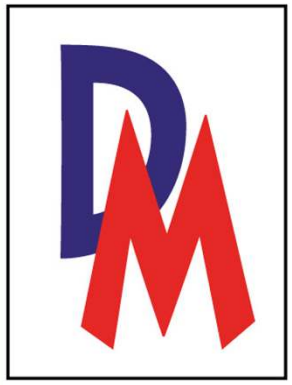
Cla-Val Automatic Control Valve Training

presented by Leonard Pinchuk- DM Valve



D.M. Valve & Controls Inc.
Innovative Valve Technology

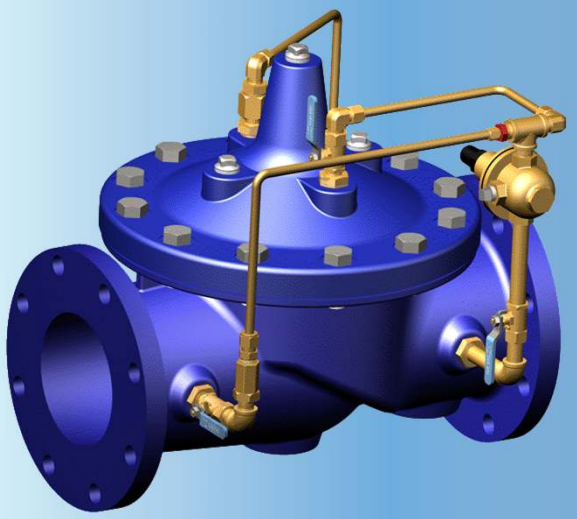
CLA-VAL Seminar Topics

- Manufacturing
- Principles of Control Valves
- Applications
- Installations
- Technical Support

CLA-VAL

Cla-Val Automatic Valve Features

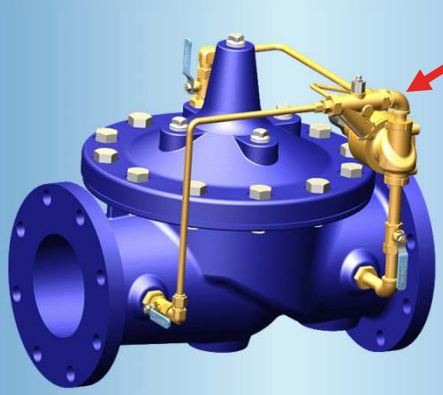
- Drip-tight shut-off
- No packing glands
- No breakaway friction
- No external linkages
- No lubrication needed
- Lowest operating friction



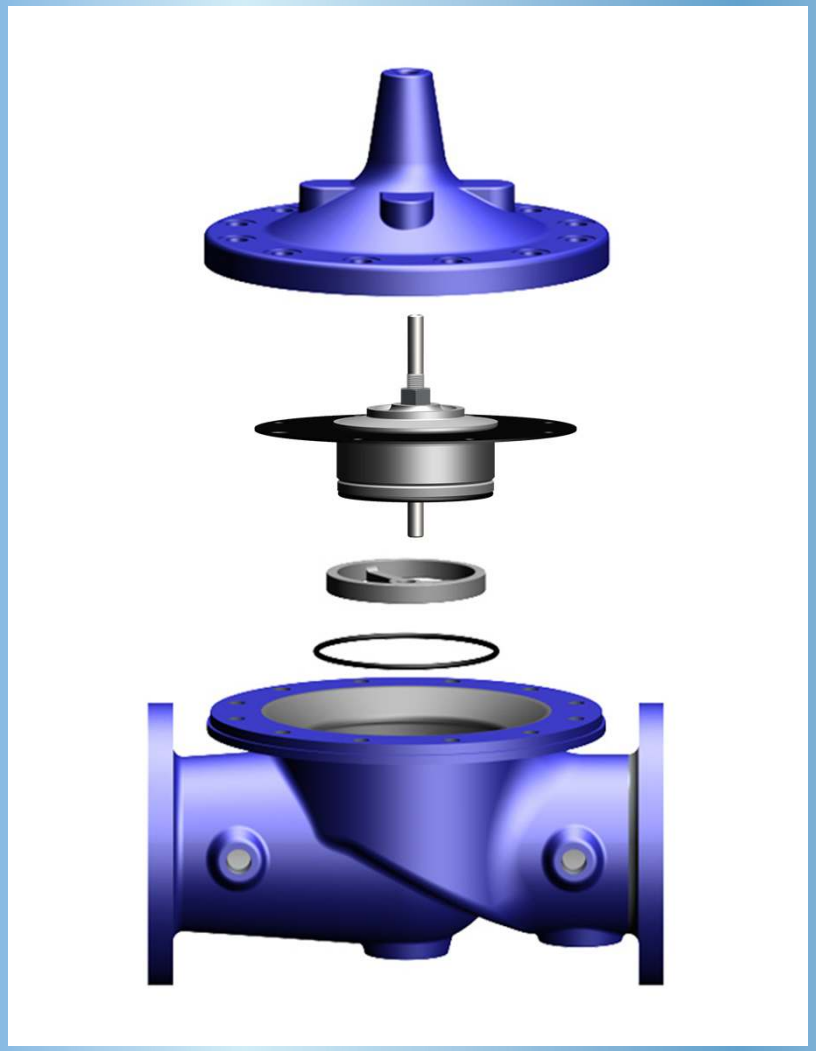
Cla-Val Automatic Control Valves Consist of…

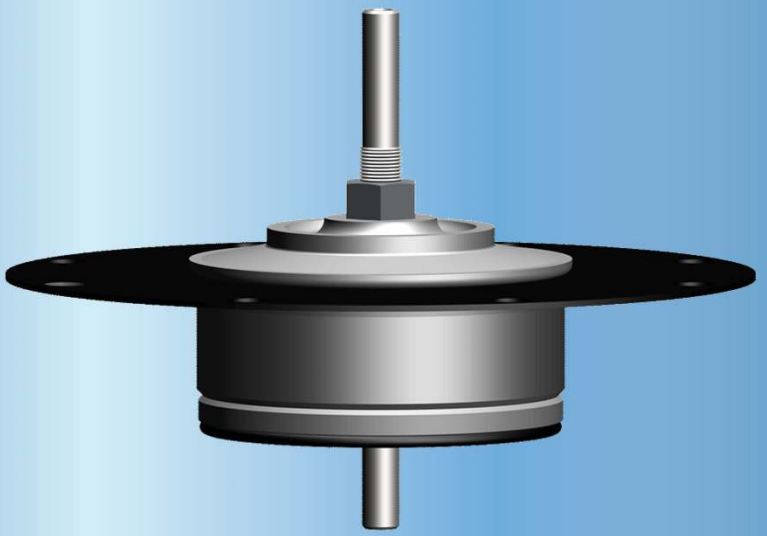
Main Valve

Pilot Control System



One Moving Part Inside the Valve





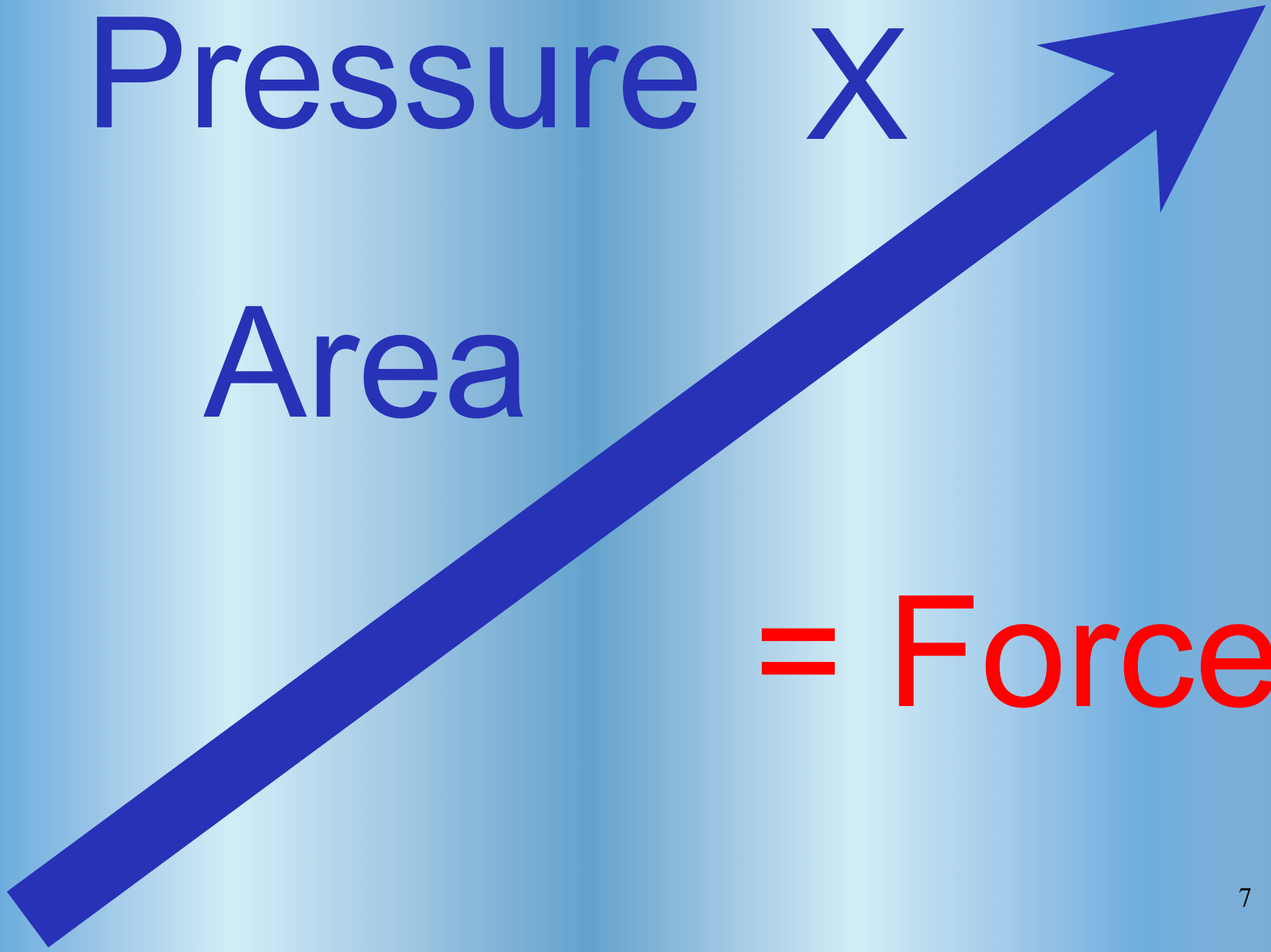
Disc & Diaphragm Assembly

Basic Hydraulics

CLA-VAL

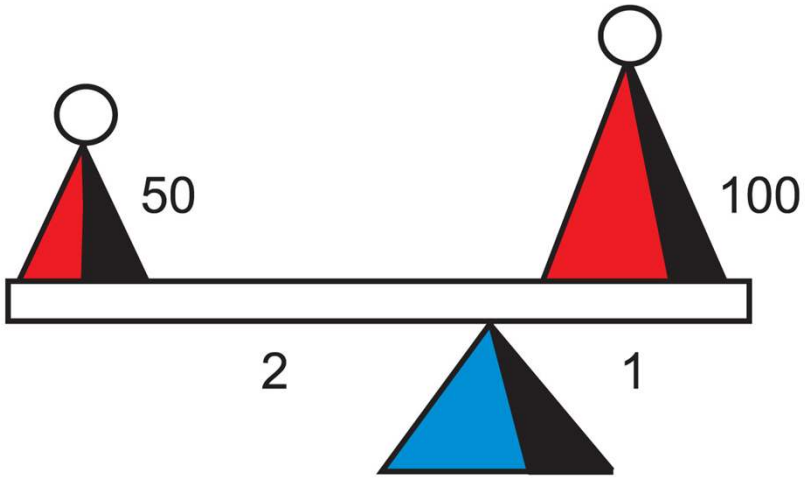
Pressure X

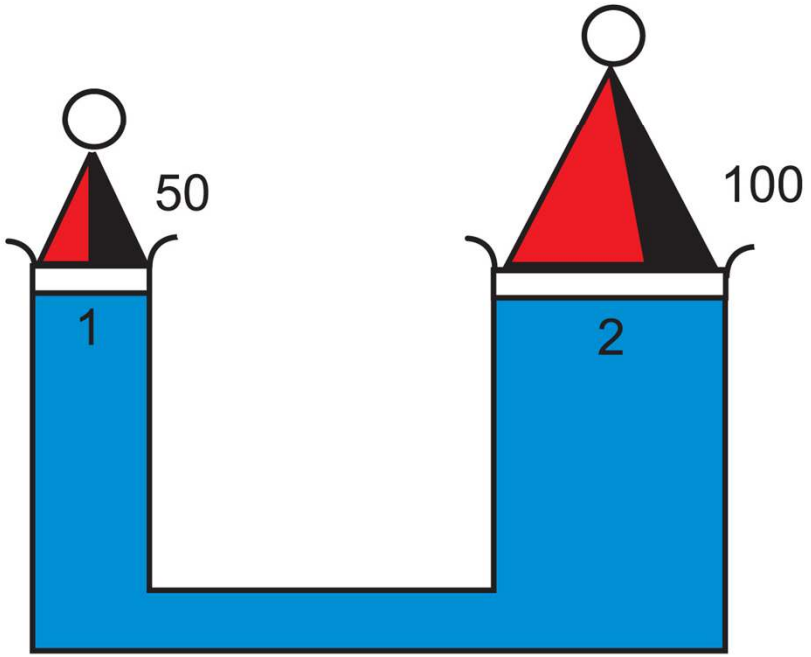
Area



= Force

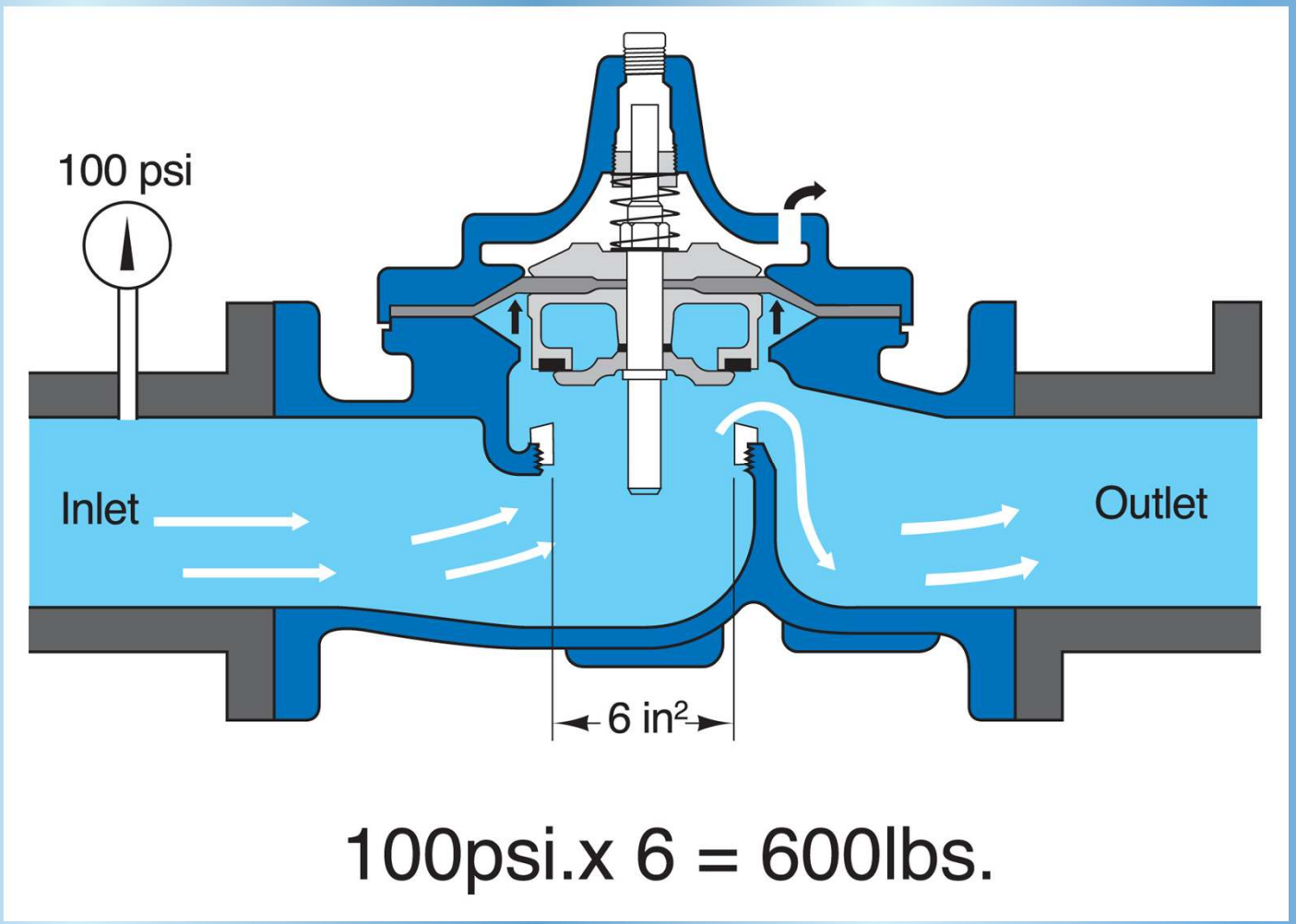
The Hydraulic Advantge





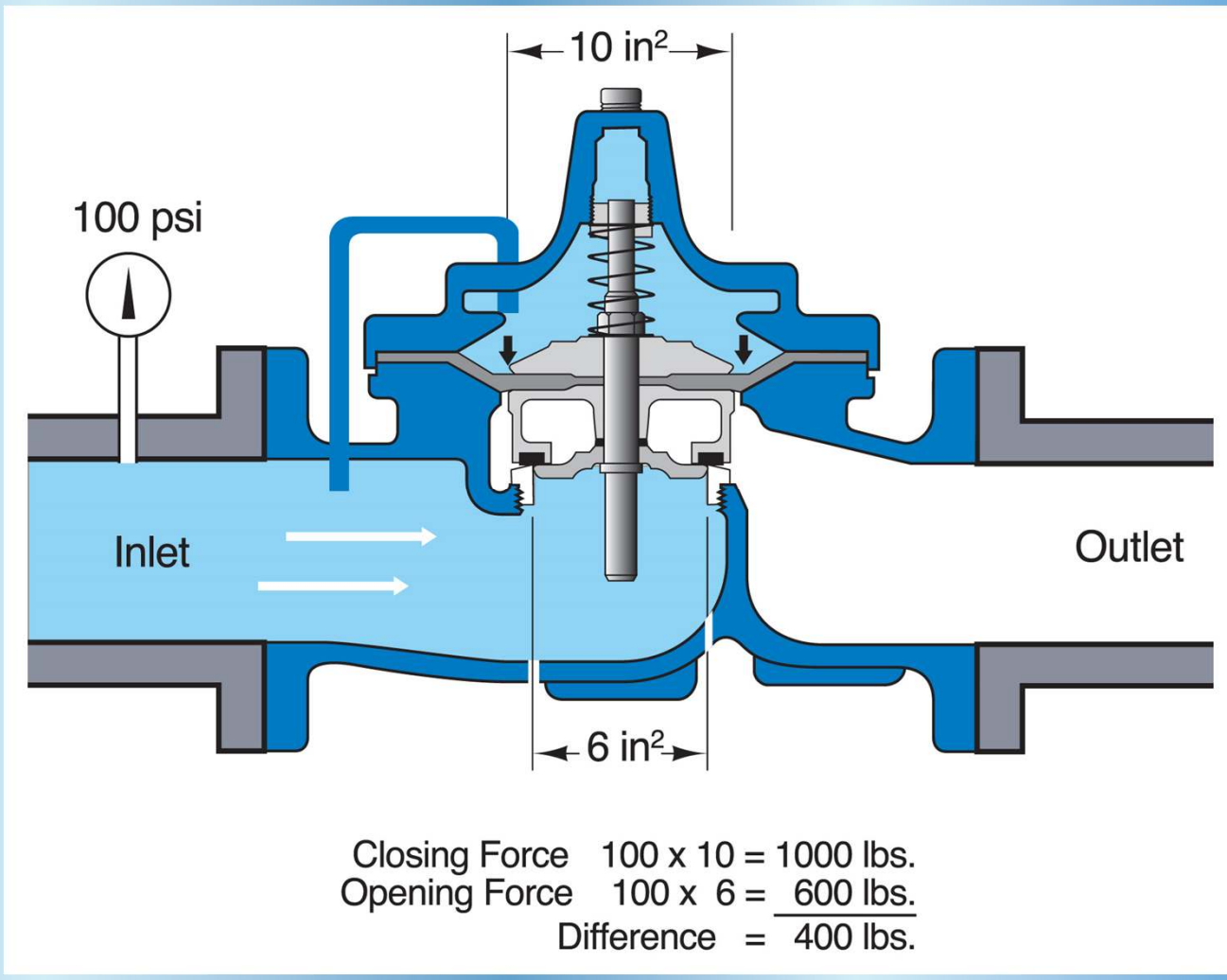
Fluid can be used like levers

Line Pressure to Open



100psi.x 6 = 600lbs.

Line Pressure to Close



Closing Force 100 x 10 = 1000 lbs.
Opening Force 100 x 6 = 600 lbs.
Difference = 400 lbs.

Just a reminder…

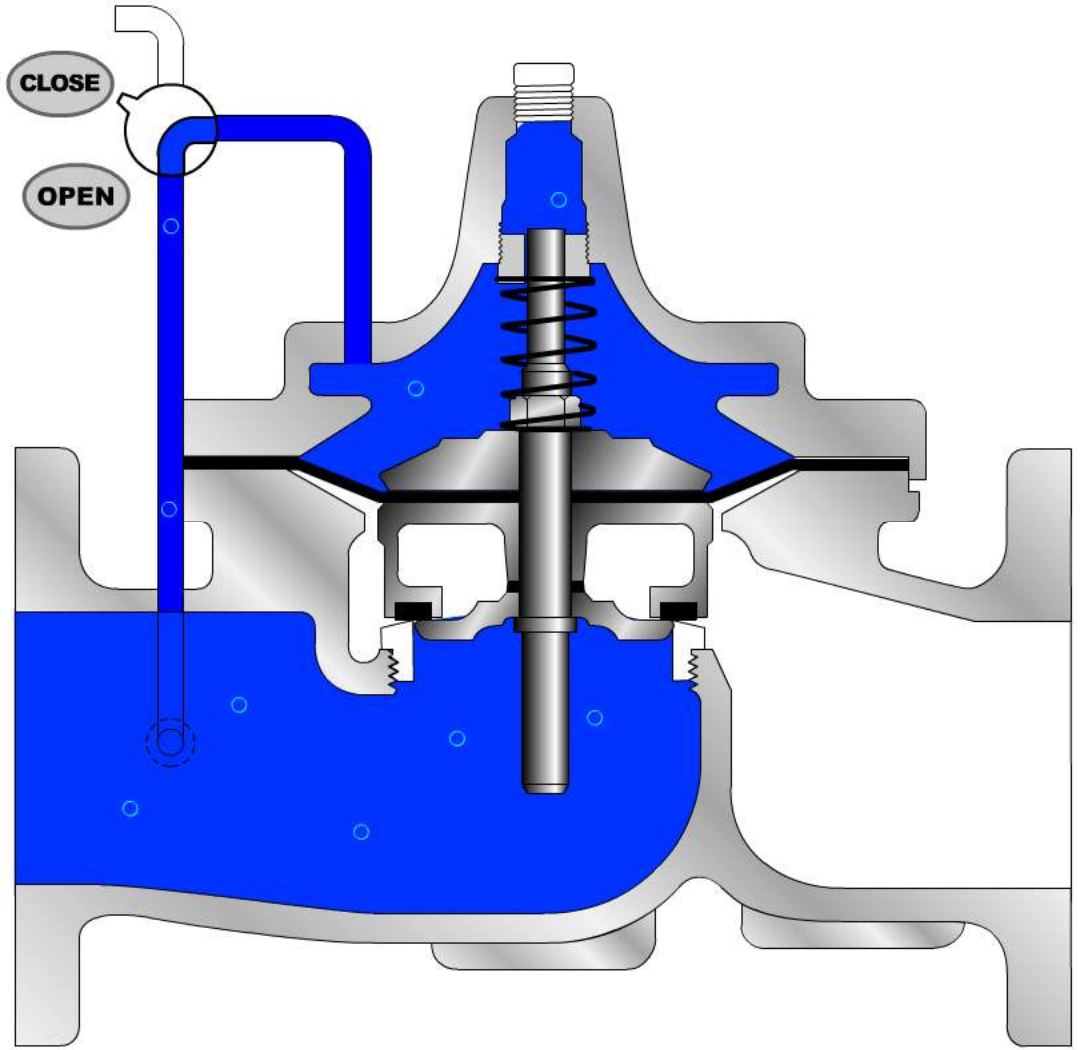
- Water on the cover to close the main valve
- Water off the cover to open the main valve
- Knowing this makes troubleshooting easier…

CLA-VAL

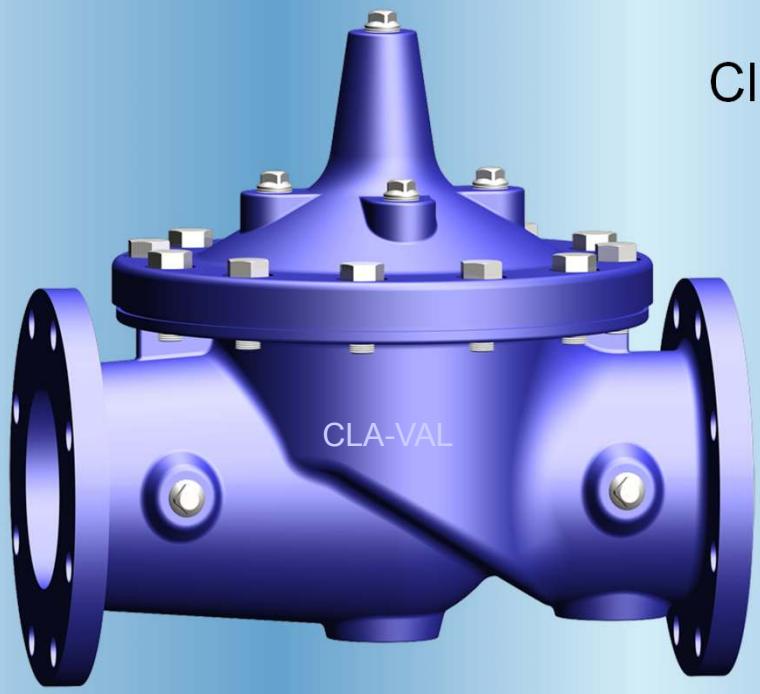
EXIT

Valve Opening/Closing Operation

PLAY PAUSE RESTART

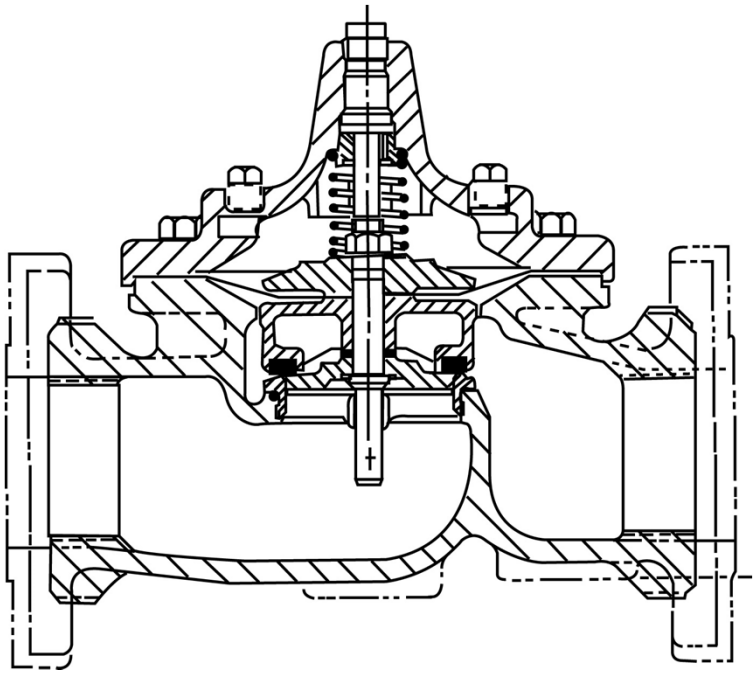


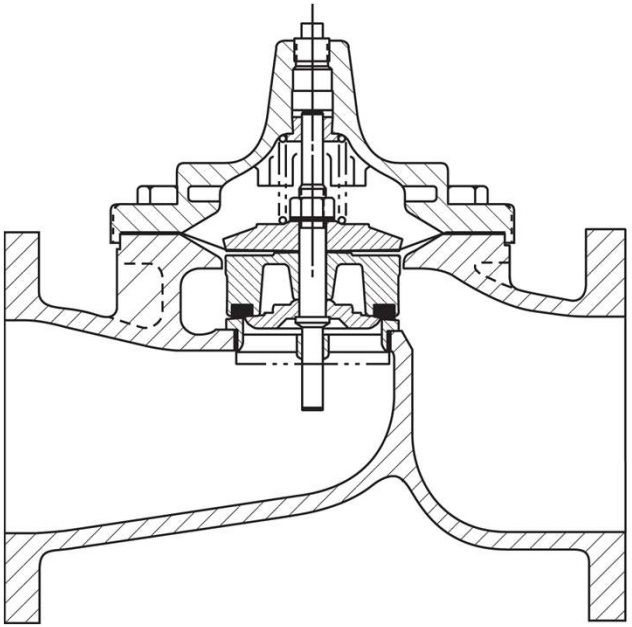
Main (Basic) Valve



Cla-Val Model
100-01

Hydraulic Control = Hytrol





Model 100-01

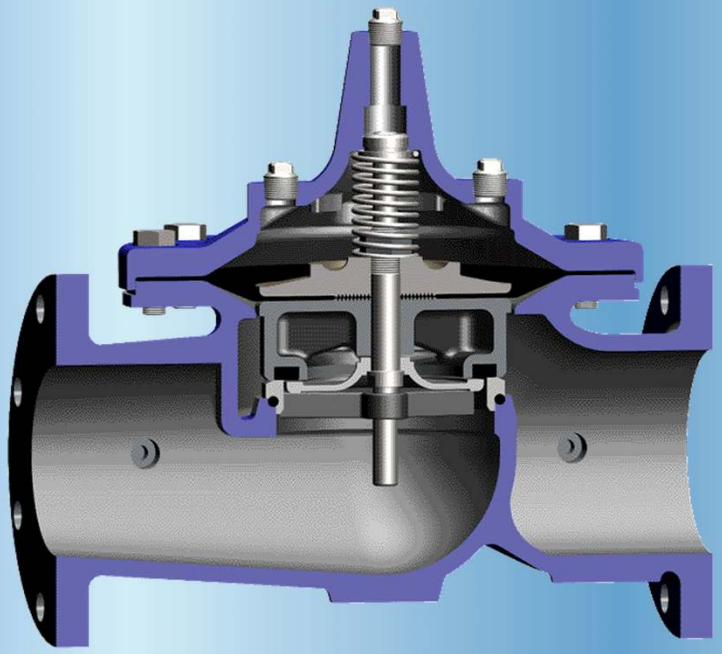
Model 100-20

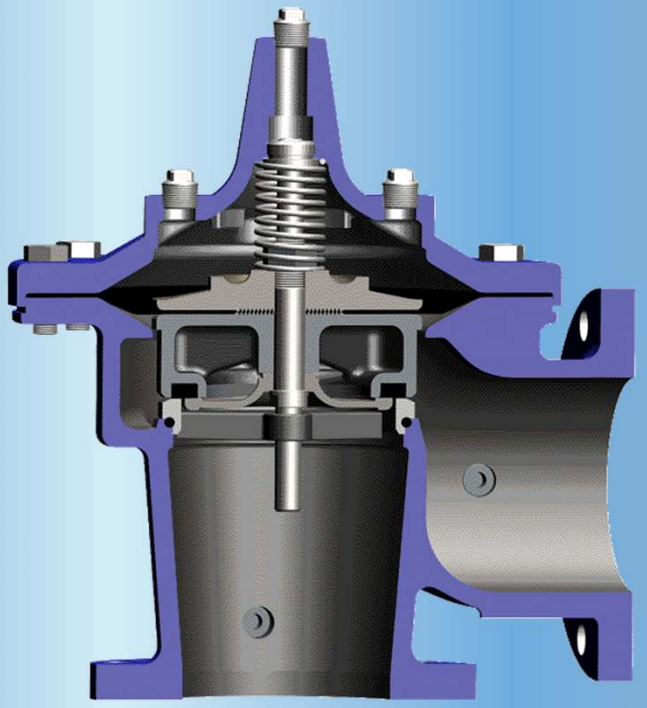

From the smallest: 3/8-inch

To the largest: 48 inch


DANGER
CLA-VAL

Globe and Angle Pattern





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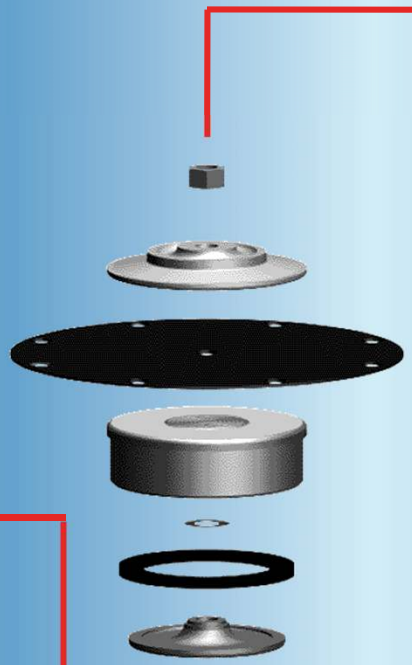
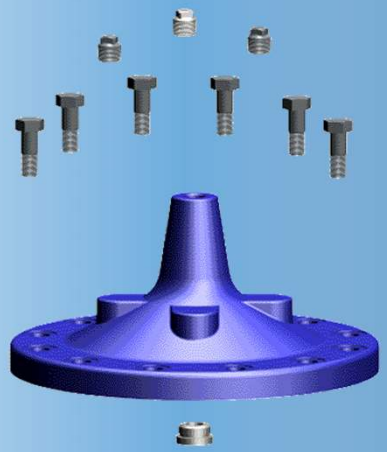
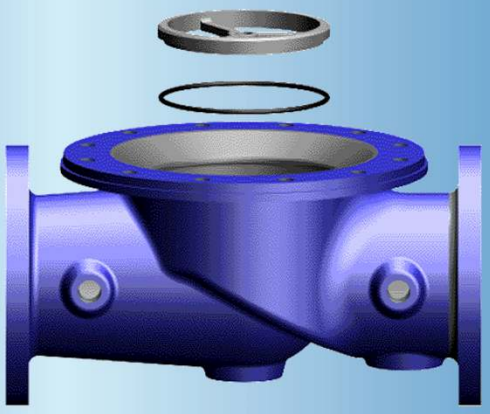
Three Simple Assemblies





