

# Total Organic Carbon

**THORNTON**

Leading Pure Water Analytics

- Continuous real-time TOC monitoring
- Low maintenance design
- No reagents or chemicals needed
- No moving parts
- Point-of-use or portable monitoring capability



## 550 TOC Total Organic Carbon Analyzer

**METTLER TOLEDO**

## Features

- Continuous analysis and rapid display updates
- Display TOC, resistivity or conductivity (compensated or uncompensated) and temperature simultaneously
- 4-20 mA analog output, user-selectable for TOC, resistivity/conductivity or temperature
- RS232 digital output for TOC, resistivity or conductivity (compensated or uncompensated) and temperature
- Two SPDT relay outputs for high/low setpoint alarms
- UV lamp run-time indication and expiration alarm
- User-defined password protection for setup and maintenance menus

## Benefits

- Wide dynamic operating range of 0.05 Mohm-cm to 18.2 Mohm-cm
- Real-time continuous monitoring, no time-consuming batch measurements.
- Obtain real data as it happens and react with alarms when necessary
- Point-of-use or portable monitoring
- Low maintenance: no gases or reagents to handle, store or replace. No membranes or moving parts.
- Easy access to UV lamp with diagnostics and lamp expiration alarm
- Small, flexible, versatile: use as an on-line monitor or to profile TOC, resistivity and temperature throughout the system
- Meets USP <643> and EP 2.2.44 requirements

## Applications

**Pure and Ultrapure** water production requires monitoring of organic contamination throughout the treatment process. The 550 provides continuous, fast, and reliable monitoring of TOC levels from post RO waters to point-of-use. With continuous on-line measurements, the 550 ensures TOC excursions will not be missed.

**Pharmaceutical-grade waters** must meet strict water quality requirements. This highly regulated industry mandates the monitoring of Total Organic Carbon levels for PW (Purified Water), WFI (Water for Injection) and HPW (Highly Purified Water). The instruments used in this application must also undergo periodic testing to verify its ability to accurately measure TOC. Testing requirements are spelled out in the USP Chapter <643> and EP 2.2.44 guidelines. The 550 TOC analyzer provides the performance needed to meet these requirements, while offering added benefits such as continuous online measurement in a low-maintenance, easy-to-use package.

**Semiconductor manufacturing** processes have some of the most stringent specifications for organic contamination in pure and ultrapure water systems. Use the 550 throughout the plant to monitor the integrity of reverse osmosis membranes, the effectiveness of TOC destruct UV lamps, resin bed performance and shedding. The 550-SX model is specifically designed to monitor low concentration levels of organics, typically found after final polish or at point-of-use locations.

**Recycle and reclaim** applications take advantage of the fast analysis time. The 550 TOC analyzer provides continuous monitoring, not batch cycles, with high and low set point alarms for TOC, resistivity or temperature to allow diversion from the fab or other secondary applications if proper water quality is not met.

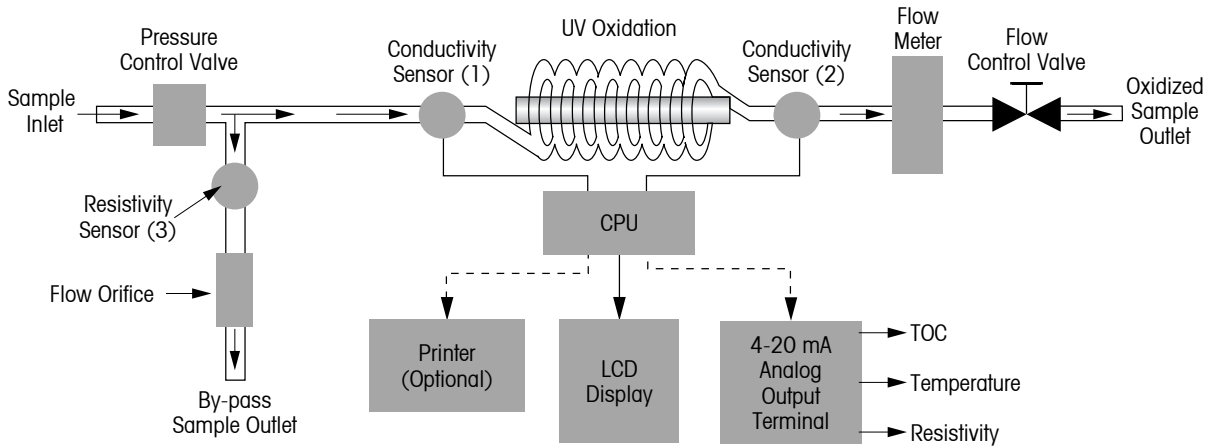
**Power generation** makeup water treatment – from reverse osmosis to demineralizers, the 550 provides fast reliable monitoring of TOC contaminants in the water system. The 550-HT Hi Temp version will monitor organics in fluids at elevated temperatures, to 90 °C.

