

Sievers* InnovOx On-Line TOC Analyzers

For organics monitoring
includes BOD and COD reporting





Overview

Sievers InnovOx Total Organic Carbon (TOC) Analyzers are designed to continuously measure organic carbon in a broad range of water streams ranging from steam condensate to wastewater influent and effluent to concentrated brine in chemical applications. All InnovOx Analyzers include robust sample handling capability and industry leading supercritical water oxidation (SCWO) technology, all designed to enhance performance and uptime in challenging applications.

Industries Served

- Pharmaceutical
- Hydrocarbon Processing
- Pulp and Paper
- Food and Beverage
- Chemical Production
- Wastewater Treatment

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%

InnovOx Robust SCWO Oxidation

Real-time Monitoring Applications

Biological wastewater plant optimization. Monitoring organics before and after treatment can allow operators to optimize the F/M (food to microorganism) ratio, thereby enhancing organics removal and reducing sludge, minimizing chemical usage as well as avoiding system upsets.

Wastewater effluent monitoring and COD/BOD correlation.[†] As a fully automated surrogate for time consuming and difficult COD and BOD tests, the InnovOx TOC instrument can continuously track the performance of a wastewater system. Optimizing the process provides confidence that regulatory testing results will be within permit limits.

Steam condensate leak detection. The InnovOx is uniquely capable of monitoring hot condensate water up to 85 °C (185 °F) and quickly identifying glycol, hydrocarbons, or other product leaks before expensive boiler/steam components or final products are damaged or contaminated.

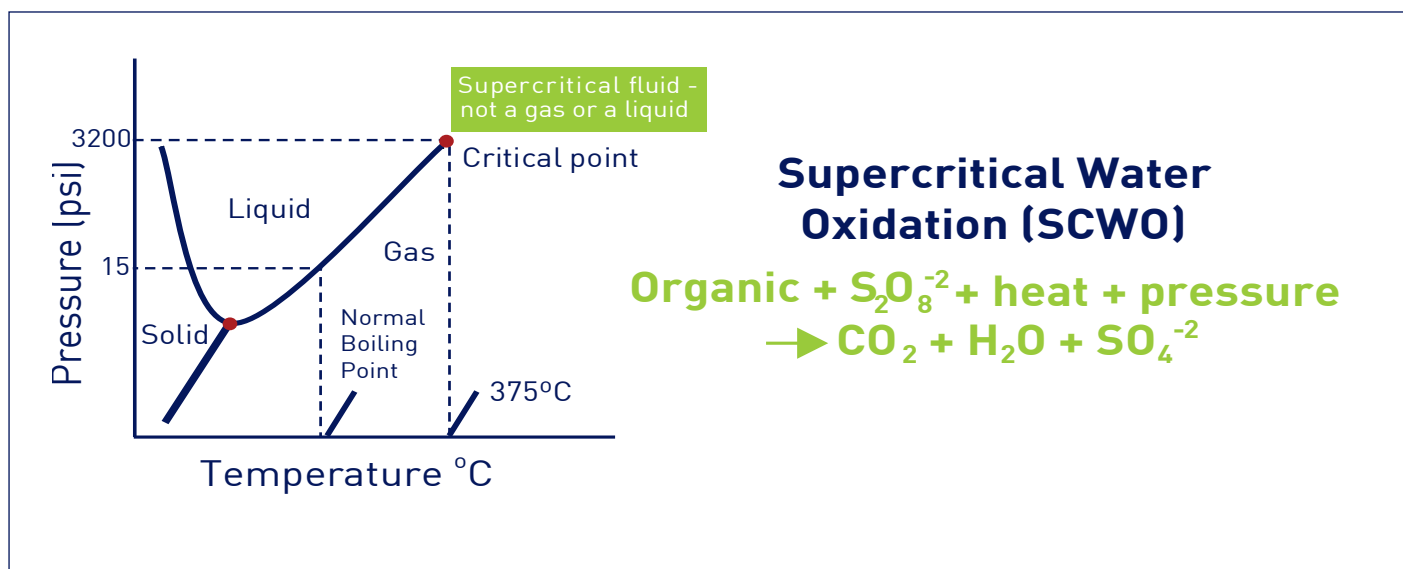
Cooling water contamination. The InnovOx continuously monitors both raw water and discharged cooling water to protect cooling systems from contamination and quickly identify leakage of any organic before discharge to the environment.

[†] BOD or COD values are calculated based on the TOC measurement.

