



## Control Valves

What they are,  
How they are applied,  
How to select the correct one.



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## Agenda

- Control Valve 101 Quick Review
- Single Rolling Diaphragm
- Pressure Reducing Valves
- Pressure Sustaining/Relief Valves
- Surge Anticipation Valves
- Level Control/Altitude Valves
- Redundancy High Performance Valve
- Flow Metering
- Anti-Cavitation
- Q & A

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## Main Valve Body Basics



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## Product Line Overview



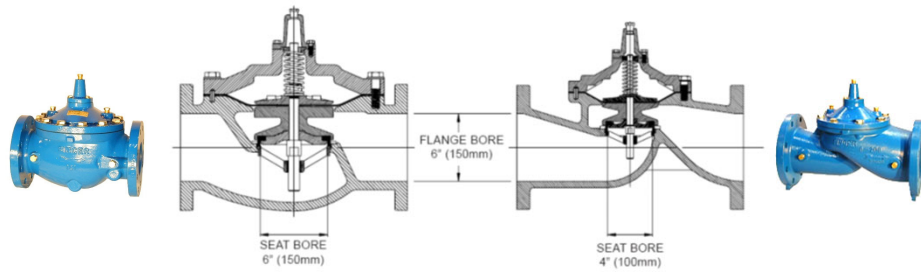
- Sizes ½" to 48"
- Globe or Angle Style Main Valve Bodies
- 150#, 300#, Threaded, & Groove Connections
- 65/45/12 Ductile Iron Main Valve Body
- AISI 316 Stainless Steel Main Valve up to 6" in size

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## Product Line Overview

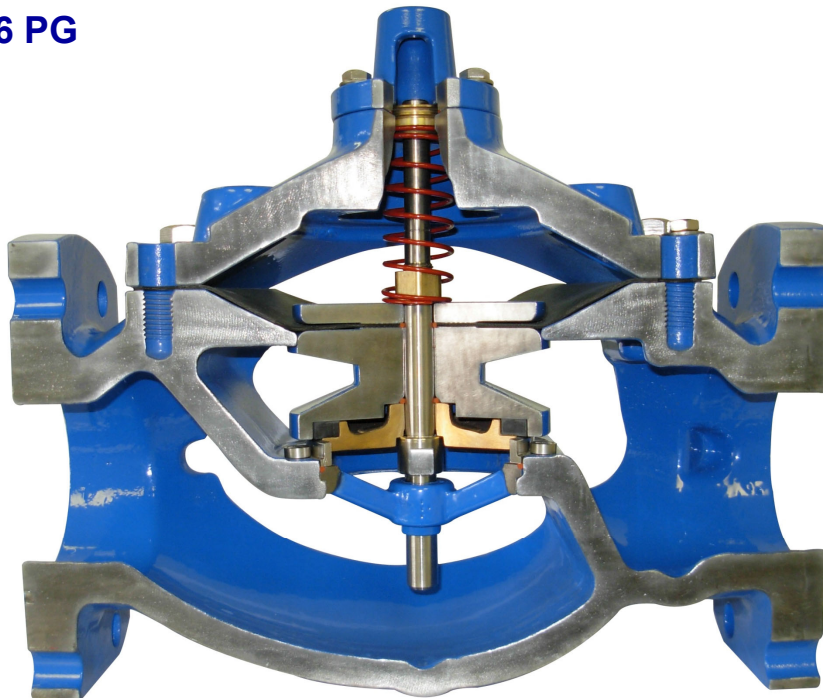
**106 SERIES FULL PORT**  
(6" PG model shown)

**206 SERIES REDUCED PORT**  
(6" PG model shown)



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**106 PG**



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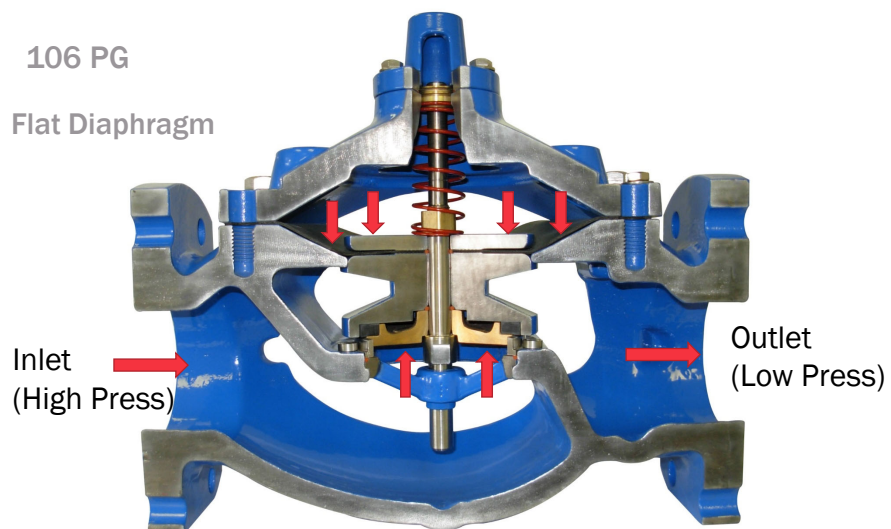
## SRD - Single Rolling Diaphragm Technology



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106 PG  
Flat Diaphragm



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## Why it works...

Surface Area:

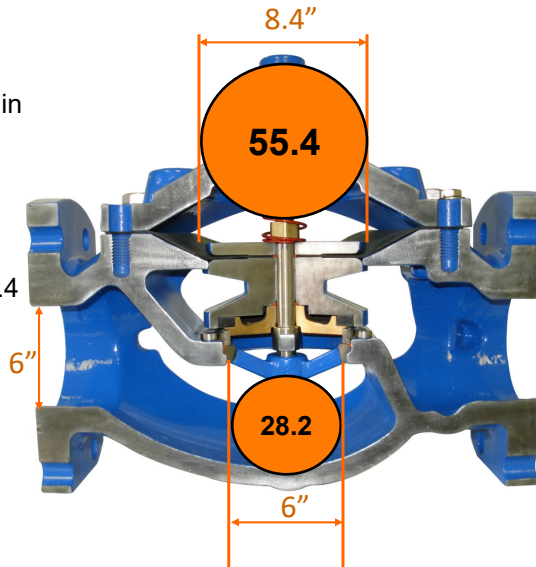
Calculation:  
 (Surface area) X (PSI) = Force in pounds

Assume 100 psi in line and in bonnet

Area on top of diaphragm is 55.4 sq inch

Orifice Area is 28.2 sq. inch.

