



# Pump Circulation and Pressure Sustaining Control Valve

## Pump Check Valve Enhancer

### Model 748

- 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)
- Applicable to existing systems
- Controlled pipeline fill-up

The Model 748 Pump Circulation and Pressure Sustaining Control Valve adds the advanced “active check valve” logic to standard pump systems. It is a hydraulically operated, diaphragm actuated control valve that opens or shuts off in response to electric signals (during the pump starting and stopping processes) while sustaining discharge pressure. By progressively circulating pump flow, it enables a standard mechanical check valve to respond gradually during the pump starting and stopping processes, preventing pipeline surges.



### Features and Benefits

- **Line pressure driven**
  - Independent operation
  - No motor required
  - Long term drip tight sealing
- **Off-line (circulation) installation**
  - Replaces in-line “active check valve”
  - Reduced system energy consumption
  - Low capital investment
  - Short valve operating time
  - Applicable to existing systems
- **Solenoid controlled**
  - Wide ranges of pressures and voltages
  - Low cost wiring
- **In-line serviceable** – Easy maintenance
- **Double chamber**
  - Full powered opening and closing
  - Non-slam opening and closing characteristic
  - Protected diaphragm

### Major Additional Features

- Relief override – **748-3Q**
- Electronic control – **748-18**
- Pump circulation and flow control valve – **749-U**
- Deep well pump electric control valve – **745**

See relevant BERMAD publications.



## Principle of Operation

The Model 748 Pump Circulation and Pressure Sustaining Control Valve, installed off-line, enhances standard pump systems with advanced “active check valve” logic. It is particularly suited to:

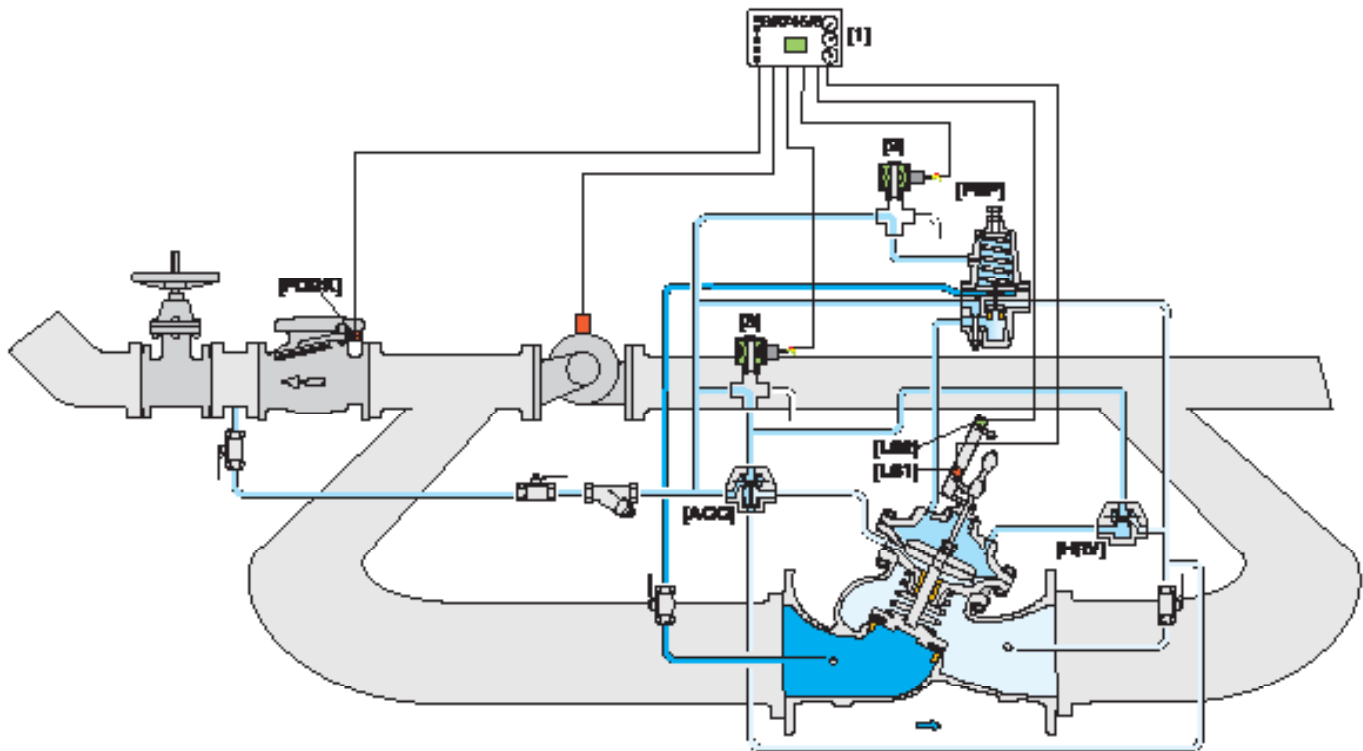
- Large diameter systems where line sized automatic control valves are not available or very expensive
- Existing systems with mechanical check valves
- System designs where mechanical check valves are preferred

