

Sievers InnovOx

Laboratory and On-Line TOC Analyzers



Overview

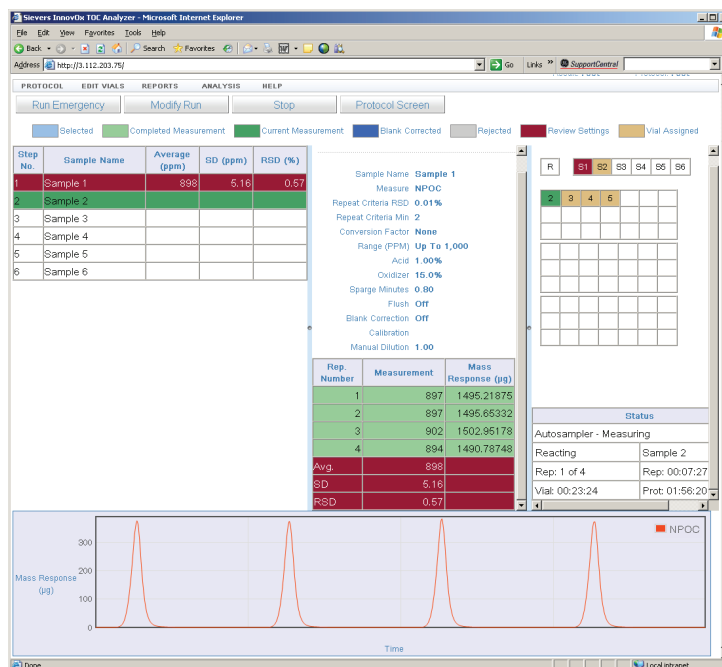
GE Analytical Instruments designed the Sievers* InnovOx Total Organic Carbon (TOC) Analyzers to provide industry-leading sample handling robustness and instrument uptime for process, environmental, and wastewater organic carbon analysis. Available in both Laboratory and On-Line models, the InnovOx uses an innovative Supercritical Water Oxidation technique that offers enhanced reliability, greater ease of use, and lower maintenance than typical combustion or UV persulfate TOC analyzers.

Features and Benefits

Wide Dynamic Operating Range—Measures up to 50,000 parts per million (ppm).

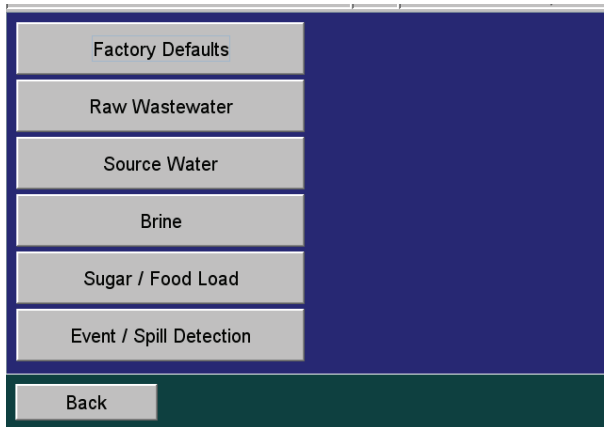
- **Versatile Measurement Modes**—Measures Total Inorganic Carbon (TIC), NPOC, Total Carbon (TC) and TOC by difference (TC-TIC).
- **Sample Handling Robustness**—Uses an innovative Supercritical Water Oxidation (SCWO) technique to achieve superior TOC recoveries regardless of organic compounds and particulate impurities in the sample. The InnovOx can handle a wide variety of traditionally difficult sample matrices, including brine, cellulose, and humic acid (see table on page 4) with unprecedented reliability.
- **Easy Operation**—The InnovOx On-Line offers preset protocols for easy startup. Both On-Line and Laboratory models have intuitive color touch-screen interfaces, and operate immediately without any necessary heater warm-up or detector stabilization.

- **Low Maintenance and Cost of Ownership**—Robust by design, the InnovOx requires minimal operator intervention or preventive maintenance, offers up to six months' calibration stability, and features a solid state nondispersive infrared (NDIR) detector.
- **Ethernet Web browser interface (Lab)**—Allows users to remotely monitor and control Analyzer operations and results using a Web-based interface via the instrument's Ethernet port.
- **User-configurable alarms and outputs (On-Line)**—Notifies user of water system events and enables remote monitoring of analysis results and performance.

