

Anatel®

## A-1000 & A-1000XP

TOTAL ORGANIC CARBON ANALYSIS SYSTEMS  
FOR SEMICONDUCTOR WATERS



Modern semiconductor ultrapure water systems demand TOC analyzers that provide the lowest detection limits, most accurate results, maximum sensitivity to the smallest changes in water quality, and a measure of reliability that meets the most rigorous quality standards. The Anatel family of A-1000 TOC Analyzers meets the challenge.

## INCREASING SEMICONDUCTOR PRODUCT YIELD

Ultrapure water has proven to be the most effective and environmentally friendly cleaning reagent in the semiconductor manufacturing industry. As computing power and memory of solid state devices increase, so do their vulnerability to contamination and the need for the cleanest process water. Today, organics of very small molecular weight can cause wafer defects that negatively impact yield and profit.

Our A-1000 is ideal for monitoring ultrapure water production and measuring the influent and effluent water at rinse stations to ensure that cleaning is complete. You can monitor hot and cold water equally well to detect and report quickly even the most rapid TOC changes in the UPW system.

## A-1000 FEATURES & BENEFITS: TOTAL CONFIDENCE, NO GUESSWORK

The A-1000 family of TOC Analyzers includes all the features you need to monitor organic contamination in today's most efficient ultrapure water systems. Even at capacities of thousands of liters per minute, TOC levels often must be maintained at less than 1-3 ppb. And you can't afford to miss even the smallest excursion that might affect your product yield.

Considering that 1 ppb of carbon is equivalent to 1 second in 32 years, only the A-1000 is going to provide the sensitivity, accuracy, and stability you need for your critical UPW TOC measurements. Check these features and benefits for the confidence you need to ensure the correct operation of your water system.



### FEATURES

- Patented stopped flow, photocatalytic oxidation
- Dynamic end-point detection
- Network multiple sensors on our integral ANET
- Detection limits to 0.02 ppb TOC
- Convenient serial, analog, and digital interfacing
- Portable sensors

### BENEFITS

- You're always sure of complete, rapid oxidation.
- Reliably and accurately detect the completion of each oxidation cycle.
- Set instrument parameters and acquire data from as many as 8 sensors with a single C80 Controller... the most convenient control available.
- Even the smallest changes in TOC concentration can be detected and reported so that you always know the current status of your water system.
- A complete array of data handling is included to allow you to manage the data in almost any way you wish using the user-friendly connector block on every sensor.
- A-1000 Sensors can be permanently installed or you can use the portable models for diagnostics throughout the water system.

## THE A-1000XP -- A THIRD GENERATION TOC ANALYZER FOR YOUR MOST DEMANDING ULTRAPURE WATER APPLICATIONS.

The A-1000XP combines all of the convenient features of the A-1000 family with a level of performance that matches the most modern, zero-contaminant water systems being designed for entry into the twenty-first century.

The A-1000XP is extraordinarily stable and repeatable, reporting resolutions to 0.001 ppb TOC. This performance provides maximum sensitivity for detecting the smallest TOC changes that could be expected in an ultrapure water system, even when dissolved oxygen levels are less than 2 ppb.

### REPORTING THE DATA

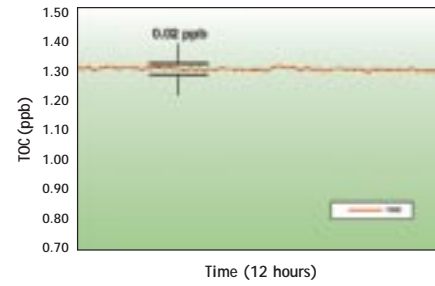
The A-1000 printer provides tabulated data that include: time of analysis, TOC in ppb, % of a user-set alarm value, the trend in ppb/h, the resistivity (Mohm-cm) of the water, temperature (°C), and the curve or profile type (P1, P2, or P3) representing the organics present.