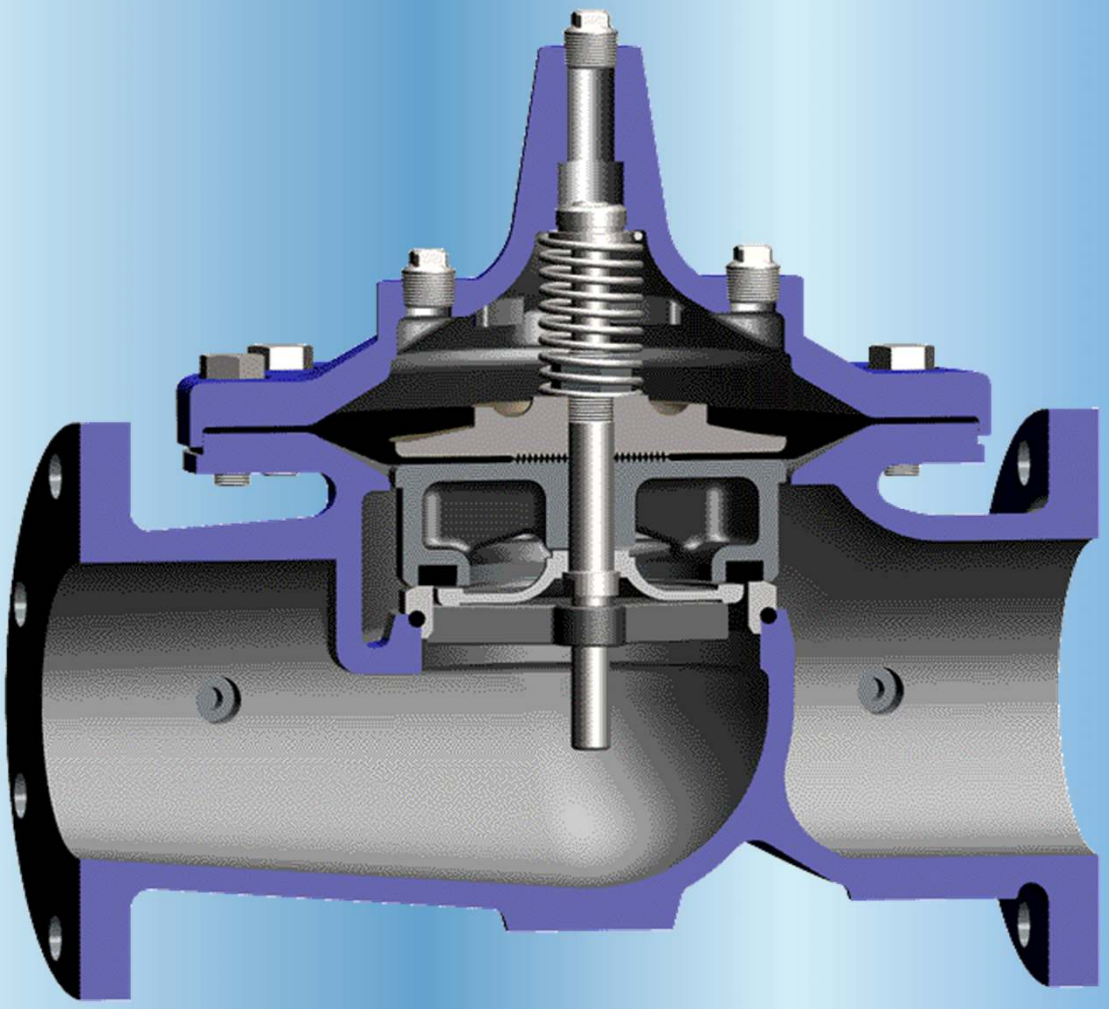
Cover & Bearing Assembly

Diaphragm & Disc Assembly



Valve Body & Seat Assembly

A Look Inside the Hytrol



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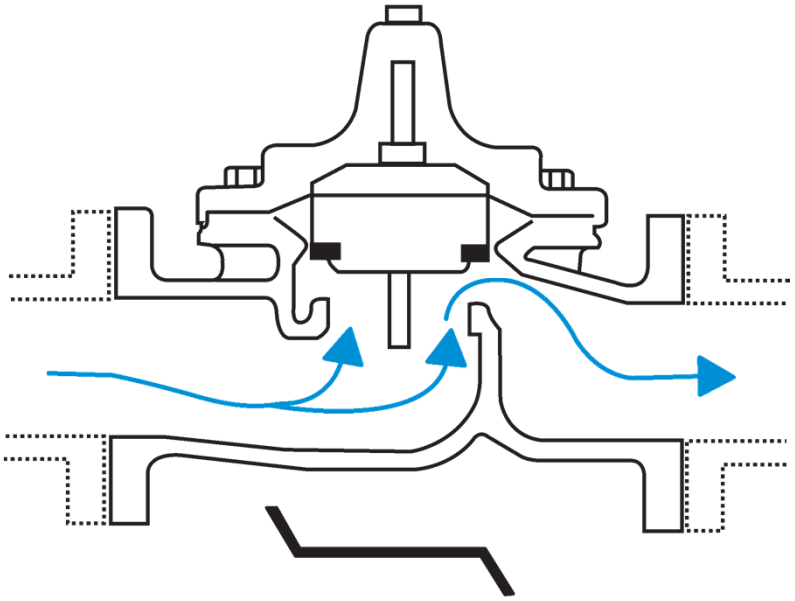
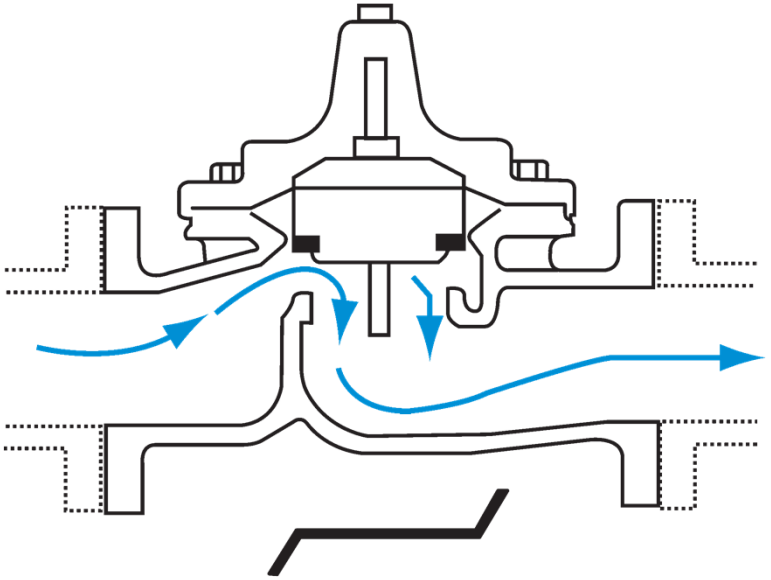
Flow Direction

Normal Flow

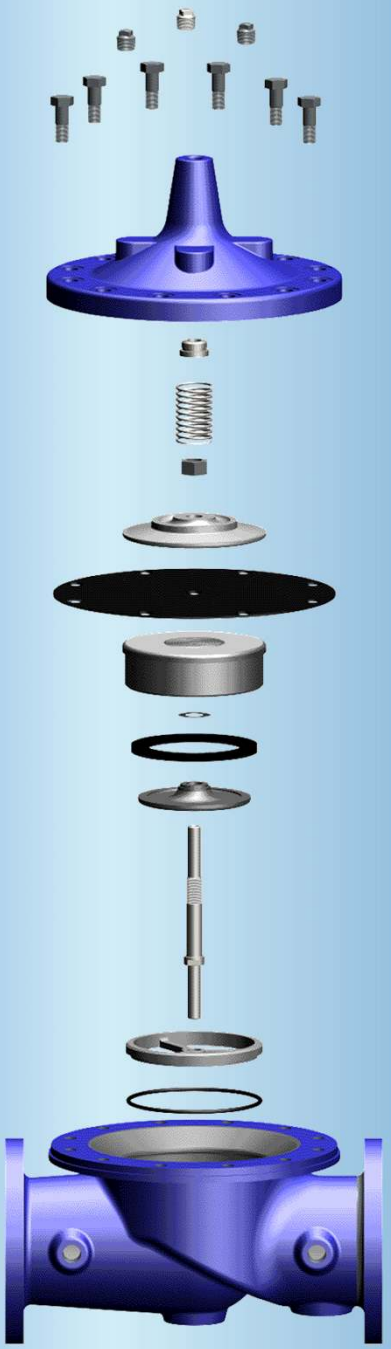


Up and Over Seat

Reverse Flow



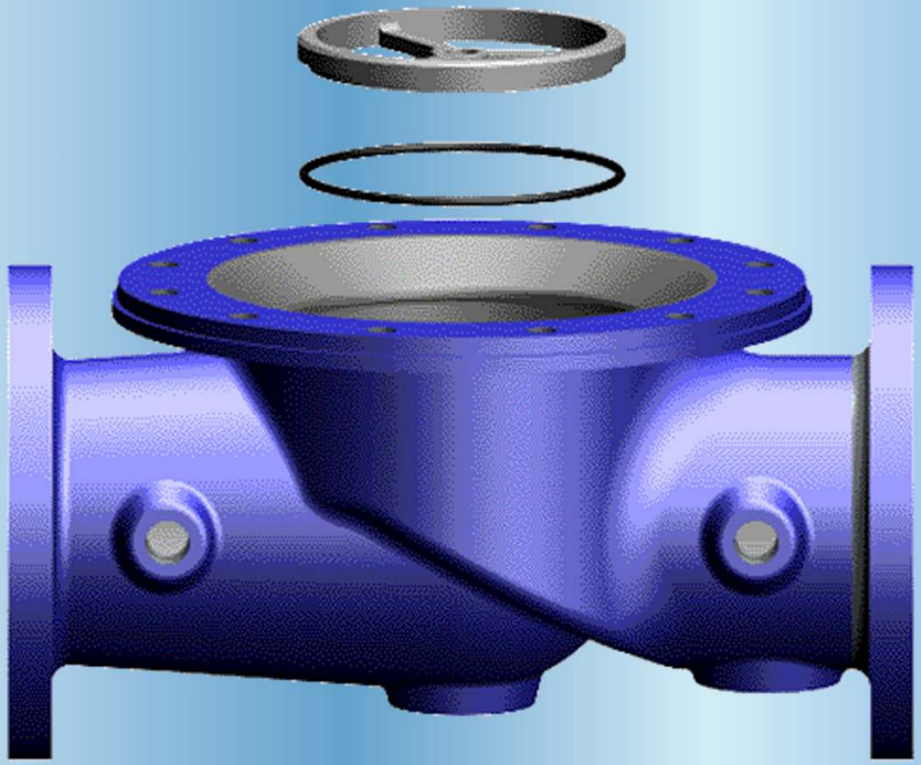
Over Seat and Down



Hytrol Main Valve

- Simple Construction
- Easy to Service
- Fewest Parts

Body and Seat Assembly



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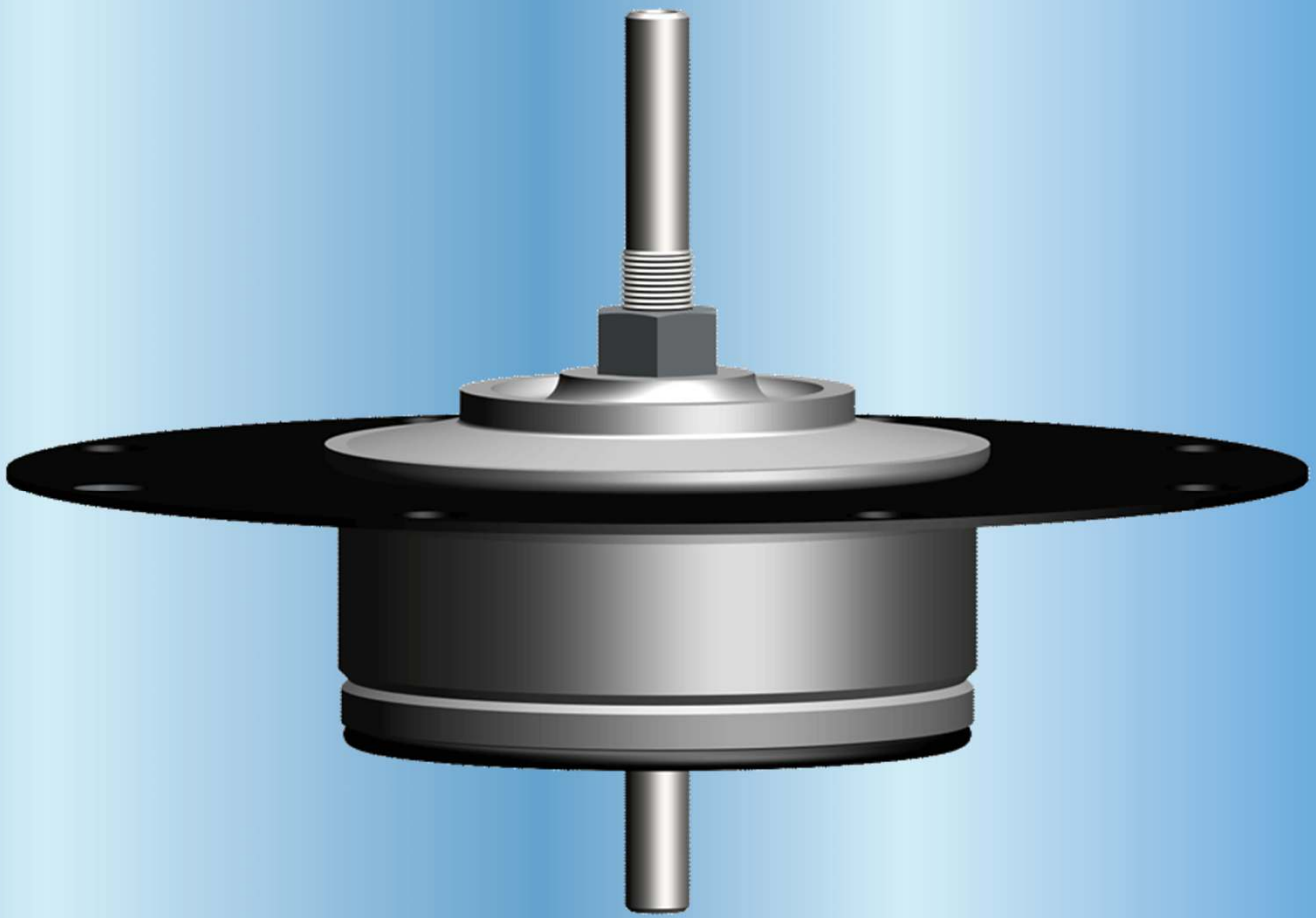
Complete Diaphragm and Disc Assembly



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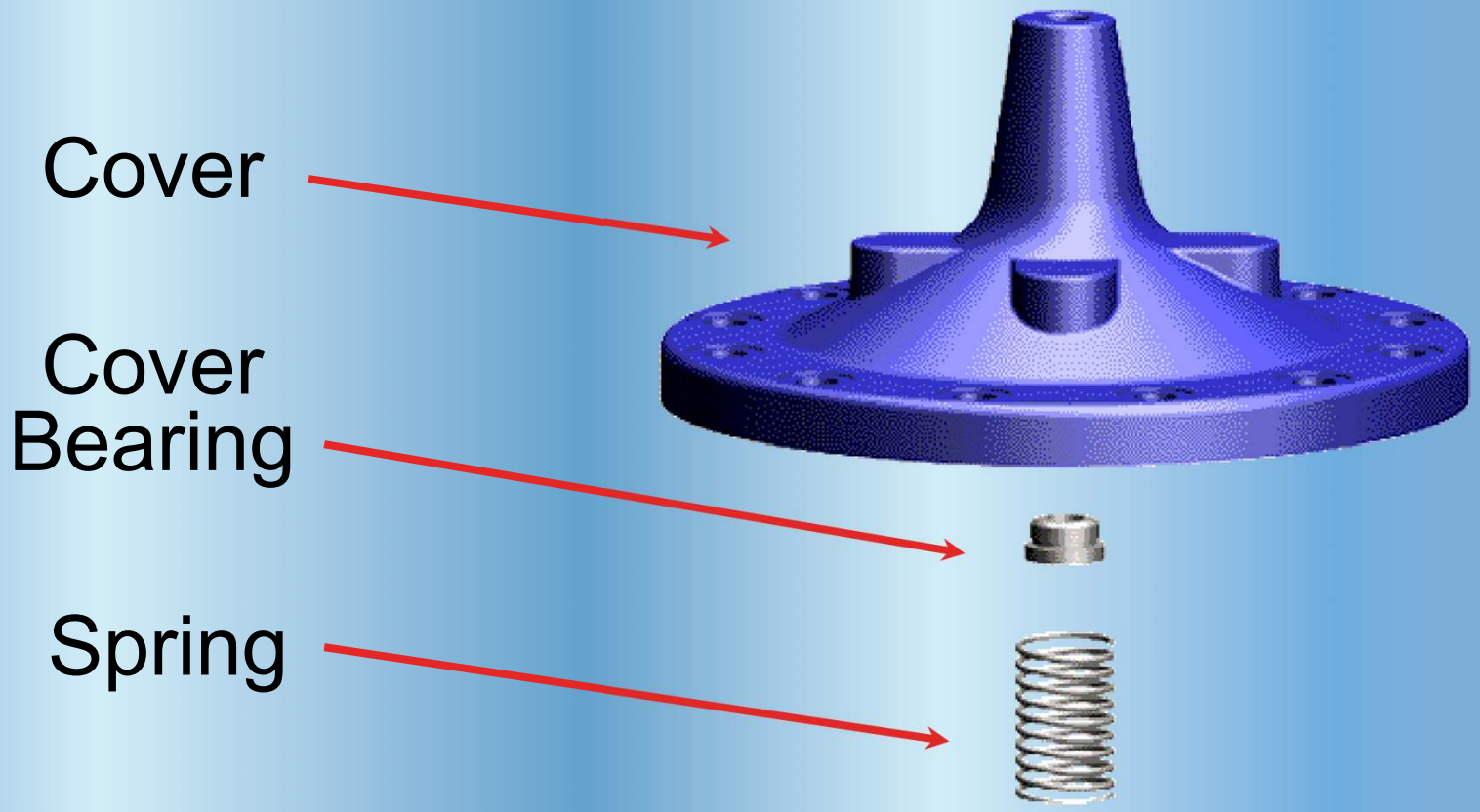
Cover and Spring Assembly



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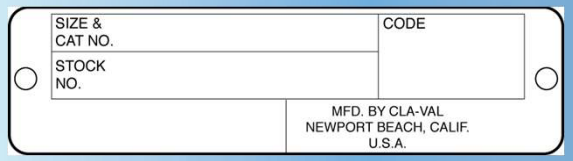
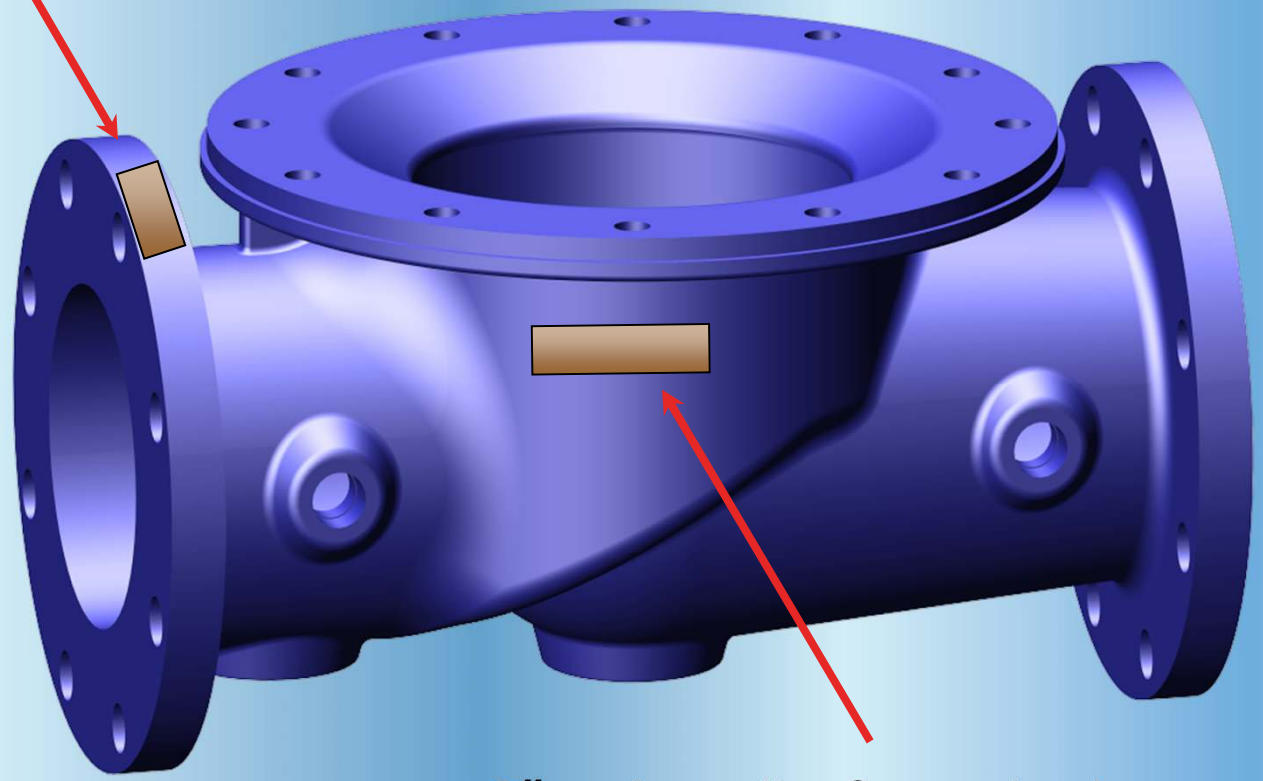
Name Plate Locations

