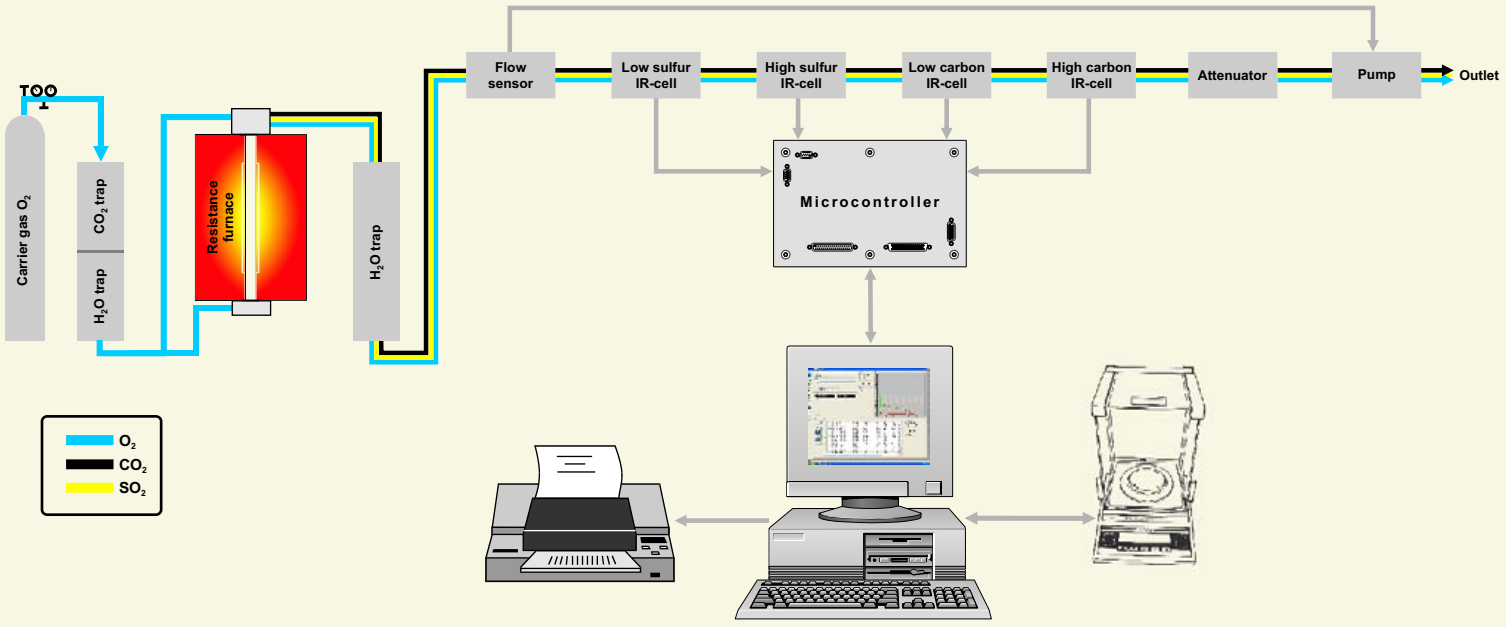
# HELIOS
## Carbon / Sulfur Determinator

**ELTRA**
Analysers made in Germany


- 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

# HELIOS Double Dual Range Carbon / Sulfur Determinator with Autoloader




## Description

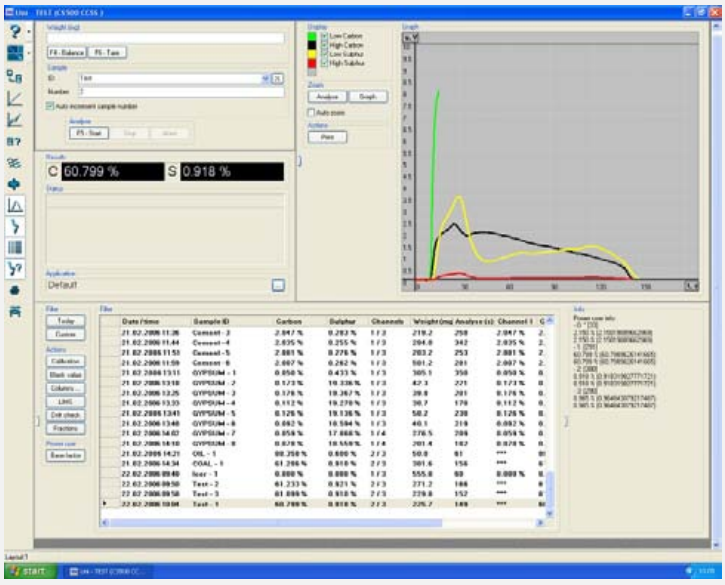
The Helios incorporates the latest in combustion technology. It is designed for the rapid simultaneous determination of carbon and sulfur in coal, coke, oil, ashes, catalysts, lime, gypsum, soils, rubber, leaves, soot, tobacco, waste, sand, glass, etc.
The Helios can be supplied with up to four independent 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 Helios features a microcontroller, a high temperature resistance furnace for temperatures up to 1550°C, solid state infrared detectors with auto-zero and auto-range control and an automatic sample loading device.

