



# Torch

Combustion TOC Analyzer

# Automated Productivity with the Torch Combustion TOC Analyzer

## Description

The Torch Combustion TOC Analyzer utilizes patent pending Static Pressure Concentration (SPC) for the analysis of TOC using high temperature combustion with an optional TN module.

The Torch Combustion TOC Analyzer is designed to accurately detect carbon content in aqueous matrices down to the ppb level. Chemistries and sample processing with Windows®-driven PC control, provides a fast, reliable test of the quality of water and solutions. It uses a High Temperature Combustion Furnace, and a pressurized NDIR detector (*patent pending*) that allows a degree of sensitivity previously unattainable.

The Torch Analyzer contains a built in autosampler with three vial rack choices and PC driven control, and automated calibration and Intellidilution which will automatically dilute over-range samples to within the working calibration range. Maintenance is simplified by design allowing easy access to all areas of the unit.

## How It Works

The Torch uses safe and proven High Temperature Combustion, oxidation of carbon material into carbon dioxide utilizing Non-Dispersive Infrared (NDIR) detection. This process allows the user to reach sensitivity levels from 50ppbC - 30,000ppmC.

The exit valve from the NDIR is closed to allow the detector to become pressurized. Once the gases in the detector have reached equilibrium, the concentration of the carbon dioxide (CO<sub>2</sub>) is analyzed. This pressurization of the sample gas stream in the NDIR, Static Pressure Concentration, allows for increased sensitivity and precision by measuring the entirety of the oxidation products of the sample in one reading, as compared to flow-through technology. The output signal is proportional to the concentration of CO<sub>2</sub> in the carrier gas, from the oxidation of the sample.

## Options

- **TN Analysis** – The TN Module allows for simultaneous Carbon and Nitrogen analysis to be performed. TN module achieves detection levels of 50ppb to 2000ppm.
- **Mixing Tray** – The Mixing Tray allows for even distribution of particulate laden waters, where a true representative sample is required.
- **In-vial Sparging** – This feature increases throughput by removing IC in the vial, instead of using the syringe to deliver the sample to the IC Sparger.

## Applications and Industries

TOC sampling and analysis are used in a wide range of applications in several industries.

- Environmental
- Pharmaceutical
- Petrochemical

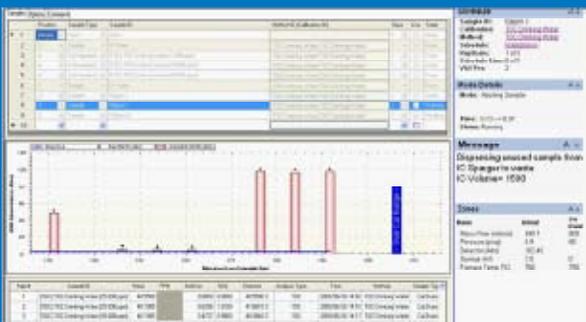
## Methods

531C, 5310B, EPA, 415.3, 9060, EN-1484 and ISO 8245

USP <643>, EUP 2.2.44

TN – EN-12260 and DIN-EN-ISO 11905-2

## Keep Samples in Range with Intellidilution



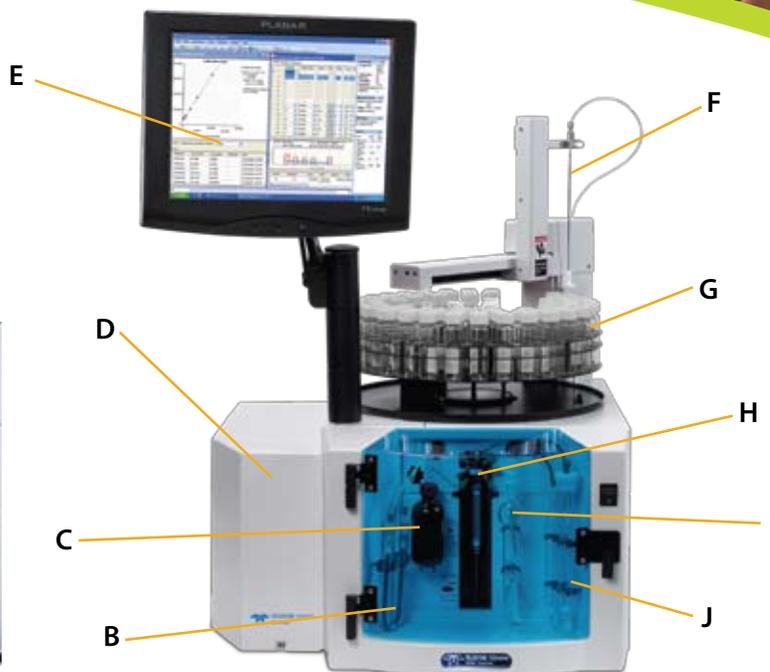
The sample run screen shown here shows a blue status bar indicating that the current sample has exceeded the defined calibration range and the intellidilution feature has been initiated.