2-1/2″ and larger flanged valves





2″ and smaller flanged valves and all threaded and grooved valves

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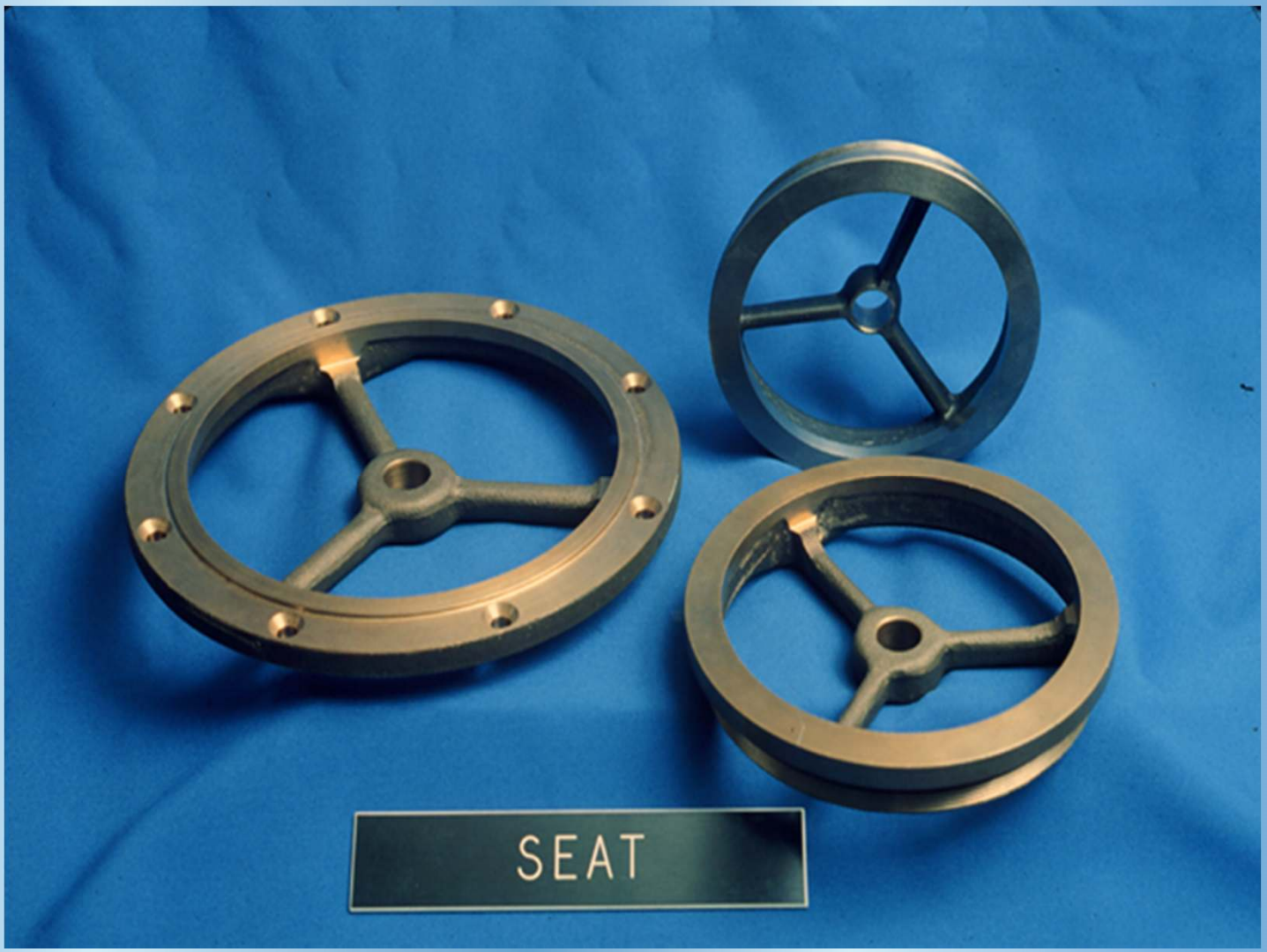
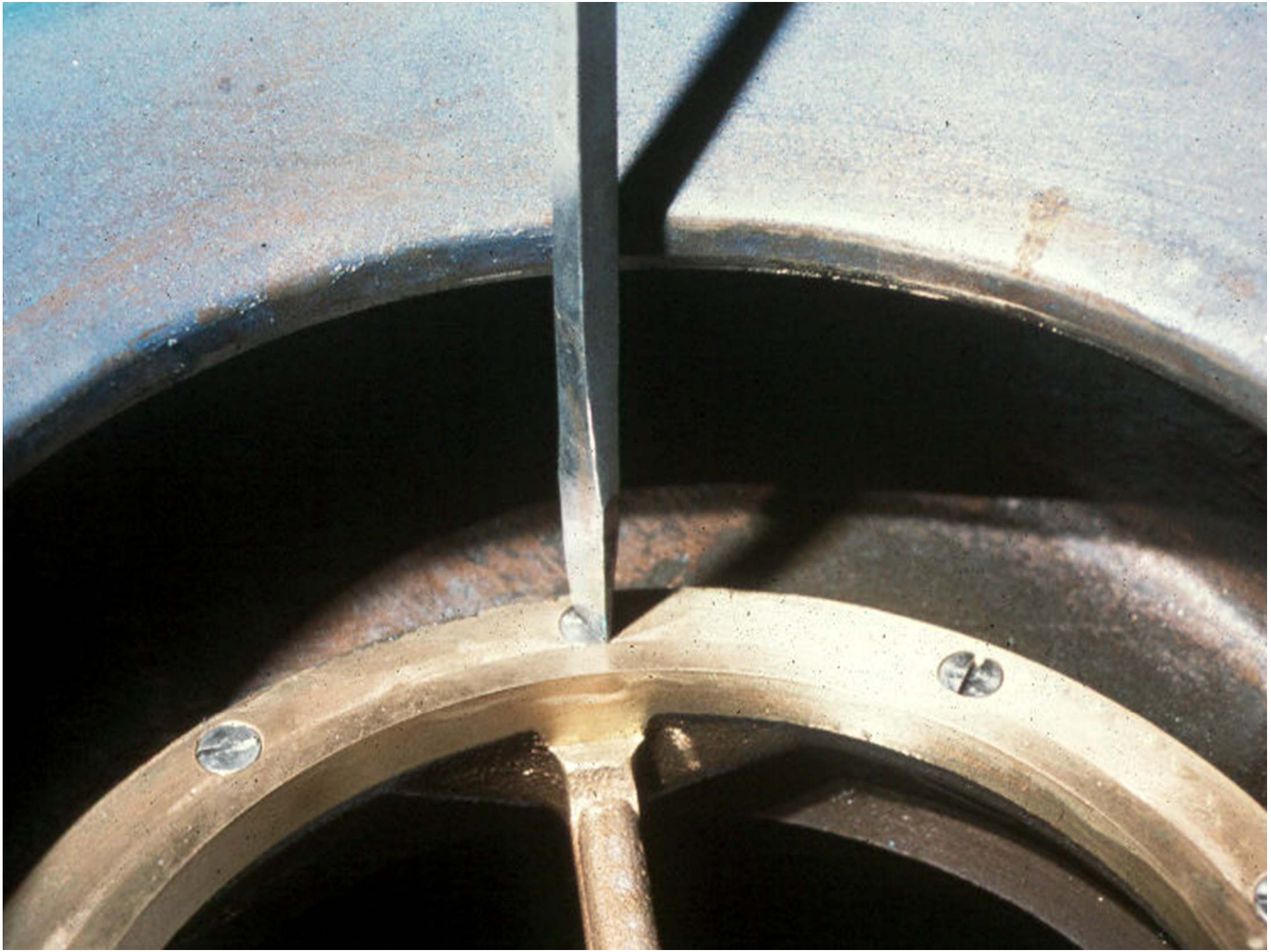
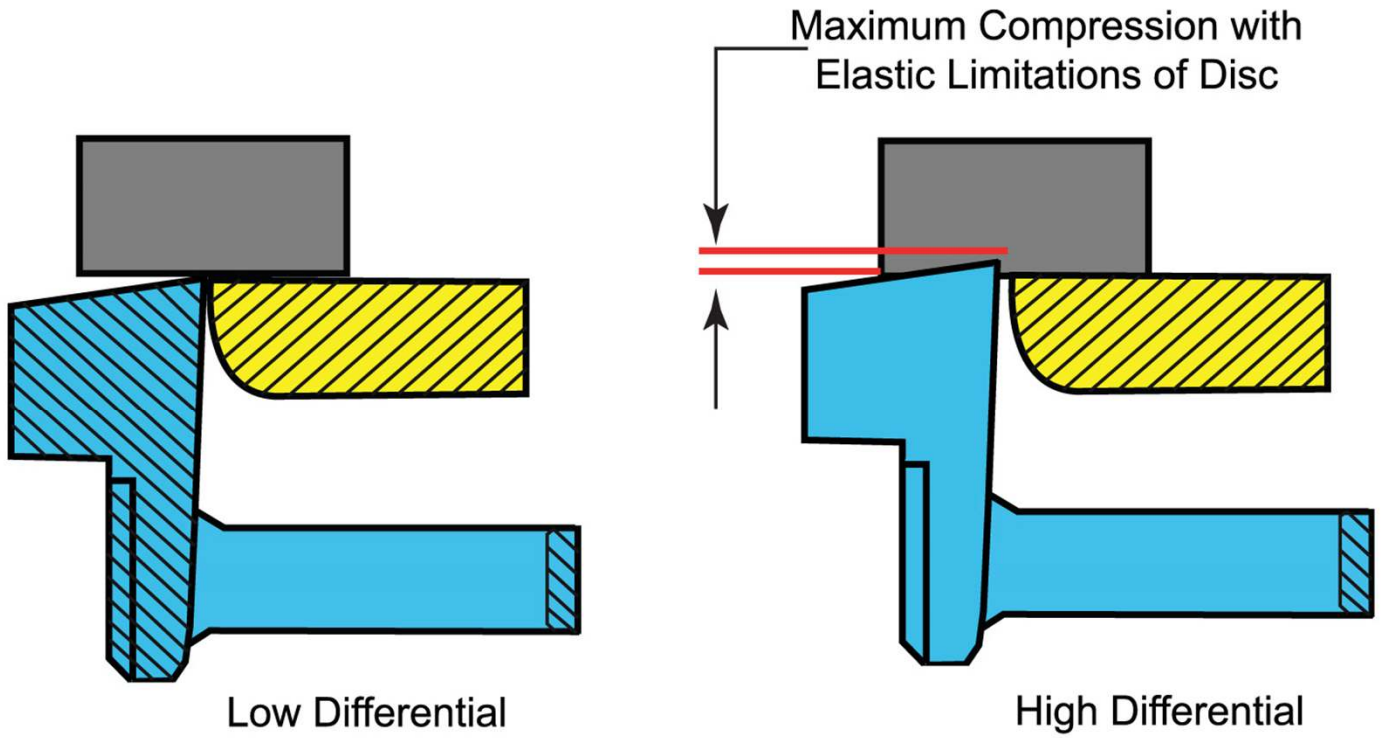
Cla-Val Nameplate

Renewable Seat

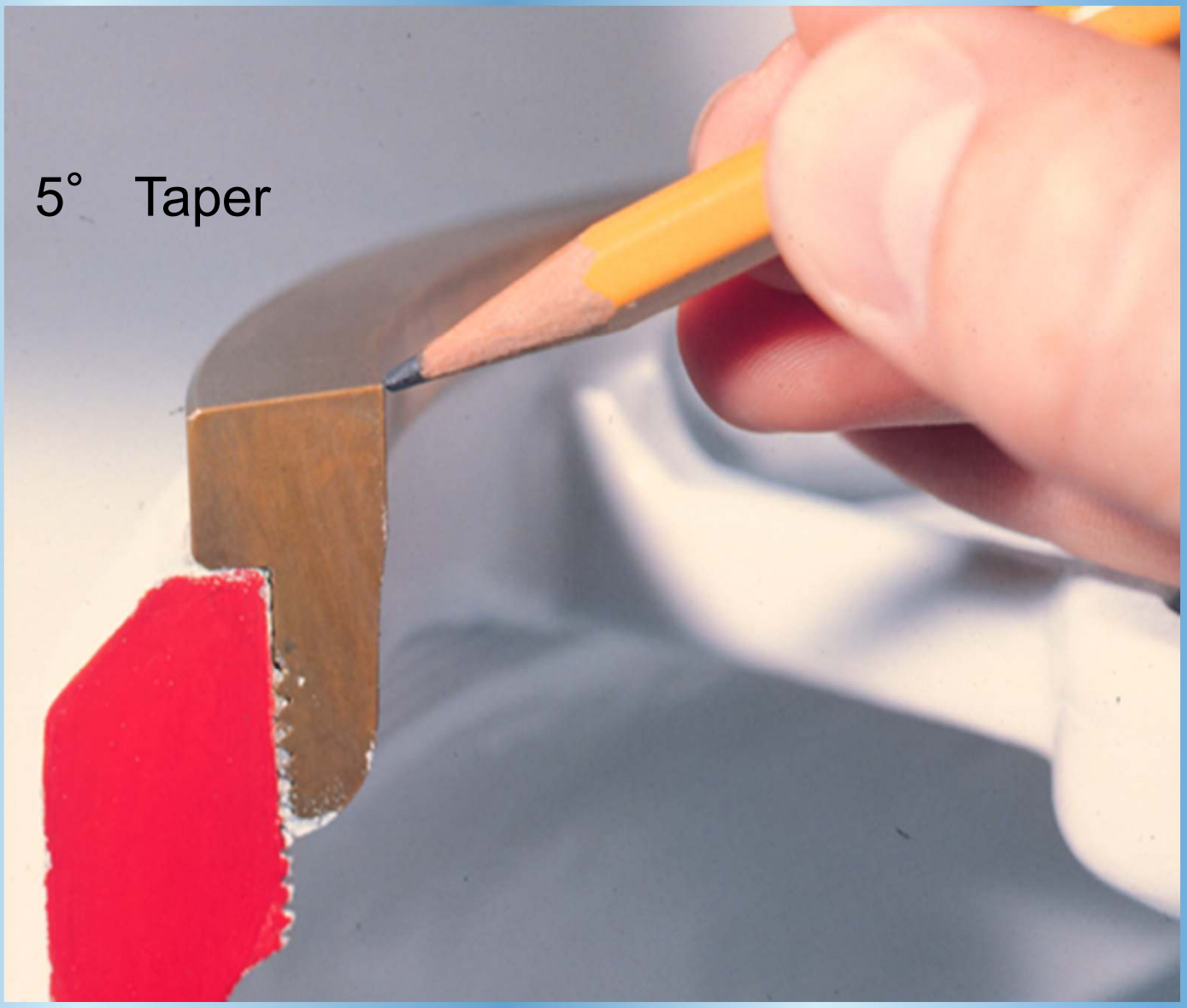




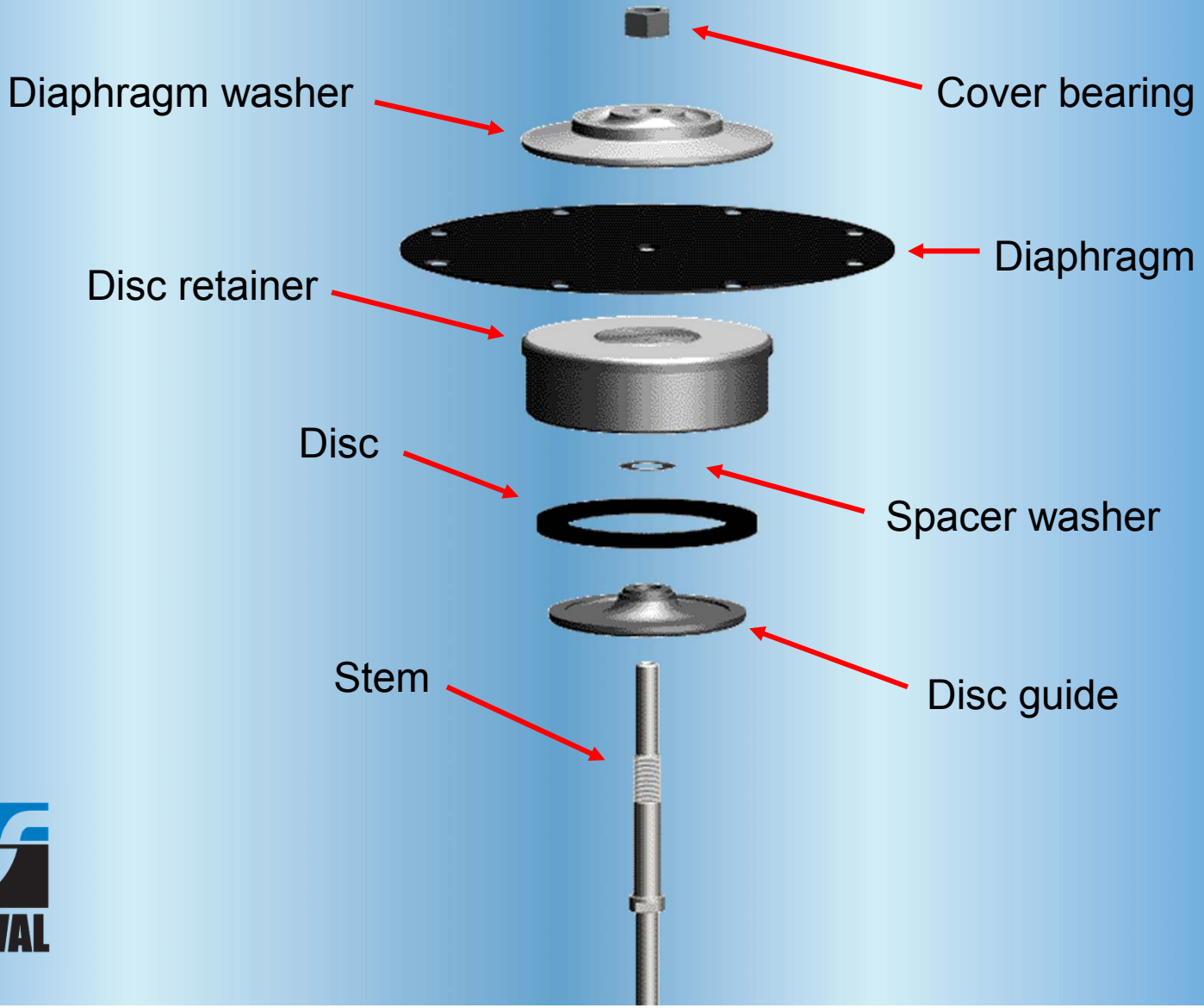
Drip Tight Sealing



Seat Design Features



Diaphragm and Disc Assembly



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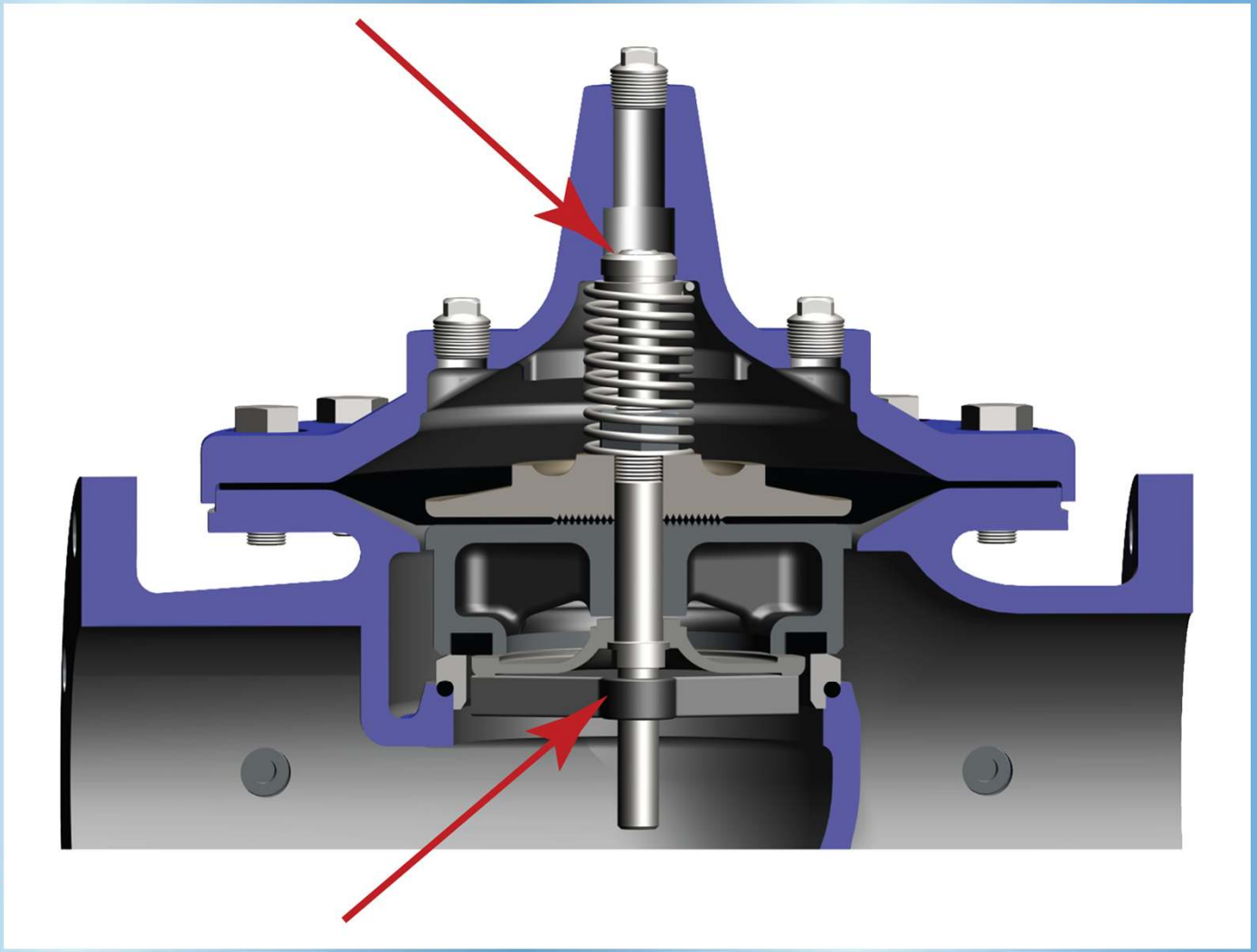
Top and Bottom Guided Stem



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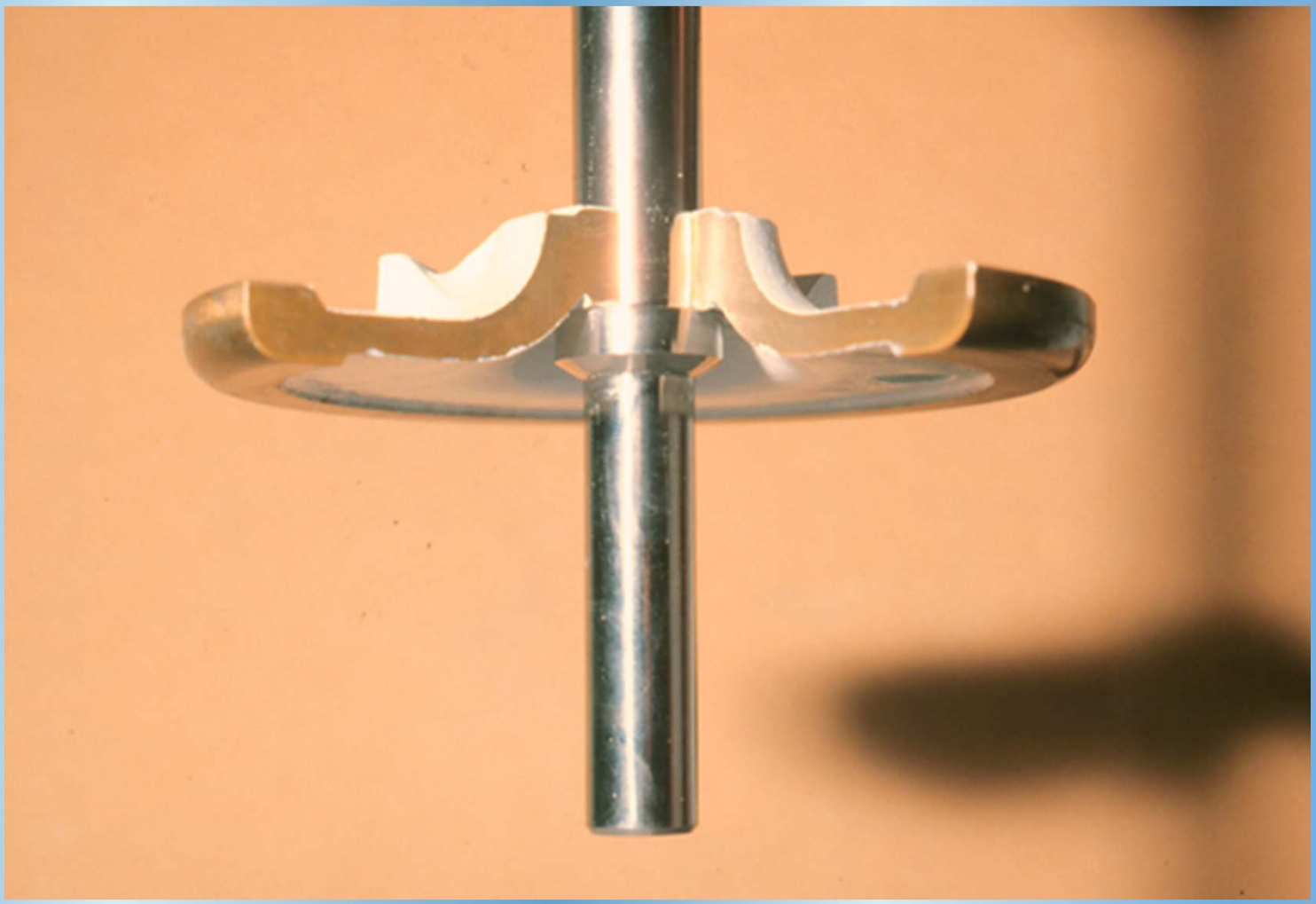
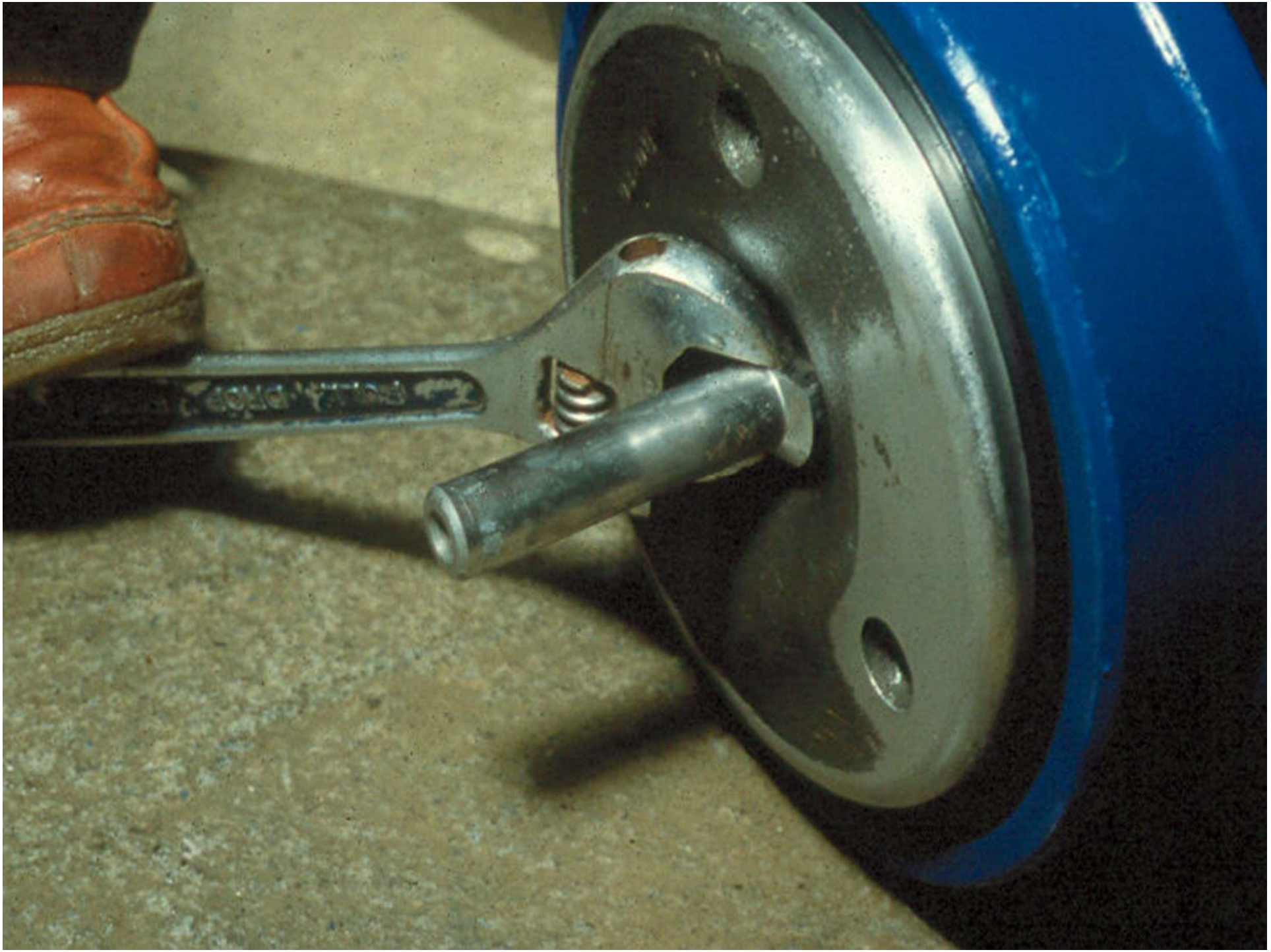
Disc Guide

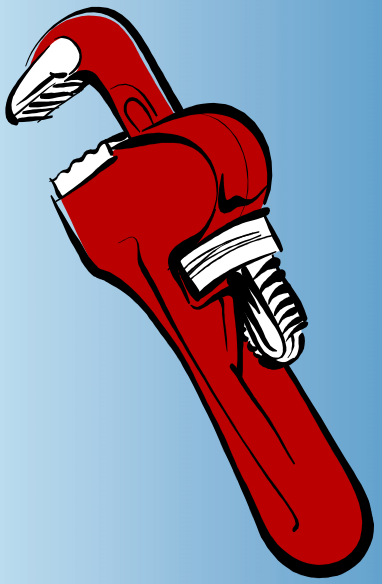




Valve Stem

No wrenches!