ANATEL CORPORATION A-1000XP Organics Analyzer S/N 1127 ID: 6 Name:SN-1127						
TOC LIMIT (PPB)	SAMPLE TIME (HH:MM:SS)	CYCLE TIME (HH:MM:SS)	TOC MULTIPLY			
500	00:01:00	00:00:00	1.000			
3/16/00						
TIME	TOC (PPB)	%AL	TREND (PPB/HR)	RESIS @25C	TEMP	CRV TYP
10:56	0.504	1%	+0.0	18.2	28.0	P2
11:01	0.500	1%	+1.2	18.2	28.1	P2
11:07	0.500	1%	+1.3	18.2	28.1	P2
11:12	0.500	1%	+1.2	18.2	28.1	P2
11:17	0.500	1%	+1.1	18.2	28.1	P2
11:22	0.496	1%	+1.0	18.2	28.0	P2
11:27	0.498	1%	+1.1	18.2	27.9	P2
11:32	0.501	1%	+1.3	18.2	27.9	P2

The A-1000 printer report includes TOC, resistivity, temperature, and TOC trend.

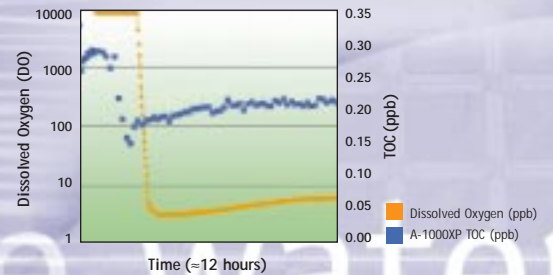


### A-1000XP STABILITY AND REPEATABILITY DATA



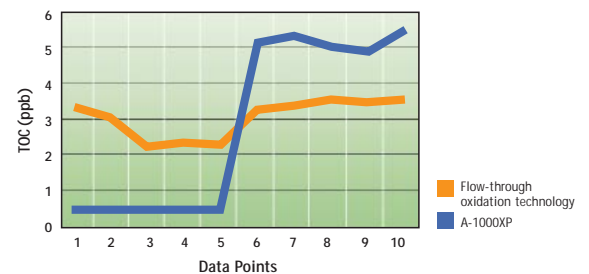
Data from the A-1000XP, monitoring an ultrapure water system at approximately 1 ppb TOC for almost 12 hours, show a peak-to-peak variation of  $< 0.02$  ppb.

### A-1000XP PERFORMANCE WITH CHANGING DISSOLVED OXYGEN (DO) CONCENTRATIONS



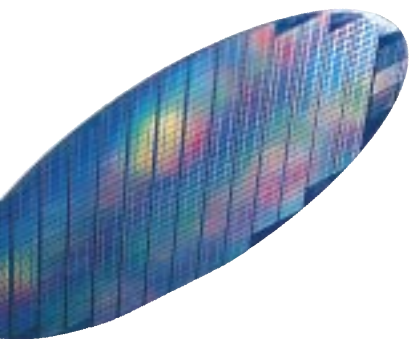
These data demonstrate the A-1000XP performance at  $< 1$  ppb TOC in ultrapure water with  $< 2$  ppb dissolved oxygen. The TOC measurements are unaffected by changing DO concentrations. A small reported change in TOC is due to the removal of the volatile organic species by the degassification system.

### INSTRUMENT ACCURACY, 5 PPB DOSE OF IPA, WITH SAMPLE WATER DO $< 10$ PPB



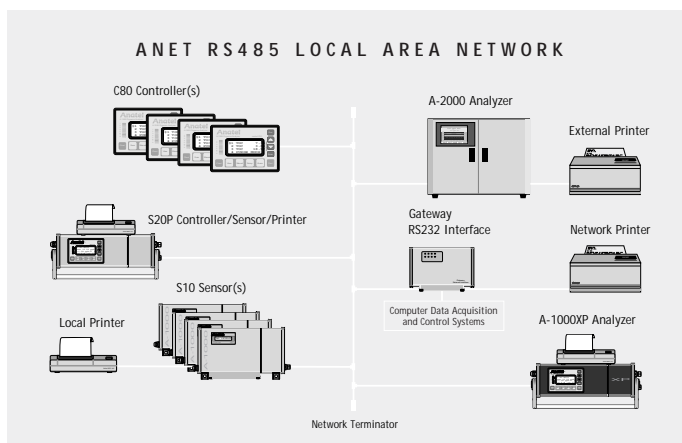
Different oxidizing technologies react differently in the presence of residual process chemicals and varying levels of dissolved oxygen (DO). The A-1000XP immediately detected the dose of IPA, while the flow-through technology was unable to respond accurately.





