Pump Circulation and Pressure Sustaining Control Valve

Pump Check Valve Enhancer

- 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

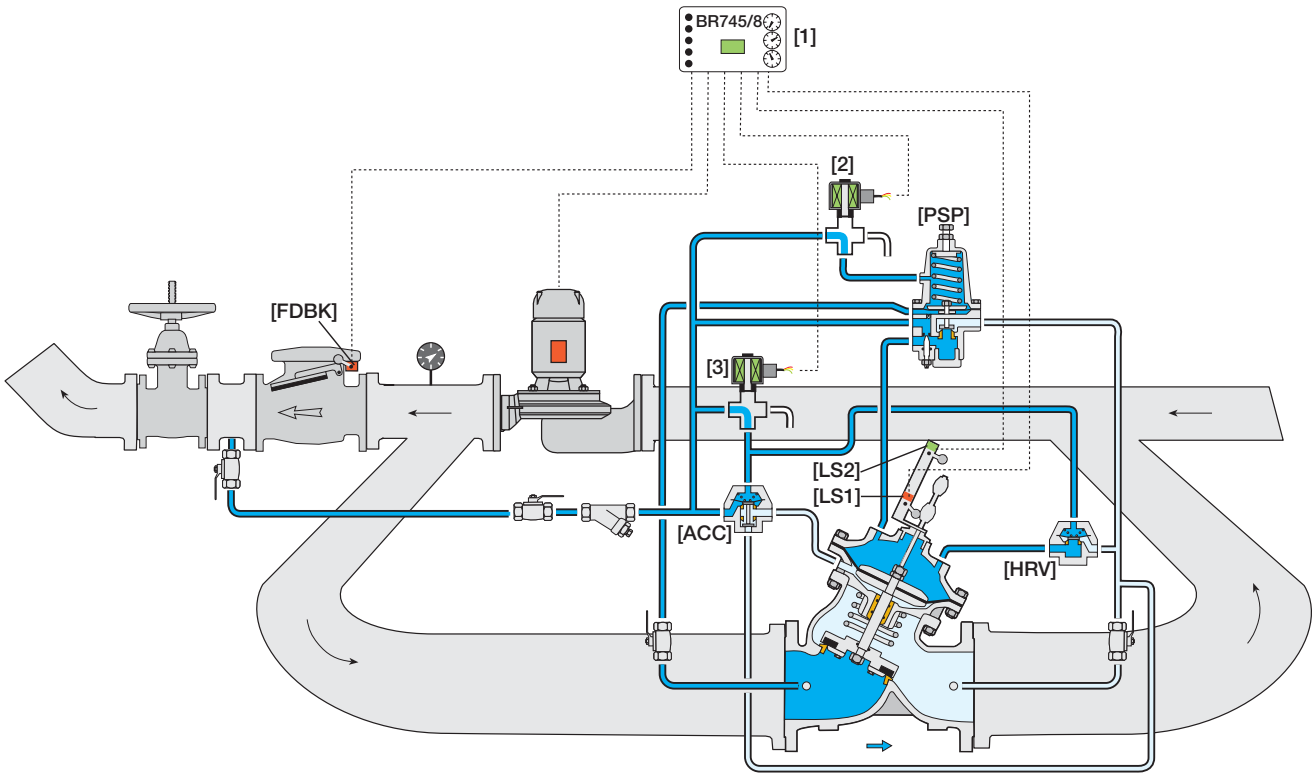
The Model 748 Pump Circulation and Pressure Sustaining Control Valve, installed off-line, enhances standard pump systems with advanced “active check valve” logic. It is particularly suited to:

- 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.

