APA 6000 Alkalinity Analyzer with AquaTrend Interface

The compact APA 6000™ Alkalinity Analyzer is a microprocessor-controlled process analyzer designed to continuously monitor total and phenolphthalein alkalinity. Typical applications include potable water, boiler water, cooling water and beverages in the range of 1 to 1000 mg/L total alkalinity and 5 to 1000 mg/L phenolphthalein alkalinity. The analyzer combines titrimetric and colorimetric methods of detection to determine concentration and provides accurate, reliable results with lower costs and reduced maintenance requirements.

Performance Features

- Selectable readout in total, phenolphthalein, bicarbonate, carbonate, and hydroxide alkalinity.
- Analyzer operates unattended for one month between reagent changes in clean water applications.
- Rapid cycle times. Instrument performs an analysis every 5 minutes.
- Operator-defined user interface offers a choice of graphical or numeric readout. Numeric readings can be displayed in units of mg/L, ppm or gr/gal.
- Automatic self-cleaning, self-calibrating and self-priming functions simplify daily operation.
- Self-diagnostics alert operator to any abnormal conditions in the instrument.
- Corrosion-resistant design protects electronic and mechanical components.
- Grab sample measurements can be made without interrupting sample flow.
- Designed to meet stringent safety and emission standards.
- Sample sequencing kits available to sample up to three streams.
- User-configured output capability for two 4-20 mA outputs and two alarm relays, expandable up to 14 4-20 mA outputs and 14 alarm relays.
- Can configure up to four PID control loops.
- Datalogging allows you to store, graph, trend and display measurement data for up to 30 days.

Analyzer Overview

The APA 6000 Alkalinity Analyzer consists of five basic components: an auto burette, a multi-position valve, a mixing chamber, a colorimetric detector and the AquaTrend® Interface. In a typical measurement cycle, the auto burette

FIGURE 1. APA 6000 Alkalinity Analyzer

aspirades accurate volumes of sample, standards and reagents. Once the sample and reagent mix with the indicator, the mixture is then dispensed to the detector, which produces a precise reading of the sample's alkalinity concentration. Sample temperature throughout the analysis process is maintained at 50 °C in order to ensure repeatability.

Method of Analysis

This analyzer employs a carrierless sequential injection analysis technique to perform titrations. A slug of acid is injected into a sample stream, creating a dispersion zone. The acid will be most concentrated in the middle of the zone, falling (exponentially) to zero at the fringes of the dispersion zone. Within this zone there will be an element of fluid where the acid is exactly neutralized by the bases. To visualize the two endpoints, this stream is merged with a solution of m-cresol purple and bromcresol green. The merging of the sample/acid stream with the pH indicator solution occurs just prior to the colorimetric detector. This combination of pH indicators provides a continuous colorimetric response to pH at 600 nm, the wavelength of the colorimetric detector. As the titration zone/indicator solution passes through the detector, the colorimetric output will vary. Initially, before the

leading edge of dispersed acid slug arrives, the absorbance will be high. As the dispersion zone passes through, absorbance will be reduced as acid neutralizes the bases and reduces the pH. The absorbance eventually returns to the initial level when the last of the dispersion zone has passed. The result is a peak, the width of which is inversely proportional to the concentration of alkalinity in the sample stream.

AquaTrend Interface

The analyzer contains an integral AquaTrend Interface built into the door of the instrument. The interface features a large graphical display, menu-driven software and on-screen prompting to guide you step by step through all instrument set-up, calibration and operational procedures. AquaTrend features include:

Self Test Diagnostics. The AquaTrend Interface automatically monitors key instrument and network functions. If an instrument or system malfunction is detected, the interface will display an error code, and store the error in the alarm log.

Security Lockout. A convenient lockout feature allows supervisors to restrict access to programmable functions with a four-digit password.

Datalogging. Datalogging capability allows you to graph, trend and display measurement data for the last hour, last day or last 30 days.

Analyzer Output Capability

Alarms. Analyzer features two internal alarm relay outputs. An operator can program alarm points anywhere within the overall analyzer range. System warning and system alarms can also be used to drive additional alarm relay closures. Optional Signal Output Modules are available for adding capacity for a total of 14 alarm relay outputs.

PID Control. Analyzer offers programmable output options for up to four PID control loops. This feature allows the analyzer to monitor and control critical processes.

