CS - 580
Carbon / Sulfur
Determinator

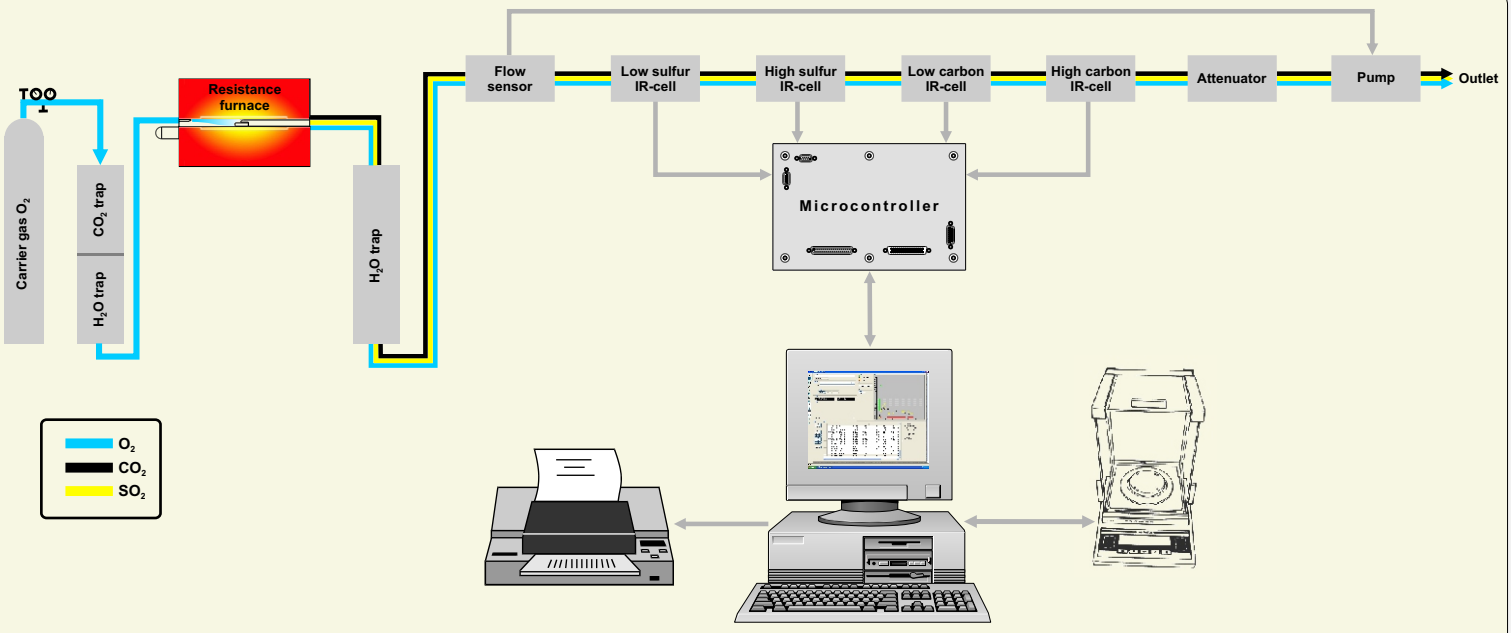
ELTRA
Analysers made in Germany

Double Dual Range

- Four solid state infrared cells
- Infrared paths made of gold
- No halogen trap required
- Fractional analysis of free and bound carbon and sulfur
- Separation of inorganic and organic carbon
- Separation of sulfides and sulfates
- Furnace temperature up to 1550°C
- Electronic gas flow control
- PC controlled

