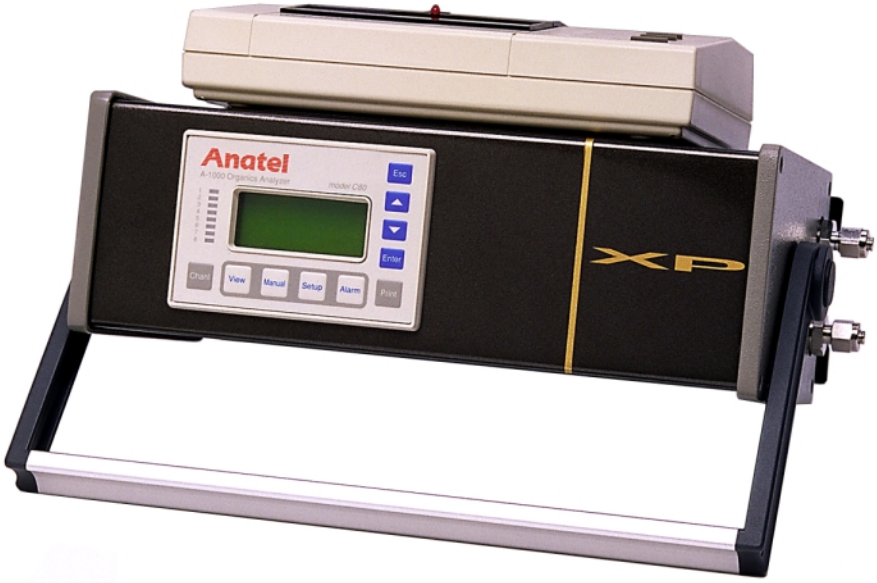
A-1000XP
Extended Performance
TOC Analyzer
User Guide



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A-1000XP Extended Performance TOC Analyzer User Guide

(19811801)

Revision History

Revision	Date	Comments
01	February 1998	Initial Release.
02	March 2000	Changes to document the Model A-1000XP-S Stationary Extended Performance TOC Analyzer.

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This manual is printed on recycled paper.

ISO 9002 REGISTERED

WARRANTY STATEMENT

One Year Limited Hardware Warranty

Anatel Corporation (the Seller) warrants to the Buyer that the goods manufactured by the Seller will be free from defects of material and workmanship for one (1) year from the date of shipment. Seller's sole obligation under the foregoing warranties will be limited to either, at Seller's option, replacing or repairing defective goods or refunding the purchase price for such goods theretofore paid by Buyer; and Buyer's exclusive remedy for breach of such warranties will be forcement of such obligation of Seller.

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These warranties will not extend to goods subjected to misuse, neglect, accident, improper installation or maintenance, or which have been altered or repaired by anyone other than an authorized representative of the Seller.

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The Seller makes no other warranty, either expressed or implied, with respect to this product. The Seller specifically disclaims the implied warranty of merchantability and fitness for a particular purpose. Some states, provinces or countries do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion may not apply. However, any implied warranty of merchantability or fitness is limited to the one-year duration of this written warranty.

This warranty provides specific legal rights, and other rights may exist which vary from state to state, province to province, or country to country.

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Apparatus and products are manufactured and sold by ANATEL Corporation under one or more of the following U.S. patents: 4,626,413; 4,666,680; 4,683,435; 4,868,127; 5,047,212; 5,260,633; 5,275,975; 5,334,940; 5,677,190 and equivalents in other countries where issued. Purchaser is granted a paid-up, non-exclusive license to practice under these patents for the useful life of this apparatus or product.