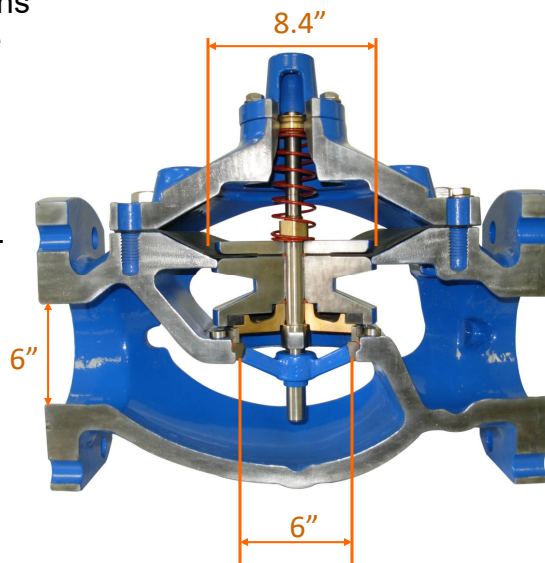
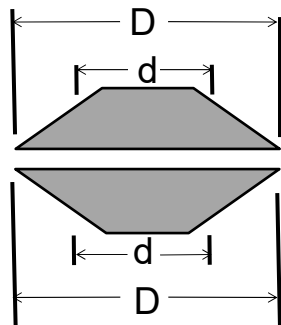
Closing Force =  
 $100 \times 55.4 = \underline{5,540 \text{ lbs}}$   
 Opening Force =  
 $100 \times 28.2 = \underline{2,820 \text{ lbs}}$



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## Valve Operation

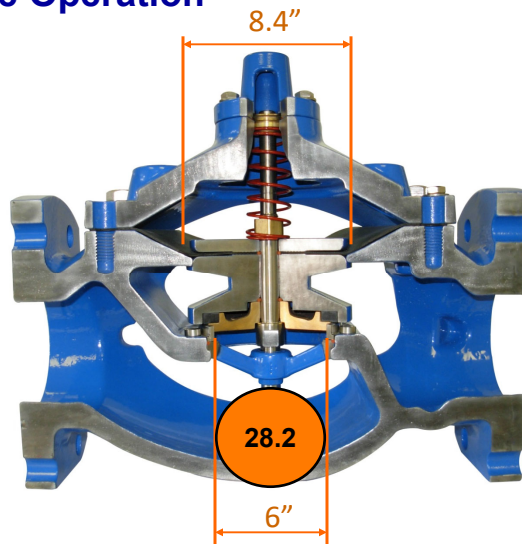
- As the main valve opens the surface area of the diaphragm increases.
- As the surface area increases so does the available closing force.



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## Valve Operation

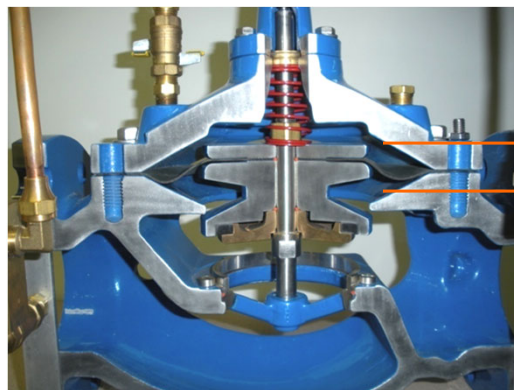
- The opening, or orifice area remains constant.
- In larger size valves this relationship become important is maintaining control.



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## Large Flat Diaphragm Valves

Hydraulic control becomes difficult In larger size valves over 6" that have flat diaphragms.

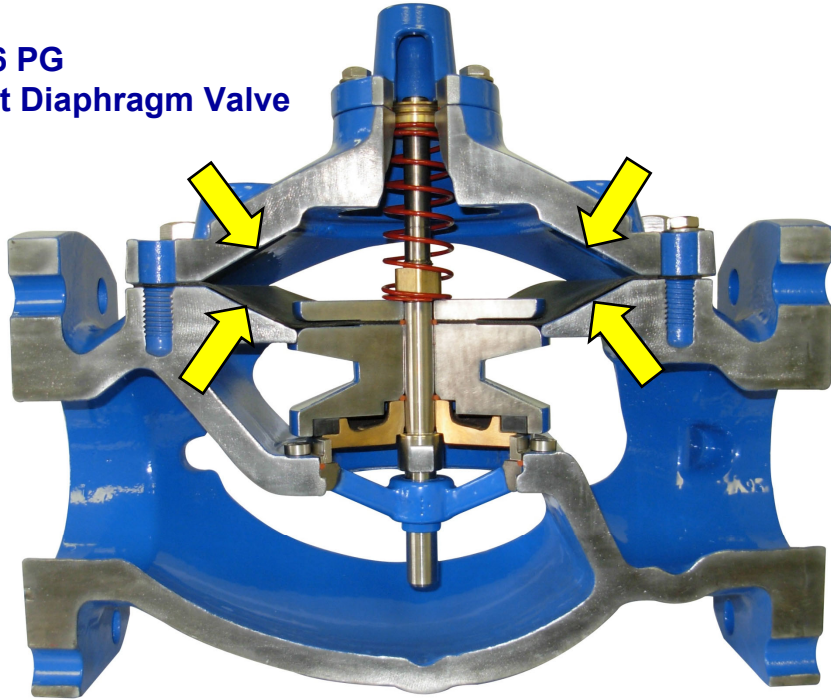


Best level of control when the valve is 20%-80% open

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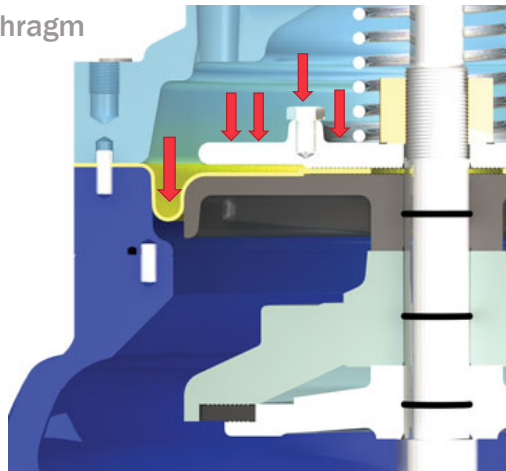


**106 PG**  
**Flat Diaphragm Valve**



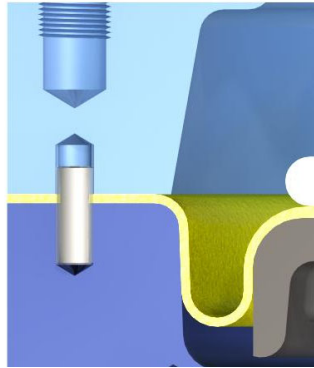
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**Rolling Diaphragm**



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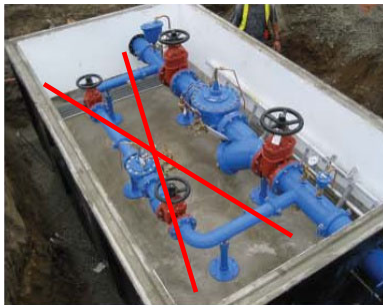
## 106 PG-SRD Single Rolling Diaphragm



- Diaphragm is exposed to control pressure over the entire stroke of the valve.
- There is no loss of diaphragm surface area as in flat diaphragm valves.
- Maximizes the effective area for optimal control. “No hunting”.
- Provides for low flow and high flow stability.