# Torch

## Features and Benefits



Note: Plumbing side of Torch with covers removed.



**A. Combustion Furnace** - The combustion furnace provides the high temperature necessary to oxidize the carbon in the sample into CO<sub>2</sub>. The combustion tube contains a bed of proprietary catalyst that promotes oxidation of organics. Access to the combustion tube is simplified by using a unique rail system for furnace movement. The design of the furnace permits easy installation, monitoring and maintenance of the combustion tube.

**B. Halogen Scrubber** - The detector, which measures CO<sub>2</sub>, can be affected by halogens and water vapor. To prevent analytical errors, the Halogen Scrubber removes chlorine and other halogens from the CO<sub>2</sub> before it enters the detector.

**C. Acid Container** - The acid container is a large 125mL bottle that reduces reagent preparation frequency.

**D. TN Analyzer** - See TN Analysis under the *Options* section.

**E. Touch Screen** - The Touch Screen allows for all analysis to be done at the instrument at the touch of a finger, and reduces bench space usage by the elimination of a keyboard and monitor.

**F. Septum Piercing Needle** - The Septum Piercing Needle allows for vial caps with a septa thus eliminating sample exposure time to the atmosphere.

**G. Autosampler** - The Torch has a standard 40mL vial, 75 position integrated autosampler with an arm and carousel for position selection. (Optional tray - See *Options* section.)

**H. Syringe and Valve** - The Syringe Pumper is a precision measuring instrument that draws in and dispenses fluid. The Syringe Driver can dispense 100µL to 2.0mL of sample.

**I. Moisture Control System (MCS)** - The Torch MCS consists of: Condensing Loop, Cooling Fan, Mist Trap, and Permeation Dryer, all designed to remove moisture from the sample. After oxidation of the sample, carrier gas sweeps CO<sub>2</sub> and water vapor out the Combustion Furnace through tubing cooled by a fan to condense water vapor. Next, the CO<sub>2</sub> travels through the Mist Trap, where most of the condensate is collected and removed. The gases then travel to the Permeation Dryer, which removes the rest of the moisture from the sample gas.

**J. IC Sparger** - The IC Sparger is a glass fritted vessel that holds the sample while purging the Inorganic Carbon (IC) out of the sample and preparing it for analysis. After the addition of acid, purge gas flows through the sparger, removing the IC from the sample. The Torch detects IC in the IC mode or it can direct the IC to vent into the atmosphere while in the TOC mode.

## Additional Features

**Static Pressure Concentration (SPC)** - After the sample oxidizes, it is swept into the detector and pressurized ensuring the entire sample is present. The Non-Dispersive Infrared (NDIR) detector measures the concentration of carbon dioxide. This NDIR detection is based on Static Pressure Concentration, a proprietary sensing technology. SPC has shown to significantly increase analysis sensitivity response by as much as 50%.

**Intellidilution** - This intelligent feature detects when a sample is out of range and will dilute it back to within the calibration range. It has the ability to meet individual analytical needs due to pre-set ranges.

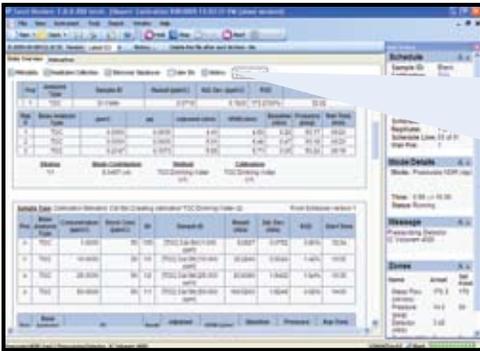
**Autocalibration** - Uses a single stock solution and automatically will dilute final volumes based on the users linearizing concentration requirements, thus eliminating the need for multiple manual calibration standard concentration levels.

**Mass Flow Controller (MFC)** - The MFC regulates either flow or pressure depending on the mode of operation. It allows for higher flows for clean up between samples and allows the user to optimize the sparge flow for each sample. Because of the MFC, the instrument automatically validates the system integrity by recording the pressure each time a sample is run. The MFC also performs pneumatic integrity tests on valves to make sure they are leak tight.