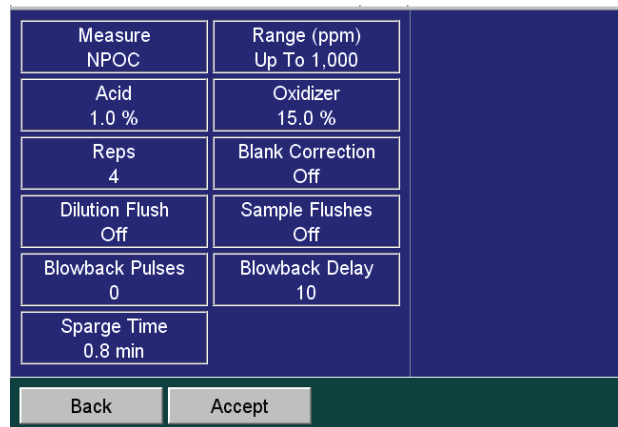


InnovOx Laboratory TOC Analyzer Web Interface





InnovOx On-Line TOC Analyzer Touch-Screen Interface



InnovOx On-Line TOC Analyzer Touch-Screen Interface

Key Applications

- Petrochemical
- Food and Beverage
- Chlor-alkali Chemistry
- Pharmaceutical
- Environmental Labs
- Manufacturing
- Municipal/Industrial Wastewater
- Power
- Research
- Pulp and Paper
- Brine and Seawater
- Unconventional Oil & Gas

Technology and Operation

The InnovOx features three main steps, each with significant process innovations:

Sample Handling and Reagent Mixing

The InnovOx ensures superior sample representation and accuracy by processing a large sample volume and thoroughly agitating the sample in the Sample Mixing Chamber. The sample and reagents are added through a sample coil delivery system which prevents syringe contamination.



Supercritical Water Oxidation (SCWO)

Using a patented SCWO technique (see sidebar below), the Sievers InnovOx takes the water sample to a supercritical state by increasing the temperature, and subsequently the pressure, within the reactor. The properties of supercritical water enable an ultra-efficient oxidation of TOC to carbon dioxide, even in the presence of chloride and other inorganic species that negatively interfere with traditional oxidation techniques.

NDIR Detection

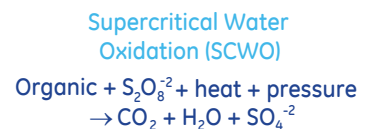
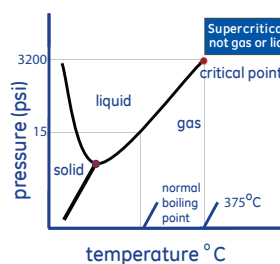
The InnovOx uses a highly stable, nondispersive infrared (NDIR) detector. Unlike other NDIR detectors, the InnovOx NDIR has no moving parts, and features tight temperature control of the IR source and detector.

Visit the library at www.geinstruments.com to see animations of key components and the innovative SCWO oxidation technique.

Supercritical Water Oxidation (SCWO)

Supercritical Water Oxidation (SCWO) was originally developed to treat large volumes of aqueous waste streams, sludges, and contaminated soils. SCWO destroys organic wastes using an oxidant in water and temperatures and pressures above the critical point of water: 375 °C (770 °F) and 22.1 mPa (3,200 psi). These conditions enable rapid and complete oxidation of organic carbon to CO₂.

Today, SCWO research and development is focused on treating a variety of toxic and hazardous organic wastes. GE Analytical Instruments is the first company to use this technique in a commercial laboratory TOC instrument.



InnovOx On-Line Analyzer Details

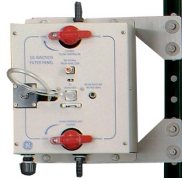
Accessories and Options

Air Purifier

The Air Purifier removes CO₂ from the air so the Analyzer can use house air as the compressed gas source.