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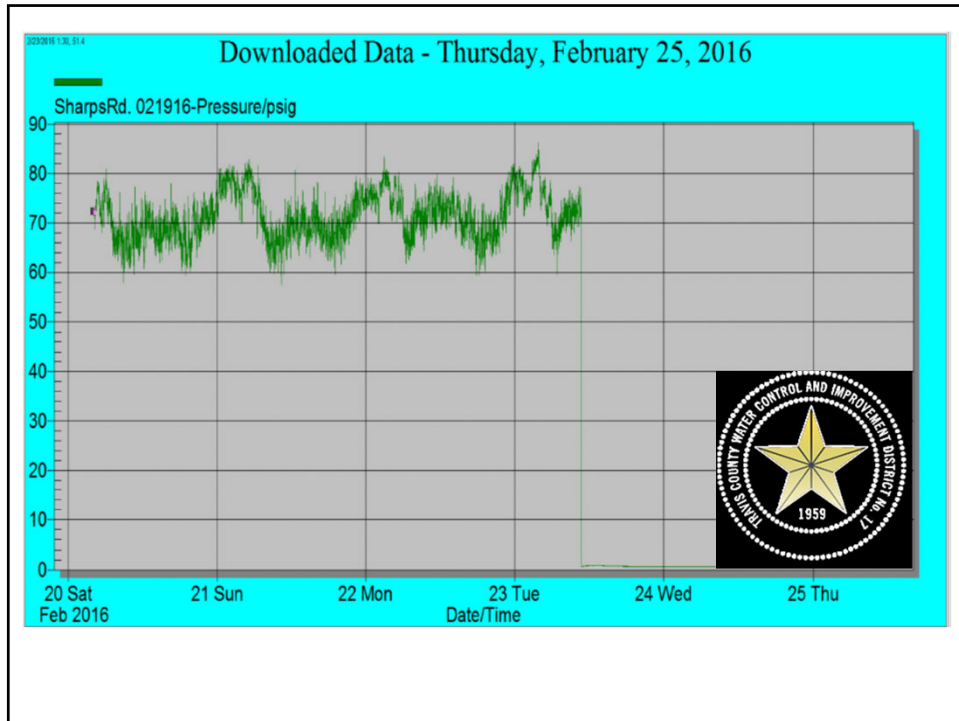
## 106 PG-SRD Single Rolling Diaphragm



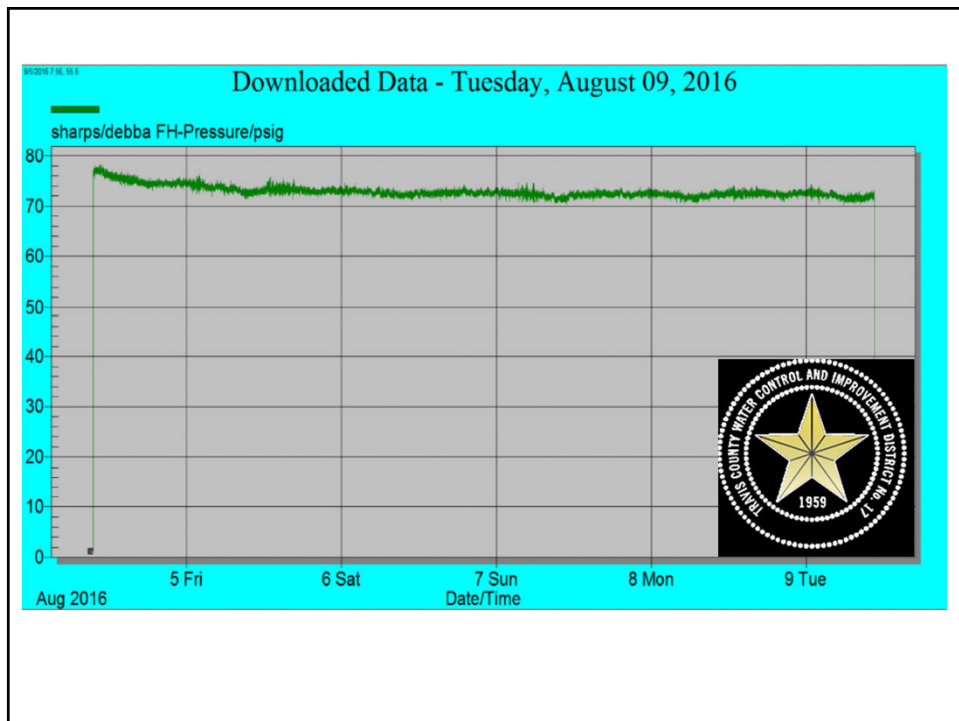
- Low flow stability – without the need for external bypass for low flow
- Save space and construction cost.
- 5 – 4900 GPM on a 10” valve.
- Lowest flow capability in the Industry.
- Available in 6” and larger valve sizes.

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## Pressure Reducing Valves



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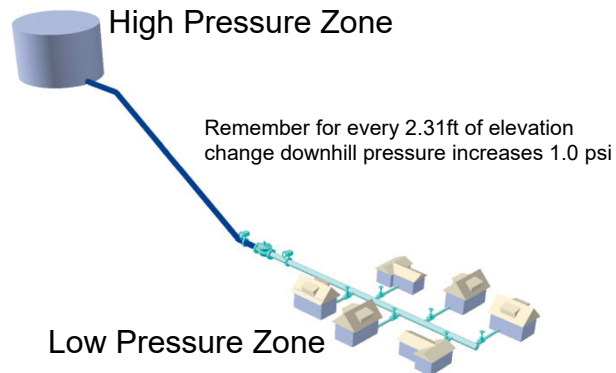
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### Where would I use?

- Anywhere where you want to have a lower pressure downstream –
  - Pipeline going downhill and elevation change would result in overpressure at bottom of hill
  - Feeding into a residence or commercial building
  - Discharge of a pump

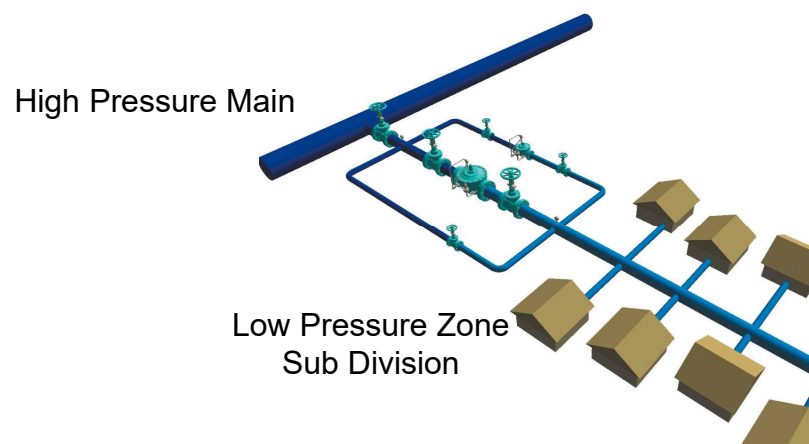
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## Pressure Reducing



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## Pressure Reducing



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## PR–Pressure Reducing



- Maintains a **CONSTANT DOWNSTREAM PRESSURE** regardless of fluctuations in supply pressure or flow.
- Many combinations and variations of functions possible with other pilots and features added.

