

**Features**

- TOC-True **or** NPOC
- Microsoft Windows Touch Screen Computer
- 2 Alarm Levels  
1 Master Fault Alarm
- 4-20 mA Outputs
- RS-232C
- Separate Electronics & Liquid Compartments
- Rugged FRP Enclosure

**Options**

- Digital Injection
- Dual NDIR Analyzers
- Correlated BOD/COD
- Benchmark/Auto Validation
- Auto-Cal/Auto-Clean
- Automatic Multi-Range
- Multi-Stream Analysis
- 485 Output
- Network Ready

**ON - LINE UV / HEATED PERSULFATE**

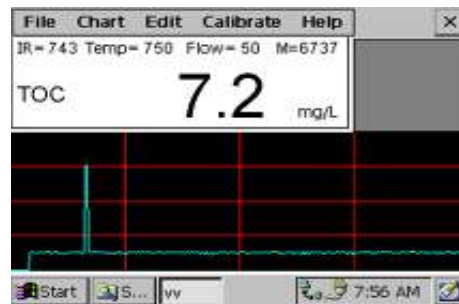


**-CHOICE OF PLATFORMS-**



**Microprocessor**

- Interactive Menus



**Windows CE Computer  
with Touch Screen**

- Touch Screen
- Paperless Chart Recorder
- VGA Color
- PCMCIA Slot
- Network Ready
- Solid State Data Storage

**Description**

TOC Systems, Inc. uniquely offers all methods of TOC analysis\* and recommends **UV/Heated Persulfate** as the method of choice for many applications.

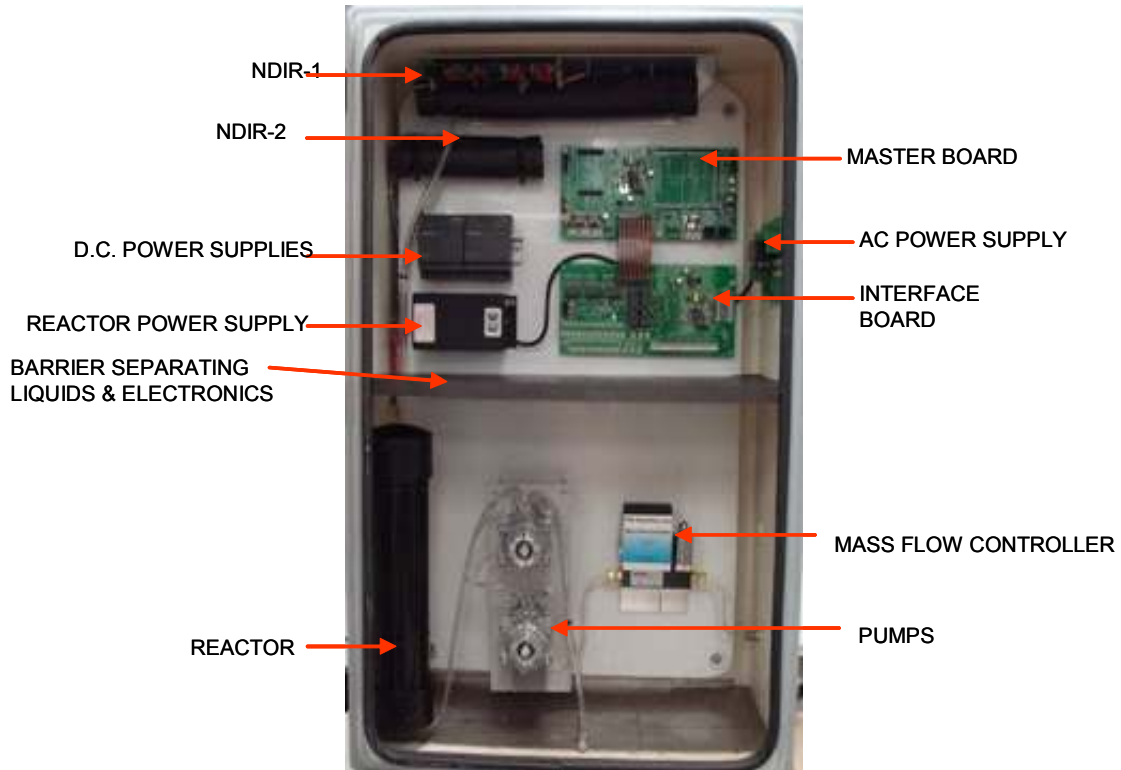
Only the StarTOC analyzers offer the features and reliability of operation associated with its team's pioneering experience in TOC analysis since 1969\*\*.