Use “soft jaws”



Bearing Surface

Bearing Surface

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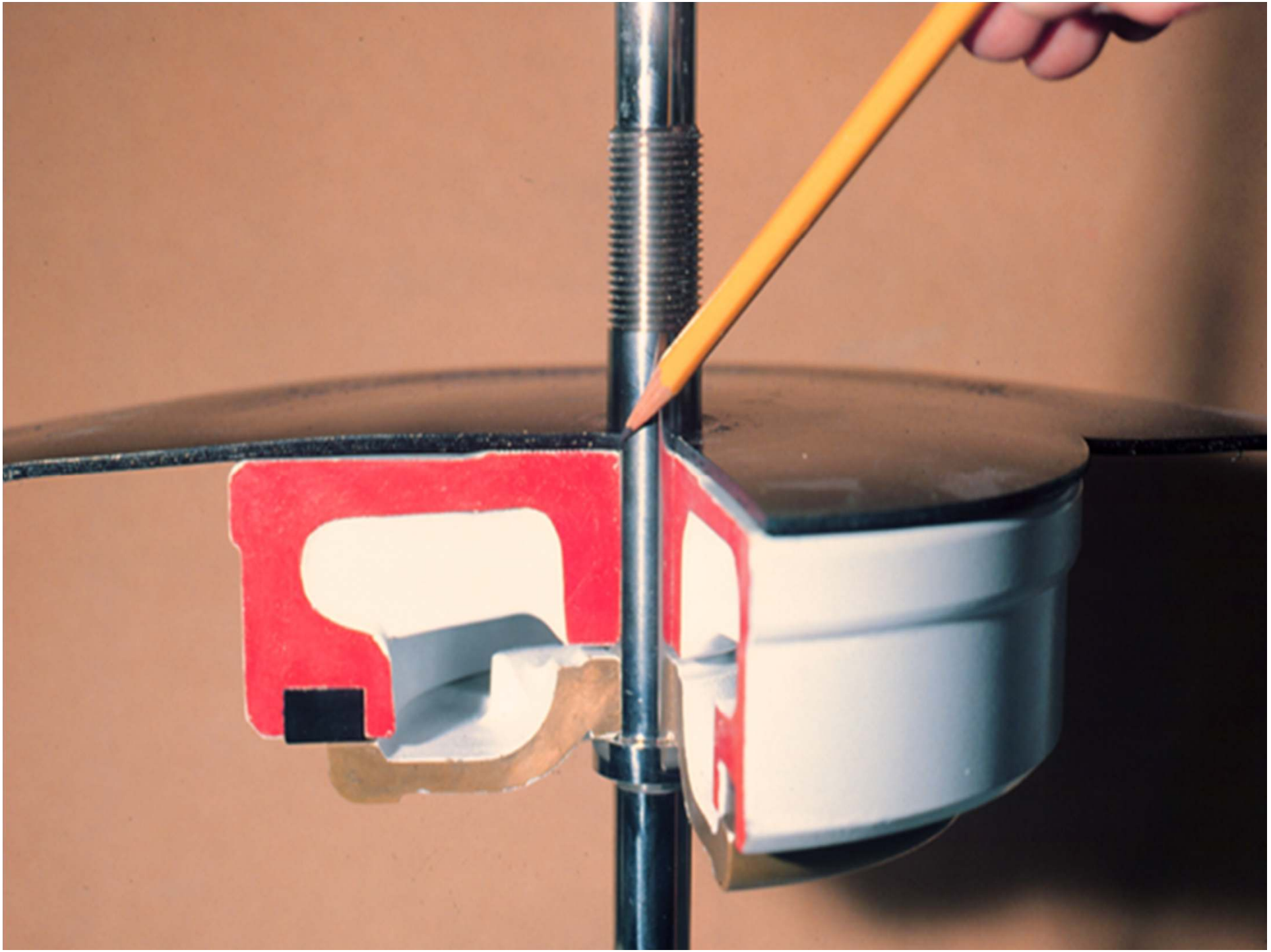
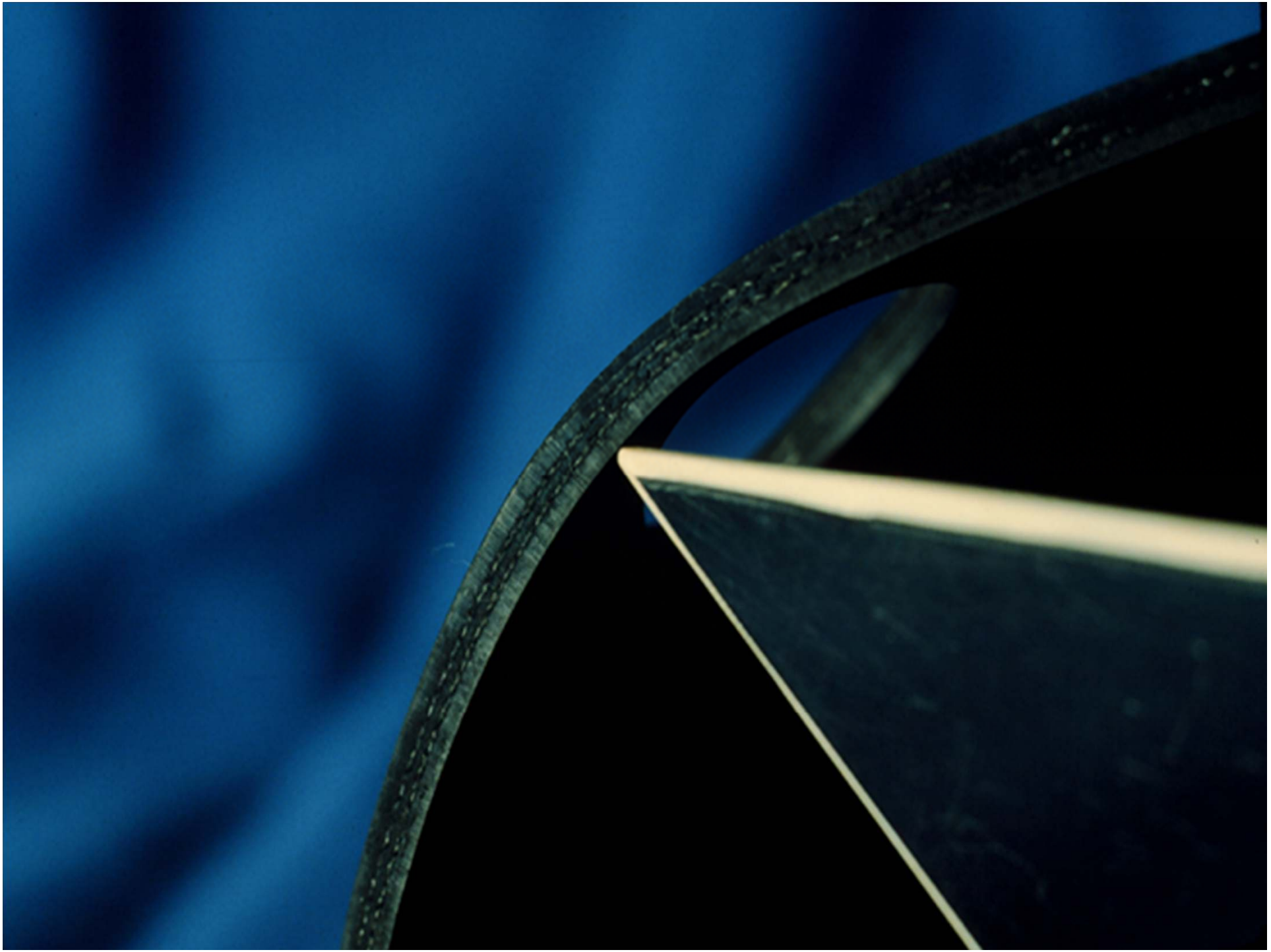
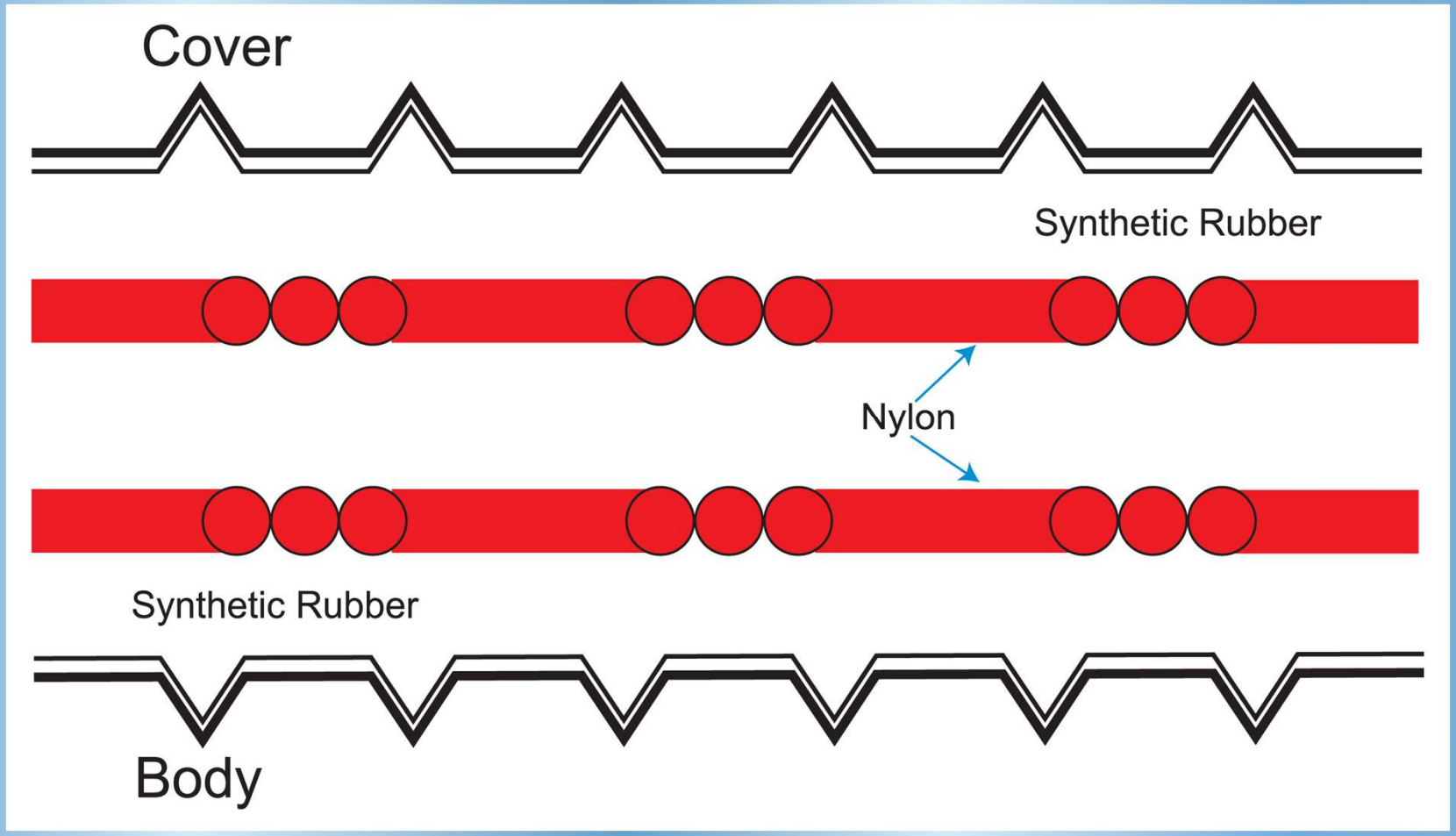
Do Not Use When
Damaged!



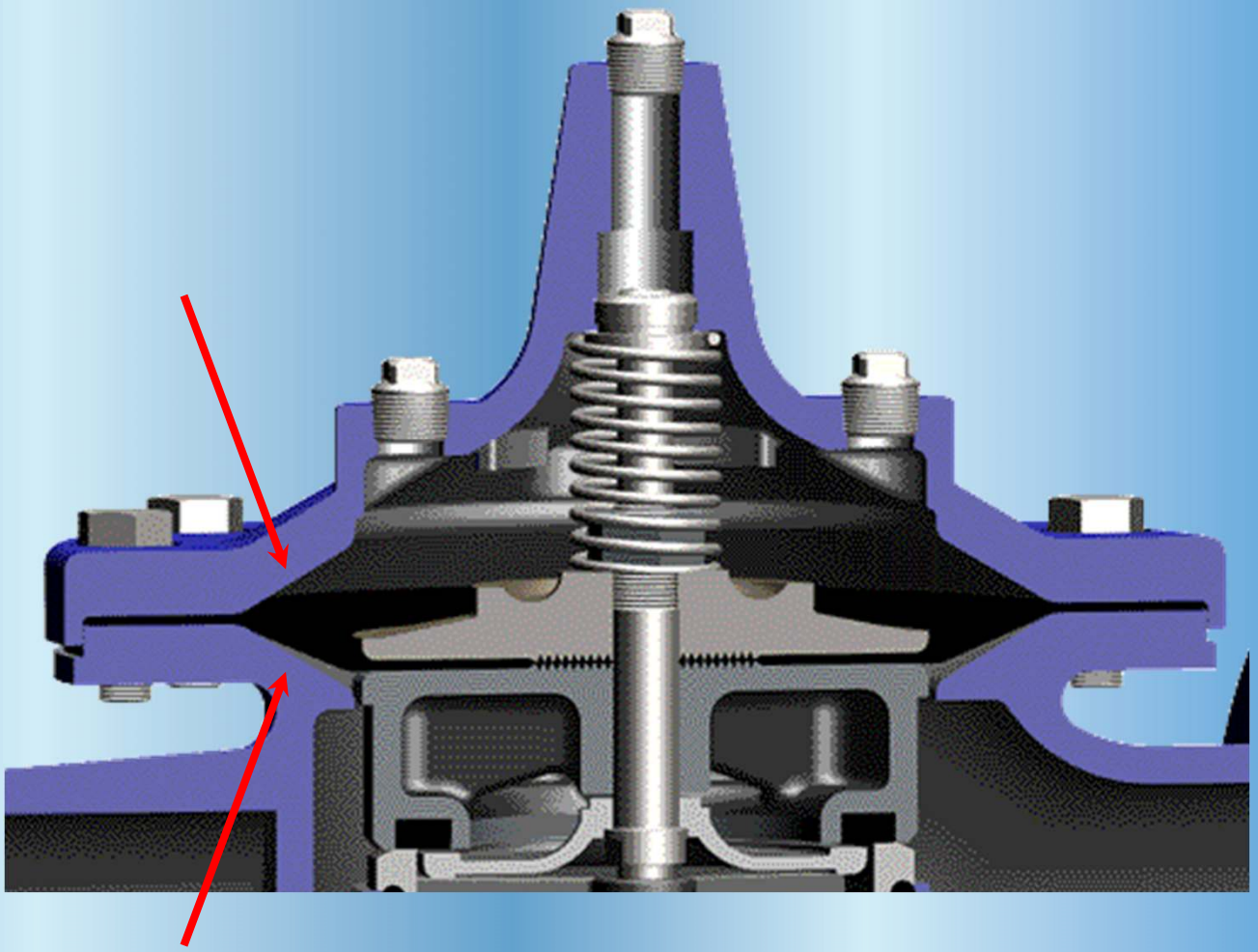
Date Stamp



Diaphragm Gripping



Fully Supported Diaphragm



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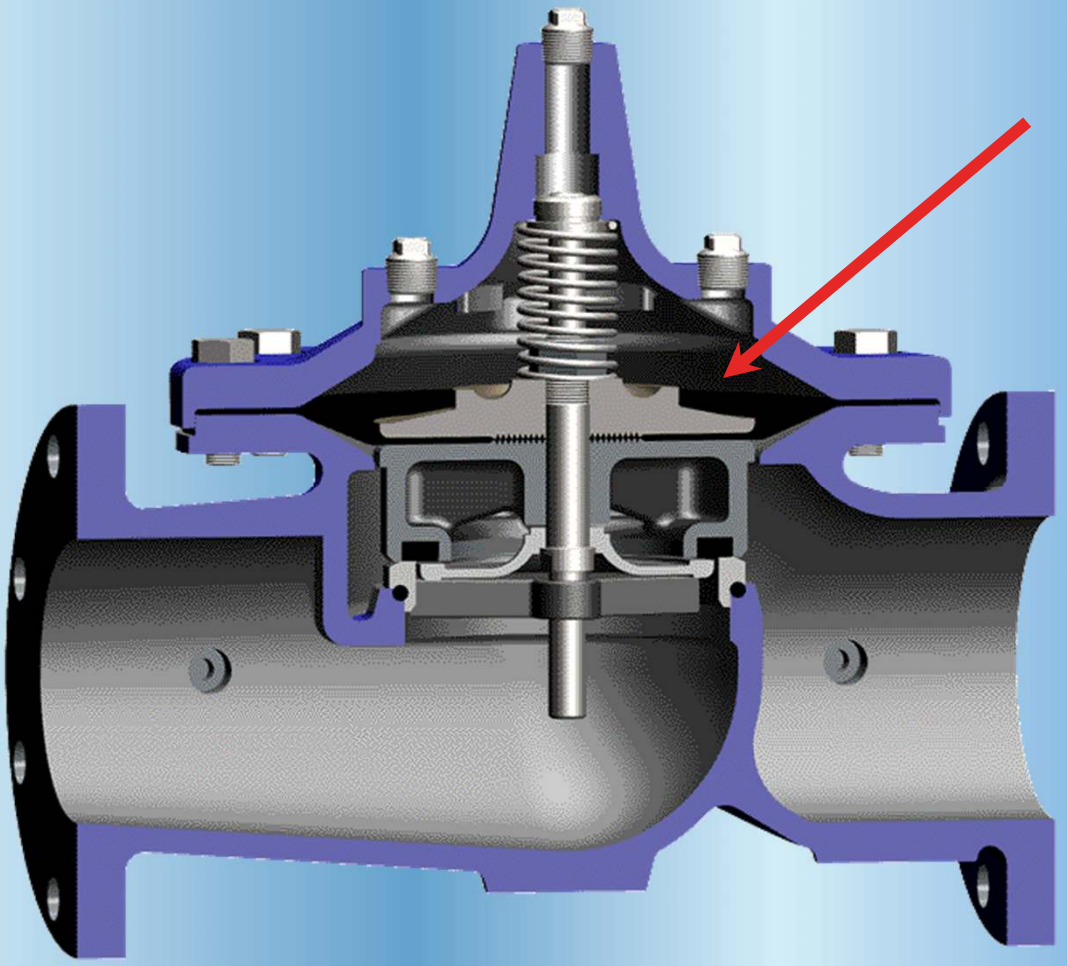
Cover Chamber



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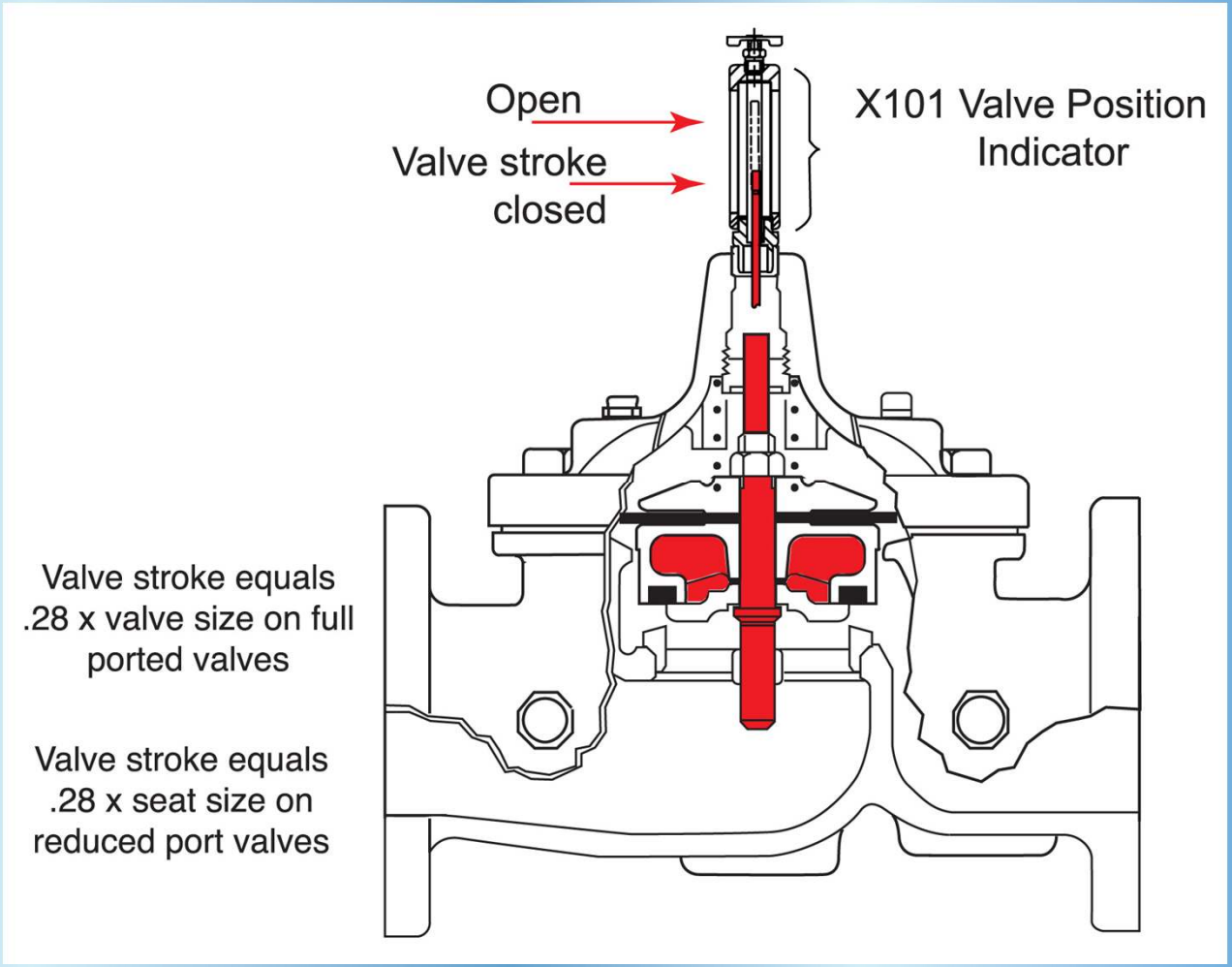
Measured Stroke



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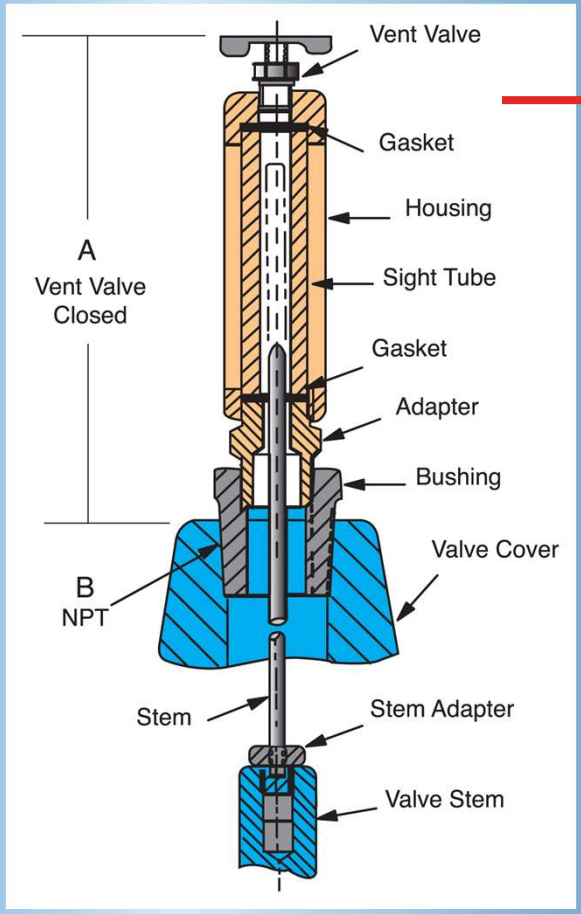
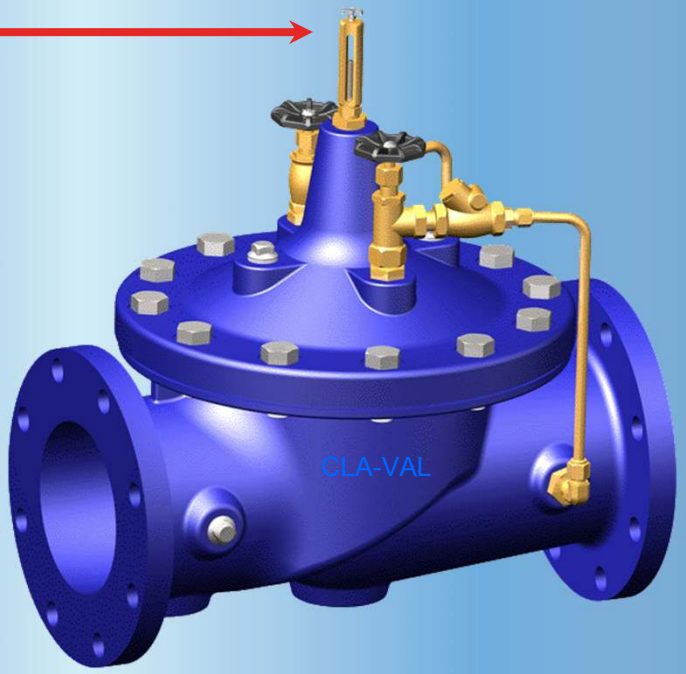
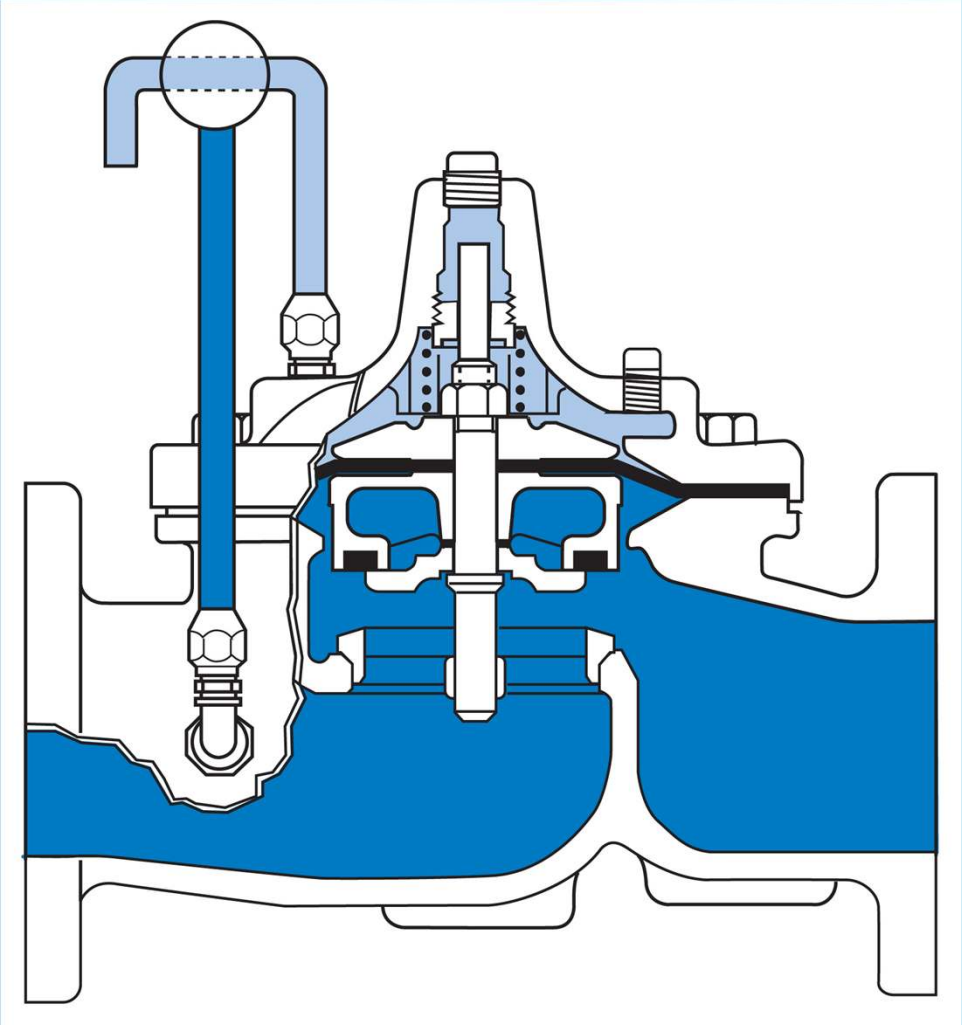
X101 Valve Position Indicator