Filter Panel

This accessory filters one sample stream, and it is automatically cleaned by back flushing with compressed air. The Filter Panel is adjustable for various particulate levels.



Fail-Safe Accessory

Sensors detect when the flow rate of each sample stream stops or consumables need replenishing.

IP56

The IP56 configuration protects the Analyzer from water spray and dust that would interfere with its operation.

NEMA 4X

The NEMA 4X enclosure protects the instrument from corrosive environments.

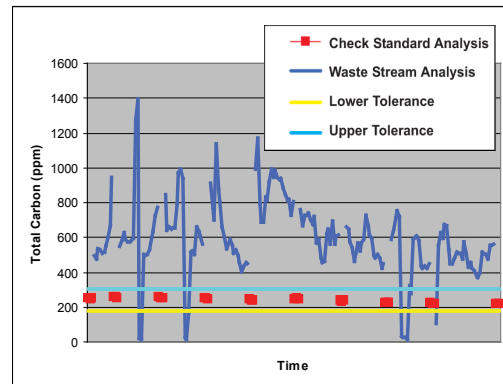
Other Accessories

Other accessories include a mounting stand, a sample peristaltic pump, and multi-stream (2, 5) configurations.

Specifications

Operating Specifications[†]

Analysis Modes	NPOC, TOC (TC-IC), TC, IC
Dynamic TOC Range	Up to 50,000 ppm TOC
TOC Limit of Detection (LOD)	0.05 ppm NPOC
TOC Accuracy**	±3%
TOC Precision**	RSD ≤ 1.5%
TOC Linearity***	R ² ≥ 0.995, measured as NPOC
Analysis Time	2.6 to 8.3 min in online mode
TOC Calibration Stability	Up to 6 months
Particle Diameters in Sample	≤ 200 µm diameter without filtration, > 200 µm with optional Filter Panel
Ambient Temperature Range	10–40 °C (50–104 °F)
Maximum Relative Humidity	Up to 95%, non-condensing
Sample Temperature Range	10–60 °C (50–140 °F)
Sample Volume	0.6 ml to 3 ml
Sample Inlet Pressure	125 psig maximum with provided control valve 0.5 psig minimum without optional sample pump
Drain	Gravity drain



Analyzer Specifications

Outputs	External USB port (1), internal USB ports (2), Ethernet (1), Binary End-of-Analysis Output (1), Isolated 4–20 mA Analog Outputs (5)
Display	Color, touch-sensitive LCD
Power	100–240 ±10% VAC, 280 W, 50/60 Hz
Dimensions	Analyzer: H: 92.7 cm (36.5 in); W: 64.6 cm (25.4 in); D: 38.7 cm (15.3 in)
Weight	Analyzer: 36.3 kg (80 lb)
Safety Certifications	CE, ETL listed. Conforms to UL Std. 61010-1. Certified to CSA C22.2 No. 61010-1.
IP Rating	IP56 (optional)

Consumables

Acid Reagent	As needed
Oxidizer Reagent	As needed
Reagent Grade Water	As needed
Pumps	12 months
Sample Flow Path Tubing	3 months
Valve Seals (2)	Up to 3 months, depending on sample matrix
Sample Pump Tubing (optional)	3 months

Maintenance Frequency

As needed	
As needed	
As needed	
12 months	
3 months	
Up to 3 months, depending on sample matrix	
3 months	

Estimated Maintenance Time

5 minutes
5 minutes
5 minutes
15 minutes
15 minutes
15 minutes
15 minutes

InnovOx Laboratory Analyzer Details

Accessories and Options

GE Autosampler

For high-volume laboratory applications, the InnovOx can be used with the GE Autosampler. It can handle up to 120 35-mL sample tubes or up to 63 40-mL or 60-mL vials in one protocol. An optional stirring station creates a homogeneous mixture for analysis during the sampling process.



Air Filter

The Air Filter is used to purify ambient air and pressurize it sufficiently for use as sparge and carrier gas. It easily attaches to the back of the Lab model, so the Analyzer can be used in place of external carrier gas cylinders.



Sievers Certified Standards and TOC Vials

Sievers Certified Reference Materials are available for InnovOx calibration and verification needs, as well as reliable and economical 40-mL and 60-mL TOC vials.

