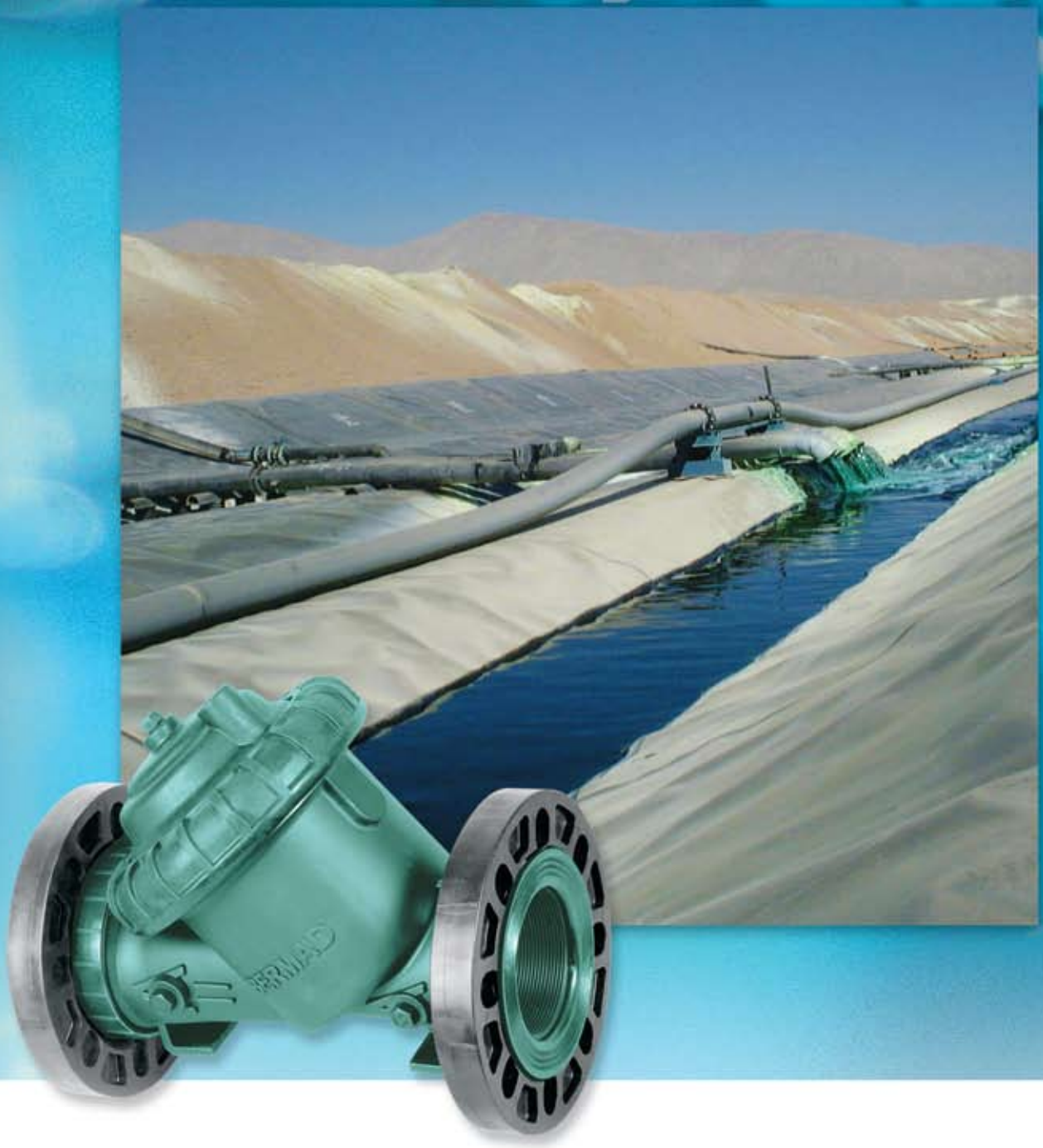
BERMAD Mining



BERMAD Mining Catalog

THE HEART OF YOUR SYSTEM

BERMAD

Advanced Control Valves for the Mining Industry

Over the decades, BERMAD has become one of the world's leading suppliers of advanced control valve solutions for the mining of copper, gold and other precious metals mines.

Bringing together extensive experience, cutting-edge technological know-how and precision engineered manufacturing, BERMAD offers a comprehensive range of custom-made, high performance control valves that are widely deployed and thoroughly proven throughout the industry.

Employed in solvent extraction processes, BERMAD's innovative automated technologies are used in numerous control applications including:

- Pressure reduction for heap leaching systems
- Pump control systems with surge protection
- Combined pressure control and on/off commands for fixed timed leaching sequence and lateral flushing
- Electronic control for quality mixing systems

BERMAD's cost-effective customized solutions replace older or less advanced manual valves, enabling customers to accurately achieve their specific control requirements.

Features & Advantages:

- **Advanced, hydraulic self-operated valves**
- **Highly corrosion resistant construction materials**
- **Accurate operation, high clogging resistance**
- **Complete selection of control applications**

BERMAD Mining

BERMAD Product Series

BERMAD Applications

Bermad's 700 Series

Bermad's 800 Series

Bermad's 100 Series

Pumping Systems

BERMAD offers you the Active Check Valve, which prevents fluid surge damage with its controlled pump activation and shut-off; surge anticipators that diminish the surge effect created when pumps suddenly shut down, and pressure release valves that provide hydraulic defense against human error or system failure.

BERMAD's engineers provide ongoing customer support backed by extensive experience with specialized programs for running system data, predicting its hydraulic behavior, and in developing ideal solutions.

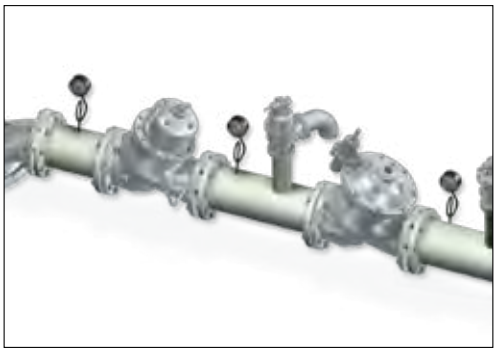
Pressure Reducing Systems

BERMAD can offer you systems solutions that are customized to your needs. With a broad systems outlook and solutions based on uncompromising reliability, BERMAD markets a wide range of products and accessories including diaphragm actuated pressure reducing valves, piston actuated pressure reducing valves, pressure reducing valves for graduated pressures up to 600 psi (40 bar), "smart" pressure reducing valves for variable operating times, and much more.

Level Control Systems

BERMAD offers a wide range of Level Control Valves for community reservoirs, fluid towers, active industrial reservoirs, fire protection reservoirs, and more. The BERMAD Level Control Valves, from diameters of 2" to 32", offer as standard a double chambered industrial valve design that promises prioritized full powered closing while its restrained, non-slam closing characteristics safeguard the system against damage from pressure surges.

