requirements</b>     | 230 V, 50/60 H, max. heating up current 20 A                                                                                                |
| <b>Dimensions (W x H x D)</b> | 58 x 52 x 75 cm                                                                                                                             |
| <b>Weight</b>                 | ~ 77 kg                                                                                                                                     |
| <b>Required equipment</b>     | PC, monitor, balance (resolution 0.0001g)                                                                                                   |
| <b>Optional accessories</b>   | TIC module                                                                                                                                  |

[www.eltra.com/cs-r](http://www.eltra.com/cs-r)

## ORDER DATA

### ELTRA ELEMENTRAC CS-R

(Please order PC, monitor, balance and consumables (starter-kit, anhydrone, sodium hydroxide) separately)

Measuring ranges at 350 mg sample weight  
(alternative configurations on request)

2)

|            |                                                                                    |      |              |                                     |
|------------|------------------------------------------------------------------------------------|------|--------------|-------------------------------------|
| 88200-3006 |   | CS-r | 2xC          | 0.004 – 100 % C                     |
| 88200-3008 |   | CS-r | 2xS          | 0.001 – 31.4 % S                    |
| 88200-3015 |   | CS-r | 1xC<br>+ 2xS | 0.03 – 100 % C<br>0.001 – 31.4 % S  |
| 88200-3016 |   | CS-r | 2xC<br>+ 1xS | 0.004 – 100 % C<br>0.001 – 11.4 % S |
| 88200-3017 |  | CS-r | 2xC<br>+ 2xS | 0.004 – 100 % C<br>0.001 – 31.4 % S |

Further measuring range combinations on request

(Please order PC, monitor, balance and consumables (starter-kit, anhydrone, sodium hydroxide) separately)

### REQUIRED ACCESSORIES

#### PC, MONITOR, BALANCE

|            |                                                                                                                |
|------------|----------------------------------------------------------------------------------------------------------------|
| 71015-1000 | Computer with Intel Core i5-8400 Processor, 256 GB SSD; 8 GB RAM; Windows 10 operating system; keyboard; mouse |
| 88400-0584 | Monitor, TFT (23.8 inch)                                                                                       |
| 88400-0645 | Balance (resolution 0.0001 g)                                                                                  |

#### REQUIRED CONSUMABLES / CHEMICALS FOR FIRST OPERATIONS

|            |                                                                                                                                     |
|------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 88500-0003 | ELEMENTRAC CS-r Starter-kit for 500 analyses (500 disposable porcelain boats, 50 g glass wool, 50 re-usable boats, 100 g Combsolid) |
| 90200      |  Anhydrone (magnesium perchlorate), 454 g 1)     |
| 90210      |  Sodium hydroxide, 500 g 1)                      |

## FURTHER OPTIONS AND CONSUMABLES

### CHEMICALS (FILLINGS FOR GLASS AND QUARTZ TUBES)

90200  Anhydron (magnesium perchlorate), 454 g l)

90210  Sodium hydroxide, 500 g l)

90331  Glass wool, 454 g

90332  Glass wool, 50 g

92610  Tube of high vacuum grease, 35 g

88600-0008  Combsolid, 100 g l)

91000-1005  Copper, flakes, 25 g

90840  Quartz sand, 100 g

88400-0508  Steel wool

### BOATS

90160  Disposable porcelain boats 86 x 13 x 10 mm, 1000 pieces

90153  Re-usable ceramic boats, premium, 58 x 22 x 14 mm, 500 pieces

88600-0011  Re-usable ceramic boats, 95 x 13 x 10 mm, 500 pieces

88400-0502  Re-usable inconel boat, 54 x 18 x 13.5 mm, 1 piece

88400-0503  Re-usable inconel boat, 54 x 18 x 9 mm, 1 piece

#### TOOLS FOR OPERATION: SPATULAS, TWEEZERS, TONGS AND OTHER

|            |                                                                                   |                                                                     |
|------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 88400-0229 |  | Tweezers (160 mm), curved, 1 piece                                  |
| 88400-0472 |  | Tweezers (145 mm), straight, 1 piece                                |
| 88400-0475 |  | Set with 6 spatula and 1 tweezers, for multiple weighing procedures |
| 90145      |  | Tongs for ceramic crucibles and boats, 220 mm, 1 piece              |
| 88600-0009 |  | Screen glass with edge guard                                        |
| 88400-0499 |  | Safety glasses                                                      |
| 36216-2001 |                                                                                   | Combustion boat insertion stick, 1 piece                            |
| 36218-2001 |                                                                                   | Combustion boat removing stick, 600 mm, 1 piece                     |

