TECHNICAL SPECIFICATION

Mol CS1000 elemental analyzer & Mol Premier® 1350 high-temperature furnace

Enabling elemental analysis of carbon and sulfur in solid samples

Analysing system consists of the following parts:

Mol CS1000 elemental analyzer
High-temperature furnace
Windows-based control and evaluation software
Computer, Display, Mouse, Keyboard

Mol CS1000

- Burns samples such as coal, coke, oil, ashes, catalysts, lime, gypsum, soils, rubber, waste and other solid and liquid materials in a high-temperature ceramic furnace fed with oxygen, and produces non-dispersive IR (NDIR) gases in the form of %C and %S.
- Works according to the principle of determination by measurement with detectors and meets or exceeds common standards like:
    - **ISO-10694**
      Soil quality - Determination of organic and total carbon after dry combustion (elementary analysis).
    - **ASTM E 1915**
      Standard Test Methods for Analysis of Metal Bearing Ores and Related Materials for Carbon, Sulfur, and Acid-Base Characteristics.
    - **ASTM D 5016**
      Standard Test Method for Total Sulfur in Coal and Coke Combustion Residues Using a High-Temperature Tube Furnace Combustion Method with Infrared Absorption.
    - **ASTM D 1619**
      Standard Test Methods for Carbon Black-Sulfur Content.
    - **ASTM D 1552**
      Standard Test Method for Sulfur in Petroleum Products by High Temperature Combustion and Infrared (IR) Detection or Thermal Conductivity Detection (TCD).
    - **ASTM D 4239**
      Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion.
- Uses the NDIR (Non-dispersive Infrared Absorption) for CO_2 and SO_2.
- Is under warranty for at least 1 year from delivery.
- Will be guaranteed for 10 years of spare parts supply and service.
- Is able to measure carbon and sulfur elements simultaneously.

- Integrated IR (infrared) detection unit is newest technology, uses pulsable infrared-emitters and do not contain any moving mechanical parts.
- The average sample weight is 350 mg.
- In order to largely eliminate problems with sample inhomogenity, can take a more higher sample weight.
- Requires Oxygen(≥2.5) 200 – 400 kPa.
- Required chemicals:
  - Magnesium perchlorate and
  - Sodium hydroxide.
- Has a fully electronic flow control (Mol EFC).
- Input voltage is 230 VAC ± 10% 50 Hz, 16 A max.
- Standby power is less than 100 W.
- Dimension is (WxHxD): 60 cm (24″) x 57 cm (23″) x 55 cm (22″).
- Weight is approx. 45 kg.
- Dont need a halogen trap even for permanent analyses of acidified samples.
- Can be retrofitted with additional infrared detectors.
- Can be equiped with 1, 2, 3 or 4 infrared detectors, one for sulfur or one for carbon minimum. 2 for sulfur and 2 for carbon maximum. Individual configurations due to customer needs possible.
- Is fully computer controlled.
- Has at least one dust filte as standard to ensure that combustion gases reach the detectors without containing any impurities.
- Typical analysis time is around 90 seconds on average.
- Is able to operate smoothly at 15-33°C and 20-80% humidity.
- The computer, monitor and device software to be used with Mol CS1000 are provided free of charge.

Mol Premier® high-temperature furnace

- High-temperature resistance heated, horizontal furnace that can either be operated by an integrated touchdisplay (standalone) or by the central control- and evaluation software.
- Dimension is (WxHxD): 33 cm (13″) x 57 cm (23″) x 55 cm (22″).
- Characterized by particulary high efficiency, low energy consumption and low wear.
- Additional sensor in the electronic system measures the ambient temperature and and corrects the reference point of the thermocouple so that changes in the ambient temperature do not affect the furnace temperature.
- Fully automatic current limitation prevents the maximum permissible output of the heating elements from beeing exceeded, thus enabling maximum service life of the heating elements used.
- Weight is approx. 60 kg.
- 15 cm (6″) heated zone.
- Input voltage is 230 VAC ± 10% 50 Hz, 16 A max.
- Average heat-up time 100 °C / min.
- Power requirements:
  - 900 W at constant 1,350 ° C.
  - 2000 W maximum heat-up power.
- Uses Thermocouple Typ S according to DIN EN 60584.
- Tube diameter 28 mm.
- Uses ceramic combustion boats as sample carrier
- Is made of high temperature resistant ceramic and is horizontal type.
- Is designed to minimize heat loss during combustion.
- Is operating by programming it to the desired temperature up to 1,550 °C.
- Temperature accuracy is +/-1% of the programmed temperature.

Mol control and evaluation software

- When desired, the sulfur results can be obtained as %S, %SO_2 and %SO_3 and the carbon results can be obtained as %C and %CO_2 and Mol CS1000 software can be programmed this way.
- Can be connected to a precision scale where the samples are weighed and the weight values are automatically sent to the Mol CS1000 software.
- Has a Diagnostic menu that instantly shows the user the course of the analysis and device functions.
- Includes a yearly maintenance reminder that can be disabled.
- Is able to calculate statistical values such as RSD and average.
- Has the ability to save different methods that can be created for samples with different characteristics and use them without any changes when recalled.
- Allows single-point or multi-point calibration.
- Is able to calibrate carbon and sulfur together as well as allowing them to be calibrated separately.
- Does automatically transfer the analysis results into a database at the end of the analysis and therefore allow users to export them individually or in bulk later.
- Can export data to MSOffice (Excel and Word), OpenOffice (Write and Calc) and Notepad.
- Can create custom report.
- Allows pressure control.
- Can do fractional analysis by peak separation for up to 5 heating stages.
- Can do fractional analysis by manual peak separation.
- Can do analysis with up to 5 temperature stages.
- Has a real-time diagnostic feature.
- Shows data related to the sample, such as sample name, weight, analysis method, date, time, analysis time and percentage sulfur and carbon values, areas, fractions etc.

- Can store up to 10 individual user layouts.
- Auto memorizes sample ids.
- Has TARE function for connected scale.
- Shows continously infrared signals.
- Automatically switches off infrared emitters when unused.
- Does full-automatic drift control and compensate
- Shows setpoint, temperature and continous furnace temperature over time in a graph.
- Has a filter-function for the database.
- Database columns can be shown or hidden individually.