## NETWORKED TOC ANALYZERS FOR INTEGRATED DATA REPORTING

Multiple A-1000 analyzers can be networked with one or more C80 controllers. This unique network capability provides direct and immediate readings of TOC levels at the most remote and appropriate locations throughout your entire water system. The system is so flexible that the C80 controller can be located at the water facility or in a remote office. By accessing each sensor's data from the controller site, you know immediately the TOC levels at the key points in your system. You can also print the data from all analyzers at a single location in a convenient report format.



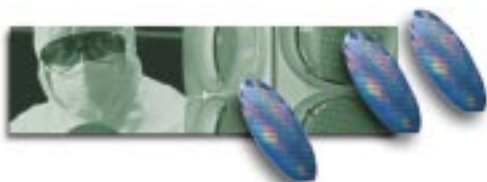
The ANET accommodates as many as eight A-1000, A-1000XP, and A-2000 TOC analyzers for optimal monitoring of your water system. The Gateway interface allows a complete network of as many as eight sensors to be interfaced to a single computer, so that you can understand at a glance the status of your entire water system.

## ACCURACY AND OXIDATION EFFICIENCY

### TOC DOSING EXPERIMENT - IPA RESPONSE (% ERROR)

	1ppb	5ppb	25ppb	50ppb	75ppb	100ppb
A-1000XP	0.99 (-1.0%)	5.09 (+2.0%)	25.45 (+2.0%)	50.52 (+1.0%)	75.125 (+0.2%)	100.3 (+0.3%)
Flow-through	0.60	3.72	19.86	40.70	66.49	91.15
membrane technology	(-40%)	(-26%)	(-21%)	(-18.6%)	(-11.3%)	(-8.9%)
Flow-through	0.74	3.61	43.05	108.5	156.5	234.6
technology	(-26%)	(-28%)	(+72%)	(+117%)	(+109%)	(+136%)

To examine the overall accuracy and oxidation efficiency of three commonly available technologies, a TOC dosing experiment was conducted with 6 concentrations of isopropyl alcohol (IPA) from 1 to 100 ppb as carbon. The A-1000XP recovered each concentration within 2%, while the flow-through/membrane technology consistently under-reported the actual value and the flow-through technology typically over-reported the TOC level.



## A-1000 & A-1000XP SPECIFICATIONS

	A - 1000	A - 1000XP
TOC Range ppb C	0.05 - 1999	(XP Mode) 0.02 - 1.999 (STD Mode) 2.00 - 1999 ppb
Water Temperature Range	0 - 100 °C	18 - 32 °C
Water Resistivity Range	5 Mohm-cm all waters 1 Mohm-cm neutral waters 0.2 Mohm-cm with CO <sub>2</sub> as conductive species	15.0 - 18.2 Mohm-cm (@25 °C)
Detection Limit (@25°C, 3X Std. Dev.)	0.05 ppb	0.02 ppb
Accuracy (instrument to instrument agreement)	±0.5 ppb or ±5% (whichever is greater)	±0.05 ppb MDL to 0.999 ppb ±0.1 ppb 1.000 to 1.999 ppb ±0.5 ppb or ±5% (whichever is greater), 2 to 1999 ppb
Repeatability	±0.5 ppb	±0.05 ppb
Resolution	0.01 ppb	0.001 ppb

## ORDER INFORMATION

C80 CONTROLLER, 115 VAC	FG 1000202
C80 CONTROLLER, 230 VAC	FG 1000302
S10 STATIONARY SENSOR	FG 1000401
S20P PORTABLE	FG 1000601
A-1000XP PORTABLE	FG 1002501
A-1000XP STATIONARY SENSOR	FG 1002301

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