BOOSTER PUMP CONTROL VALVE

INTRODUCTION

This specification covers the design, manufacture, and testing of 2-1/2 in. (65 mm) through 8 in. (200 mm) Control Valves

PART 1 - GENERAL

1. Standard products - use the same manufacturer for multiple units of same type.

2. "Tying" of equipment into packages for the purpose of thwarting competition shall be considered to be in non-compliance with these specifications.

3. Manufacturers shall price items under different subsections or sections separately.

PART 2 - PRODUCTS

2.01 BOOSTER PUMP CONTROL VALVE

A. FUNCTION

The Booster Pump control valve is designed for installation on the discharge of booster pumps to eliminate starting and stopping surges caused by the normal stopping and starting of the pump. The valve shall be equipped with a built-in lift type check feature to prevent reverse flow, operating independently of the solenoid control. On pump start up, the pump starts against the closed booster pump control valve. When the pump is started, the solenoid control is simultaneously energized and the pump control valve begins to open slowly, at a rate controlled by an opening speed control. Line pressure is gradually increased to full pumping head. When the pump is signaled to shut-off, the solenoid control is first de-energized and the pump control valve begins to close slowly, at a rate control by a closing speed control. Flow is gradually reduced while the pump continues to run. When the pump control valve is nearing the fully closed position and flow rate is almost zero, a limit switch assembly affixed to the cover of the pump control valve, which serves as an electrical interlock between the valve and the pump, releases the pump starter and the pump stops. Should a power failure occur while the pump is running, a built-in lift-type check valve closes the moment flow stops, preventing reverse flow regardless of solenoid or diaphragm assembly position.

B. MATERIALS

1. Material Specification for the Basic Hydraulic Powercheck Control Valve as follows:

Component	Material
Body, Cover and Power Unit	Ductile Iron-ASTM A536 *Cast Steel or Bronze (optional)*
Main Valve Trim	Stainless Steel *Other Materials Available (optional)*
Seat	Stainless Steel *Other Materials Available (optional)*
Stem, Nut and Spring	Stainless Steel
Seal Disc	Buna-N® Rubber
Diaphragm	Nylon Reinforced Buna-N® Rubber *Other Materials Available (optional)*
Internal Trim Parts	Stainless Steel: Bronze; Brass
End Detail	Flanged (2-1/2” – 8”) Threaded (2-1/2” – 3”) Grooved (2-1/2” – 8”)
Pressure Rating	Class 150 lb. (250psi Max.)

	Class 300 lb. (400psi Max.)
Temperature Range	Water to 180°F
Any other wetted metallic parts	Stainless Steel; Bronze; Brass
Coating	Fusion Bonded Epoxy Coating (Interior and Exterior); ANSI / NSF 61 Approved / AWWA coating specifications C116-03.
Optional Accessories	*Gauges, Anti Cavitation Trim, Etc.*

C. MANUFACTURE

1. Main Powercheck Valve:

   a. The Main Powercheck valve shall be hydraulically operated, single diaphragm actuated, globe or angle pattern. The valve shall consist of four major components; the body with seat installed, the cover with bearing installed, the intermediate chamber with bearing installed and the diaphragm assembly. The upper diaphragm assembly and lower disc retainer assembly shall be the only moving parts. The diaphragm shall form a seal between the cover chamber and the intermediate chamber. The main valve shall consist of two distinct operating chambers that are detachable and completely independent of the flow through the main valve body. An O-ring seal in the intermediate chamber shall separate operating pressure from line pressure. The two piece stainless steel valve stem shall be guided by two bearings; one located in the cover and one in the intermediate body. When a pressure reversal occurs, the valve will immediately close, preventing reverse flow thru the valve. The split stem design will allow the lower disc retainer assembly to check closed regardless of the upper diaphragm position. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. Y-pattern valves shall not be permitted. The Main Powercheck valve shall comply with NSF/ANSI Standard 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.

2. Main Valve End Connections:

   a. End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150 or Class 300 (2-1/2” thru 8”) or Threaded End Connections (2-1/2” and 3”) or Grooved End Connections (8”).

3. Main Valve Body:

   a. No fabrication or welding shall be used in the manufacturing process.

   b. The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three and one half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the discs firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hours-glass shaped disc retainers shall be permitted and no V-type or slotted-type disc guides shall be used.

   c. The diaphragm assembly containing a two piece non-magnetic 303 stainless steel stem; of sufficient diameter to withstand high hydraulic pressures and shall be fully guided through its complete stroke by a removable bearing in the valve cover and a removable bearing in the intermediate power unit body. The valve shall be capable of modulating between a fully open and tightly closed position, unless a static condition or pressure reversal occurs, in which case the valve shall close to prevent reverse flow, regardless of diaphragm position. The upper stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The valve seat shall be a solid, one-piece design and shall have a minimum five-degree taper on the seating surface for a positive, drip-tight shut off. The diaphragm assembly shall be the only moving part and shall form two sealed chambers in both the upper and lower portion of the valve, separating the operating pressure from the line pressure. No bolts or cap screws shall be permitted for use in the construction of the diaphragm assembly.

d. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm's center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 X per layer of nylon fabric and shall be cycled tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body, power unit body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position.

e. The main valve seat, stem bearing in the power unit body and main valve cover shall be removable. The cover bearing and seat in the 6" and smaller size valve shall be threaded into the cover and body. The valve seat in the 8" and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained held within the power unit body. To insure proper alignment of the valve stem, the valve body, power unit body and cover shall be machined with a locating lips. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc retainer and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. The valve shall be designed such that both the cover assembly and internal diaphragm assembly can be disassembled and lifted vertically straight up from the top of a narrow opening/vault. Y-pattern valves shall not be permitted. The seat shall be of the solid one piece design. Two piece seats or seat inserts shall not be permitted. Packing glands and/or stuffing boxes shall not be permitted.

