

700 Series

# Pump Circulation and Pressure Sustaining Control Valve Pump Check Valve Enhancer

# Mod∈l 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.

# 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.

#### 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





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# 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:

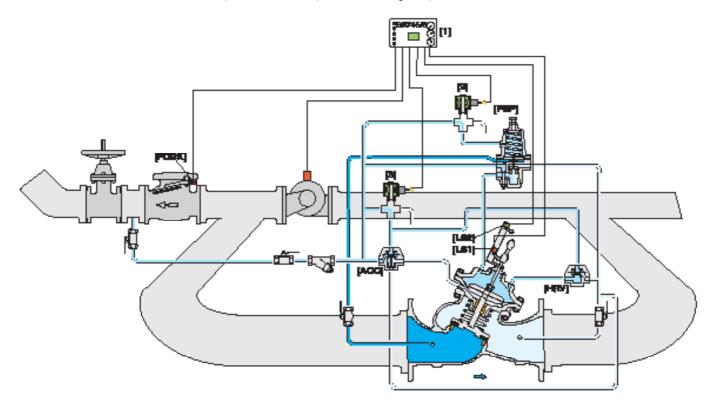
- Large diameter systems where line sized automatic control valves are not available or very expensive
- Existing systems with mechanical check valves
- System designs where mechanical check valves are preferred

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.





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#### 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							

## 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



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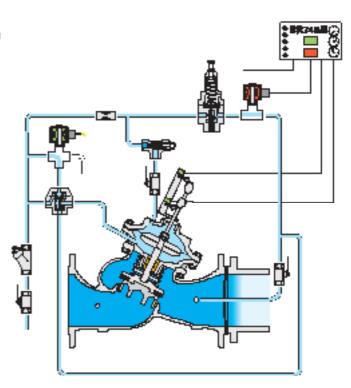
## **Additional Applications**

## 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.

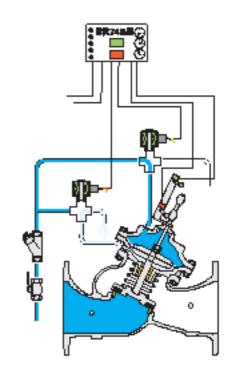
Complete process control is accomplished by the dedicated controller BR 745/8-E that coordinates all system components.



#### 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)



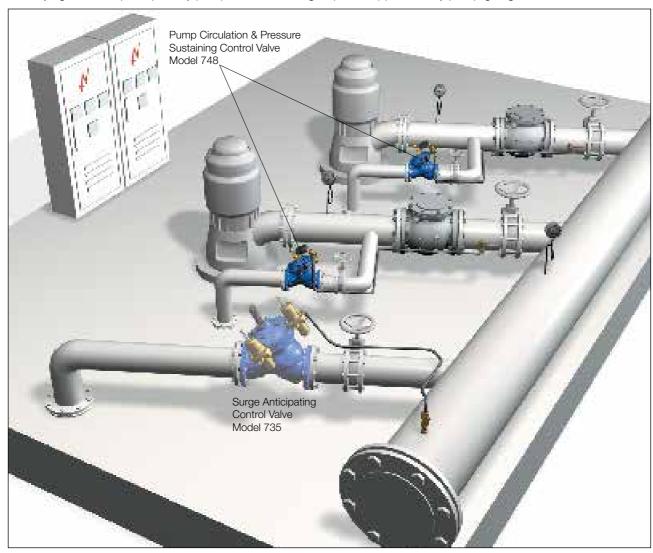


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# **Typical Applications**

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.







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#### **Technical Data**

Size Range: DN40-900; 11/2-36" End Connections (Pressure Ratings):

Flanged: ISO PN16, PN25 (ANSI Class 150, 300)

Threaded: BSP or NPT
Others: Available on request

Valve Patterns: "Y" (globe) & angle, globe (DN600-900; 24"-36")

Working Temperature: Water up to 80°C; 180°F

**Standard Materials:** 

Body & Actuator: Ductile Iron

Internals: Stainless Steel, Bronze & coated Steel
Diaphragm: Synthetic Rubber Nylon fabric-reinforced

Seals: Synthetic Rubber

H (mm / inch)

Weight (Kg/lb)

L (mm / inch)

W (mm / inch)

R (mm / inch)

h (mm / inch)

H (mm / inch)