DECLARATION OF CONFORMITY

(according to ISO/IEC Guide 22 and EN 45014)

MANUFACTURER'S NAME: Anatel Corporation

MANUFACTURER'S ADDRESS: 2200 Central Avenue
Boulder, Colorado 80301, USA

declares that the product

A-1000XP Total Organic Carbon (TOC) Analyzer, inclusive of model(s):

- **C80 Controller**
- **A-1000XP and A-1000XP-S TOC Analyzers**

to which this declaration relates, *meets the essential health and safety requirements* and is in conformity with the following EU Directive:

EMC Directive 89/336/EEC

and is in conformity with the relevant sections of the following EC standards and other normative documents:

Safety: LVD EN 61 010–1:1993 + A2:1995

EMC: CENELEC EN 50 081–2:1993, Class B†
- Conducted EN 55 011:1992, Class B, Group 1
- Radisted EN 55 011:1992, Class B, Group 1

CENELEC EN 50 082–2:1995
- IEC 801–2, EN 61 000–4–2; 4kV CD, 8kV AD
- IEC 801–4, EN 61 000–4–4; 2kV Signal Lines, 2kV Power Lines
- IEC 801–3, ENV 50 140, EN 61 000–4–3; 10V/m
- IEC 801–6, ENV 50 141, EN 61 000–4–5; 10V

† The product was tested in a typical configuration of Anatel's TOC Monitoring System.

Supplementary Information:

The product herewith complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC Directive 89/336/EEC**. The subject products were also tested by **LGA Ref #EMC–295/2129** for certificate of conformity to EMC directive, and **LGA GS Mark Certificate #9741007**, conformity to LVD directive. The instrument also is Year 2000-compliant.

The CE Marking applies only to 230 VAC instruments and has been affixed on the devices according to the **EU Directive 89/336/EEC.**

VP of Operations
Anatel Corporation
Boulder, Colorado

The Anatel A-1000XP TOC Analysis System is comprised of a line of precision instruments which meet or exceed the following international requirements and standards of compliance:

EN61010–1
Electrical Equipment for Laboratory Use,
Part 1: General Requirements

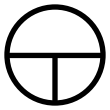
CAN/CSA–C22.2 No. 1010.1–92
Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements

IEC 1010–1–92
Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements including Amendment No. 1: 1992 & Amendment No. 2: 1995

Customer satisfaction through continuous quality improvements.

In addition, the following international symbols are found on the instruments and throughout the *A-1000XP Extended Performance TOC Analyzer Addendum*:

Caution
Reference Document: ISO 3864, No. B.3.1



On/Off Power Disconnect
Reference Document: IEC 417, No. 5011

Protective Earth (Ground) Terminal
Reference Document: IEC 417, No. 5019

Secondary Earth (Ground) Terminal
Reference Document: IEC 417, No. 5017

CAUTION

Anatel cannot address all health and safety issues associated with using the A-1000XP TOC Analyzer. Inherent dangers include high voltage electronics and ultraviolet radiation. It is strongly recommended that you read the User Guide *thoroughly before installing or operating the instrument. If you have any questions regarding the A-1000XP, contact:*

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(1–877–426–2835)

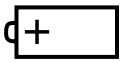
The UV lamp used for oxidation by the A-1000XP emits ultraviolet radiation and contains small amounts of mercury vapor. When replacing it, dispose of the expired UV lamp in accordance with applicable local regulations. Anatel accepts used lamps for proper disposal — repackage and return them (at user's expense) to the above address, Attn: UV Lamp Recycling.

Avoid installations where the A-1000XP could be exposed to an acidic or caustic atmosphere, as may be present in a deionized water regeneration area or near acid waste sumps. Exposure will corrode the instrument's electronic circuity and damage analysis components. If the unit is to be placed in such an environment, it must be mounted in an enclosure which conforms to the instrument's operational specifications.

Although the instrument's electronics and analysis modules are physically separated, the enclosure is rated only as splashproof and components are not completely protected against external conditions. Do not subject the A-1000XP to direct water streams or other adverse environmental elements.

The A-1000XP contains high voltage electronics. Always physically disconnect power from the instrument before performing maintenance procedures to avoid potential electrostatic discharge resulting in possible shock or damage to instrument components.

