

Booster Pump Control Valve

Active Check Valve

Model 740

- 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)

The Model 740 Booster Pump Control Valve is a double chambered, hydraulically operated, diaphragm actuated active check valve that opens fully or shuts off in response to electric signals. It isolates the pump from the system during pump starting and stopping, to prevent pipeline surges.



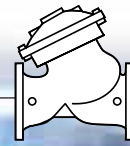
Features and Benefits

- **Line pressure driven**
 - Independent operation
 - No motor required
 - Long term drip tight sealing
- **Solenoid controlled**
 - 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**
 - Full powered opening (option “B”) and closing
 - Non-slam opening and closing characteristic
 - Protected diaphragm
- **Balanced seal disk** – High flow capacity
- **Flexible design** – Easy addition of hydraulic features

Major Additional Features

- Booster Pump Control Valve with Independent Lift Check - **740-2S**
- Pressure sustaining – **743**
- Pressure reducing – **742**
- Flow control – **747-U**
- Pump circulation control – **748**
- Deep well pump electric control – **745**
- Full powered opening & closing – **740-B**
- Electronic control – **740-18**
- Pressure sustaining & Pressure reducing – **743-2Q**

See relevant BERMAD publications.



Sequence of Operation (Normally-Open Type)

The Model 740 is a solenoid controlled valve equipped with a limit switch, a 3-Way solenoid pilot and check valves.

Normally Closed type is also available.

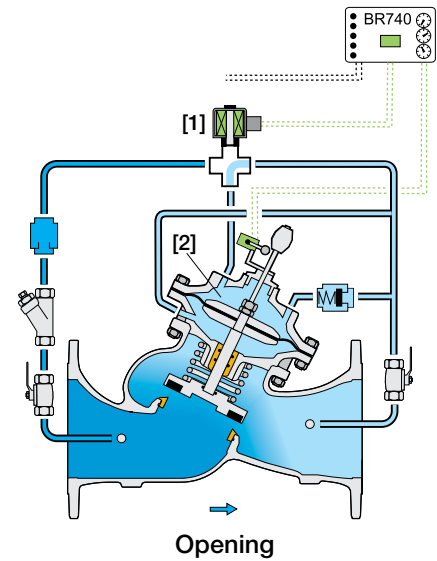
For large valves, an accelerator quickens valve response.

Pump Starting Procedure

Prior to pump start, the valve is hydraulically closed although electrically open. The de-energized solenoid [1] connects the upper control chamber [2] to valve outlet introducing system static pressure.

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 solenoid, allowing the valve to gradually open.

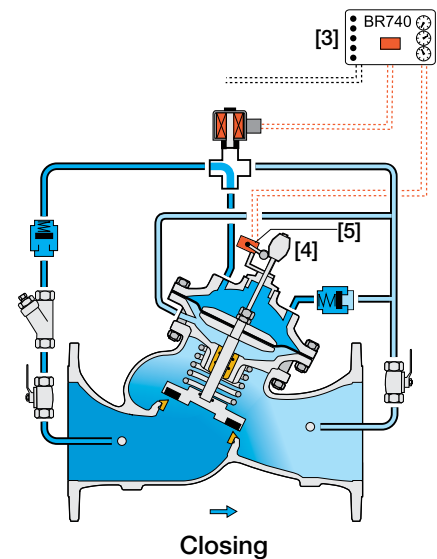


Pump Stopping Procedure

In pumping systems with standard check valves, the shut-down command is issued directly to the pump, abruptly shutting it down.

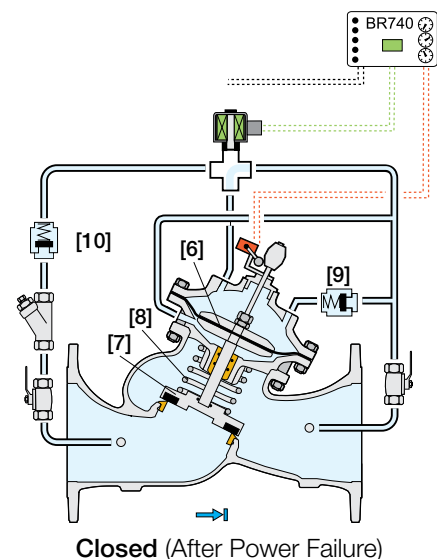
In systems with “active check valves,” the shut-down command is issued to the controller [3] which energizes the solenoid. The solenoid then applies pumped pressure to the upper control chamber, gradually closing the main valve and isolating the running pump from the system. As the indicator collar [4] moves down, it activates the valve’s limit switch [5], 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.