Because we offer a full line of High Temperature Combustion, UV/Heated Persulfate, Ozone Promoted and Ultra-Pure TOC Analyzers, we are able to offer you objective, unbiased advice and can therefore fully commit our total resources to providing you the best possible installation.

**View and listen** to a short video, approximately 2 minutes about TOC Systems.  
<http://tocsystemsinc.com/impactmovie>

\*StarTOC™ is a brand of TOC Systems, Inc.

# StarTOC UV / HEATED PERSULFATE METHOD



- Most Accessible for Service
  - No Local Repair
    - Parts Exchange Service Policy (overnight delivery of replacement modules)
- Oxidizes particles up to 3 mm in diameter.  
(No sample valves to clog or jam)
- Rugged FRP Enclosure allows direct outside installation and integral heating, cooling and purging, without requiring additional costly shelters.

# ELIMINATE Analyzer-Sample System Interface Problems -



## Features & Benefits:

A single package, sample system fully integrated with the analyzer assures proper overall system operating conditions

- AND -

A single source of total analytical responsibility, accountable to project management for its success.

## - WITH Analyzer Side Panel-Mounted Complete Sample Systems



(No Filtration Sample System)

Sample Pump

Fast By - Pass

Heat Exchanger Sample Cooler

Self-Cleaning Filters

Custom Sample Systems



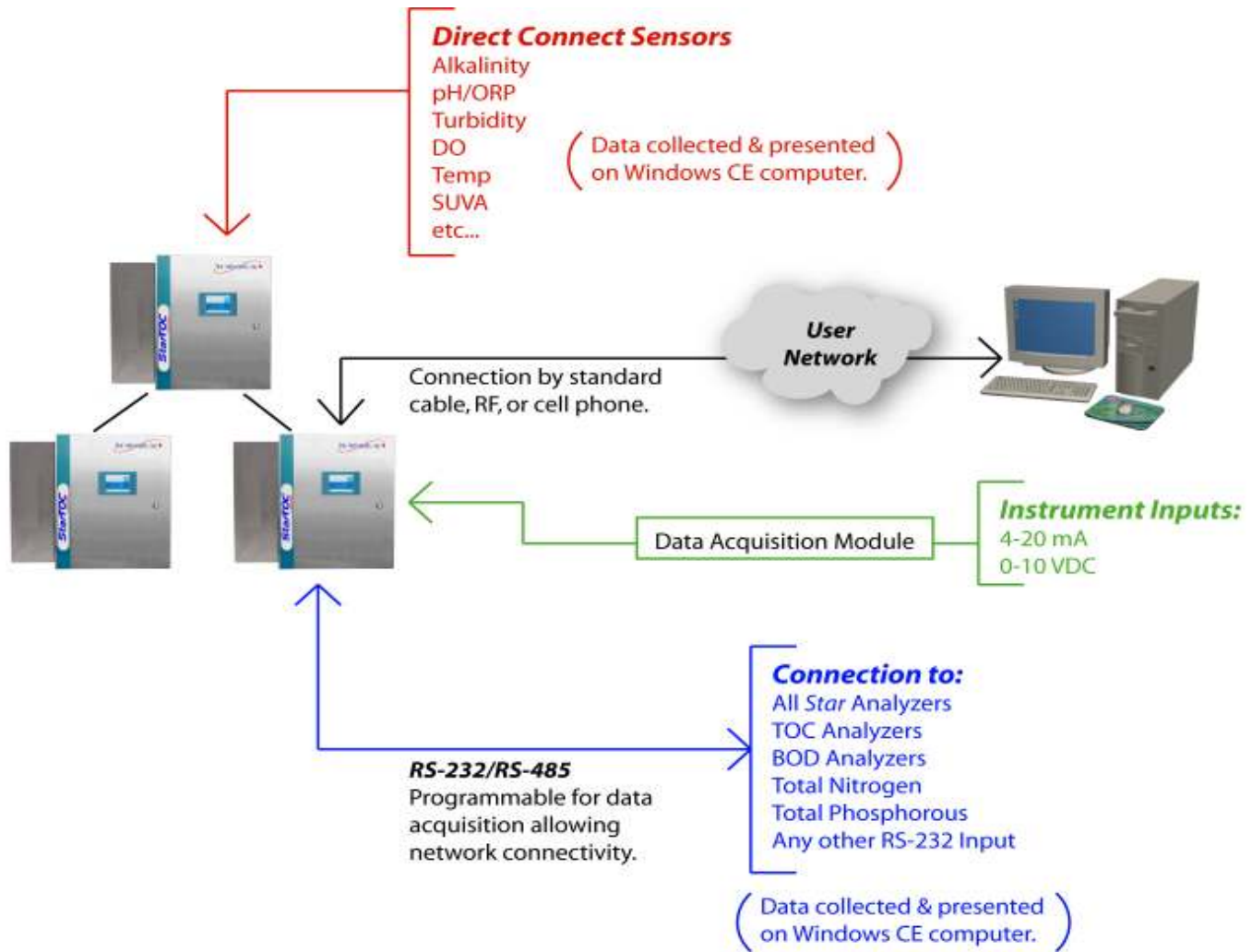
(Blow Back Sample System)