High-salt seawater and brine monitoring. The patented SCWO oxidation technology was designed to measure organics reliably in high-salt or brine samples commonly encountered in refineries. Unlike combustion TOC technologies that can easily be plugged or damaged by salt, the InnovOx oxidation reactor is self-cleaning and is not affected by salts coming out of solution.

Supercritical Water Oxidation (SCWO)

Sievers InnovOx TOC Analyzers employ a unique supercritical water oxidation approach to oxidation that uses both heat and pressure. In a sealed reactor, the sample and persulfate are heated to 375 °C (770 °F). This high temperature and corresponding increased pressure of 22.1 MPa (3,200 psi), allows for the supercritical state to be achieved, and dramatically improves the efficiency of the oxidation process, thereby offering better recovery for difficult matrices. As an added benefit, inorganic salts are no longer soluble at these conditions, and therefore do not interfere with the oxidation reaction.



Compliance

US EPA Method 415.1 – Organic carbon in drinking, surface, seawater, and waste water

US EPA Method 415.3 – Organic carbon in surface and drinking water

US EPA Method 9060A – Organic carbon in ground, surface, saline, and waste water

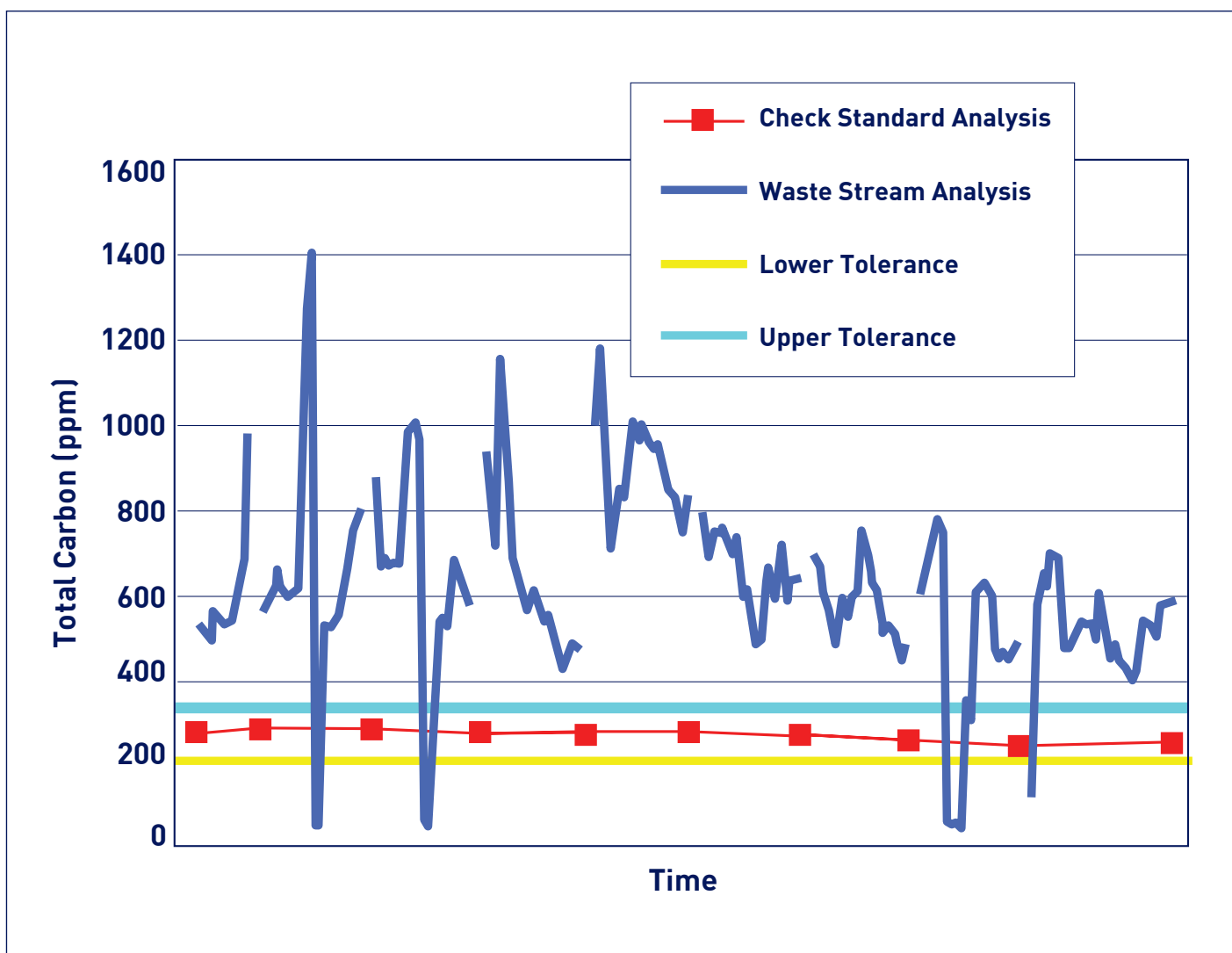
CEN Method DIN EN 1484 – Organic carbon in drinking, ground, surface, sea, and waste water

