ELTRA®
a VERDER company

CARBON / SULFUR ANALYZER

ELEMENTRAC CS-i

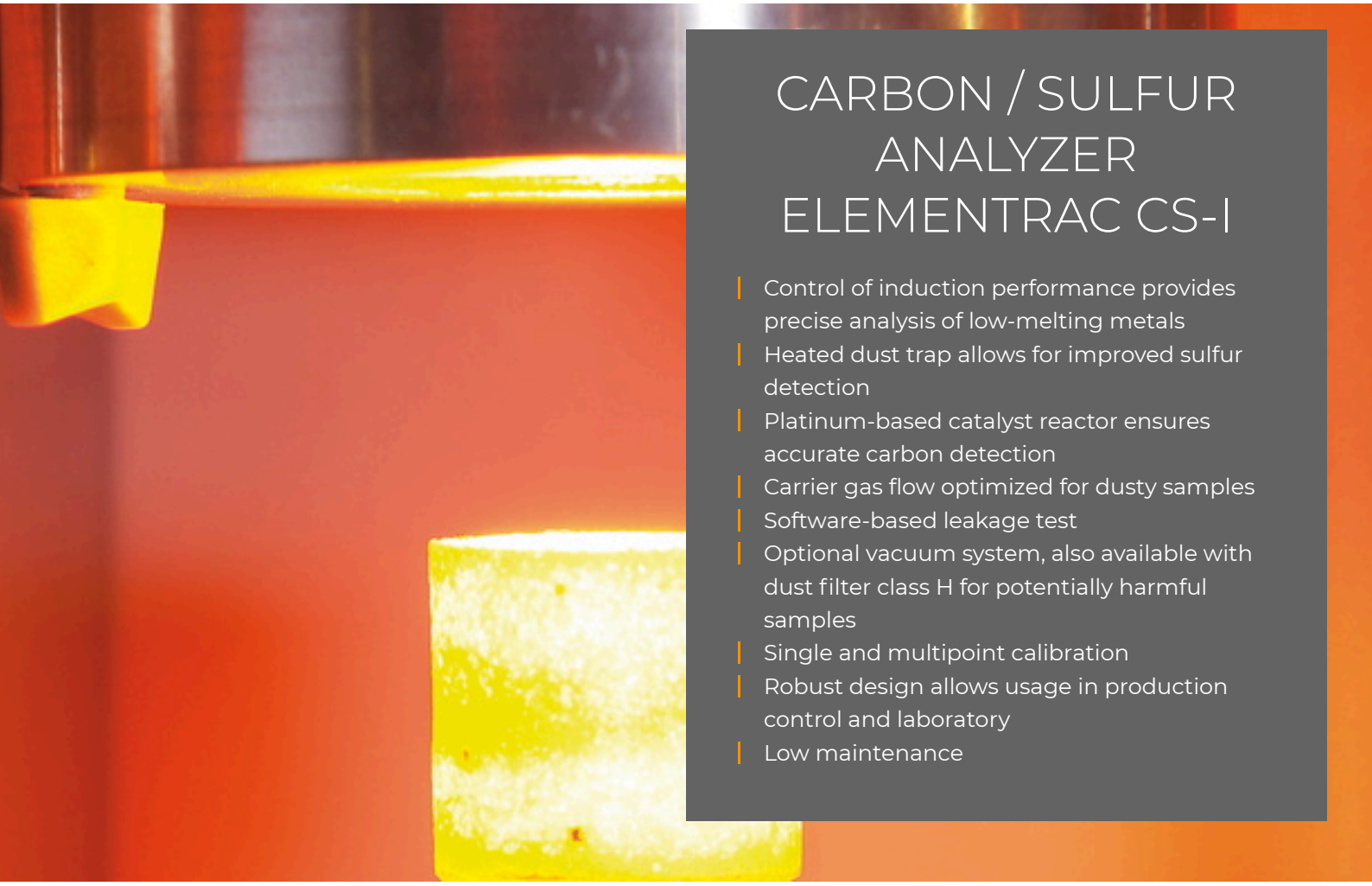
The elemental analyzer ELEMENTRAC CS-i measures the carbon and sulfur concentration in predominantly inorganic samples through combustion in an induction furnace and the subsequent analysis of the gaseous combustion products carbon dioxide and sulfur dioxide.