Pumping Systems



2-Step Pressure Reducing System

Reservoir Control Systems

Heap Leaching System

[1] - Double-Chambered Actuator

- Actuator assembly can be removed as one integral unit
- Simple on-site conversion to single-chambered
- Same valve body accepts both actuators (Diaphragm and Piston)

[2] - Diaphragm Assembly

The flexible, unshaped, EPDM diaphragm is supported over the majority of its surface.
Diaphragm load is limited only to the stretching forces applied to the active area.

[3] - Piston Assembly

Vented lower chamber provides differential piston principle of operation and air cushioning. Constant active area together with the sturdy construction and unobstructed long travel ensures stable and accurate regulation.
The “shaft diameter” central guiding and the dynamic piston-seal reduce friction and jamming risk.

[4] - Cover Plug

Enables on-site retrofit of:

- **Indicator [4A]:** For visual valve position indication
- **Limit Switch:** For signaling open / close valve position with NC and NO contacts.
- **Position Transmitter:** For analog transmission of valve position.

[5] - Inherent Separation Partition

The inherent separation includes the bearing [5A], which provides complete central guiding for the valve moving assembly. The separation partition separates the lower control chamber from the flow in both the single-chambered, and the double-chambered configurations.

[6] - Spring

Required for single-chambered configurations. Superfluous for double-chambered configurations (unless check feature is required).

[7] - Seal Disc Assembly

Self-aligning, seal disk assembly provides balanced, free movement and a resilient seal for perfect, drip-tight sealing.
It enables using several variations of seals and plugs for a wide range of applications and working conditions.

[8] - Seat

Raised, replaceable in-line and on-site.

[9] - Wide Body (“Y” or Angle Pattern)

Hydro-dynamically designed for efficient flow with minimal pressure loss and excellent resistance to cavitation.
Full bore, valve port area clear of obstructions; no ribs or stem guides. Increases capacity by 25% over standard globe valves.

[10] - End Connections

Conforms to pressure ratings and standards of: ISO, ANSI, JIS, BS, and others.