ISO 8245 – Organic carbon in drinking, ground, surface, sea, and waste water

ASTM D5173 – Standard Guide for On-Line Monitoring of Total Organic Carbon in Water by Oxidation and Detection of Resulting Carbon Dioxide

Pattern Approval Certificate for Measuring Instruments of the People's Republic of China, issued by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China

SM 5310E – Standard Methods for the Examination of Water and Wastewater Total Organic Carbon Section E Supercritical Water Oxidation



InnovOx On-Line Analyzer Data

Product Capabilities

- Wide dynamic range of 50 ppb to 50,000 ppm TOC
- Robust sample handling options for reliable operation even with high suspended solids
- Patented supercritical water oxidation (SCWO) for superior TOC recovery and high reliability
- Reliable NDIR detection technology with no moving parts
- Straightforward operation
- High temperature option allows measurement of samples up to 85°C
- Versatile measurement modes include TOC (TC-IC) or NPOC
- Handles tough TOC samples, like cellulose and brine, with no residuals left in reactor
- Oxidation carried out in a tantalum reactor where no catalyst is needed. Reactor is not a consumable
- Multiple customizable backflush options

Options & Accessories

Multi-stream capability. Either 2-stream (standard) or 5-stream (optional) configurations. Allows monitoring of multiple sample streams where processes are not so dynamic that they require continuous monitoring.

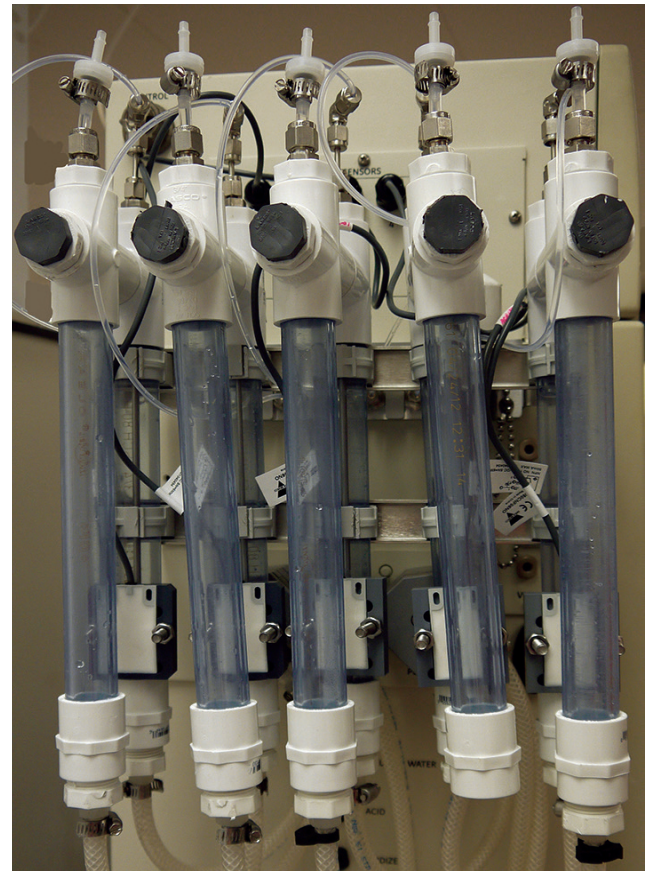
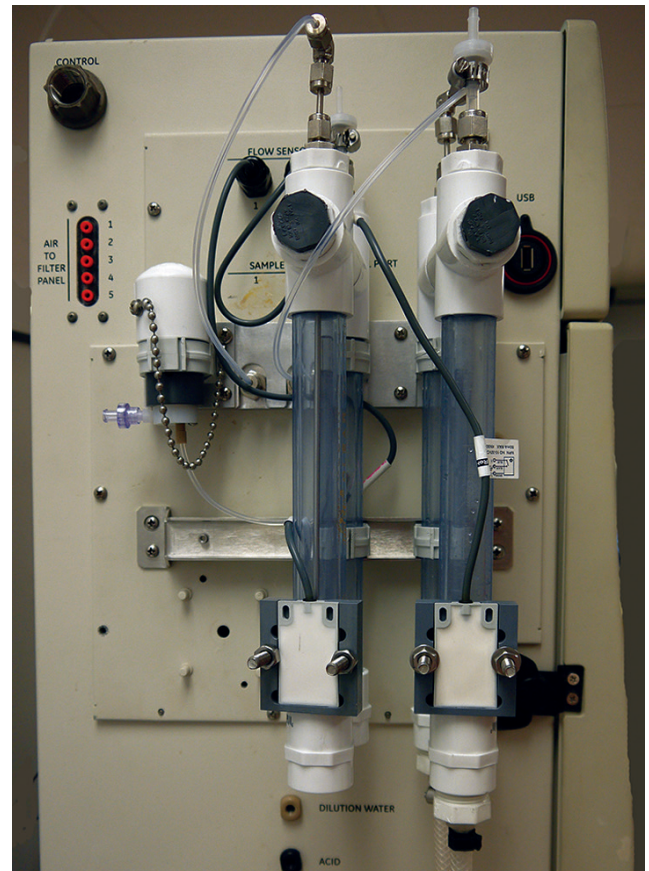
High-temperature sampler. Stainless steel components allow for monitoring of samples up to 85°C. Ideal for use in steam condensate and cooling tower applications (available in 2-stream version only).