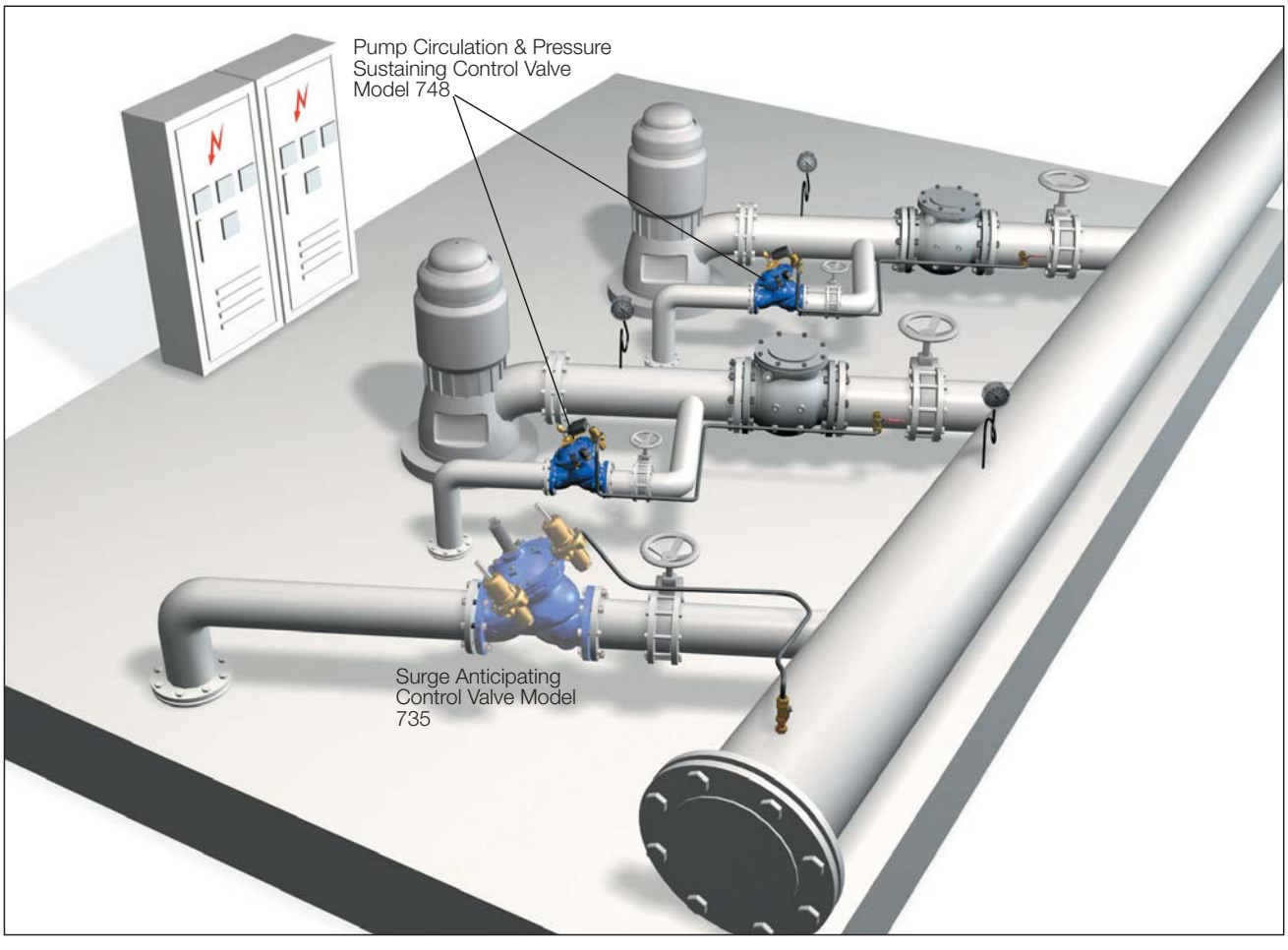
Pump starting

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.

Typical Installation

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.

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 **(2)**	Failure parameter after which Model 748 is expected to be fully open
TD2	Starting **(4) & (5)**	Process parameter during which all discharge is circulated
	Stopping **(10)**	Failure parameter after which Model 748 is expected to close
TD3	Starting **(5)**	Failure parameter during which the check valve is expected to open
	Stopping **(8)**	Failure parameter during which the check valve is expected to close

Engineer Specifications

The Pump Circulation & Pressure Sustaining Control Valve shall open or shut off in response to electric signals (during pump starting and stopping processes). When open, it shall sustain discharge pressure. By progressively circulating pump flow, it shall enable a standard mechanical check valve to respond gradually during the pump starting and stopping processes, preventing pipeline surges.

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.

