**PLEASE NOTE: The following specification contains areas, highlighted in yellow and with the [ ] symbol. In these areas, the engineer has to make a selection, add specific, project related information and has to delete what is not applicable for the specific project.**

GENERAL

* 1. Section includes:
     1. Instrument for semi-continuous, online monitoring of Chemical Oxygen Demand (COD) in water using titration.
  2. Measurement Procedures
     1. The analytical method to determine Chemical Oxygen Demand in water is redox tritration
        + 1. after oxidation by acid-potassium dichromate solution, conform with ISO 6060
          2. after oxidation by potassium permanganate solution, conform with ISO 8467 and JIS K0806.
  3. Alternates
     1. Analyzers without standard automatic procedures for calibration, validation and cleaning are not acceptable.
     2. Analyzers without the ability for single sample ("grab sample") measurement are not acceptable.
     3. Analyzers without option for up to 8 sample streams are not acceptable.
     4. Analyzers without analog and digital output options are not acceptable.
     5. Analyzers without an integrated industrial panel PC are not acceptable.
  4. System Description
     1. Performance Requirements
        1. Measuring Range (parts per million)
           1. Dichromate method  
              [ ] 5 to 100 mg/L O2   
              [ ] 40 to 500 mg/L O2  
              [ ] 60 to 1,000 mg/L O2  
              [ ] 80 to 1,500 mg/L O2  
              [ ] 600 to 10,000 mg/L O2
           2. Permanganate method  
              [ ] 1 to 20 mg/L O2   
              [ ] 20 to 200 mg/L O2
        2. Limit of detection
           1. Dichromate method ≤5 mg/L (range 5 – 100 mg/L)
           2. Permanganate method ≤1 mg/L (range 1 – 20 mg/L)
        3. Precision / Repeatability
           1. Better than 5% full scale range for standard test solutions
     2. Other Specifications
        1. Cycle Time
           1. 40 minutes including oxidation time of 30 minutes.  
              Note: standard method for dichromate destruction requires 120 minutes.
        2. Cleaning
           1. Automatic; frequency freely programmable
        3. Calibration
           1. Automatic; 2-point; frequency freely programmable
        4. Validation
           1. Automatic; frequency freely programmable
        5. Alarm
           1. 1x malfunctioning, 4x user-configurable, max. 24 VDC/0.5 A, potential free contacts
        6. Protection class
           1. Analyzer cabinet: IP55
           2. Panel PC: IP65
        7. Material
           1. Hinged part: Thermoform ABS, door: plexiglass
           2. Wall section: Galvanized steel, powder coated
  5. Certifications
     1. CE compliant
     2. UL certified
  6. Environmental Requirements
     1. Operational Criteria
        1. Operating temperature: 10 to 30 °C ±4 °C deviation (50 to 86 °F ±7.2 °F deviation)
        2. Reagent temperature: keep between 10 to 30 °C (50 to 86 °F)
        3. Relative humidity: 5 to 95 %, non-condensing
  7. Warranty
     1. Warranted from manufacturer defects for two years (Europe) or one year (all other geographies) from date of shipment.
  8. Maintenance and Service
     1. Unscheduled Maintenance
        1. Check and clean the analyzer components, depending on cleanliness of the sample
     2. Scheduled Maintenance / preventative
        1. Monthly
           1. Reagents refill; validation and / or calibration
        2. Quarterly
           1. Pump tubing replacement
        3. Annually
           1. Calibration
           2. Replacement of all tubing
           3. Replacement of valves and pistons

1. PRODUCTS
   1. Manufacturer
      1. Hach
      2. EZ7000 Series Chemical Oxygen Demand Analyzer
   2. Manufactured Unit
      1. The Chemical Oxygen Demand analyzer consists of a microprocessor controlled titrator designed to monitor Chemical Oxygen Demand semi-continuously in a sample stream. Automatic cleaning, calibration and validation are available.
   3. Equipment
      1. Online Analyzer
         1. Utilizes redox titration.
         2. With automatic calibration, validation, priming and cleaning
         3. If chosen, the instrument can monitor up to 8 sample streams.
         4. Plug-and-play airtight fittings for connecting reagent tubing
         5. High precision micropumps for reagent dosing and dilution
      2. Controller
         1. Industrial panel PC with 5.7” TFT color display, compact flash memory, modular compact I/O system
         2. User interface with different user levels (Automatic, User Level 1, User Level 2, Administrator)
         3. If chosen, includes capability to communicate measurements via 4-20 mA outputs, Modbus TCP/IP, Modbus RS485 or RS232.
      3. Reagents and Standards
         1. The analyzer shall use quick connect reagent containers with pre-installed tubing.
         2. Reagents and standards shall be prepared according instructions on the Method + Reagent sheet.
   4. Components
      1. Analytical instrument  
         To deliver:
         1. Chemical Oxygen Demand Analyzer as selected in section 1.1.A.
         2. Wall-mount bracket
         3. Reagent containers
         4. User Manual
         5. Method + Reagent Sheet
      2. Dimensions: refer to analyzer drawings
      3. Weight: 25 kg (55 lb)
   5. Instrument Options,

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Must be added to instrument at time of order.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Number of sample streams (fill in, select up to 8):

[ ] sample streams

Outputs (select / fill in one)

[ ]x 4-20 mA Outputs (fill in, select up to 8)

[ ]x 4-20 mA Outputs and Modbus RS485 (fill in, select up to 4)

[ ]x 4-20 mA Outputs and Modbus TC/IP (fill in, select up to 4)

[ ] Modbus RS485

[ ] Modbus TCP/IP

Power supply

[ ] 220 VAC / 50 Hz

[ ] 110 VAC / 60 Hz

* 1. Instrument Accessories

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Select as many as required

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

[ ] External dilution unit

[ ] Universal Filtration System, pore size 50 µm

[ ] Universal Filtration System, pore size 100 µm

[ ] Heavy-Duty Filtration System, pore size 50 µm

[ ] Heavy-Duty Filtration System, pore size 100 µm

[ ] Table Stand

[ ] Floor Stand

1. EXECUTION
   1. Preparation
      * 1. Mounting
           1. As shown on the drawings
        2. Inlet and outlet connection sizes
           1. As shown on the drawings
        3. Sample Flow Rate
           1. 100 to 300 mL/minute
        4. Sample Pressure
           1. By external overflow vessel
        5. Sample Temperature
           1. 10 to 30 °C ±4 °C deviation (50 to 86 °F ±7.2 °F deviation)
        6. Other sample requirements
           1. Maximum particle size 100 µm, <0.1 g/L suspended solids, turbidity <50 NTU
        7. Instrument air
           1. Dry and oil free according to ISA-S7.0.01-1996 quality standard for instrument air
        8. Demineralized water
           1. For rinsing and/or dilution
        9. Cooling water
           1. Flow rate approx. 5L/h
           2. Temperature max. 30 °C (86 °F)
           3. Pressure max. 0.5 bar
        10. Drain
            1. Atmospheric pressure, vented, min. ø 64 mm
        11. Earth connection
            1. Dry and clean earth pole with low impedance (> 1 Ohm) using an earth cable of > 2.5 mm2
            2. Power supply
   2. Installation
      1. Install analyzer following transmittal drawings and instrument user manual.
   3. Manufacturer’s Service and Start-Up
      1. 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.
      2. 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.
      3. 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.
      4. Use of manufacturer’s service parts is required. Third-party parts are not approved for use.

END OF SECTION

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