

GE Power & Water  
Water & Process Technologies  
Analytical Instruments

# The Sievers 900 Series TOC Analyzers



# Patented Innovations for Superior Performance and Flexibility

Dedicated to continuous product innovation, GE Power & Water invests heavily in research and development. The Analytical Instruments team has acquired more than 30 patents for technical innovations—including the Sievers\* Membrane Conductometric Method and the Integrated On-Line Sampling System.

## The Sievers Membrane Conductometric Detection Method for Unsurpassed TOC Measurement

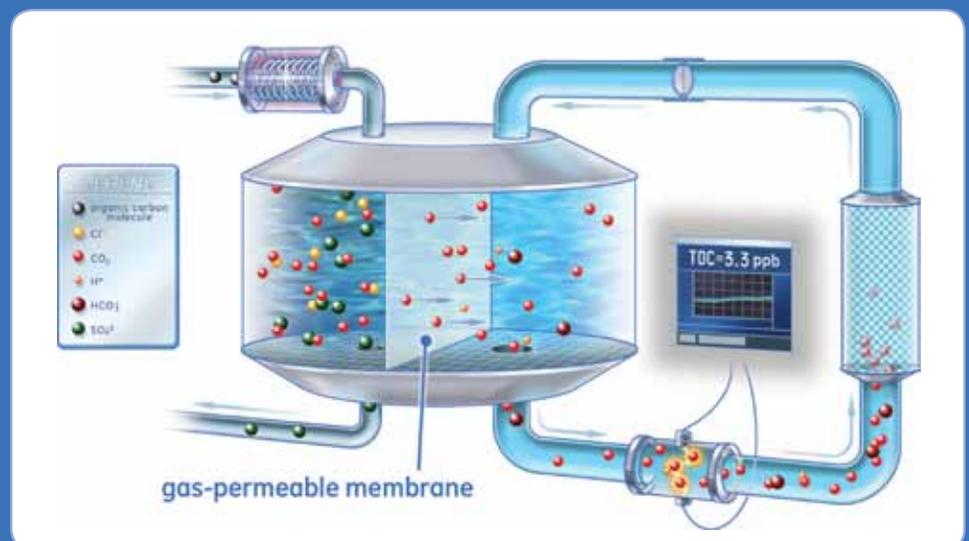
The Sievers Membrane Conductometric Detection method has proven to be an extremely reliable technique for measuring Total Organic Carbon (TOC). Unlike instruments using non-dispersive infrared (NDIR) detection, the conductometric detection method exhibits a dynamic range of six orders of magnitude with an extremely stable calibration and is not susceptible to significant drift over time. This method allows for less frequent calibration with no compromise in analytical performance.

The patented Membrane Conductometric Detection technology uses a gas-permeable membrane that selectively passes only the CO<sub>2</sub> produced from the oxidation of organics. By preventing compounds such as acids, bases, and halogenated compounds from interfering with the measurement of CO<sub>2</sub> from oxidation, the Membrane Conductometric Method delivers unmatched sensitivity, selectivity, stability, accuracy, and precision. (To see an animated demonstration of this technology, visit the Library at [www.geinstruments.com](http://www.geinstruments.com).)

## Patented Integrated On-Line Sampling System Provides High Sampling Flexibility

Available on the On-Line and Portable Analyzers, the proprietary Integrated On-Line Sampling System (iOS System\*) enables easy introduction of external standards and samples. This unique feature allows users to introduce calibration, validation, and system suitability standards directly without removing the instrument from the continuous sample source or changing the sample inlet configuration. The iOS System also accommodates grab samples for spot checks of TOC samples from other locations in a water system.

Sievers Membrane Conductometric Detection Method



## Delivering Unsurpassed Ease of Use, Productivity, and Reliability

The Sievers\* 900 Series TOC Analyzers represent the next generation of the best-selling Sievers Model 800. Based on GE's patented, proven analytical technology, the 900 Series Analyzers offer unsurpassed ease of use, analytical performance, versatility, and reliability, and are designed to meet diverse application needs and regulatory requirements. The 900 Series is available in three models—the 900 Laboratory, the 900 On-Line, and the 900 Portable.