**System profiling** is easy with the quick set up and portability of the 550. Profile the water system for trouble shooting TOC excursions or to spot check TOC levels after various treatment processes throughout the plant. Continuous online measurements make fast data collection simple and easy.

## Principal of Operation

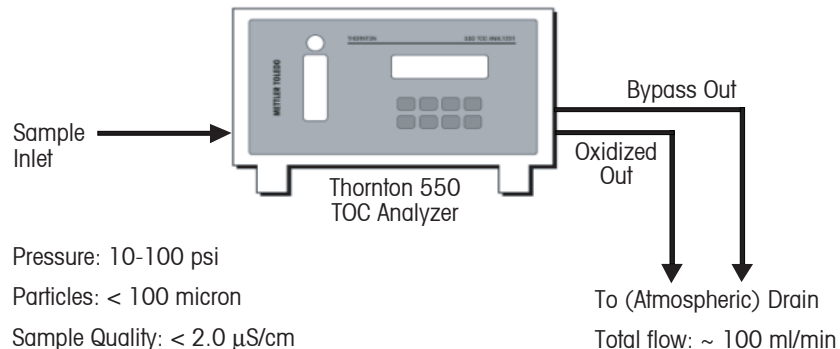
The Thornton 550 TOC Analyzer measures Total Organic Carbon based on differential conductivity (see page 3). The sample water enters the analyzer and passes through a pressure regulator, which controls sample pressure to downstream components. Here the sample splits into two flow paths, where a portion of the flow is directed to the by-pass line where resistivity/conductivity and temperature are measured. These values are represented on the LCD display. The remainder of the sample is directed through a second conductivity sensor, measuring the sample conductivity prior to oxidation. Next, the sample enters the oxidation chamber. As the sample moves through the oxidation chamber it is subjected to high intensity ultraviolet radiation at 185 nanometers, effectively oxidizing the sample. After oxidation, the sample passes through a third conductivity sensor where the conductivity and temperature are measured again to determine the level of Total Organic Carbon (TOC). The measurement and sample flow are continuous; therefore measurement update time is minimized, providing rapid response.

## Principal of Operation



## 550 TOC Analyzer Installation

The Thornton 550 TOC Analyzer is designed to minimize installation and setup time. There are three tubing connections required, one for the sample inlet, one for the oxidized sample outlet and a third for the sample bypass flow. It is recommended that a valve be installed on the sample inlet as a shutoff valve to isolate the analyzer from the process line as needed (valve not supplied by Thornton).