# TekLink™

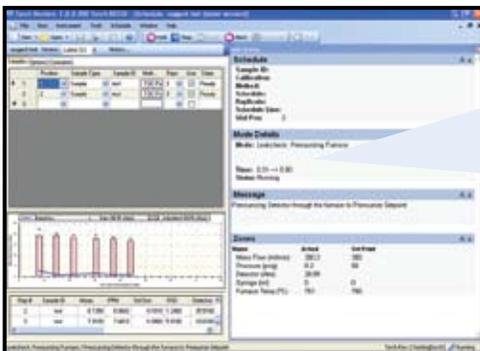
## Fully Optimized User Interface

TekLink™ - Tekmar's TekLink™ software allows the user to enter all analysis parameters and then once activated, will continuously monitor the system ensuring operating limits are not exceeded. TekLink™ is capable of performing useful diagnostics such as leak and benchmark tests for validation. All instrument parameters, method scheduling, and editing can be programmed. TekLink™ provides pre-developed methods, allowing startup with little or no modifications and also contains an optional 21 CFR Part 11 compliant installation.



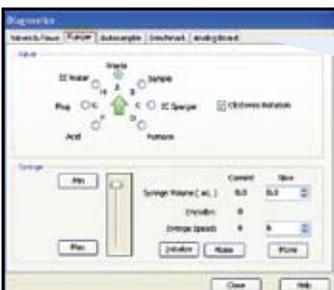
Sample History, Electronic Signatures, Metadata, Replicates Collection and User IDs are some options you can choose with the exporting data function.

**Schedule Report Screen** - The Schedule Report screen demonstrates flexibility in reporting, which allows the user to define what is captured in the report.



The Mode Details give you the status of the current leak check.

**Leak Check Screen** - The Leak Check screen identifies the region of the system that is being checked and the time remaining of the leak check.



The tabs on this screen show features that can be controlled from the diagnostic menu. (i.e.: motor movement and valve control)

**Diagnostics Screen** - This screen demonstrates full control diagnostics, which allows for manipulation of all hardware components.