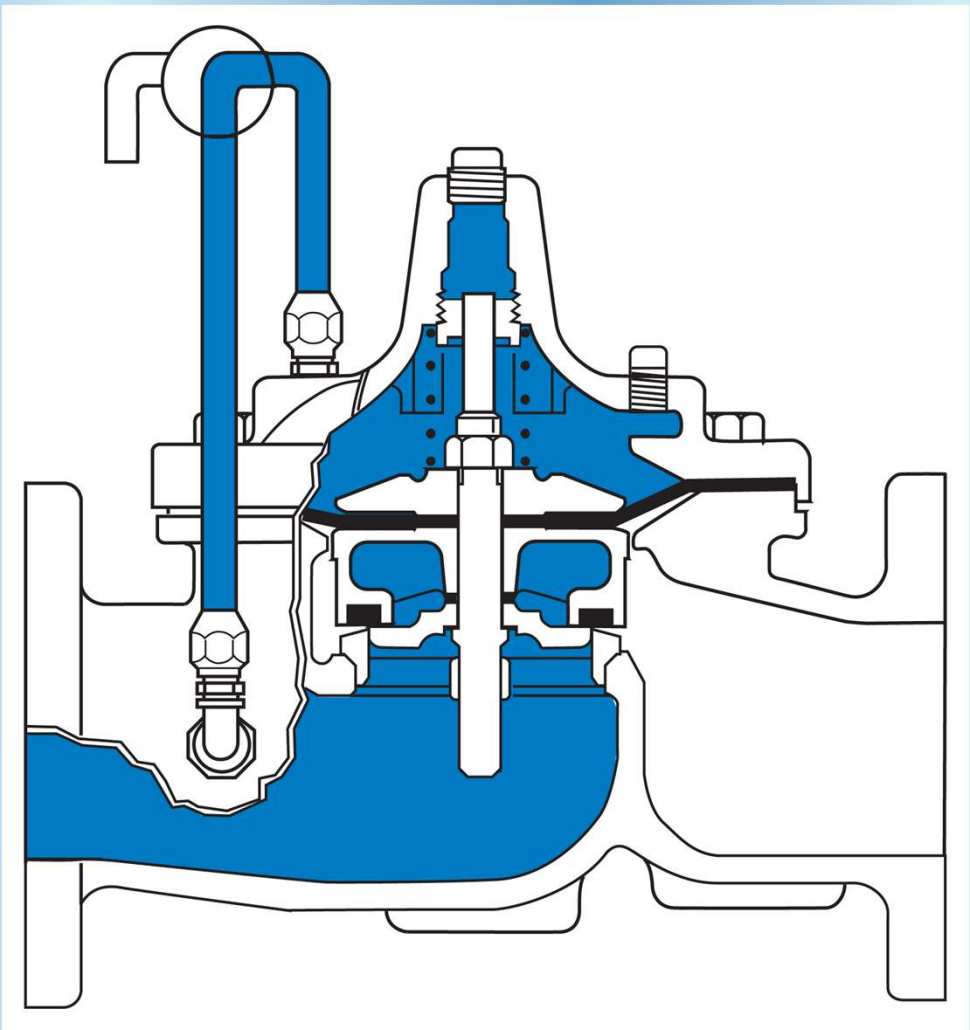
Cla-Val Pilot Controls

Open with 3-Way Pilot



- Non-Modulating

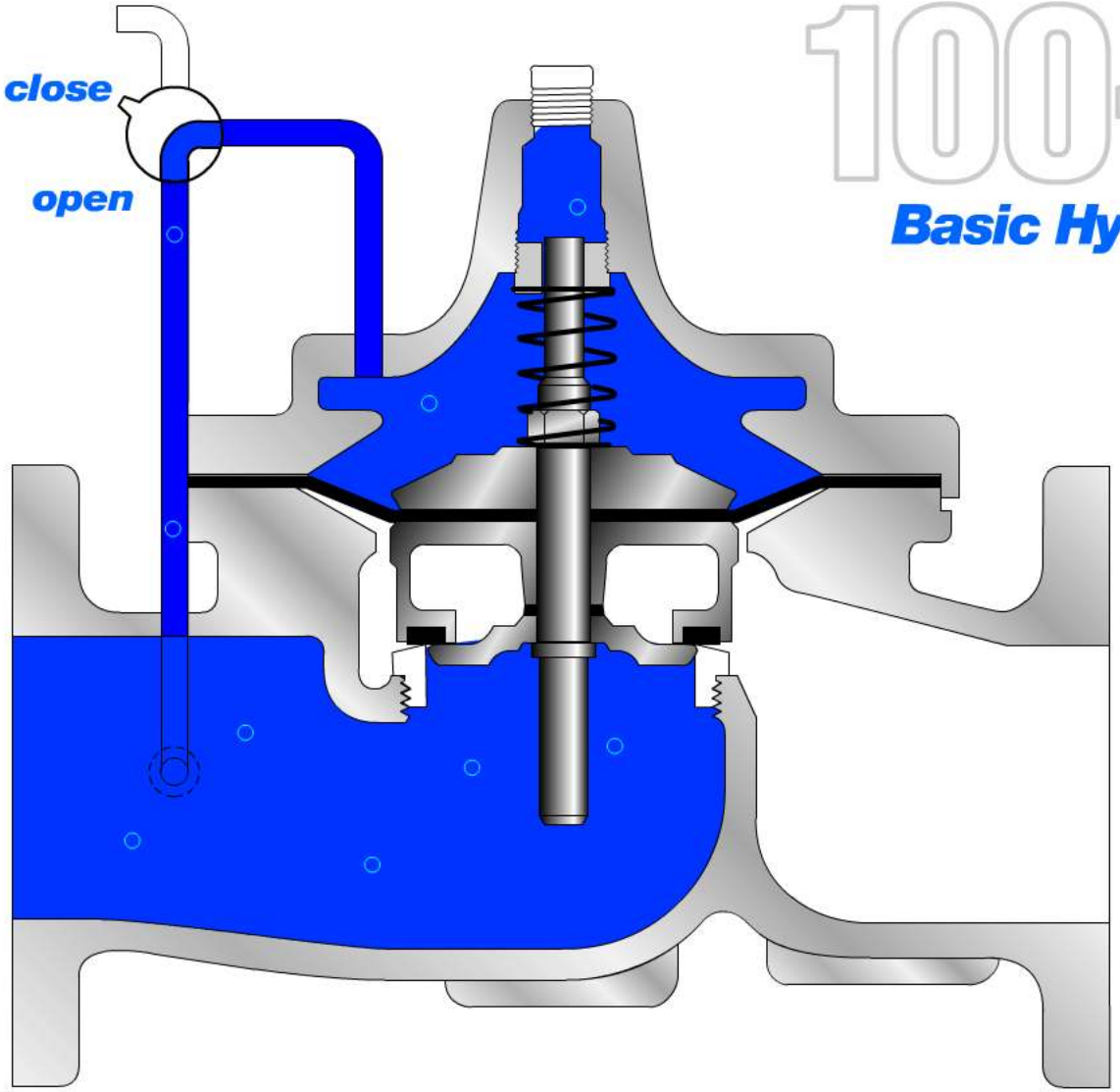
Closed with 3-Way Pilot



- Non-Modulating

Close Valve

Open Valve

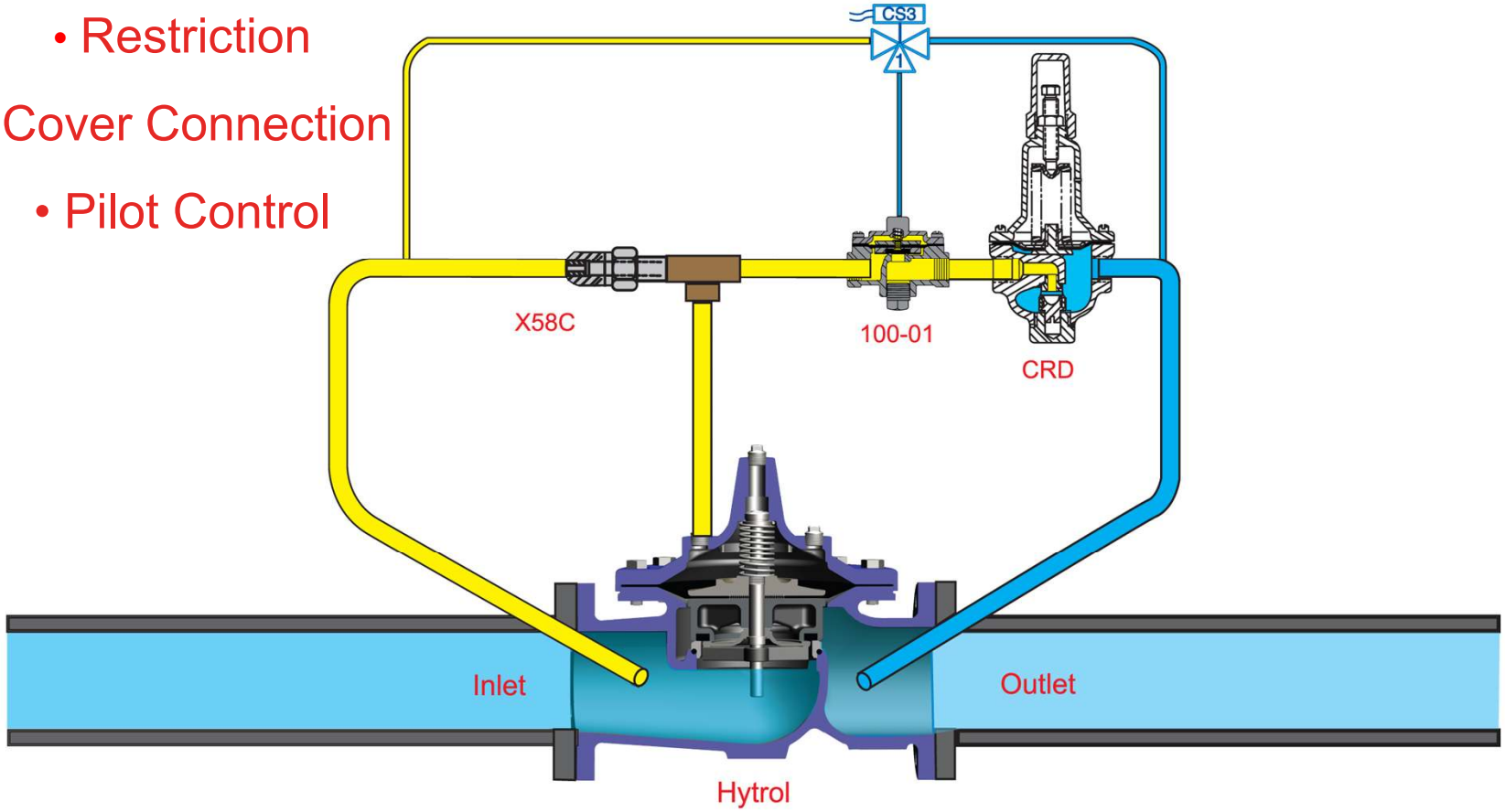


100-01

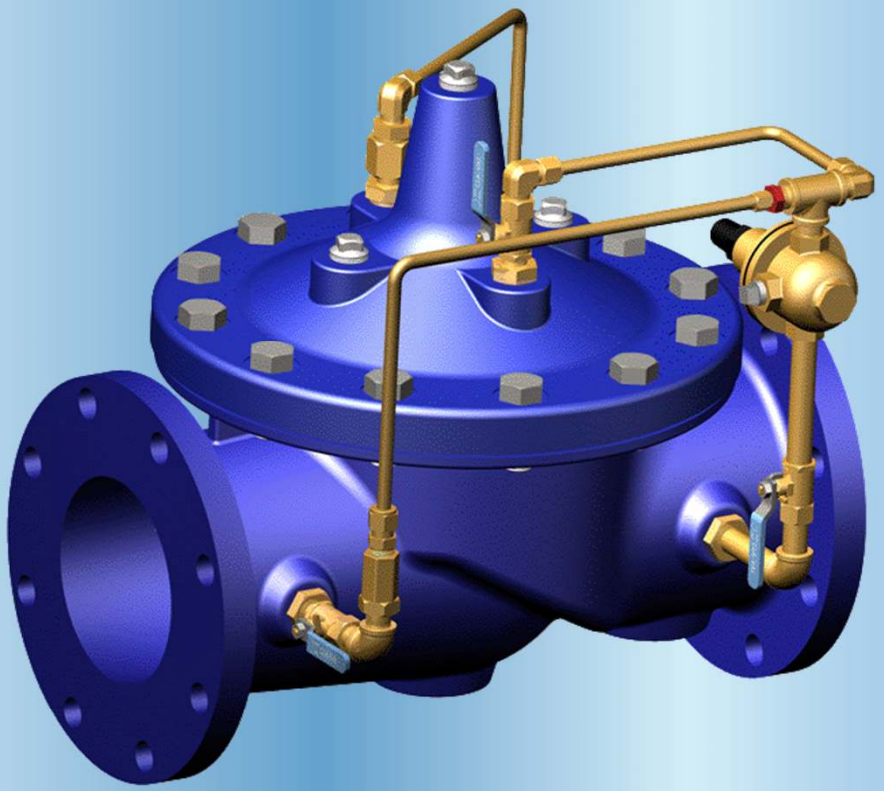
Basic Hytrol Valve

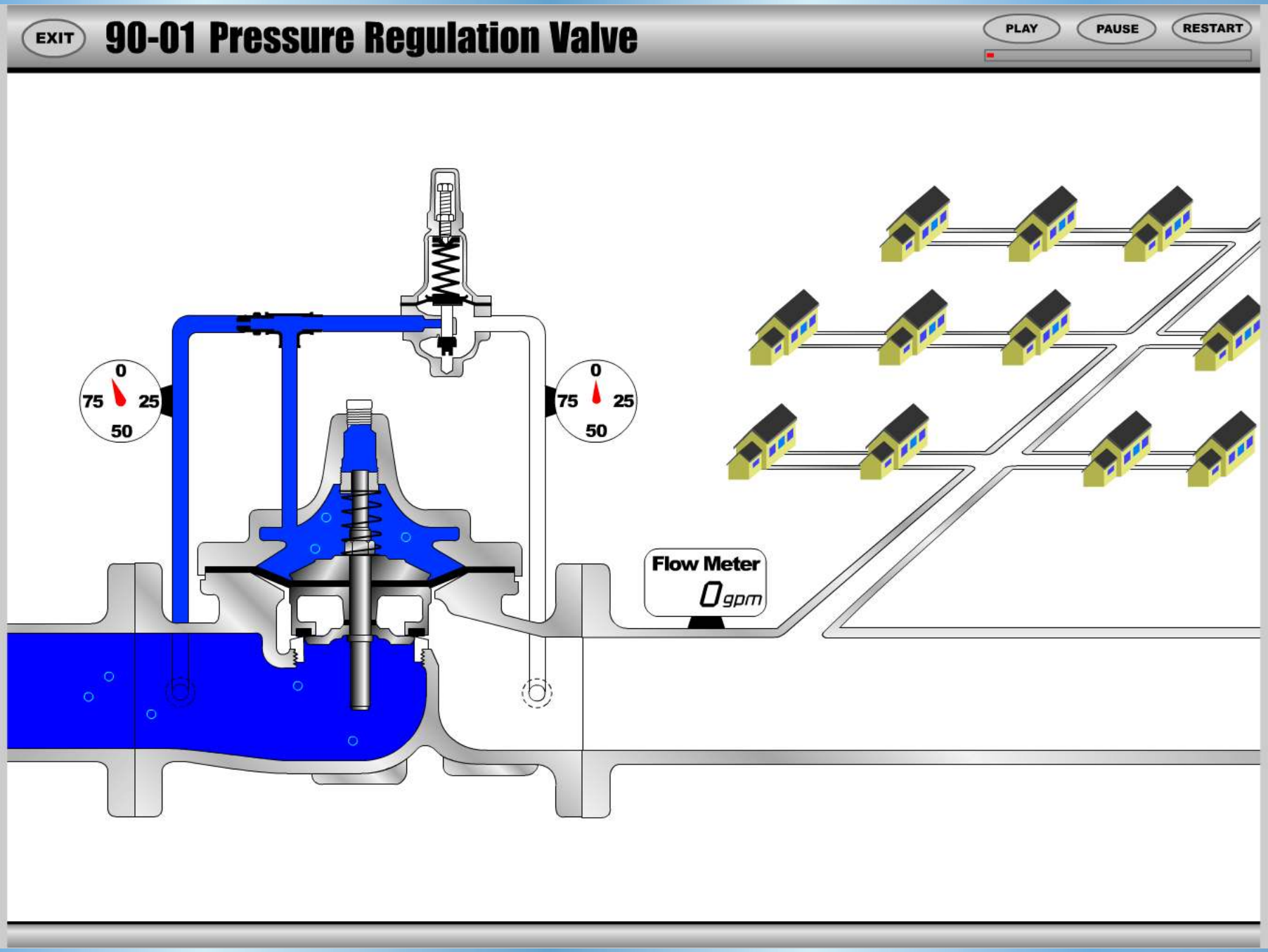
A Modulating Pilot System Has…

- Restriction
- Cover Connection
- Pilot Control

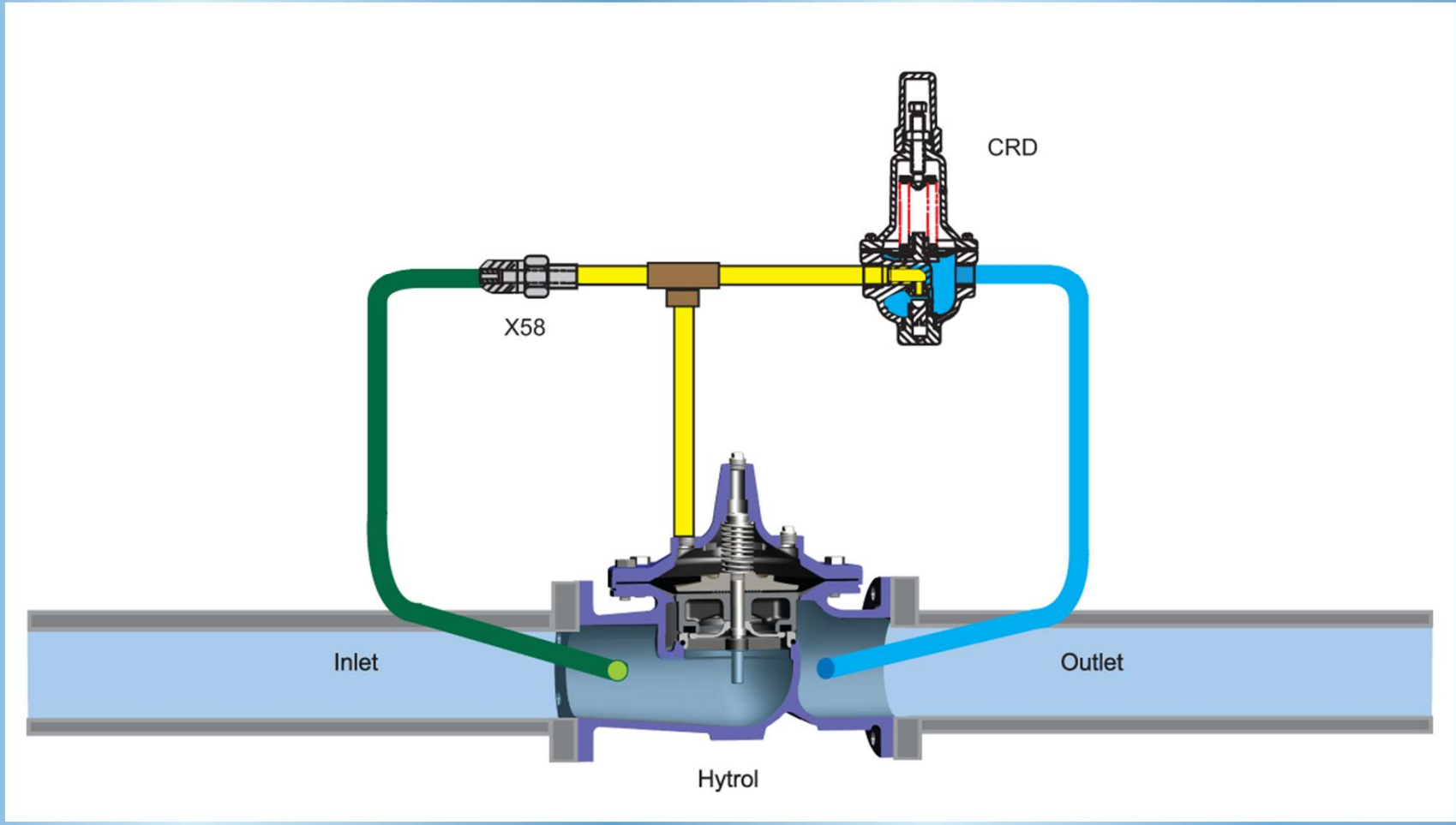


Pressure Reducing Valves

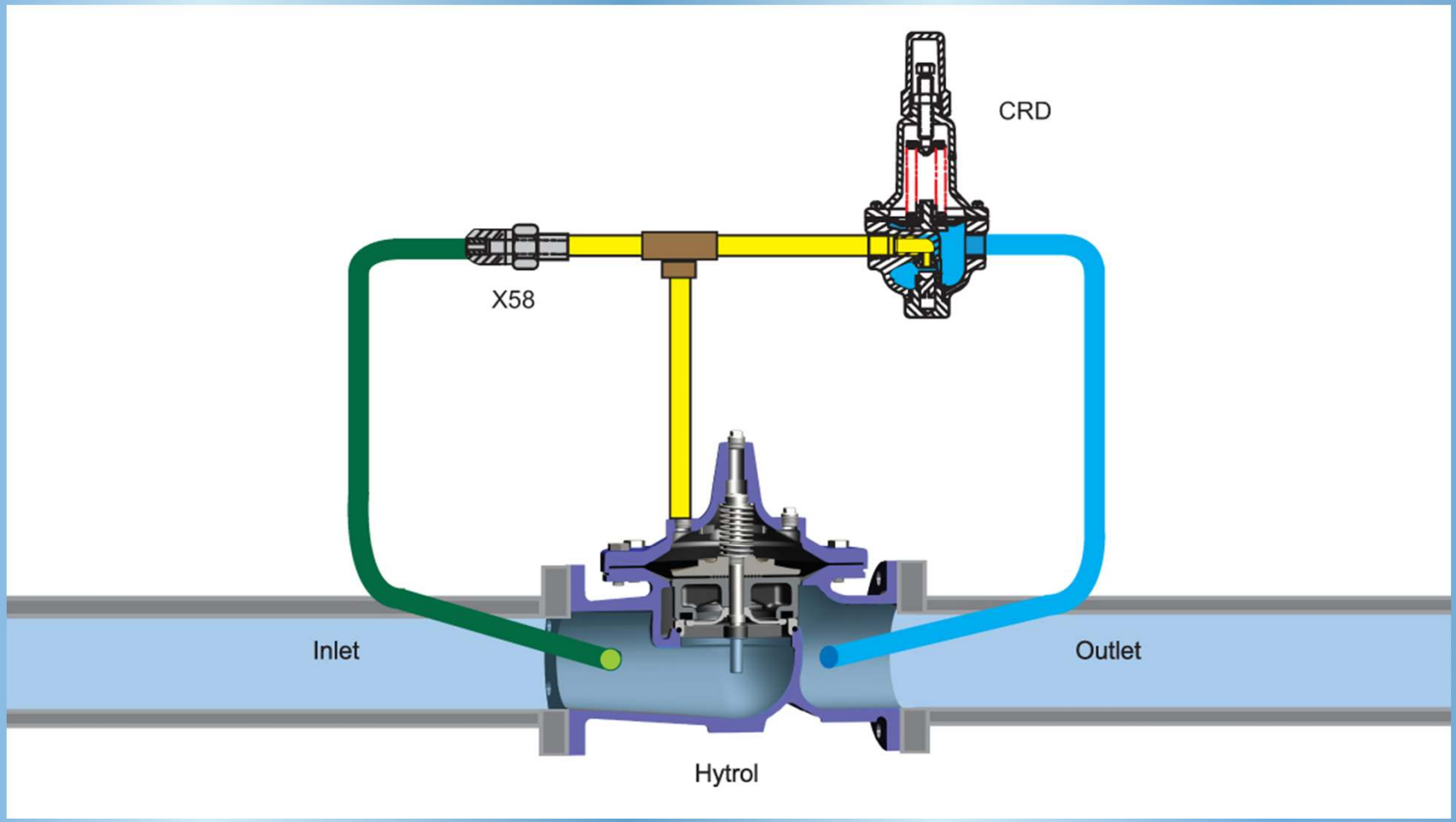



EXIT
90-01 Pressure Regulation Valve
PLAY
PAUSE
RESTART
0
75
25
50
0
75
25
50
Flow Meter
0 gpm