TÜV CERT
DIN EN ISO 9001
Certificate: 01 100 0020005

CS-580 Double Dual Range Carbon / Sulfur Determinator



Description

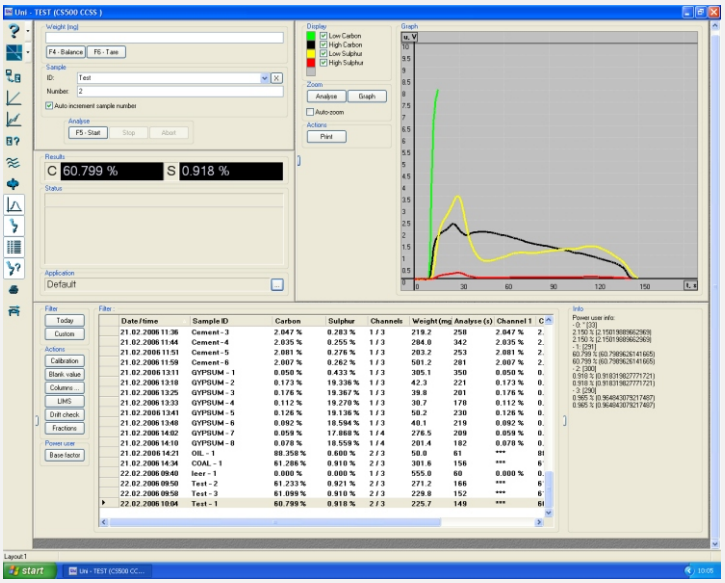
The CS-580 incorporates the latest in combustion technology. It is designed for the rapid simultaneous determination of carbon and sulfur in coal, coke, oil, ashes, catalysts, lime, gypsum, soils, rubber, leaves, soot, tobacco, waste, sand, glass, etc.
The CS-580 can be supplied with up to four independent infrared cells. The sensitivity of these cells can be customized to meet specific requirements. The IR-absorption lengths can be individually selected to offer optimum precision for the analysis of high and low levels of both, sulfur and carbon. The CS-580 features a microcontroller, a high temperature resistance furnace up to 1550°C and solid state infrared detectors with auto zero and auto range control.

Analysis procedure

The sample is weighed into a combustion boat on an electronic balance which is interfaced to the PC. By pressing a key the sample weight is transferred to the PC. If required, the sample weight can also be entered manually. The ceramic boat with the sample is placed on the furnace platform. The start key is pressed and the analysis cycle begins.
The sample is pushed into the furnace. At the end of the cycle, the analysis results appear on the built-in display.

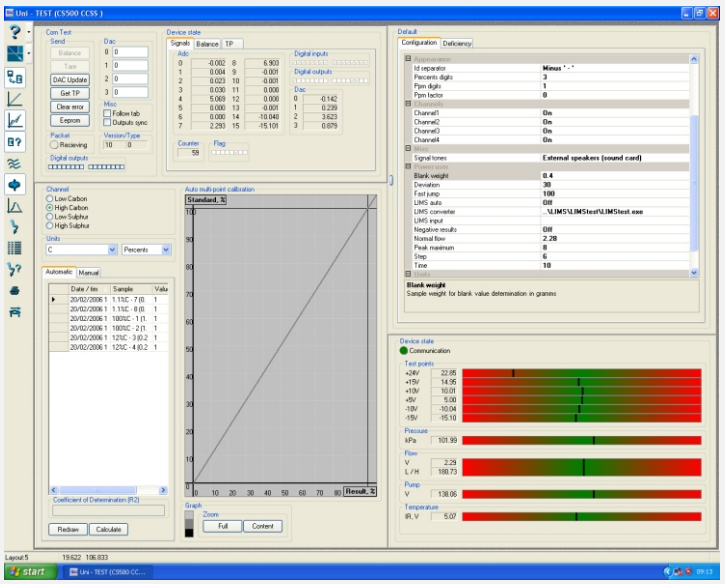
PC control with Windows software

Comprehensive analyser control and easy operation are provided by the PC and software connected to the computer.