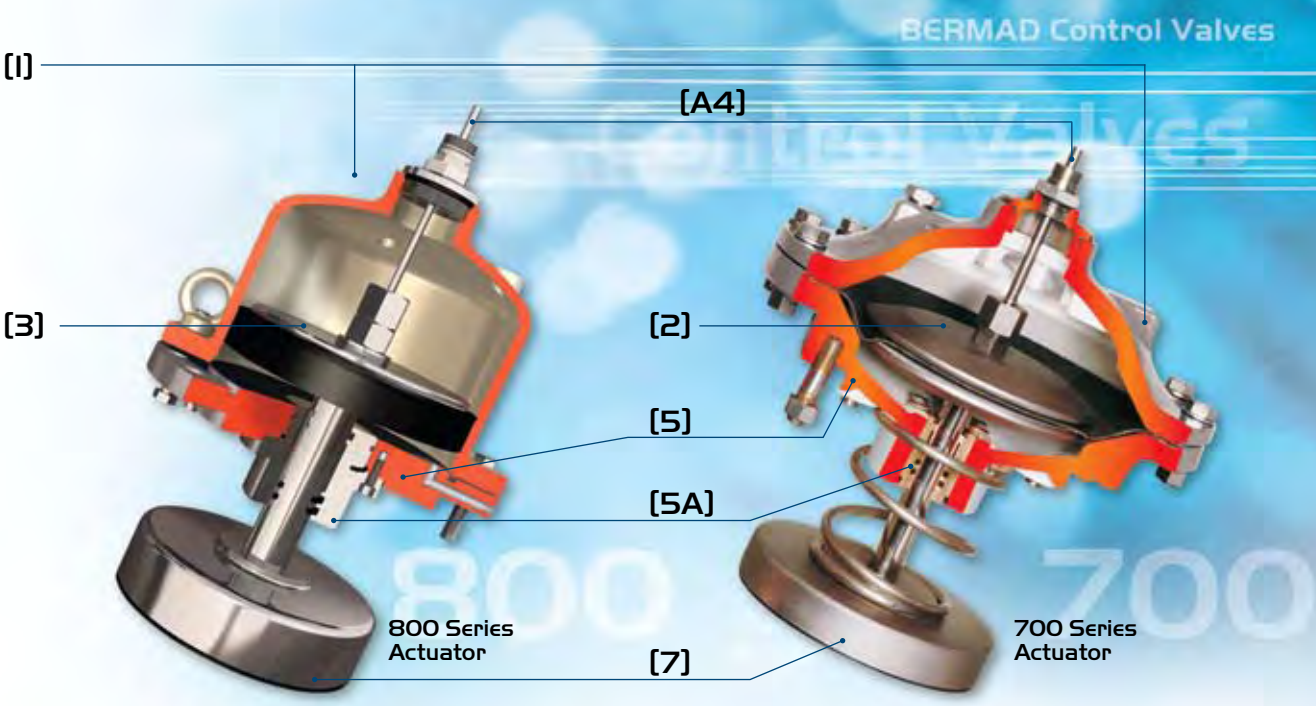
Valve Plug Options

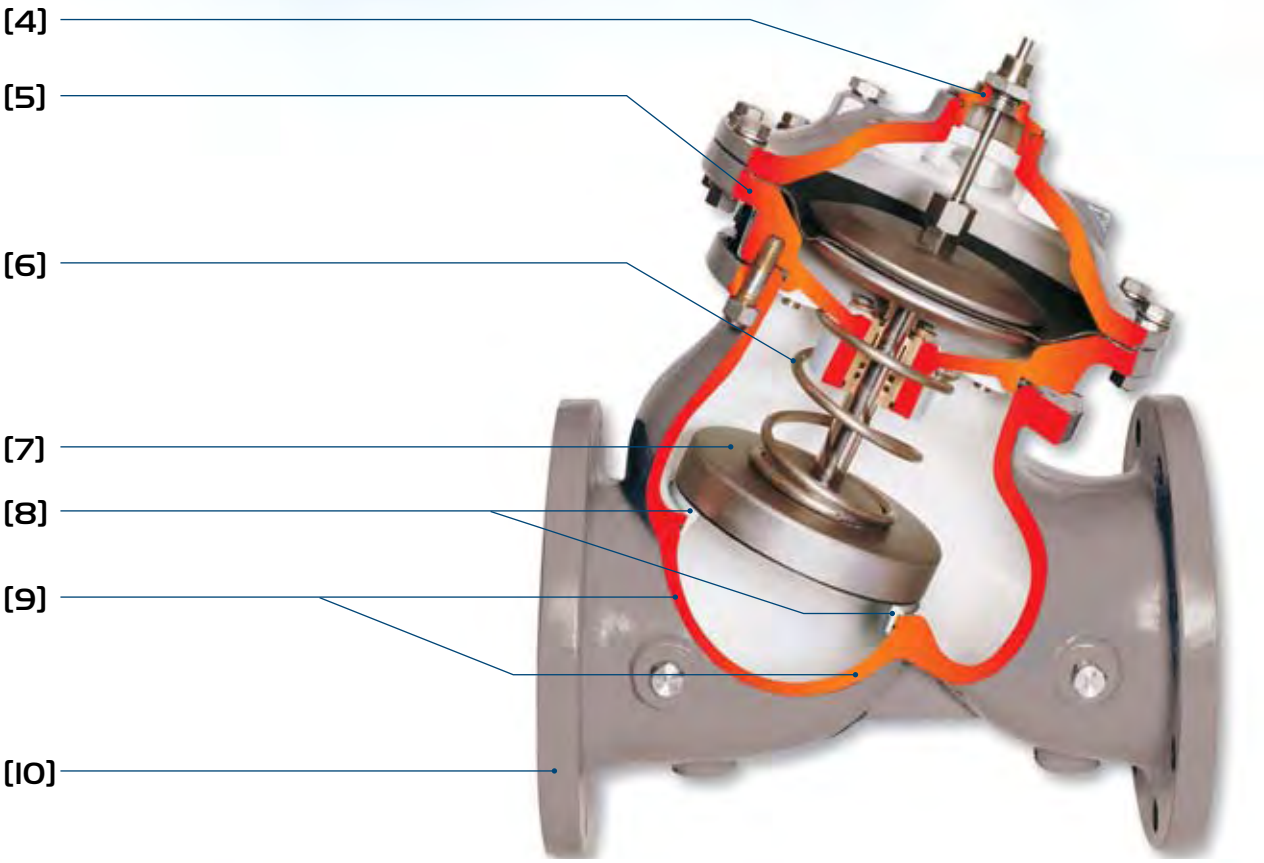
Flat Disc

“Quick opening plug”: Standard plug provides high flow and quick response.

Throttling Plug

A throttling plug is used in order to provide more accurate, stable and smooth response for pressure and flow regulation while reducing noise and vibration.
Two types are available:
“U” shape (standard) and “V” shape.


[1]
[A4]
[3]
[2]
[5]
[5A]
800 Series
Actuator
700 Series
Actuator
[7]


[4]
[5]
[6]
[7]
[8]
[9]
[10]

[1] Cover Ring

The cover ring fastens valve cover to body, stiffening and strengthening the valve body, enabling simple maintenance. A cover ring key is available.

[2] Pilot Adaptor

The pilot adaptor allows connection of the pilot valve or hydraulic relay to the valve body.

[3] Valve Cover

The cover's strong construction meets rough service conditions.

[4] Auxiliary Closing Spring

One single high grade stainless steel spring provides a wide operation range, ensuring low opening pressure and secured closing.

[5] Plug Assembly

The unitized Flexible Super Travel (FST) plug assembly combines a long travel guided valve plug, peripherally supported diaphragm, and replaceable diaphragm and valve seal. The diaphragm fully meets the valve's operating pressure range requirements.

[5.1] Diaphragm Holder
[5.2] Diaphragm
[5.3] Plug
[5.4] Plug Seal

[6] hYflow 'Y' Valve Body

Polypropylene construction meets rough service conditions with high chemical and cavitation resistance.
End-to-end "look-through" design and full bore seat with unobstructed flow path, free of any in-line ribs, supporting cage, or shafts, enables ultra-high flow capacity with minimal pressure loss.

[7] End Connections

Adaptable on-site to a wide range of end connection types and sizes:

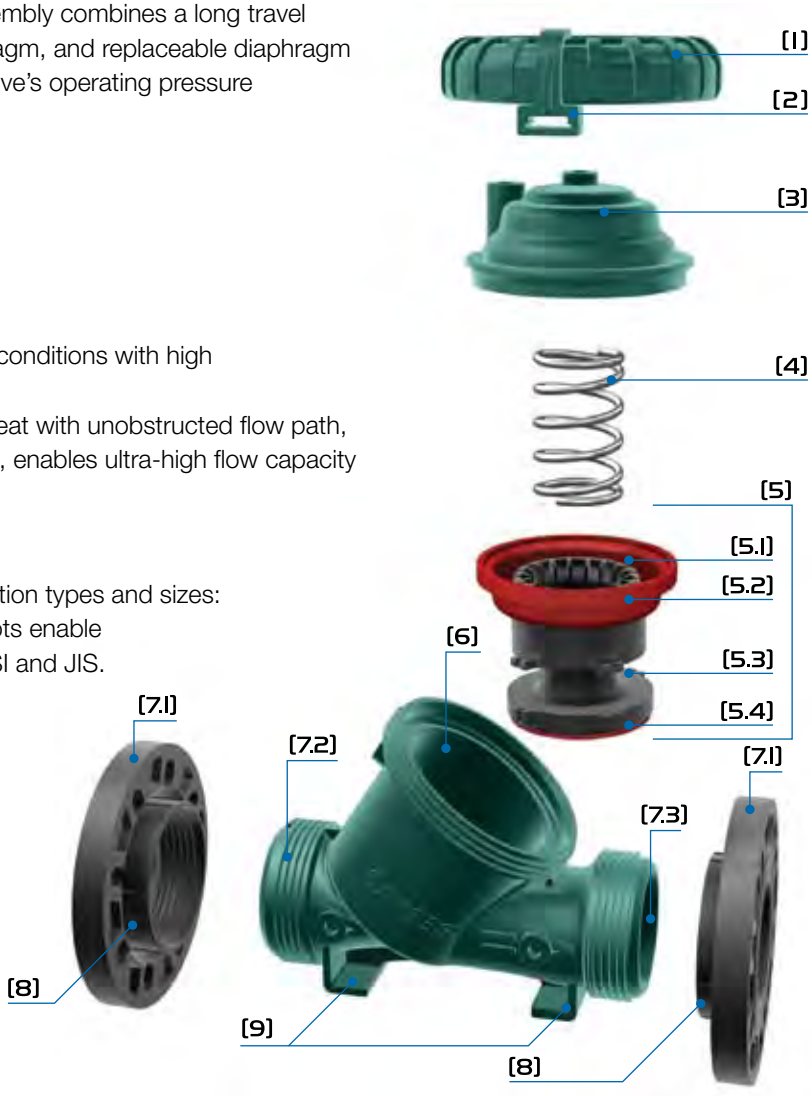
[7.1] Flanges: Plastic or metal with elongated slots enable meeting diverse flange standards ISO, ANSI and JIS.
[7.2] Flange adaptor external thread
[7.3] Internal threads

[8] Flange Adaptor

Articulated flange connections isolate the valve from line bending and pressure stresses.

