

Delta P Carver Master Specification

May 2024

for

Delta Pak Vertical Multi-Stage and End Suction Packaged Pressure Booster System

SYSTEM:

The booster system shall meet the requirements of **NSF ANSI 61/372** and be “**Buy American Act**” **compliant**. The control panels shall be **UL 508A Certified**. The booster system shall operate under the following conditions:

- Total system flow required: GPM
- System pressure set point: PSI
- Power source (voltage, phase, frequency):
- Redundancy required (% of total system flow per pump):
- Number of pumps per system:
- Available Suction Pressure (min and max): PSI

PUMPS:

Vertical Multi-Stage pumps or End Suction close coupled centrifugal pumps with **304 stainless steel impellers** and diffusors shall be provided. The pumps shall be sized to meet the following requirements:

- Flow rate per pump: GPM
- TDH (system pressure set point – min suction pressure): FT'
- Pump motor power: HP

MOTORS:

If the pump does not have a thrust bearing the motor shall have High Thrust bearings. The motor shall be of two pole design. The motors shall be Premium Efficient, inverter duty with Class F insulation and TEFC enclosures. The motor shall have a 1.15 service factor at rated horsepower.

MOUNTING FRAME COMPONENTS:

The entire system shall be mounted on a **stainless-steel support frame**.

VALVES:

Isolation valves shall be provided for the inlet and discharge of each pump. These valves shall be **lever-operated lug style butterfly valves**. Valve bodies shall be rubber lined ductile iron or stainless. Valve discs shall be stainless or nylon coated ductile iron disc and ethylene-propylene fitted stainless steel shaft. Valves must be rated for maximum system pressure.

Each pump shall be provided with a **non-slam type check valve** between the pump discharge and its isolation valve. Check valves shall be all stainless steel, stainless steel fitted with epoxy coated ductile iron bodies or glass reinforced composite.

CONTROL PANEL:

The pumping system control panel shall incorporate the following:

1. The pump controller, and all its components including variable frequency drives up to 15hp on 208/230v and 30hp on 460v, shall be housed in a NEMA 1, UL listed, ventilated, control enclosure. Variable frequency drives over 15hp on 208/230v and 30hp on 460v shall be separately mounted on the frame. The controller shall have a main power disconnect switch, with enclosure door interlock, which disconnects main power before the control cabinet may be opened. All power, primary and secondary, shall be de-activated when opening the main disconnect switch.
2. The controller shall be constructed of UL listed components including primary and secondary power components, and shall be UL 508A listed, "INDUSTRIAL CONTROL PANELS". The controller shall be "Touch Safe" with no barehanded shock hazards. All secondary control circuit wiring shall be 24 volts, AC/DC, or less, including all pilot lights, selector switches, panel meters, and alarm devices. The primary motor branch circuits shall have manual motor protectors for systems up to 15 HP on 208/230V and 30 HP on 460V systems. Fuses shall not be acceptable. For systems above these horsepowers, the VFD manufacturers fusing guidelines will be followed for branch circuit over current protection.
3. The controller shall utilize a programmable 24-volt central processing unit, with removable memory card to control all pump staging, and timing functions. The processing unit shall also provide contact closure for Low Suction Cut-off, High System pressure, Secondary High system pressure, and Over Temperature alarms. All alarm conditions shall have audible and visual indicators, with timed delayed "proof of condition" automatic reset. (Must meet ASHRAE 90.1 Requirements)
4. The controller shall have the following standard features:
 - Main power un-fused, door interlocked disconnect switch.
 - Individual suction and system pressure gauges, glycerin filled, panel mounted, stainless steel.
 - 2 analog and 6 digital inputs suitable for sensors and switches
 - Illuminated 5.7" TFT color touch screen operator interface with 240x100 resolution, 65,536 colors and 128kb of internal memory minimum.
 - Low suction condition shall be initiated via a pressure transducer, (for pressure feed systems), or a submersible level pressure transducer (for break tank operation).
 - Surge Arrestor
 - BACnet (both TCP/IP and MS/TP options)
 - Dry Contacts for fault monitoring
 - Power supply shall be 60-100W minimum 24 volt AC/DC.

Note: The system shall be designed with standard components that are not proprietary to the manufacturer.

PUMP SEQUENCING:

Pump sequencing shall be controlled by the central processing unit. The central processing unit shall initiate the lead pump when the system pressure drops below the pressure set point and shall run at the minimum speed necessary to satisfy demand. Lag pumps shall be initiated sequentially if the operating pump(s) reaches the maximum frequency and the pressure set point is not satisfied after a variable time delay. After the pressure set point is reached, the pumps shall continue to run for a variable Off Delay period to prevent short cycling of the pumps. After all pressures have been satisfied, and all functions have timed out, the system shall sequentially shut down pumps as minimum frequency is reached and finally revert to the stand-by mode when the final operating pump is shut down. The central processing unit shall provide alternation between equally sized pumps to ensure equal run time. (Must meet ASHRAE 90.1 Requirements)

PUMP THERMAL RELIEF:

Provide thermal actuated relief valve to prevent pumps from overheating due to deadheading condition. The protective device shall be set no higher than 140 degrees F.

BLADDER TANK:

No bladder tank is required for this system.

PRESSURE REGULATION:

The central processing unit shall provide pressure regulation, via a reference pressure transducer and PID control, by adjusting pump speeds through individual variable frequency drives. No other pressure regulator valves shall be required. In the event of a drive failure, the next drive in the sequence shall start automatically and the failed drive shall indicate a fault condition. In the event of a loss of transducer signal, the system shall be programmed to enter a "fail-safe mode" which will ramp pumps to a safe-speed and maintain positive pressure on the system piping without shutting the system down. Failure of the major control components shall not compromise the building pipe pressure ratings. The system shall have automatic building piping system failure sensing and shut down. The system shall have an autofill feature that prevents potential water hammer damage when filling the building piping system on initial startup after draining the system.

MANIFOLD DESIGN AND FABRICATION:

All manifolds, nipples, and welded attachments to the manifolds shall be of type 304 stainless steel materials. Piping shall be sized to limit fluid velocities to under 11 feet per second under rated flow conditions. Manifolds shall be provided with roll groove flange connections for piping attachment during installation. Manifolds shall be designed to allow location of the piping attachment on either side of the package during installation.

All welding shall be in accordance with Section IX of the ASME Boiler and Pressure Vessel code. All welding on stainless steel piping shall be back-purged with inert gas during the entire welding procedure. Welds shall be cleaned and passivated before final assembly.

TESTING:

The completed system shall be hydrostatically tested to a minimum of 1.5 times the specified system working pressure for duration of 30 min.

Completed units shall be subjected to a performance test. All control functions shall be verified by test for proper operation. Each pump shall be tested from shut off conditions to specified flow and pressure. Suction pressure, discharge pressure, flow rate and power shall be recorded per Hydraulics Institute test standards. A copy of the standard test plan and completed test report shall be provided to the purchaser upon request. An unfiltered sound level test shall be completed at low flow and rated condition.

START-UP:

A factory certified technician shall perform initial start-up and owner training. A certified start-up report shall be provided to the owner.

PARTS:

A complete listing of parts and equipment for the system shall be provided.

WARRANTY, AND FACTORY AUTHORIZED SERVICE:

The manufacturer's standard warranty shall be provided for 36 months the date of shipment.

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