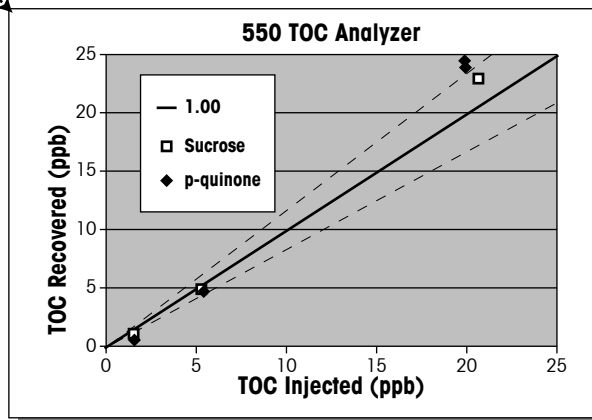
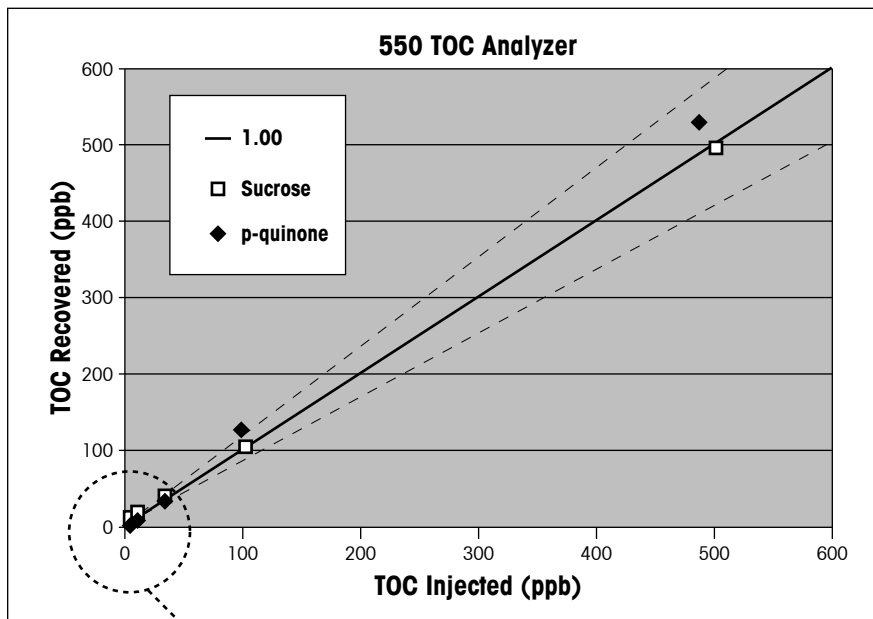


TOC Performance

Description	550	550-HT	550-SX	
Measurement Range	0.1-1000 ppb	0.1-1000 ppb	0.05-30 ppb	
Repeatability	± 0.1 ppb < 10 ppb TOC ± 1% > 10 ppb TOC	± 0.1 ppb < 10 ppb TOC ± 1% > 10 ppb TOC	± 0.05 ppb < 5 ppb TOC ± 1% > 5 ppb TOC	
Resolution	0.01 ppb	0.01 ppb	0.001 ppb	
Limit of Detection	0.1 ppb	0.1 ppb	0.05 ppb	
Linearity (Accuracy)*	1.00 ± 0.05	1.00 ± 0.05	1.00 ± 0.05	
Min. Water Quality**	> 0.5 MΩ-cm < 2.0 μS/cm	> 0.5 MΩ-cm < 2.0 μS/cm	> 10 MΩ-cm	
Sample Water	Resistivity/Conductivity	0.05-18.2 MΩ-cm (0.055-20 μS/cm)	0.05-18.2 MΩ-cm (0.055-20 μS/cm)	5.0-18.2 MΩ-cm
	Temperature	15-50°C	15-90°C	15-40°C
	Particle Size	< 100 μm	< 100 μm	< 100 μm
	Flow Rate	20 ml/min	20 ml/min	20 ml/min
	Pressure	10-100 psi at Inlet	10-100 psi at Inlet	10-100 psi at Inlet

\* Values expressed in terms of Slope, defined as TOC recovered vs. TOC injected based on tests performed using samples of known concentrations of organics.  
 \*\* Sample water quality requirements to meet stated TOC performance specifications shown.

Graphs show typical TOC recovery performance when injecting two known organics at various concentrations. Solid line represents Linearity (slope) = 1.



