BERMAD Waterworks

700 Series
Model 743

Booster Pump Control and Pressure Sustaining Valve

Active Check Valve

- Isolates system from the effects of pump starts and stops for:
  - Solitary single speed pumps
  - Battery of single speed pumps (add & switch)
  - Battery of variable speed pumps (add)
- Pump overload and cavitation protection
- Controlled pipeline fill-up

The Model 743 Booster Pump Control & Pressure Sustaining Valve is a hydraulically operated, diaphragm actuated active check valve that opens or shuts off in response to electric signals. It isolates the pump from the system during pump starting and stopping, to prevent pipeline surges. While open, it sustains minimum discharge pressure regardless of fluctuating flow.

Features and Benefits

- Line pressure driven
  - Independent operation
  - No motor required
  - Long term drip tight sealing
- Solenoid controlled
  - Low power consumption
  - Low cost wiring
  - Wide ranges of pressures and voltages
  - Normally Open or Normally Closed
- Check feature (spring loaded type)
  - Replaces line sized check valve
  - Fail-safe mechanical closure
- In-line serviceable – Easy maintenance
- Double chamber design
  - Non-slam opening and closing characteristic
  - Protected diaphragm
- Balanced seal disk – High flow capacity

Major Additional Features

- Pump differential pressure sustaining – 743-06
- Electronic control – 743-18
- Pressure sustaining & Pressure reducing – 743-2Q

See relevant BERMAD publications.
**Sequence of Operation (Normally Open Type)**

The Model 743 is a pilot controlled valve equipped with an adjustable, 2-Way pressure sustaining pilot (optional with sealed spring cell), a 2-Way solenoid pilot (optional 3-Way), a limit switch and check valves. Two optional solenoid control circuits are available:
- 2-Way solenoid (see explanations & drawings below)
- 3-Way solenoid, controlling the pressure sustaining pilot sealed spring cell

**Pump Starting Procedure**
The needle valve [1] continuously allows flow from the valve inlet into the upper control chamber [2]. Prior to pump start, the valve is hydraulically closed although electrically open. As pump starts, valve upstream pressure builds and rises above the system static pressure, causing opening hydraulic forces to rise. The upper control chamber pressure is released to valve outlet through the pressure sustaining pilot [3] and the de-energized solenoid [4], allowing the valve to gradually open. If as a result of valve opening, the discharge pressure drops to pilot setting, the pressure sustaining pilot throttles causing the main valve to throttle, and sustaining upstream pressure at pilot setting.

**Pump Stopping Procedure**
In pumping systems with standard check valves, the shut-down command is issued directly to the pump, abruptly shutting it down.
In systems with “active check valves”, the shut-down command is issued to the BR740-E electronic controller [5] which energizes the solenoid. The solenoid then closes, stopping release of pressure from the upper control chamber, gradually closing the main valve. As the indictor collar [6] moves down, it activates the limit switch [7], signaling the controller to shut down the pump. After a preset time delay, the controller de-energizes the solenoid and resets the limit switch command, allowing the pump to start when next signaled. The valve remains hydraulically closed and electrically open.

**Power Failure - Spring Loaded, Zero Velocity Non-Return Valve**
If electric power fails during pumping, the upstream pressure immediately drops causing the hydraulic forces acting on the diaphragm assembly [8] and closure [9] to balance. The spring [10] then breaks this balance, closing the valve before the flow can change direction. Once the main valve has closed, the check valve [11] allows downstream pressure into the upper control chamber while the check valve [12] traps it, resetting the main valve for the next pump starting process.
Typical Applications

Network Over Demand

Network demand is greater than pump design specifications:
- During empty pipeline filling
- During over demand by consumers
- When the pump pressure specification is much higher than system resistance

Any of these factors might cause pump overload and cavitation damage.

The Model 743, by adding a pressure sustaining feature to the Booster Pump Control Valve, ensures that the pump operates within design specifications protecting both the pump and the system.

BR 740-E Electronic Controller

The BR 740-E coordinates between all system components to eliminate surges from the system. This controller provides built-in operating modes that can be selected on-site. These modes are based on accumulated know-how to prevent errors that might occur during on-site programming.