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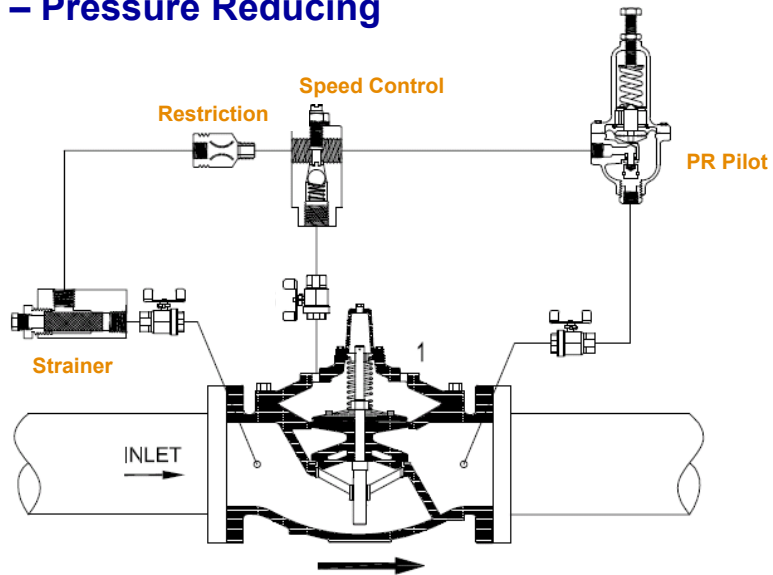
## How the Pressure Reducing Pilot Works



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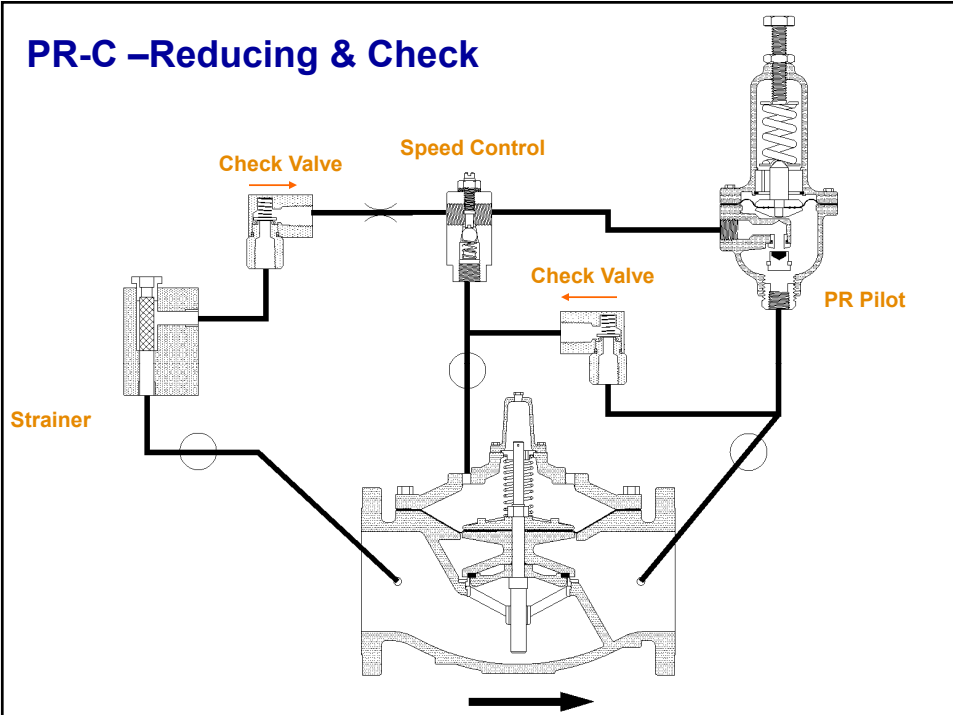
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## PR – Pressure Reducing



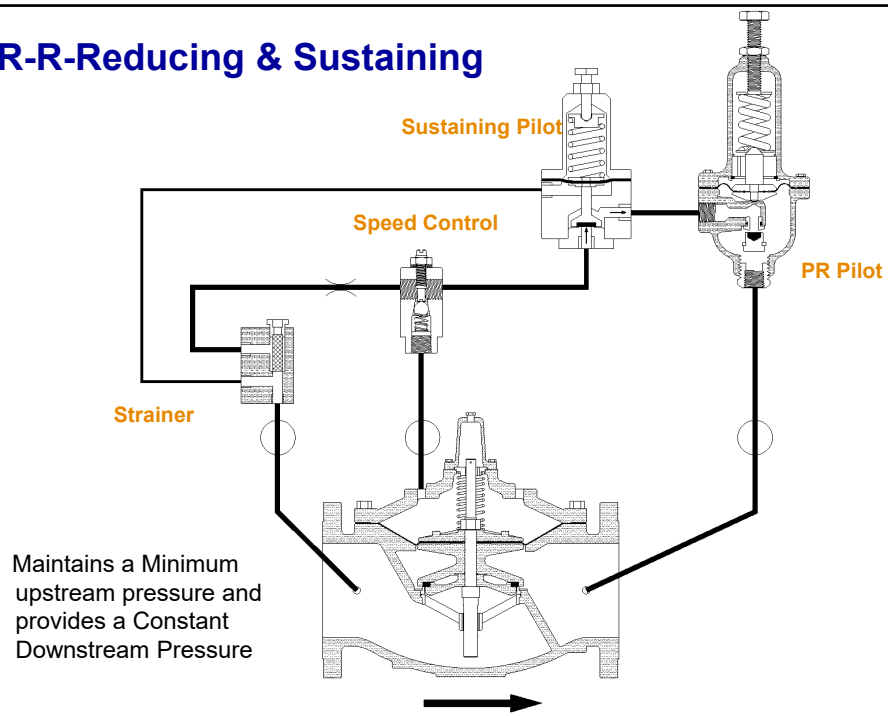
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## PR-C –Reducing & Check



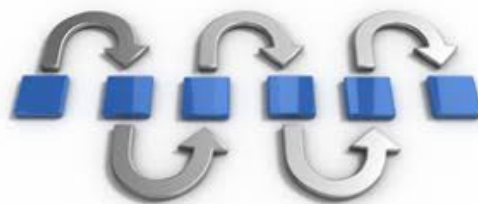
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## PR-R-Reducing & Sustaining



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## Pressure Sustaining Valves



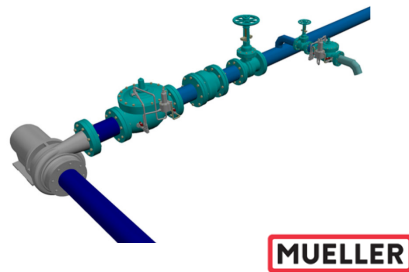
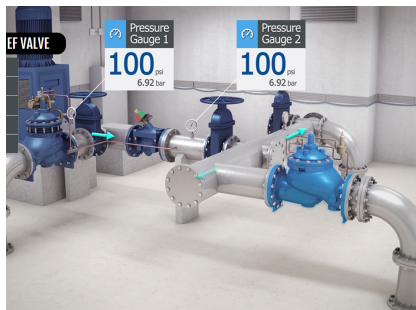
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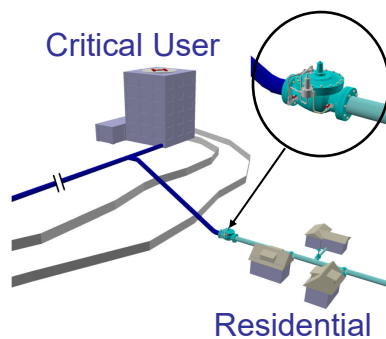
## Where would I use?