The high temperature of more than 2000 °C ensures complete decomposition of the sample and thus reliable and accurate elemental analysis over a wide concentration range.

The ELEMENTRAC CS-i meets and exceeds the requirements of all common standards for carbon and sulfur measurement, such as ASTM E1019, DIN EN ISO 15350 .

Click to view video

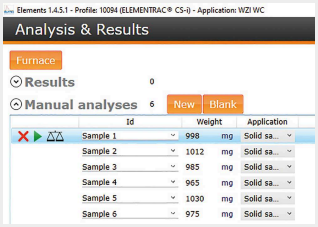
Product Video



CARBON / SULFUR ANALYZER ELEMENTRAC CS-I

- Control of induction performance provides precise analysis of low-melting metals
- Heated dust trap allows for improved sulfur detection
- Platinum-based catalyst reactor ensures accurate carbon detection
- Carrier gas flow optimized for dusty samples
- Software-based leakage test
- Optional vacuum system, also available with dust filter class H for potentially harmful samples
- Single and multipoint calibration
- Robust design allows usage in production control and laboratory
- Low maintenance

OPERATION AND ANALYSIS PROCESS



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

Sample volumes of 50 mg to 1000 mg are typical for C/S analysis. The sample is weighed in a ceramic crucible and accelerators like tungsten are added. The geometry of the sample (e. g. wire, powder, pin etc.) is not essential for a reliable analysis.

Step 3: Analysis

The ceramic crucible is then placed on the pedestal and the analysis is started via the ELEMENTS software. The software controls all subsequent steps like combustion and evaluation.

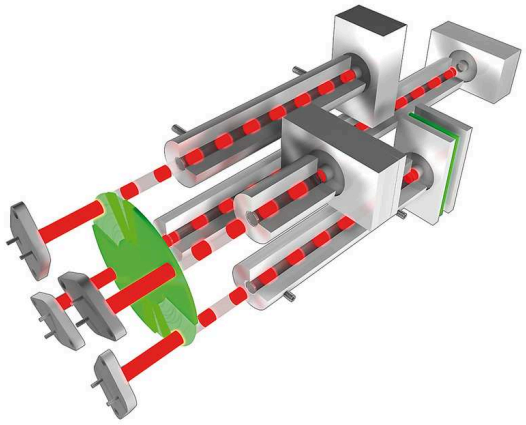
Step 4: Data output and export

45-60 seconds after the analysis has started, the measured carbon and sulfur concentrations are available for export as a report or via LIMS.

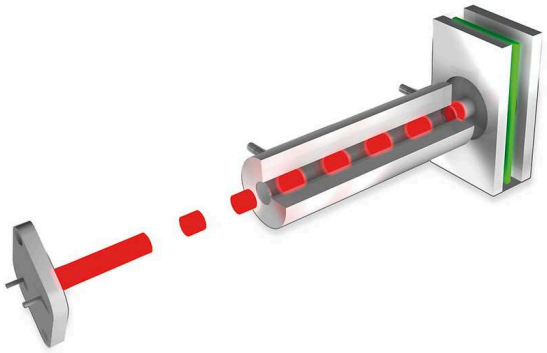
CONFIGURATIONS

The ELEMENTRAC CS-i is available as a single-element analyzer for carbon or sulfur only, or in a configuration for simultaneous measurement of both carbon and sulfur. It uses up to 4 IR cells which can be configured according to customer requirements. The longer the cuvette, the more sensitive it is for low concentrations like 10 ppm. Shorter cuvettes also allow measurement in the low ppm range, however with increasing standard deviation of the measured values. For optimum analysis of low and high concentrations, a configuration of two IR cells for one element should be selected. The latest detector technology permits advanced configurations to reliably cover the measuring range from 0.6 ppm to more than 6 % for a sample weight of 1000 mg. Optional gold cuvettes provide higher reliability for elemental analysis of halogenated samples. For reliable analysis of materials with a high sulfur content, the CS-i can be equipped with more robust IR cells to extend the measurement range and improve the reproducibility of the results. It is also possible to equip the CS-i with a halogen trap. Another option is a special configuration for measuring cement.