(Heat Exchanger and Sample-Conditioner System)



## Network Enabled

Utilization of an onboard Windows CE computer allows direct networking. Central control of analyzer operation and data management are easily facilitated.



## Preferred Application

Difficult industrial samples requiring accurate TOC analysis with minimum maintenance.

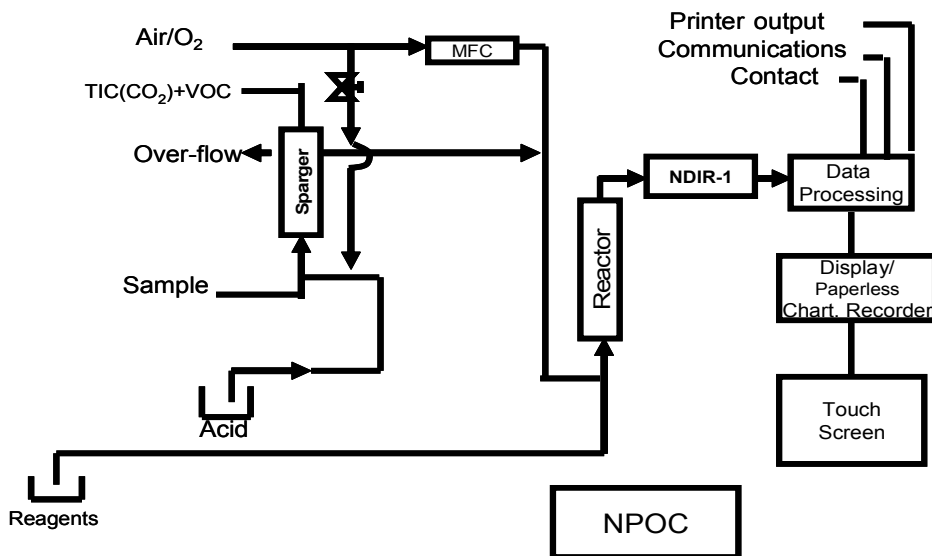
Standard Method 5310 C/D  
EPA 415 1  
EPA 9060

ASTM D 4839-88  
ASTM D 4778-88

Regulatory Compliance Guaranteed

<sup>(2)</sup> *The Pitfalls of Process TOC Analysis and How to Avoid Them*  
1999 Instrument Society of America Tutorial