During the pump starting and stopping processes the Model 748 circulates zero to 100% of pump discharge to suction, while sustaining discharge pressure slightly below system static pressure. It prevents pipeline surges by enabling a standard mechanical check valve to respond gradually:

- When the pump starts, it gradually closes, increasing check valve upstream pressure
- Prior to pump stop, it gradually opens, reducing that pressure

Complete process control is accomplished by a dedicated controller that coordinates all system components.

The controller consists of three timers (TD1, TD2 & TD3) used for timing the process and for failure control.



## Sequence of Operation

### Prior to pump starting

The pump is off, the check valve and Model 748 are closed.

### Pump starting

1. An external starting signal is sent to the controller BR745/8-E [1]
2. The Controller triggers TD1 and energizes solenoids [2] and [3] to power open the Model 748.
3. The upper limit switch [LS2] contact closes, confirming that the Model 748 is fully open.
4. The controller simultaneously triggers TD2, starts the pump, and initiates the pressure sustaining function of the Model 748 by de-energizing solenoid [3].
5. At the end of TD2, the controller simultaneously triggers TD3 and de-energizes solenoid [2] gradually closing the Model 748 (gradually directing the discharge to the main line).
6. The closed Model 748 closes [LS1] contacts and allows pump discharge to open the check valve closing [FDBK] contacts.



### Continuous pumping

The pump is on, the check valve is open & the Model 748 is closed.

### Pump stopping

7. An external shut-down signal is sent to the controller.
8. The controller triggers TD3 and energizes solenoid **[2]** to open the Model 748 (gradually directing the discharge out of the main line) while sustaining discharge pressure to slightly below system static pressure.
9. Reduced discharge pressure upstream from the mechanical check valve allows it to gradually close. The closed check valve opens **[FDBK]** contacts signaling the controller that the check valve is closed.
10. The controller simultaneously triggers TD2, shuts down the pump, and de-energizes solenoid **[2]** to close the Model 748.

The closed Model 748 closes **[LS1]** contact.

The system is now ready for the next pump starting procedure.

### Time Delays

Item	Pump Stage	Time delay
TD1	Starting <b>(2)</b>	Failure parameter after which Model 748 is expected to be fully open
TD2	Starting <b>(4) &amp; (5)</b>	Process parameter during which all discharge is circulated
	Stopping <b>(10)</b>	Failure parameter after which Model 748 is expected to close
TD3	Starting <b>(5)</b>	Failure parameter during which the check valve is expected to open
	Stopping <b>(8)</b>	Failure parameter during which the check valve is expected to close

## Control System Specifications

### Standard Materials:

#### Pilot:

Body: Stainless Steel 316 or Bronze  
 Elastomers: Synthetic Rubber  
 Spring: Galvanized Steel or Stainless Steel

#### Solenoid:

Body: Brass or Stainless Steel  
 Elastomers: NBR or FPM  
 Enclosure: Molded epoxy

#### Tubing & Fittings:

Stainless Steel 316 or Copper & Brass

#### Accessories:

Stainless Steel 316, Brass and Synthetic Rubber Elastomers

#### Pilot Adjustment Range:

0.5 to 3.0 bar ; 7 to 40 psi  
 0.8 to 6.5 bar ; 11 to 95 psi  
 1 to 16 bar ; 15 to 230 psi  
 5 to 25 bar ; 70 to 360 psi

### Solenoid Electrical Data:

#### Voltages:

(ac): 24, 110-120, 220-240, (50-60Hz)  
 (dc): 12, 24, 110, 220

#### Power Consumption:

(ac): 30 VA, inrush; 15 VA (8W), holding or 70 VA, inrush; 40 VA (17.1W), holding  
 (dc): 8-11.6W