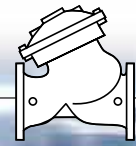
The valve remains hydraulically closed and electrically open.



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 [6] and closure [7] to balance. The spring [8] then breaks this balance, closing the valve before the flow can change direction. Once the main valve has closed, the check valve [9] allows downstream pressure into the upper control chamber while the check valve [10] traps it, resetting the main valve for the next pump starting process.





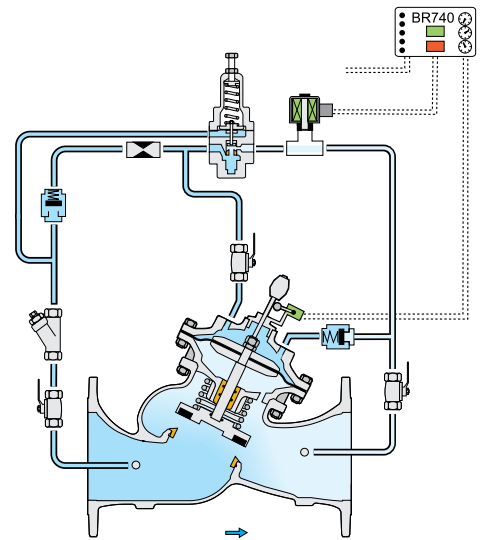
Additional Applications

Booster Pump Control & Pressure Sustaining Valve Model 743

Network demand is greater than pump design specifications:

- During filling empty pipeline
- During over demand by consumers
- When the pump pressure specification is higher than system resistance

Any of these factors might cause pump overload and cavitation damage. The Model 743 adds a pressure sustaining feature to the Booster Pump Control Valve ensuring the pump operates within design specifications. This protects both the pump and the system while maintaining the operation sequence of the standard Model 740.

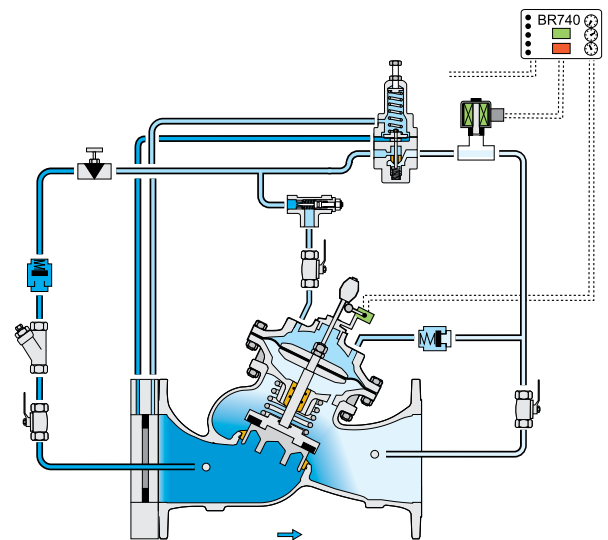


Booster Pump Control & Flow Control Valve Model 747-U

When network demand is greater than pump design specifications and the pump curve (Flow versus Pressure) is relatively steep, the Booster Pump Control & Pressure Sustaining Valve Model 743 is the most suitable for pump overload and cavitation protection.

However, when the pump curve is relatively flat, pump protection with respect to discharge pressure is not sufficient, and protection according to flow is recommended.

The Model 747-U adds a flow limiting feature to the operation sequence of the standard Model 740.



Booster Pump Control & Pressure Reducing Valve Model 742

Standard pumps are specified to boost pressure by a constant differential. Excessive discharge pressure can be caused by increased suction pressure, as in:

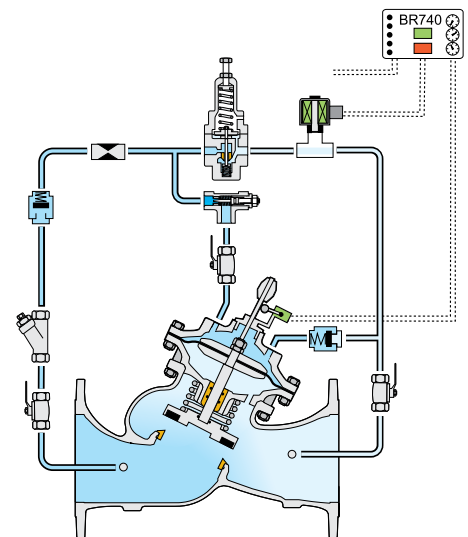
- Varying supply network pressure or supply from multiple sources
- Pumping from water tower with high level differential
- Deep well initial draw down

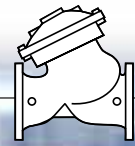
When the pump curve (Flow versus Pressure) is relatively steep, the Pressure Relief (Circulation) Model 730 is the most suitable.