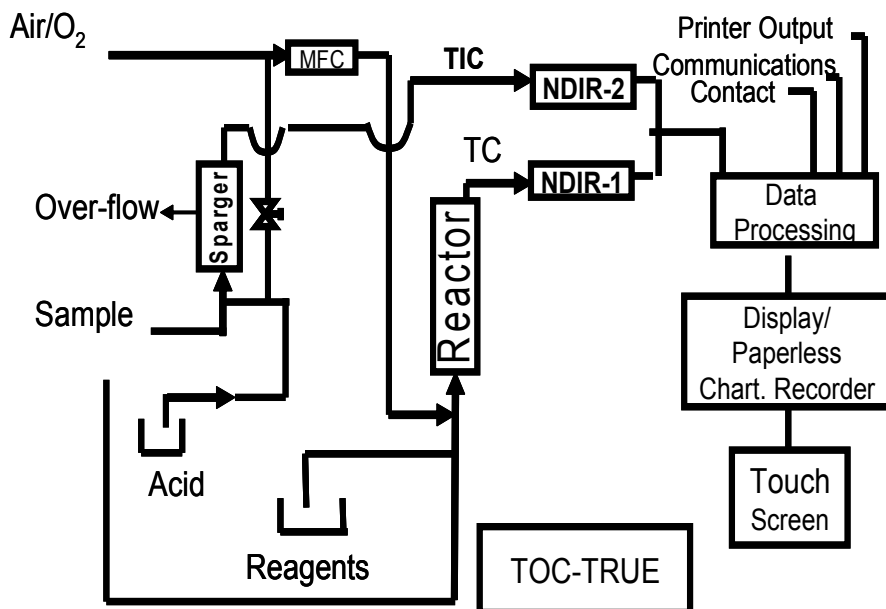
StarTOC™ is a brand of TOC Systems, Inc.



## NPOC Analysis

“NPOC” (Non-Purgeable Organic Carbon) mode is preferred for accuracy when no volatile organics are in the sample. Pump (P-1) delivers the sample to the sparger, where it is mixed with acid by pump (P-3) to lower its pH to approximately 2.0. At this pH, the inorganic carbon in the sample is converted to dissolved  $\text{CO}_2$  and is stripped (sparged) from the sample by air/ $\text{O}_2$  and vented to atmosphere, along with any purgeable/volatile organics. The carbonate-

free sample is drawn from the sparger by pump (P-2) and delivered to the Reactor, where the remaining NPOC is oxidized to  $\text{CO}_2$ , which is measured by the NDIR (Non-Dispersive Infrared Analyzer) as a direct correlation of NPOC in the sample. **NPOC is often erroneously reported as “TOC”.**



## TOC-True Analysis

TOC-True mode is the preferred method of use if any volatile hydrocarbons are present in the sample, which would be lost in the Inorganic Carbon removal sparging stage in an “NPOC” analysis. The TOC-True method measures both TC (Total Carbon) and TIC (Total Inorganic Carbon) for a more accurate and complete analysis of the total organics in the sample, including the purgeable/volatile organic carbon. By subtracting the TIC from the Total Carbon in the sample,

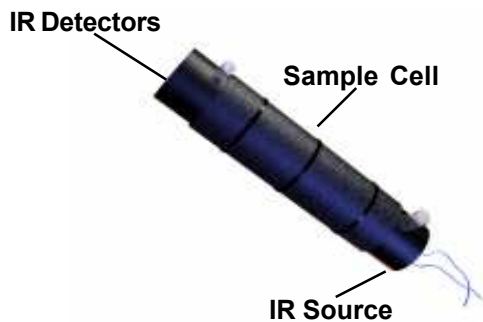
**all species of organic carbon are measured, not just the NPOC.**

## Benchmark/Auto-Validation

Benchmark<sup>(2)</sup> is the validation technique, whereby on command a chemical calibration standard is automatically introduced to the analyzer and the response is compared to the previous analyzer calibration. If the response falls within a certain specified limit, the computer/output indicates “Benchmark Passed”. If the response falls outside specified performance limits, either a “Maintenance Request” or a “Fault” alarm is activated, depending on preset tolerances. Thus, in cases of process spills, when the analyzer performance is questioned, Benchmark can rapidly and automatically validate analyzer performance. It eliminates time consuming and unnecessary recalibration cycles, which take the analyzer out of service just when it is most critically needed. Benchmark may be on-demand, or operator programmed for designated day and time activation on a repetitive basis.