Specifications

Operating Specifications¹

Analysis Modes	IC, NPOC, TC, TOC (TC-IC)
Dynamic TOC Range	Up to 50,000 ppm TOC
TOC Limit of Detection (LOD)	0.05 ppm as NPOC
TOC Accuracy**	± 3%
TOC Precision**	RSD ≤ 1.5%
TOC Linearity	R ² ≥ 0.995, measured as NPOC
Analysis Time	2.6 to 9.2 min, depending on mode
TOC Calibration Stability	Up to 6 months
Particle Diameters in Sample	≤ 800 µm diameter
Ambient Temperature Range	10–40 °C (50–104 °F)
Maximum Relative Humidity	Up to 95%, non-condensing
Sample Temperature Range	10–60 °C (50–140 °F)
Sample Volume	0.6 ml to 3 ml
Sample Inlet Pressure	Ambient
Maximum Backpressure	Gravity drain

InnovOx Measurements for Brine, Cellulose, and Humic Acid Samples			
Replicate	28% Brine Solution (Process Sample)	90 m Cellulose Solution (100 ppm C)	Humic Acid Solution (10 ppm C)
1	5.80	95.1	10.2
2	5.69	98.0	10.1
3	5.59	90.9	10.4
4	5.68	104	10.4
5	5.69	93.2	10.2
6	5.53	98.0	10.2
7	5.49	93.3	10.4
8	5.70	101	9.91
9	5.57	103	9.86
Mean	5.66	97.3	10.19
Stand. Dev.	0.12	4.50	0.20
RSD	2.13%	4.63%	2.0%

Analyzer Specifications

Outputs	Ethernet (1), USB (3)
Display	Color, touch-sensitive LCD
Power Requirements	100–240 ±10% VAC, 400 W, 50/60 Hz
Dimensions	Analyzer: H: 52.05 cm (20.5 in); W: 32.26 cm (12.7 in); D: 58.42 cm (23.0 in) GE Autosampler: H: 52.2 cm (20.5 in); W: 28.2 cm (11.1 in); D: 53.3 cm (21.0 in)
Weight	Analyzer: 22.41 kg (49.4 lb); GE Autosampler: 14.1 kg (31.1 lbs)
Safety Certifications	CE, ETL listed. Conforms to UL Std. 61010-1. Certified to CSA C22.2 No. 61010-1.

Consumables

Acid Reagent
Oxidizer Reagent
Reagent Grade Water
Air Filter Cartridge
Pumps
Sample Flow Path Tubing
Valve Seals (2)

Maintenance Frequency

As needed, typically for 6 months (285 mL)
As needed, typically 30-day stability
As needed
3 months of operation
24 months
6-12 months
Up to 3 months of operation, depending on sample matrix

Estimated Maintenance Time

5 minutes
5 minutes
5 minutes
5 minutes
15 minutes
15 minutes
15 minutes

* Trademark of General Electric Company; may be registered in one or more countries.

** Measured at 25 ppm NPOC or TOC

*** See Operation & Maintenance Manual for calibration recommendation

¹ Stated analytical performance is achievable under controlled laboratory conditions that minimize operator and standards errors. The Sievers InnovOx TOC Analyzer is protected by one or more of the following US and foreign patents: US 8,101,417, 8,101,418, 8,101,419, 8,101,420 and 8,114,676.



The Americas
GE Analytical Instruments
6060 Spine Road
Boulder, CO 80301-3687 USA
T +1 800 255 6964
T +1 303 444 2009
F +1 303 527 1797
geai@ge.com

Europe/Middle East/Africa
GE Analytical Instruments
Unit 3, Mercury Way
Urmston, Manchester
UK M41 7LY
T +44 (0) 161 864 6800
F +44 (0) 161 864 6829
geai.europe@ge.com

Asia Pacific
GE Analytical Instruments
5/F, Building 2, No.1 Hua Tuo Rd.
Zhangjiang Hi-Tech Park, Pudong
Shanghai, China 201203
T +(86) 8009159966
geai.asia@ge.com
geai.india@ge.com

