**Design Envelope 4280 IVS Sensorless**

File No: 100.194

Date: April 24, 2018

Supersedes: New

Date: New

Typical Specifications

Close-Coupled End Suction Pumps with Integrated Controls

1. Supply and install as shown on plans and specifications, Armstrong Series 4280 Design Envelope pumps. The pumps shall be single stage, end suction design with integrated controls. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as outlined in the plans and specifications. The complete pump unit shall be labeled with ETL listing certification that the product conforms to UL Std 778 and is certified to CSA Std C22.2 No.108.
2. Pump casing shall be constructed of ASTM A48 class 30 cast iron with ANSI 125 / PN16 flanges for working pressure below 175 psig (12 bar) at 150°F (66°C) and ASTM A536 ductile iron with ANSI 250 / PN25 flanges for working pressures to 375 psig (25 bar) at 150°F (66°C). The casing shall be hydrostatically tested to 150% maximum working pressure. The casing shall be radially split to allow removal of the rotating element without disturbing the pipe connections. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the suction connection to allow for the installation of a seal flush line.
3. The impeller shall be bronze, fully enclosed type. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. Two-plane balancing is required where installed impeller diameter is less than 6 times the impeller width.
4. The pump shaft shall be carbon steel with bronze shaft sleeve.
5. The pump shall be fitted with a single spring inside type mechanical seal, with EPDM elastomers and resin-bonded carbon vs. sintered silicon carbide faces rated up to 250°F (121°C).
6. The pump shall be close coupled to a NEMA JM or JP frame motor. Motor enclosure shall to be ODP or TEFC with NEMA Premium Efficiency 12.12 rating. Acceptable motor insulation for variable speed operation is NEMA MG-1 Part 31.
7. The integrated controls shall be rated UL Type 12 and be an integral component of the pumping unit with a 5 hp motor, TEFC, 460/3/60.
8. The integrated controls shall be of the VVC-PWM type providing near unity displacement power factor (cos Ø) without the need for external power factor correction capacitors at all loads and speeds. The controls shall incorporate DC link chokes for the reduction of mains borne harmonic currents and to reduce the DC link ripple current thereby increasing the DC link capacitors lifetime. RFI filters will be fitted as standard to ensure the controls meets low emission and immunity requirements.
9. The integrated controls and motor protection shall include: motor phase to phase fault, motor phase to ground fault, loss of supply phase, overvoltage, under-voltage, motor over-temperature, inverter overload, over-current.
10. The integrated controls shall have the following additional features:
11. Sensorless override for BAS/BMS control signal
12. Manual pump control or closed loop PID control
13. Programmable skip frequencies and adjustable switching frequency for noise and vibration control
14. Auto alarm reset
15. Analog I/O: Two current or voltage inputs minimum, one speed output
16. Digital I/O: Two inputs programmable, Two programmable outputs
17. One RS485 port for serial communications to building management systems
18. Two programmable pulse inputs
19. Two programmable relay inputs
20. Standard serial communication protocols BACnet MS/TP (default), BACnet IP, Modbus RTU

**Environmental Ratings:**

1. Temperature: 14°F to 113°F up to 3300 ft (-10°C to 45°C up to 1000 m)
2. Max Relative Humidity: 0 to 95%
3. Where selected, pump shall have the Sensorless Bundle which includes Sensorless control, Flow Readout, Constant Flow, and Constant Pressure functionality. Sensorless control shall provide automatic speed control in variable volume systems without the need for pump mounted (internal/external) or remotely mounted differential pressure sensor. The default operating mode under Sensorless control shall be Quadratic Pressure Control (QPC) whereby head reduction with reducing flow will be according to a quadratic control curve, the head at minimum flow being 40% of the design duty head. Control mode setting and minimum/maximum head setpoints shall be user adjustable via a built-in programming interface. Flow Readout shall provide a readout of the calculated flow rate on pump user interface, as well as to a BAS if connected. Constant Flow control shall maintain the desired flow rate at varying pressures. Constant Pressure control shall maintain the desired pressure at varying flow rates.
4. If the quantity of pumps in a system is 2 to 4-maximum, including any standby, a Sensorless controller shall be added to a pumping unit and set up at the factory to operate in parallel Sensorless mode. The pump controls, which will be linked on site by the control contractor, will automatically stage the units, as appropriate, to maintain the best efficiency pumping and minimum operating cost. The standby unit will be brought into the rotation to exercise and equalize wear. The sequence of controls and staging points will be submitted to the engineer for approval at the time of order.
5. If the Energy Performance Bundle is selected, Auto-Flow Balancing and Maximum Flow Control functions shall be included to optimize pump performance to site conditions for systems where pumps are generally oversized. The Energy Performance Bundle is only available if the Sensorless Bundle is enabled. Auto-Flow Balancing shall automatically determine the control curve between the design flow at the on-site system head, and the minimum (zero-flow) head that will typically be lowered (reset). The Maximum Flow Control shall limit pump flow rate to a pre-set maximum for system equipment stability and resulting energy savings.
6. If the Protection Bundle is selected, it shall protect flow sensitive equipment by setting minimum limits on the pump operation through the Minimum Flow Control and Bypass Valve Control functions. The Protection Bundle is only available if the Sensorless Bundle is enabled. The Minimum Flow Control shall limit the pump flow rate to a pre-set minimum to protect equipment in the system from damage. The Bypass Valve Control can actuate a 2-way bypass valve to protect flow sensitive equipment, bypassing the loads and re-circulating flow back to flow sensitive equipment, if the pre-set minimum flow rate is reached.
7. If selected the Zone Optimization Bundle is designed for multi-zone HVAC systems where [max 2] system differential pressure (DP) feedback sensors are required for circulating pump speed control and zone flow stability. The system pump controls will ensure each sensor setting is maintained with as little over-pressure as possible.
8. If selected, the Dual Season Setup allows the heating and cooling parameters to be pre-set for pumps in 2-pipe systems for quick and convenient changeovers.
9. If On-Site Pump Commissioning is selected, an Armstrong representative shall assist in setting up pump communication to the BAS (does not include physical wiring), adjust the pump parameters to on-site conditions, perform warranty registration of pumps, and set up the router and connection of multiple pumps to the network and internet.
10. Pump Manager – a performance management service (under the industry category of automated fault detection and diagnostics) to remotely and automatically track and help manage pump performance with analytic and diagnostic alerts, web accessible trends and automated reports available to the building end user/owner. Pump Manager helps sustain optimal performance and efficiency, minimize unexpected failures and provide predictable maintenance costs. An option for a discount on Extended Warranty for the corresponding pumps is available with a Pump Manager subscription. Available in yearly increments. This service requires an active internet connection. Building owners are to go to www.armstrongfluidtechnology.com/pump-manager to activate.