#### TOOLS FOR STORAGE, TRANSPORTING AND WEIGHING

|            |                                                                                     |                                                              |
|------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 88400-0477 |  | Weighing boat, 1 piece, for weighing and usage of granulates |
|------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------|

#### TOOLS FOR MAINTENANCE

|            |                                                                                     |                                                                              |
|------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 88400-0473 |  | Powder funnel (plastics), 1 piece, for easy filling of chemical tubes        |
| 88400-0490 |  | Rubber plug 29 x 35 x 30 mm, 1 piece, for sealing big glass tubes like 09090 |
| 71010      |  | Brush, 16 mm, 1 piece, for cleaning balance from dust                        |
| 88600-0026 |                                                                                     | Anhydrone filter tube, glass tube filled with Anhydrone 1)                   |

## CALIBRATION MATERIALS

**Calibration materials may show slight variations depending on the current lot.**

To see the current certification please visit [www.ELTRA.com](http://www.ELTRA.com).

#### COAL: CERTIFIED SULFUR CONTENT

|            |                                                                                     |                           |
|------------|-------------------------------------------------------------------------------------|---------------------------|
| 92511-3005 |                                                                                     | Coal, 50 g, <0.1 % S      |
| 92511-3010 |    | Coal, 50 g, 0.1 – 0.5 % S |
| 92511-3020 |    | Coal, 50 g, 0.5 – 1.0 % S |
| 92511-3030 |    | Coal, 50 g, 1.0 – 1.5 % S |
| 92511-3040 |    | Coal, 50 g, 1.5 – 2.0 % S |
| 92511-3050 |    | Coal, 50 g, 2.0 – 3.0 % S |
| 92511-3060 |   | Coal, 50 g, 3.0 – 4.0 % S |
| 92511-3070 |  | Coal, 50 g, 4.0 – 5.0 % S |
| 92511-3080 |  | Coal, 50 g, >5.0 % S      |

#### COAL, PREMIUM, C/H/N/S, ASH, VOLATILE CONTENT, CERTIFIED

|            |                                                                                     |                                    |
|------------|-------------------------------------------------------------------------------------|------------------------------------|
| 92550-3010 |                                                                                     | Coal, premium, 50 g, ~ 1 % S       |
| 92550-3020 |  | Coal, premium, 50 g, ~ 1 % S       |
| 92550-3040 |  | Coal, premium, 50 g, 1.0 – 3.0 % S |
| 92550-3060 |  | Coal, premium, 50 g, > 3.0 % S     |

#### COKE, PREMIUM, C/H/N/S, ASH, VOLATILE CONTENT, CERTIFIED

|            |                                                                                     |                     |
|------------|-------------------------------------------------------------------------------------|---------------------|
| 92560-3010 |  | Coke, premium, 50 g |
|------------|-------------------------------------------------------------------------------------|---------------------|

#### PET COKE, PREMIUM, C/H/N/S, ASH, VOLATILE CONTENT CERTIFIED

92570-3020 Pet coke, premium, 50 g, ~ 1 % S

92570-3040 Pet coke, premium, 50 g, ~ 1 % S

#### OTHER

90812-3001  Limestone, 25 g, 0.04 % S

90812-3002  Limestone, 25 g, 0.4 % S

90812-3003 Limestone, 25 g, < 5 % C

90812-3004 Limestone, 25 g, 5 – 10 % C

90817-3001 Soil, 25 g, > 2 % C, S

90817-3002 Soil, 25 g, < 1 % C, S

90817-3003 Soil, 25 g, > 2 % C, S

90817-3004 Soil, 25 g, < 2 % C, < 1 % S

91900-1001  Ore, 30 g, ~1.4 % S

91900-1002  Ore, 30 g, ~4.2 % S

91900-1003 Ore, 30 g, ~3 % S

#### PRIMARY SUBSTANCES FOR CALIBRATION, 32 % S

90710-3010  EDTA, 50 g

90710-3030 Sucrose, 50 g

90810  Calcium carbonate, 100 g

90821  Barium sulphate, 50 g

90824  Sulfanilic acid, 50 g

91900-2001 Zinc sulfide, 50 g, 32 % S

**Please note: Every analyzer requires PC, monitor, balance and some consumables (crucibles, chemicals)  
which have to be ordered separately**