

# Phoenix

# Apollo

## Laboratory TOC Analyzers and Services Designed To Meet Your Needs

- Simple, Reliable and Dependable Instruments
- Low Cost of Operation
- Expert Service and Support

# 8000

- UV-Persulfate Oxidation Technology
- Outstanding Analytical Precision and Accuracy
- Superior Low Level Detection

# 9000

- Combustion Oxidation Technology
- Flexible Furnace Temperature to Meet Your Application Requirements
- Wide Analytical Range
- Total Nitrogen (TN<sub>T</sub>) Capability

**TEKMAR DOHRMANN**

## Tekmar-Dohrmann: Offering Solutions, not Just Instruments

Tekmar-Dohrmann is committed to providing the analytical solutions you need. More than just an instrument company, we will work with you to determine the right instrument based on your requirements, assist you with establishing effective operating procedures for your application, and continue to support you as your needs change in the future.

## Simply Stated: The Evolution Continues

With over 30 years of experience, Tekmar-Dohrmann is proud to introduce the Phoenix 8000 and Apollo 9000 Total Organic Carbon (TOC) Analyzers. Integrating a high throughput XYZ autosampler and employing revolutionary open architecture design concepts, our line of TOC analyzers is the standard for analytical dependability, versatility, and productivity. Building on years of experience, both the Phoenix 8000 and Apollo 9000 offer superior analytical accuracy and precision for a wide range of laboratory TOC applications.

## Simply Choose

To determine the Total Organic Carbon content of a sample, two techniques can be used: UV/Persulfate and Catalytic Combustion. Tekmar-Dohrmann understands that no one TOC analyzer can meet all applications and we will work with you to match your application needs with the best instrument.

### UV/Persulfate

Phoenix 8000 uses sodium persulfate in combination with UV light to oxidize organic material. This TOC technique achieves outstanding analytical accuracy, precision, and long-term calibration stability due to its ability to inject high sample volumes (up to 20 ml) and low system background.

Phoenix 8000 is perfect for applications requiring high sensitivity such as drinking, pharmaceutical grade, (Clean-in-Place, Water-for-Injection), ground, surface, semiconductor grade, steam power and ultra-pure water.

### Catalytic Combustion

Apollo 9000 uses combustion (680°C to 1000°C) with a patented reusable platinum catalyst for the lowest detection limits while maximizing TOC recovery. This TOC technique has the characteristics of being effective for difficult to oxidize compounds such as proteins, particulates and samples with high chloride content. With an additional module, the Apollo 9000 can also analyze Total Nitrogen (TN<sub>p</sub>) in accordance with EN-12260 and DIN-EN-ISO 11905-2.

Apollo 9000 is best for applications requiring particulate analysis such as wastewater and industrial effluents, as well as drinking, surface, seawaters, brines and certain Clean-in-Place applications.



STS 8000 Autosampler

## Simple to Apply

The application of TOC analyzers has been revolutionized in recent years. Consequently, Tekmar-Dohrmann TOC analyzers have been designed to be flexible to meet the demands of a wide variety of industries.

### Source and Drinking Water

Water treatment plants use TOC as a simple, fast and inexpensive screen to determine natural organic material (NOM). The USEPA and the drinking water industry have promulgated the Disinfectants and Disinfection By-Products Rule (D/DBP) to reduce the public risk of exposure to harmful by-products during water purification. Phoenix 8000 and Apollo 9000 HS meet this requirement and Standard Method 5310C and 5310B respectively, as well as EPA Methods 415.1, 9060, and EN-1484.

### Wastewater and Industrial Effluent

Since the relationship between BOD, COD and TOC was established in the late 1970s, TOC analyzers have become an analytical backbone in many wastewater and industrial effluent treatment laboratories worldwide.

The Apollo 9000 is highly recommended for this application. Designed specifically for TOC analysis of dirty, salty or particulated water, the Apollo 9000 provides high throughput for difficult real-world samples. With an optional TN module, the Apollo 9000 can simultaneously do both TOC and TN analysis. Optional sampling accessories such as magnetic stirring, particulate sample kit, plus a variable furnace temperature aid in the analysis of the most difficult applications and exceed industry methods such as Europe's EN 1484 or ISO 8245 rigorous particulate requirements.

### Pharmaceutical

US Pharmacopoeia Method 643 and European Pharmacopoeia 2.2.44, which replace the Oxidizable Substances Test, along with Clean-in-Place (CIP) applications have created a new demand for TOC analysis. Water for Injection (WFI) requires an instrument to be analytically dependable for low-level TOC measurements. Phoenix 8000 meets detection limit requirements while providing a true TOC measurement for standardization and validation.

