PART 1 GENERAL

1.1 Section includes:
A. Hardness Analyzer for the measurement of high and low ranges hardness in water.

1.2 Measurement Procedures
A. The method of measuring high and low ranges hardness will be a microprocessor-controlled process analyzer designed to use an EPA-approved calmagite chemistry method to monitor high range hardness (10 to 1,000 mg/L) and low range hardness (50 to 10,000 µg/L) colorimetrically.

1.3 Alternates
A. Other methods of measurement that do not use the EPA-approved calmagite chemistry method are not acceptable.

1.4 System Description
A. Performance Requirements
1. High range Hardness
a. Measuring Range
1) 10 to 1,000 mg/L as $CaCO_3$
b. Accuracy
1) ±5% of reading or ±2 mg/L as $CaCO_3$, whichever is greater
c. Repeatability
1) ±5% of reading or ±2 mg/L as $CaCO_3$, whichever is greater
d. Response Time
1) <17 minutes to 90% for single channel
2. Low range Hardness
a. Measuring Range
1) 50 to 10,000 µg/L
b. Accuracy
1) ±5% of reading or ±0.05 mg/L, whichever is greater
c. Repeatability
1) ±3% of reading or ±0.03 mg/L, whichever is greater
d. Response Time
1) <5 minutes to 90% for single channel

1.5 Certifications
A. EMC: CE compliant for EMC Immunity EN 61326-1
B. Safety: EN 61010-1 and General Purpose UL/CSA 61010-1
C. Australian C-TICK and Korean KC markings
D. NEMA 4X/IP66
E. Class A limits for radio and noise emission as specified by the FCC and EN55011 (CISPR11).

1.6 Environmental Requirements
A. Operational Criteria
1. Operating temperature
a. 5 to 50°C (41 to 122°F)
2. Sample Temperature
a. 5 to 50°C (41 to 122°F)
3. Sample Pressure

a. 2.5 to 100 psi at Basic Water Conditioning Filter; 0.5 to 30 psi maximum at sample inlet block.

4. Sample Flow
   a. 100 to 1,000 mL/min to sample inlet block.
5. Sample Inputs
   a. Up to 2 sample streams with optional hardware
6. Relative Humidity
   a. 95% relative humidity, non-condensing
7. Maximum Altitude
   a. 2000m (6560 ft)

1.7 Warranty

A. The analyzer includes a one-year warranty from the date of shipment and shall include a 30-day supply of standards and reagents.

1.8 Maintenance Service

A. Scheduled Maintenance
   1. Monthly
      a. Reagents and standards:
         1) Replace
         2) Clean reagent compartment and tubing
      b. Cleaning solution: fill cleaning solution container
      c. Autoburette module:
         1) Inspect for seal or fitting leaks.
         2) Inspect for particulate build up.
         3) Lubricate lead screw and ceramic piston guide.
      d. Valve module:
         1) Inspect module and associated tubing for leaks
      e. Sample conditioning filter:
         1) Inspect filter
         2) Check sample flow
         3) Clean or replace the filter
      f. Mixer Module
         1) Inspect for particulate build up
   2. Every three months
      a. Autoburette module:
         1) Replace piston seals and o-rings
      b. Valve module:
         1) Replace valve rotor
         2) Dry and inspect condition of stator (if scored, replace)
         3) Check for leaks. Replace as needed.
   3. Every six months
      a. Autoburette module:
         1) Check for need to replace piston seals.
         2) Inspect for signs of leakage
      b. Tubing and fittings:
         1) Inspect for leaks or damage. Replace as needed.
B. Unscheduled Maintenance
   1. Clean instrument enclosure.
   2. Fuse replacement.

PART 2 PRODUCTS

2.1 Manufacturer

A. Hach Company, Loveland Colorado
   1. Model APA6000™ Hardness Analyzer

2.2 Manufactured Unit

A. The APA 6000™ Hardness Analyzer consists of microprocessor-controlled analyzer designed to continuously monitor hardness in a sample stream. The APA 6000™ Hardness Analyzer includes Echelon LonWorks® Bus communication technology.