# Torch Specifications

Chemistry:	Oxidation by Combustion: From 680°C - 1000°C
TOC Detector:	Nondispersive Infrared (NDIR) with Static Pressure Concentration (SPC) – Patent-Pending
TN Detector:	PMT Chemiluminescence Detector
TOC Analytical Modes:	TOC (NPOC), TC-IC, TC, IC
TOC Analytical:	<p>Limit of Detection: 50ppb  Maximum Measurable Concentration: 30,000ppm  Carryover: ≤ 1.0% Cross Contamination  Sample Size: 100µl to 2.0mL  Precision*: ≤1.5% RSD, ±15ppb, typical of a mid range standard (Whichever is greater over seven replicates).**</p> <p>* Analytical performance is affected by laboratory water, reagent and gas purity, sample container cleanliness, sample matrix, gas regulator cleanliness and precision, and operator skill.  ** %RSD Area, as opposed to %CV, calculates precision after blank subtraction. This yields a lower precision measurement, but improves sensitivity and accuracy.</p>
TOC Analysis Time:	5-6 minutes typical for TOC analysis: 29 minutes typical for triplicate TOC analysis
TN Analytical Modes:	TN, TC/TN, TOC (NPOC)/TN, TC-IC/TN
TN Analytical:	<p>Limit of Detection: 50ppb  Maximum Measurable Concentration: 2,000ppm  Carryover: ≤ 1.0% Cross Contamination  Sample Size: 100µl to 2.0mL  Precision*: ≤1.5% RSD, ±15ppb, typical of a mid range standard (Whichever is greater over seven replicates).**</p> <p>* Precision specification for the following standards: Ammonium Chloride, Ammonium Nitrate, Potassium Nitrate and Urea. Analytical performance is affected by laboratory water, reagent and gas purity, sample container cleanliness, sample matrix, gas regulator cleanliness and precision, and operator skill.  ** %RSD Area, as opposed to %CV, calculates precision after blank subtraction. This yields a lower precision measurement, but improves sensitivity and accuracy.</p>
TN Analysis Time:	7-8 minutes typical for TOC/TN analysis: Approximately 30 minutes typical for triplicate TOC/TN analysis
Carrier Gas Handling:	Mass Flow Controller for instant control of carrier gas (0-500mL/min). Automatic Leak Check capability.
Liquid Handling:	Syringe Driver, 7-port distribution valve. Auto-dilution capability for higher TOC concentrations and difficult matrixes. Self-cleaning sample handling process that cleans Injection Line on every repetition.
Sample Introduction:	Integrated Autosampler
Controller:	PC, Interface through Windows™ XP and Vista Options: Integrated PC, Touch Screen monitor display and attached Multi-Rotational Arm
Data Handling:	<p>Reports exportable XML, CSV, and HTML format  Real-time and historical graphical display of NDIR &amp; CLD detector data  Ability to view historical results from multiple schedules on one graphical display.  Ability to store customized individual test methods  Priority samples via schedule interrupt  Recalculation of data, outlier deletions, and precision performance criteria controls (21 CFR Part 11 compliance – Electronic signatures and Audit Trails)</p>
Calibration:	Auto-Calibration from Single Stock Standards or User Calibration Standards
21 CFR Part 11 Software Compliance:	Teklink™ TOC Software is a 21 CFR Part 11 tool for your laboratory compliance
Other Features:	<ul style="list-style-type: none"> <li>- Pre-programmed point and click method set-up</li> <li>- Instrument condition light</li> <li>- Built-in PC Standalone feature with Touch Screen attached to instrument</li> <li>- Validation Support Package available</li> <li>- Automatic shutdown/standby</li> <li>- Auto-dilution of samples/standards</li> <li>- ASM Sparge methods</li> <li>- Stirring Option</li> <li>- TN Module</li> <li>- Intellidilution</li> </ul>
Principal Applications:	Waste Water, Industrial Waste Effluent, Drinking and Surface Water, Ground Water, Clean-in-place (CIP) Validation, Sea Water, Brine Solutions
Official Methods:	EPA 415.1, 415.3 and 9060A, Standard Method 5310B, EP 2.2.44, ISO 8245, EN 1484, USP 643 (Chapter 24), ASTM D2579, prENV 13370, AOAC 973.47, (TNb option – DIN-ISO 11905-2, EN-12260)
Certification:	CE, EMC EN 50081-1 and EN 50082-1
TOC Utility Requirements:	Voltage: 100/120/240 VAC (±10%) factory configured, Frequency: 50/60 Hz, Power: 1200VA
TN Utility Requirements:	Voltage: 100/120/240 VAC (±10%) factory configured, Frequency: 50/60 Hz, Power: 300VA
TOC Dimensions:	18" W x 24.5" D x 32" H, Shipping weight 147lbs
TN Dimensions:	8" W x 20" D x 18" H, Shipping weight 50lbs
TOC Gas Supply:	Hydrocarbon and Carbon Dioxide (CO <sub>2</sub> ) free air with TOC content <1ppm or UHP O <sub>2</sub> . Gas can be supplied from a cylinder or TOC gas generator. If a TOC gas generator is used, resulting gas must be hydrocarbon and water free. To assure clean carrier gas is used, we suggest employing a complete CO <sub>2</sub> removal system and hydrocarbon trap between the gas source and analytical instrument.
TN Gas Supply:	High Purity Oxygen, 99+%
TOC Gas Inlet Pressure:	65 to 100 psi
TN Gas Inlet Pressure:	30 to 35 psi
Autosampler:	<ul style="list-style-type: none"> <li>- Accuracy: ±2.5mm</li> <li>- Vertical punch strength: 8.3lbs</li> <li>- Repeatability: ±0.25mm</li> <li>- Auto-rinsing from sample and/or rinse water via built-in rinse station</li> </ul>
Rack Selection:	<p>(All rack selections come with (4) positions in the center of the rack for 125mL bottles)</p> <ul style="list-style-type: none"> <li>- 75 position; 40mL VOA vials</li> <li>- 90 position; 55mL test tubes</li> <li>- 75 position Mixing; 40mL VOA vials</li> <li>- 120 position; 20mL test tubes</li> </ul>

## Service and Support You Can Count On

Teledyne Tekmar can help with your instrument installation. Our team of trained service professionals can provide extended onsite training for successful operation and instrument maintenance. For those needing documentation on analytical performance and operating procedures, Tekmar offers validation packages. These packages come complete with Installation Qualification (IQ), Operational Qualification (OQ), and Operating guidelines. Our validation packages are ideal to help you comply with your specific methodology. We also provide on-site validation packages performed by factory trained and certified engineers.

Our experience in state-of-the-art instrument design translates to the most capable support available. From a fully staffed Applications Laboratory to our worldwide network of technical professionals, we are ready to be your partner and assure that you achieve the maximum productivity from your instrument. Our outstanding customer service is a natural extension of our world class, ISO 9001 Certified Quality System.



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