

TOC-3600E

Total Organic Carbon Analyzer



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Analytical Technologies Limited

An ISO 9001 Certified Company

www.analyticalgroup.net

TOC Analyzer (Conductometric Method) is specially designed for high-purity water quality detection. Adopting advanced differential conductivity detection technology, the instrument efficiently converts organic carbon in water samples into carbon dioxide through UV oxidation, and accurately measures the resulting conductivity change, realizing precise and rapid analysis of TOC content.

The product features low detection limit, high sensitivity, fast response and excellent stability, with a concise and user-friendly operation interface. It is widely used for the detection of production water, water for injection and purified water in pharmaceutical, microelectronic, electric power and other industries, serving as a reliable tool to ensure water quality safety and meet pharmacopoeia and relevant industrial regulatory requirements.

Detection Principle

The core detection principle of the instrument is based on the differential conductometric method, and the key to accurate measurement lies in photochemical oxidation technology.

The instrument irradiates water samples directly with UV light of specific wavelengths to generate highly oxidative free radicals (e.g., $\cdot\text{OH}$ hydroxyl radicals). These high-energy free radicals rapidly and thoroughly oxidize and degrade organic molecules in water into carbon dioxide (CO_2). The generated CO_2 dissolves in water to form carbonic acid, causing a significant change in the water sample's conductivity. A high-precision conductivity sensor accurately captures the conductivity difference before and after oxidation, automatically deducts background interference such as inorganic carbon, and finally converts the data via the instrument's built-in algorithm model to obtain the specific and accurate total organic carbon (TOC) content in the water sample.

This photochemical oxidation method requires no high temperature or high pressure, features fast and complete reaction, and combines the high sensitivity of conductivity detection, making it particularly suitable for precise monitoring of high-purity water.

Application Scope

Specially designed for organic pollution monitoring in high-purity water systems, the instrument is widely used in industries with strict water quality requirements.

It is a reliable tool for online monitoring of purified water, water for injection (WFI) and cleaning validation in the pharmaceutical industry, ensuring compliance with various national pharmacopoeia specifications. In the microelectronic and semiconductor fields, it can monitor ultrapure water quality, a key link to ensure chip yield. It is also applicable

to water quality control of nuclear power, ultra-high pressure boiler feed water and other systems in the electric power industry, as well as routine analysis in scientific research laboratories, providing accurate data support for refined water quality management and product quality control in various fields.

Instrument Features

Built based on the advanced "UV Oxidation-Differential Conductometric Method" principle, the instrument integrates high-sensitivity detection, intelligent operation, low-consumption maintenance and compliance safety, serving as an ideal solution for TOC monitoring of high-purity water in pharmaceutical, microelectronic, electric power and other industries. Its core advantages are reflected in the following five aspects:

1. Accurate and Reliable Detection Performance

- (1) Parts-per-billion (ppb) ultra-high sensitivity: Equipped with a high-stability differential conductivity detection system and exclusive signal processing algorithm, it achieves an extremely low detection limit of 0.001 mg/L (1 ppb), meeting the stringent requirements for purified water and water for injection specified in the other standards.
- (2) Fast and efficient oxidation capacity: Fitted with 185 nm and 254 nm dual-wavelength UV lamps to generate strong oxidative $\cdot\text{OH}$ free radicals, which can thoroughly and rapidly oxidize organic matter into CO_2 at room temperature and atmospheric pressure. Single detection time is less than 12 minutes, with stable oxidation efficiency >99%, eliminating the risks of high-temperature waiting and incomplete conversion in combustion methods.
- (3) Excellent repeatability and anti-interference: The instrument features automatic temperature compensation, real-time baseline correction and background deduction functions, delivering outstanding repeatability ($\text{RSD} \leq 2\%$) for low-concentration samples and effectively eliminating interference from common inorganic carbon (IC) and ions in water.

2. Intelligent and Convenient User Experience

- (1) Full-touch intelligent operating system: Equipped with a 7-inch high-definition capacitive touch screen running a deeply customized Android system. The intuitive and user-friendly UI provides a wizard-based operation process, guiding users step by step from startup, cleaning, calibration to detection, greatly reducing the training threshold for operators.

(2) Flexible detection and calibration modes: Supports three detection modes (offline single, online continuous and timed interval), adapting to both laboratory random inspection and online monitoring scenarios. The calibration process is intelligent, supporting multi-point automatic fitting, and historical calibration curves and fitness (R^2) can be viewed with one click in the software.

