

SECTION 40 76 69

Colorimetric Orthophosphate Analyzer Measuring System

PART 1 General

1.01 SUMMARY

- A. Requirements for a colorimetric analyzer and application-specific sample conditioning for the determination of orthophosphate concentration in a sample. The analysis method used shall be dependent on the measuring range. For ranges up to 10 mg/L (10 ppm) the analyzer shall use a molybdenum blue colorimetric method and for ranges up to 50 mg/L (50 ppm) the analyzer shall use the vanadate molybdate yellow colorimetric method. Using a combination of different wavelengths the absorption is measured across the entire concentration range. The light absorbed is directly proportional to the concentration of orthophosphate in the sample.
- B. Related Sections
 - 1. Control and Information Systems Scope and General Requirements.
 - 2. Power Instruments, General.

1.02 SUBMITTALS

- A. Furnish complete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer's certifications, Manufacturer's Field Reports.
- B. Product Data:
 - 1. Dimensional Drawings.
 - 2. Materials of Construction.
 - 3. Measurement accuracy.
 - 4. Measurement range.
 - 5. Enclosure Rating.
 - 6. Classification Rating.
 - 7. Power.
 - 8. Output options.

1.03 QUALITY ASSURANCE

- A. Manufacture facilities shall be certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the manufacturer.
- B. Any instruments that are not stored in strict conformance with the manufacturer's recommendation shall be replaced.

1.05 PROJECT OR SITE CONDITIONS

- A. Provide instruments suitable for the installed site conditions including but not limited to material compatibility, site altitude, process and ambient temperature, and humidity conditions.

1.06 WARRANTY

- A. The analyzer shall have standard one year warranty from date of shipment and if the analyzer is commissioned by a factory certified technician, the warranty is extended to three years from the date of shipment.

1.07 MAINTENANCE

- A. Provide all parts, necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.
- B. The analyzer shall have configurable programs available to automate the cleaning of the internal systems, and contain a supply of cleaning solution.
- C. All routine maintenance to be possible without the need for tools.
- D. Reagent shall be available in inactive, un-mixed form with a shelf life of 12 months from the date of manufacture.
- E. Reagent lifetime: Blue method for 6 months, Yellow method for 3 months, with a measuring interval of 15 minutes.

1.08 LIFECYCLE MANAGEMENT

- A. Instrument documentation, like original calibration certificates, manuals and product status information shall be accessed via a web enabled system with a license. The instrument-specific information shall be accessed via its serial number. When services are provided by an authorized service provider the services information like subsequent field calibrations shall be archived and accessible via this web enabled system.

PART 2 PRODUCTS

2.01 SYSTEMS/ASSEMBLIES

- A. Manufacturer
 - 1. Endress+Hauser, Liquiline System CA80PH Orthophosphate Analyzer.

- B. Performance Criteria

- 1. Measurement Range (Model dependent):
 - a. 0.05 to 2.5 mg/L (ppm) or
 - b. 0.05 to 10 mg/L (ppm) or
 - c. 0.5 to 20 mg/L (ppm) or
 - d. 0.5 to 50 mg/L (ppm)
- 2. Accuracy: In all ranges, $\pm 2\%$ of full scale.
- 3. Reproducibility:
 - a. Blue method: $\pm 2\%$ of displayed value +0.01 mg/L.
 - b. Yellow method: $\pm 2\%$ of displayed value +0.05 mg/L.
- 4. Measurement interval:
 - a. Blue method: 11 min, adjustable to >11 min.
 - b. Yellow method: 8 min, adjustable to > 10 min.
- 5. Instrument status displayed via local display.
- 6. Maintenance interval tracked through integral electronics.

- C. Certifications

- 1. CE marked.
- 2. CSA C/US General Purpose.

- D. Environmental

- 1. Process temperature: 40°- 100°F.
- 2. Ambient temperature: 40°- 100°F.
- 3. Operating humidity: 10-95%, none condensing.

2.02 MANUFACTURED UNITS

- A. The analyzer shall be a colorimetric/photometric device with integral transmitter/electronics that can be wall-mounted or free-standing with a base cabinet, with interconnection to an appropriate sample preparation system.
 - 1. The analysis method used shall be dependent on the measuring range. For ranges up to 10 mg/L (10 ppm) the analyzer shall use a molybdenum

blue colorimetric method and for ranges up to 50 mg/L (50 ppm) the analyzer shall use the vanadate molybdate yellow colorimetric method.

2. The analyzer shall use sample and reagent dosing syringe dispensers, not peristaltic pumps.
 3. Analyzer reagents shall be shelf stable, for a period of 12 months from date of manufacture, prior to preparation and shall require only deionized (DI) water for preparation.
 4. The system shall be capable of sampling from one or two sample points with internal sample collection cup(s) with optional level detect.
 5. The molybdenum blue analyzer shall be available for order with an optional reagent cooling system, to extend reagent lifetime.
 6. The analyzer enclosure shall be made of Plastic ASA + PC. The analyzer should include self-monitoring functions of the electronics, counter (to monitor consumables such as reagents, cleaners or dispensers), photometer and as an option, sample preparation and sample collecting vessel.
 7. The analyzer should have the capability to measure samples from 2 sampling points providing multiple 4 to 20 mA analog outputs. The measuring interval should be continuous (approximately 8 minutes) and adjustable up to 15 minute intervals and the calibration interval and the cleaning interval should be between 1 and 90 days depending on the application.
 8. The analyzer should be able to measure a sample provided directly by the end user with a solid content up to 50 ppm or up to 8 g/l coming from Liquiline CAT860, CAT820 or CAT810 sample conditioning systems.
 9. The available application-specific sample conditioning systems shall be capable of filtering samples from a pressurized pipe or open channel. For those applications requiring filter cleaning, backwash systems or chemical cleaning options shall be available.
 10. Remote access to measured values, configuration and diagnostics shall be accessible through an optional, integral ethernet-based web server.
- B. The analyzer electronics/transmitter shall be integrated within the analyzer and provide local interface to the analyzer. The transmitter display will be visible through the analyzer door during normal operation.
1. The transmitter shall allow local programming that can be operated through the front display, navigation and context sensitive buttons.
 2. The transmitter will have a back-lit display with auto switch-off function, and red display background for error alarm alerts.
 3. The transmitter outputs and inputs shall include:
 - a. Up to six 4-20 mA outputs.

- b. One alarm relay (NO/NC).
 - c. Optional 4-20 mA inputs.
 - d. Optional 2 or 4 relay outputs (NO/NC).
 - e. Digital fieldbus communications.
 - f. Optional webserver for remote configuration and diagnostics using a web browser.
4. Digital communications protocols available shall include the following without using an external converter. Digital communication shall be available as a native output from the sampler. Use of an external third-party signal converter is not acceptable.
- a. 4-20mA, HART.
 - b. Modbus TCP with webserver.
 - c. EtherNet/IP with webserver.
 - 1) EtherNet/IP communication shall be supported with the Electronic Data Sheet (EDS) file available for download directly from the sampler. The Add-On Profile (AOP) for integration shall be a Level 3 profile to simplify control system integration.
 - 2) The EtherNet/IP communications shall also be supported with Add-on Instructions (AOI) files and pre-configured faceplates for ease of control system integration.
5. The transmitter configuration shall be field-upgradeable with modular I/O that allows the analyzer to be modified/upgraded in the field without powering down the instrument.
6. The analyzer transmitter should have the capability to be reconfigured to measure up to four Memosens sensor inputs for additional analytical measurement points.
7. The transmitter shall support commissioning options via a service interface or device driver less operation via an internal web server accessible through a transmitter accessible RJ-45 port.
8. The transmitter shall retain all setup parameters and accumulated measurements internally in non-volatile memory in the event of power failure.
9. The transmitter shall incorporate fully configurable data logs that can be ring or stack, facilitating internal records of measurement data, sensor data, calibrations, hardware modifications, software updates, and events.
10. The analyzer and transmitter will operate on 100 to 120 VAC /200 to 240 VAC $\pm 10\%$ or 24 VDC $\pm 10\%$, 50 or 60 Hz.

2.03 ACCESSORIES

- A. Provide the appropriate sample preparation system to ensure a properly filtered sample is provided to the analyzer. The sample preparation system shall be controlled by the analyzer for sample delivery timing and control of automatic backflush.
- B. Stainless steel tag - labeled to match the contract documents.

2.04 SOURCE QUALITY CONTROL & CALIBRATION

- A. Reagents, standards and cleaning solutions for the analyzer will be supplied with MSDS data sheets.

2.05 SAFETY

- A. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electric Code latest addition.
- B. All devices shall be suitable for operation in a non-hazardous area.
- C. Device failure modes, self-monitoring characteristics and diagnosis shall follow NAMUR standard NE 43.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process condition.
- B. Examine the installation location for the instrument and verify that the instrument will work properly when installed.

INSTALLATION

- C. As shown on installation details and mechanical Drawings.
- D. Installation will occur in strict accordance with the manufacturer's instructions and recommendation.
- E. Coordinate the installation with all trades to ensure that the mechanical system has all necessary appurtenances including weld-o-lets, valves, etc. for proper installation of instruments.
 - 1. General contractor.

2. Electrical or Instrumentation contractor.
3. Endress+Hauser factory trained authorized service provider or representative.
4. Site (owner/operator) personnel.
5. Engineer.

3.02 FIELD QUALITY CONTROL

- A. Each instrument shall be tested before commissioning and the ENGINEER shall witness the interface capability in the PLC control system and associated registers.
 1. Each instrument shall provide direct programming capability through the PLC.
 2. Each instrument shall be supported with a device profile permitting direct integration in the PLC.
- B. The ENGINEER shall witness all instrument verifications in the field.
- C. Manufacturers Field Services are available for start-up and commissioning by a Factory field service representative or a manufacturer's authorized service provider (ASP) – the warranty against manufacturing defects is three years.
 1. Manufacturer representative shall verify installation of all installed flow tubes and transmitters.
 2. Manufacturer representative shall notify the ENGINEER in writing of any problems or discrepancies and proposed solutions.
 3. Manufacturer representative shall perform field verification at the time of installation for long-term analysis of device linearity, repeatability and electronics health. A comparative report shall be generated for each meter tested.
 4. Manufacturer representative shall generate a configuration report for each meter.

3.03 ADJUSTING

- A. Verify factory setup of all instruments in accordance with the Manufacturer's instructions.

3.04 PROTECTION

- A. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning.
 1. The ENGINEER shall be the sole party responsible for determining the corrective measures.