Recorders. Analyzer features two internal data recorder outputs. Recorders can be programmed to cover any segment of the overall range to provide optimum resolution on a recorder chart. Analyzer provides two outputs of 4-20 mA or 0-20 mA for external recorders or controllers. Optional Signal Output Modules are available for adding capacity for a total of 14 analog outputs.

Construction

The instrument case is designed to meet NEMA-4X/IP66 industrial enclosure requirements. The instrument's front cover, which is constructed of corrosion-resistant materials, opens to allow full access to the analyzer's components. The analyzer can be used as a bench-top instrument, or can be wall or panel mounted without affecting the environmental integrity of the case. Electrical connections are made through the back of the analyzer. Hydraulic connections are made through fittings in the chemistry compartment and through the manifold at the base of the instrument. All chemical reagents are housed in separate, spill-containing compartments on the sides of the instrument.

FIGURE 2. Typical AquaTrend Interface display

System Accessories

A wide range of accessories is available for the APA 6000 Analyzer to increase application flexibility. Each of the system accessories described below operates on 12 Vdc power and requires the PS1201 Power Supply.

FIGURE 3. Remote AquaTrend Interface

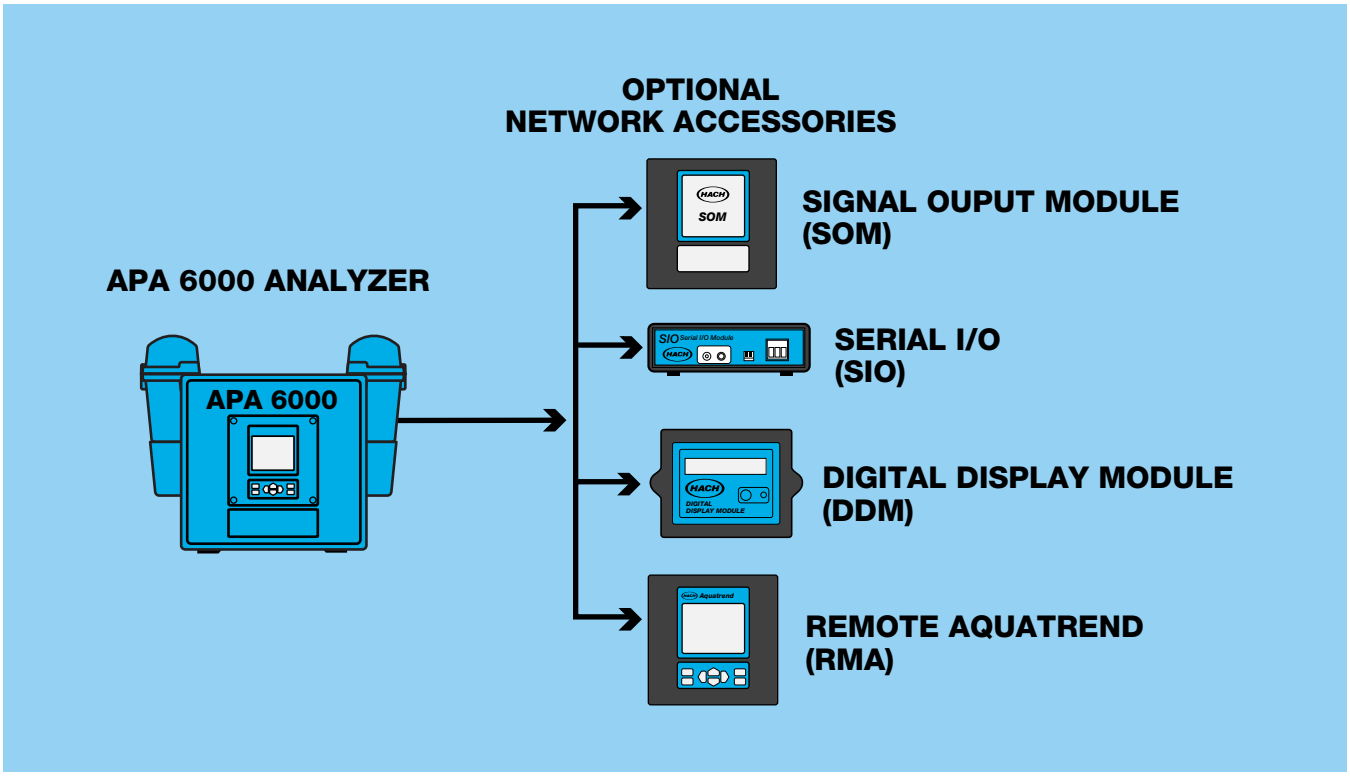


FIGURE 4. Typical Installation with Remote AquaTrend

FIGURE 5. Serial I/O Module

Remote AquaTrend Interface. With a Remote AquaTrend, you can control all network functions, access instrument set-up menus, and perform calibrations on any APA 6000 Analyzer from a remote location.

