

## Technical Data

---

### Two-Stage Valve

#### Model BV89

---

##### General

The Model BV89 Brodie Two-Stage Valve is normally closed and designed for precise, accurate control and shut-off of petroleum products. The valve controls a predetermined amount of product to guarantee smooth, positive shut-off. Operational functions may include low flow start-up when used with a time delay circuit or other system controls.

The Model BV89 - Two-Stage shut-off plus pressure control achieved by sensing and controlling valve outlet pressure.

##### Design Features

- Precision flow rate and batch control
- Modular construction -all internal parts including seat ring can be removed with the cylinder assembly without disturbing line connections.
- No diaphragms or stuffing boxes
- 45° body design assures high capacity
- Positive shut-off
- Linear control characteristics with uniform response speed
- Automatic check valve - no reverse flow
- Fail-safe closes on loss of electrical power
- Characterized ports for better low flow response

##### "AP" (Aggressive Products) Option

The "AP" option valve cylinder incorporates a combination of seals and O-ring materials to provide optimum performance in aggressive product applications. Specify "AP" Option at time of order when valve is to be used on products which may affect standard seals.

##### Principle of Operation

Typical Control Systems consist of three primary pieces of equipment: flowmeter, preset counter (electronic or mechanical), and two-stage shut-off valve. The meter is the primary flow measuring device. The preset counter is used to determine the volume of liquid to be controlled by the valve at predetermined settings. The sequential switches of the batch controlling mechanism control the solenoid pilots of the control valve. The control valve operates on a balanced piston principle. Electrically operated solenoid pilots position the valve piston by increasing or decreasing hydraulic pressure on the top of the piston as dictated by sequencing switches. When pressure on both sides of the valve piston is equal, the main valve spring acts as a differential force and closes the valve. When the pressure against the bottom of the piston exceeds the pressure (plus the force of the spring) exerted against the top of the piston, spring pressure is overcome and the valve is opened.

The control valve is designed to close in two distinct stages. As the preset counter reaches the first stage of shut-off, the preset trips the sequence switches to place the valve in the first stage (low flow) shut-off position. The first stage closure reduces the flow rate through the valve to approximately 10 to 20 percent of the rated capacity of the meter. The preset trips the sequencing switches again and the valve closes.

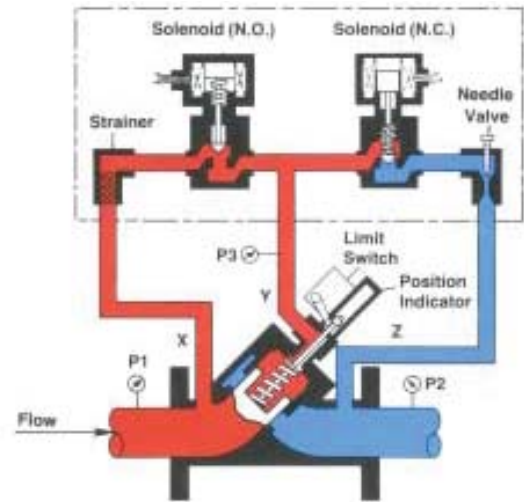
##### Applications

Two-stage electrical control valves are suited for those applications requiring precise shut-off, such as truck or railcar loading or similar batching operations.

## Typical Installation

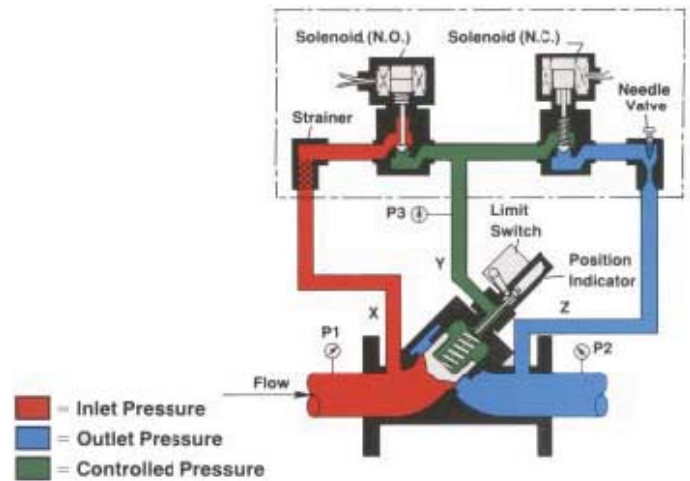
### Closed Position

The normally closed solenoid is closed. The normally open solenoid is open. Y-port (P3) to Z-port (P2) is closed. X-port (P1) and Y-port (P3) pressures are balanced. The main valve spring being the differential force, closes the piston and keeps it seated.



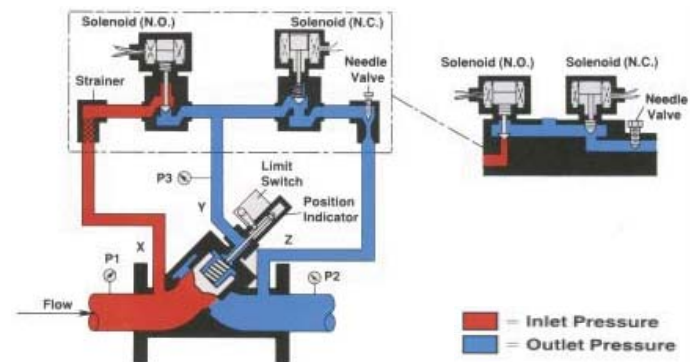
### Low Flow Position

The normally closed solenoid is closed. The normally open solenoid is closed. Y-port (P3) to Z-port (P2) is closed. X-port (P1) to Y-port (P3) is closed. Note: The product cannot flow to or from the top of the piston (Y-port). The piston is locked hydraulically in the low flow position. During the transition stage from high flow to low flow, the normally closed solenoid was closed and the normally open solenoid was open (X-port/P1 /to Y-port/P3/was open). During the closing cycle, the limit switch was activated causing the N.O. solenoid to be closed hydraulically locking the valve in an intermediate position.