INFRARED CELLS WITH FLEXIBLE MEASURING RANGE



CUVETTE WITH VARIABLE LENGTH



INTEGRATED STANDARD SOLUTIONS

The chemicals and filters required for operation of the ELEMENTRAC CS-i are conveniently arranged on the front of the analyzer and may be concealed behind a removable door. This arrangement substantially reduces maintenance time and increases usability. Innovative details of the ELEMENTRAC CS-i significantly improve the reproducibility of carbon and sulfur measurements.

Catalyst

- For accurate carbon determination
- Extended reaction path ensures complete oxidation of incomplete combustion products (carbon monoxide)
- Best possible reproducibility even for very high carbon concentrations

Heated Dust Trap

- The dust generated by inductive combustion is collected in an external dust filter
- Efficient heating of the dust trap prevents condensation of water vapor
- Significant improvement of recovery rates and reproducibility of sulfur measurements

Intelligent Lance Management / Oxygen Supply

- Individual control of the oxygen supply during inductive combustion
- A lance flushes the entire oxygen flow to the center of the crucible to ensure complete oxidation of the carbon and sulfur contained in the sample (solid samples)
- Oxygen flow is supplied through the combustion chamber to avoid swirling and loss of sample material (dusty samples)
- Accurate analysis of low-density samples

Control of Induction Power

- For optimized combustion of metals with a low melting point, such as copper, tin or magnesium
- Reduced power in the induction furnace allows for safe and accurate analysis without sample loss through splashing during heating

OPTIONS

In addition to the features already integrated in the ELEMENTRAC CS-i further options are available to increase efficiency and extend the application range.

AUTOLOADER

The induction furnace of the ELEMENTRAC CS-i can be equipped with an optional automatic sample loader. The standard module offers 36 crucible positions, the XL model even features 130 positions. It is the largest Autoloader available in the market for this type of application.

Click to view video

TIC MODULE

Carbon can be determined as total carbon (TC) or in fractions, i. e. total organic carbon (TOC) or total inorganic carbon (TIC). When combined with the CS-i, ELTRA's TIC module measures the TIC content (e. g. lime) by acidification in products like soil or construction materials.

ELEMENTRAC CS-I GLOVEBOX

With the **new ELEMENTRAC CS-i Glovebox** variant, we are expanding our portfolio with powerful solutions for controlled-atmosphere analysis. The model is engineered for seamless glovebox integration, ensuring precise, reliable results while protecting both sensitive samples and users.

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!

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-I

TYPICAL SAMPLE MATERIALS

alloys, aluminum, ashes, carbides, cast iron, cement, ceramics, copper, ferroalloys, glass, gypsum, iron, limestone, metals, minerals, ores, refractory metals, sand, silicon, slag, soil, steel, ...

copper

soil

steel

FUNCTIONAL PRINCIPLE

In the induction furnace of the elemental analyzer the sample is melted in a pure oxygen atmosphere, causing sulfur to react to sulfur dioxide (SO_2) and carbon to a mixture of carbon monoxide (CO) and carbon dioxide (CO_2). The combustion gases pass through a dust filter and moisture absorber for purification. In the next step the sulfur dioxide is detected in infrared cells. In the CS-i infrared cells with different sensitivities (high/low) can be adapted according to the user's requirements. Oxidation of both, carbon monoxide to carbon dioxide and sulfur dioxide to sulfur trioxide follow the sulfur measurement. The SO_3 gas is removed with cellulose wool; the carbon content is detected by infrared cells which can be individually customized. The ELEMENTRAC CS-i elemental analyzer can be equipped with up to 4 independent infrared cells.

