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SPECIFICATIONS
BGe-1531XSP-100042 R1

Series e-1531X Smart Pump

DIVISION 23 – Heating, Ventilating, and Air-Conditioning (HVAC)
23 21 00 – Hydronic Piping and Pumps
23 21 23 - Hydronic Pumps

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Provide pumps and required system trim for heating, chilled water, and dual temperature water systems including all related appurtenances for a complete and operating systems.

1.02 SECTION INCLUDES

A. End Suction, Close Coupled Pump (Foot Mounted)

1.03 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including general and supplementary Conditions and Division 1 Specification Sections, apply to these Sections.

- Section *** - Alignment of Rotating Equipment
- Section *** - Cast-in-Place Concrete
- Section *** - Mechanical General Requirements
- Section *** - Supports, Anchors, and Sleeves
- Section *** - Motors and Starters
- Section *** - Drives
- Section *** - Mechanical Identification
- Section *** - Vibration Isolation
- Section *** - Piping Insulation
- Section *** - Equipment Installation
- Section *** - Hydronic Piping and Specialties
- Section *** - Testing, Adjusting, and Balancing
- Section *** - Meters and Gauges
- Section *** - Electrical

1.04 QUALITY ASSURANCE

A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

B. Ensure pump operation at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall confirm to the ANSI/HI 9.6.1-1997 standards for Centrifugal and Vertical Pumps for NPSH Margin.

C. Ensure pump pressure ratings are at least equal to system's maximum operating pressure at point where installed, but not less than specified.

D. Equipment manufacturer shall be a company specializing in manufacture, assembly, and field performance of provided equipment with a minimum of 20 years experience.

E. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump's balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the contractor and to the Engineer.

1.05 PRODUCT HANDLING

A. Protection: Use all means necessary to protect equipment before, during, and after installation.

B. Replacement and Repair: All scratched, dented, and otherwise damaged units shall be repaired or replaced as directed by the Architect Engineer.

1.06 REGULATORY REQUIREMENTS

A. Conform to Health/Life Safety Code for Public Schools

B. Conform to International Mechanical Code

C. Conform to BOCA National Building Code

D. Conform to BOCA National Fire Protection Code

E. Conform to State of Illinois Plumbing Code

F. Conform to National Electric Code NFPA 70

G. Conform to Illinois Accessibility Code

H. Conform to applicable ANSI/HI standards

I. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.07 SUBMITTAL

A. Submit each item in this article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Submit manufacturer's installation instructions under provisions of General Conditions and Division 1.

C. Product Data including certified performance curves and rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate pump's operating point on curves.

D. Complete Package information Product Data including:

- System summary sheet (where applicable)
- Sequence of Operation
- Shop drawing indicating dimensions, required clearances and location and size of each field connection
- Power and control wiring diagram
- System profile analysis including pump curves, system curve, and variable speed pump curves (where applicable)
- Pump data sheets - Rated capacities of selected models and indication of pump's operating point on curves.
- Submittals on furnished specialties and accessories
- Submittals must be specific to this project. Generic submittals will not be accepted

E. Hanging and support requirements should follow the recommendations in the manufacturer's installation instructions.

F. Each pump submittal shall detail the overall efficiency (wire-to-water efficiency) for the customer specified duty point and control head. Each submittal shall detail the pump-motor-drive input power requirements for the duty condition.

G. Pump and motor must meet minimum Department of Energy requirements and have a PEICL value less than 1.

1.08 OPERATION AND MAINTENANCE DATA

A. Submit Operation and Maintenance information under provisions of Division 15 "Mechanical General Requirements" and the provisions of the General Conditions and Division 1.

B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts lists.

C. Under provisions of commissioning documentation; testing of pumps, as well as training of owner's operation and maintenance personnel may be required in cooperation with the commissioning consultant.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in such a matter as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs if required for handling. Materials damaged by the elements should be packaged in such a matter that they could withstand short-term exposure to the elements during transportation.

B. Store materials in a clean, dry location protected from weather and construction traffic. Handle carefully to avoid damage.