CIP applications involve the analysis of a variety of matrices. The Phoenix 8000's superior detection limits and excellent precision make it an ideal choice. The Apollo 9000 HS may be better suited for difficult matrices.

Regardless of the application, Tekmar-Dohrmann simplifies your compliance demands by offering validation packages, 21 CFR Part 11 compliant software, and industry standard calibration and calibration validation techniques.



Phoenix 8000 TOC Analyzer



Personal Computer with TOC Talk Software

## Software as Simple as 1-2-3

TOC users requested simplicity and performance. As a result TOC Talk is divided into three simple menus: Setup, Run and Results. Parameters can be selected easily through point-and-click menus. Help screens can be called upon anywhere in TOC Talk to aid in answering questions.

### Setup

The setup menu provides access to instrument parameters and user preferences. Useful analytical tools such as continuous “near line” monitoring, outlier deletion and calibration verification can be selected. Multiple point calibration tables are easily accessed and updated. Password protection, limiting access to the software, and automatic data archiving into date stamped folders complete TOC Talk’s impressive setup selection.

### Run

Operators can select a preprogrammed method or develop a customized method to meet specialized analytical needs. For convenience, sample position, replicate, results, statistics and sample peaks are clearly viewed on one screen while analyzing samples.

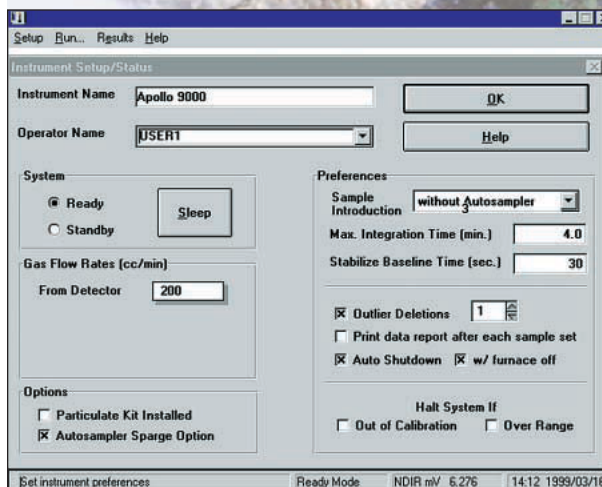
High-level samples and difficult matrixes can be automatically diluted reducing your sample preparation time. With Simultaneous Processing, a sample is analyzed while the next sample is being prepared enabling our TOC analyzers to be more productive than other TOC analyzers on the market.

### Results

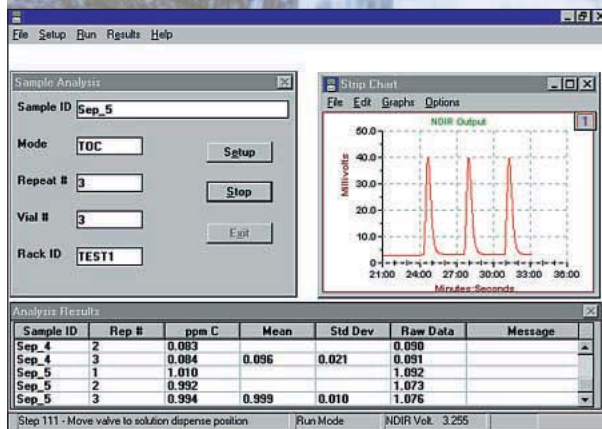
Sample data and calibration curve results are stored on the PC’s hard drive and are easily accessed. Past sample data can be recalculated using different calibration curves to aid in data management. Sample identification, results, standard deviations, RSDs, date, time and comments can be viewed on screen or printed. Sample information and results can be easily customized and exported to Excel® or to a LIMS helping you to generate industry standard reports and effortless data management.

## 21 CFR Part 11 Compliance

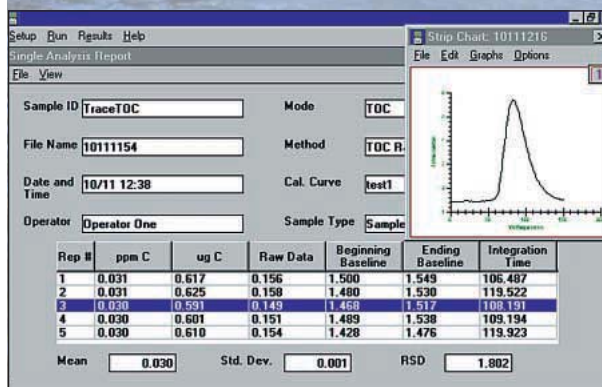
Requirements for secure electronic data keeping in the pharmaceutical market and future requirements in environmental markets are a sweeping concern for analytical instruments like TOC. 21 CFR Part 11, issued by the Food and Drug Administration (FDA), establishes the criteria under which electronic records and signatures will be considered equivalent to paper records and handwritten signatures in manufacturing processes. The EPA is also considering the FDA model for electronic data management and reporting. To help the industry comply with 21 CFR Part 11 protocols, Tekmar-Dohrmann offers software packages for CFR compliance for our line of Total Organic Carbon (TOC) analyzers for use in monitoring Water for Injection (WFI) and Clean In Place (CIP) applications.