TECHNICAL DATA

Measured elements	carbon, sulfur
Samples	inorganic
Furnace alignment	vertical
Sample carrier	ceramic crucibles
Field of application	construction materials, engineering / electronics, geology / mining, glass / ceramics, steel / metallurgy
Furnace	induction furnace, above 2,000 °C
Detection method	solid state infrared absorption
Number of IR cells	1 - 4
Material of IR path	aluminum (optional gold)
Typical analysis time	40 seconds (nominal)
Chemicals required	magnesium perchlorate, platinum-based catalyst, sodium hydroxide
Gas required	compressed air (4 bar/ 60 psi) oxygen 99.5 % pure (2 - 4 bar / 30 - 60 psi)
Power requirements	230 V, 50/60 Hz, max. 15 A, 3450 W
Dimensions (W x H x D)	52 x 84 x 75 cm
Weight	~ 150 kg
Required equipment	PC, monitor, balance (resolution 0.0001g)
Optional accessories	Autoloader (for 36 crucibles), HTF-540 pre-heating furnace, carrier gas purification, halogen trap, vacuum cleaner

www.eltra.com/cs-i

ORDER DATA

ELEMENTRAC CS-I

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

				Measuring ranges at 1000 mg sample weight 2)
88200-1001		CS-i	1xC	0.0002 – 3.5% C
88200-1002		CS-i	2xC	0.00006 – 3.5% C
88200-1003		CS-i	1xS	0.0002 – 0.42% S
88200-1004		CS-i	2xS	0.00006 – 2.3% S
88200-1005		CS-i	1xC + 1xS	0.0002 – 3.5% C 0.00006 – 0.15% S
88200-1006		CS-i	2xC + 1xS	0.00006 – 3.5% C 0.00006 – 0.15% S
88200-1007		CS-i	1xC + 2xS	0.0002 – 3.5% C 0.00006 – 2.3% S
88200-1008		CS-i	2xC + 2xS	0.00006 – 3.5% C 0.00006 – 2.3% S
88200-1013		CS-i	2xC + 2xS	0.00006 – 7% C 0.00006 – 6.4% S

ELEMENTRAC® CS-I GLOVEBOX

CS-i	**2xC**	**0.6 ppm –3.5 % C**	**2xS**	**0.6 ppm–2.3 % 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
88400-0645		Balance (resolution 0.0001 g)

CRUCIBLES AND CHEMICALS FOR ELEMENTRAC CS-I		
88500-0001		Starter-kit for 1,000 analyses (1,000 crucibles, 2,500 g tungsten, 908 g pure iron accelerator, 50 g glass wool, 50 g cellulose, 50 g quartz wool)
90200		Anhydrone (magnesium perchlorate), 454 g 1)
90210		Sodium hydroxide, 500 g 1)
88400-0535		Pt/Si catalyst,15 g

FURTHER OPTIONS AND CONSUMABLES

ACCESSORIES (HARDWARE)		
72070		Oxygen regulator
88200-9000		Carrier gas purification furnace, without filling (please order filling and quartz wool separately)
88200-1400		Autoloader for 36 crucibles
88400-0610		Barcode scanner
88200-1500		Autoloader for 130 crucibles
88600-0020		Halogen trap CS-i / CS-d
88600-0025		Vacuum cleaner for CS-i, with HEPA filter

CRUCIBLES AND LIDS		
90149		Ceramic crucibles, premium, Ø 1”, foil-wrapped, 1,000 pieces
90148		Ceramic crucibles, premium, Ø 1”, bagged, 1,000 pieces
88400-0176		Ceramic filtering crucibles, 100 pieces
88600-0014		Ceramic lid, 10 mm hole, 250 pieces