2.3 Equipment

A. The analyzer uses calmagite chemistry for colorimetric measurement of Hardness at a wavelength of 600 nm (High range) or 520 nm (Low range).
B. The analyzer has a digital display in a numeric or graphical format.
C. The analyzer is capable of automatic calibration, cleaning, and self-priming.
D. Samples are continuously purged to assure fresh sample to the analyzer and reduce analysis lag time.
E. An automatic burette is used to dispense metered volumes of sample, standards, and reagents.
F. Sample, standard, and reagent flow are directed to the detector module by a rotary valve.
G. Grab-sample (10 mL) analysis is possible without interrupting continuous sample flow to the analyzer.
H. The analyzer is equipped with the following communications capabilities.
   1. Fourteen user-defined internal recorders, of which four can be used for PID control.
   2. Two user-selectable recorder/controller outputs of 4-20 mA, with expansion capability up to 14.
   3. Recorder output span is user-adjustable over the entire span of the analyzer.
   4. Fourteen user-defined alarms. Alarms may be programmed for sample concentration alarms, analyzer system warning, and analyzer system shutdown.
   5. Two unpowered SPDT relays, with expansion capability up to 14, for internal alarms.
   6. Two relay contacts rated for 5 A resistive load at 230 Vac.
   7. The analyzer shall be capable of communication on an Echelon LonWorks® Bus network.
I. Analyzer components are assembled to a NEMA-4X(indoor)/IEC 529 (IP66) plastic enclosure.
J. All standards and reagents are isolated from the analyzer electronics in separate drip-proof plastic containers.
K. Power requirement are 95 to 240 Vac, 50/60 Hz.

2.4 Components

A. Standard Equipment
   1. Analyzer
   2. Installation Kit with Grab Sample Kit
   3. Maintenance Kit
   4. Tool Kit
   5. User Manual
   6. One month supply of reagents
B. Dimensions: 522 x 627 x 527 mm (21 x 25 x 21 in)
C. Weight: 25.5 kg (56.0 lbs)

2.5 Optional Accessories

A. Sample Sequencing Kit
B. Y-Strainer Kit
C. Micro Filter System
D. AquaTrend Network with Signal Output Module

PART 3 EXECUTION

3.1 Preparation

A. Mounting
    1. Wall Mounting
    2. Bench Mounting
    3. Panel Mounting
B. Sample inlet
    1. ¾-inch NPT male or female
C. Drain
    1. Gravity, air break, or vent recommended
D. Drain Fitting
    1. ¾-inch NPT barbed hose fitting
E. Data Communications Distance
    1. Maximum node-to-node distance
        a. 400m (1312 feet)
    2. Maximum total wire length
        a. 500m (1640 feet)

3.2 Installation

A. Contractor will install the analyzer in strict accordance with the manufacturer's instructions and recommendation.
B. Manufacturer's representative will include a half-day of start-up service by a factory-trained technician, if requested.
    1. Contractor will schedule a date and time for start-up.
    2. Contractor will require the following people to be present during the start-up procedure.
        a. General contractor
        b. Electrical contractor
        c. Hach Company factory trained representative
        d. Owner's personnel
        e. Engineer

3.3 Manufacturer's Service and Start-Up

A. Contractor will include the manufacturer's services to perform start-up on instrument to include basic operational training and certification of performance of the instrument.
B. Contractor will include a manufacturer's Service Agreement that covers all the manufacturer's recommended preventative maintenance, regularly scheduled calibration and any necessary repairs

beginning from the time of equipment startup through to end user acceptance / plant turnover and the first 12 months of end-user operation post turnover.

C. Items A and B are to be performed by manufacturer's factory-trained service personnel. Field service and factory repair by personnel not employed by the manufacturer is not allowed.
D. Use of manufacturer's service parts and reagents is required. Third-party parts and reagents are not approved for use.

END OF SECTION