

## Total Inorganic Carbon Analysis

By Acidification and Coulometric Detection



**Applications include:** Carbonates in pharmaceuticals, dissolved carbon dioxide in sea water, carbonates in geological materials, carbon dioxide in amine and hydrazine, carbonates in black liquors, carbonates in food

**CONFORMS TO ASTM D 513**

The **CM140 Total Inorganic Carbon Analyzer** is a complete analytical system allowing the direct measurement of total inorganic carbon in a wide variety of sample matrices and concentrations. Combining a self-contained unit for the acidification of a sample (to evolve CO<sub>2</sub>), with a highly sensitive CO<sub>2</sub> detector, the CM140 easily handles solid or liquid samples with concentrations from ppm levels to 100% inorganic carbon without user calibration. UIC's analyzers are rugged, accurate and adaptable to most TIC applications. The CM140 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

### CM5230 Acidification Module

- 10, 25, 50 or 100 ml reaction vessels
- Selectable volume acid dispenser
- Internal air pump with flow controller
- Pre-acidification scrubber for removal of CO<sub>2</sub> from carrier gas
- Post-acidification scrubber for removal of interferents released during sample digestion
- Controlled sample heating and stirring

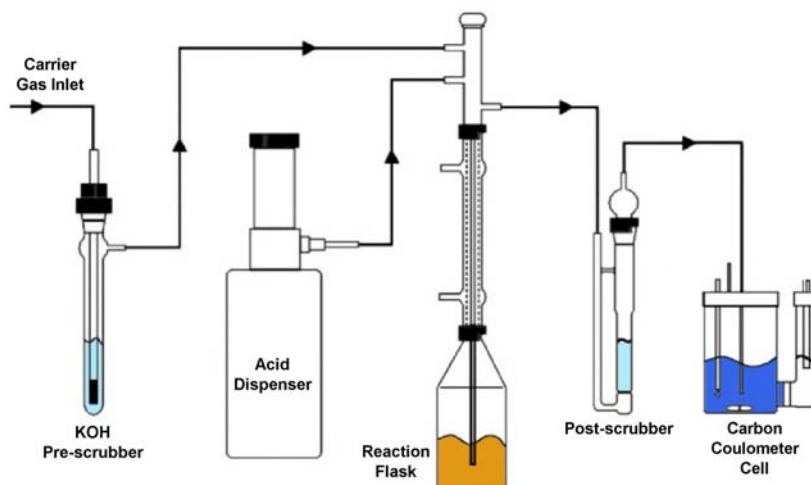
### Instrument Capabilities

A major advantage of the CM140 Total Inorganic Carbon 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 evolved from sample acidification. 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.

Additionally, it is possible to analyze either solid or liquid samples. Sample flasks are available in 10, 25, 50 and 100 ml sizes. Solids or liquids may be weighed directly into the sample flasks. Alternatively, liquid samples may be syringe injected through a septum.

Reaction times vary with sample type and temperature although 5 to 7 minute analyses are typical. To quicken CO<sub>2</sub> evolution, sample heating and stirring capabilities are included within the CM5230 Acidification Module. Other features include the ability to: select different acids; add wetting/emulsifying agents; and, modify the flow path and scrubbers to optimize a particular application.

## Principles of Operation



### Total Inorganic Carbon (TIC)

Upon introducing a sample into the sample flask, the system is purged with a CO<sub>2</sub>-free carrier gas to eliminate atmospheric carbon dioxide. At that point, the analysis is initiated by adding an aliquot of acid through the acid dispenser into the sample flask, causing inorganic carbon to be evolved as CO<sub>2</sub>. Using the built-in heater and magnetic stirrer to facilitate the fast evolution of inorganic carbon, the CO<sub>2</sub>-free carrier gas transports the reaction products through a post-scrubber (to remove potential interferences) and ultimately into the reaction cell within the CM5015 Coulometer. There, the resulting carbon dioxide is automatically measured using absolute coulometric titration.

### 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

### CM140 - Total Inorganic Carbon in Solids or Liquids

**Includes:** CM5015 CO<sub>2</sub> Coulometer and CM5230 Acidification Module with tools and accessories for the analysis of solid or liquid samples. Must also choose either the CM5131 (10ml), CM5132 (25ml), CM5133 (50ml) or CM5134 (100ml) Sample Introduction Kit. (P/N CM140-01 110V, 50/60Hz) (P/N CM140-02 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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