Engineer Specifications

The Pump Control & Pressure Sustaining Valve shall open or shut off in response to electric signals. It shall isolate the pump from the system during pump starting and stopping, to prevent pipeline surges. While open, it shall sustain minimum discharge pressure regardless of fluctuating flow.

**Main Valve:** The main valve shall be a center guided, diaphragm actuated, globe valve of either oblique (Y) or angle pattern design. The body shall have a replaceable, raised, stainless steel seat ring. The valve shall have an unobstructed flow path, with no stem guides, bearings, or supporting ribs. The body and cover shall be ductile iron. All external bolts, nuts, and studs shall be Duplex® coated. All valve components shall be accessible and serviceable without removing the valve from the pipeline.

**Actuator:** The actuator assembly shall be double chambered with an inherent separating partition between the lower surface of the diaphragm and the main valve. The entire actuator assembly (seal disk to top cover) shall be removable from the valve as an integral unit. The stainless steel valve shaft shall be center guided by a bearing in the separating partition. The replaceable radial seal disk shall include a resilient seal and shall be capable of accepting a V-Port Throttling Plug by bolting.

**Control System:** The control system shall consist of a solenoid pilot, an adjustable, direct acting, 2-Way pressure sustaining pilot, two check valves (for 12” valves and larger, an additional check valve), a limit switch, two isolating cock valves, and a filter. All fittings shall be forged brass or stainless steel. The assembled valve shall be hydraulically tested.

**Quality Assurance:** The valve manufacturer shall be certified according to the ISO 9001 Quality Assurance Standard. The main valve shall be certified as a complete drinking water valve according to NSF, WRAS, and other recognized standards.
**Technical Data**

**Dimensions and Weights**

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<th>Size</th>
<th>A (inch)</th>
<th>B (inch)</th>
<th>C (inch)</th>
<th>L (inch)</th>
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<td>345</td>
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Data is for Y-pattern, flanged, PN16 valves.

**Main Valve**

- **Valve Patterns**: "Y" (globe) & angle
- **Size Range**: 1/8–32" (40-800 mm)
- **End Connections (Pressure Ratings)**:
  - Flanged: ISO PN16, PN25 (ANSI Class 150, 300)
- **Threaded**: BSP or NPT
- **Others**: Available on request
- **Working Temperature**: Water up to 80°C (180°F)
- **Standard Materials**:
  - Body & Actuator: Ductile Iron
  - Internals: Stainless Steel, Bronze & coated Steel
  - Diaphragm: NBR Nylon fabric-reinforced
  - Seals: NBR
- **Coating**: Fusion Bonded Epoxy, RAL 5005 (Blue)
  - NSF & WRAS approved or Electrostatic Polyester Powder, RAL 6017 (Green)

**Control System**

- **Standard Materials**:
  - Body: Brass, Bronze or Stainless Steel
  - Elastomers: NBR
- **Solenoil Standard Materials**:
  - Body: Brass or Stainless Steel
  - Elastomers: NBR or FPM
- **Solenoil Electrical Data**:
  - Voltages: (ac): 24, 110-120, 220-240, (50-60 Hz) (dc): 12, 24, 110, 220
  - Power Consumption: (ac): 30 VA, inrush; 15 VA (8W), holding
  - (dc): 8-11.6W
- **Values might vary according to specific solenoil model**
  - For pressure sustaining pilot valve selection table, refer to Model 730.

**How to Order**

Please specify the requested valve in the following sequence: (for more options, refer to Ordering Guide)

- **WW**
- **Size**
- **Primary Feature**
- **Additional Feature**
- **Pattern**
- **Body Material**
- **End Connections**
- **Coating**
- **Voltage & Position**
- **Tubing & Fittings**
- **Additional Attributes**

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**Solenoid Selection**

- **Valve Pressure Rating**
  - 2-Way
  - 3-Way
  - PN 16
  - PN 25

- **BR 740-E Controller**
  - Supply voltage: 110, 230 Vac 50/60 Hz
  - Power consumption: <8 VA
  - Solenoil circuit fuse: 2A (Internal)
  - Pump control circuit fuse: 1A (Internal)
  - Dimensions (DIN): 96 x 96 x 166 mm, 0.75 kg
  - Housing material: NORIL (DIN 43700)
  - Limit Switch
  - Switch type: SPDT
  - Electrical rating: 1A, type gl or gG
  - Enclosure rating: IP66