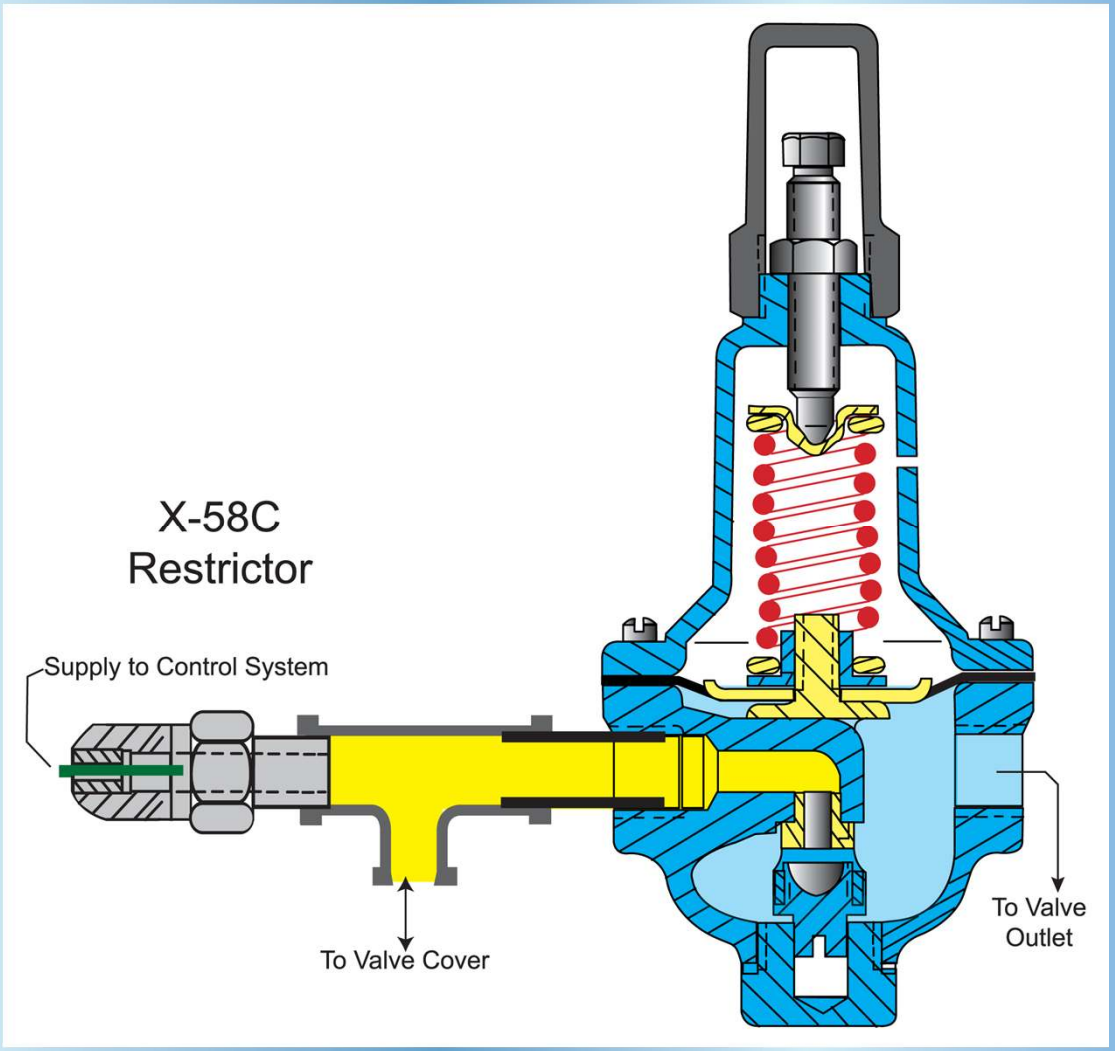
90 Series Pressure Reducing Valve



Basic Operation of 90 Series PVS



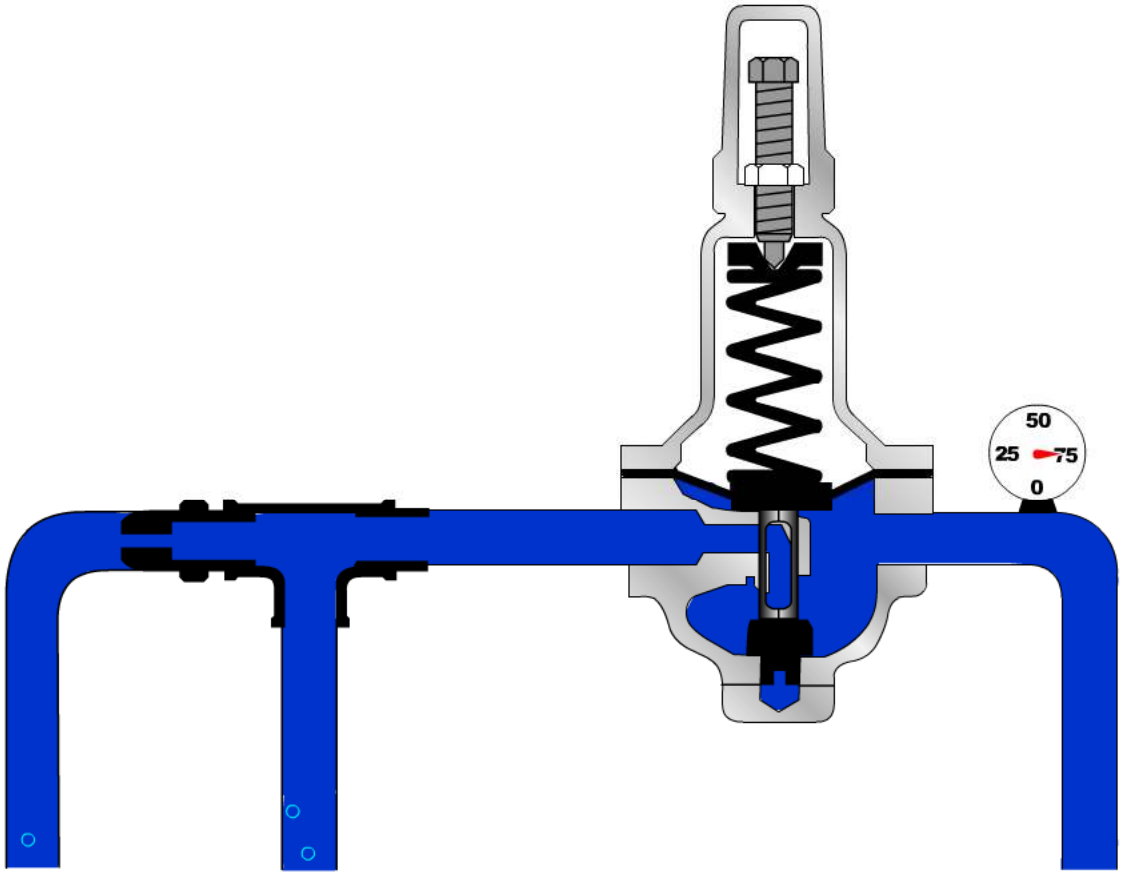
Operation of 90 Series PVS



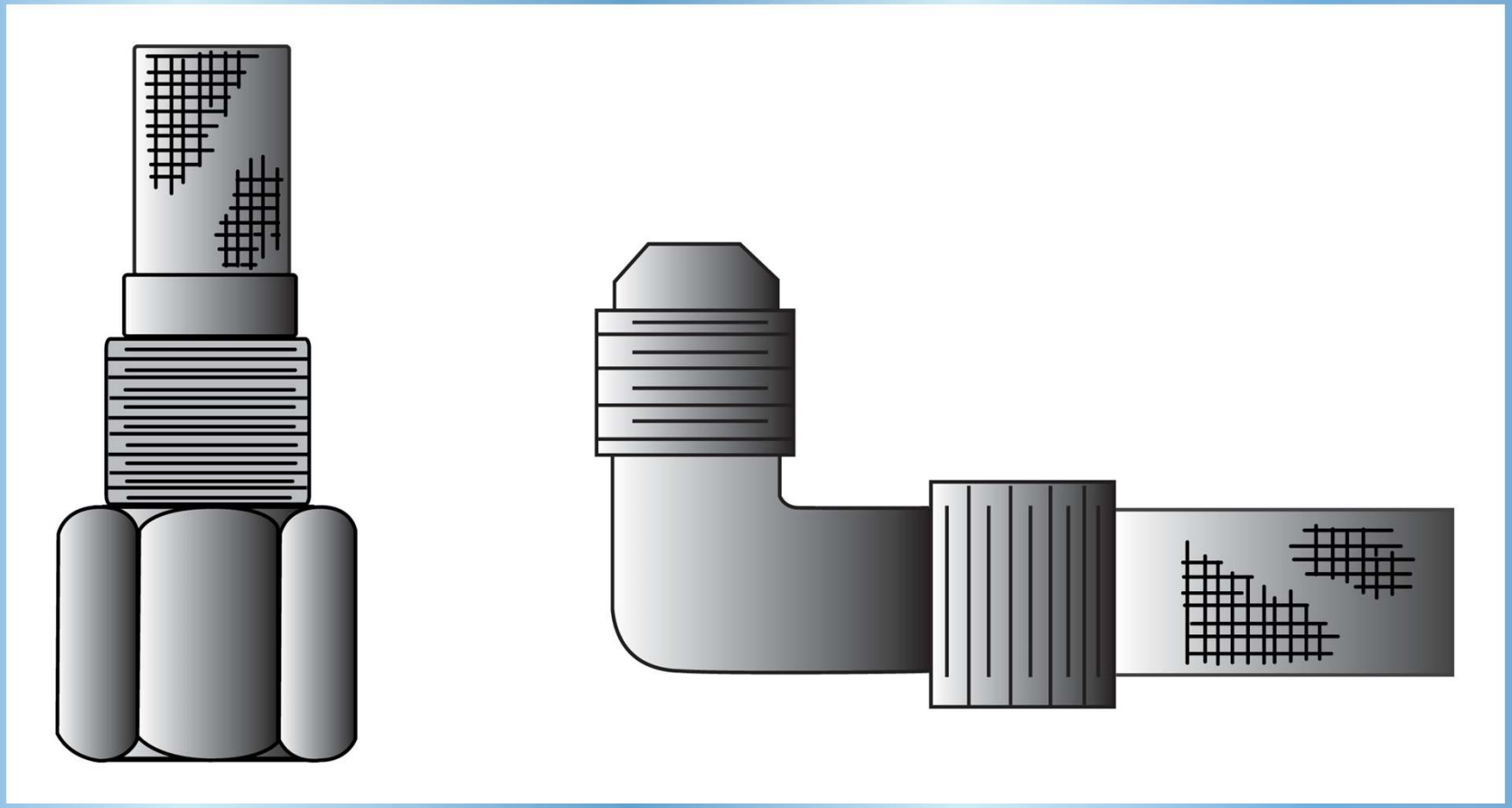
EXIT

CRD

PLAY PAUSE RESTART

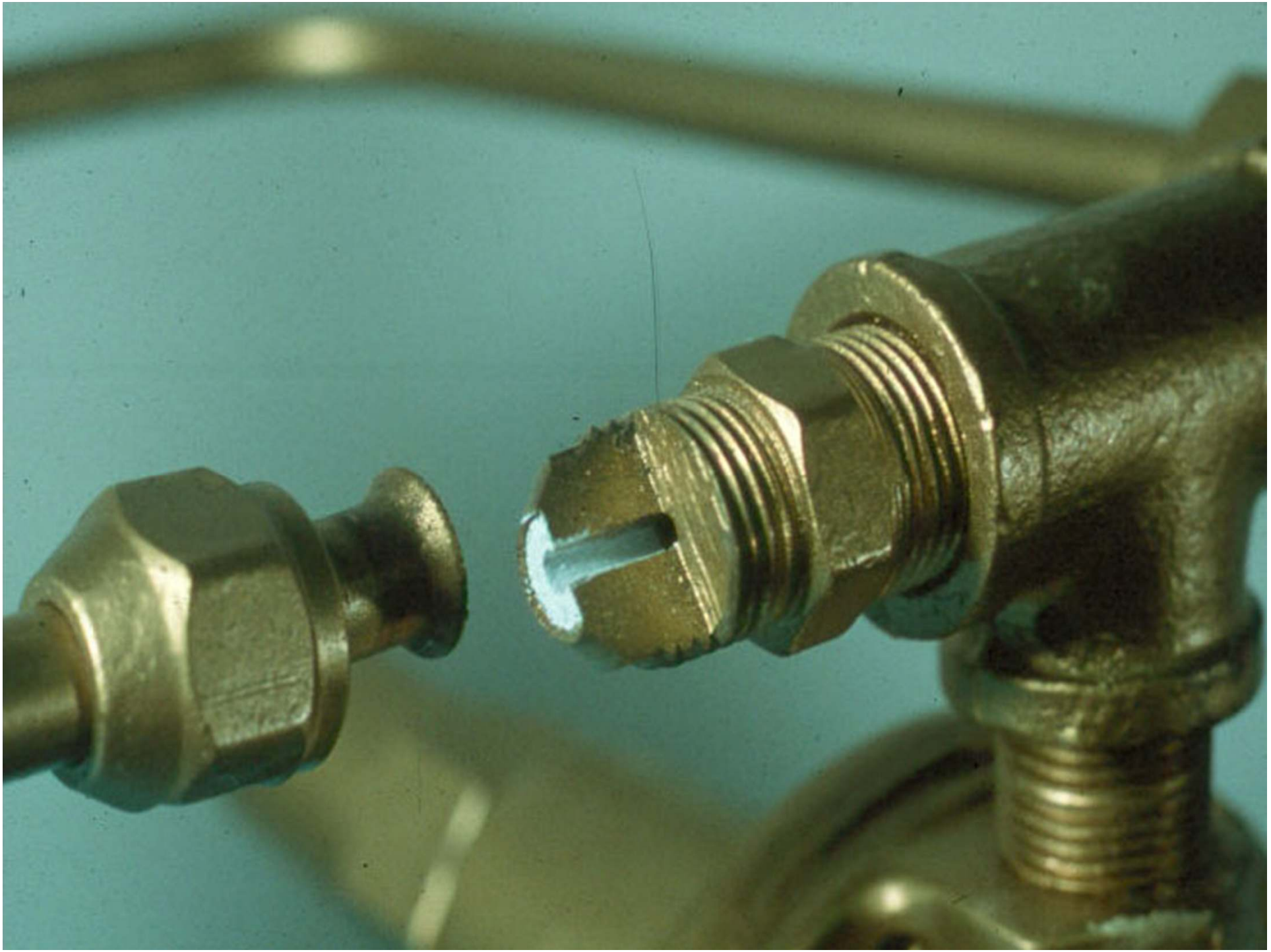


X46 Flow Clean Strainer

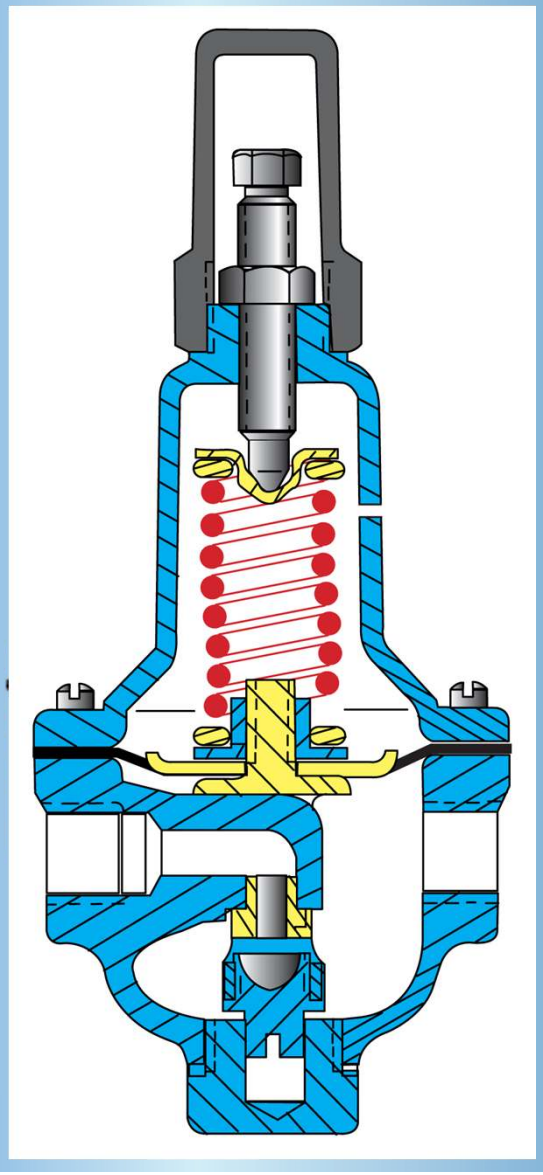


CLA-VAL

Orifice Restrictions



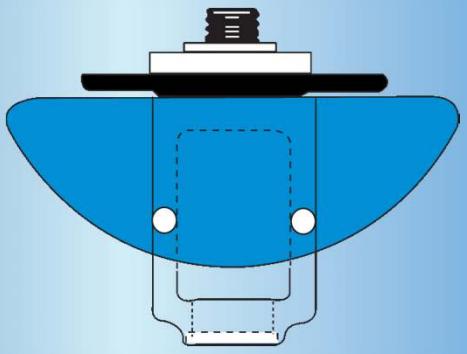
CRD Reducing Pilot Control



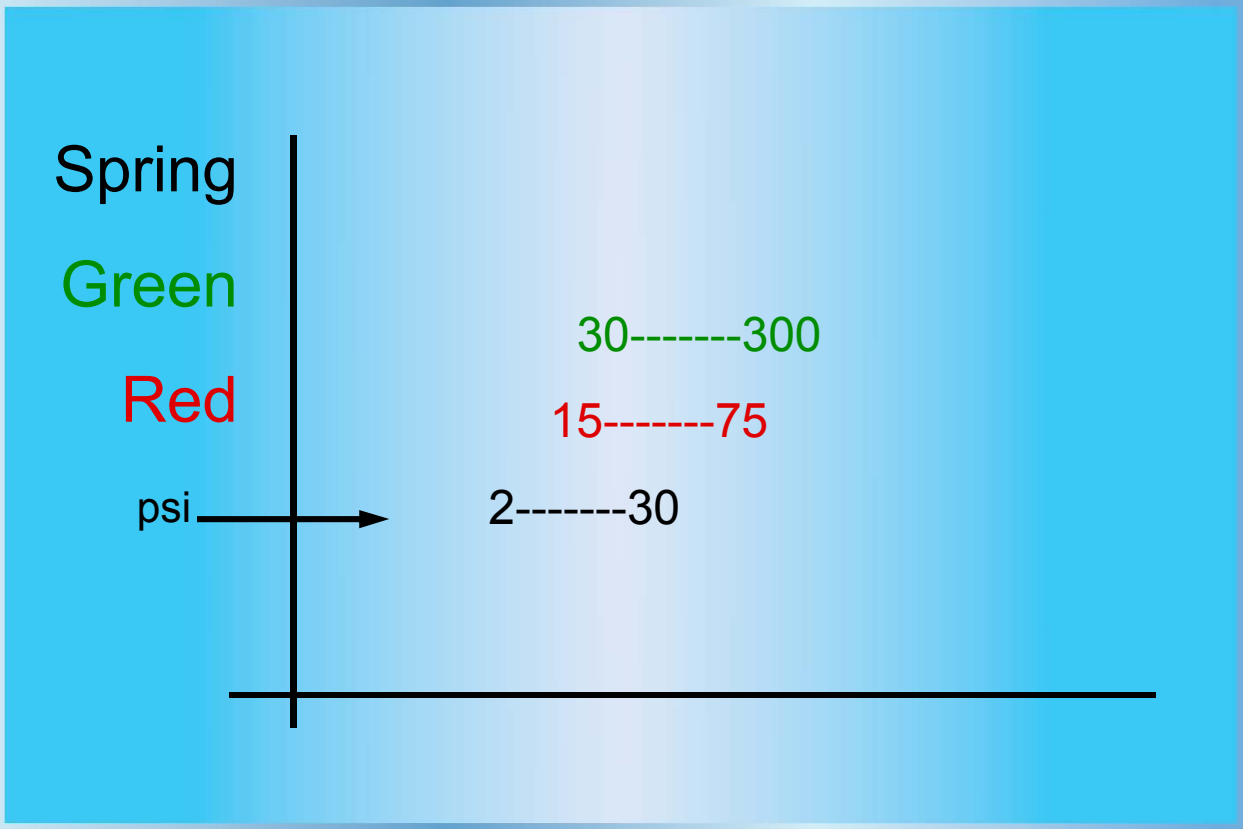
- Normally open
- Closes on pressure rise
- Senses outlet pressure

CRD Troubleshooting

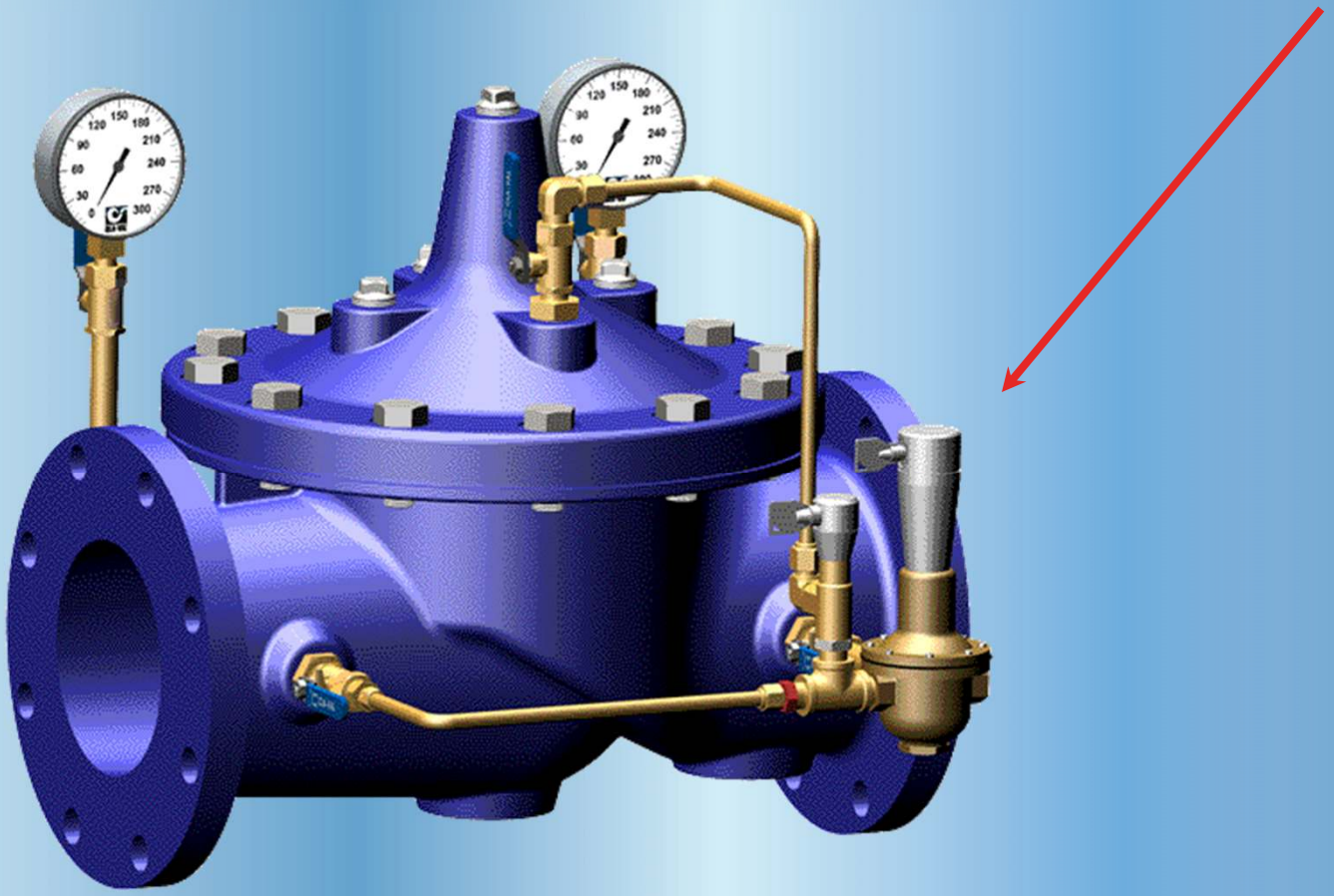
- Make a visual check
  - ✓ Cover vent hole
  - ✓ Pressure gauge
- Vary control adjustment
- Check disc
- Check yoke alignment



CRD Adjustment Ranges

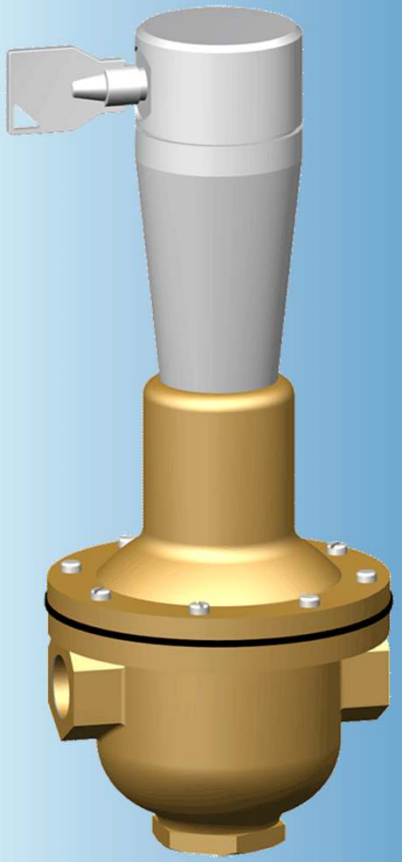


X140 Locking Cap

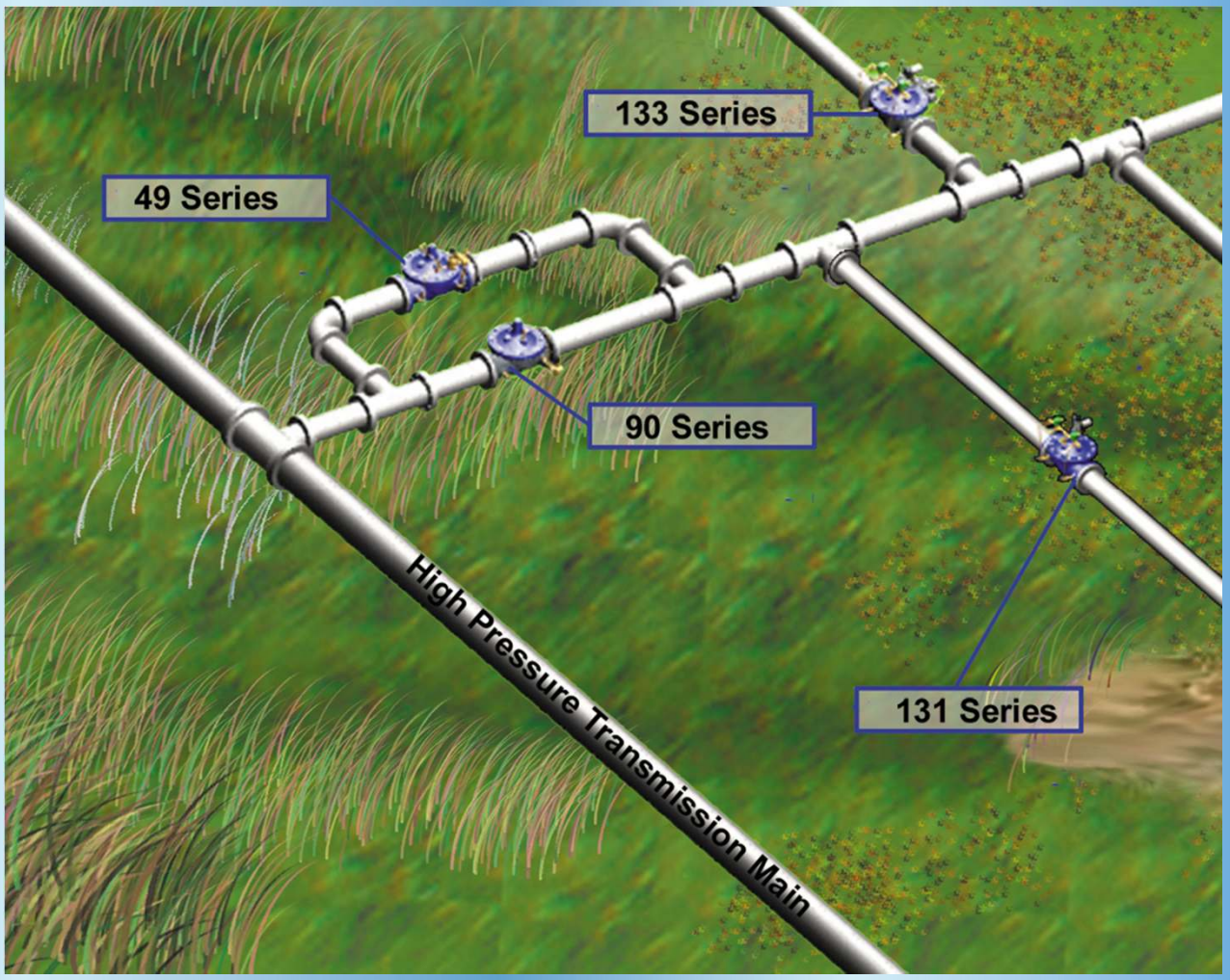


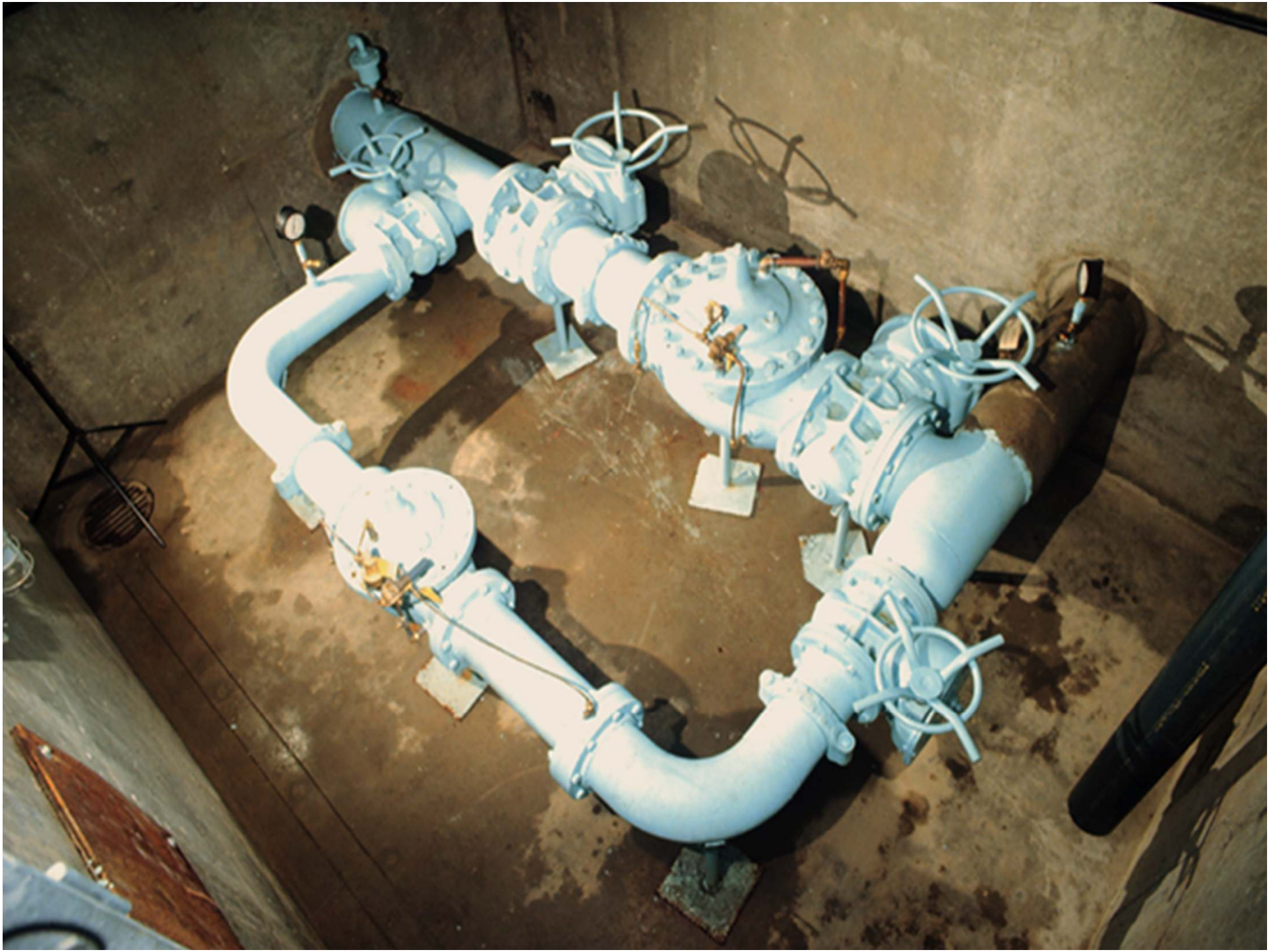
CLA-VAL

X140 Locking Cap



Typical PRV Station - Clayton Valley





Sizing Factors and Cavitation

- Flow rate capacity
  - At allowable pressure drop
  - At maximum velocity
- Pressure rating
  - Of valve and pilot system
  - Of valve flange
- Cavitation damage potential
- Materials compatibility

CLA-VAL

Valve Selection "Matrix" in Catalog

Valve Selection			These Symbols and Indicate Available Sizes																
		Inches	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
		mm	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
		End Detail	Threaded	Threaded & Flanged				Flanged											
Model 90-01	Basic Valve 100-01	Globe	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲		▲
		Angle		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					
	Suggested Flow (gpm)	Max. Continuous	93	125	210	300	460	800	1800	3100	4900	7000	8400	11000			25000		50000
		Max. Intermittent	120	160	260	370	580	990	2250	3900	6150	8720	10540	13700			31300		62500
		Min. Continuous	10	10	15	20	30	50	115	200	300	400	500	650			1750		2900
	Suggested Flow (Liters/Sec)	Max. Continuous	6	8	13	19	29	50	113	195	309	441	529	693			1575		3150
		Max. Intermittent	7.6	10.1	16.4	23	37	62	142	246	387	549	664	863			1972		3940
		Min. Continuous	.6	.6	.9	1.3	1.9	3.2	7.2	13	19	25	32	41			110		180
Model 690-01	Basic Valve 100-20	Globe					▲**	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
		Angle						▲	▲	▲									
	Suggested Flow (gpm)	Max. Continuous					260	580	1025	2300	4100	6400	9230	9230	16500	16500	16500	28000	
		Min. Continuous					15	30	50	115	200	300	500	500	900	900	900	1850	
	Suggested Flow (Liters/Sec)	Max. Continuous					16	37	65	145	258	403	581	581	1040	1040	1040	1764	
		Min. Continuous					.9	1.9	3.2	7.2	13	19	32	32	57	57	57	117	

690-01 is the reduced internal port size version of the 90-01.

**Flanged End Detail Only

For 100-01 basic valves, suggested flow calculations were based on flow through Schedule 40 Pipe. Maximum continuous flow is approx. 20 ft/sec (6.1 meters/sec) & maximum intermittent is approx. 25 ft/sec (7.6 meters/sec) and minimum continuous flow is approx. 1 ft/sec (.3 meters/sec). For 100-20 basic valves, suggested flow calculations were based on flow through the valve seat. Approx. 26 ft/sec (7.9 meters/sec) was used for maximum continuous flow & 1 ft/sec (.3 meters/sec) is used for minimum continuous flow. Maximum continuous flow through the valve seat for the 30" 100-20 is approx. 20 ft/sec (6.1 meters/sec).

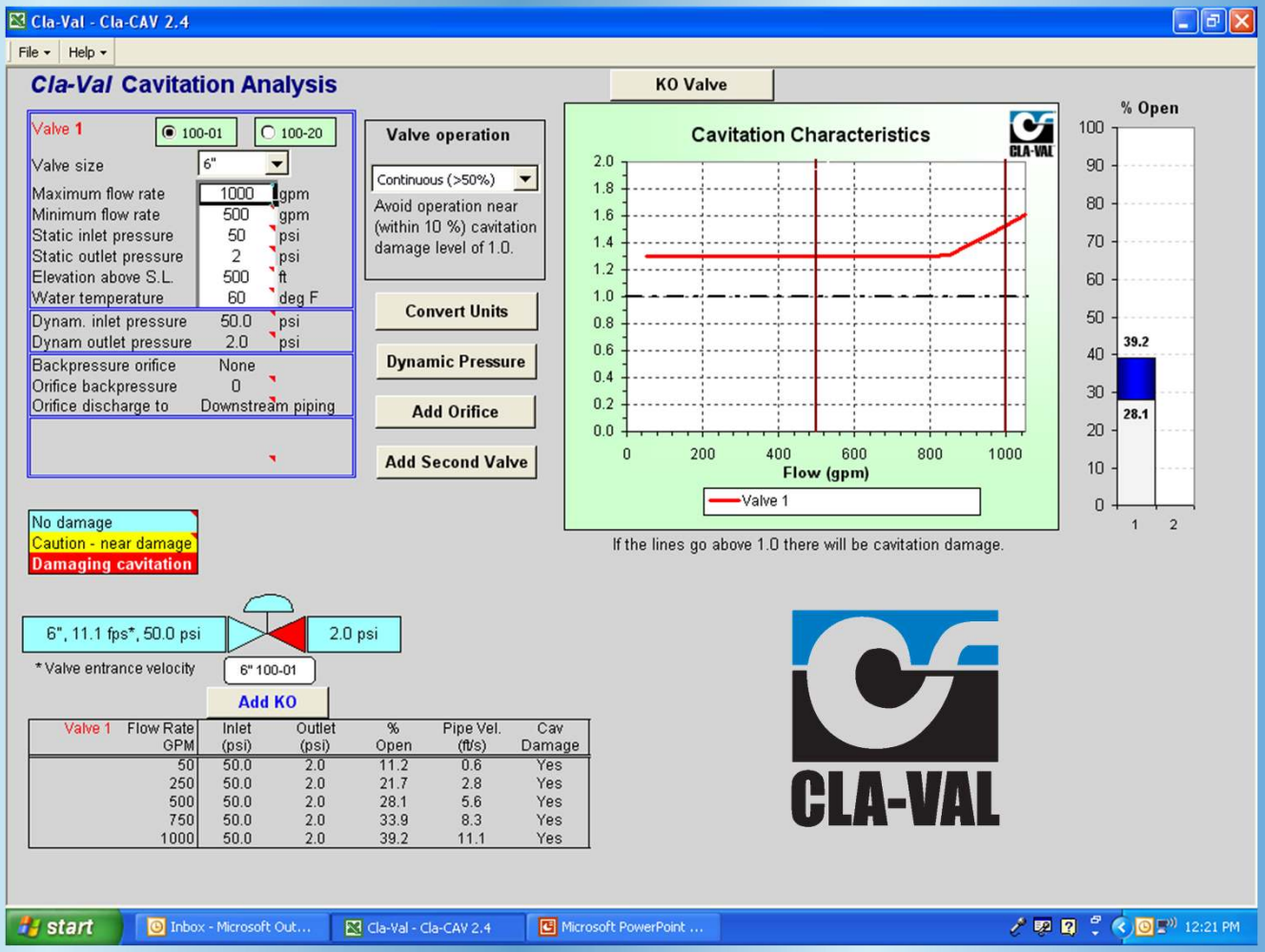
Many factors should be considered in sizing pressure reducing valves including inlet pressure, outlet pressure and flow rates. For sizing questions or cavitation analysis, consult Cla-Val with system details.