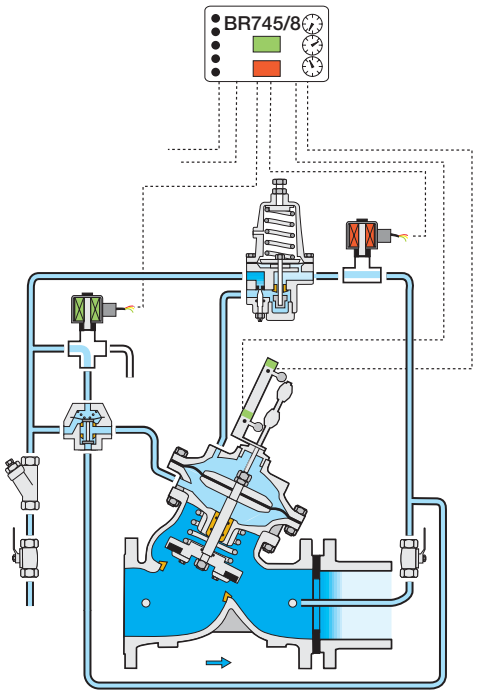
Control System: The control system shall consist of two 3-Way solenoid pilots, a 2-Way adjustable, direct acting pressure sustaining pilot, an accelerator, a hydraulic relay valve, two limit switches, three isolating cock valves and a filter. All fittings shall be forged brass or stainless steel. The 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.

Additional Applications

Pump Circulation & Flow Control Valve Model 749-U

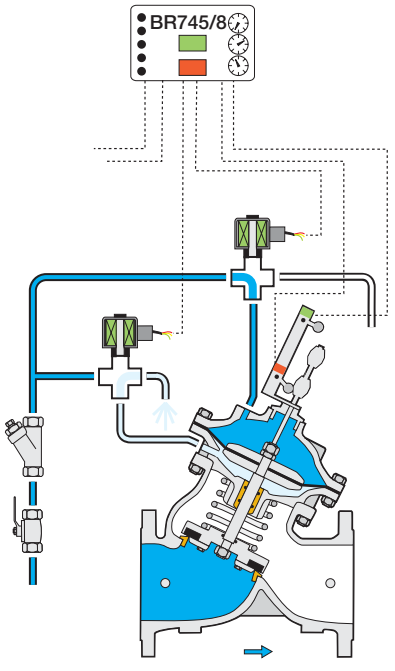
Pumps are subject to overload and cavitation damage when circulation flow is greater than pump design specifications. When the pump curve (Flow versus Pressure) is relatively steep, the Model 748 Pump Circulation & Pressure Sustaining Valve is the most suitable for protection.
However, when the pump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



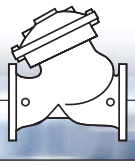
Deep Well Pump Electric Control Valve Model 745

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)



BERMAD Waterworks



700 Series

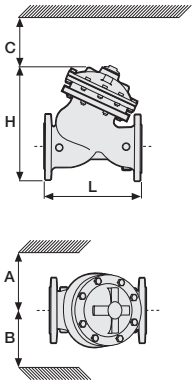
Model 748

Technical Data

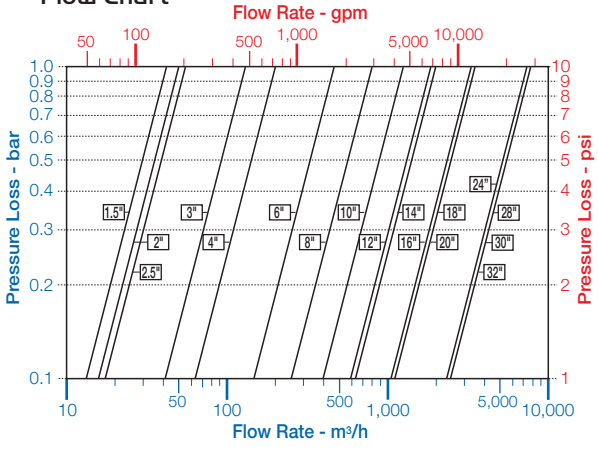
Dimensions and Weights

Size		A, B		C		L		H		Weight	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
40	1½"	350	14	180	7	205	8.1	239	9.4	9.1	20
50	2	350	14	180	7	210	8.3	244	9.6	10.6	23
65	2½"	350	14	180	7	222	8.7	257	10.1	13	29
80	3"	370	15	230	9	250	9.8	305	12.0	22	49
100	4"	395	16	275	11	320	12.6	366	14.4	37	82
150	6"	430	17	385	15	415	16.3	492	19.4	75	165
200	8"	475	19	460	18	500	19.7	584	23.0	125	276
250	10"	520	21	580	23	605	23.8	724	28.5	217	478
300	12"	545	22	685	27	725	28.5	840	33.1	370	816
350	14"	545	22	685	27	733	28.9	866	34.1	381	840
400	16"	645	26	965	38	990	39.0	1108	43.6	846	1865
450	18"	645	26	965	38	1000	39.4	1127	44.4	945	2083
500	20"	645	26	965	38	1100	43.3	1167	45.9	962	2121