[9] Valve Legs

Stabilize the valve and serve also as mounting brackets.



Pressure Reducing Valves

Establishing various pressure zones is one of the most common means of achieving balance in fluid transmission and distribution networks. Pressure Reducing Valves (PRV) force the dynamic parameters of the supply system into a constant predetermined delivery pressure. An active PRV, through definition of minimum required pressure at each pressure zone's critical point, enables continuous readjustment of delivery pressure. This allows the system to work at a lower average pressure.

Model 720

Model 720

The Model 720 Pressure Reducing Valve is a hydraulically operated, diaphragm actuated, control valve that reduces higher upstream pressure to lower constant downstream pressure regardless of fluctuating demand or varying upstream pressure.

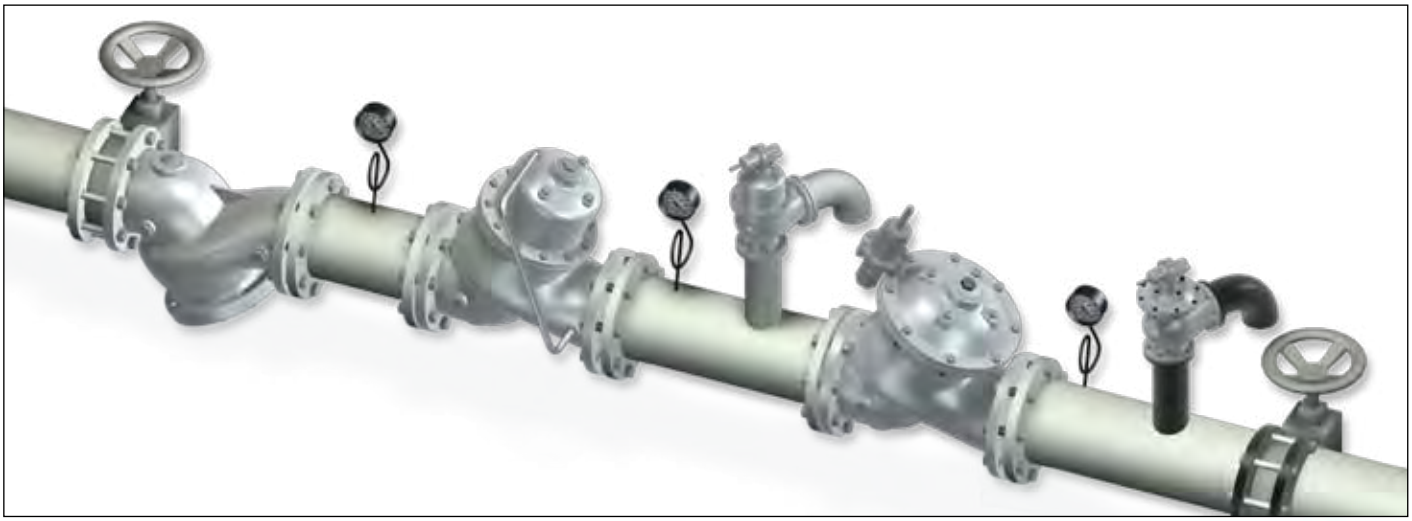
Model 820

Model 820

The Model 820 piston- actuated Pressure- Reducing Valve enables operation at higher upstream pressures. It extends the pressure- rating range upper- limit to 600 psi (40 bar).

Applications

- **Cavitation damage protection**
- **Throttling noise reduction**
- **Burst protection**
- **System maintenance savings**



Booster Pump Control Valves

Pump Control Valves protect pumps, pipelines, and other system components by isolating the pipeline from the sudden velocity changes associated with pump starting and stopping. The “Active Check Valve” logic of operation is a pumping-system control method that prevents the system from experiencing surges rather than eliminating them.

Model 740

Model 840

Model 740

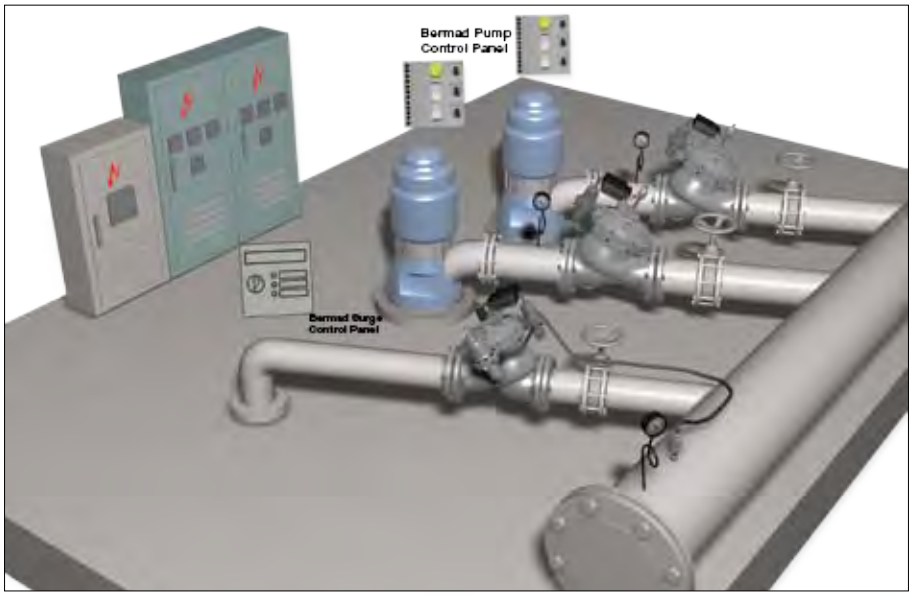
The Model 740 Booster Pump Control Valve is a hydraulically operated, diaphragm actuated, active check valve that opens fully or shuts off in response to electric signals. It isolates the pump from the system during pump starting and stopping, to prevent pipeline surges.

Model 840

The Model 840 piston actuated Booster Pump Control Valve enables operation at high pressure pumping systems. It extends the pressure rating range upper limit to 600 psi (40 bar).

Applications

- **Isolation of pump start-and-stop effects from system, for:**
  - **Solitary single speed pumps**
  - **Battery of single speed pumps (add and switch)**
  - **Battery of variable speed pumps (add)**



Surge Anticipating Valves

Abrupt pump stopping is followed by a pressure drop as the fluid column continues traveling along the line. The returning column hits the closed pump check valve, creating a high pressure surge wave, which travels at up to 4 Mach. Eliminating such a surge requires anticipation and pre-action. Surge Anticipating Valves react to the pressure drop, accepting the returning column while already open, thus eliminating the surge.

Model 735-M

Model 735-M

The Model 735-M Surge Anticipating Valve is an off-line, hydraulically operated, diaphragm 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 735-M smoothly closes drip-tight as quickly as the relief feature allows, while preventing closing surge. The valve also relieves excessive system pressure.