Replacement of the A-1000XP Sensor's onboard lithium battery presents a potential fire, explosion and burn hazard. Properly dispose of expired batteries—do not attempt to incinerate, recharge or disassemble.



When replacing the battery, ensure that the positive (+) indicator on the battery is inserted at the positive end of battery holder.

Use the grounded power cord provided—do not clip the ground pin.

Orientation is important when installing the portable Access 643P TOC Analyzer—the instrument must be operated in an upright position with the integral C80 Controller's front panel facing upwards. Vertical operation assures that any air bubbles, which may affect TOC readings, are purged from the instrument's measurement cell.

The A-1000XP
Extended Performance TOC Analyzer

The Anatel A-1000XP Extended Performance TOC Analyzer offers the highest accuracy and reliability currently available in the monitoring of ultrapure water systems. The A-1000XP offers Total Organic Carbon detection at levels as low as 0.02 ppb TOC (parts per billion) with a resolution of 0.001 ppb. This remarkable performance allows detection of even the smallest TOC changes within water systems, making it sensitive enough for the most demanding high-purity water applications.

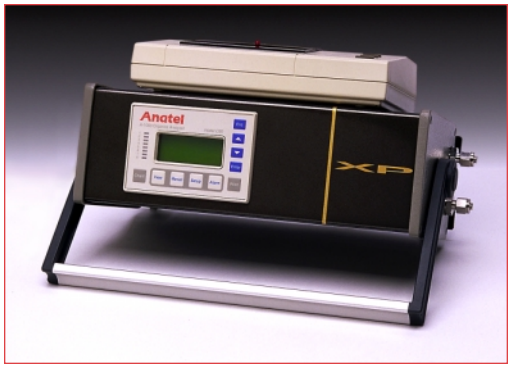
Its sophisticated detection also allows the A-1000XP to determine if the sample is suitable for extended performance analysis. When TOC, resistivity and/or temperature criteria are not within acceptable limits, the instrument reports an alarm condition and reverts to the lower resolution analysis of the standard Sensors. The A-1000XP display and outputs are adjusted automatically to reflect the lower detection standard until the problem is corrected.

The A-1000XP is a complete stand-alone, portable unit that includes a C80 Controller and an onboard printer for real-time data outputs. The A-1000XP-S is a stationary unit designed to be installed in a more permanent location. As components of the A-1000 TOC Analysis System of precision instruments, both models network directly with existing Sensors to expand monitoring capabilities.

The interface and other features familiar to A-1000 users are standard. However, the A-1000XP's enhanced performance requires closer adherence to installation, maintenance and operational guidelines to ensure optimum performance. This document addresses issues specific to the A-1000XP. Refer to the accompanying *Anatel A-1000 TOC Analysis System User Guide* for comprehensive information on the instrument and its operation.

XP.1 General Information

This document contains the following A-1000XP information:



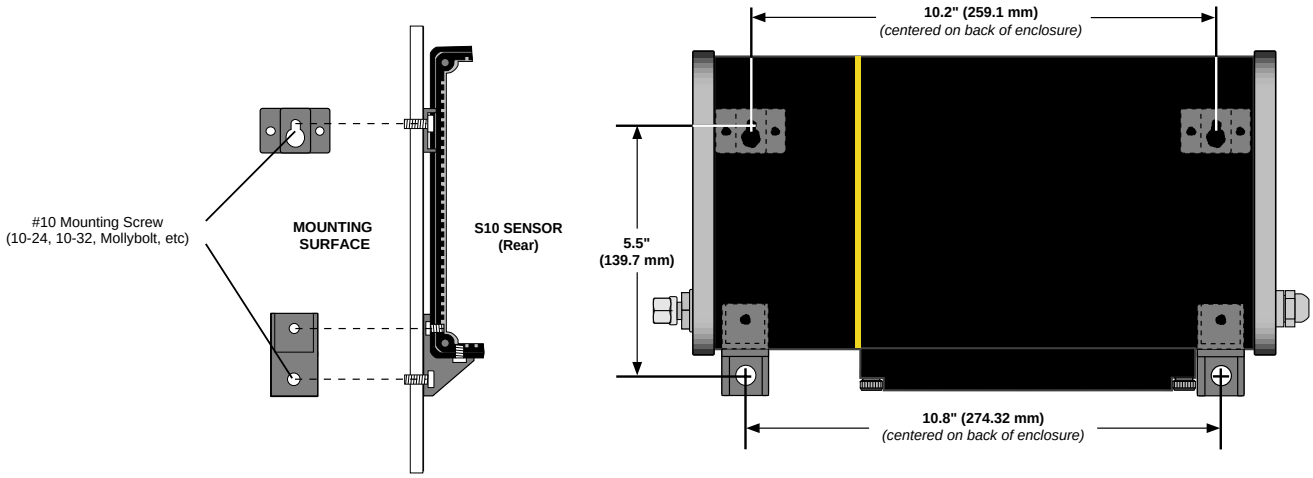
XP.2 Installation Considerations

Once instrument components have been checked and initially set up (refer to *Section 2.2* of the *A-1000 User Guide*), the A-1000XP Analyzer can be installed. The A-1000XP-S Analyzer and a supervising C80 Controller require permanent mounting while the portable Model A-1000XP is designed to stand vertically on its attached feet, allowing this instrument to easily move to different locations to perform spot analyses.

Because the A-1000XP is designed specifically for the purest water systems, the instrument's inlet ports have been optimized to provide the cleanest possible flow path during sample introduction. The distance between the sample point and the Analyzer should be kept as short as possible, preferably using a section of non-permeable tubing, such as Kynar® or 316L electropolished stainless steel. Teflon™ PFA/PTFE may be used, but there is a potential for sample corruption due to the permeability of the tubing. It also is recommended that no intermediate isolation valve be installed (see *Section 2.3.1.2* of the *A-1000 User Guide*) to further minimize the potential for contamination. If an isolation valve is necessary, clean it thoroughly of all lubrication and other debris before installation.

CAUTION: *Do not expose the A-1000XP to a caustic atmosphere, as may be present in a DI regeneration area or near an acid waste sump; exposure will corrode electronic circuitry and damage analysis components. If an Analyzer must be installed in a hazardous area, it must be protected by a suitable enclosure which complies with all instrument operating specifications.*

The A-1000XP Analyzers combine the necessary components into a single compact package that physically separates the internal electronics from the measurement cell to avoid potential water damage. Both instruments are splash-resistant, but not waterproof, and therefore should be installed in a dry and relatively dust-free environment. Do not allow the air flow through the intake and outlet filters located on the bottom of the Analyzer to be obstructed or get wet. The ambient air temperature should not exceed 40 °C (104 °F) wherever the instrument is mounted and additional ventilation may be necessary.

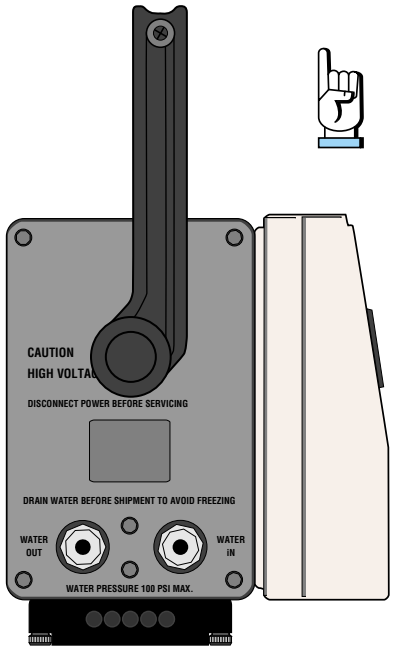


A-1000XP-S Mounting Template

As noted, the A-1000XP-S Analyzer is designed to be a stationary unit. The A-1000XP-S Analyzer is secured using two 1/4" mounting brackets located on the rear of the instrument in conjunction with two 1/4" tie-down tabs positioned along its bottom. The mounting dimensions for the A-1000XP-S are shown above.