## Analysis procedure

The sample is weighed into a combustion crucible 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. After optional entry of a sample ID, both sample ID and weight are transferred to the sample stack by pressing a button. The ceramic crucible with the sample is placed on the crucible tray of the autoloader. By pressing the start key, the sample will be automatically loaded into the furnace. The analysis is carried out automatically as well. At the end of the analysis, the results are displayed on the PC screen and saved in the database on the HDD of the PC for further review, report creation, statistical calculations, printout etc.

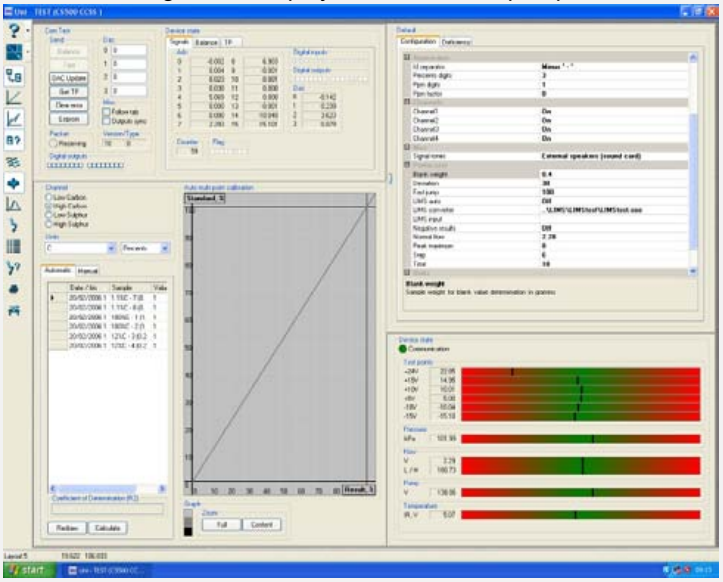
## PC control with Windows 2000/XP software

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 against 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.



The Helios complies to the specifications of the standards: ISO-10694 • ASTM E1915-97 • D-1552 • D-4239 • D-5016 • D-1619 • DIN EN 13137 • PN-93 G-04514/17

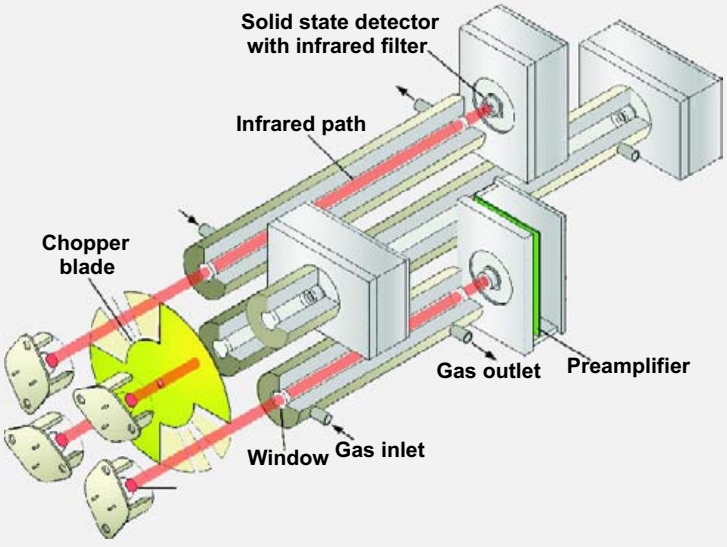
# HELIOS Double Dual Range Carbon / Sulfur Determinator with Autoloader

## Autoloader

The Helios is equipped with an automatic sample loading device, the autoloader, which enables running large numbers of samples without operator intervention. It perfectly meets the requirements of laboratories with high samples throughput.The robust and reliable autoloader can accommodate 130 crucibles, giving hours of unattended operation. Models with 104 and 36 crucibles are also available. On request, the loader can be delivered to accommodate more than 130 crucibles.The crucibles trays on the loader are easily accessible to the operator even from a sitting position. The sophisticated control software allows adding and deleting the samples whilst a sequence is running, and making “out of sequence” analysis of urgent samples.