1.10 WARRANTY

A. Provide a minimum One (1) year warranty on materials and installation under provision of Section 15010.

1.11 EXTRA MATERIALS

A. Provide one (1) set of mechanical seals for each model type of primary pump scheduled.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. The specifying engineer reserves the right to specify a primary supplier / lead spec manufacturer on all supplied schedule and specification documents. These primary suppliers have lead their respective industry in research and development and their products have had proven track records in the field. These primary suppliers, in the opinion of this engineering firm, produce a superior product to the alternately listed manufacturers. The contractor may choose to supply equivalent equipment as manufactured by the alternately specified manufacturer. This alternately specified equipment shall be supplied on a deduct alternate basis and based on the approval of the supplied alternate manufacturer's submittals.

B. The use of a primary supplier and deduct alternates protects the specifying engineer's design concept, but allows for a check-and-balance system to protect the post-commissioning owner.

2.02 END SUCTION CLOSED COUPLED PUMPS (FOOT MOUNTED)

A. The pumps shall be close coupled, foot mounted, single stage, end suction, vertical split case design, in stainless steel fitted construction. Suitable standard operations at 225 °F and 175 PSIG working pressure. The pump internals shall be capable of being services without disturbing piping connections.

B. The pumps shall have a solid SAE1144 steel shaft (or equal) that is integral to the motor. A non-ferrous shaft sleeve shall be employed to completely cover the wetted area under the seal.

C. The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.

D. Pump shall be equipped with an internally flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall have a brass housing, Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.

E. Pump shaft shall connect to a stainless steel impeller. Impeller shall be hydraulically and dynamically balanced, keyed to the shaft and secured by a stainless steel locking cap screw or nut.

F. Pump should be designed to allow for true back pull-out access to the pump's working components for ease of maintenance.

G. Pump volute shall be of a cast iron design for heating systems (or cast bronze for domestic water systems) with integrally cast pedestal volute support, rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. Volute shall include gauge ports at nozzles, and vent and drain ports.

H. hydrovar X motors shall meet scheduled horsepower, speed, voltage, and enclosure design in accordance with the nameplate values of the motor. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed coupled pump design. Motors shall meet NEMA specifications.

I. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall conform to the ANSI/HI 9.6.1-1997 standards for Centrifugal and Vertical Pumps for NPSH Margin.

J. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.

K. Pump manufacturer shall be ISO-9001 certified.

L. Each pump shall be factory hydrostatically tested and name-plated before shipment.

M. Pump and motor must meet minimum Department of Energy requirements and have a PEICL value less than 1.

2.03 ACCESSORIES

A. Where noted on schedule an EPR/Silicon-Carbide-Silicon Carbide (250F maximum operating temperature) seal should be used in lieu of the Buna standard seal (225F maximum operating temperature).

B. Where noted on schedule pumping equipment may require one or all of the following tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or Witnessed Tests.

C. Pumps shall be packaged with (2) pressure sensors and associated cabling. Pressure sensors shall be rated up to 100 PSIG and 300 PSIG for the inlet (suction) and outlet (discharge) pump connections respectively.

PART 3 - MOTOR

3.01 hydrovar X

General Performance and Design

A. The unit shall be coupled to a hydrovar X variable-speed, permanent magnet (non-rare earth) assisted reluctance (PMAREL) motor-drive.

B. The hydrovar X unit shall include provisions to disconnect the drive and motor independently. The motor-drive combination shall perform in accordance with the PDS (power drive system) values indicated on the unit motor nameplate and as outlined by IEC standards for IE5 and IES2 efficiencies.

C. The motor-drive unit mounting dimensions shall conform to the frame size and type indicated on the unit nameplate.

D. All hydrovar X units shall be rated for an environmental protection rating of NEMA 4/IP55 and working temperatures of -4 to 122°F (-20 to +50°C).

E. hydrovar X units shall be compatible with both 3-phase 50 Hz or 60 Hz supply and rated for either 200-240V (+/- 10%) or 380-480V (+/- 10%) ranges. The motor-drive combination will not require shaft grounding rings.

Drive Controls and Wiring

A. Units shall be fitted with a full-color HMI (human machine interface) display controlled by rubber button physical input controls.

B. hydrovar X units shall be compatible with Modbus RTU and BACNet MS/TP communication protocols.

C. Units shall be equipped with the ability to perform wireless communication via the Xylem X App.

D. The unit shall support up to (4) analog inputs, (5) digital inputs, (1) analog output, (2) relay outputs (Form C), and (1) 10V output supply. Supported analog input and output ranges are: 0-20 mA, 4-20 mA, 0-10V, and 2-10V.