Serial I/O Module. For detailed record keeping, select the Serial I/O Module (SIO). The SIO allows you to download complete measurement and diagnostic data as it is generated to a personal computer or printer via an RS232 port.

Digital Display Module. The Digital Display Module (DDM) is an eight character remote display that can be used for continuous readout of measurement values for any given sensor measurement. The display can be mounted up to 400 meters (1312') from the sensor unit.

Signal Output Module. An optional Signal Output Module (SOM) is available to increase alarm and recorder output capability. The module features two recorder outputs selectable for 0-20 mA or 4-20 mA. Output span is programmable over any portion of the measurement range. Also included are two high/low set-point alarms, each equipped with an SPDT relay with unpowered contacts rated for 5A resistive load at 230 Vac.

PS1201 Power Supply. A PS1201 Power Supply is required for Signal Output, Digital Display, or Serial I/O Modules. Designed for pole, wall or panel mounting, the surge-protected power supply provides 25 watts of power for additional devices.

FIGURE 6. Signal Output Module

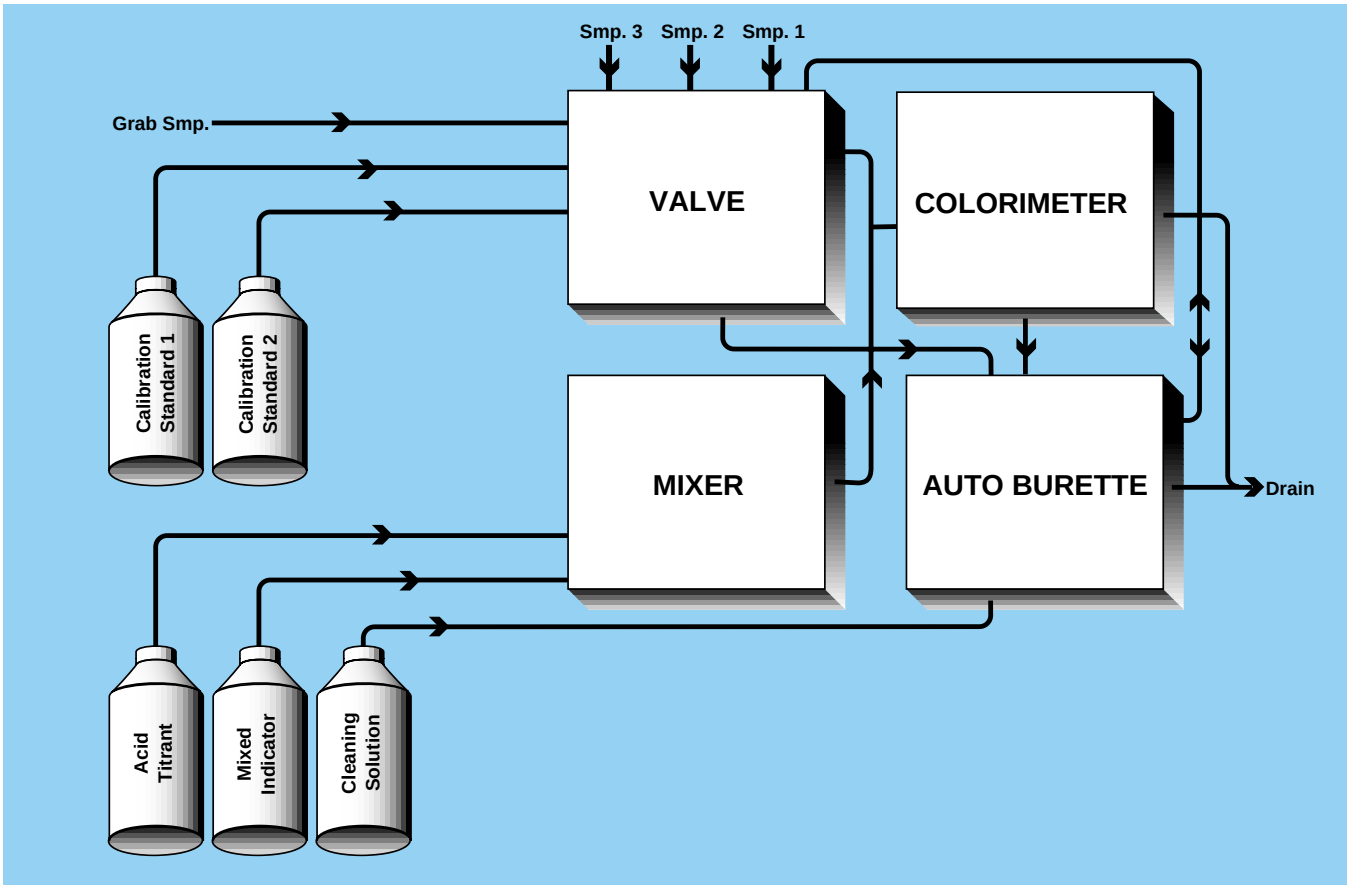


FIGURE 7. Analyzer Flow Diagram

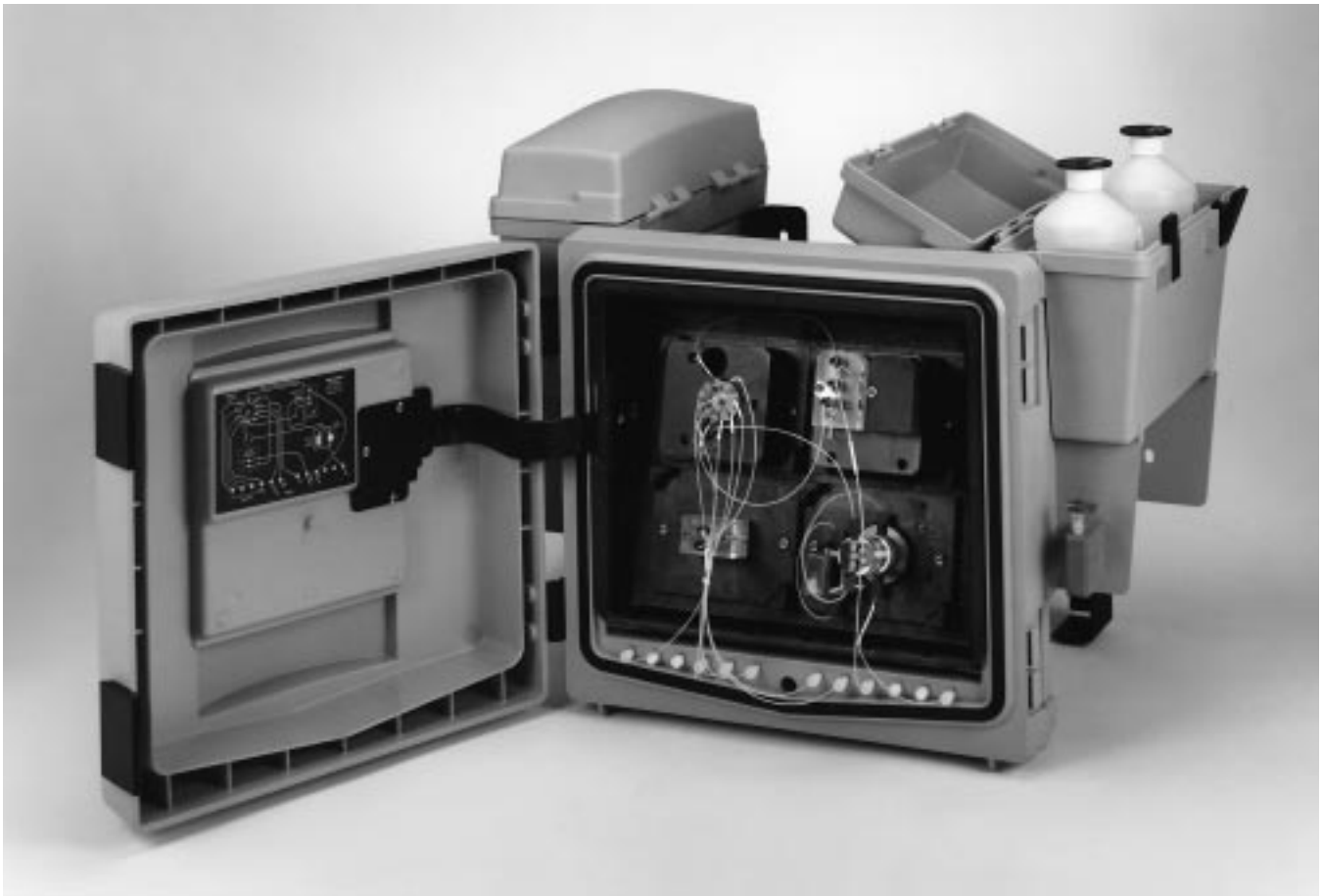


FIGURE 8. All analyzer components are easily accessible for maintenance.

Specifications

Range:
1 to 1000 mg/L as $CaCO_3$ total alkalinity; 5 to 1000 mg/L as $CaCO_3$ phenolphthalein alkalinity

Accuracy:
Better than ± 5% of reading or ± 1.0 mg/L, whichever is greater

Repeatability:
Better than 3% of reading or ± 0.6 mg/L, whichever is greater

Response Time:
Less than 5 minutes for 90% response to setup change at instrument sample fitting.

Cycle Time:
Less than 5 minutes

Calibration Cycle:
Normal 30 minutes

Sample Temperature Range:
5 to 50 °C

Analog Output:
Two 4-20 mA outputs suitable for recorders or PID control. Output span programmable over any portion of the 1 to 1000 mg/L range (130 Vac isolation from earth ground).