## Infrared cells

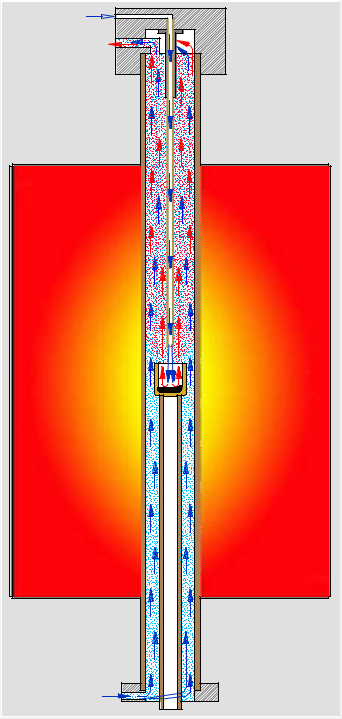
The infrared cells of the Helios do not require any manual zero adjustments. The zero and sensitivity adjustments of the infrared cells are permanently and automatically controlled by the electronics. The detectors utilize solid state sensors combined with infrared filters. The sensors are not gas filled, thus eliminating long term problems due to gas leakage. The Helios 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 vertical resistance furnace ensures that sufficient oxygen is blown into the crucible, giving efficient combustion. The oxygen is supplied into the furnace via two inputs, one of which is a lance directly over the crucible. 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.

The combustion crucibles used for analyses with Helios are standard ceramic crucibles, which are 1” or 25 mm in diameter.
In many applications, for example, coal and coke analyses, the crucibles can be used many times, before they are wasted.

## Electronic flow controller

An essential part of the gas flow system is the electronic flow controller ensuring stable gas flow.

## 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.

# Helios Specifications

## MEASURING RANGES

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

## SENSITIVITY

| | |
|---|---|
| Carbon<br>5µg C resp. 10 ppm C at 500mg sample [1] | Sulfur<br>1µg S resp. 2 ppm S at 500mg sample [1] |

## ACCURACY

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

## GENERAL SPECIFICATIONS

| | |
|---|---|
| Normal sample weight<br>400mg for coal | Normal analysis time<br>60 to 120 sec. |
| Furnace temperature<br>Adjustable up to 1550 °C | Gas required<br>Oxygen 99.5% pure 2 to 4 bar (30 to 60 psi) 3 l/min |
| Interfaces:<br>Computer - serial [4] | Chemicals<br>$CO_2$ trap sodium hydroxide<br>$H_2O$ trap magnesium perchlorate |
| Power requirements: 230 V AC ±10% 50/60 Hz<br>Stand-by at constant 1350°C maximum heat up power<br>0.33A / 75W 1000 Watts 2000 Watts | Detection method<br>Solid state infrared absorption for $CO_2$ and $SO_2$ |
| Weight<br>Analyser: approx. 90 kg<br>Autoloader: approx. 15 kg | Dimensions Width Height Depth<br>Analyser 55cm (21") 100cm (39.5") 60cm (23.5")<br>Autoloader 85cm (33.5") 35cm (13.5") 45cm (17.5") [3] |

## ACCESSORIES

Balance 0.0001g to 60 g ±0.0001 g [5]

Computer PC with HDD, 3.5" drive, CD-ROM, 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, parallel) are connected to the PC. 5) Visit our web site for further details (http://www.eltragmbh.com/helios/information.shtml).

## Typical results

Coal

| | | | | | |
|---|---|---|---|---|---|
| 15.03.07 09:20 | Coal/008 | 346.7 mg | 75.029 %C 2/0 | 2.1331 %S 3/0 | 085 |
| 15.03.07 09:22 | Coal/009 | 356.0 mg | 75.169 %C 2/0 | 2.1237 %S 3/0 | 080 |
| 15.03.07 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

| | | | | | |
|---|---|---|---|---|---|
| 16.03.07 09:49 | Lime/014 | 769.2 mg | 11.645 %C 2/0 | 0.1524 %S 3/0 | 127 |
| 16.03.07 09:52 | Lime/015 | 702.4 mg | 11.721 %C 2/0 | 0.1763 %S 3/0 | 112 |
| 16.03.07 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

| | | | | | |
|---|---|---|---|---|---|
| 15.03.07 14:44 | Slate/037 | 812.3 mg | 1.4556 %C 1/0 | 0.0226 %S 3/2 | 050 |
| 15.03.07 14:49 | Slate/038 | 822,1 mg | 1.4691 %C 1/0 | 0.0236 %S 3/2 | 050 |
| 15.03.07 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

| | | | | | |
|---|---|---|---|---|---|
| 15.03.07 16:00 | Rubber/020 | 83.8 mg | 58.768 %C 2/0 | 1.5265 %S 3/0 | 050 |
| 15.03.07 16:02 | Rubber/021 | 79.3 mg | 57.945 %C 2/0 | 1.5298 %S 3/0 | 051 |
| 15.03.07 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

| | | | | | |
|---|---|---|---|---|---|
| 15.03.07 16:12 | Oil/025 | 79.5 mg | 88.235 %C 2/0 | 0.8981 %S 3/0 | 050 |
| 15.03.07 16:13 | Oil/026 | 67.8 mg | 88.923 %C 2/0 | 0.9135 %S 3/0 | 050 |
| 15.03.07 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**

**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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