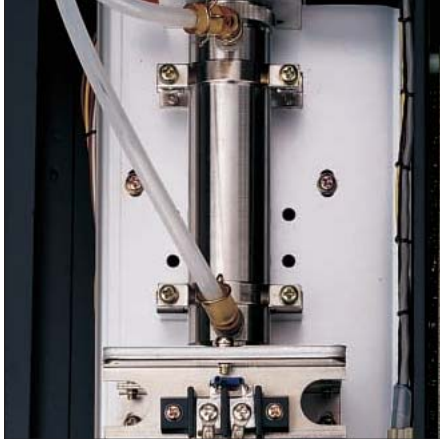
### Setup



### Run



### Results



**NDIR Detector**



**Reaction Chambers**

## Simple by Design

Phoenix 8000 and Apollo 9000 are designed to be simple to use and easy to maintain. Industry standard hardware is conveniently located for easy troubleshooting and quick repair.

The heart of these TOC analyzers is a high precision liquid handling syringe, which allows for variable sample injection (from 20  $\mu$ l up to 20 ml) without the need for sample loops or pump tubing.

The Non-Dispersive Infra-Red (NDIR) detector that Phoenix 8000 and Apollo 9000 uses is sensitive for very low levels of TOC. However, with our exclusive combination of variable sample injection volume and dilution, the analyzers are able to measure higher concentrations of TOC than other TOC analyzers on the market. Since the NDIR detector has an especially wide linear range, the need for multiple calibration curves or time-wasting reruns is minimized.

## Simple Maintenance

Virtually any component in our TOC analyzers can be accessed in less than two minutes. Glassware for both the Phoenix 8000 and Apollo 9000 is placed at the front of the unit for easy access and monitoring. Sample and gas lines are color coded for quick identification. Internal components are carefully laid out with the customer in mind. As a result, down time and cost of operation is kept to a minimum.

## TOC Accessories

### Reliable, High Throughput STS 8000 Autosampler

The STS 8000 Autosampler is a high capacity, dependable robotic XYZ autosampler suitable for virtually any TOC sample. With easy access to sample racks, sample loading with the STS 8000 is fast and easy. Sample cross-contamination concerns are eliminated with a built-in needle rinsing function. The STS 8000 supports a variety of industry standard glassware (many with cap and septa), giving you the lowest possible cost of operation. A magnetic stirrer option is available for meeting ISO 8245 and EN-1484 requirements.

### Total Nitrogen ( $TN_p$ ) Module

Many applications require both TOC and  $TN_p$  analysis. To meet this need for our customers, Tekmar-Dohrmann can provide an optional TN module with our Apollo 9000 line of TOC instruments. This compact module will measure TN simultaneously with TOC using a chemiluminescence detector and in accordance with your water requirements such as EN-12260 and DIN-EN-ISO 11905-2.

### Solids, Sludges and Sediments

The Tekmar-Dohrmann 183 Boat sampler expands the Phoenix 8000 and Apollo 9000 capabilities to include solids, sediments and sludges and can measure from ppm to % levels. Samples are introduced into a quartz or platinum boat, which is then advanced into a furnace which can be set up to 1000° C. The analysis is complete in less than 5 minutes. This simple, easy-to-use boat sampler inherently produces quality analytical results.