Values might vary according to specific solenoid model

#### BR 745/8-E Controller

Supply voltage: 110, 230 V(ac) 50/60 Hz  
 Power consumption: <8 VA  
 Solenoid circuit fuse: 2A (Internal)  
 Pump control circuit fuse: 1A (Internal)  
 Dimensions : 96 x 96 x 166 mm (DIN), 0.75 kg  
 Housing material: NORYL (DIN 43700)

#### Limit Switch

Switch type: SPDT  
 Electrical rating: 10A, type gl or gG  
 Operating temperature: Up to 85°C (185°F)  
 Enclosure rating: IP66

#### Notes:

- Maximum flow velocity: 0.3-15 m/sec ; 1-50 ft/sec
- Minimum operating pressure: 0.7 bar ; 10 psi.  
 For lower pressure requirements consult factory



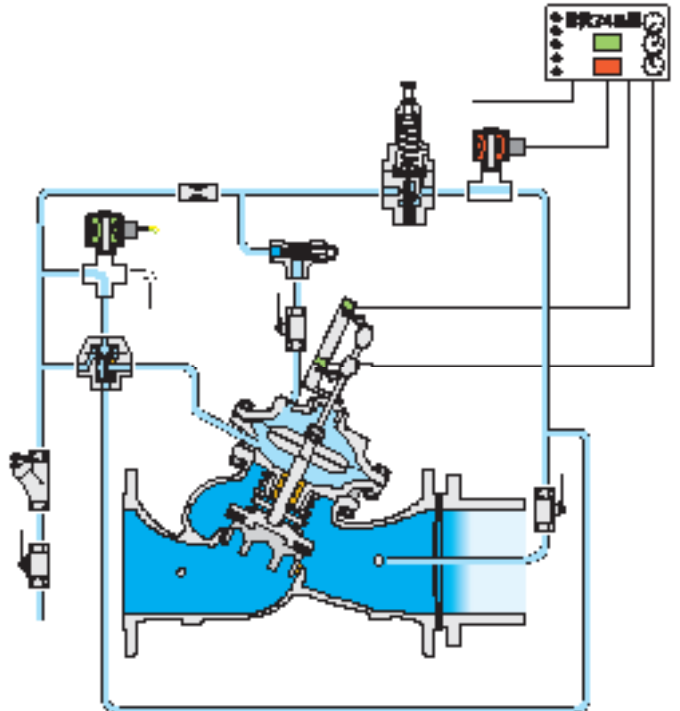
### Additional Applications

#### Pump Circulation & Flow Control Valve Model 749-U

Pumps are subject to overload and cavitation damage when circulation flow is greater than pump design specifications. When the pump curve (Flow versus Pressure) is relatively steep, the Model 748 Pump Circulation & Pressure Sustaining Valve is the most suitable for protection.

However, when the pump curve is relatively flat, pump protection with respect to discharge pressure is not sufficient. Protection according to flow is recommended. The Model 749-U protects the pump by actually limiting the flow.

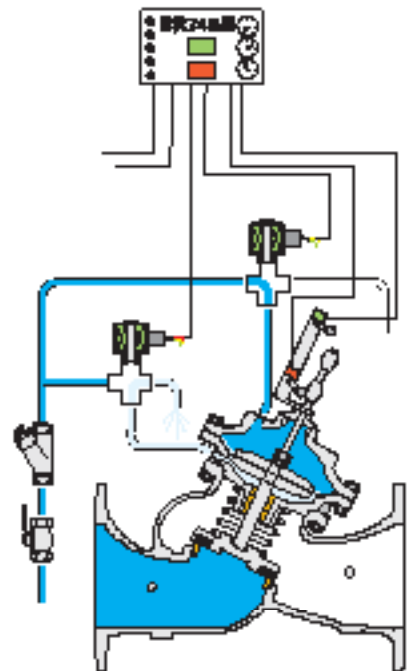
Complete process control is accomplished by the dedicated controller BR 745/8-E that coordinates all system components.