Weight (Kg/lb)

Coating: Fusion Bonded Epoxy, RAL 5005 (Blue) approved for

drinking water or Electrostatic Polyester Powder

# Differential Pressure Calculation

$$\Delta P = \left(\frac{Q}{(Kv;Cv)}\right)^2$$

 $\Delta P$  = Differential Pressure for fully open valve (bar; psi)

 $\mathbf{Q}$  = Flow rate (m<sup>3</sup>/h; gpm)

Kv = Metric system - valve flow coefficient (flow in m³/h at 1 bar ΔP with 15°C water)

Cv = US system - Valve flow coefficient (flow in gpm at 1 psi  $\Delta P$  with 60°F water)

Cv = 1.155 Kv

# Flow Data & Dimensions Table

		DN / Size	40	1.5"	50	2"	65	2.5"	80	3"	100	4"	150	6"	200	8"	250	10"	300	12"	350	14"	400	16"	450	18"	500	20"
g	i 🖫	Kv / Cv - Flat	54	62	57	66	60	69	65	75	145	167	395	456	610	705	905	1,045	1,520	1,756	-	-	2,250	2,599	-	-	4,070	4,701
ä	700ES	Kv / Cv - V-Port	46	53	48	56	51	59	55	64	123	142	336	388	519	599	769	888	1,292	1,492	-	-	1,913	2,209	-	-	3,460	3,996
Flow Data	700 & 700EN	Kv / Cv - "Y" Flat	42	49	50	58	55	64	115	133	200	230	460	530	815	940	1,250	1,440	1,850	2,140	1,990	2,300	3,310	3,820	3,430	3,960	3,550	4,100
ū	5 5	Kv / Cv - "Y" V-Port	36	41	43	49	47	54	98	113	170	200	391	450	693	800	1,063	1,230	1,573	1,820	1,692	1,950	2,814	3,250	2,916	3,370	3,018	3,490
S		L (mm / inch)	230	9.1	230	9.1	290	11.4	310	12.2	350	13.8	480	18.9	600	23.6	730	28.7	850	33.5	-	-	1,100	43.3	-	-	1,250	49.2
	25	W (mm / inch)	150	5.9	165	6.5	185	7.3	200	7.9	235	9.3	300	11.8	360	14.2	425	16.7	530	20.9	-	-	626	24.6	-	-	838	33
700-ES	PN16; 25	h (mm / inch)	80	3.1	90	3.5	100	3.9	105	4.1	125	4.9	155	6.1	190	7.5	220	8.7	250	9.8	-	-	320	12.6	-	-	385	15.2
2	- E	H (mm / inch)	240	9.4	250	9.8	250	9.8	260	10.2	320	12.6	420	16.5	510	20.1	605	23.8	725	28.5	-	-	895	35.2	-	-	1,185	46.7
		Weight (Kg/lb)	10	22	10.8	23.8	13.2	29	15	33	26	57.2	55	121	95	209	148	326	255	561	-	-	437	960	-	-	1,061	2,334
		L (mm / inch)	-	-	-	-	-	-	310	12.2	350	13.8	480	18.9	600	23.6	730	28.7	850	33.5	-	-	-	-	-	-	-	-
Z	25	W (mm / inch)	-	-	-	-	-	-	200	7.9	235	9.3	320	12.6	390	15.4	480	18.9	550	21.7	-	-	-	-	-	-	-	-
700-FN	PN16; 25	h (mm / inch)	-	-	-	-	-	-	100	3.9	118	4.6	150	5.9	180	7.1	213	8.4	243	9.6	-	-	-	-	-	-	-	
1	<u>_</u>	H (mm / inch)	-	-	-	-	-	-	305	12	369	14.5	500	19.7	592	23.3	733	28.9	841	33.1	-	-	-	-	-	-	-	
		Weight (Kg/lb)	-	-	-	-	-	-	21	46.2	31	68.2	70	154	115	253	198	436	337	741	-	-	-	-	-	-	-	-
	0.0	L (mm / inch)	205	8.1	210	8.3	222	8.7	250	9.8	320	12.6	415	16.3	500	19.7	605	23.8	725	28.5	733	28.9	990	39	1,000	39.4	1,100	43.3
	PN16	W (mm / inch)	155	6.1	165	6.5	178	7	200	7.9	223	8.8	320	12.6	390	15.4	480	18.9	550	21.7	550	21.7	740	29.1	740	29.1	740	29.1
	9	h (mm / inch)	78	3.1	83	3.3	95	3.7	100	3.9	115	4.5	143	5.6	172	6.8	204	8	242	9.5	268	10.6	300	11.8	319	12.6	358	14.1
Jec		H (mm / inch)	239	9.4	244	9.6	257	10.1	305	12	366	14.4	492	19.4	584	23	724	28.5	840	33.1	866	34.1	1,108	43.6	1,127	44.4	1,167	45.9
700 Flanged	<u> </u>	Weight (Kg/lb)	9.1	20	10.6	23	13	29	22	49	37	82	75	165	125	276	217	478	370	816	381	840	846	1,865	-	2,083		2,121
— В		L (mm / inch)	205	8.1	210	8.3	222	8.7	264	10.4	335	13.2	433	17	524	20.6	637	25.1	762	30	767	30.2	1,024	40.3	1,030	40.6	1,136	-
70	PN25	W (mm / inch)	155	6.1	165	6.5	185	7.3	207	8.1	250	9.8	320	12.6	390	15.4	480	18.9	550	21.7	570	22.4	740	29.1	740	29.1	750	29.5
	P "	h (mm / inch)	78	3.1	83	3.3	95	3.7	105	4.1	127	5	159	6.3	191	7.5	223	8.8	261	10.3	295	11.6	325	12.8	357	14.1	389	15.3
	"Y" Clas	H (mm / inch)	239	9.4	244	9.6	257	10.1	314	12.4	378	14.9	508	20	602	23.7	742	29.2	859	33.8	893	35.2	1,133	44.6	1,165	45.9	1,197	47.1
		Weight (Kg/lb)	10	22	12.2	27	15	33	25	55	43	95	85	187	146	322	245	540	410	904	434	957	900	1984	967	2,132	986	2,174
	25 300	L (mm / inch)	155	6.1	155	6.1	212	8.3	250	9.8										_								
	9, 5	W (mm / inch)	122	4.8	122	4.8	122	4.8	163	6.4	1		R.	\$						5	DEC	:ify	шŀ	ιEΠ	OL	d∈r	ַחוי	J:
	15 E	h (mm / inch)	40	1.6	40	1.6	48	1.9	56	2.2			S. F.	To Page														_