Orienting the portable A-1000XP, as with the other portable Analyzers, is critical. It should be maintained in an upright position with the integral Controller facing upwards to ensure that its measurement cell is thoroughly flushed between analysis cycles.

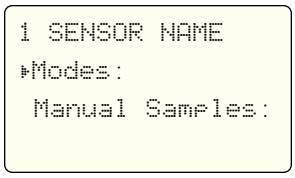
Turn the A-1000XP and, if applicable, its attached printer ON. The Analyzer first conducts a series of self-diagnostic routines (indicated by the flashing green Controller LED) to verify that it is operating properly. The LED then flashes red while the supervising Controller establishes communications with its associated Analyzer. When self-diagnostics have been successfully completed, the instrument begins an automatic analysis cycle in an attempt to determine sample suitability.



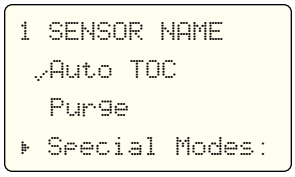
A-1000XP Orientation

Once it is initially installed the A-1000XP should be placed in the Clean Mode for a prolonged period (up to 3 or 4 hours) to establish maximum internal stability. Extended cleaning may be required if the instrument remains inoperable for longer than one week. To place the A-1000XP in the Clean Mode:

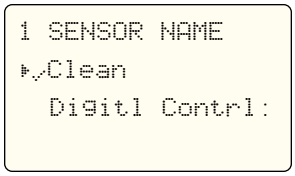
1. Press the Manual Key in order to access the Sensor's ***Manual Menu***.



2. Specify *Modes* and press Enter to display its submenu.



3. Specify *Special Modes* and press Enter to display the available options.



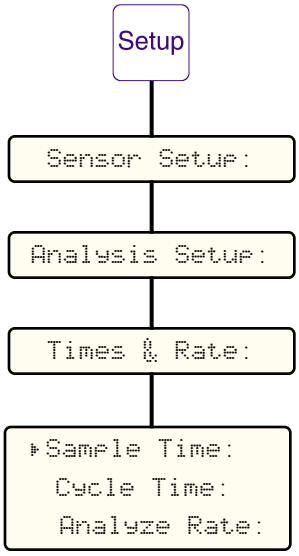
4. Use the ▲ ▼ Keys to specify *Clean*.

5. Press Enter to place the instrument in its Self-Clean Mode of operation. In this Mode, the Analyzer's UV lamp is turned on to oxidize any contaminants inside its measurement cell and its solenoid valve is opened to flush away impurities. *"CLEAN MODE"* is displayed on the Controller's LCD for the Sensor.

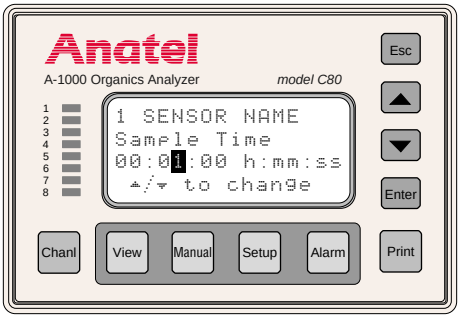
XP.3 Setup Considerations

In general, a longer *Sample Time* furnishes greater stability and, therefore, higher accuracy. Anatel recommends at least three minutes to assure data integrity. Actual analysis times depend on the nature of the individual water system. Also note that the A-1000XP does not operate in the *Fast Analyze Rate* even under standard mode operation.

To set the A-1000XP's *Sample Time*:



1. Press the Setup Key to display its submenu.
2. Use the ▲▼ Keys to specify *Sensor Setup*.
3. Press Enter to access its submenu.
4. Specify *Analysis Setup* from among the available selections and press Enter to display its options.
5. With the ***Times & Rate Menu*** displayed, use the ▲▼ Keys to specify *Sample Time*.
6. Press Enter to access this A-1000XP parameter screen. The current *Sample Time* is displayed in an *hour:minute:second* format and represents duration, not clock time. The flashing block cursor initially highlights the hour division.