### Features and Benefits

#### Unmatched Ease of Use

The 900 Series Analyzers are simple to install, operate, and maintain. They offer:

- **Fast Installation and Operation.** Pre-calibrated at the factory, the Analyzers can be installed and prepared for analysis in less than one hour. No special training is required to set up, operate, or maintain the instruments.
- **Minimal Maintenance.** The Analyzers require minimal hands-on labor to maintain—typically a few hours per year. The modular design facilitates quick consumables replacement.
- **Self-Contained Enclosure.** The Analyzers are self-contained in a rugged dust- and spray-resistant enclosure with internal reagent packs. They require no external chemicals or gas supplies.
- **Intuitive Touch-Screen Interface.** A large, color display makes it easy to set up instrument parameters, view data, review trends, and evaluate the remaining consumables' life.
- **Easy Data Transfer.** Data can be downloaded via a USB port or using standard serial, parallel port, and Ethernet connectivity. Data files can be opened directly in Microsoft® Excel®. The On-Line and Portable models also offer analog outputs for data transfer.

#### Extended 12-Month Calibration Stability

GE's patented Sievers Membrane Conductometric TOC Detection technique (see facing page) features conductivity sensors that are not susceptible to drift or fluctuation,

resulting in superior calibration stability. Recommended calibration is just once per year and can easily be conducted on-site. In contrast, TOC Analyzers that use NDIR detection often require weekly or even daily calibration.

#### Reliability

GE's Analytical Instruments' team of scientists and engineers designed the 900 Series using advanced materials and modular components for extended operating life and easier maintenance in the field. The result: enhanced reliability for maximum uptime.

#### Exceptional Performance Across a Wide Analytical Range

The 900 Series' exceptional accuracy and precision extends across a wide dynamic range of 0.03 parts per billion (ppb) to 50 parts per million (ppm).<sup>1</sup> From ultrapure water to drinking water and industrial process waters, the Analyzers offer unsurpassed analytical performance for a variety of applications and feed water quality types.

#### High Productivity and Efficiency

The 900 Series automation and productivity features were designed to minimize hands-on operator involvement. Automated operations, such as calibration, verification, and data analysis reports, combine with a four-minute analysis time for high productivity. For diagnostic work, the Analyzers produce TOC data in minutes after connecting the sample line. The Autoreagent feature automatically establishes the optimal flow rates for each sample, thus eliminating the need for user intervention and data interpretation in selecting the appropriate flow rates.

#### On-Line and Grab Sampling

For the On-Line and Portable Analyzers, the patented Integrated On-Line Sampling System (iOS System) simplifies the introduction of external standards and samples. The operator does not need to remove the instrument from the continuous sample source or to change the sample inlet configuration. The iOS System even accommodates grab samples for spot checks of TOC samples from other locations in the water system.

## Industry Applications

Key 900 Series applications include pharmaceutical; municipal water and analytical labs; microelectronics; power; and general purpose TOC testing.

### Pharmaceutical

The 900 Series was designed to meet the most stringent pharmaceutical regulatory requirements and to ensure compliance support within the FDA-regulated environment. All 900 Series Analyzers are engineered to measure TOC as prescribed by:

- US Pharmacopeia (USP)
- European Pharmacopeia (EP) 2.2.44 Total Organic Carbon
- Indian Pharmacopeia (IP) 2.4.30
- Chinese Pharmacopeia (CP) Appendix VIII R
- Japanese Pharmacopeia 16 (JP16) 2.59 monographs for Purified Water and Water for Injection

For cleaning validation applications, the instrument's Autoreagent capability allows for accurate analysis of samples with unknown content and concentration.

### Municipal Water and Analytical Labs

The 900 Series Analyzers monitor raw and finished water TOC for coagulant dosage optimization and compliance reporting. The Analyzers use USEPA-approved methodology, including USEPA Disinfectants and Disinfection Byproducts Rule (D/DBP Rule), Standard Methods 5310 C, and USEPA 415.3.

### Microelectronics

The 900 Series measures TOC, IC, and TC to help companies manage any stage of the water purification system and to ensure maximum uptime. The Analyzers accurately measure system feed water, reverse osmosis (RO) product, and final product water.