Wastewater sampler. For wastewater applications, a sampler is available in either 2-stream or 5-stream configurations. Configurable for either low to moderate or high levels of particle content without the maintenance of filtering systems. Ideal for wastewater applications in a wide range of industrial applications.

NEMA 4X. Enclosure for harsh environments. For use in elevated ambient temperatures or high dust applications.

Fail safe. Monitors for the presence of sample flow and adequate supply of reagents/check standards to increase reliability. Recommended for most applications.

Exterior sample pumps. Auxiliary sample pumps for applications where a pressurized sample is not available. Pulls sample from a reservoir or tank.



Wastewater 2-Stream and 5-Stream Option

System Specifications

Operating Specifications¹

Analysis Modes	NPOC, TOC (TC-IC), TC, IC
Range	50 ppb to 50,000 ppm TOC
Precision	RSD \leq 3% of reading at $>$ 5 ppm NPOC or TOC
Accuracy	Greater of \pm 3% of reading or \pm 0.25 ppm, 1 to 100 ppm, NPOC or TOC
Linearity	R ² \geq 0.995, measured as NPOC
LOD	\leq 50 ppb
TOC Calibration Stability	Up to 6 months
Analysis Time	2.6 to 8.3 minutes in Online mode
Particle size	\leq 200 μ m and up to 100 ppm TSS with clean water sampler or $>$ 200 μ m and up to 1,000 ppm TSS with optional wastewater sampler
Smallest Inner Diameter (ID)	1.57 mm or 1570 μ m
Sample Temperature	5-60 °C (41-140 °F), or 5-85 °C (41-185 °F) with high-temperature options
Ambient Temperature	10-40 °C (50-104 °F)
Source Sample Pressure	Maximum back pressure at the Analyzer must be $<$ 1 psi. Achieve this with a combination of gravity drain and recommended flow of the equipped sampler.
Minimum Sample Flow Rate	50 mL/min without filtration; 3 - 5 GPM with filtration
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 analytical; 1 for stream ID)
Inputs	Binary Input (1) for Remote Analysis Start/Stop
Display	Color LCD w/touch-screen
Power	100 - 240 \pm 10% VAC, 50 - 60 Hz, 400 VA
Alarm Relays	System Fault Alarm (1); User-Configurable Alarms, High and Low Limit (4)
Communications Protocols	Modbus [®] ; TCP/IP over Ethernet
Installation/Overvoltage Category	II
Sample Streams	2 Streams (standard), 5 Streams (optional)
Dimensions	H: 92.7 cm (36.5 in.); W: 64.6 cm (25.4 in.); D:38.7 cm (15.3 in)
Weight	36.3 kg (80 lb)
Safety Certifications	CE, ETL listed. Conforms to UL Std. 61010-1. Certified to CSA C22.2 NO. 61010-1

Environment

Enclosure Options	IP56
Maximum Relative Humidity	Up to 95%, non-condensing
Maximum Altitude	3,000 m (9,800 ft)
Pollution Degree	2

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

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