Auto-Cal and Auto-Clean utilities are also included in this option p/n 18039-1.

## NDIR (The key component for reliable TOC analysis.)



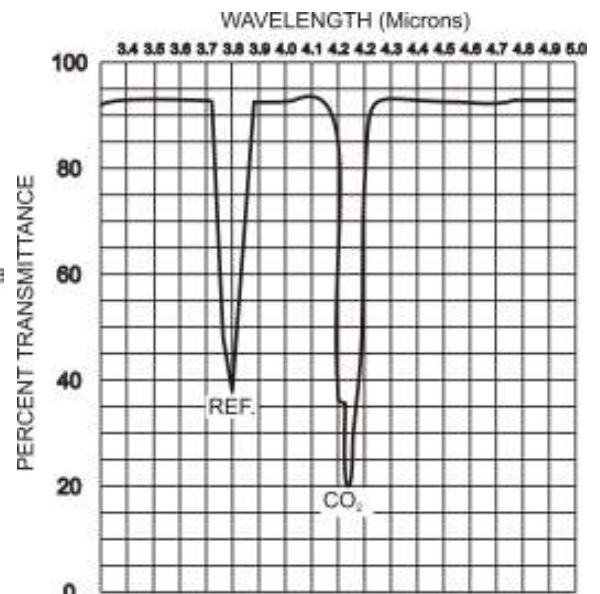
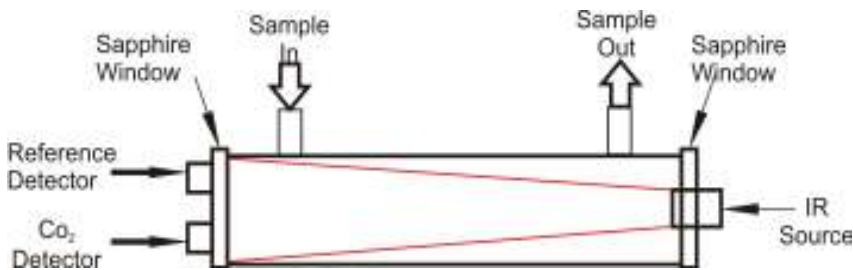
- Specific, Interference-Free CO<sub>2</sub> Detection
- Dual-Wavelength Ratioing Compensates for Drift
- Computer-Controlled for Accuracy
- Sapphire Protected Optics
- Non Corrosive, Non-Reflective Sample Cell (Borosilicate)

- No Moving Parts or tools required for Easy Maintenance and Service
- No Critical Realignment Required



### Detection Technique

The NDIR CO<sub>2</sub> detector uses a solid-state, dual-wavelength system with a single borosilicate glass sample cell that requires no wall reflectivity. There is a reference and a CO<sub>2</sub> specific detector in the sample path. Use of the true zero filter eliminates water vapor interference and the requirement for chemically removing acid gases prior to detection. An infrared source is cycled on and off to avoid mechanical choppers required in alternate NDIRs. The StarTOC NDIR has **no moving parts**.



Automatic gain control (AGC) is employed during the reference/sample cycle to compensate for such factors as NDIR source deterioration, dirty optical windows, and detector gain changes. When the AGC level reaches a predetermined threshold, the output alerts the Operator to check the NDIR. Malfunctions of major NDIR components are detected as an alarm, providing fail-safe operation. Signal detection is completely synchronous and, because of the differential technique of ratioing the Zero and CO<sub>2</sub> outputs, zero drift is virtually eliminated. All critical optics are protected by sapphire windows. The sample cell can be easily removed and the windows cleaned within 15 minutes, without realignment or the use of any tools.

This absolute measuring, dual-line spectra comparison NDIR provides simple, direct measurement of all CO<sub>2</sub> contributing factors (including background) for a true and accurate calibration and precisely offsets these effects for very accurate TOC determinations. The consequences of water vapor interferences in low-level precision TOC analysis are avoided.