The optional *Turbo* mode, with a four-second analysis time and an extended operating range of 0.20 ppb to 10 ppm<sup>1</sup>, was specifically designed for reclaim applications.

### Power

Controlling the level of organics and carbonic acid in power waters is critical to minimizing corrosion and maintaining water system optimization in power plants. The unsurpassed analytical range of the 900 Series Analyzers makes it possible to use one type of sensitive analyzer for both TOC and CO<sub>2</sub> measurements throughout the plant. The 900 Series is ideally suited for detecting possible organic contamination of cogeneration waters. The 900 Series Analyzers use ASTM-approved methods, including D 5904-96, 5997-96, and 6317-98.

### General Purpose TOC Testing

The 900 Laboratory and Portable Analyzers' wide operating range, exceptional analytical performance, and ease of use make it ideal for testing laboratories. They measure water samples from a variety of applications with varying sample matrices and concentrations with the highest efficiency and accuracy.

## Industry Applicability

Select from the Laboratory, On-Line, or Portable models to meet specific application requirements.

	Laboratory	On-Line	Portable
Pharmaceutical	X	X	X
Municipal Water	X	X	X
Microelectronics	X	X	X
Power	X	X	X
General Purpose	X		X



## 900 Series Options and Accessories

### GE Autosampler with Sievers DataPro 900\* Software

The GE Autosampler can be used with the 900 Laboratory or Portable Analyzer for automated laboratory applications. It provides random access capability with high sample capacity (up to 63 positions for 40- or 60-mL vials, or 120 positions for 35-mL tubes and 17-mL vials). An optional needle station is also available.

The DataPro 900 software integrates the GE Autosampler with the 900 Analyzers to offer productivity-enhancing features such as automated calibration and validation protocols. DataPro 900 also gives users full sampling flexibility with custom sample protocols and user-defined sampling capabilities.

### 900 Turbo Mode

The 900 On-Line and Portable Analyzers are available in *Turbo* mode, which is particularly suited for a wide range of reclaim water applications requiring quick process control feedback. *Turbo* Analyzers feature a range of 0.20 to 10,000 ppb.<sup>1</sup> TOC, IC, and TC measurements are updated every four seconds, ensuring that even short-lived excursions are captured.

### 900 Inorganic Carbon Remover (ICR)

The 900 ICR reduces inorganic carbon (IC) levels in sample streams with high IC/TOC ratios, producing more accurate TOC results. The ICR is integrated inside the 900 On-Line or attached to the side of the 900 Laboratory or 900 Portable.

### DataGuard\* 21 CFR Part 11 Compliance Support

The DataGuard\* software and firmware offer comprehensive tools for compliance with 21 CFR Part 11 requirements. Features include user login security with multiple access levels, electronic signature capability, and automatic creation of an independently generated audit trail.

## Options Applicability

	Laboratory	On-Line	Portable
Autosampler	X		X
DataGuard	X	X	X
ICR	X	X	X
<i>Turbo</i>		X	X

## TOC Standards

Sievers Certified Reference Materials represent a comprehensive offering of ready-to-use TOC standards for calibration, linearity, and USP system suitability applications. Sievers Standards can be used with the 900 Series Analyzers as well as most other TOC analyzer brands. GE's large-scale production capabilities provide substantial cost advantages compared to in-house standards preparation. Based on GE's expertise in preparing and storing standards, both the accuracy and extended shelf life of Sievers Standards are guaranteed, even at low concentrations.

## Backed Up with Comprehensive Technical Support

GE's Analytical Instruments group provides ongoing phone and electronic technical support, as well as on-site installation, maintenance, calibration, and training services.



## 900 Laboratory Analyzer

The Sievers 900 Laboratory TOC Analyzer offers superior productivity for laboratory TOC measurements. Automated calibration and validation procedures, fast analysis time, automated reagent adjustment, and the high-capacity GE Autosampler combine for an unequalled level of efficiency, flexibility, and ease of use. A 19.2 cm (7.6 in) wide profile efficiently uses valuable bench space.