Data is for Y-pattern, flanged, PN16 valves
Weight is for PN16 basic valves
"C" enables removing the actuator in one unit
"L", ISO standard lengths available
For more dimensions and weights tables, refer to Engineering Section



Flow Chart



Data is for Y-pattern, flat disk valves
For more flow charts, refer to Engineering Section

Main Valve

Valve Patterns: "Y" (globe) & angle
Size Range: 1½–32" (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:
Accessories: Bronze, Brass, St.Steel & NBR
Tubing: Copper or Stainless Steel
Fittings: Forged Brass or Stainless Steel
Pilot Standard Materials:
Body: Brass, Bronze or Stainless Steel
Elastomers: NBR
Internals: Stainless Steel
Solenoid Standard Materials:
Body: Brass or Stainless Steel
Elastomers: NBR or FPM
Solenoid 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 or 70 VA, inrush; 40 VA (17.1W), holding
(dc): 8-11.6W

Values might vary according to specific solenoid model
For pressure sustaining pilot valve selection table, refer to Model 730.

Solenoid Selection

Valve Size	Solenoid Model		Accelerator /HRV	
	330 (2.0 mm)	311 (1.0 mm)	54 / 50	2x 58HC
1½-20"	■		■	
1½-20"		■	■	
24 -32"	■			■
24 -32"		■		■
PN 16			PN 25	

BR 740-E Controller
Supply voltage: 110, 230 V(ac) 50/60 Hz
Power consumption: <8 VA
Solenoid circiut fuse: 2A (Internal)
Pump control circuit fuse: 1A (Internal)
Dimensions (DIN): 96 x 96 x 166 mm, 0.75 kg
Housing material: NORYL (DIN 43700)
Limit Switch
Switch type: SPDT
Electrical rating: 10A, type gl or gG
Enclosure rating: IP66

How to Order

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

Sector	Size	Primary Feature	Additional Feature	Pattern	Body Material	End Connections	Coating	Voltage & Position	Tubing & Fittings	Additonal Attributes
WW	6"	748	00	Y	C	16	EB	4AC	CB	SS

Sector: Waterworks

Size: 1½ - 32"

Primary Feature: Pump Circulation & Pressure Sustaining

Additional Feature:

No Additional Feature	00
Closing and Opening Speed Control	03
Relief Override	3Q

Multiple choices permitted

Pattern:

Oblique (up to 20")	Y
Angle (up to 18")	A
Globe (24-32" only)	G

Body Material:

Ductile Iron Standard	C
Cast Steel	S
St. Steel 316	N
Nickel Alumin. Bronze	U

End Connections:

ISO-16	16
ISO-25	25
ANSI-150	A5
ANSI-300	A3
JIS-16	J6
JIS-20	J2

When static pressure is less then 1.5 bar (20 psi) - consult factory

Coating:

Epoxy FB Blue	EB
Polyester Green	PG
Polyester Blue	PB
Uncoated	UC

Voltage & Position:

24VAC/50Hz - N.C.	4AC
24VAC/50Hz - N.O.	4AO
24VDC - N.C.	4DC
24VDC - N.O.	4DO
24VDC - L.P.	4DP
220VAC/50-60Hz N.C.	2AC
220VAC/50-60Hz N.O.	2AO

Tubing & Fittings:

Copper Tubing & Brass Fittings	CB
Plastic Tubing & Brass Fittings	PB
St. St. 316 Tubing & Fittings	NN

Additonal Attributes:

V-Port Throttling Plug	V
Large Control Filter	F
Electric Limit Switch	S
Valve Position Transmitter	Q
St. St. 316 Control Accessories	N
St. St. 316 Internal Trim (Closure & Seat)	T
St. St. 316 Actuator Internal Assembly	D
Delrin Bearing	R
Viton Elastomers for Seals & Diaphragm	E
Pressure Gauge	6

Multiple choices permitted

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