**Apollo 9000 TOC Analyzer**

# Phoenix 8000 UV-Persulfate TOC Analyzer and STS 8000 Autosampler

## Specifications

### Phoenix 8000

<b>Chemistry:</b>	Photochemical Oxidation via UV-Sodium Persulfate	
<b>Detector:</b>	Nondispersive Infrared (NDIR)	
<b>Analytical Modes:</b>	TOC (NPOC), TC-IC, TC,IC, (POC optional)	
<b>Analytical:</b>	<p>Limit of Detection: 2 ppb  Maximum Measurable Concentration: 10,000 ppm (sample volume and dilution dependent)  Precision*: <math>\leq 2\%</math> RSD or CV, +/- 1ppb or +/- 0.02 ugC, whichever is greater over, seven replicates.**  Sample Size: 500 <math>\mu</math>l to 20 mL  Analysis Time: 4 to 8 minutes, typical  * Analytical performance affected by laboratory water, reagent and gas purity, as well as sample container cleanliness, sample matrix, gas regulator cleanliness and precision, and operator skill.  ** %CV Area, as opposed to %CV and %RSD, calculates precision <u>before</u> blank subtraction. This yields a lower precision measurement, but impacts sensitivity and accuracy</p>	
<b>Liquid Handling:</b>	Syringe pump, 8-port distribution valve Dilution method provided for range 200 to 10,000 ppm Auto-rinsing from sample and/or rinse water	
<b>Sample Introduction:</b>	Automatic syringe injection or Autosampler	
<b>Controller:</b>	PC, Interface through Windows™ (2000, XP)	
<b>Data Handling:</b>	Spreadsheet reports transferable to Microsoft™ Excel™ Real-time display of curves Ability to store customized individual test methods Priority samples via scheduled interrupt	
<b>Calibration:</b>	Multi-point and auto-blanking	
<b>21 CFR Part 11 Software Compliance:</b>	TOCTalk Version 3.5 is 21 CFR Part 11 compliant	
<b>Other Features and Options:</b>	Pre-programmed point and click method setup Automatic shutdown/standby Automatic data file management Validation Support Package available	Flow rate monitoring Priority sample via scheduled interrupt Solids Module Certification Protocol available
<b>Principle Applications:</b>	Drinking and Surface Water, Ground Water, Cleaning In Place (CIP) Validation, Water for Injection (WFI), Boiler Feed Water, Cooling Water	
<b>Official Methods:</b>	EPA 415.1, 415.2, 415.3, Standard Method 5310C, EP 2.2.44, USP 643 (Chapter 24), ASTM D4779 and D4839, prENV 13370	
<b>Certification:</b>	CE, EMC EN 50081-1 and EN 50082-1	
<b>Utility Requirements:</b>	Voltage:	100/120/230 VAC ( $\pm 10\%$ )
	Frequency:	50/60 Hz
	Power:	368 VA

<b>Dimensions:</b>	12" W x 25" D x 22" H (30.5cm W x 63.5cm D x 56cm H); 54.4 kg (120 lb.) shipping weight
<b>Gas Supply</b>	99.999% pure nitrogen (5.0 Ultra High Purity) or hydrocarbon and CO <sub>2</sub> free air with TOC content <1ppm. Gas can be supplied from a cylinder or TOC gas generator. If a TOC gas generator is used, resulting gas must be hydrocarbon, and water free. To assure clean carrier gas is used we suggest employing a complete carbon dioxide (CO <sub>2</sub> ) removal system and hydrocarbon trap (Teledyne-Tekmar part # 14-1362-000) between the gas source and analytical instrument. It is recommended when using hydrocarbon and CO <sub>2</sub> free air that an ozone trap be used (Teledyne-Tekmar part # 511-940)
<b>Gas Pressure:</b>	30 to 35 psi (206.7 to 241.2 kPa)

### STS-8000 Autosampler

<b>Sampler Changer Type:</b>	XYZ robot with stationary rack design	
<b>Positioning Performance:</b>	Accuracy: +/-1mm in XYZ dimensions\ Repeatability: +/-0.25 mm in XYZ dimensions	
<b>Septum Piercing:</b>	Available with septum piercing kit; vertical punch strength of 3.8 kg (8.38 lbs.)	
<b>Rinsing:</b>	Auto-rinsing from sample and/or rinse water via built-in rinse station.	
<b>Rack Selection:</b>	(2) 77 position trays for 25 mL culture tubes (18 x 150 mm); (2) 42 position trays for 50-60* mL culture tubes (25 x 150 mm); (2) 35 position trays for 40 mL VOA vials (28 x 95 mm); (2) 12 position trays for 4 oz. (125 mL) Boston Round bottles (48 x 117 mm) * Screw cap tube has 50 mL capacity to neck. Disposable tube has approx. overflow capacity of 60 mL.	
<b>Dimensions:</b>	21.1" W x 17.2" D x 14.6" H (53.5cm W x 43.7cm D x 37.1cm H) 39 lbs. (17.7 kg)	
<b>Electrical:</b>	Voltage: 100/120/230 VAC (±10%) Frequency: 50/60 Hz	Power: 200VA
<b>Certification:</b>	UL, CSA, and CE; EMC EN50081-1 and EN 50082-1	