Cavitation Damage

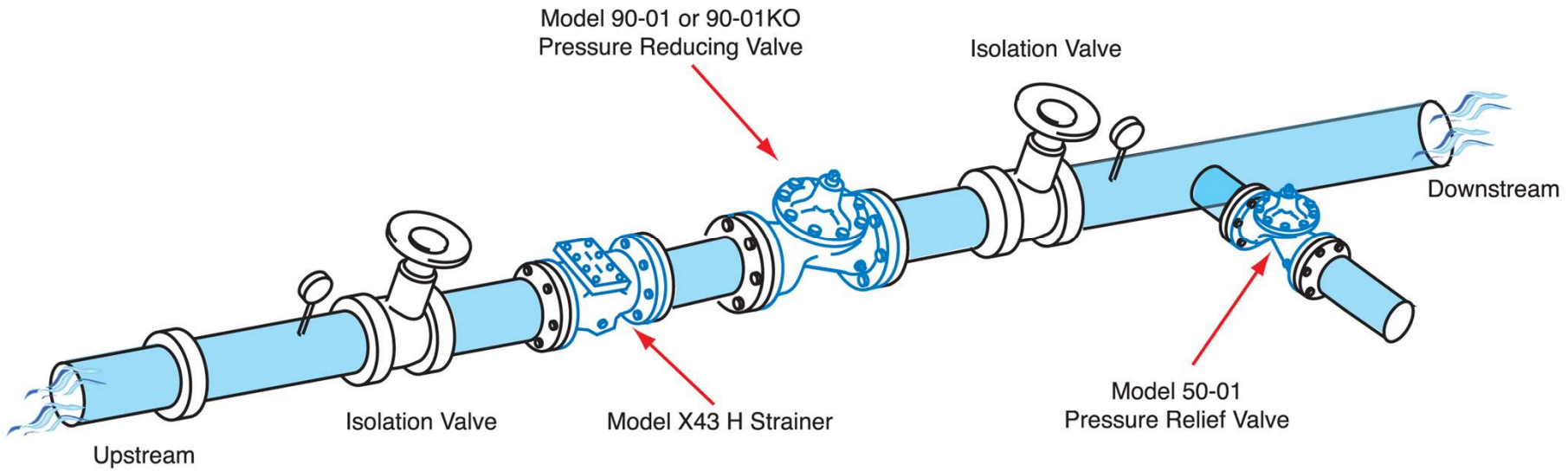

Cavitation Damage

Cavitation Damage

CLA-CAV Cavitation Analysis Program



Pressure Reducing Application: High Pressure Drop

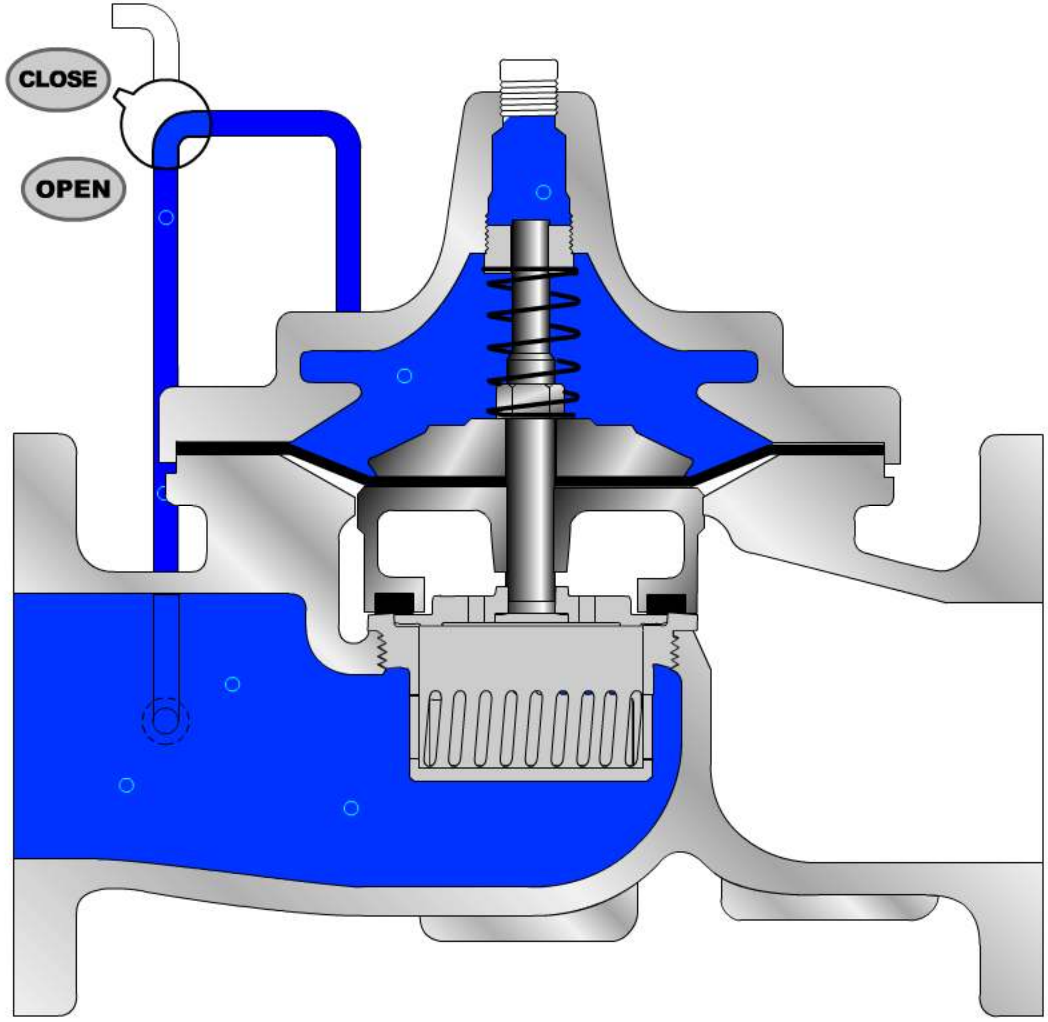


CLA-VAL

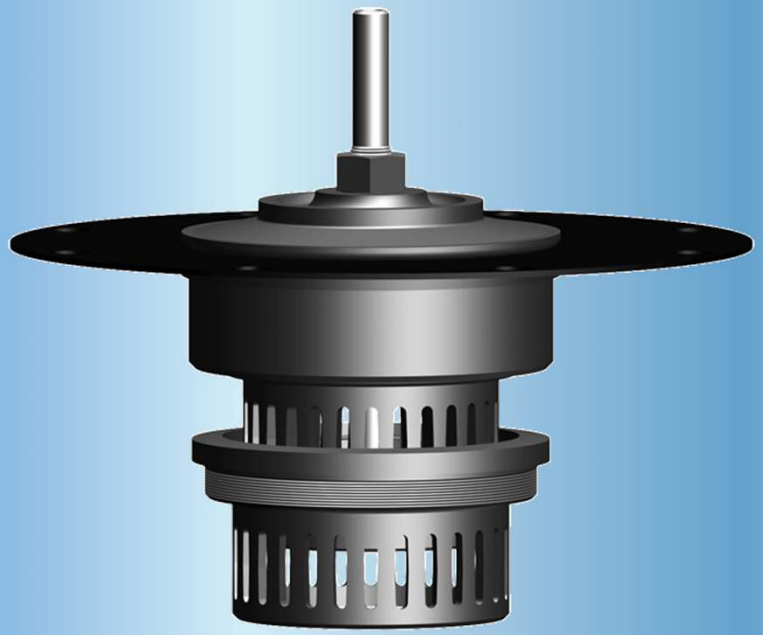
EXIT

100-01K0 Anti-Cavitation Hytrol Valve

PLAY PAUSE RESTART



100-01KO Anti-Cavitation Components



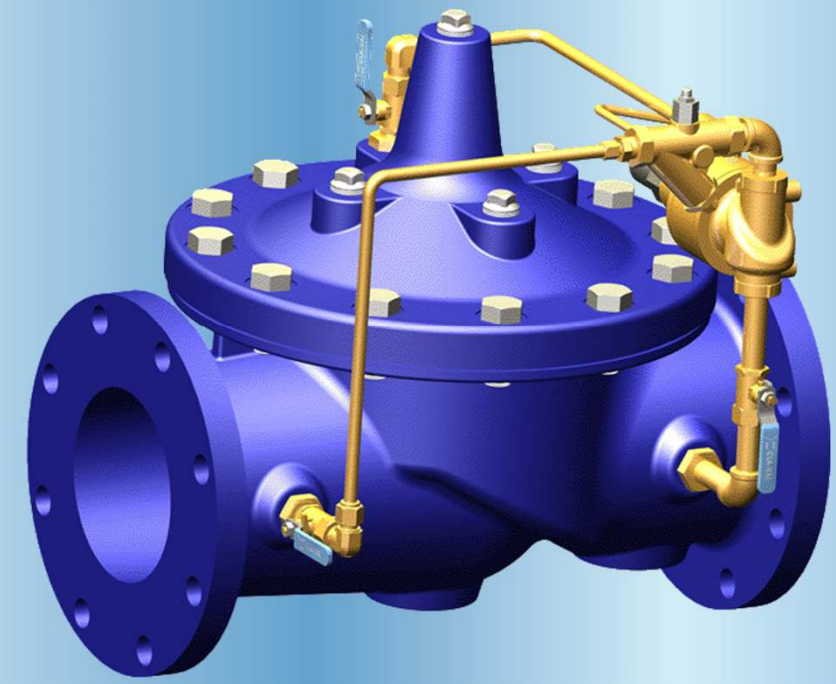
Disc Guide

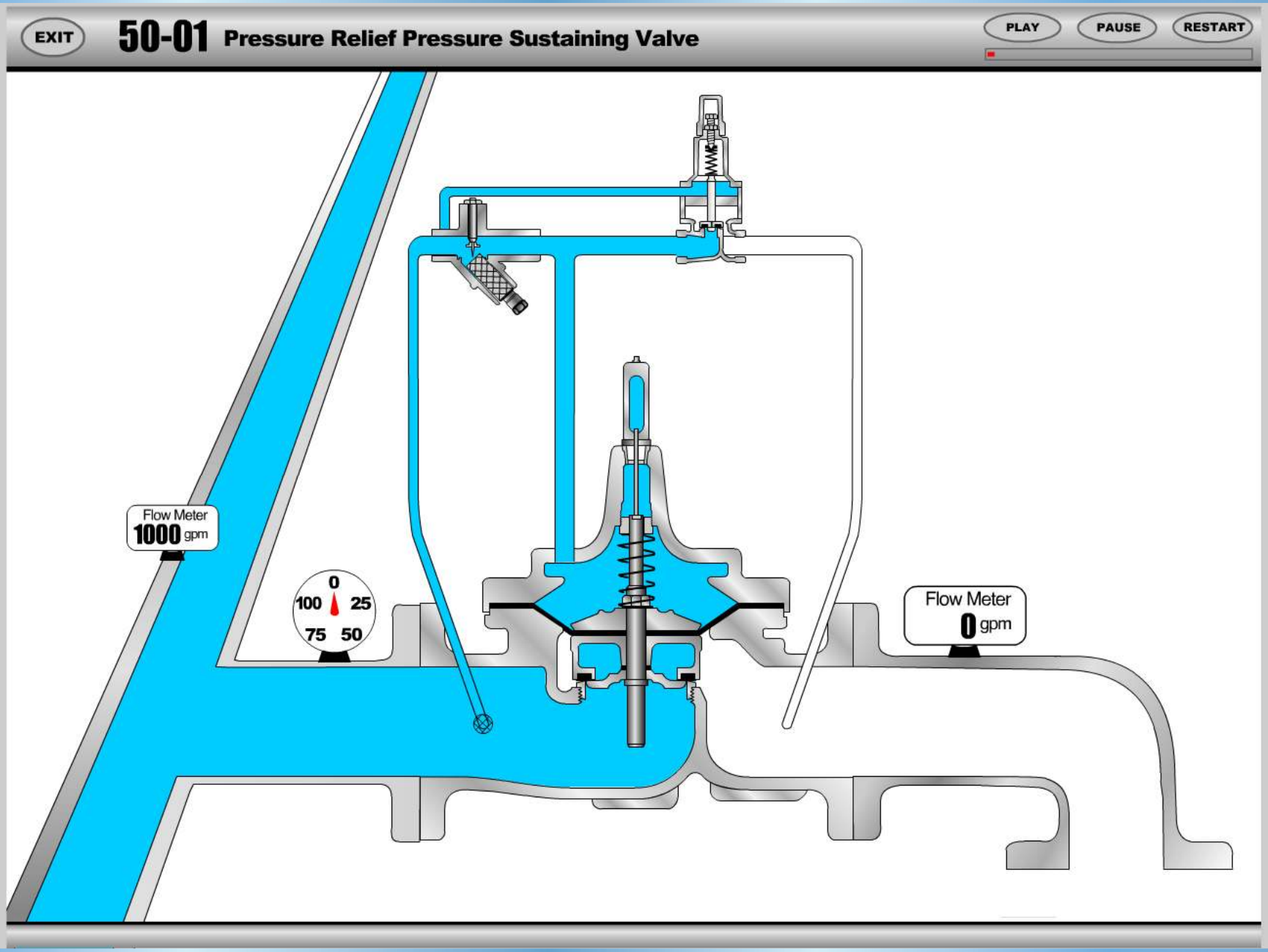
Seat

KO Anti-Cavitation Retrofit Kit

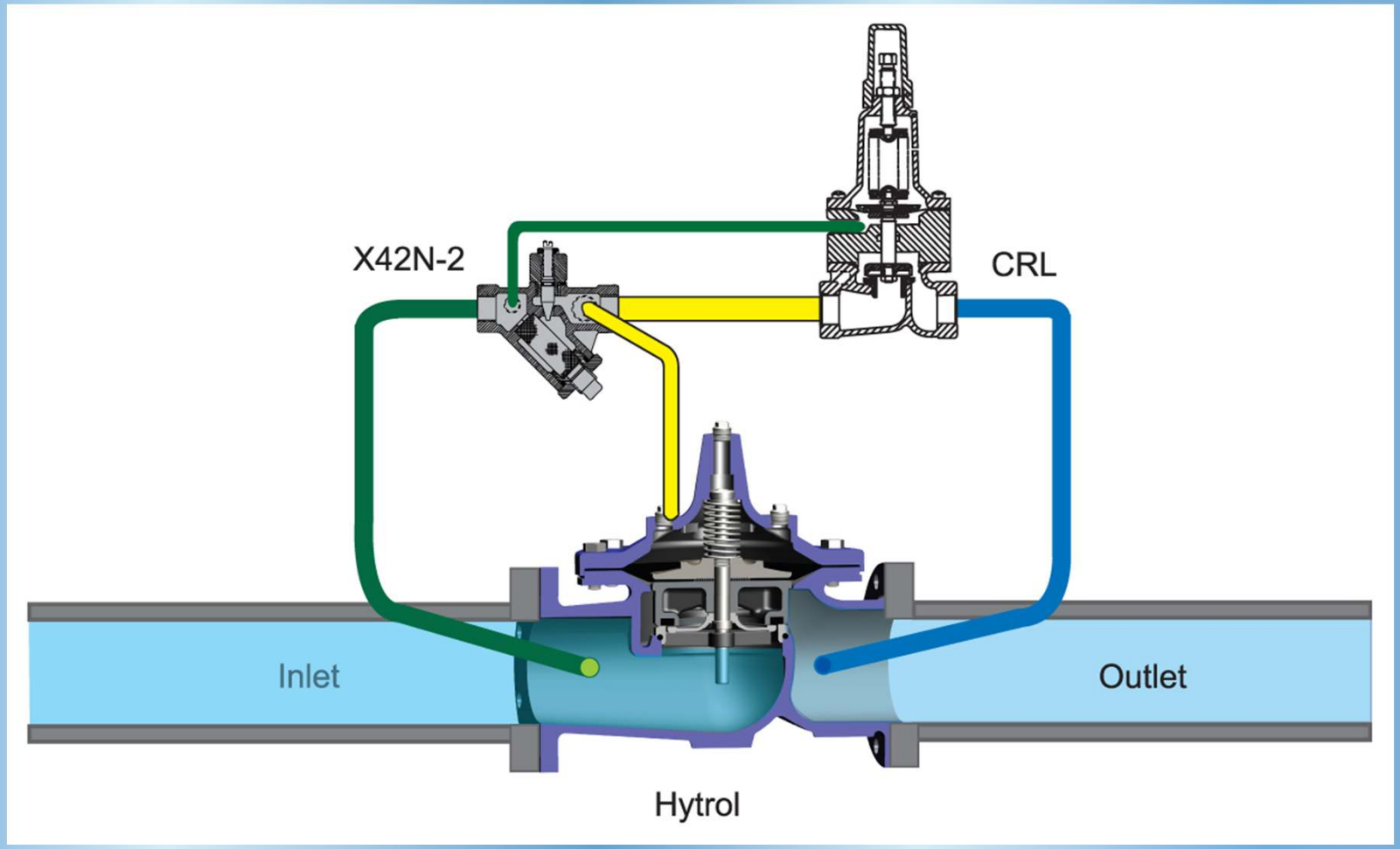
CLA-VAL

Pressure Relief Valves

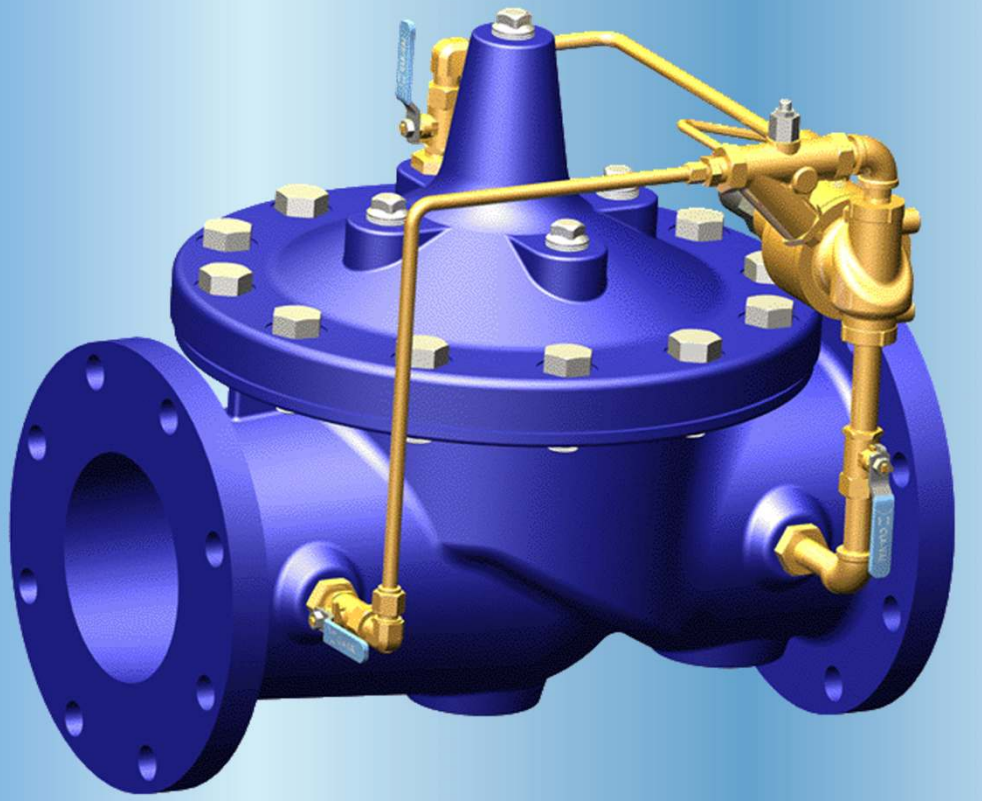



EXIT
50-01 Pressure Relief Pressure Sustaining Valve
PLAY
PAUSE
RESTART
Flow Meter
1000 gpm
0
100
25
75
50
Flow Meter
0 gpm

50 Series Principles of Operation

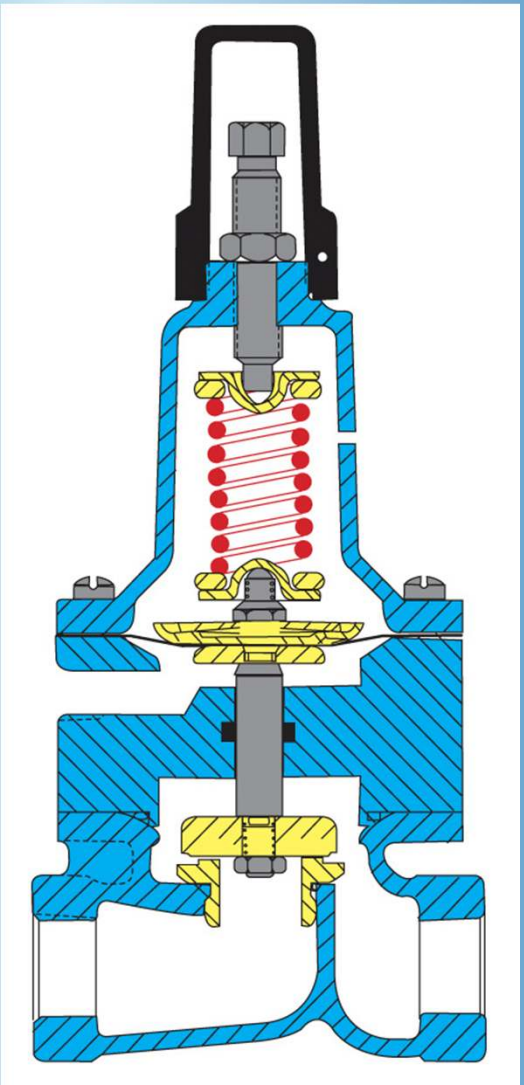


One Valve…Three Functions

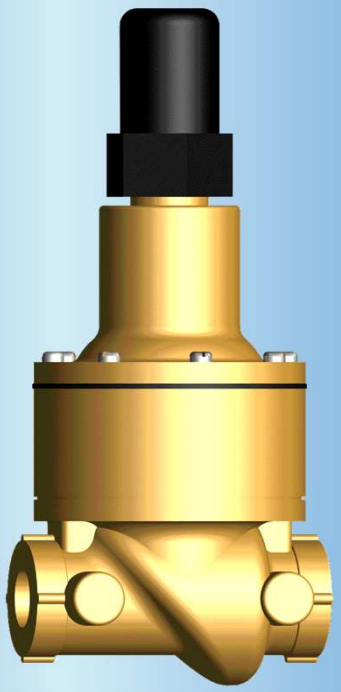


- Pressure Relief
- Pressure Sustaining
- Back Pressure

CRL Relief Pilot Control



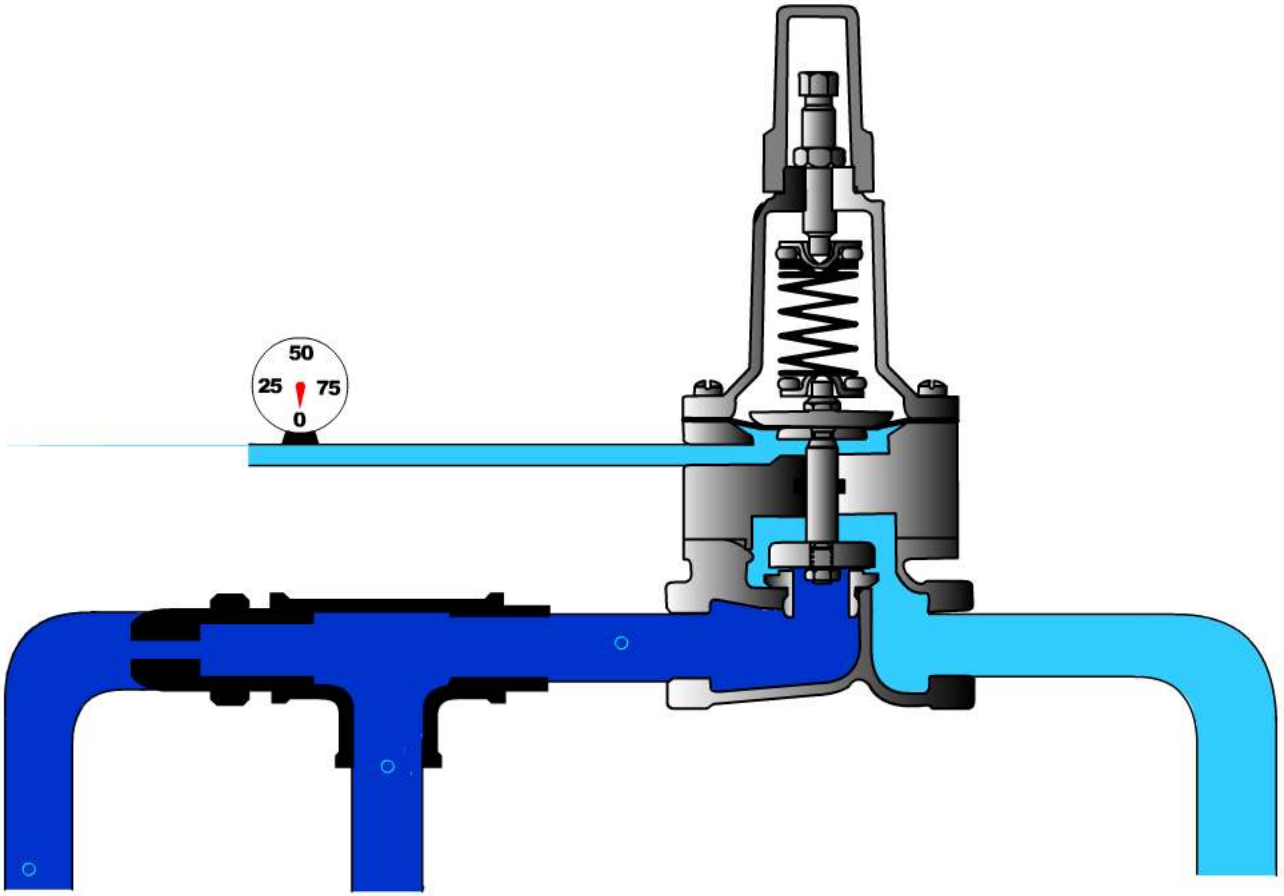
- Normally closed
- Opens on pressure rise
- Senses inlet pressure remotely