Relay Outputs:
Two SPDT relays with contacts rated for 5A resistive load at 230 Vac. Additional relays available through Signal Output Module, if connected.

Power requirements:
95-240 Vac, 50/60 Hz ± 2 Hz

Sample Sequencing:
Optionally capable of analyzing up to three sample streams.

Case:
NEMA-4X(indoor)/IEC 529 (IP66) with provision for air purge. Reagent enclosure is drip-proof

Drain:
Gravity, air break or vent recommended.

Grab Sample Volume:
10 mL minimum

Sample Flow Rate:
20-1000 mL/min

Sample Filter Inlet:
3/4" NPT male or female

Sample Pressure:
0.35-6.9 Bar (5 to 100 psig)

Drain Fitting:
3/4" NPT barbed hose fitting

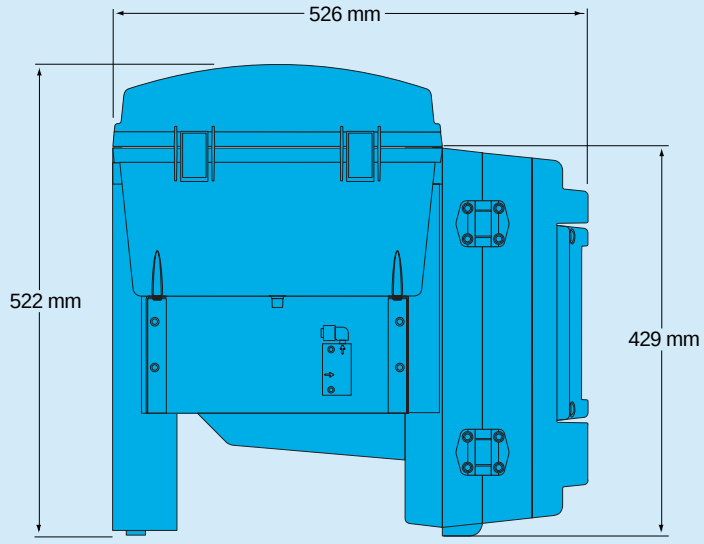
Certification:
NRTL certified to UL and CSA standards and CE approved

Dimensions:
522 x 627 x 526 mm (21 x 25 x 21")

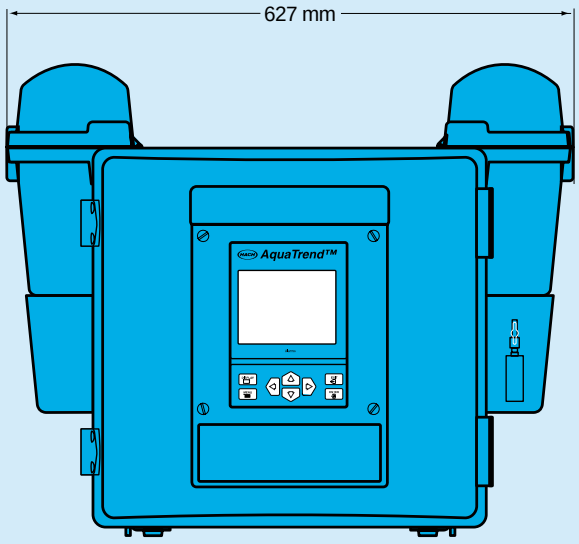
Data Communications Distance:
Maximum node-to-node distance is 400 m (1312').
Maximum total wire length is 500 m (1640').

