

## TC and TOC Analysis of Solids and Liquids



### By Combustion and Coulometric Detection

**Applications include:** Soils and sediments, geological materials, sludges, sulfur, liquids containing particulates, water and wastewater, brines, process fluids, corrosive agents and acids.

**CONFORMS TO ASTM D 4129**

The **CM135 TC/TOC Analyzer** is a complete analytical system capable of measuring total carbon and total organic carbon in solid and liquid samples. Combining a high-temperature combustion furnace with a highly sensitive CO<sub>2</sub> detector, the CM135 is capable of analyzing samples containing carbon concentrations from ppm levels to 10,000 ugC (absolute) without user calibration. UIC's analyzers are rugged, accurate and adaptable to most TC/TOC applications. They are used extensively in industrial, research and educational laboratories worldwide. The CM135 system includes the following components pictured above:

#### CM5015 CO<sub>2</sub> Coulometer

- No user calibration
- Wide, linear dynamic range
- Readability to 0.01 ug Carbon
- User selectable display units
- 10" LCD Touch Screen
- SD Card data storage
- LIMS Compatible

#### CM5300 Horizontal Furnace with CM5321 and CM5322 Furnace Kits

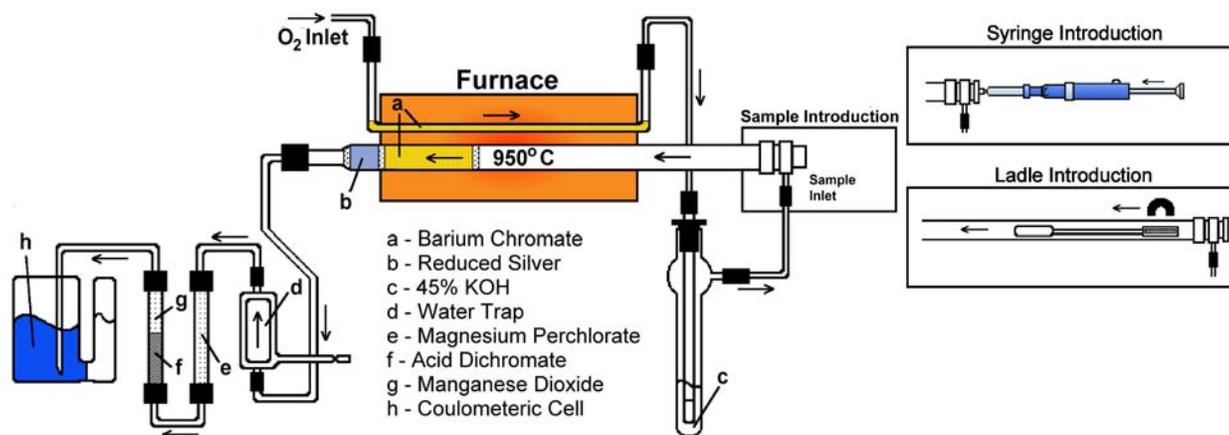
- Programmable up to 1100°C
- Pre-combustion scrubbers for removal of interferences from oxygen carrier gas
- Post-combustion scrubbers for removal of interfering gases formed during sample combustion
- Sample introduction using constant rate syringe or quartz ladle

#### Instrument Capabilities

A major advantage of the CM135 TC/TOC Analyzer is the use of coulometric detection. Employing the principles of Faraday's Law, the CM5015 CO<sub>2</sub> Coulometer automatically measures the absolute mass amount of carbon dioxide resulting from sample combustion. No user-calibration is required and linear detection is available from less than 1 ug carbon to over 10,000 ug carbon. Using this 100% efficient coulometric process, relative standard deviations of 0.2% or better are common for standard material. For smaller concentrations, an absolute deviation of approximately 1 ug C is typical.

Oxidation times vary with sample type and temperature although 5 to 7 minute analyses are typical.

## Principles of Operation



### Total Carbon

Solids and slurries are initially weighed into platinum or porcelain “boats” which are then placed into a quartz ladle. Liquid samples up to 200ul are drawn into the constant rate syringe. In either case, the analysis is initiated by introducing the sample into the high temperature oxygen atmosphere (typically 950°C) within the sample combustion zone. In that environment, all carbon within the sample is rapidly oxidized to CO<sub>2</sub>. Interfering reaction products (including sulfur oxides, halides, water and nitrous oxides) are removed by the post-combustion scrubbers. The resulting carbon dioxide is then swept into the CM5015 CO<sub>2</sub> Coulometer where it is automatically measured using absolute coulometric titration.

### Total Organic Carbon

Prior to injection into the furnace, liquid samples are acidified and purged of CO<sub>2</sub> and carbonate carbons. This “pre-treated” sample is then reacted as described above. (Note: Although the direct TOC analysis of solids is occasionally performed using various sample pre-treatment methods, we generally recommend our CM150 system which allows for the separate analysis of TIC. The TOC result is then calculated by difference, where TOC = TC - TIC.)

### Data Handling

Names, weights and sizes of up to 50 samples can be entered, to be used by the CM5015 in calculating the final result. Analytical progress is displayed on the 10” LCD touch screen in user-selectable units. Detailed analysis information is automatically saved to an on-board SD card after each sample. Data can also be transmitted through the standard serial and Ethernet ports to be captured on a personal computer or LIMS. In addition, a detailed report can be printed to the optional small format printer while each sample is running.

## Ordering Information

### CM135 - Total Carbon / Total Organic Carbon in Solids and Liquids

**Includes:** CM5015 CO<sub>2</sub> Coulometer, CM5300 Horizontal Furnace, and CM5321 and CM5322 Furnace Kits with tools and accessories for the analysis of liquid samples. *Must also choose* either Sample Introduction Kit CM5323 (small volume) or CM5324 (large volume) to be included with system. (P/N CM135-01 110V, 50/60Hz) (P/N CM135-02 220V, 50/60Hz)

### Optional Equipment:

**Printer** – 3” format impact printer. Includes cable, power supply, paper and ribbon. (P/N CM124-078)



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