

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 23 Section "Common Work Results for HVAC"

1.2 SUMMARY

- A. This Section includes
- B. Hydronic pumps and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. UL Compliance: Fabricate and label pumps to comply with UL 778, "Motor-Operated Water Pumps," for construction requirements.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.
- B. Store pumps in dry location.
- C. Retain protective covers for flanges and protective coatings during storage.
- D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.
- E. Comply with pump manufacturer's written rigging instructions.

1.7 COORDINATION

- A. Coordinate electrical power with Division 26.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Hydronic Pumps
 - 1. Taco
 - 2. Armstrong
 - 3. Bell & Gossett ITT
 - 4. PACO
 - 5. Grundfos
 - 6. Patterson
 - 7. Wilo

2.2 PUMPS

- A. Vertical Close Coupled Pump
 - 1. Pumps shall be Taco Model 1900 or approved equal. The pumps shall be single stage end suction rear pull out design. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as called for in the plans/schedules.
 - 2. Pump casing shall be a centerline discharge design constructed of ASTM A48 class 30 cast iron. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections.
 - 3. All casings shall be flanged connections.

4. The impeller shall be ASTM C87500 or C89833 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted with a holding taper and left handed 431 series stainless steel bolt. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.
5. The pump shall incorporate a dry shaft design to prevent the circulating fluid from contacting the shaft. The pump shaft shall be AISI 1045 carbon steel with field replaceable copper nickel 90-10 shaft sleeve. In order to improve serviceability and reduce the cost of ownership the shaft sleeve must be slip on (press on not allowable) and must be easily replaced in the field.
6. The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250°F. The pump shall be close coupled to a NEMA standard JM frame motor.
7. In order to both simplify and reduce the total cost of ownership, the manufacturer shall standardize on no more than three sizes of mechanical seals through out the entire range of the family of pumps. The manufacturer shall not use multiple part numbers for the same part.
8. Pump shall be fitted with integral Variable Frequency Drive fastened to adjustable mounting bracket. The integration of the drive shall be done in such a way that it will allow for either vertical drive orientation independent of vertical or horizontal pump orientation.
9. Factory prepackaging of drive shall include drive programming, motor rotation set, and pre-wiring with VFD shall be electrically connected to the pump motor. Connection wires to be routed via ½" Sealtite tubing with 45 degree Sealtite connectors.

B. Integral Variable Frequency Drive

1. Construction: Enclosure shall be rated for IP 20 and NEMA Type 1 with included conduit kit.
2. Application Data
 - a. The AC Drive shall be sized to operate a variable torque load.
 - b. The speed range shall be from a minimum speed of 1 Hz to a maximum speed of 200 Hz.
3. Environmental Ratings
 - a. The AC Drive shall meet IEC / EN61800-3, UL 1995 type 1 plenum rated, and RoHS
 - b. The AC Drive shall be designed to operate in an ambient temperature from -10 to 40 °C (+14 to 104 °F) without derating the drive, -10 to 50 °C (+14 to 122 °F) with derating the drive.
 - c. The storage temperature range shall be -25 to 70 °C (-13 to 158 °F).
 - d. The maximum relative humidity shall be 95%, non-condensing or dripping water. Compliant with IEC600068-2-3
 - e. The AC Drive shall be rated to operate at altitudes less than or equal to 3300 ft (1000 m). For altitudes above 3300 ft (1000 m), the AC Drive current should be derated 1% for every 330 ft (100 m) up to 6,600 ft (2,000 m).
 - f. IP54 environmental rating shall be available on certain models upon request. (See IP54 ratings) The top of the drive controller shall be IP21 and IP41.

- g. Pollution rating shall be 1 HP to 25 HP at 200/240 V, 1 HP to 5 HP at 380/480V: Pollution degree 2 per IEC / EN61800-5-1, 30 HP to 40 HP @ 200/240 V, 30HP to 100 HP @ 380/480 V: Pollution degree 3 per IEC / EN61800-5-1
- h. Vibration Resistance shall be 1.5mm to peak from 3 to 13 Hz, 1gn from 13 to 150 Hz, conforming to IEC/EN 60068-2-6.
- i. Shock resistance shall be 15 gn for 11 ms conforming to IEC/EN 60068-2-27

4. Ratings

- a. The AC Drive shall be designed to operate at 208 Vac \pm 10% or 230 Vac \pm 10% or 460 Vac \pm 10%.
- b. The AC Drive shall operate from an input frequency range of 50 to 60 Hz \pm 5%.
- c. The displacement power factor shall not be less than 0.96 lagging under any speed or load condition.
- d. The efficiency of the AC Drive at 100% speed and load shall typically be 95% or greater.
- e. The variable-torque rated AC Drive nominal full load current limit shall be not less than 110% for 60 seconds.

5. Protection

- a. Upon power-up, the AC Drive power converter shall automatically test for valid operation of memory, valid operation of pre-charge circuit, loss of communication, DC-to-DC power supply, and control
- b. The AC Drive power converter shall be protected against short circuits between output phases and also phase-to-ground.
- c. Upon loss of the analog process follower reference signal, the AC Drive power converter shall be programmable to display a detected fault condition signal.
- d. The output frequency shall be software enabled to fold back when the motor is in an overcurrent condition.
- e. The output switching frequency of the AC Drive power converter shall be selectable from 6 to 16 kHz. De-rating of the AC Drive power converter may be required if the factory setting is modified.
- f. The AC Drive power converter shall provide an auto reset feature which can provide up to 10 programmable reset attempts after a detected fault has occurred.
- g. Lead Length to be 50 meters max out to the motor without a choke.

6. Adjustments and Configurations

- a. The AC Drive power converter will be factory programmed to operate all specified optional devices.
- b. The acceleration and deceleration ramp times shall be adjustable from 0.1 to 3200 seconds.
- c. The AC Drive power converter configuration shall have provisions for an Energy Savings motor type.
- d. The AC Drive power converter shall have memory capability to retain and record drive operation and detected fault type for the past four faults.

7. Keypad Display Interface

- a. An operator interface shall offer the modification of AC Drive power converter adjustments through a keypad. All electrical values, configuration parameters, I/O assignments, application and activity function access, detected fault condition signals, local control, adjustment storage, and diagnostics shall be accessible.
- b. The AC Drive power converter software revision, output current, motor frequency, and motor voltage shall be readable through the drive display.

8. Operator Controls

- a. The control power for the digital inputs and outputs shall be 24 Vdc.
- b. The terminal block shall be used for all logic and analog signal connections to the power converter

9. Serial Communication: The AC Drive shall have serial communications capability for BACnet.

10. Harmonic Mitigation: Each drive shall include reduced harmonics technology to reduce power system harmonics.

2.3 PUMP SPECIALTY FITTINGS

- A. Pumps shall have a check valve and shutoff valve instead of the multi-purpose valve.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment foundations for compliance with requirements for installation. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

- A. Install pumps and equipment according to manufacturer's written instructions.
- B. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
- C. Pipe connections to pumps shall be made in such a manner so as not to exert any stress on pump housings. If necessary to meet this requirement, provide additional pipe supports and flex connectors.
- D. Pumps shall not be run dry to check rotation.
- E. Provide a single gage with three-input selector valve; locate at pump suction and discharge tappings, also strainer.

- F. Install electrical connections for power, controls, and devices. Electrical power and control wiring and connections are specified in Electrical Specification Sections. Ground equipment. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 COMMISSIONING

- A. Verify that pumps are installed and connected according to the Contract Documents.
- B. Verify that electrical wiring installation complies with manufacturer's written instructions and the Contract Documents.
- C. Start-test-check and commission in accordance with manufacturers recommendations.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps as specified below:
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
 - 2. Review data in maintenance manuals.

END OF SECTION 232123