88600-0017		Ceramic lid, 4 mm hole, 1000 pieces

ACCELERATORS		
90220		Tungsten, premium, 2,500 g
90260		Iron accelerator, premium, 908 g
88600-0013		Iron accelerator, high purity, 454 g
88600-0010		Eltracell tungsten-tin accelerator, 750 g
90280		Tin accelerator, 908 g
90240		Copper accelerator, 1392 g

CHEMICALS		
90200		Anhydrone (magnesium perchlorate), 454 g 1)
90210		Sodium hydroxide, 500 g 1)
88400-0535		Pt/Si catalyst,15 g
90331		Glass wool, 454 g
90340		Cellulose, 100 g
90341		Cellulose, 50 g
90330		Quartz wool, 50 g
92610		Tube of high vacuum grease, 35 g

88400-0122		Filling for carrier gas purification furnace

GENERAL TOOLS AND ACCESSORIES

23110		Spatula, 1 piece, M size
23111		Spatula, 1 piece, L size
23113		Spoon, 1 piece, for dosing sample and accelerator in CS series
90145		Tongs for ceramic crucibles and boats, 220 mm 1 piece, for CS series
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

TOOLS FOR STORAGE, TRANSPORTING AND WEIGHING

36121		Quartz boat, 74x22x10 mm, 1 piece, for weighing pins
71010		Brush, 16 mm, 1 piece, for cleaning balance from dust
88400-0477		Weighing boat, 1 piece, for weighing and usage of granulates
88600-0015		Crucible holder, for storage of crucibles

TOOLS FOR MAINTENANCE

51100-8000	O-ring set CS-i
51100-8002	Maintenance kit CS-i

88400-0473		Powder funnel (plastics), 1 piece, for easy filling of chemical tubes
88400-0489		Rubber plug 14x20x24 mm, 1 piece, for sealing small glass tubes like 88400-0006
88400-0332		Threaded rod M4x150, 1 piece, for removing paper filter holder
88600-0027		Sodium hydroxide, Anhydrone filter tube, for removing paper filter holder

CALIBRATION MATERIALS

Calibration materials may show slight variations depending on the current lot.
To see the current certification please visit www.ELTRA.com.

STEEL AND CAST IRON		
92400-3020		Steel, 150 g, 0.001 – 0.01 % C Details
92400-3030		Steel, 150 g, 0.01 – 0.05 % C Details
92400-3050		Steel, 150 g, 0.1 – 0.2 % C Details
92400-3060		Steel, 150 g, 0.2 – 0.5 % C Details
92400-3061		Steel, 150 g, 0.2 – 0.5 % C Details
92400-3062		Steel, 150 g, 0.2 – 0.5 % C Details
92400-3070		Steel, 150 g, 0.5 – 1.0 % C Details
92400-3090		Cast iron, 150 g, 2.0 – 3.0 % C Details
92400-3091		Cast iron, 150 g, 2.0 – 3.0 % C Details
92400-3100		Cast iron, 150 g, 3.0 – 5.0 % C Details
92400-3101		Cast iron, 150 g, 3.0 – 5.0 % C Details
92400-3102		Cast iron, 150 g, 3.0 – 5.0 % C Details
92400-4005		Steel, 150 g, ~0.05 % S Details
92400-4010		Steel, 150 g, ~0.1 % S Details

92400-4020		Steel, 150 g, ~3 % S Details

STEEL PINS		DETAILS
92500-1001		C/S pins, 454 g, ~0.2 %~C Details
92500-1002		C/S pins, 454 g, ~0.4 %~C Details
92500-1003		C/S pins, 454 g, ~0.8 % C Details
92500-2001		C/S pins, 454 g, ~0.2 % S Details

TUNGSTEN CARBIDE		
90816-3001		Tungsten carbide, 100 g, ~6.1 % C

OTHER CALIBRATION MATERIAL SUITABLE FOR RESISTANCE AND INDUCTION FURNACE		
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
91900-2001		Zinc sulfide, 50 g, 32 % S
90810		Calcium carbonate, 100 g

90821		Barium sulphate, 50 g

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