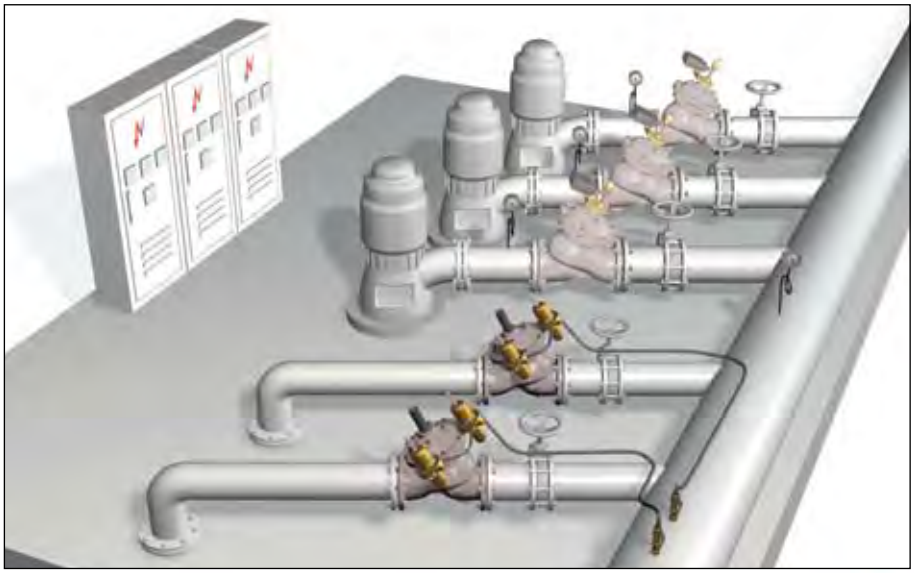
Model 835-M

Model 835-M

The Model 835-M piston actuated Surge Anticipating Valve enables operation at high pressure pumping systems. It extends the pressure rating range upper limit to 40 bar (600 psi).

Applications

- **Eliminates surge for all pumping systems:**
  - **Booster and deep well, single & variable speed**
- **Eliminates surge for all distribution networks:**
  - **Networks operating with different mining solutions such as; RAFF, PLS, Cynide and**
  - **Difficult to maintain, remote locations, older systems**



Electronic Control Valve

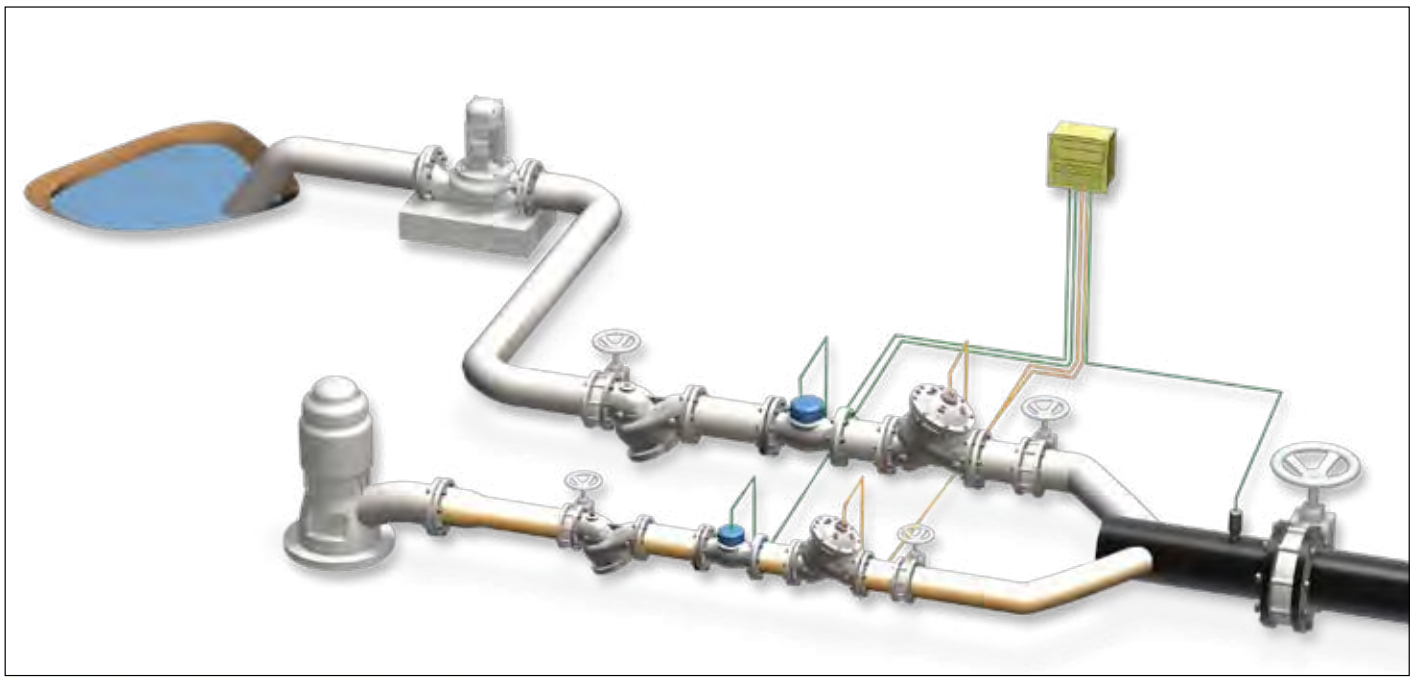
Electronic Control Valves combine the advantages of excellent modulating, line pressure driven, hydraulic valves with the electronic control world. In today's world of fluids control - modern, dynamic and communication intensive electronic control valves are needed for real time control of pressures, flows, temperatures, levels, etc., both as single variables, and as a function of each other.

Model 718-03

The Model 718-03 Electronic Control Valve is a hydraulically operated, diaphragm actuated, control valve that, in response to signals from an electronic controller, modulates open or closed to control pressure, level, flow, temperature and/or other parameters requiring control, according to the set values programmed into the controller. For very low pressure applications, refer to the full powered opening and closing Model 718-03-B.

Applications

- **Mixture quality control in Mixing Junctions**
- **Control of pressure, flow, level, temperature, etc.**
- **Flow control as a function of reservoir level**
- **Pressure control as a function of demand or time**
- **Flow control as a function of temperature**



Pressure Reducing Valve with Electric On/Off

Establishing various pressure zones is one of the most common means to achieve balance in fluid transmission and distribution networks. Pressure Reducing Valves (PRV) force the dynamic parameters of the supply system into a constant predetermined delivery pressure. An active PRV, through definition of minimum required pressure at each pressure zone's critical point, enables continuous readjustment of delivery pressure. This allows the system to work at a lower average pressure.