(3) One-key intelligent maintenance: Integrated with "one-key cleaning" and "one-key calibration" functions to simplify daily operations. The system has self-diagnosis capability to warn of UV lamp life, pipeline status, sensor abnormalities, etc.

3. Comprehensive Compliant Data Management

(1) Meeting data integrity requirements: Built-in GMP/GLP-compliant audit trail system that automatically records all key operations (login, detection, calibration, setting modification, etc.), operators and timestamps. Supports three-level user authority management (administrator, operator, observer) to ensure data immutability and traceability.

(2) Multiple data interconnection channels: Built-in Wi-Fi and Ethernet interfaces, allowing detection data to be uploaded to the enterprise LIMS or exclusive cloud platform in real time or in batches for remote monitoring and centralized management.

Equipped with a USB port for convenient local data export.

(3) Instant report output: Built-in high-speed thermal printer, which can automatically or manually print complete reports including detection results, curve spectra, sample information and QR codes for convenient data archiving and on-site recording.

4. Economical and Efficient Low-Maintenance Design

(1) Extremely low operating cost: Adopts pure physical photo-oxidation principle without any expensive consumables such as catalysts, combustion tubes or carrier gases (e.g., high-purity oxygen). Compared with traditional combustion methods, the annual operating cost can be reduced by more than 60%.

(2) Long service life of core components: Key components such as UV lamps have a designed service life of up to 8,000 hours; the quartz reactor features corrosion resistance and excellent light transmittance. The modular design makes daily maintenance and component replacement simple and fast, requiring no professional personnel.

(3) Outstanding instrument durability: The whole machine has a compact and robust structure, and key flow paths are made of corrosion-resistant materials, adapting to complex environments of laboratory and online installation, with low failure rate and

effectively ensuring the continuity of production and detection.

5. Safe and Reliable Design Guarantee

(1) Intrinsically safe and eco-friendly: The entire detection process is carried out at room temperature and atmospheric pressure, with no high-temperature or high-pressure risks, no flammable and explosive gases, and no toxic or harmful reagents, being highly friendly to the environment and operators.

(2) Complete safety protection: Equipped with multiple safety designs such as power grounding protection, liquid leakage alarm, and UV lamp compartment safety interlock (optional) to ensure user operation safety.

Technical Parameters

1. Detection Principle: UV Oxidation-Differential Conductometric Method
2. Measuring Range: 0.001~1.600 mg/L (1~1600 ppb)
3. Detection Limit: ≤ 0.001 mg/L
4. Relative Error (RE): $\pm 5\%$ or ± 0.005 mg/L (whichever is greater), verified with 0.01~1.0 mg/L standard solution
5. Relative Standard Deviation (RSD): $\leq 2.0\%$ (for 0.1 mg/L standard solution)
6. Linearity and Calibration: $R^2 \geq 0.999$ (0~1.6 mg/L)
7. Response Time: < 12 min (from sample injection to stable result)
8. Sample Adaptability: Sample temperature 1~70
9. Operating System & Display: Customized Android 10 system with 7-inch high-definition capacitive touch screen (resolution 1024×600)
10. Data Storage & Traceability: Local storage capacity $\geq 100,000$ sets of complete detection data and curve spectra; built-in GMP/GLP-compliant audit trail system and three-level user authority management to meet data integrity requirements
11. Data Output: Built-in high-speed thermal printer; Wi-Fi (2.4G/5G), Gigabit Ethernet (RJ45), USB Host interface, supporting wireless/wired data transmission to LIMS or cloud platform
12. Power Supply & Power Consumption: AC 100~240V, 50/60 Hz global wide voltage design; rated power ≤ 50 W, standby power consumption < 10 W
13. Dimensions & Weight: 350 mm(L)×250 mm(W)×350 mm(H), net weight approx. 3 kg
14. Operating Environment: Temperature 10~40, humidity $\leq 85\%$ RH (non-condensing)

- 15. Service Life of Key Components & Consumables
- 16. (1) UV Lamp: Designed service life $\geq 8,000$ hours, with system usage time statistics and replacement reminder
- 17. (2) Quartz Reactor: Corrosion-resistant, high light transmittance, permanent core component with no consumption
- 18. (3) No conventional consumables: No need for catalysts, combustion tubes, carrier gases (high-purity oxygen/nitrogen), etc., with annual operation and maintenance cost far lower than combustion analyzers
- 19. Safety Protection: Equipped with power grounding protection, system fault self-diagnosis and alarm functions to ensure safe use.

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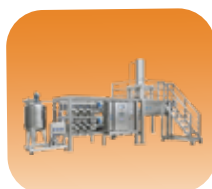
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