SAMPLE TIME SCREEN

7. Use the ▲ ▼ Keys to specify the time division to be changed.

8. Press Enter to enable the Controller's Edit Mode and the flashing block becomes an underscore.

```
1 SENSOR NAME
Sample Time
00:01:00 h:mm:ss
 ▲/▼ to change
```

9. Use the ▲ ▼ Keys to scroll until the desired interval is displayed. Again, a minimum *Sample Time* of three minutes is recommended to obtain the best analysis results.

```
1 SENSOR NAME
Sample Time
00:03:00 h:mm:ss
 ▲/▼ to change
```

10. Press Enter to update the setting and advance to the next time period.

11. Repeat the editing process with each time period until the desired *Sample Time* has been entered into the display.

12. Press Esc three times to retain the setting and return to the ***Analysis Setup Menu***.

It is suggested that the *Valve@Idle* setting remain *"Open"* to permit continuous flow through the instrument and ensure maximum accuracy. To specify the A-1000XP sample valve setting when it is in the Idle state:

13. Specify *More Setup* in the ***Analysis Setup Menu*** and press Enter.

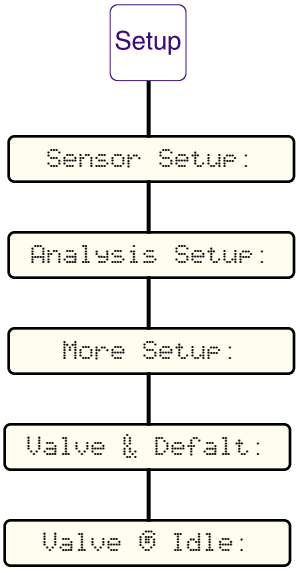
14. Specify *Valve & Defalt* from among the available selections and press Enter to display its options.

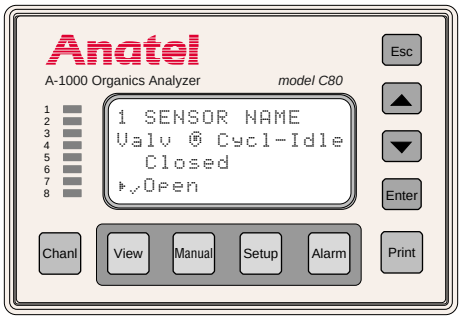
15. Specify *Valve @ Idle* and press Enter to display its parameter screen.

16. Use the ▲ ▼ Keys to select *"Open"* as the sample valve setting during the Sensor's Idle State.

17. With the desired *Valve @ Idle* setting indicated, press Enter to enable it.

18. Press Esc retain the setting and exit the screen.





VALVE AT IDLE SCREEN

With the A-1000XP Analyzer sufficiently cleaned and properly set up, automatic TOC analysis can be initiated on the instrument:

1. Press the Manual Key to access its Manual Mode.

2. Specify *Modes* once again and press Enter.

3. Specify *Auto TOC* and press Enter to initiate automatic analysis based on the factory default parameter settings.

```
1 SENSOR NAME
▸✓Auto TOC
  Purge
  Special Modes:
```

4. Press Esc to exit the screen.

XP.4 Operational Considerations

The first A-1000XP analysis after cycling power on the instrument establishes sample suitability for Extended Performance operation (it is strongly recommended that the A-1000XP be run for at least a half hour at each sampling point to establish maximum stability). Assuming the sample is within acceptable operational limits, high resolution analyses are performed. If at any time the sample's TOC, temperature or resistivity exceeds instrument specifications, several things happen:

- The instrument generates an alarm, indicated by its Controller LED turning red.
- A message is output to the printer and a Code specific to A-1000XP operation is logged on the instrument indicating the nature of the problem:

Code	*Indication*
36	XP TOC HIGH
37	XP TEMP LOW
38	XP TEMP HIGH
39	XP RESIST LOW

- The A-1000XP reverts to the standard mode of operation, its display and printout dropping one decimal point of resolution. For example, a reading of 2.475 ppb would be reported as 2.48 ppb, allowing you to determine the instrument's current operational mode at a glance.