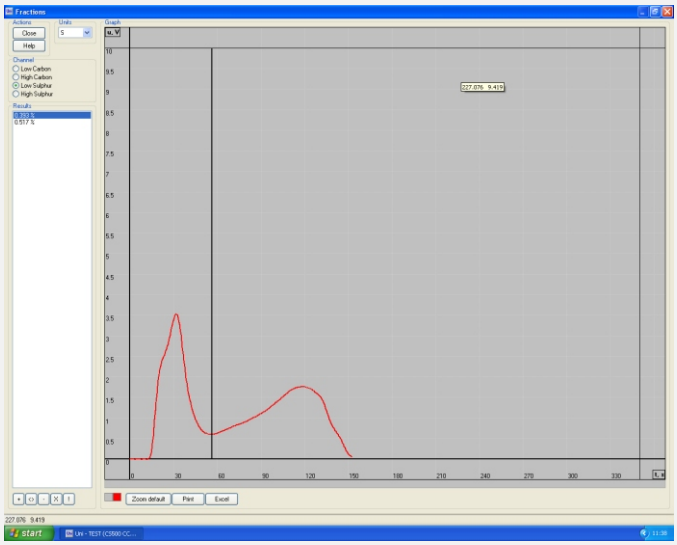
The multilingual software provides the user with the following features:

- Optional display layout - adjustable screen appearance of the program windows.
- User profiles with multi-level access - parameter changes protected by unauthorized acces.
- Sample ID memory - supplemented with running analysis number.
- Data base (analysis results storage) - all data for each analysis is stored and can be recalled later for review, report creation, statistical calculations or results recalculation with modified parameters.
- Optional data base configuration - displays only results meeting specified conditions, for example, certain date/time period, specific sample I.D. etc.
- Visualisation of the results consistency.
- Peak separation calculation procedure for fractional analysis.
- LIMS communication and data export (Notepad, Excel etc.).
- Basic one-point and advanced multi-point calibration.
- Barometric pressure compensation.
- Simultaneous calibration of more than one measuring range.
- Procedure for automatic linearity correction calculation.
- Applications memory and deficiency checks - adjustable analysis counters to prompt the changing of reagents, cleaning of filters and other maintenance procedures.
- Hardware diagnostics display and technical report printouts.



Fractional analysis

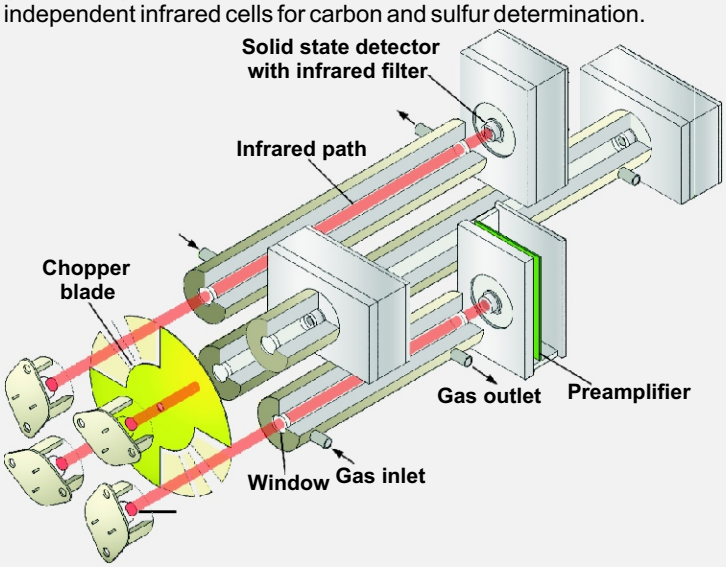
Due to the fact that free carbon and sulfur burn at lower temperatures than carbides and sulfates, the CS-580 can separate and measure free carbon, free sulfur and carbides and sulfates.



After inserting the sample in the combustion boat into the furnace, the boat gradually heats up. The free carbon and sulfur within the sample burn first, while carbides and sulfides burn several seconds later. The peak separation software integrates the individual peaks and then displays the results at the end of the combustion.

Infrared cells

The infrared cells of the CS-580 do not require any manual zero adjustments. The zero and sensitivity adjustments of the infrared cells are permanently and automatically controlled by the electronics. The detectors utilize solid state sensors combined with infrared filters. The sensors are not gas filled, thus eliminating long term problems due to gas leakage. The CS-580 can be equipped with up to four independent infrared cells for carbon and sulfur determination.