- Possibly on outlet of a pump – ensuring backpressure on pump to improve suction lift, reduce pump cavitation, limit power draw
- In a line to protect an upstream user that cannot accept pressure below a certain point



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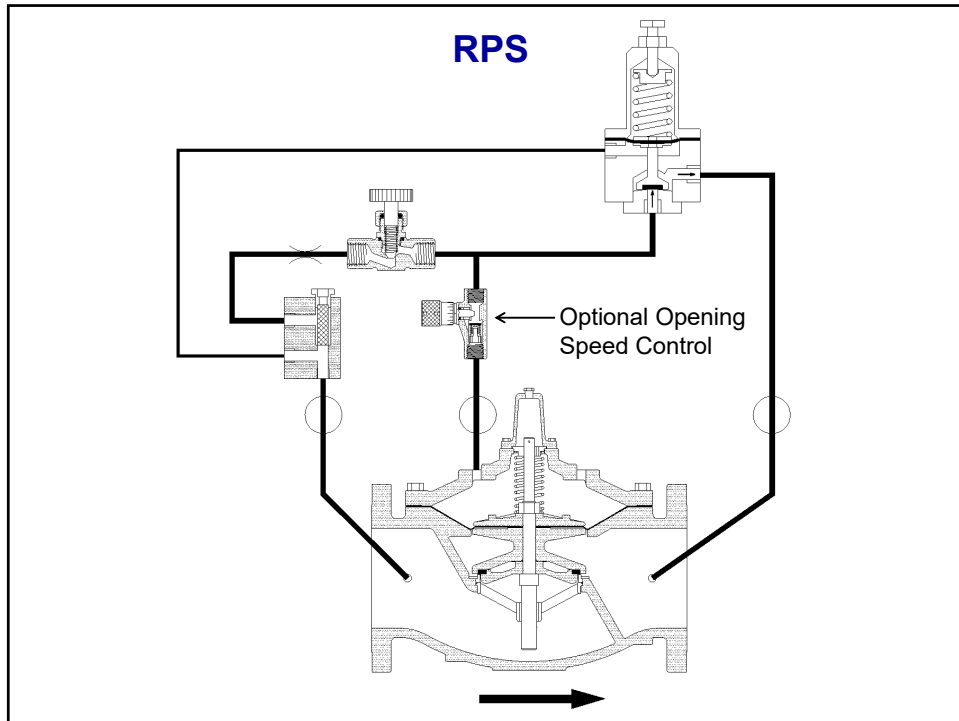
## Pressure Sustaining



Pressure Sustaining :

- maintains a minimum upstream pressure
- discharge to system downstream

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### Where would I use?

- Keep back pressure for critical use
- Maintain pressure upstream from a pipe break

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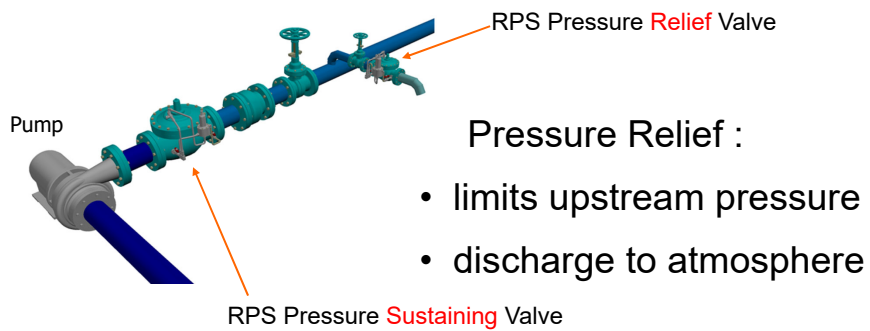
## Pressure Relief Valves



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## RPS – Pressure Relief



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## Surge Anticipation Valves



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### 106 RPS-L&H

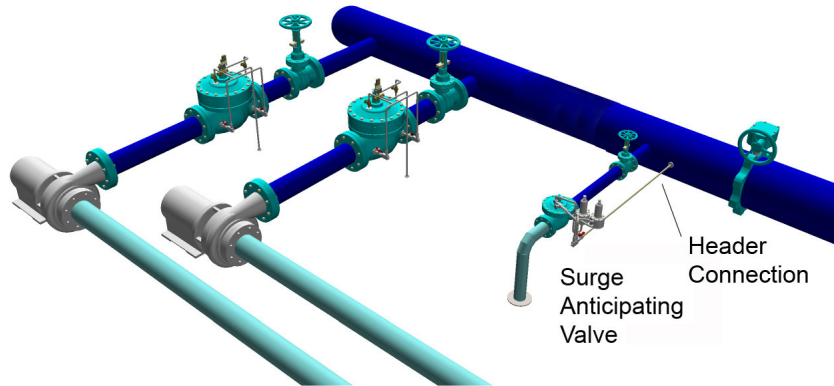


- Valve has low and high pressure pilots
- Valve opens at beginning of low pressure wave anticipating the high pressure wave following
- Protects pumps, check valves etc. from potential surge damage

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## Surge Anticipating Relief Valves

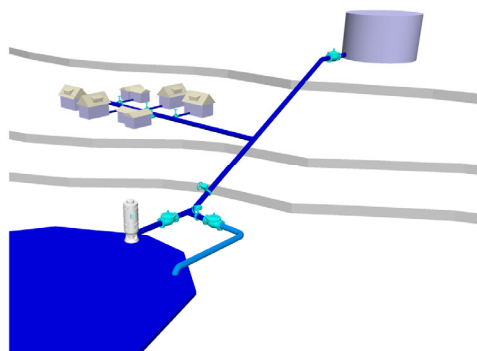
- Surge anticipating valves react to low pressure after a power failure but have the added safety of a high pressure relief setting as well.