Any of these reported alarm conditions can be acknowledged, but the A-1000XP will remain in the standard mode of operation until the sample criteria are again met. If resistivity is exceptionally high (or conductivity excessively low), it is possible there are bubbles in the measurement cell, or the cell is less thermally stable. Extending the *Sample Time* as described above should correct readings. If the problem persists, call Anatel for assistance.

It is also important to note that performing regular maintenance procedures as scheduled is crucial due to the extreme sensitivity of the instrument. Inlet prefilter service, indicated for the standard A-1000 Sensors, does not apply to the A-1000XP as its Water In port is not equipped with a filter screen.

XP.5 A-1000XP Specifications

The following instrument specifications pertain to the A-1000XP.

Note: A-1000XP specifications are subject to change without notice.

Performance Specifications

Automatic TOC Mode —

Operating Range —
- XP Mode: 0.02 to 1.999 ppb as carbon
- Standard Mode: 2.00 to 1999 ppb as carbon

Repeatability: ±0.05 ppb
Sample Water Temperature Range: 18 ˚C to 32 ˚C (65 ˚F to 90 ˚F)
Sample Water Resistivity Range: 15.0 to 18.2 MΩ-cm
Inlet Pressure: 100 psig maximum (690 kPa)
Alarm Function: indicates when the A-1000XP exceeds suitable TOC, resistivity or temperature range

Purge (Resistivity/Conductivity) Mode —

Operating Range:
- Resistivity: 0.01 to 18.20 MΩ-cm
- Conductivity: 0.05 to 100 microsiemens/cm
- Temperature Compensation: To 25 ˚C over entire range of 0 °C to 100 ˚C (based on a NaCl model)

Display Resolution: Three significant figures as resistivity
Four significant figures as conductivity
Accuracy *(instrument-to-instrument)*:
±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)
Resolution: 0.001 ppb
Detection Limit *(@25 °C, 3X Std. Dev.)*: 0.02 ppb

PHYSICAL SPECIFICATIONS

General —

Installation Category:	II, IEC 1010
Pollution Degree:	2, IEC 664

Anet Network Capacities —

Type:	RS-485
Maximum Sensors:	8
Maximum C80 Controllers (any configuration):	8
Maximum Network Length:	1 km (3,000 ft)
Network Cabling:	Shielded Twin-axial, Twist-Lock BNC

Display —

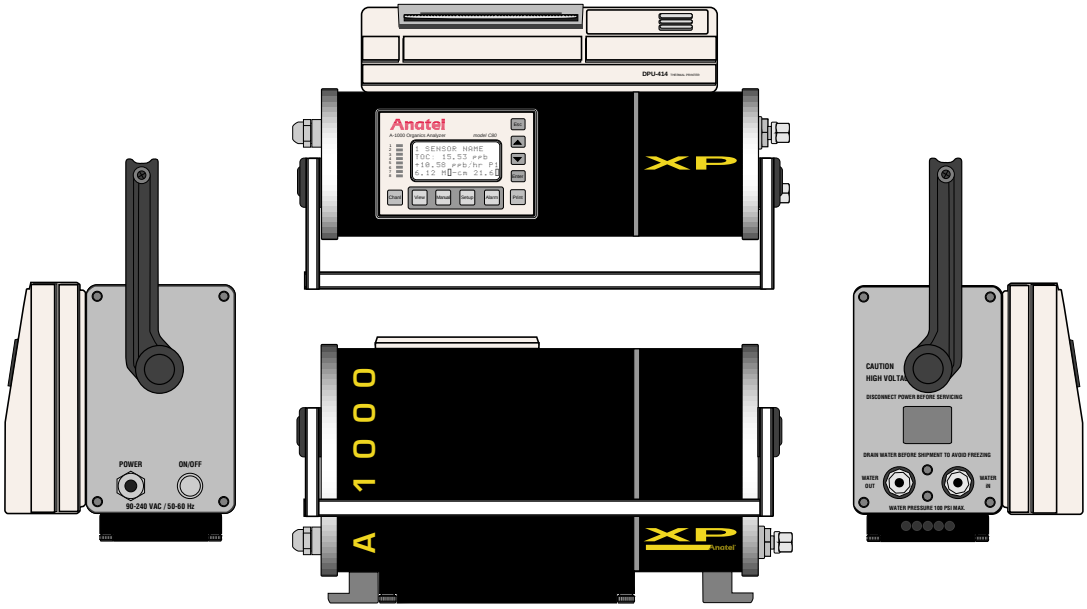
Main:	
A-1000XP:	4-line x 16-character Super-Twist LCD
A-1000XP-S:	1-line x 16-character Super-Twist LCD
Backlighting (adjustable):	Yellow LED
Character Height:	0.163″