E. hydrovar X units shall be equipped with (2) RS485 terminal block connections. The unit shall feature a removable gland plate of which the power supply opening is dimensioned for standard U.S. trade size conduit fittings.

F. hydrovar X units shall be capable of multi-pump controls up to (8) pumps in parallel and feature a suite of input-driven control programming options including pressure, flow, temperature, and level as well as quadratic and linear proportional pressure control.

G. hydrovar X units shall support the ability to operate at a user-defined fixed rotational speed (Actuator mode) without external input controls.

PART 4 - EXECUTION

4.01 INSTALLATION

A. All components shall be installed in accordance with manufacturer's installation instructions.

B. Pumps substitutions shall be provided with connection sizes equal to those scheduled. Pump connections shall not be downsized.

C. Pump substitutions shall not be provided at efficiencies less than those scheduled.

D. Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow.

E. Furnish and install triple duty valves on the discharge side of all pumps and furnish and install a line size shut-off valve on the suction side of all pumps. Anywhere that 5 straight pipe diameters of pipe can not be provided on the inlet side of a pump a suction diffuser shall be used to provide appropriate flow distribution into the eye of the pump's impeller.

F. Provide temperature and pressure gauges where and as detailed or directed.

G. On systems where pump seals require flushing water or cooling water for a heat exchanger kit. Provide cooling water supply piping and connections and well as the return piping, if required. Piping should be of adequate size to pass required flow rate.

H. Proper access space around a device should be left for servicing the component. No less than the minimum recommended by the manufacturer.

I. Provide an adequate number of isolation valves for service and maintenance of the system and its components.

J. Circulating pump shall have sufficient capacity to circulate the scheduled GPM against the scheduled external head (feet) with the horsepower and speed as scheduled and/or as denoted on the drawings. Motors shall be of electrical characteristics as scheduled, denoted and/or as indicated on the electrical plans and specifications. Pump characteristics shall be such that the head of the pump under varying conditions shall not exceed the rated horsepower of the drive motor.

K. On systems where the final balancing procedure requires the triple duty valve to be throttled more than 25% to attain design flow (on a constant speed pumping system), and no future capacity has been built in to the pump the pump impeller must be trimmed to represent actual system head resistance. The pump provider and engineer of record, based on the balancing contractor's reports, shall determine the final impeller trim diameter.

L. Mounting of vertical turbine pump motors (shipped loose) shall be the responsibility of the contractor. The motors shall be field mounted in accordance with manufacturer's installation instructions.

M. Install foot mounted and base mounted pumps on vibration isolation pad or house keeping pad, via anchor bolts. Set and level and grout in place.

N. All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any loads or stresses being applied to the connections or piping. All piping shall be fitted to the pumps even though piping adjustments may be required after the pipe is installed.

O. On components that require draining, contractor must provide piping to and discharging into appropriate drains.

P. Provide drains for bases and seals, piped to and discharging into floor drains.

Q. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturers instruction and applicable state, federal, and local codes.

R. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the controls contractor. All wiring shall be performed per manufacturers instructions and applicable state, federal, and local codes.

4.02 DEMONSTRATION

A. The system manufacturer or factory-trained representative shall provide start-up of the any packaged pumping system. This start-up shall include verification of proper installation, system initiation, adjustment and fine-tuning. Start-up shall not be considered complete until the sequence of operation, including alarms, has been sufficiently demonstrated to the owner or the owner's designated representative. This jobsite visit shall occur only after all hook-ups, tie-ins, and terminations have been completed. A start-up reports outlining factory provided start-up and equipment performance shall be provided to the Architect/Engineer after it completion.

B. Manufacturer's trained representative shall provide on-site training for any packaged systems for the owner's designated personnel. The training shall fully cover maintenance and operation of all system components.

C. Four (4) copies of the maintenance and operation manuals for all HVAC system components shall be submitted to the Architect/Engineer.

D. The system manufacturer must have complete HVAC training program available for owner's personnel. The training sessions shall take place at the manufacturer's facility and shall cover all aspects of HVAC system design, service, and operation.

END OF SECTION

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