Model 120

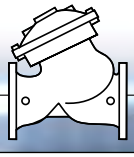
Model 120 is a hydraulically self-operated control valve, which uses the hydraulic force of the line pressure to reduce upstream pressure to lower constant downstream pressure. The Model 120 valve is usually installed at the head of the leaching system. The valve controls the inlet pressure to the leaching system creating uniform solution distribution between the pads. The Model 120 valves also control the quantity of solution on each pad by controlling the inlet pressure. The local control of each pad results in significant solution savings.

Model 120-55

Model 120-55 : The addition of a solenoid to the control loop enables the opening and closing of the valve by a remote controller. Pressure reducing performance is similar to that of Model 120. Model 120-55 operates with a variety of solenoid voltage ranges: 24VAC, 24VDC, Latch 9VDC, 12VDC.

Applications

- **Copper and Gold Mining Leaching Systems**



Pressure Reducing

Characteristic	BERMAD Pressure Reducing Valve	Throttled Isolation Valve/Orifice Plate
Operation	Valve is designed to operate at required downstream pressure irrespective of change in upstream pressure and demand.	The Throttled or Orifice valve is designed for required pressure.
Regulation	Built for regulation	Not built for regulation
Effect of change in upstream pressure	Downstream pressure is constant	Downstream pressure varies
Effect of change in demand	Downstream pressure is constant	Downstream pressure varies
Effect of change in upstream flow rate	Downstream pressure is constant	Downstream pressure varies
Sealing	Drip-tight sealing; pressure does not increase	No drip-tight sealing. Pressure increases over time
Service	Easy in-line inspection and service	Must be removed from the line for inspection or service.
Energy consumption	None	None
Manual operation	Not required. Self-operated on fluid line pressure	Required
Additional features	Possible; additional features such as flow control, anti-drainage of pipeline, etc., can be added	Not possible
Maintenance	Very low, since it is built for regulation	Very high due to cavitation and seat leakage

Level Control

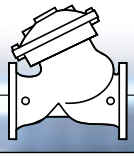
Characteristic	BERMAD Level Control Valve	Mechanical Float Valve
Operation	Static head of reservoir is sensed through pilot which controls valve opening and closing. Main valve is installed at ground level.	Float and arm assembly are in tank as they are heavy and cumbersome, and have a tendency to leak.
Requirement of float in tank	No installation in tank	Must be installed in tank
Location	Valve is installed at ground level, making it easily accessible	Required in-tank installation
Sensitivity to waves in tank	No	Yes
Flow factor (Cv) of valv	Very hig	Low
Service	Easy in-line inspection and service.	Must be removed from the line for inspection or service.
Surge generation	With controlled opening/closing, surges are eliminated	Yes, due to sudden closure and opening
Energy consumption	None	None
Additional features	Possible; additional features such as flow control and pressure sustaining can be added	Not an option
Life	High durability, long-lasting	Very low due to mechanical float corrosion and wearing out of hinges.

Pump Control

Characteristic	BERMAD Pump Control Valve	Electrically Operated Butterfly Valve
Actuator	Built-in	Externally mounted
Non-return valve requirement	Not required; built-in non-return feature	Non-return valve required
Closing characteristic	Linear	Non linear
Surge generation	With inherent controlled opening and closing, surges are eliminated	Uniform opening and closing speed with "quick opening" characteristic generates line surge
Valve status upon power failure	Works as non-return valve and closes drip-tight	Remains in last position, i.e, if open, will remain open
Service	Easy in-line inspection and service	Must be removed from the line for inspection or service
Energy consumption	Very low energy consumption; solenoid operated with 24 VAC/24 VDC	High power motor, high energy consumeption
Sealing	Drip-tight sealing; does not increase over time and pressure	No drip-tight sealing; increases over time and pressure.
Additional features	Additional features can be added, such as pressure sustaining, operation of valve in specified pressure limits, flow control, etc.	Not an option
Infrastructure	Low power Low infrastructure cost Easy to operate and maintain	High power line, usually 3-phase 380V High cost controlling devices Each service call for the valve involves a qualified electrician

Surge Protection

	'BERMAD' Surge Anticipating Valves	Air Vessels	Zero Velocity Valve
Principle of operation	Opens automatically when pump shuts off. When the upsurge returns, it finds open outlet, thereby dissipating the surge energy by relieving solution outside the network.	Combination of pressurized air and fluid at normal operation. When the pump stops, the air expands pushing the solution into the pipe. During the upsurge, the air is compressed, and the surge pressure is thus dissipated.	Dividing pipeline in to sections, assuming the upsurge of each section will not exceed the maximum level allowed. The valve closes before the flow reverses.
Degree of protection	Upsurge can be limited to even lower level than duty point of the pumps.	Upsurge cannot be reduced to normal level; some pressure increase is unavoidable. Large, long pipelines require huge capacity.	Upsurge level is a result of location and number of valves.
Maintenance	Simple installation and minmal off-line maintenance, since there are fewer moving parts.	Compressor and automatic controls require continuous maintenance.	Valves cannot be maintained as they are in-line. Complete shut down of system is required.
Experience	BERMAD technology and solutions are used worldwide, offering superior performance.	Very old method (conventional system)	Not recommended in large diameter network, and definitely not in cases of large topographical differences.
Head losses	None	Negligible	Yes
Cost	Low	High	Low



700 Series

Available Sizes & Patterns
- 1½" - 20" (40 - 500 mm) - Y and Angle
- 24" - 32" (600 - 800 mm) - Globe

Connection Standard
- Flanged: ANSI B-16.42
- Threaded: NPT

Fluid Temperature
- Up to 180ºF (80°C)

Working Pressure
- ISO PN 16: 16 bar
- Class #150: 250 psi
- ISO PN 25: 25 bar
- Class #300: 400 psi

Materials for 1½" to 20" Valves Only
- **Main valve body and cover**
  Ductile Iron EN 1563 (ASTM A-536)
  Carbon Steel (ASTM A-216-WCB)
  Stainless Steel 316 CF8M (316)
  Alloy 20
  Duplex
  Hastalloy
  254 SMO
- **Main valve internals**
  Stainless steel and bronze
- **Control Trim**
  Stainless Steel 316 fittings & tubing
  Monel® & Ni-Al-Bronze ASTM B148 C95800
  Hastalloy C-276
- **Elastomers**
  NBR (Buna-N)
  EPDM
  Viton
- **Coating**
  Fusion Bonded Epoxy, RAL 5005 (Blue)
  NSF 61 and WRAS approved
  or Electrostatic Polyester Powder,
  RAL 6017 (Green) WRAS approved

800 Series

Available Sizes & Patterns
- 1½" - 20" (40 - 500 mm) - Y Pattern
- 1½" - 18" (40 - 450 mm) - Angle