However, when the pump curve is relatively flat, circulation is not sufficient, as the additional flow hardly effects the discharge pressure.

The most suitable solution is to reduce the discharge pressure to protect the consumers.

The Model 742 adds a pressure reducing feature while maintaining the operation sequence of the standard Model 740.



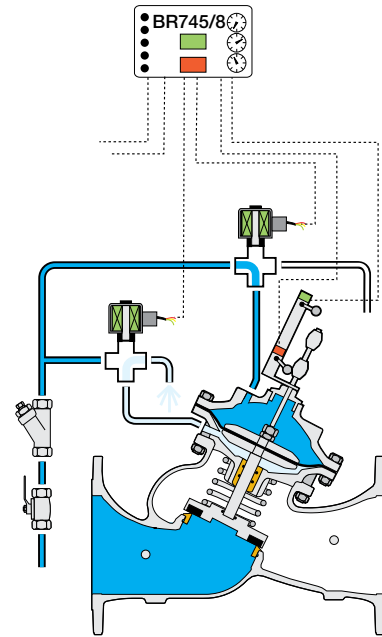


Additional Applications

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)



Control System Specifications

Standard Materials:

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

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 740-E Controller

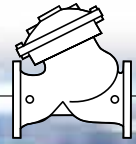
Supply voltage: 110, 230 V(ac) 50/60 Hz
 Power consumption: <8 VA
 Solenoid circuit fuse: 2A (Internal)
 Pump control circuit fuse: 1A (Internal)
 Dimensions: 96 x 96 x 166 mm (DIN), 0.75 kg
 Housing material: NORYL (DIN 43700)

Limit Switch

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

Notes:

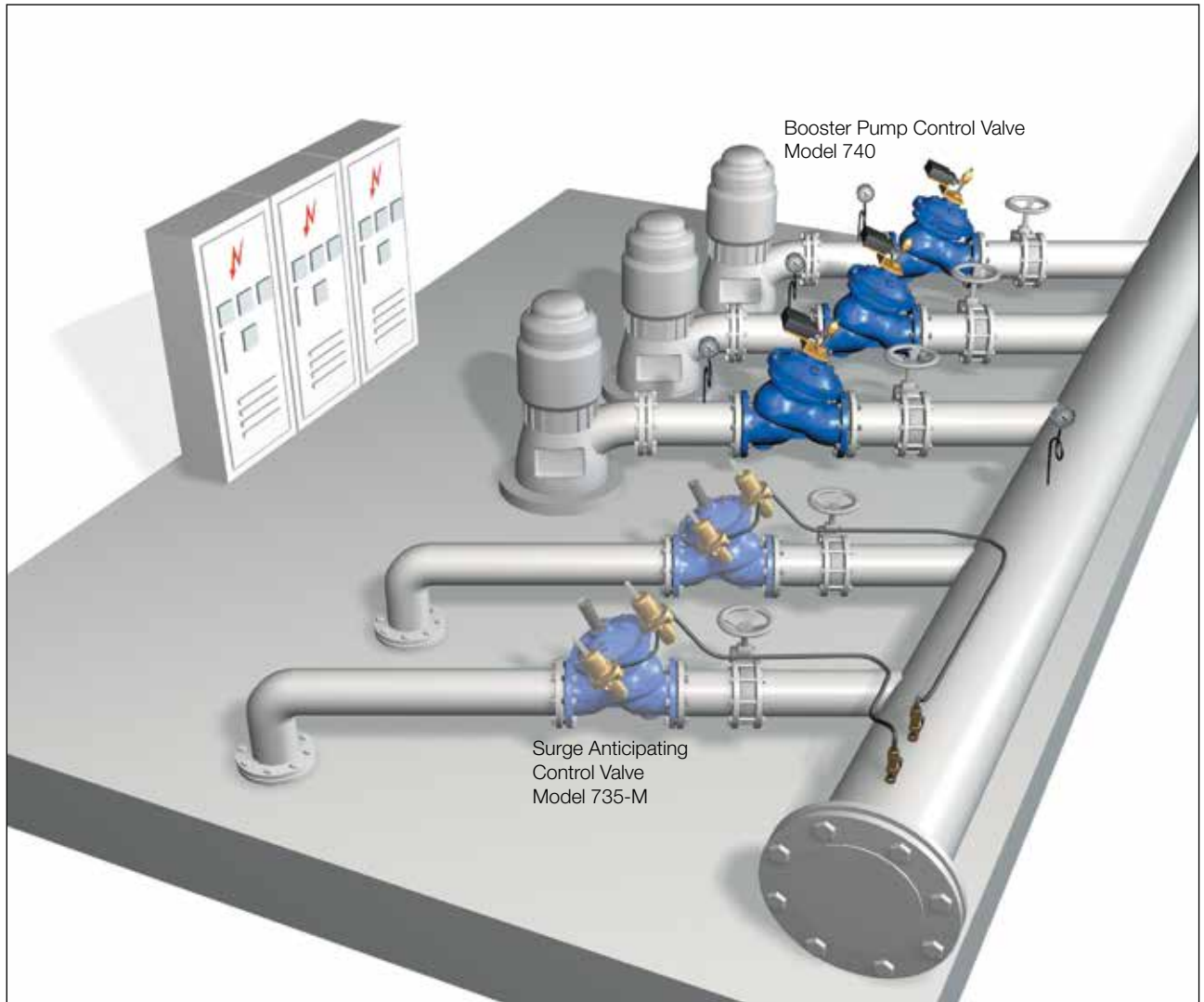
- Recommended continuous flow velocity:
 0.1-6.0 m/sec ; 0.3-20 ft/sec
- Minimum operating pressure: 0.7 bar ; 10 psi.
 For lower pressure requirements consult factory



Typical Applications

In this system, a pump battery supplies the main line through a manifold. The Model 740, installed downstream from each pump:

- Prevents surge generation rather than minimizing surge damage
- Provides surge free starting and stopping of supplementary pumps
- Allows surge free switching between “on-duty” pumps
- Delays reaction of variable speed primary pump to single speed supplementary pump going on line or off line.



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.





Technical Data

Size Range: DN40-900 ; 1½-36"
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
Coating: Fusion Bonded Epoxy, RAL 5005 (Blue) approved for drinking water or Electrostatic Polyester Powder

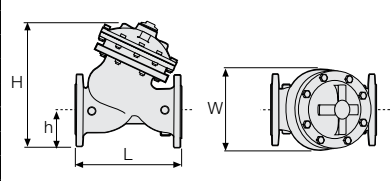
Differential Pressure Calculation

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

ΔP = Differential Pressure for fully open valve (bar; psi)
Q = Flow rate (m³/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 ΔP 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"	
Flow Data	700ES	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
	700EN	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
	700ES	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
	700EN	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
700-ES	PN16; 25	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
		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
		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
		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
700-EN	PN16; 25	L (mm / inch)	-	-	-	-	-	310	12.2	350	13.8	480	18.9	600	23.6	730	28.7	850	33.5	-	-	-	-	-	-	-	-	-
		W (mm / inch)	-	-	-	-	-	200	7.9	235	9.3	320	12.6	390	15.4	480	18.9	550	21.7	-	-	-	-	-	-	-	-	-
		h (mm / inch)	-	-	-	-	-	100	3.9	118	4.6	150	5.9	180	7.1	213	8.4	243	9.6	-	-	-	-	-	-	-	-	-
		H (mm / inch)	-	-	-	-	-	305	12	369	14.5	500	19.7	592	23.3	733	28.9	841	33.1	-	-	-	-	-	-	-	-	-
700 Flanged	"Y", PN16 Class 150	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
		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
		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
		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 Threaded	"Y", PN25 Class 300	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	44.7
		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
		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
		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
700 Threaded	Angle PN16; 25 Class 150; 300	L (mm / inch)	155	6.1	155	6.1	212	8.3	250	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		W (mm / inch)	122	4.8	122	4.8	122	4.8	163	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		h (mm / inch)	40	1.6	40	1.6	48	1.9	56	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		H (mm / inch)	201	7.9	202	8	209	8.2	264	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Specify when ordering:

- 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

DN / Size		600	24"	700	28"	750	30"	800	32"	900	36"
Globe PN16 Class 150	L (mm / inch)	1,450	57.1	1,650	65	1,750	68.9	1,850	72.8	1,850	72.8
	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
	H (mm / inch)	1,965	77.4	1,985	78.1	2,015	79.3	2,048	80.6	2,095	82.5
Globe PN25 Class 300	L (mm / inch)	3,250	128	3,700	146	3,900	153.5	4,100	161.4	4,250	167.3
	W (mm / inch)	1,500	59.1	1,650	65	1,750	68.9	1,850	72.8	1,850	72.8
	h (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