## Installation Requirements

The StarTOC™ UV / Heated Persulfate Method Process model can handle suspended solids up to 3 mm without filtration, thus providing a truly representative sample.

TOC Systems, Inc. furnishes recommended installation drawings. The user must provide the following:

1. Electrical Source (110/220 VAC 10 Amp service with cutoff switch)
2. Gravity fed drain with air break or StarTOC return to process pump option.
3. A source of CO<sub>2</sub>-free air, or oxygen with a maximum flow rate of 300 cc/minute at 15 psig.

*(Optional Star Oxygen Generator requires electricity only.)*

## Specifications

Nominal at 25°C. Subject to custom application requirements.

Measuring Range (Std)	0-10 ppm through 0-2,000 ppm without dilution
Repeatability	+/- 2% of Full Scale
Drift	Compensated, self calibrated NDIR (+/- 2% non-accumulative)
Response Time T <sub>90</sub>	From 9 minutes, depending on range
Analog Outputs	4-20 mA (2 each)
Relay Outputs	2 TOC adjustable level alarms
Computer/ Display	Microsoft Windows CE Touch Screen Computer. Color VGA Display, Solid-Stage Data Storage, Paperless Chart Recorder, PCMCIA Slot, Network-Ready & Optional RS-485 or
Power Supply	110/ 220 VAC 10 Amp service recommended
Enclosure	Fiberglass (FRP)
Dimensions (HxWxD)	76 x 61 x 31 (cm) 30 x 24 x 12 (in.)
Weight	23 Kg. 50 Lbs
The analysis range and precision are affected by sample introduction, sample homogeneity, sample container cleanliness, reagent purity, chemical	

## Purchase Specifications

The Analyzer shall use the EPA, ASTM and Standard Approved Methods for TOC analysis. It shall utilize the UV/Heated Persulfate method. An onboard Windows CE Computer shall be used to control all analyzer functions automatically and be configured with a touch screen, paperless chart recorder and be network-ready. It shall store time/date stamped historical data records for a minimum of 3 months (Std). CO<sub>2</sub> detection shall be by a solid-state, single path length non-dispersive infrared analyzer (NDIR), having no moving parts. It shall be self-calibrated and interference-free. A computer controlled Mass Flow Controller shall be used to provide maximum analytic stability and reliability of results. The Analyzer shall be housed in a FRP enclosure to avoid corrosion and have separate compartments for liquid handling and electrical systems. The Analyzer shall be a TOC Systems, Inc. StarTOC™<sup>1</sup> Dual Method Ozone/ Hydroxyl Radical and UV/Heated Persulfate Analyzer, suitable for the on-line designated application.