		DN / Size	600	24"	700	28"	750	30"	800	32"	900	36"
Globa PN1	9	L (mm / inch)	1,450	57.1	1,650	65	1,750	68.9	1,850	72.8	1,850	72.8
	PN1 150	W (mm / inch)	1,250	49.2	1,250	49.2	1,250	49.2	1,250	49.2	1,250	49.2
		h (mm / inch)	470	18.5	490	19.3	520	20.5	553	21.8	600	23.6
	Globe Class	H (mm / inch)	1,965	77.4	1,985	78.1	2,015	79.3	2,048	80.6	2,095	82.5
		Weight (Kg/lb)	3,250	7,150	3,700	8,140	3,900	8,580	4,100	9,020	4,250	9,350
	2	L (mm / inch)	1,500	59.1	1,650	65	1,750	68.9	1,850	72.8	1,850	72.8
	PN2 300	W (mm / inch)	1,250	49.2	1,250	49.2	1,250	49.2	1,250	49.2	1,250	49.2
		h (mm / inch)	470	18.5	490	19.3	520	20.5	553	21.8	600	23.6
200	Globe Class	H (mm / inch)	1,965	77.4	1,985	78.1	2,015	79.3	2,048	80.6	2,095	82.5
	<u>o</u> .	Weight (Kg/lb)	3,500	7,700	3,700	8,140	3,900	8,580	4,100	9,020	4,250	9.370

7.9 202

5.5 12 8 18 17 37

122 4.8 122 4.8

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83 | 3.3 | 102 | 4

225 8.9 242 9.5 294

201

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8

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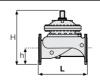
264 10.4

159 6.3

55 2.2

115 4.5

163





- Size
- Main model
- Additional features
- Pattern
- Body material
- End connection
- Coating
- Voltage & main valve position
- Tubing & Fittings materials
- Operational data (according to model)
- Pressure data
- Flow data
- Reservoir level data
- Settings
- \* Use Bermad's Waterworks Ordering Guide