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## Surge Anticipator

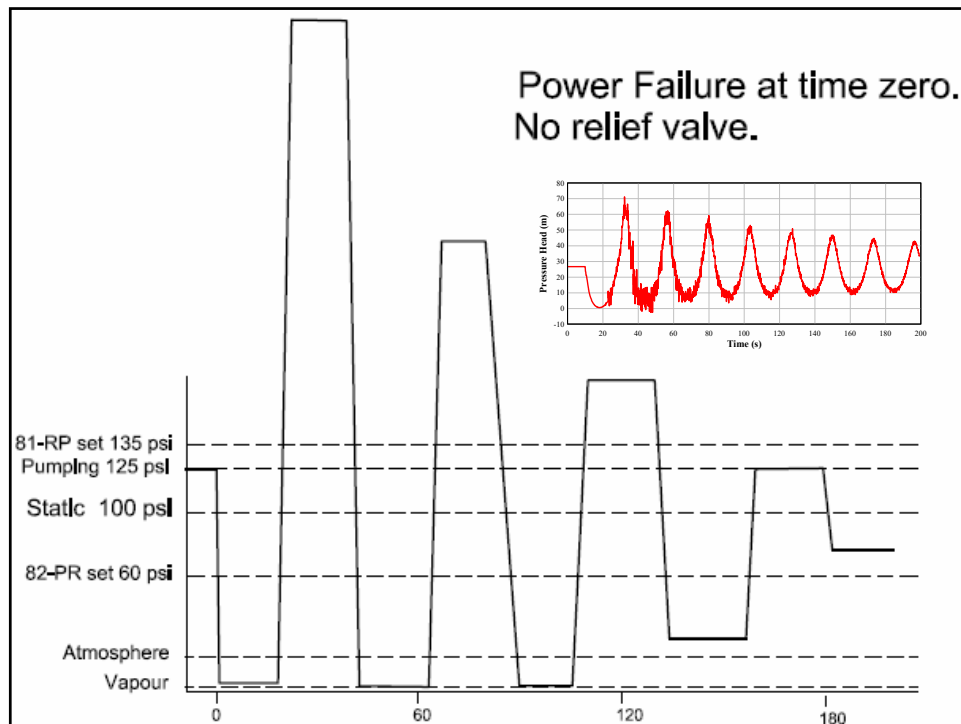
- Why do we need a Surge Valve?



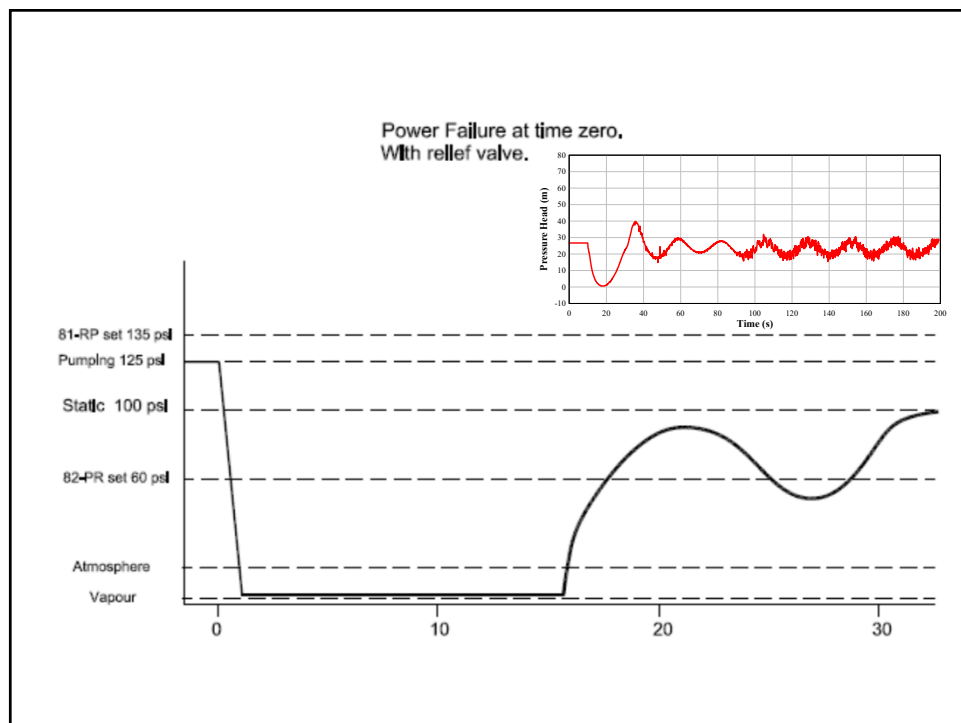
When pumps are started and stopped under correct operation surges should not occur.

However, if the pump should suddenly stop due to power failure?

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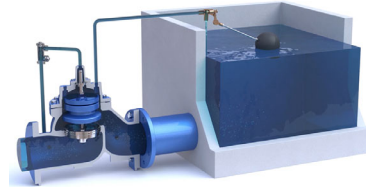
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## Level Control

### Float Valve / Altitude Valves

- A control valve that controls level in a tank, basin, or reservoir
- Altitude valves on water towers either elevated or ground storage tanks
- Float valves modulating & non modulating



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## Elevation



Elevation – what do we mean?

- A control valve that controls level in a raised tank, e.g.: altitude valves on water towers

### Types

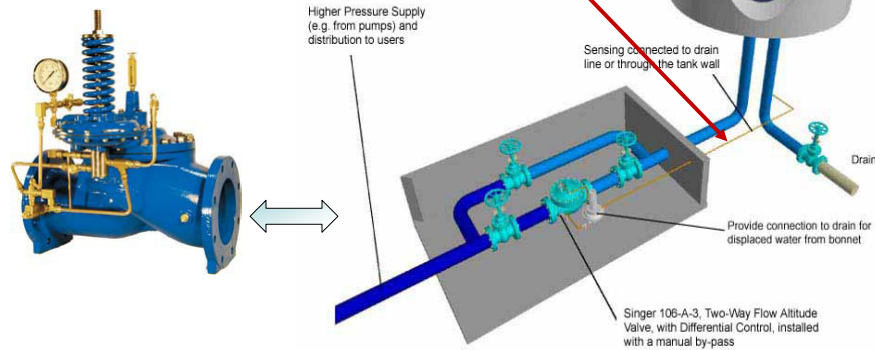
- Type 1 – Two Way Flow
- Type 2 – One Way Flow
- Type 3 – Two Way Flow with Adjustable Differential Control
- Type 4 – One Way Flow with Adjustable Differential Draw Down

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## Elevation

### Type 1 – Two-Way Flow Altitude Control

Closes with precise repeatability on high reservoir level.  
Opens when supply pressure falls a small fixed amount below the reservoir level.

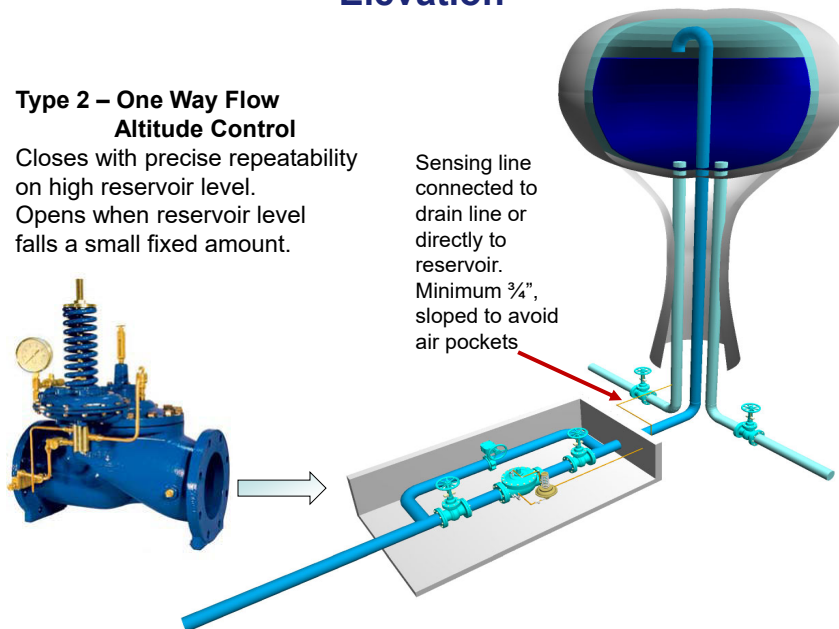


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## Elevation

### Type 2 – One Way Flow Altitude Control

Closes with precise repeatability on high reservoir level.  
Opens when reservoir level falls a small fixed amount.