## Ordering Information

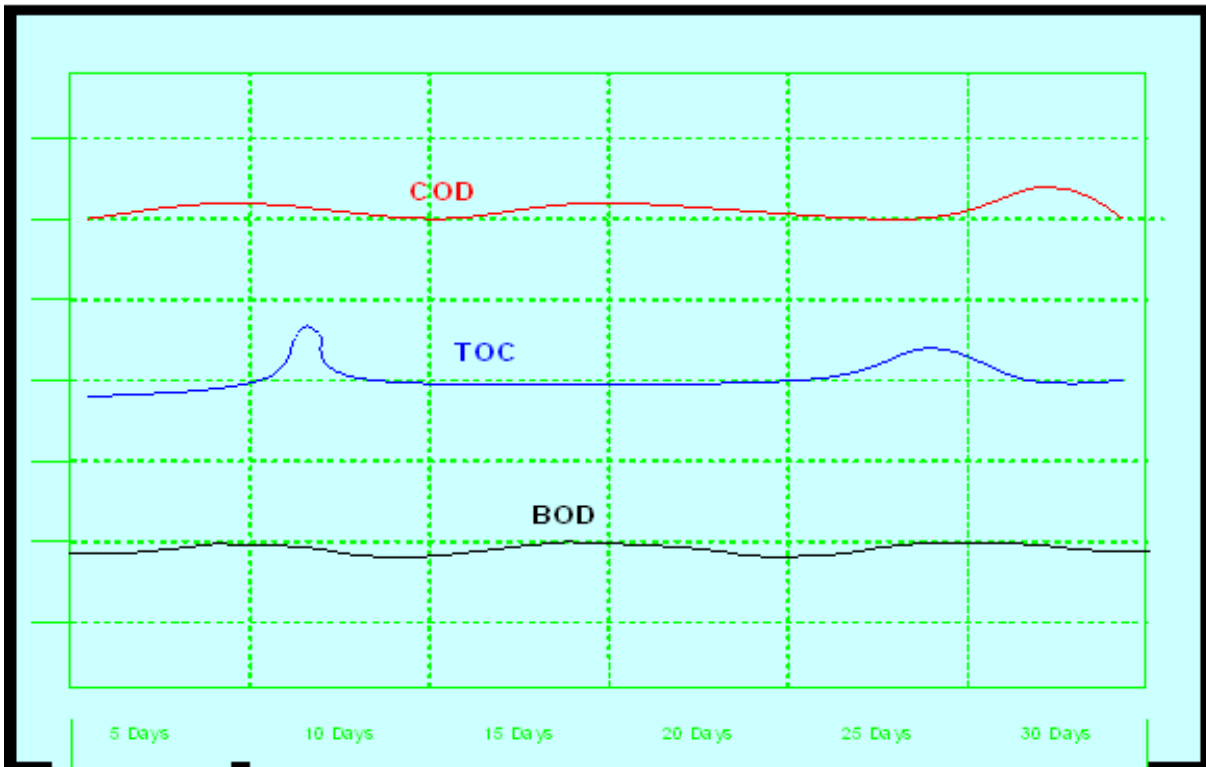
<i>DESCRIPTION</i>	<i>ORDER NUMBER</i>
<b>StarTOC UV Heated Persulfate method, Microsoft Windows-CE Computer based , Single Stream Analyzer, Benchmark, Auto-Calibrate, Auto-Clean, Paperless Chart Display, Historical Records Digitally Stored for a minimum of three (3) months.</b>	
(Specify "TOC-True or 'NPOC") TOC Configuration ('NPOC") TOC Configuration ('TOC-True" )	StarTOC Model UVPD StarTOC Model UVPT
<b>Multi-stream Sequencer to Multiplex Up to 6 Streams, Std. (Requires Microsoft Windows Computer)</b>  2-Stream Sequencer with independent 4-20 mA 3-Stream Sequencer with independent 4-20 mA 4-Stream Sequencer with independent 4-20 mA 6-Stream Sequencer with independent 4-20 mA	MSS-2 MSS-3 MSS-4 MSS-6

(1)Microsoft is a registered trade mark of Microsoft Corporation)



# CORRELATED PROCESS COD/BOD

(option available for all StarTOC on-line models)

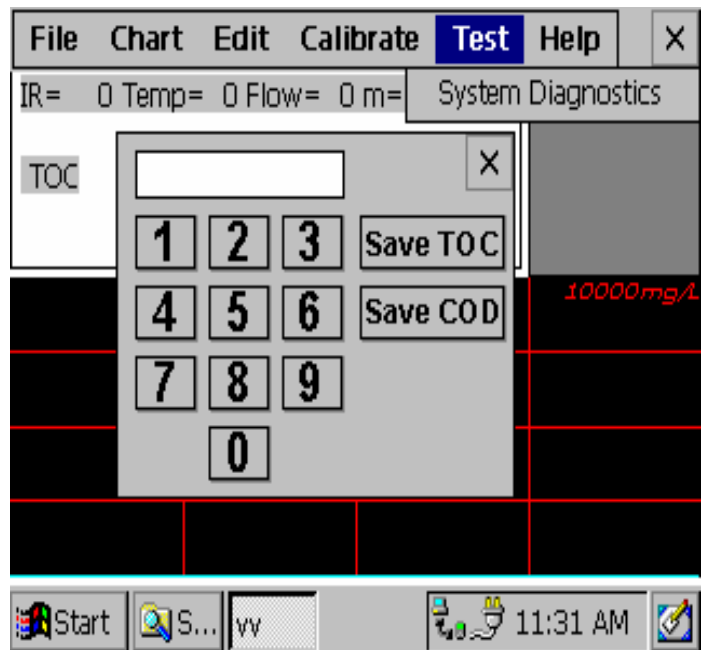


## Benefits

- Excellent Correlation (Requires initial correlation of Lab analysis with “grab samples”).

