ELTRA®
a VERDER company

CARBON / HYDROGEN / SULFUR ANALYZER

ELEMENTRAC CHS-r

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

The CHS-r with up to 3 infrared cells is designed for carbon, sulfur and hydrogen 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 CHS-r combustion analyzer meets or exceeds the requirements of all common ASTM, DIN, EN or ISO standards for elemental analysis.

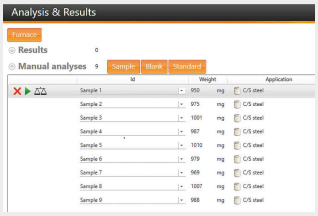
CARBON / SULFUR ANALYZER

ELEMENTRAC CHS-R

- Fast, simultaneous measurement of carbon, sulfur and hydrogen
- 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%

OPERATION AND ANALYSIS PROCESS

The ELEMENTRAC CHS-r elemental analyzer determines the elements carbon, sulfur and hydrogen by combustion of the sample in an oxygen stream and subsequent measurement of the combustion gases CO_2, SO_2 and H_2O in selective infrared measuring cells. A high sample weight of up to 500 mg ensures excellent reproducibility of the measurement 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/sulfur - carbon/hydrogen/sulfur), operation is identical in all 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 analysis of carbon, hydrogen 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, hydrogen and sulfur concentrations are available for export as a report or via LIMS. Depending on the selected configuration, carbon, sulfur and hydrogen values are available for the individual sample.

SOLUTIONS & OPTIONS IN DETAIL

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

Included: Two Anhydrone Columns

For reliable analysis of carbon and sulfur, the combustion gases must be freed from water vapor prior to IR detection. The CHS-r elemental analyzer has two drying columns filled with magnesium perchlorate to reliably prevent absorption effects in large sample volumes.

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_2 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 CHS-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 laboratory space, the ELEMENTRAC CHS-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 CHS-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!

CARBON / SULFUR ANALYZER ELEMENTRAC CHS-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 CHS-R

TYPICAL SAMPLE MATERIALS

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

coal

soil

plastic

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FUNCTIONAL PRINCIPLE

In the elemental analyzer CHS-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 (CO_2, H_2O, SO_2) coming from the furnace and first pass through a dust filter and then into the heated H_2O infrared cell. After the water vapor is chemically absorbed, the dried CO_2 and SO_2 gas is detected in the additional infrared cells. Depending on the configuration, it is possible to combine up to three infrared cells with different sensitivities.

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TECHNICAL DATA

Measured elements	carbon, hydrogen, sulfur
Samples	organic
Furnace alignment	horizontal (resistance furnace)
Sample carrier	ceramic boats
Field of application	agriculture, biology, chemistry / plastics, coal / power plant, construction materials, environment / recycling, medicine / pharmaceuticals
Furnace	resistance furnace (ceramic tube), adjustable up to 1550 °C (steps of 1 °C)
Detection method	solid state infrared absorption
Number of IR cells	1 - 3
Material of IR path	gold
Typical analysis time	60 - 180 s
Chemicals required	magnesium perchlorate, sodium hydroxide
Gas required	oxygen 99.5 % pure (2 - 4 bar / 30 - 60 psi)
Power requirements	230 V, 50/60 Hz max. heat up current 2000 W
Dimensions (W x H x D)	58 x 52 x 75 cm
Weight	~ 77 kg
Required equipment	PC, monitor, balance (resolution 0.0001g)
Optional accessories	TIC module

ORDER DATA

ELTRA ELEMENTRAC CHS-R

				Measuring ranges at 350 mg sample weight (alternative configurations on request)	**2)**
88200-3100		CHS-r	1xC + 1xH + 1xS	0.03 – 100 % C 0.002 – 4.2 % H 0.001 – 1.14 % S	
88200-3101		CHS-r	1xC + 1xH + 1xS	0.03 – 100 % C 0.002 – 4.2 % H 0.01 – 3.42 % S	
88200-3102		CHS-r	1xC + 1xH + 1xS	0.03 – 100 % C 0.002 – 4.2 % H 0.005 – 2.28 % S	
88200-3103		CHS-r	1xC + 1xH + 1xS	0.004 – 21 % C 0.002 – 4.2 % H 0.001 – 1.14 % S	
88200-3109		CHS-r	1xC + 1xH + 1xS	0.03 – 100 % C 0.002 – 4.2 % H 0.05 – 31.4 % S	

Further measuring range combinations on request

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		
88500-0004		ELEMENTRAC CHS-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		Anhydrone (magnesium perchlorate), 454 g 1)
90210		Sodium hydroxide, 500 g 1)
90331		Glass wool, 454 g
90332		Glass wool, 50 g
92610		Tube of high vacuum grease, 35 g
88600-0008		Combsolid, 100 g 1)
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 1)	glass tube filled with Anhydrone

CALIBRATION MATERIALS

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

To see the current certification please visit 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, <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

LIQUID CALIBRATION MATERIAL

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