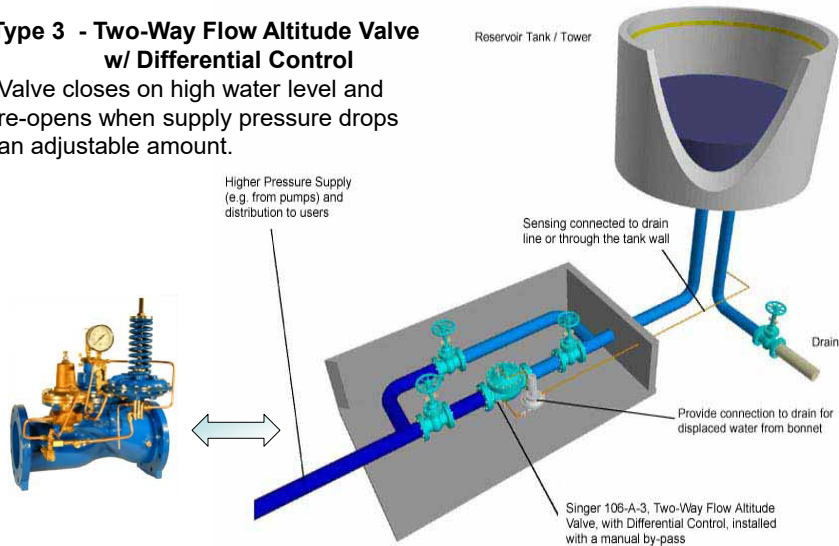


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## Elevation

### Type 3 - Two-Way Flow Altitude Valve w/ Differential Control

Valve closes on high water level and re-opens when supply pressure drops an adjustable amount.

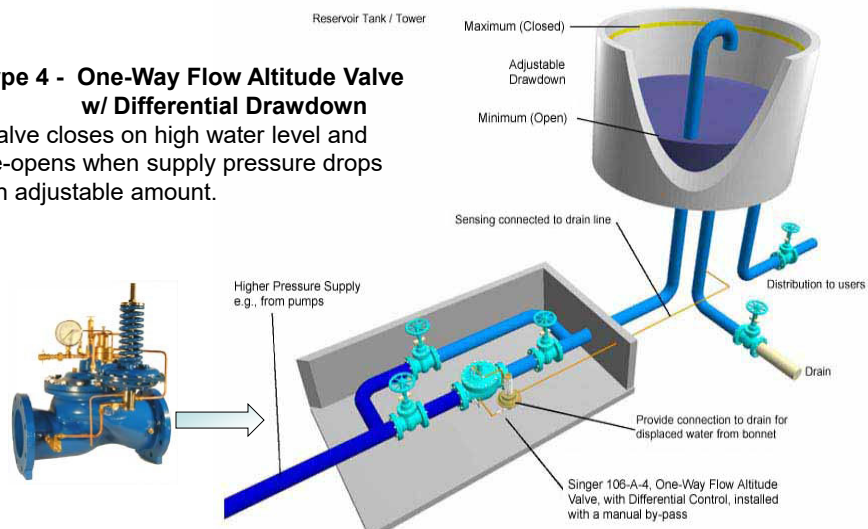


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## Elevation

### Type 4 - One-Way Flow Altitude Valve w/ Differential Drawdown

Valve closes on high water level and re-opens when supply pressure drops an adjustable amount.



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## Float Control

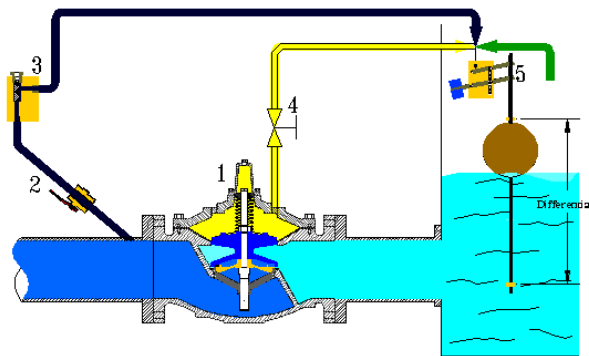
- Two types
  - On/Off - Singer Model 106-F Type 5
  - Utilizes Model Float Pilot
  - Modulating –Model 106-F Type 4
  - Utilizes Model R400 or Model 34 Pilot



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## 106 F Type 5 On/Off

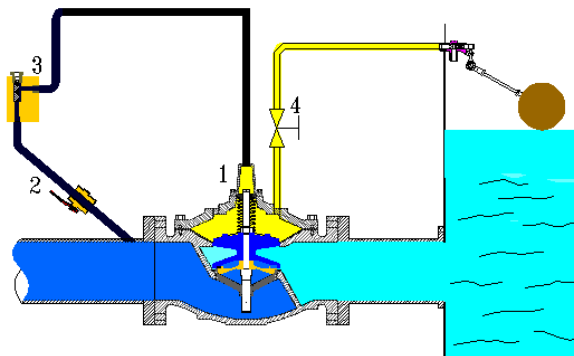
**FLOAT CONTROL VALVE**  
With Adjustable Differential



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## 106 F Type 4 - Modulating

**FLOAT CONTROL VALVE - F-IV**  
MAINTAINS TANK FULL



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## Model 106-SPI-MV Flow Metering Valve



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### Metering Technology

- In the municipal world, several metering technologies are utilized
- For main line meters, the most common are magnetic flow meters
- Other types include turbine, propeller, positive displacement, V Cone DP meters

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## Flow Metering Valves

- Proven Insertion Magnetic Flow Meter Technology
- 2% Accuracy of READING not full scale
- NIST Traceable – Fully Lab Certified
- Flow rate accuracy from .3ft/sec to 32 ft/sec
- Self cleaning – Maintenance free
- Available in sizes 4" - 48" for any Control Valve Model



Converter

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## Model PR-SM

**REDUNDANCY**

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## What happens when a pressure reducing valve *fails*?



You get exactly what you do not want, HIGH PRESSURE DOWNSTREAM that can lead to:

- Pipe breaks
- Damaged pipes within the distribution network
- Water loss
- Consequential associated damages
- Interruption of service
- Damaged expensive filter membrane media in water treatment plant

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## Applications // PR-SM



- Areas of critical service where loss of control is not an option.
- Where potentially two types of controls are required.
- Ideal for plant work filter membrane installations regulating flow and providing overpressure protection to the filter media.