Connection Standard
- Flanged: ANSI B16.5

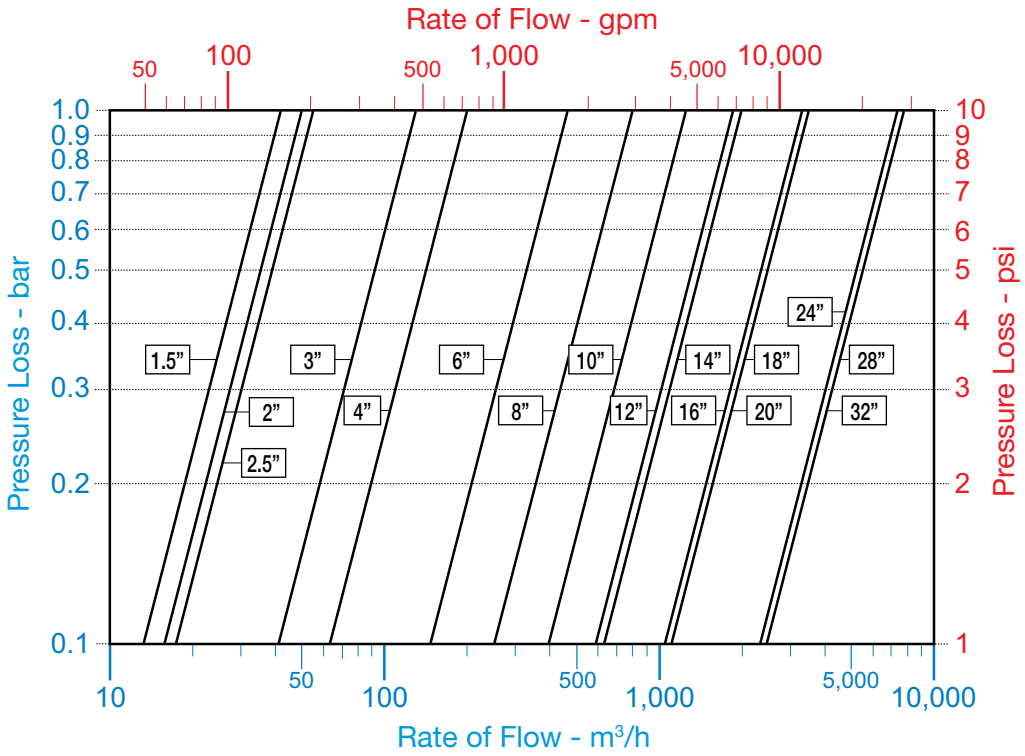
Fluid Temperature
- Up to 80ºC (180°F)

Working Pressure
- ISO PN 16: 16 bar
- Class #150: 250 psi
- ISO PN 25: 25 bar
- Class #300: 400 psi
- ISO PN 40: 40 bar
- Class #400: 600 psi

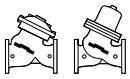
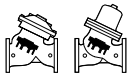
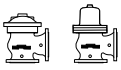
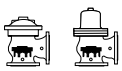
Materials for 1½" to 20" Valves Only
- **Main valve body**
  Carbon Steel (ASTM A-216-WCB)
  Stainless Steel 316 CF8M (316)
  Alloy 20
  Duplex
  Hastalloy
  254 SMO
- **Valve cover (piston cylinder)**
  Stainless Steel
- **Main valve internals**
  Stainless Steel and bronze
- **Control Trim**
  Stainless Steel 316 fittings & tubing
  Monel® & Ni-Al-Bronze ASTM B148 C95800
  Stainless steel 316
  Hastalloy C-276
- **Elastomers**
  NBR (Buna-N)
  EPDM
  Viton
- **Coating**
  Fusion Bonded Epoxy, RAL 5005 (Blue)
  NSF 61 and WRAS approved
  or Electrostatic Polyester Powder, RAL
  6017 (Green)
  WRAS approved

* The above mentioned Materials are available, according to Mine type and requirements.

Flow Chart



Valve Flow Coefficient

		mm	40	50	65	80	100	150	200	250	300	350	400	450	500
		inch	1.5"	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
Y-Pattern Flat Disc		Kv	42	50	55	115	200	460	815	1,250	1,850	1,990	3,310	3,430	3,550
		Cv	49	58	64	133	230	530	940	1,440	2,140	2,300	3,820	3,960	4,100
Y-Pattern U-Plug		Kv	36	43	47	98	170	391	693	1,063	1,573	1,692	2,814	2,916	3,018
		Cv	41	49	54	113	200	450	800	1,230	1,820	1,950	3,250	3,370	3,490
Angle Flat Disc		Kv	46	55	61	127	220	506	897	1,375	2,035	2,189	3,641	3,773	NA
		Cv	53	64	70	146	250	580	1,040	1,590	2,350	2,530	4,210	4,360	NA
Angle U-Plug		Kv	39	47	51	108	187	430	762	1,169	1,730	1,861	3,095	3,207	NA
		Cv	45	54	59	124	220	500	880	1,350	2,000	2,150	3,580	3,710	NA

		mm	600	700	750	800
		inch	24"	28"	30"	32"
G-Pattern Flat Disc		Kv	7,350	7,500	7,500	7,500
		Cv	8,490	8,670	8,670	8,670

Valve flow coefficient, Kv or Cv

$$Kv(Cv)=Q\sqrt{\frac{Gf}{\Delta P}}$$

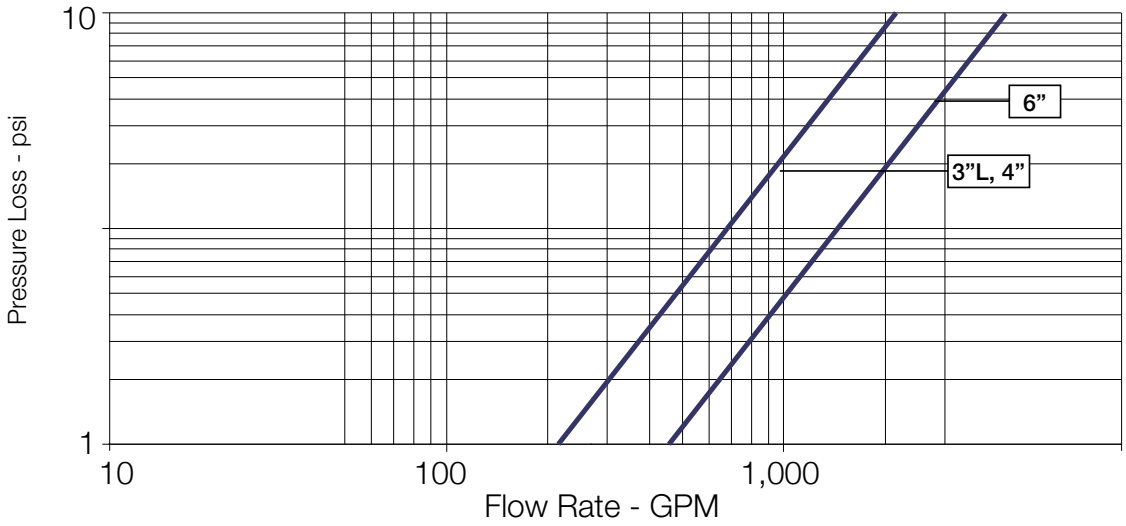
Where:

Kv = Valve flow coefficient (flow in m^3/h at 1bar Diff. Press.)
Cv = Valve flow coefficient (flow in gpm at Diff. Press. 1psi)
Q = Flow rate (m^3/h ; gpm)
ΔP = Differential pressure (bar ; psi)
Gf = Liquid specific gravity (Water = 1.0)

Cv = 1.155 Kv

Flow Chart

100 Series, Control Valves "Y" Pattern



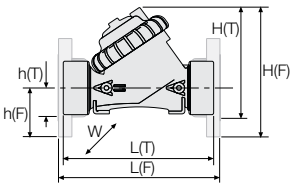
Technical Specifications

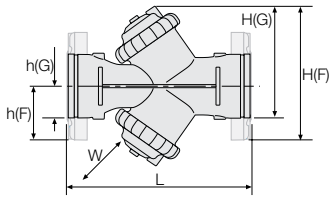
Available Patterns & Sizes:
3"L, 4" & 6"
Available End Connections:
Threaded: Female NPT: 3"L
Flanged: ANSI 150: 3"L, 4" & 6"
Grooved (Victaulic): 6"
Socket (Solvent Weld PVC): 3"L, 4"
Pressure Rating: 90 psi
Temperature Range: 140°F
Standard Materials:

- Body, Cover, Cover Ring and Plug: Fiberglass Reinforced Polypropylene
- Diaphragm: Nylon Reinforced EPDM
- Seals: EPDM
- Spring: Stainless Steel

Flow Properties - Cv

Sizes	3"L	4"	6"
Pattern	Y	Y	Y
Cv	231	231	462





Dimensions and Weights

Sizes		3"L			4"		6"	
Pattern		Y			Y		Y	
Ends Connections		Threaded NPT	Socket (Solvent Weld)	Flanged ANSI 150	Socket (Solvent Weld)	Flanged ANSI 150	Grooved (Victaulic)	Flanged ANSI 150
L	(in)	3 3/4	14 1/8	12 1/4	14 1/8	13 3/4	18 7/8	18 7/8
H	(in)	9 1/2	9 1/2	11	9 1/2	11 3/8	7 5/8	11 1/4
h	(in)	2 3/8	2 1/2	3 7/8	2 1/2	4 3/8	3 7/8	5 3/4
W	(in)	7 1/2	7 5/8	3 7/8	7 5/8	4 1/2	15 1/8	15 1/8
Weight	(lb)	6.6	9.4	8.8	8.7	10.8	19.4	28.2

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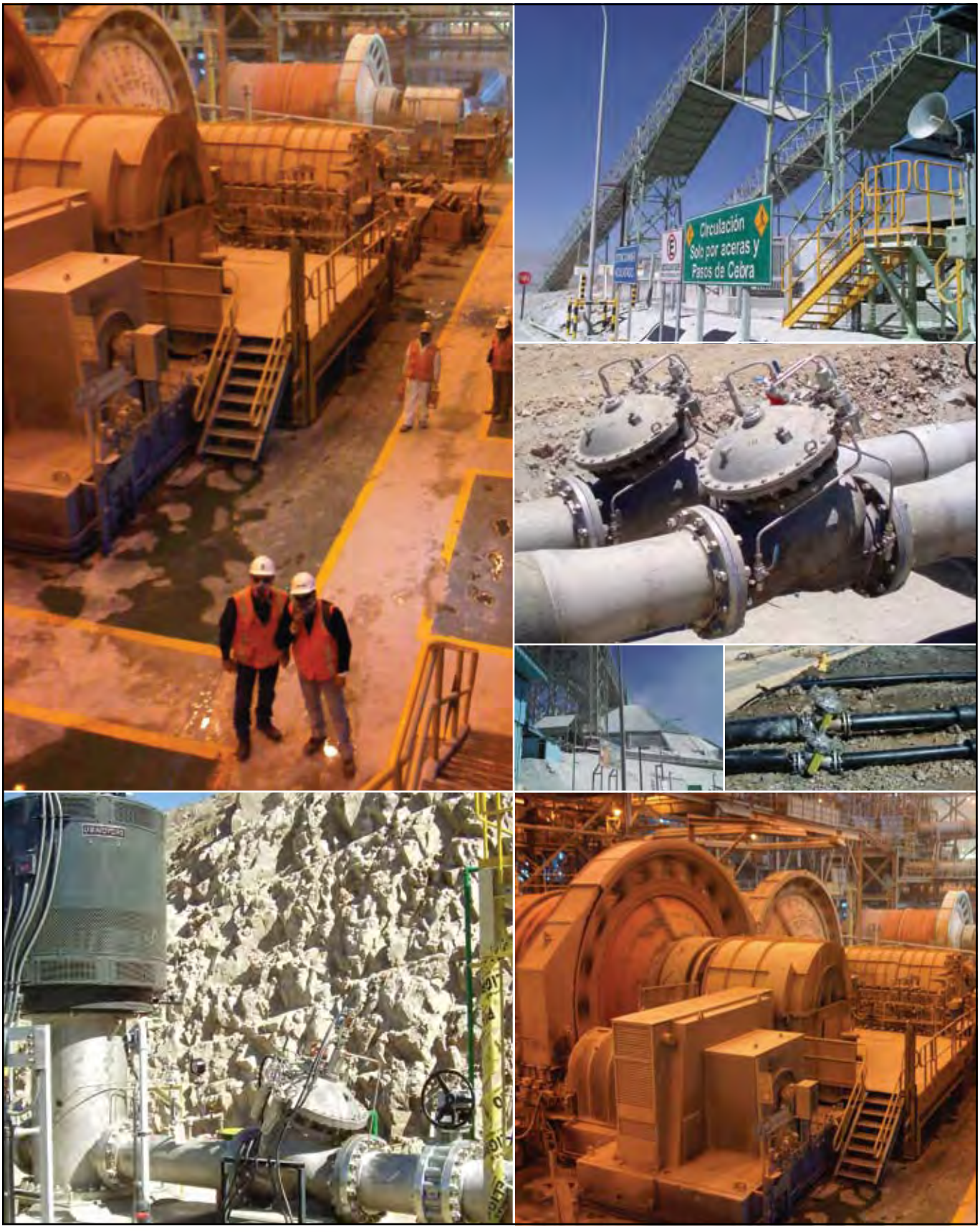

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