### Fully Open - No Control

The normally closed solenoid is open. The normally open solenoid is closed. Y-port (P3) is open to Zport (P2). X-port (P1) is closed off by the normally open solenoid. The pressure on the bottom of the piston (P1) is greater than the pressure at (P3) plus the spring force.  $(P1 \text{ minus } P2)$  is equal to or greater than the spring force.



### Materials of Construction

**Main Valve Body:** Steel-ASTM-A216-GR-WCB  
**Main Valve Cylinder:** 17-4 PH Stainless Steel, Heat Treated  
**Main Valve Piston:** Stainless Steel  
**Seat Ring:** Stainless Steel  
**O-Rings:** Viton (Standard)  
 (Other Elastomers Available)  
**Other Internal Parts:** Stainless Steel  
**Pilot Valve Body:** Steel (Standard)  
**Pilot Valve Trim:** Stainless Steel  
**Tubings and Fittings:** Steel (Standard)

### Optional Equipment

- Pilot Line Isolation Block Valves
- Fusible Link Pilot Valve (closes at 1600F)
- Manual Override (Opens Valve)
- Adjustable Thermal Relief
- Closing Speed Control
- Low Flow Start-up

### Recommended Spare Parts

O-Rings

### Flange Connections

Valve Size	Connections	Max Working Pressures @100F	DIN Connections	Max Working Pressure
2"-6"	150 lb. ANSI	285 psi	DN 80 - DN 150 PN 25	25 Bar
2"-6"	300 lb. ANSI	740 psi	DN 80 - DN 150 PN 64	51 Bar

Temperature Range: -20°F to 150°F (-29°C to 66°C)

### Shipping Weight And Volume (Approximate)

Valve Size	Shipping Weight and Volume
2"	69 lbs. @ 3 Cu. Feet
	31.3 kgs. @ 0.085 Cu. Meters
3"	105 lbs. @2.36 Cu. Feet
	47.63 kgs. @ 0.067 Cu. Meters
4"	140 lbs. @ 2.51 Cu. Feet
	63.5 kgs. @ 0.071 Cu. Meters
6"	250 lbs. @ 4.84 Cu. Feet
	113.4 kgs. @ 0.137 Cu. Meters

### Maximum Operating Pressure Differential (MOPD)

175 psi (1207.5 kPa) MOPD.

### Valve Capacity Data

Valve Size	2"	3"	4"	6"
*Cv-gpm	90	190	315	700

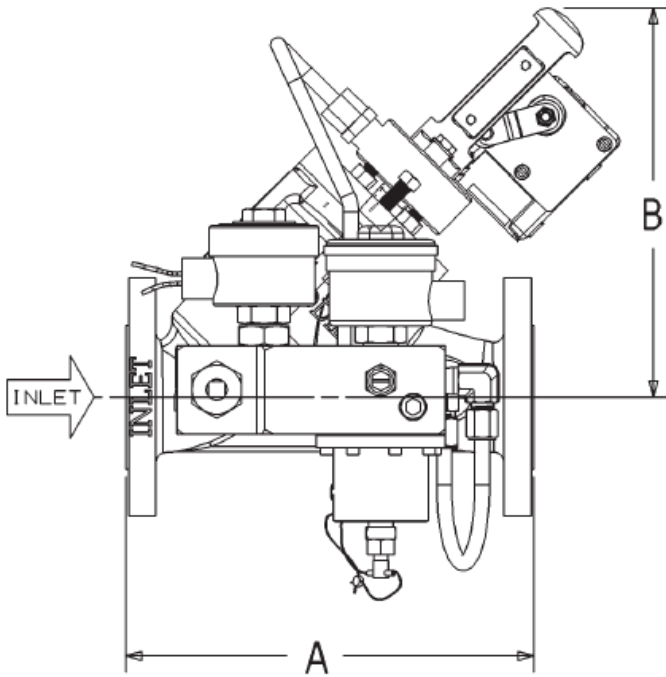
\*Cv based on wide open valve utilizing water at 60F (15.6C).

### Ordering Information

When ordering, the following information must be supplied:

- Size
- Flange Connections
- Product, Product Viscosity, Product Specific Gravity
- Minimum and Maximum Flow Rate
- Minimum, Normal and Maximum Operating Temperature
- Control Functions to be Performed
- O-Ring Material
- Control Pilot Materials
- Tubing Material
- Pilot Spring Range
- Pilot Spring Setting (psi or kPa)

Dimensions (For Certified Dimensional Prints -Consult Factory)



Valve Size	A	
	mm	inches
2"	mm	260
	inches	10 1/4"
3"	mm	279
	inches	11"
4"	mm	330
	inches	13"
6"	mm	432
	inches	17"

**NOTE:**

Do not operate this instrument in excess of the specifications listed. Failure to heed this warning could result in serious injury and/or damage to the equipment.

**Brodie International**

P.O. Box 450 (30459-0450)  
 19267 Highway 301 North  
 Statesboro, GA 30461  
 USA

Phone: +1 (912) 489-0200  
 Fax: +1 (912) 489-0294