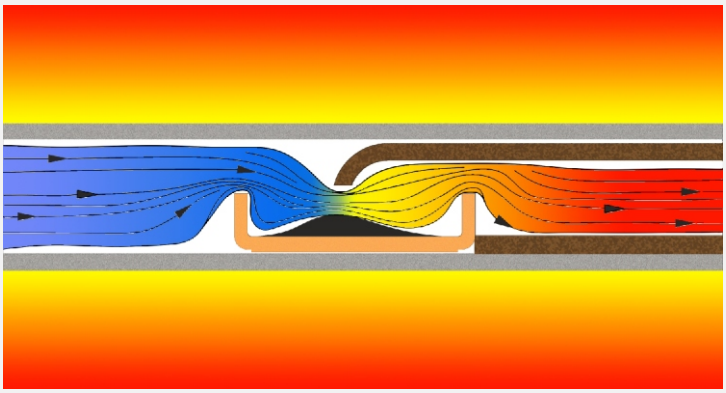
The lengths of all four cells can be individually optimized, to obtain maximum precision for the target analysis levels of each customer. Each of the cells can be installed with infrared absorption lengths ranging between 1mm and 320mm.

Resistance furnace up to 1550°C

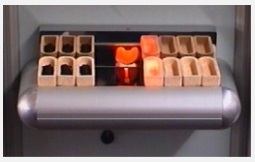
The resistance furnace employs silicon carbide heating elements. Full electronic control includes current limitation during cold-start conditions to promote long element life. A separate sensor is used to monitor ambient temperature and provide data for automatic reference point compensation ensuring that furnace temperature is not affected by fluctuations of ambient temperature. The furnace requires approximately 10 to 15 minutes to reach operating temperature.

Combustion efficiency

The design of the resistance furnace boat stop ensures that oxygen carrier gas penetrates into the crucible, ensuring efficient combustion. This design eliminates the need for fragile lances and honeycomb boat stops which tend to block easily with ash. Additionally the boat stop protects the combustion tube from the aggressive combustion products, thus extending the life of the tube.



The combustion tube is a simple straight ceramic tube that is robust and inexpensive to replace. The life expectancy of the tube is measured in thousands of analyses and not hundreds as it is the case with other analysers. (Protected by German utility model)



A variety of combustion boats can be used in the furnace including the reusable ceramic boats (L=57mm, W=22mm, H=13mm). Porcelain or quartz boats are also an option.

Electronic flow controller

An essential part of the gas flow system is the electronic flow controller. This provides a stable gas flow by eliminating the known disadvantages of mechanical controllers.

TIC-module

For the TIC determination, the sample is treated with acid in a TIC module. TIC and total carbon (TC) can be alternately analysed without modifications. For TIC analysis the sample is treated with acid in an Erlenmeyer flask inside the TIC-module. The acid decomposes the carbonates in the sample, creating CO_2. The oxygen flow purges the CO_2 out of the flask, through to the infrared detector. TC is determined when the sample is introduced into the furnace for combustion and IR detection.

Operating procedure:

An empty flask is placed on the balance.
The tare button is pressed.
The sample is put into the flask. The sample weight is entered into the analyser by pressing a key.
A magnetic stirrer is placed into the flask. The flask is attached to the TIC-module and the heated platform is raised.
The start key is pressed.
The acid is injected with the magnetic stirrer rotating. The CO_2 is released from the sample.
The infrared cell begins detection. When all the CO_2 has been released from the sample, the detector`s signal will return down to the baseline level and the analysis will be terminated.

CS-580 Specifications

MEASURING RANGES

Low carbon Up to 25mg C resp. up to 5%C at 500mg sample [1]	Low sulfur Up to 10mg S resp. up to 2% S at 500mg sample [1]
High carbon Up to 500mg C resp. up to 100%C at 500mg sample [1]	High sulfur Up to 100mg S resp. up to 100% S at 100mg sample [1]

SENSITIVITY

Carbon 5µg C resp. 10 ppm C at 500mg sample [1]	Sulfur 1µg S resp. 2 ppm S at 500mg sample [1]

ACCURACY

Low carbon [1] ±10µg C resp. ±20ppm C at 500mg sample or ±1% of C present	Low sulfur [1] ±2µg S resp. ±4ppm S at 500mg sample or ±1% of S present
High carbon [1] ±50µg C resp. ±100ppm C at 500mg sample or ±1% of C present	High sulfur [1] ±50µg S resp. ±100ppm S at 500mg [2] sample or ±1% of S present

GENERAL SPECIFICATIONS

Normal sample weight 400mg for coal	Normal analysis time 60 to 120 sec.
Furnace temperature Adjustable up to 1550 °C	Gas required Oxygen 99.5% pure 2 to 4 bar (30 to 60 psi) 3 l/min
Interfaces: serial and USB [4]	Chemicals CO_2 trap sodium hydroxide H_2O trap magnesium perchlorate
Detection method Solid state infrared absorption for CO_2 and SO_2	Analyser power requirements 230 V AC ±10% 50/60 Hz Maximum heat-up current 20A
Weight Analyser 70kg TIC-module 28kg	Dimensions Analyser 55cm (21") 80cm (31.5") 60cm (23.5") TIC-module 33cm (13") 52cm (20.5") 60cm (23.5") [3]

ACCESSORIES

Balance 0.0001g to 60 g ±0.0001 g [5]

Computer PC with HDD, DVD-ROM drive, TFT flat screen and keyboard [5]

Color printer with automatic cut sheet feed, other options on request [5]

1) Other ranges on request. 2) Possible by reducing the sample weight. 3) Allow 15 cm (6") access area behind the analyser.
4) Balance (serial - RS232) and printer USB are connected to the PC. 5) Visit our web site for further details (http://www.eltragmbh.com/cs580/information.shtml).

Typical results

Coal

22.03.10 09:20	Coal/008	346.7 mg	75.029 %C 2/0	2.1331 %S 3/0	085
22.03.10 09:22	Coal/009	356.0 mg	75.169 %C 2/0	2.1237 %S 3/0	080
22.03.10 09:25	Coal/010	339.3 mg	74.965 %C 2/0	2.1352 %S 3/0	083
	means:		75.05433	2.13067	
	sd:		0.13230	0.00544	

Lime

22.03.10 09:49	Lime/014	769.2 mg	11.645 %C 2/0	0.1524 %S 3/0	127
22.03.10 09:52	Lime/015	702.4 mg	11.721 %C 2/0	0.1763 %S 3/0	112
22.03.10 09:55	Lime/016	784.5 mg	11.773 %C 2/0	0.1512 %S 3/0	134
	means:		11.71300	1.15996	
	sd:		0.06300	0.01351	

Slate

22.03.10 14:44	Slate/037	812.3 mg	1.4556 %C 1/0	0.0226 %S 3/2	050
22.03.10 14:49	Slate/038	822,1 mg	1.4691 %C 1/0	0.0236 %S 3/2	050
22.03.10 14:53	Slate/039	805,2 mg	1.4602 %C 1/0	0.0239 %S 3/2	050
	means:		1.46163	0.02336	
	sd:		0.00453	0.00066	

Rubber

22.03.10 16:00	Rubber/020	83.8 mg	58.768 %C 2/0	1.5265 %S 3/0	050
22.03.10 16:02	Rubber/021	79.3 mg	57.945 %C 2/0	1.5298 %S 3/0	051
22.03.10 16:04	Rubber/022	91.5 mg	57.198 %C 2/0	1.5018 %S 3/0	050
	means:		57.97033	1.51937	
	sd:		0.49646	0.01342	

Oil

22.03.10 16:12	Oil/025	79.5 mg	88.235 %C 2/0	0.8981 %S 3/0	050
22.03.10 16:13	Oil/026	67.8 mg	88.923 %C 2/0	0.9135 %S 3/0	050
22.03.10 16:15	Oil/027	64.8 mg	87.325 %C 2/0	0.9248 %S 3/0	050
	means:		88.16100	0.91273	
	sd:		0.63215	0.01203	

ELTRA GmbH
Mainstr. 85 Block 20
D-41469 Neuss
Germany
☎ +(49) 2137 12822
Fax: +(49) 2137 12513
analysers@eltragmbh.com
www.eltragmbh.com

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