## Procedure

- Collect representative grab samples from analyzer & press “Store TOC” button.
- Send grab samples to lab for BOD or COD analysis.
- After receipt of lab analysis, enter BOD or COD analysis values as prompted by the Microsoft Windows CE Computer. This automatically correlates in time with the TOC measurement previously taken.
- Thereafter organic values are displayed in units of choice (BODc, CODc or TOC).

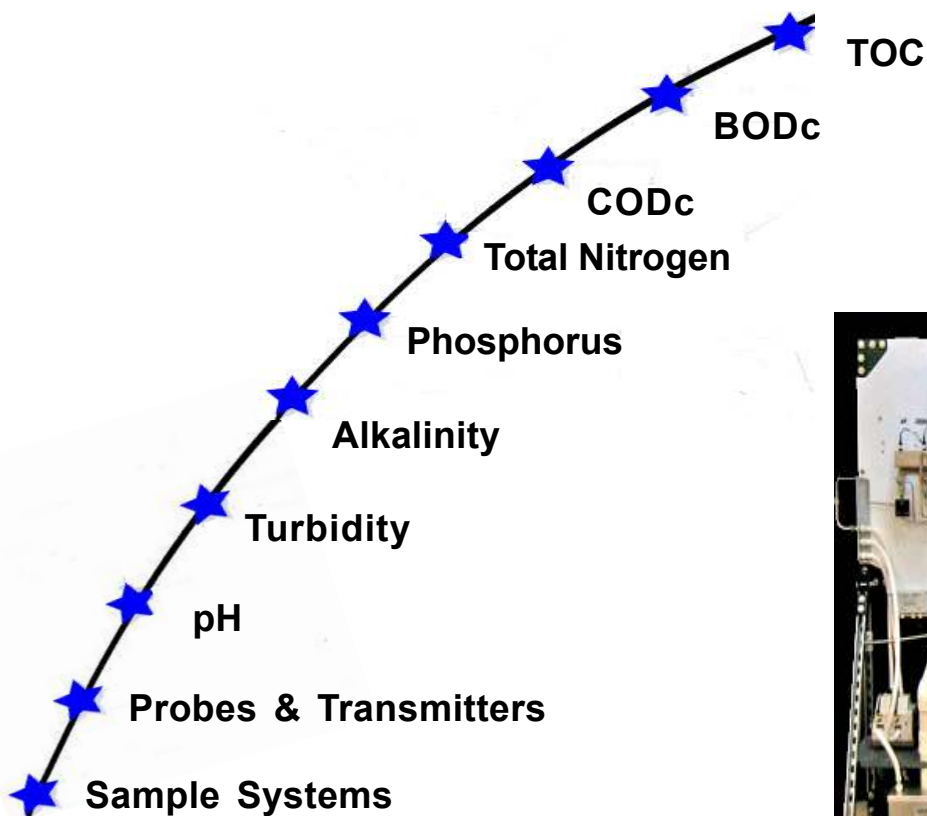


## ***We also Offer Complete, Turn-Key, Analyzer & Sample Systems***

Pre-engineered and custom packages , including small shelters with all utilities installed and ready to be delivered to your site.



- **Effluent Monitoring**
- **Waste Treatment**
- **Drinking Water**
- **Process Monitoring**
- **Panels & Small Shelters**
- **Custom Packages**



# StarTOC™ Family of TOC Analyzers (Partial).

## FOR THE LAB / BENCHTOP



Automatic



Semi-Automatic



Solids, Slurries, Liquids

## FOR THE ON - LINE / PROCESS

Continuous Pump  
Sample System



Digital Injection  
Sample System



- UV/ Persulfate
- Ozone / Hydroxyl Radical
- Total HC
- Combustion
- Ultra-Pure
- Oil-in-Water
- Dual Oxidation Methods



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