The Laboratory Analyzer is optimized for both specialized and general-purpose TOC measurements, and meets or exceeds the most common pharmaceutical and USEPA regulatory requirements in force today. It is ideal for routine analysis of TOC samples, and is also well-suited for testing laboratories that analyze a variety of sample matrices and concentrations.

## 900 On-Line Analyzer

The Sievers 900 On-Line TOC Analyzer is designed for continuous monitoring of waters. The wall-mounted analyzer comes in an IP-45 rated enclosure to withstand demanding process water environments.

In addition to the continuous TOC analysis mode, discrete grab samples, as well as standards, can be introduced using the Sievers iOS System.

## 900 Portable Analyzer

The Sievers 900 Portable TOC Analyzer is the most versatile of the three-model 900 Series. Weighing just 12.5 kg (27.5 lb), the Portable Analyzer can be easily deployed wherever it is needed in the process environment. Its lightweight and compact design makes it a powerful troubleshooting tool that can be hand-carried to any location in a water system.

The Portable Analyzer also doubles as a lab instrument for discrete samples, continuous on-line measurement, or for use with the GE Autosampler.

In recognition of its unique design, the 900 Portable won the Instrument Business Outlook (IBO) 2005 Gold Award for Best Portable Instrument Industrial Design.



# Specification Summary

	900 Laboratory Analyzer	900 On-Line Analyzer	900 Portable Analyzer
<b>Operating Specifications<sup>1</sup></b>			
Range	0.03 ppb to 50 ppm		
Precision	< 1% RSD		
Accuracy	± 2% or ± 0.5 ppb, whichever is greater		
Sample Type	Autosampler or discrete grab sample	On-line continuous or discrete grab sample	On-line continuous, Autosampler, or discrete grab sample
Display Readout	3 significant digits		
Calibration	Typically stable for 12 months		
Analysis Time	4 minutes	4 minutes (4 seconds for the optional <i>Turbo</i> mode)	
Sample Temperature <sup>2</sup>	1°C–95°C (34°F–203°F)	1°C–95°C (34°F–203°F); withstands short-term steam exposure	
Ambient Temperature	10°C–40°C (50°F–104°F)		
Sample Pressure <sup>2</sup>	n/a	Up to 250 psi	
Sample Flow Rate	n/a	50–300 mL/min (for on-line mode)	
Instrument Sample Flow Rate	0.5 mL/min		
<b>Analyzer Specifications</b>			
Outputs	Serial (RS-232) output (2); USB port (1); parallel printer port (1); Ethernet	4–20 mA output (1); alarm outputs (2); binary output (1); Serial (RS-232) output (1); USB port (1); parallel printer port (1); Ethernet	4–20 mA output (1); Serial (RS-232) port (2); USB port (1); parallel printer port (1); Ethernet
Display	Quarter-VGA, color touch-sensitive LCD display		
Power	Universal Power Supply: 100–240 ±10% VAC, 100 W, 50/60 Hz		Universal Power Supply: 100–240 ±10% VAC, 100 W, 50/60 Hz
Dimensions	H: 48.3 cm (19.0 in); W: 19.2 cm (7.6 in); D: 48.0 cm (18.9 in)	H: 62.4 cm (24.6 in); W: 45.2 cm (17.8 in); D: 26.4 cm (10.4 in)	H: 35.6 cm (14.0 in); W: 22.3 cm (8.8 in); D: 46.5 cm (18.3 in)
Weight	14.3 kg (31.5 lb)	16.9 kg (37.2 lb)	12.5 kg (27.5 lb)
Safety Certifications	ETL, CE		
Enclosure Rating	n/a	IP-45	n/a
<b>Consumables</b>			
UV Lamp	6 months		
Acid Reagent	As needed, typically 6 months (300-mL)		
Oxidizer Reagent	As needed, typically 3-month stability; available in 150- or 300-mL cartridge		
Pump Tubing	12 months		
Resin Bed	12 months		

<sup>1</sup> Stated analytical performance is achievable under controlled laboratory conditions that minimize operator and standards errors.

<sup>2</sup> If the sample temperature and pressure are above 60°C and 100 psi, the 900 Analyzer model with the stainless steel iOS is required.

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