## Ordering Information

Description	Part No.
550 TOC Analyzer 0.1 - 1000 ppb, (5-50 °C), 100 - 240 VAC, 50/60 Hz	<b>135-001</b>
550-HT TOC Analyzer 0.1 - 1000 ppb, (5-90 °C), 100 - 240 VAC, 50/60 Hz	<b>135-003</b>
550-SX TOC Analyzer 0.050 - 30.000 ppb, (5-40 °C), 100 - 240 VAC, 50/60 Hz	<b>135-005</b>

## Accessories &amp; Replacement Parts

Description	Part No.
Replacement UV lamp	<b>129-010</b>
Thermal printer, 7 VDC (Includes printer, serial interface cable, power cable and printer manual)	<b>139-003</b>
Resistor set for sensor board calibration	<b>139-005</b>
Resistor set for sensor board calibration ( -SX model only )	<b>139-009</b>
Validation Support Document Package (CD-ROM)	<b>139-017</b>

The following 550 TOC products and services are also available:

- Factory Calibrations with Certificate of Accuracy
- Factory System Suitability Testing with SST Certificate
- Field Installation and Validation support services
- Field System Suitability Test Services with SST Certificate

Please contact Thornton Technical Services for more information.



For the most current product information visit:

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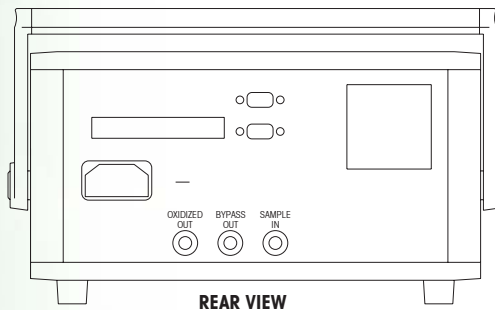
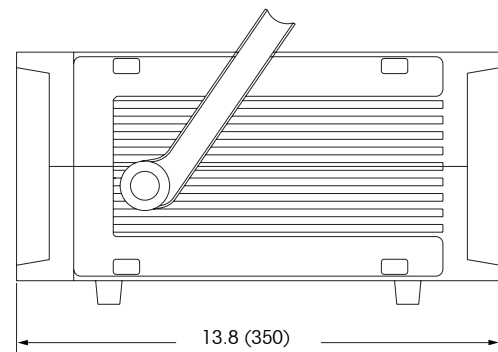
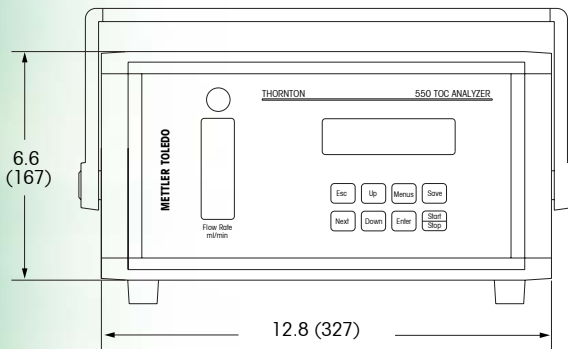
ML0095 Rev.B 04/04

### Specifications

Ambient Temp / Humidity	5-40 °C / 5-80% RH Non-condensing
Location	Industrial Environment (Indoor)
Display	LCD with back-light, displays TOC, resistivity, temperature, and operation/error indications
Analog outputs	One 4-20mA DC, Output is selectable for TOC or resistivity or temperature
Outputs Alarm outputs	Two SPDT contacts for Hi-Alarm, Lo-Alarm and Error Rated 0.4A @ 120VAC, 2.0A @ 30VDC
Alarms displayed	UV lamp replacement Alarm; Error Alarm (both on LCD)
Voltage / Current	100-240 VAC @ 50 / 60 Hz / 50W (max)
Size	12.8" (327 mm) W x 6.6" (167 mm) H x 13.8" (350 mm) D
Weight	17.6 lb. (8 kg)
Sample connections	0.25" (6 mm) tube fittings
Wetted Parts	316 SS, PVDF, high quality quartz glass

### Optional

Printer	Thermal, Serial dot (SEIKO Model: DPU414)
Print out	TOC, Resistivity, Temperature, Date and Time
Printer interval	1-99 seconds, 1-99 minutes, 1-99 hours (adjustable in increments of 1)
Power	7 VDC (provided by analyzer)



Dimensions: inches (mm).