PART 1 GENERAL

1.1 Section includes:
- A. Amperometric chlorine analyzer for the measurement of free chlorine in water.

1.2 Measurement Procedures
- A. The method of measuring chlorine will be with a two-electrode amperometric sensor with a membrane selective to hypochlorous acid (HOCl), immersed in an electrolytic medium.

1.3 Alternates
- A. Other methods of chlorine measurement such as open cell amperometric or measurement with mathematical curve pH compensation are not allowed.

1.4 System Description
- A. Performance Requirements
  1. Measurement Range: 0-20 ppm (0-20 mg/L) Hypochlorous Acid (HOCl)
  2. Detection Limit: 5 ppb (0.005 mg/L) HOCl
  3. Response Time: 90% at T_{90} seconds
  4. Accuracy: 2% or ±10 ppb HOCl, whichever is greater
  5. Calibration
     a. Electrical zero or chemical zero with dechlorinated or deozoned water
     b. Calibration of the slope by comparison with laboratory instrument
     c. pH calibration with single or two point using standards or comparison with lab method and process sample

1.5 Certifications (when connected to an sc controller)
- A. EMC: CE compliant for conducted and radiated emissions CISPR 11 (Class A limits), EMC Immunity EN 61326-1 (Industrial limits)
- B. Safety: General Purpose UL/CSA 61010-1 with cETLus safety mark
- C. Australian C-TICK and Korean KC Markings
- D. NEMA4X/IP66 dust and water ingress ratings

1.6 Environmental Requirements
- A. Operational Criteria
  1. Storage Temperature Range
     a. -20 to 60 °C (-4 to 140 °F)
  2. Operating Temperature Range
     a. 0 to 45 °C (32 to 113 °F)
  3. Sample Temperature Range
     a. 2 to 45 °C (35 to 113 °F)
  4. Sample Pressure Range
     a. 1.4 to 28 psi (0.1 to 2 bar)
  5. Sample pH Range
     a. pH 4 to pH 8 (Acidification unit available for >8 pH)

1.7 Warranty

A. Warranted for one year from date of shipment against manufacturer defects.

1.8 Maintenance Service

A. Scheduled Maintenance
   1. Chlorine sensor calibration every two months
   2. Replace pH sensor annually
   3. Replace tubing annually
B. Unscheduled Maintenance
   1. Replace membrane and electrolyte each 6 months (3 to 12 month range depending on sample)
   2. Clean electrode and pH sensor flow cell as required by sample (recommended every 6 months)

PART 2 PRODUCTS

2.1 Manufacturer

A. Hach Company, Loveland, Colorado
   1. Model 9184sc Amperometric Free Chlorine Analyzer

2.2 Manufactured Unit

A. The 9184sc chlorine analyzer consists of:
   1. Two-electrode amperometric chlorine sensor
   2. pH sensor
   3. Chlorine and pH sensor flow cell
   4. Mounting panel
   5. Digital cable to connect analyzer to sc controller

2.3 Equipment

A. The 9184sc chlorine analyzer works with Hach sc controllers only and connects to the controller by a digital plug-and-play interface.
B. The amperometric chlorine cell of the analyzer consists of
   1. Gold cathode
   2. Silver anode
   3. pH buffered Potassium Chloride reference electrolyte
   4. Sensor membrane to filter chlorine species selectively and to provide interface between the electrochemical cell and the sample
C. The pH sensor of the analyzer consists of
   1. Double junction pH electrode with silver/silver chloride reference system
D. The analyzer provides pH compensation when measuring for total free chlorine.
E. The chlorine sensor automatically compensates for temperature utilizing an embedded temperature sensor.
F. Wetted materials as follows:
   1. Chlorine Electrode: gold cathode/silver anode
   2. Sensor body: PVC
   3. Measuring cell: Acrylic

4. pH Electrode: Glass

2.4 Components

1. Mounting panel
2. Amperometric Chlorine sensor with membrane and electrolyte
3. Double junction pH sensor
4. Flow cell
5. Digital sc sensor cable
6. User manual

B. Dimensions: 270 x 250 mm x 155 mm (10.63 x 9.84 x 6.1 in)
C. Weight: 6.5 kg (14 lb)

2.5 Accessories

A. Required
   1. Hach sc Controller
B. Optional
   1. Acidification Unit
   2. Intermittent Flow Unit

PART 3 EXECUTION

3.1 Preparation

1. Mounting
   a. Instrument is able to be wall or panel mounted. The pre-assembled analyzer panel must be mounted to allow clearance above the measurement sensor for sensor removal.
2. Sample inlet
   a. ¼ inch OD connection
3. Sample Flow Rate
   a. Minimum of 14L/hr
4. Drain Fitting
   a. ½ inch ID connection

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