#### Deep Well Pump Electric Control Valve Model 745

Standard operating procedure of deep well pumps requires that initial discharge water is routed to waste disposal (oil, sand, etc.). The Model 745 Deep Well Pump Electric Control Valve, installed off-line, together with the BR 745/8-E Electronic Controller provides:

- Full powered valve opening prior to pump start
- Routing 100% of initial pump discharge to waste disposal for a pre-set time
- Gradually increasing and decreasing pump discharge flow into the main line (preventing surge)
- Short periods of valve operation (high valve durability)

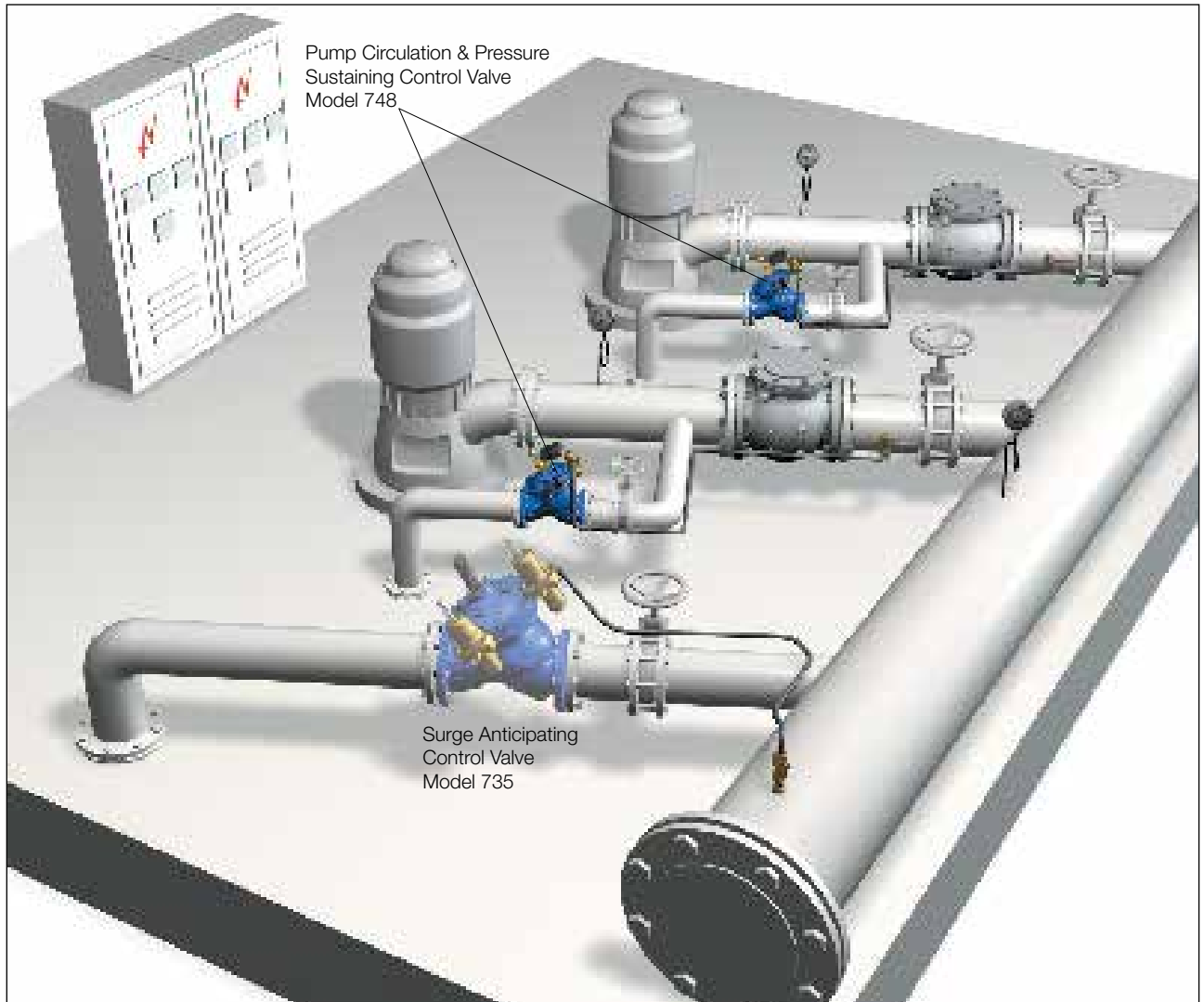




## Typical Applications

In this system, a pump battery supplies the main line through a manifold. Where standard mechanical check valves are specified or already exist, the Model 748 enhances their function by:

- Preventing surge generation rather than minimizing surge damage
- Providing surge free on and off-line sequencing of single speed pumps
- Surge free switching between “on-duty” pumps
- Delaying variable speed primary pump reaction to single speed supplementary pump going on or off-line



## BR 745/8-E Electronic Controller

The BR 745/8-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.