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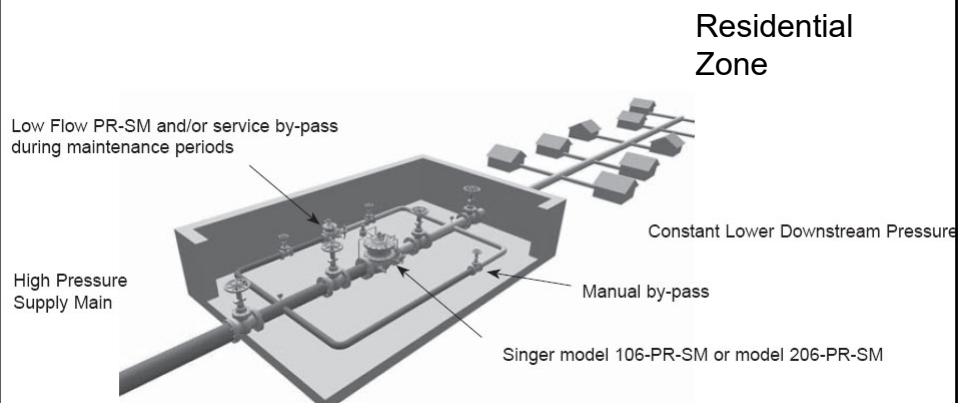
## Features // PR-SM



- Built in protection for primary diaphragm or pilot failure as well as blocked strainer.
- Optional limit switch to signal back up system is in operation.
- Specific to Singer Valve

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## Application // Pressure Reducing



With aging infrastructure cities and municipalities cannot accept overpressures within their distribution network.



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PGM

Other Optional Models

Explore The Possibilities



### Tank Fill

- HVAC Make Up Towers – Building Trades – Industrial
- Ground Storage Tanks – Municipal, Industrial
- Cold Water Domestic Storage Tanks (Break Tanks) – Building Trades
- Fire Reserve Tanks – Fire Market
- Elevated Storage Tanks – Municipal
- Fire Roof Top Tanks – Fire Market

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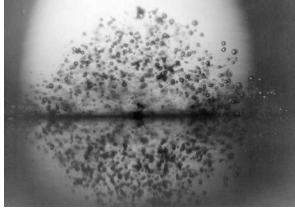
## Anti - Cavitation



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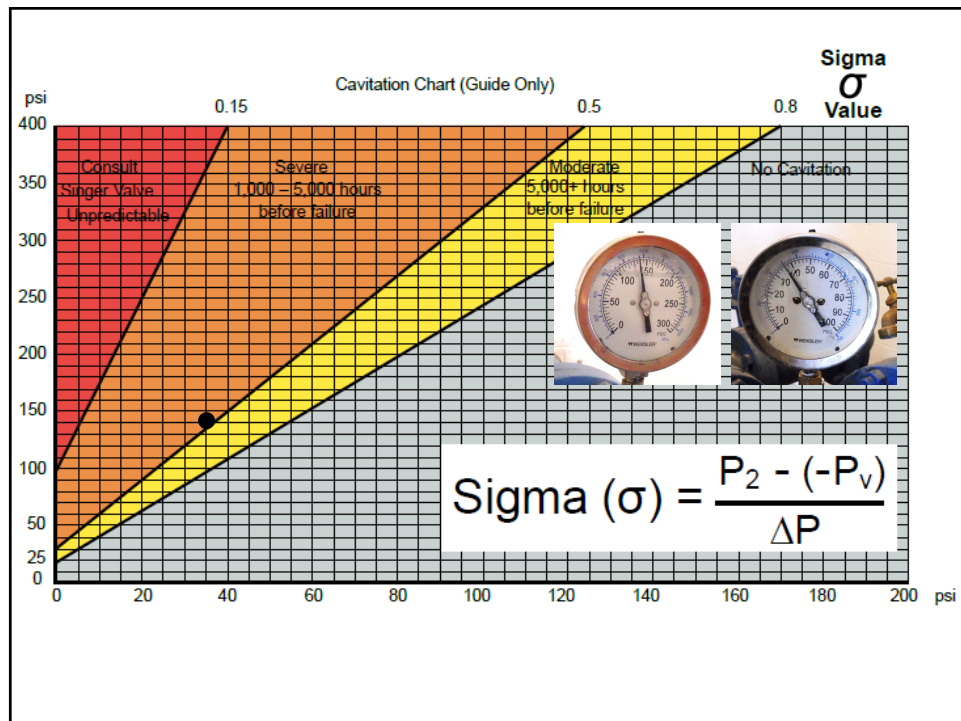
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## What is Cavitation?



- **Cavitation** consists of rapid vaporization and condensation of a liquid.
- When local pressure falls to vapor pressure, vapor bubbles are formed and when these bubbles travel to an area of higher pressure, they collapse and create great local stress.
- Reasons for low pressure is usually a partially open valve that creates very high velocity in the seat area and therefore low pressure because potential energy (pressure) is converted to kinetic energy (velocity).

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The Anti-Cavitation Trim is typically used in applications that have outlet pressure near or less than 30 percent of inlet pressure such as:

- Distribution Systems
- High Rise Buildings
- Reservoir Filling
- Reservoir Fill to Atmosphere
- Continuous Pressure Relief
- Sub-Atmospheric Considerations

***At 65% Pressure Drop  
You Should Be  
Considering AC-Trim***

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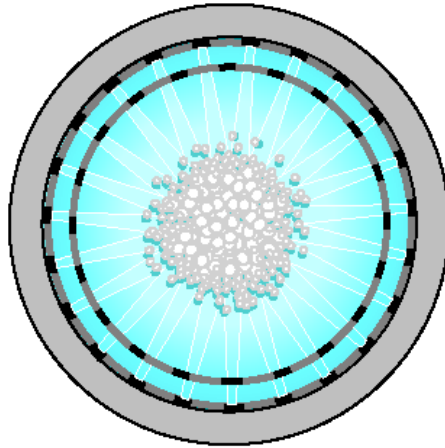
## **Cavitation Damage**



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## Cavitation Control



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## Electronic Control



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## SINGER VALVE OFFERINGS

### MECHANICAL VALVE OFFERINGS:



Pressure Reducing Valve



Pressure Sustaining Valve



Altitude Control Valve



Flow Control Valve

### ELECTRONIC VALVE OFFERINGS:



Non Modulating Valve



Electronic Override Valve



Modulating Valve



Flow Metering Valve

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## SINGER VALVE OFFERINGS

### MECHANICAL PRESSURE REDUCING VALVE:



106/206-PG  
Main Valve

+



106/206-PR  
Pilot System

### ELECTRONIC PRESSURE REDUCING VALVE:



106/206-PG  
Main Valve

+



106/206-2SC-PCO  
Pilot System

+



Control Panel

+



Pressure  
Transmitter

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## Fire Valves

- UL/FM – RPS
- ULC – PR
- UL – PR
- UL/FM – Deluge



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**Thank  
you**

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