Mounting:
Wall, bench and panel

Weight:
25.5 kg (56 lbs)



**APA 6000 Analyzer–
Side View**



**APA 6000 Analyzer–
Front View**

Typical Proposal Specification

The alkalinity analyzer shall be a continuous-reading analyzer that utilizes m-cresol purple and bromcresol green to visualize two endpoints for colorimetric measurement of alkalinity at a wavelength of 600 nm. The measurement range shall be 1.0 to 1000.0 mg/L (parts per million) total alkalinity and 5.0 to 1000.0 mg/L phenolphthalein alkalinity as $CaCO_3$. The analyzer accuracy shall be ± 5% of reading or ± 1 mg/L, whichever is greater. Precision shall be ± 3% of reading or ± 0.6 mg/L, whichever is greater. The analyzer shall provide digital display in a numeric or graphical format. The alkalinity analyzer shall be capable of automatic calibration, cleaning and self-priming.

The analyzer shall provide continuous purge for sample to drain to assure fresh sample to the analyzer and reduce analysis lag time. The analyzer shall use an auto burette to dispense metered volumes of sample, standards and reagents. Sample, standard and reagent flow shall be directed to the detector module by a rotary valve. Sample shall be delivered to the analyzer at the pressure of 5 to 100 psig and the temperature of 5 to 50 °C. The analyzer shall be capable of grab-sample analysis without interrupting continuous sample flow to the analyzer.

Fourteen user-defined internal recorders, of which four can be used for PID control, shall be provided. Two user-selectable recorder/controller outputs of 4-20 mA, with expansion capability up to 14, shall be provided. Recorder output span shall be user-adjustable over the entire span of the analyzer. Fourteen user-defined alarms shall be provided. Alarms may be programmed for sample concentration alarms, analyzer system warning and analyzer system shutdown. Two unpowered SPDT relays, also with expansion capability up to 14, shall be provided for internal alarms. Two relay contacts shall be rated for 5A resistive load at 230 Vac.

The analyzer components shall be assembled to a NEMA-4X(indoor)/IEC 529 (IP66) plastic enclosure designed for bench, wall or panel mounting. Standards and reagents shall be isolated from analyzer electronics in separate plastic containers. Power requirement shall be 95-240 Vac, 50/60 Hz. The analyzer shall be warranted for one full year against defects in materials and workmanship and shall include a 30-day supply of standards and reagents.

The analyzer shall be designed to meet UL 3101-1, CSA C22.2 No. 1010.1 and EN61010-1 (IEC 1010-1) safety standards. The analyzer shall also comply with Class A limits for radio and noise emission as specified by the FCC and EN55011 (CISPR11).

How to Order

The APA 6000 Alkalinity Analyzer is supplied with an Installation Kit, Maintenance Kit, Basic Sample Conditioning Kit, Manual, and Quick Reference Card.

51000-10	APA 6000 Alkalinity Analyzer with integral AquaTrend Interface and Reagents

Reagents

26965-53	Sulfuric Acid Titrant, 0.4 N H_2SO_4
26966-53	Mixed Indicator, pH 4.5 & pH 8.3
26967-53	Alkalinity Standard 1
26968-53	Alkalinity Standard 2
26970-53	Alkalinity Cleaning Solution

Optional Accessories

52074-00	Serial I/O Module
51250-00	Signal Output Module
52400-00	Digital Display Module
51200-00	Remote AquaTrend
46306-00	Power Cord, 120 Vac
46308-00	Power Cord, 240 Vac
52010-00	PS1201 Power Supply
51045-00	Sample Sequencing Kit
51068-00	Air Back Flush Kit
51339-00	Micro Filtration System

Cables

52157-00	22 gauge, 2 conductor cable, communication only, by the foot (in 100' to 1000' lengths)
52158-00	20 gauge, 4 conductor cable, communication and power, by the foot (in 100' to 1000' lengths)

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