Physical —

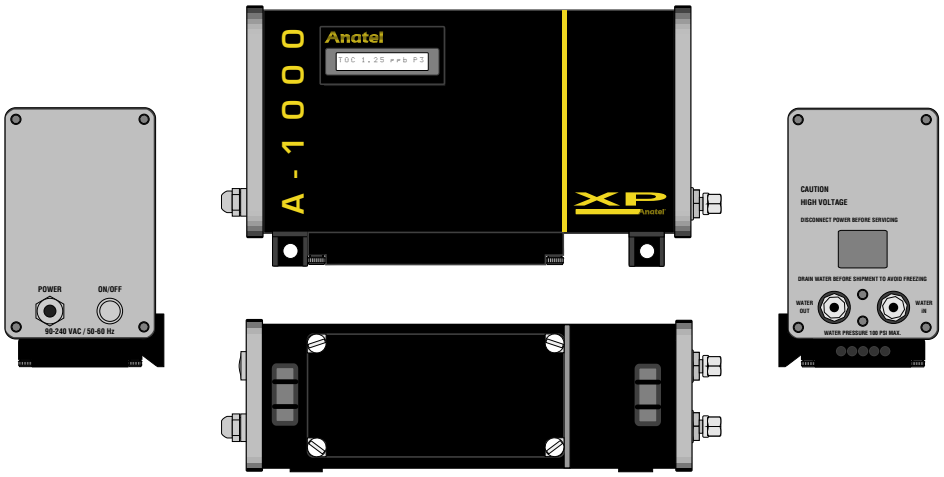
Operating Temperature:	0 ˚C to 35 ˚C (32 ˚F to 95 ˚F)
Maximum Relative Humidity:	90% RH
Maximum Altitude:	4,000 m (13,125 ft)
Size:	
A-1000XP:	330 mm L x 172 mm W x 112 mm D (13.0″ L x 6.8″ W x 4.4″D)
A-1000XP-S:	330 mm L x 106 mm W x 112 mm D (13.0″ L x 4.2″ W x 4.4″D)
Weight:	
A-1000XP:	8.25 kg (16.5 lb)
A-1000XP-S:	6.5 kg (12.75 lb)
Analysis Cell Volume:	7.5 mL
Power:	85 to 264 VAC ±10%, 50/60 Hz
Power Consumption:	2 Amps max. @ 120 VAC,

I/O Connections —

Analog:	Opto-isolated 4-20 mA output
	Non-isolated 12 VDC output @ 1/2 Amp max.
Digital I/O:	Two opto-isolated inputs
	Two opto-isolated outputs
Serial Interfaces:	RS485 opto-isolated Network
	RS232 Data Acquisition
	RS232 Printer
	RS232 Diagnostics



A-1000XP VIEWS



A-1000XP-S VIEWS

Notes: