High Pressure, Surge Anticipating Control Valve

Model 835-M

- Eliminates surge in all pumping systems:
  - Booster & deep well, single & variable speed
- Eliminates surge in all distribution networks:
  - Municipal, high-rise buildings, sewage, HVAC, irrigation
  - Difficult to maintain, remote locations, & older systems

The Model 835-M High Pressure, Surge Anticipating Valve is an off-line, hydraulically operated, piston actuated valve. The valve, sensing line pressure, opens in response to the pressure drop associated with abrupt pump stoppage. The pre-opened valve dissipates the returning high pressure wave, eliminating the surge.
The Model 835-M smoothly closes drip tight as quickly as the relief feature allows, while preventing closing surge.
The valve also relieves excessive system pressure.

Features and Benefits

- **Robust structure, piston actuated –** High pressure service
- **Replaces surge air vessels**
  - Relieves surge, fail-safe open
  - Minimal maintenance
  - Economy of space
  - Lower investment & maintenance costs
  - Especially economic for higher pressure ratings
- **Line pressure driven**
  - Independent operation
  - No motor required
  - Long term drip tight sealing
  - Adjustable hydraulic actuation
- **Double chamber –** Moderated valve closing (no surges)
- **In-line serviceable –** Easy maintenance
- **Obstacle free, full bore –** Uncompromising reliability
- **Balanced seal disk –** High flow capacity

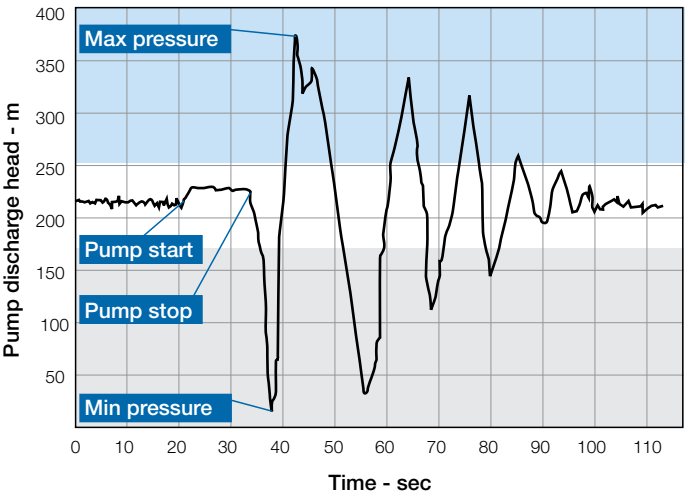
Major Additional Features

- Solenoid control – **835-55-M**
- Sensing diaphragm (for sewage) – **835-Md**
- Quick pressure relief valve – **83Q**

Operation

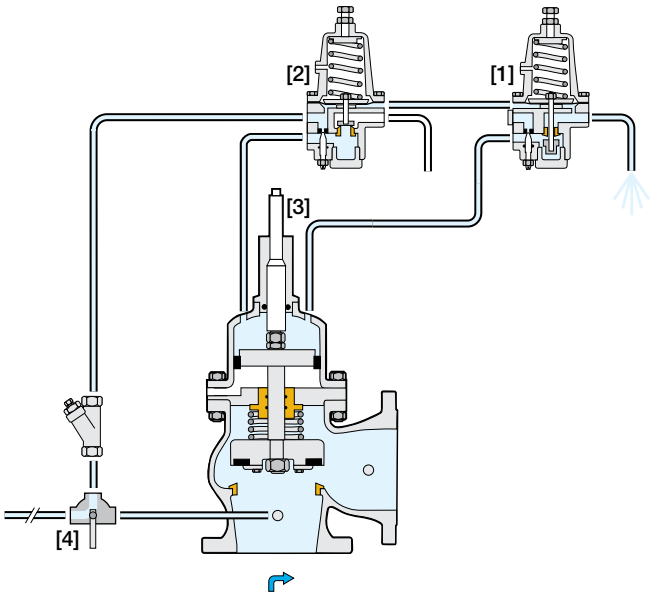
The abrupt stopping of a pump produces a pressure drop as the traveling column of water, with its inherent momentum, continues to travel along the line, generating severe low pressure.
When the traveling column of water loses its momentum, it travels back towards the pump. Should it hit the closed check valve, a very high pressure surge is created and travels throughout the system as a damaging wave at velocities of up to “Mach 4.”
No quick relief valve can react quickly enough to eliminate it.

Surge at Pump Station Without Protection

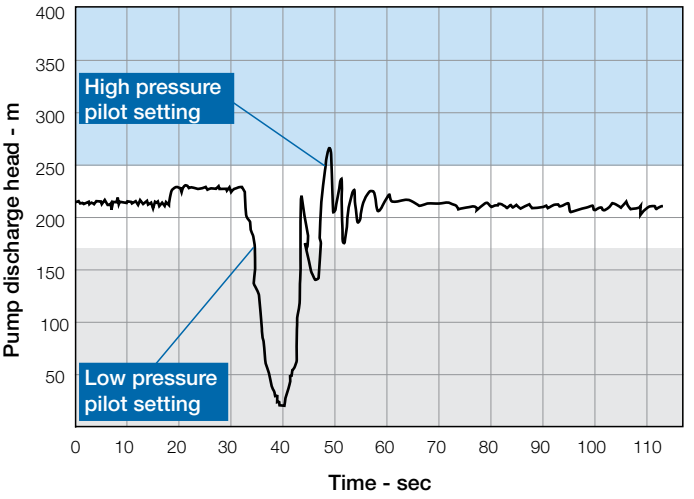


Eliminating surge requires anticipation and pre-action. The Model 835-M is well suited to this task.
The Low Pressure (LP) pilot **[1]** senses the initial pressure drop and opens. This immediate reaction allows remaining line pressure to quickly open the main valve.
The already opened Model 835-M releases the returning column of water, minimizing the line pressure rise. Should the relief rate be insufficient, and the pressure exceeds the High Pressure (HP) pilot **[2]** setting, the pilot immediately opens, further opening the main valve.
As system pressure stabilizes again at static pressure, both pilots close and the main valve begins closing. Should line pressure rise during main valve closing, the HP pilot briefly stops the process, preventing the pressure from continuing to rise.
The flow stem **[3]** limits the relief flow to prevent column separation and preserve closing pressure.
Cock valve **[4]** serves for selecting operating and sensing source:

- Directly from main discharge line - Recommended (see “Typical Application”)
- From Model 835-M inlet



Pressure at Pump Station Protected by Model 835-M



Bermad Surge Analysis Program – "BERSAP II"

Surge is the result of many factors: designed flow rate, pumping system, main line characteristics, etc. By using advanced mathematics and computer software, BERMAD's experienced engineers can perform the desired analysis.
For best analysis, all of the following data is required.

- Main Line
  - Line Profile (Chainage), elevations at accumulated length
  - Internal diameter
  - Length
  - Material
  - Wall thickness
- Pumps
  - Pump curve(s)
  - Max. number of pumps in simultaneous operation
  - Type of non-return valve
- System
  - Max. designed flow rate
  - Max. & min. levels at suction and at delivery reservoirs

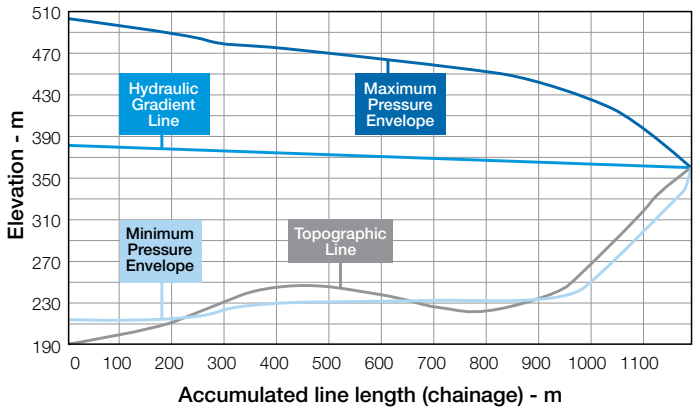
For systems with multiple pumping stations and/or multiple consumers along the supply line, the following data is also required:

- System layout including pumping station, and consumer locations, and characteristics
- Head Gradient Line (HGL) for each and every node based on "Network-Solver" analysis

This surge analysis indicates that without protection the system is exposed to:

- Pressure of ~32 bar (see max. pressure envelope line)
- Vacuum conditions (see min. pressure envelope line)

Line Hydraulic Behavior without Protection



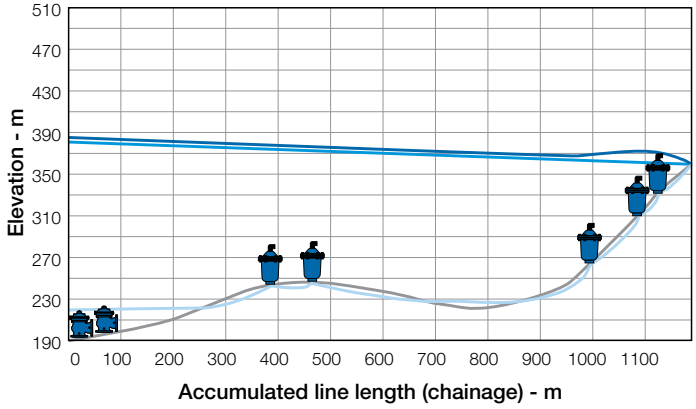
Simulated surge protection recommends:

- Two Model 835-M valves installed in parallel at the pumping station
- Five Non-Slam Air Valves installed along the line

With full surge protection, the simulation shows no surge and minimal vacuum.

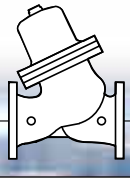
- Pressure at max. of ~19 bar (see max. pressure envelope line)
- No appreciable vacuum (see min. pressure envelope line)

Line Hydraulic Behavior with Full Protection



Any pipeline design requires air valves to admit air under vacuum conditions and to release air under pressure. The size, type and location of these air valves should consider surge protection requirements.

BERMAD Waterworks



Model 835-M | **800 Series**

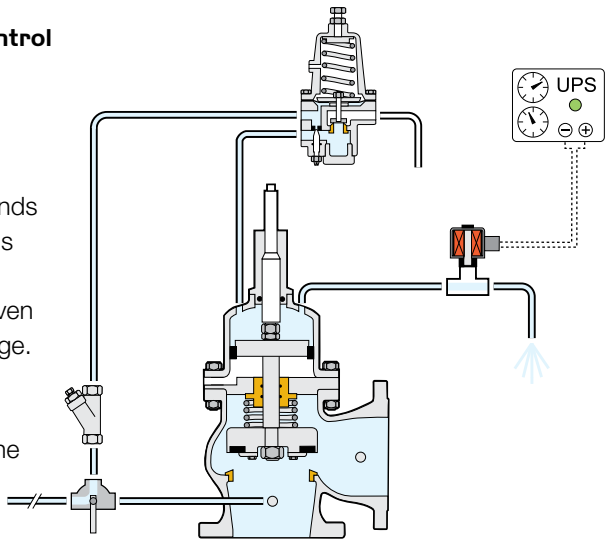
Additional Application

High Pressure, Surge Anticipating Valve with Solenoid Control
Model 835-55-M

This model provides the appropriate solution to pumping systems when:

- Static pressure is lower than 3 bar (45 psi)
- Discharge line is short & wave critical time is less than 3 seconds
- Electric control is preferred due to maintenance considerations

Upon power failure, the BR 735-UPS Controller immediately energizes the Model 835-55-M, normaly closed DC solenoid, even prior to the pressure drop associated with abrupt pump stoppage. The already opened Model 835-55-M releases the returning columm of water eliminating the surge. The Model 835-55-M, sensing line pressure, smoothly closes drip tight as quickly as the relief feature allows, while preventing closing surge.
The valve also relieves excess system pressure.



BR-735-UPS Controller

The Model 835-55-M Surge Anticipating Valve with Solenoid Control should remain closed except in the event of power failure. This requires a Normally Open (N.O.) always energized solenoid, which is vulnerable to problems (coil heating, sticking problems, calcium build-up, etc.).
The recommended alternative is using a combination of a Normally Closed (N.C.) de-energized solenoid, and an **U**n-Interruptible **P**ower **S**ource **(UPS)**.
The BR-735-UPS Controller includes two re-chargeable lithium batteries and a settable timer for determining the period that the valve remains open. The Controller, as a part of the pump control panel, immediately energizes the N.C. solenoid to open the valve for a preset time after which it de-energizes the solenoid, allowing the valve to start closing

Pilot System Specifications

Standard Materials:

Pilots:
Body: Stainless Steel 316 or Bronze
Elastomers: Synthetic Rubber
Springs: Galvanized Steel or Stainless Steel
Internal parts: Stainless Steel
Tubing & Fittings:
Stainless Steel 316 or Copper & Brass
Accessories:
Stainless Steel 316, Brass and Synthetic Rubber Elastomers

Pilots Adjustment Range:

1 to 16 bar ; 15 to 230 psi
2 to 30 bar ; 30 to 430 psi *
2 to 45 bar ; 30 to 650 psi *
* With high pressure kit

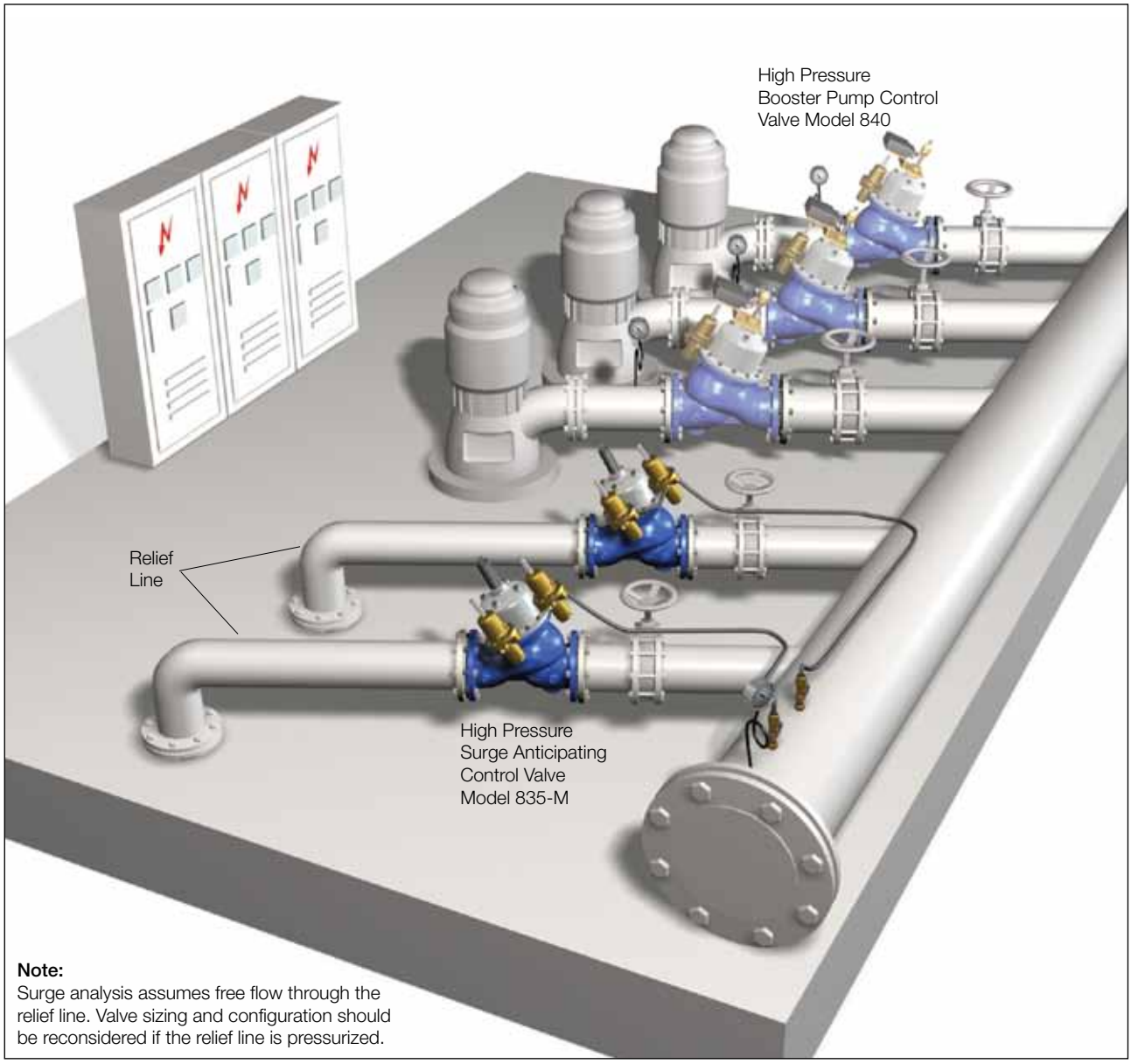
Notes:

- Maximum surge flow velocity: 15 m/sec ; 50 ft/sec
- Minimum operating pressure: 2.0 bar ; 30S psi.
  For lower pressure requirements consult factory

Typical Applications

In this system, a pump battery supplies the main line through a manifold. The Model 835-M:

- Eliminates surge on power failure
- Provides surge free switching between “on-duty” pumps
- Closes smoothly according to pilot setting



Note:
Surge analysis assumes free flow through the relief line. Valve sizing and configuration should be reconsidered if the relief line is pressurized.

BERMAD Waterworks

800 Series

Technical Data

Size Range: DN40-500 ; 1½–20”
End Connections (Pressure Ratings):
Flanged: ISO PN16, PN25, PN40 ; ANSI Class 150, 300, 400
Threaded: BSP or NPT
Others: Available on request
Valve Patterns: “Y” (globe) & angle
Working Temperature: Water up to 80°C ; 180°F
Standard Materials:
Body: Cast Carbon Steel; Ductile Iron; Stainless Steel 316
Cover: Stainless Steel 316; Bronze
Internals: Stainless Steel & Bronze
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 (m^3/h; gpm)

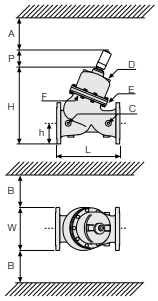
Kv = Metric system - valve flow coefficient (flow in m^3/h at 1 bar ΔP with 15°C water)

Cv = US system - Valve flow coefficient (flow in gpm at 1 psi ΔP with 60°F water)
Cv = 1.155 Kv

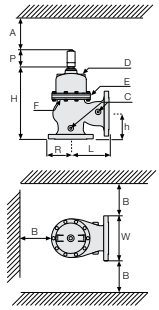
Flow Data & Dimensions Table

		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	800 "Y"	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
		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
	800 Angle	Kv / Cv - "A" Flat	46	53	55	64	61	70	127	146	220	250	506	580	897	1,040	1,375	1,590	2,035	2,350	2,189	2,530	3,641	4,210	3,773	4,360	-	-
		Kv / Cv - "A" V-Port	39	45	47	54	51	59	108	124	187	220	430	500	762	880	1,169	1,350	1,730	2,000	1,861	2,150	3,095	3,580	3,207	3,710	-	-
800 "Y" Flanged	PN10; 16 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	39.0	1,000	39.4	1,100	43.3
		W (mm / inch)	156	6.1	166	6.5	190	7.5	200	7.9	229	9.0	286	11.3	344	13.5	408	16.1	484	19.1	536	21.1	600	23.6	638	25.1	716	28.2
		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	8.0	242	9.5	268	10.6	300	11.8	319	12.6	358	14.1
		H (mm / inch)	260	10.2	265	10.4	278	10.9	327	12.9	409	16.1	526	20.7	650	25.6	763	30.0	942	37.1	969	38.1	1,154	45.4	1,173	46.2	1,211	47.7
		P (mm / inch)	-	-	-	-	-	-	-	-	-	-	135	5.3	135	5.3	142	5.6	154	6.1	154	6.1	191	7.5	191	7.5	191	7.5
		Weight (Kg/lb)	10.7	24	13	29	16	35	28	62	48	106	94	207	162	356	272	598	455	1,001	482	1,060	1,000	2,200	1,074	2,363	1,096	2,411
	PN25; 40 Class 300	L (mm / inch)	205	8.1	210	8.3	222	8.7	264	10.4	335	13.2	433	17.0	524	20.6	637	25.1	762	30.0	767	30.2	1,024	40.3	1,030	40.6	1,136	44.7
		W (mm / inch)	156	6.1	166	6.5	190	7.5	210	8.3	254	10.0	318	12.5	382	15.0	446	17.6	522	20.6	590	23.2	650	25.6	714	28.1	778	30.6
		h (mm / inch)	78	3.1	83	3.3	95	3.7	105	4.1	127	5.0	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)	260	10.2	265	10.4	278	10.9	332	13.1	422	16.6	542	21.3	666	26.2	783	30.8	961	37.8	996	39.2	1,179	46.4	1,208	47.6	1,241	48.9
		P (mm / inch)	-	-	-	-	-	-	-	-	-	-	135	5.3	135	5.3	142	5.6	154	6.1	154	6.1	191	7.5	191	7.5	191	7.5
		Weight (Kg/lb)	11.8	26	15	33	18.4	40	32	70	56	123	106	233	190	418	307	675	505	1,111	549	1,208	1,070	2,354	1,095	2,409	1,129	2,484
800 Angle, Flanged	PN10; 16 Class 150	L (mm / inch)	124	4.9	124	4.9	149	5.9	152	6.0	190	7.5	225	8.9	265	10.4	320	12.6	396	15.6	400	15.7	450	17.7	450	17.7	-	-
		W (mm / inch)	156	6.1	166	6.5	190	7.5	200	7.9	229	9.0	285	11.2	344	13.5	408	16.1	496	19.5	528	20.8	598	23.5	640	25.2	-	-
		R (mm / inch)	78	3.1	83	3.3	95	3.7	100	3.9	115	4.5	143	5.6	172	6.8	204	8.0	248	9.8	264	10.4	299	11.8	320	12.6	-	-
		h (mm / inch)	85	3.3	85	3.3	109	4.3	102	4.0	127	5.0	152	6.0	203	8.0	219	8.6	273	10.7	279	11.0	369	14.5	370	14.6	-	-
		H (mm / inch)	252	9.9	252	9.9	271	10.7	308	12.1	390	15.4	476	18.7	619	24.4	717	28.2	911	35.9	915	36.0	1,144	45.0	1,144	45.0	-	-
		P (mm / inch)	-	-	-	-	-	-	-	-	-	-	141	5.6	141	5.6	156	6.1	156	6.1	156	6.1	195	7.7	195	7.7	-	-
		Weight (Kg/lb)	10.7	24.0	13	29.0	16	35.0	26	57.0	46	101	90	198	153	337	259	570	433	953	459	1,010	950	2,090	1,020	2,244	-	-
	PN25: 40 Class 300	L (mm / inch)	124	4.9	124	4.9	149	5.9	159	6.3	200	7.9	234	9.2	277	10.9	336	13.2	415	16.3	419	16.5	467	18.4	467	18.4	-	-
		W (mm / inch)	150	5.9	155	6.1	190	7.5	200	7.9	254	10.0	318	12.5	381	15.0	446	17.6	522	20.6	586	23.1	650	25.6	716	28.2	-	-
		R (mm / inch)	78	3.1	85	3.3	95	3.7	105	4.1	127	5.0	159	6.3	191	7.5	223	8.8	261	10.3	293	11.5	325	12.8	358	14.1	-	-
		h (mm / inch)	85	3.3	85	3.3	109	4.3	109	4.3	135	5.3	165	6.5	216	8.5	236	9.3	294	11.6	299	11.8	386	15.2	386	15.2	-	-
		H (mm / inch)	252	9.9	264	10.4	271	10.7	315	12.4	398	15.7	491	19.3	632	24.9	733	28.9	930	36.6	935	36.8	1,160	45.7	1,160	45.7	-	-
		P (mm / inch)	-	-	-	-	-	-	-	-	-	-	141	5.6	141	5.6	156	6.1	156	6.1	156	6.1	195	7.7	195	7.7	-	-
		Weight (Kg/lb)	11.8	26	15	33	18.4	40	30	66	54	119	101	222	179	394	292	642	481	1,058	523	1,151	1,017	2,237	1,051	2,312	-	-

“Y” Pattern



Angle Pattern



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

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