4. Pilot Control System:

a. The pilot control system shall include an externally mounted, direct acting, four-way solenoid operated pilot valve, controlled by an external electrical power source. The pilot system shall control the valve by alternately applying pressure to either of the two control chambers of the main valve to open and close it when signaled as shown by the electrical interlock wiring diagram.

b. Solenoid pilot to be manufactured by control valve manufacture.

c. The pilot control system shall include a strainers, shut-off cocks, manual operators, shuttle valve and all required control accessories, equipment, control tubing and fittings. The pilot system shall include adjustable opening and closing speed control needle valves, utilized to prevent surging of the system on start-up and shut-down.

d. The pilot control system shall include an adjustable limit switch assembly mounted on the main valve, connected to the main valve stem. It shall be actuated by opening or closing of the valve and easily adjusted to operate at any point of the valve's travel. The limit switch will be used to complete the pump off cycle. The actuating point of the limit switch shall be adjustable.

5. Material Specification for Pilot Control:

Component	Material
Housing	Cast Aluminum and Bronze
Pilot Trim	Stainless Steel & Monel
Seals and Disc	Buna-N
Coil Insulation	Class A (molded)
Connections	FNPT
Pressure rating	300 psi Max.
Temperature Range	AC: Water to 150°F Max. DC: Water to 104°F Max.
Power Supply	120VAC / 60 Hz (standard) *Other AC Voltages (optional)* *Other DC Voltages (optional)*
Enclosure	NEMA Type 1, General Purpose, Watertight (standard) *Other NEMA Types, including Explosion proof (optional)*
Manual Operator	Brass (standard)

Control Tubing	Copper (standard) *Stainless Steel (optional)* *Flexible Braided Stainless Steel (optional)* *Polyethylene (optional)*
Control Fittings	Brass (standard) *Stainless Steel (optional)*

6. Factory Assembly:

   a. Each control valve shall be factory assembled.

   b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008.

   c. For all control valves, the factory assembly shall include the complete main valve, pilot valve(s), and all associated accessories and control equipment.

   d. During factory assembly the control valve manufacture shall make all necessary adjustments and correct any defects.

7. Nameplates:

   a. Each Control Valve and associated pilot(s) shall be provided with an identifying nameplate.

   b. Nameplates, depending on type and size of control valve, shall be mounted in the most practical position possible, typically on the inlet side of the valve body.

   c. Nameplates shall be brass and a minimum of 3/32” thick, ¾” high and 2-3/4” long.

   d. Pertinent control valve data shall be etched or stamped into the nameplate. Data shall include control valve Catalog number, function, size, material, pressure rating, end-connection details, type of pilot controls used and control adjustment range.

8. Factory Testing:

   a. Each control valve shall be factory tested.

   b. The Quality Management System of the factory shall be certified in accordance with ISO 9001: 2008

   c. Tests shall conform to approved test procedures.

   d. The standard factory tests shall include a valve body and cover leakage test, seat leakage test and a stroke test. Control valves and pilot valves, in the partially open position, with both ends closed off with blind flanges (valves) and pipe plugs (pilots), shall be subject to an air test. The applied air pressure shall be 90 psi minimum. All air pressure tests shall be applied for a minimum of 15 minutes. No visible leakage is permitted through the valve seat, the pressure boundary walls of the valve body, valve cover, pilot body, pilot cover or the body-cover joint.

   e. Control valve manufacturer shall, upon request, offer additional testing, such as high pressure hydrostatic testing, positive material inspection testing, ferrite testing, liquid penetration inspection testing, magnetic particle examination testing and radiographic examination testing.

D. PRODUCT DATA

1. The following information shall be provided:

   a. Control Valve manufacturer’s technical product data.

   b. Control Valve manufacturer’s Installation, Operation and Maintenance manual (IOM).

2. Provide specific information on all optional features specified above and confirm that these items are provided.

3. The valve manufacturer shall be able to supply a complete line of equipment from 2” through 36” sizes and a complete selection of complementary accessories and equipment.

4. The control valve manufacture shall provide a computerized cavitation analysis report which shows flow rate, differential pressure, and percentage of valve opening. Cv factor, system velocity, and if there will be cavitation damage.

PART 3 - EXECUTION

A. DELIVERY, STORAGE AND HANDLING

1. Delivery

   a. The Manufacture shall deliver the control valves to:

      Address, City, State, Zip. Attention: Phone number:
      Call 48 hours prior to delivery.

   b. Upon delivery, control valves to be unloaded and stored by the

      Owner, district or municipality.

2. Packing and Shipping

   a. Control valves specified herein shall be factory assembled. Any control valve appurtenances, accessories, parts and assemblies that are shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field.

   b. Care shall be taken in loading, transporting and unloading to protect control valves, appurtenances, or coatings from damage. Equipment shall not be dropped. All control valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage(s) shall be repaired.

   c. Prior to shipping, the control valves and all associated accessories shall be acceptably packaged and covered to prevent entry of foreign material.

   d. All packaged control valves shall be shipped, remain covered and stored on site until they are installed and put into use.

B. FIELD TESTING

1. A direct factory representative shall be made available by the equipment supplier for start-up service, inspection and necessary adjustments.

The Control Valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.

The control valve shall be **CLA-VAL Company Model No. 60-11,** Booster Pump Control Valve, as manufactured by Cla-Val Co., Newport Beach, CA 92659-0325.

END OF SECTION