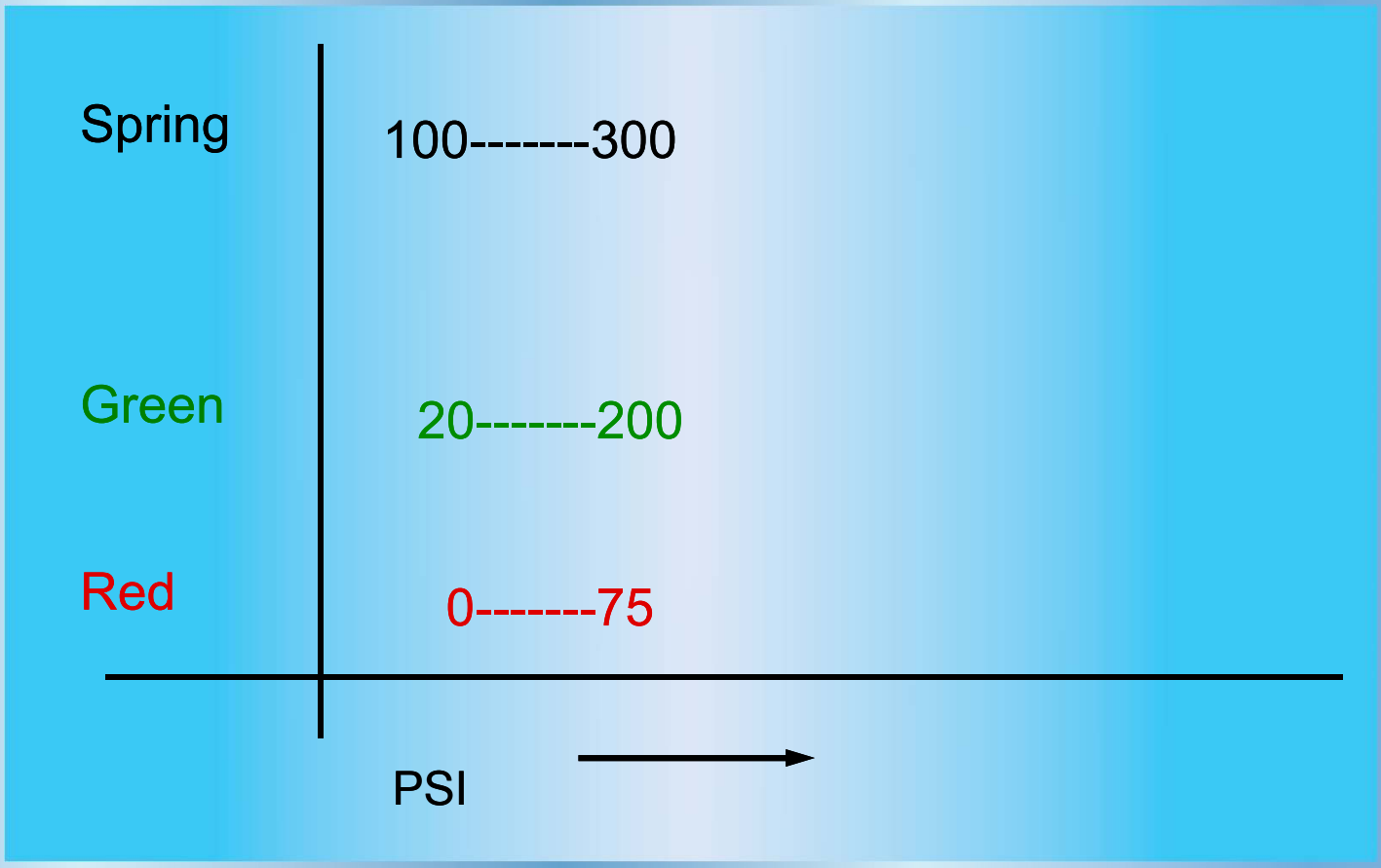
EXIT

CRL

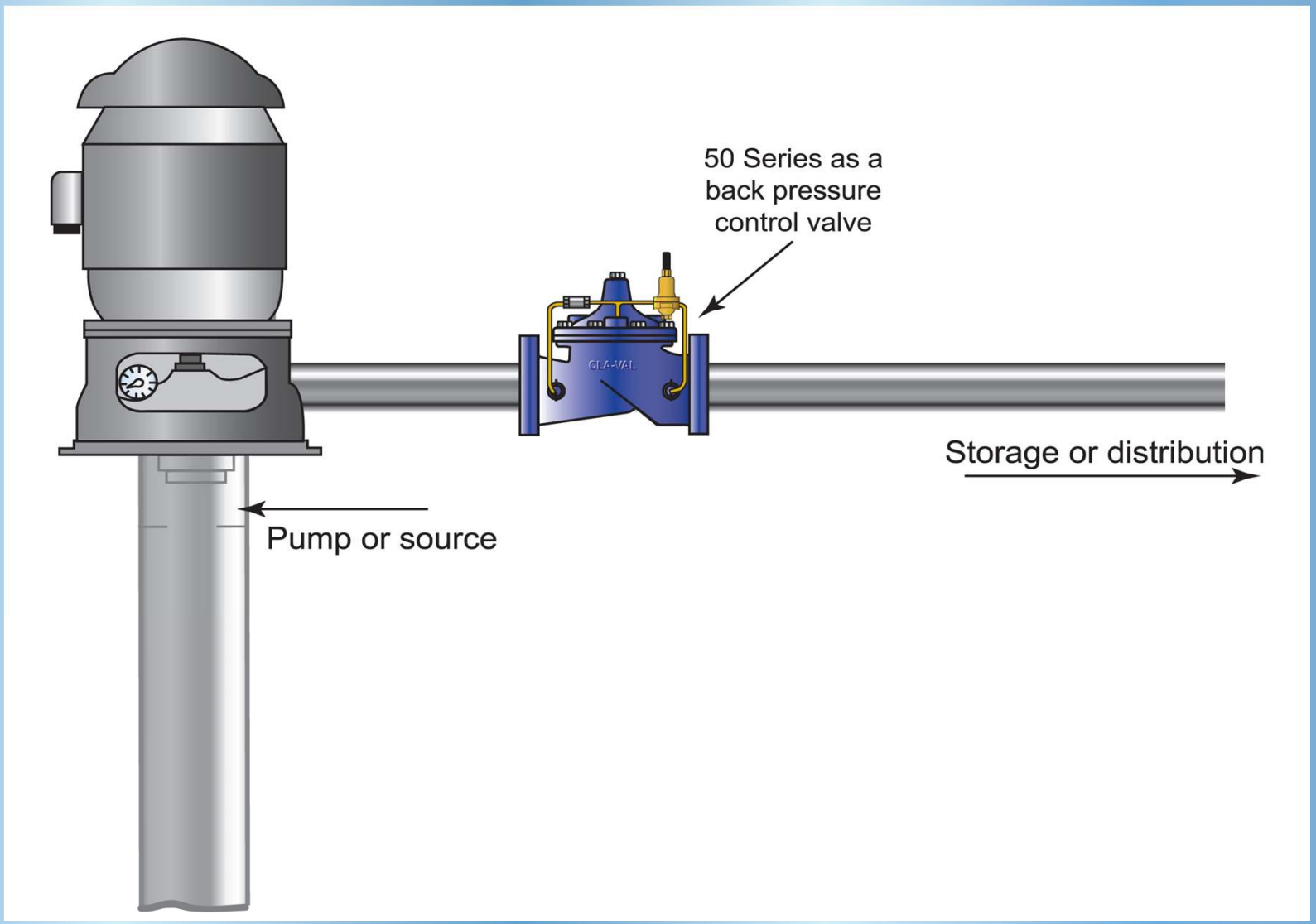
PLAY PAUSE RESTART

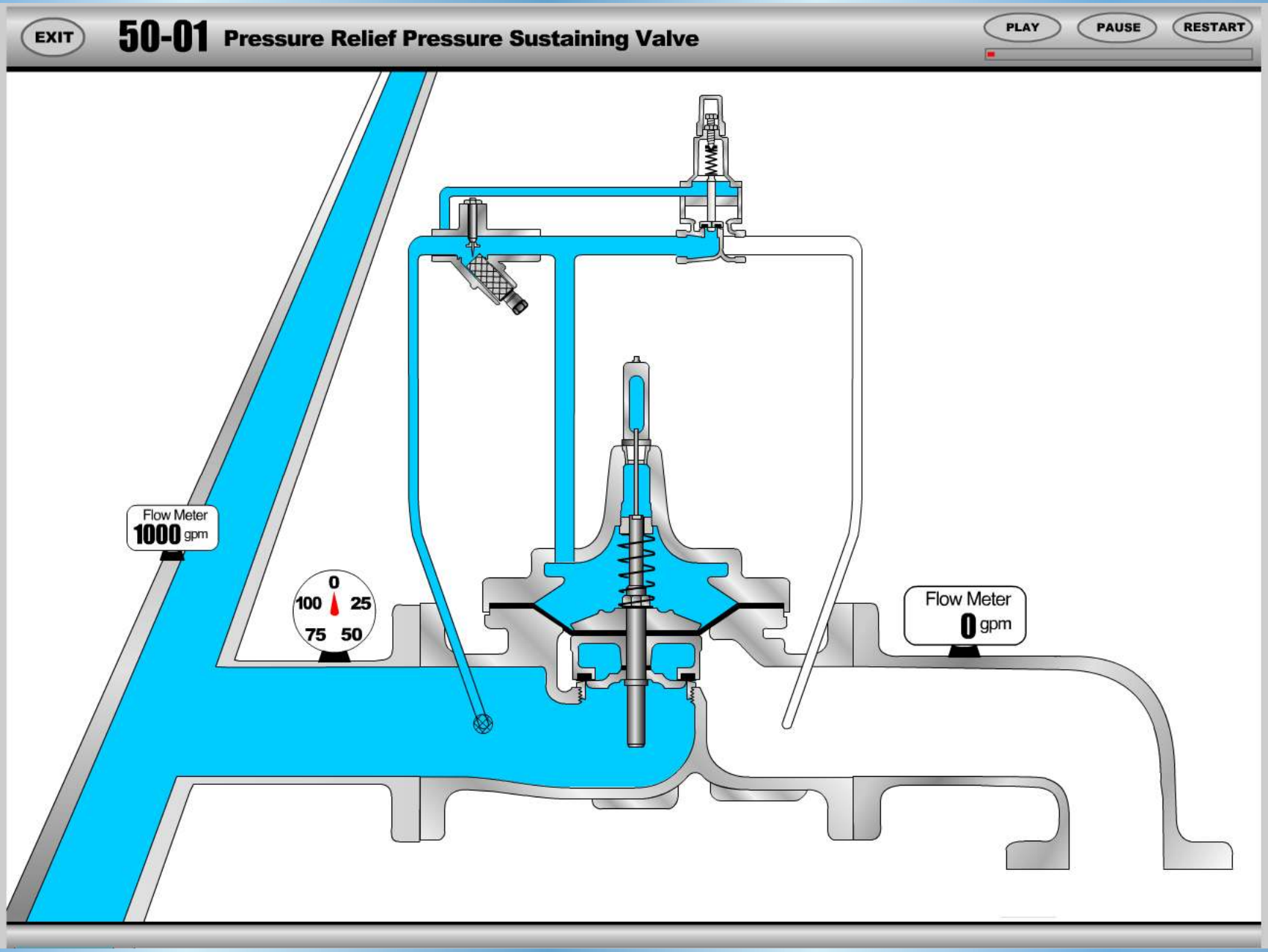


CRL Adjustment Ranges



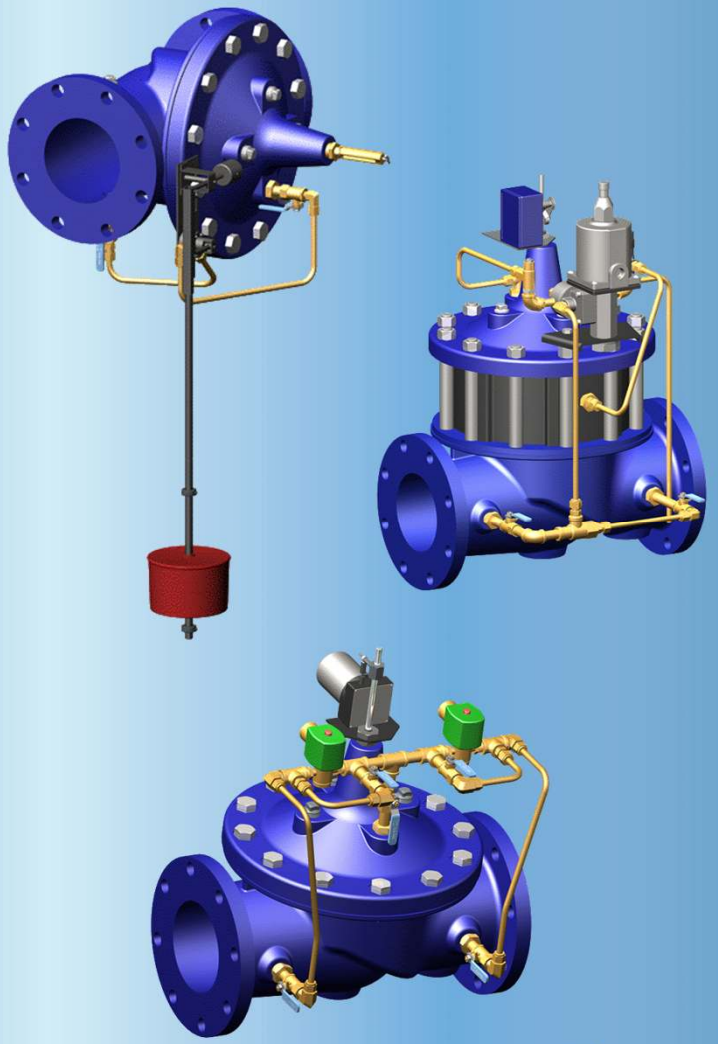
Typical Back Pressure Application




EXIT
50-01 Pressure Relief Pressure Sustaining Valve
PLAY
PAUSE
RESTART
Flow Meter
1000 gpm
0
100
25
75
50
Flow Meter
0 gpm

Non-Modulating Valves

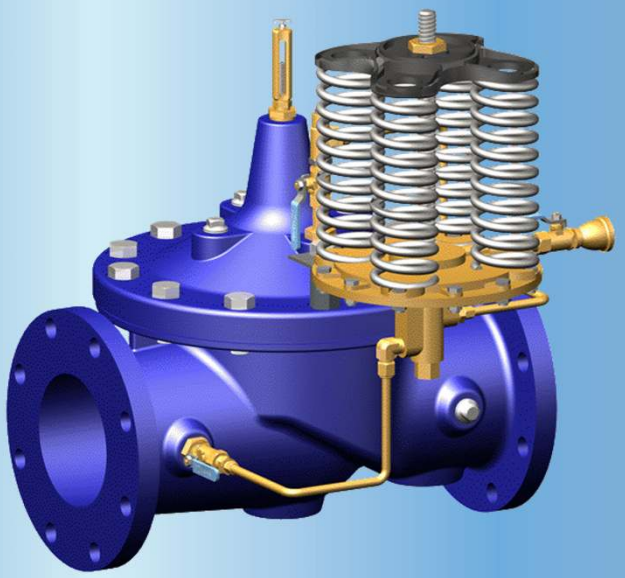
- Level Control Valves
  - Float or Floatless
- Remote Control Valves
  - Manual or Electronic
- Pump Control Valves
  - Well or Booster Stations



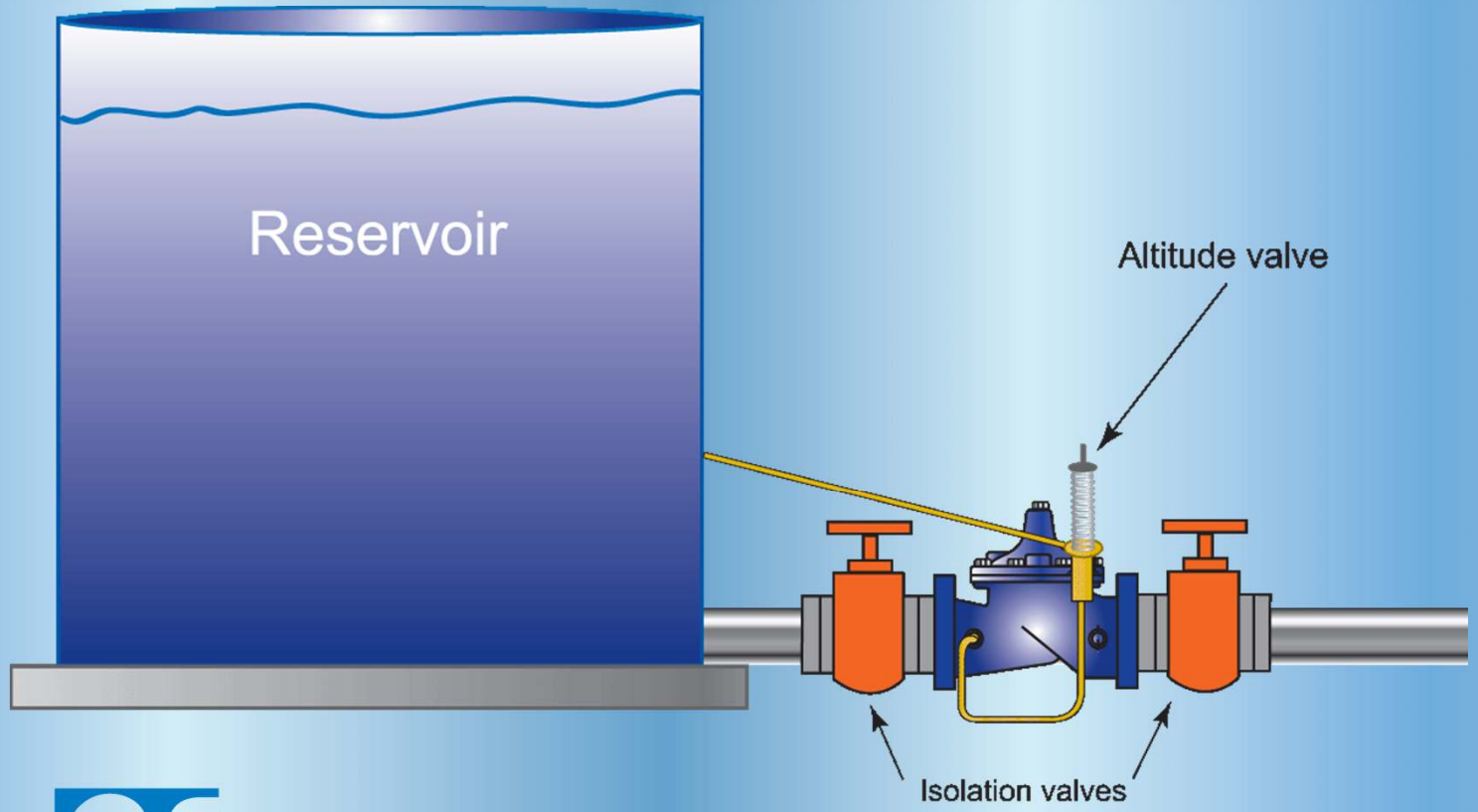
Two Basic Types of Level Control

Float

Floatless



Floatless or Altitude Valve - 210 Series

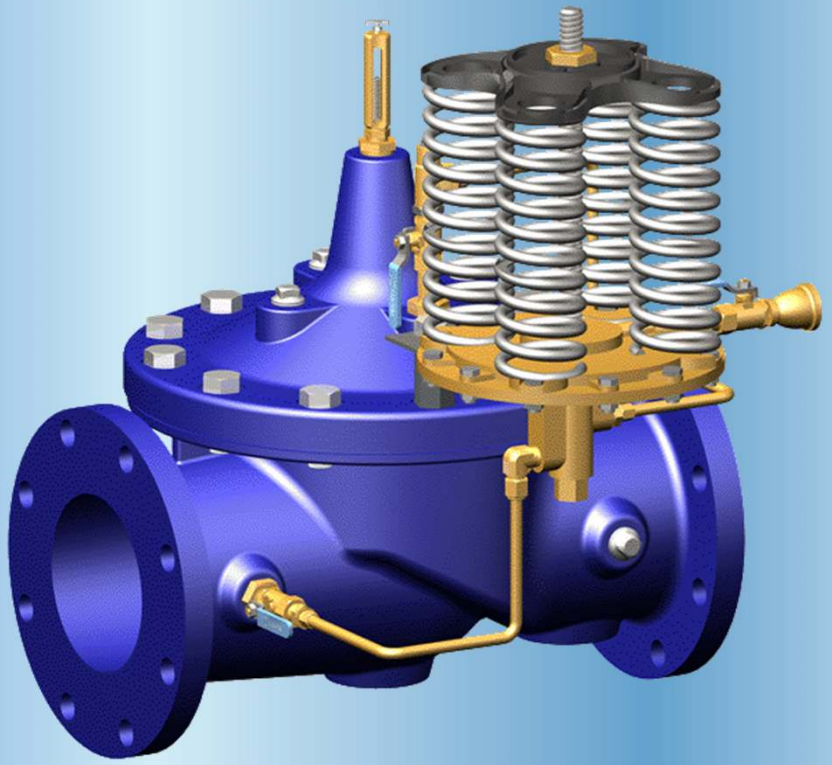


CLA-VAL

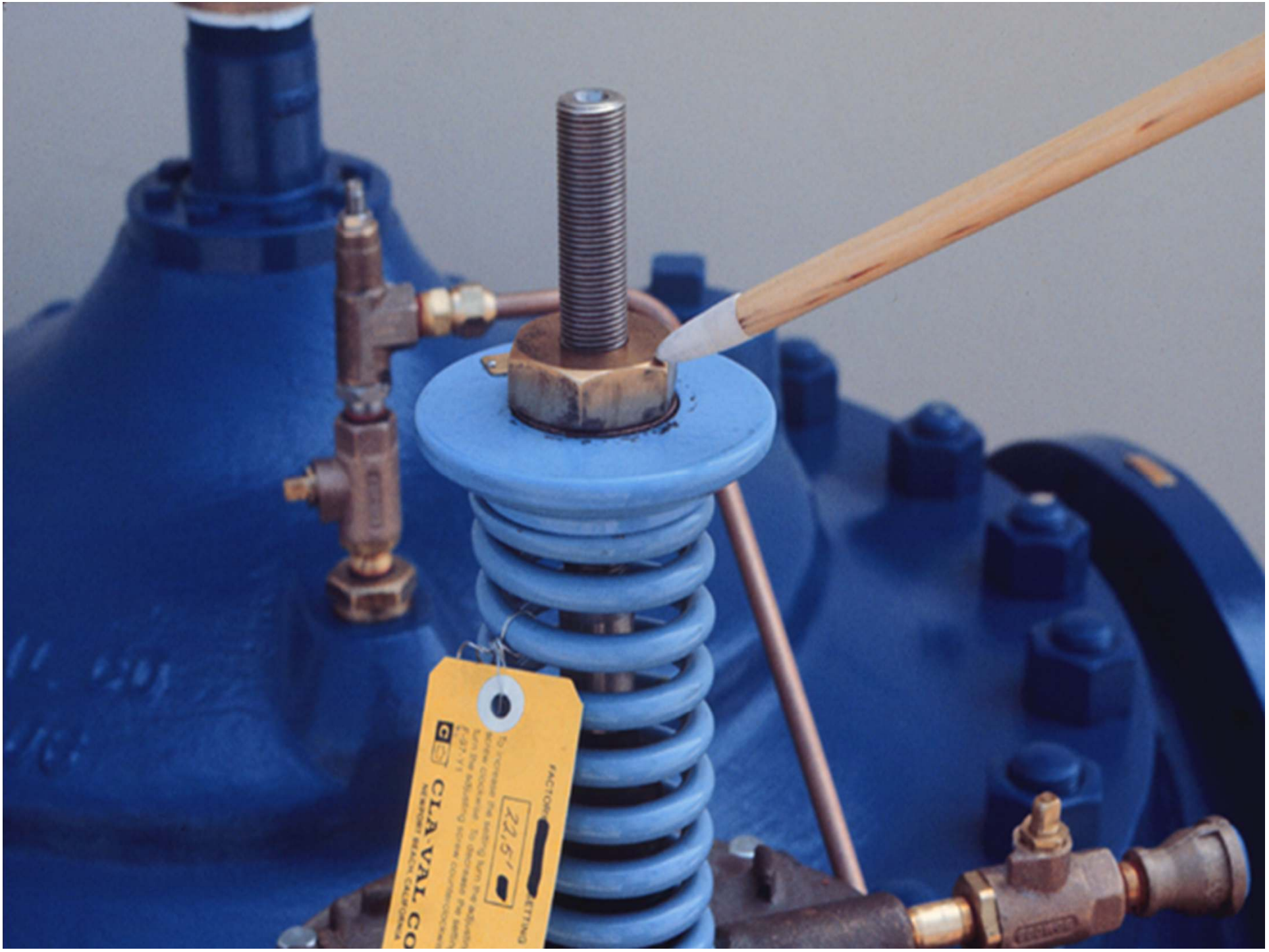

CLA-VAL


CLA-VAL

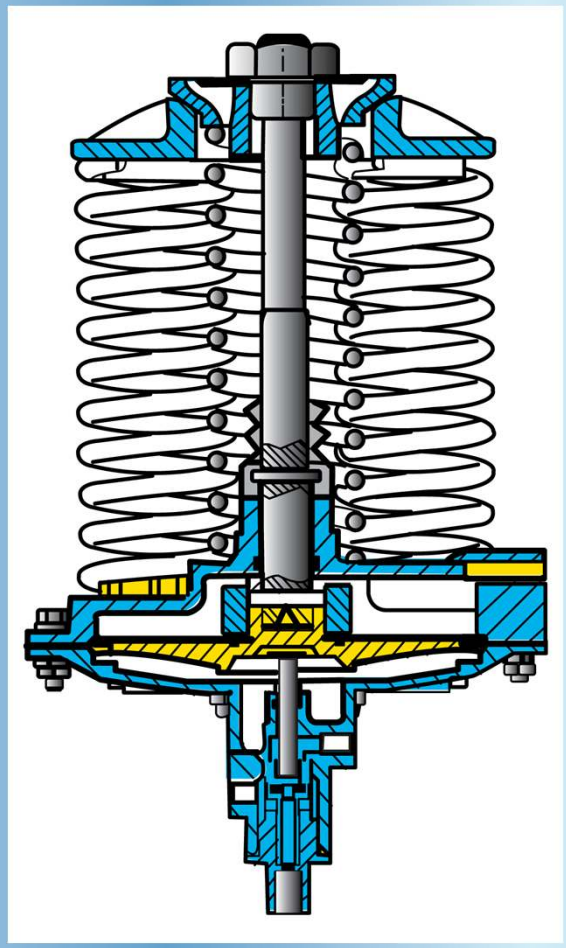
CDS6A Liquid Level Control



- Three-way pilot design
- Spring adjustable level setting
- Reservoir level sensed as pressure head changes


FACTOR
SETTING
22.5'
CLA-VAL CO

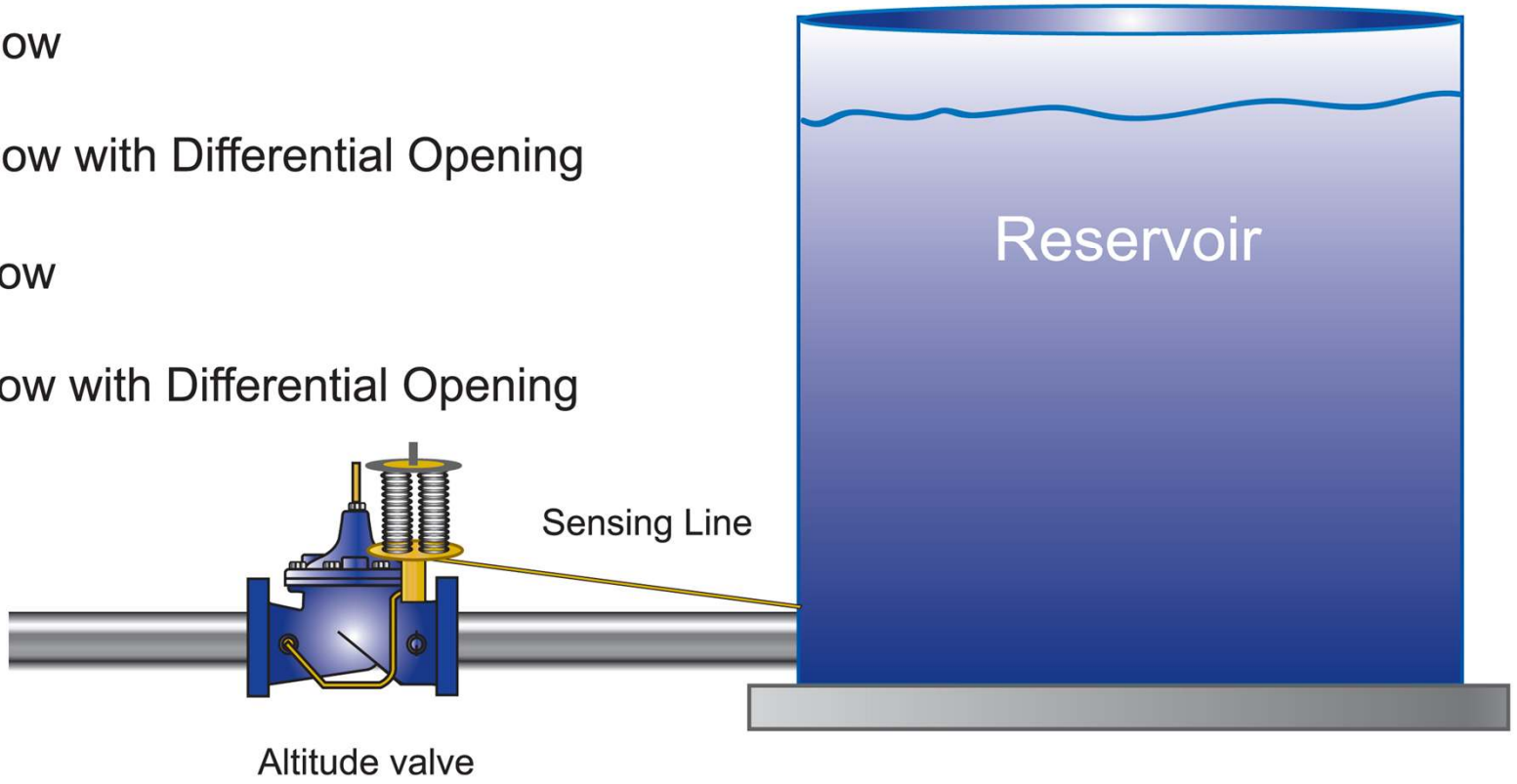
CDS-6 has 5 adjustment ranges with 1 spring



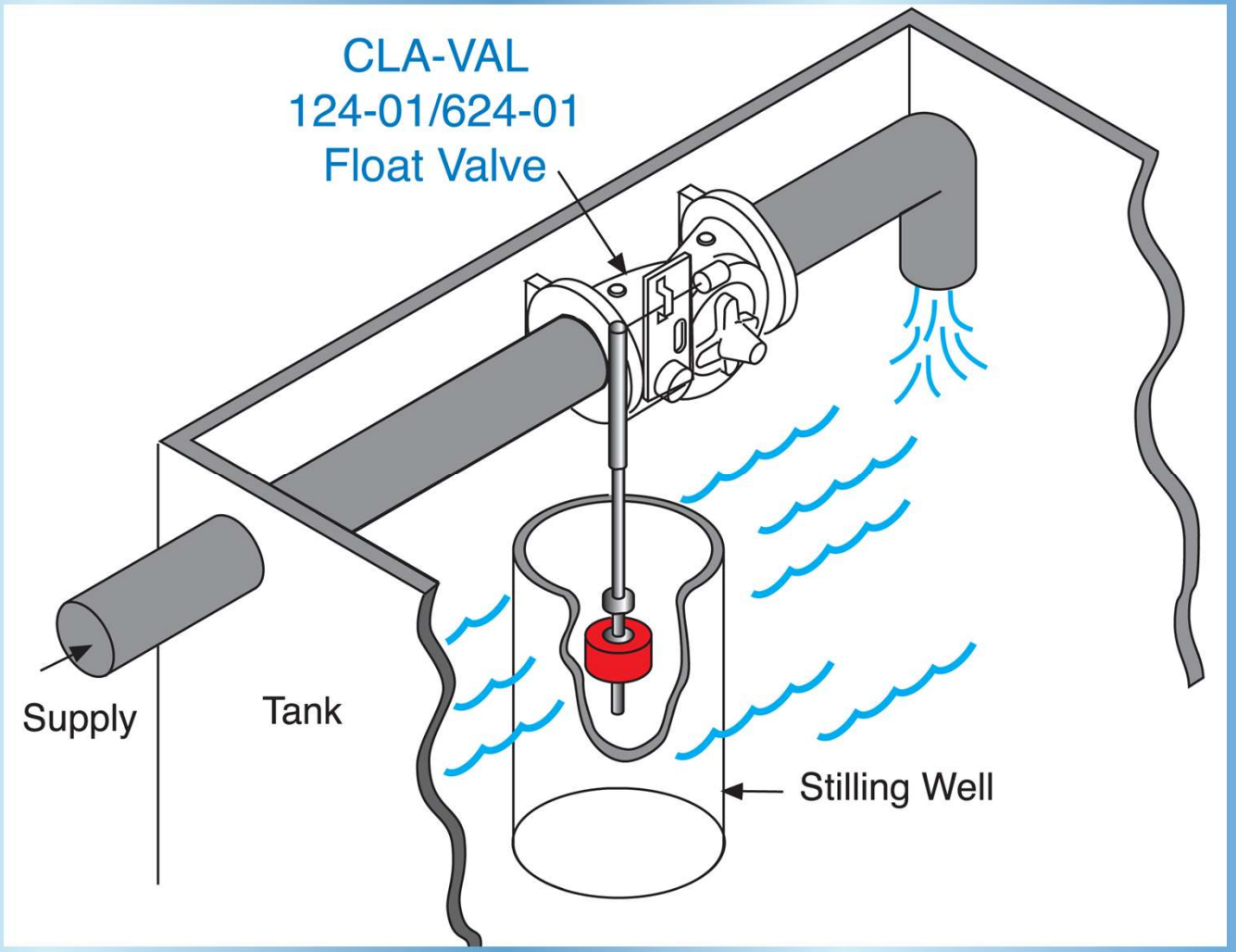
CLA-VAL

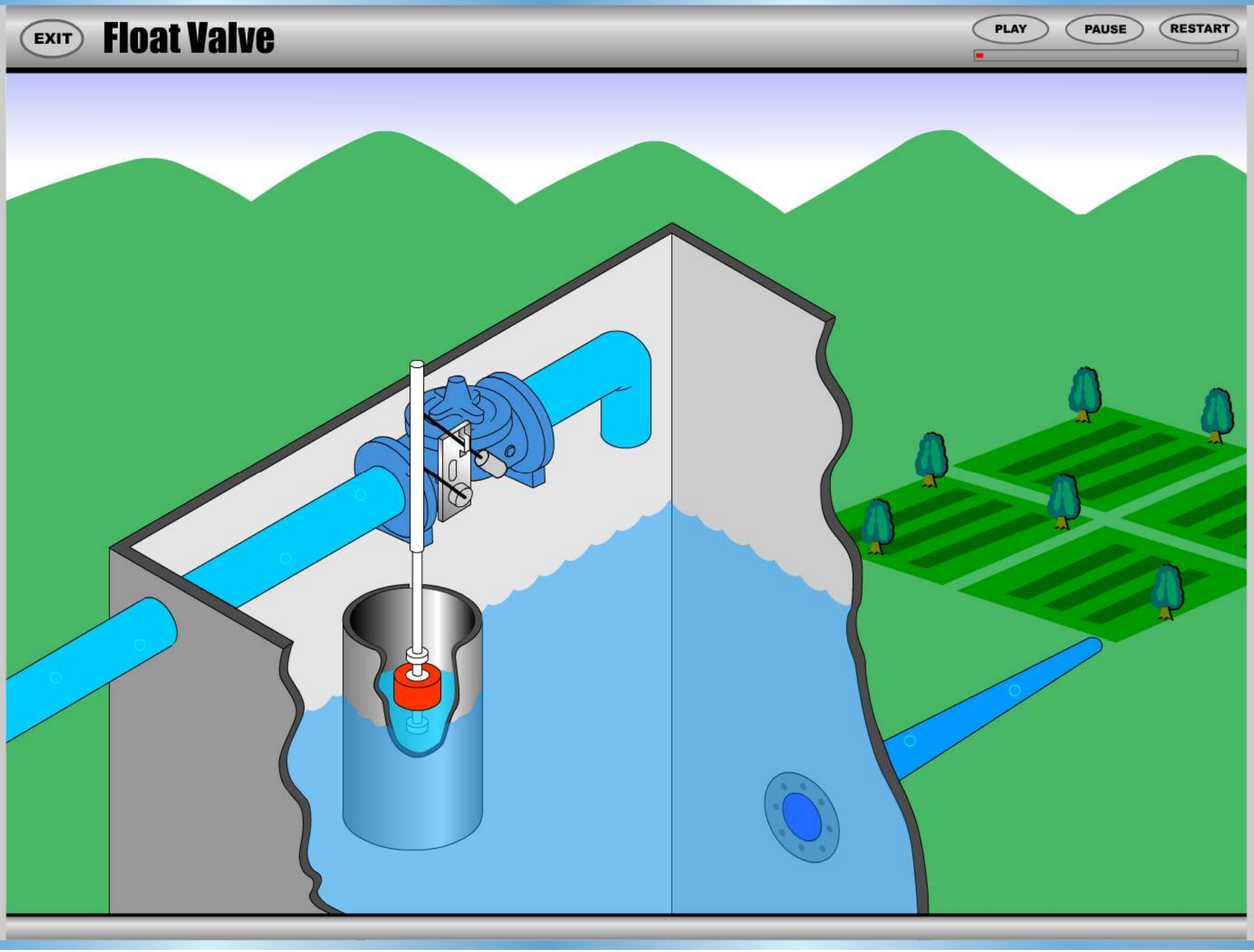
Cla-Val Altitude Valves: Four Basic Types

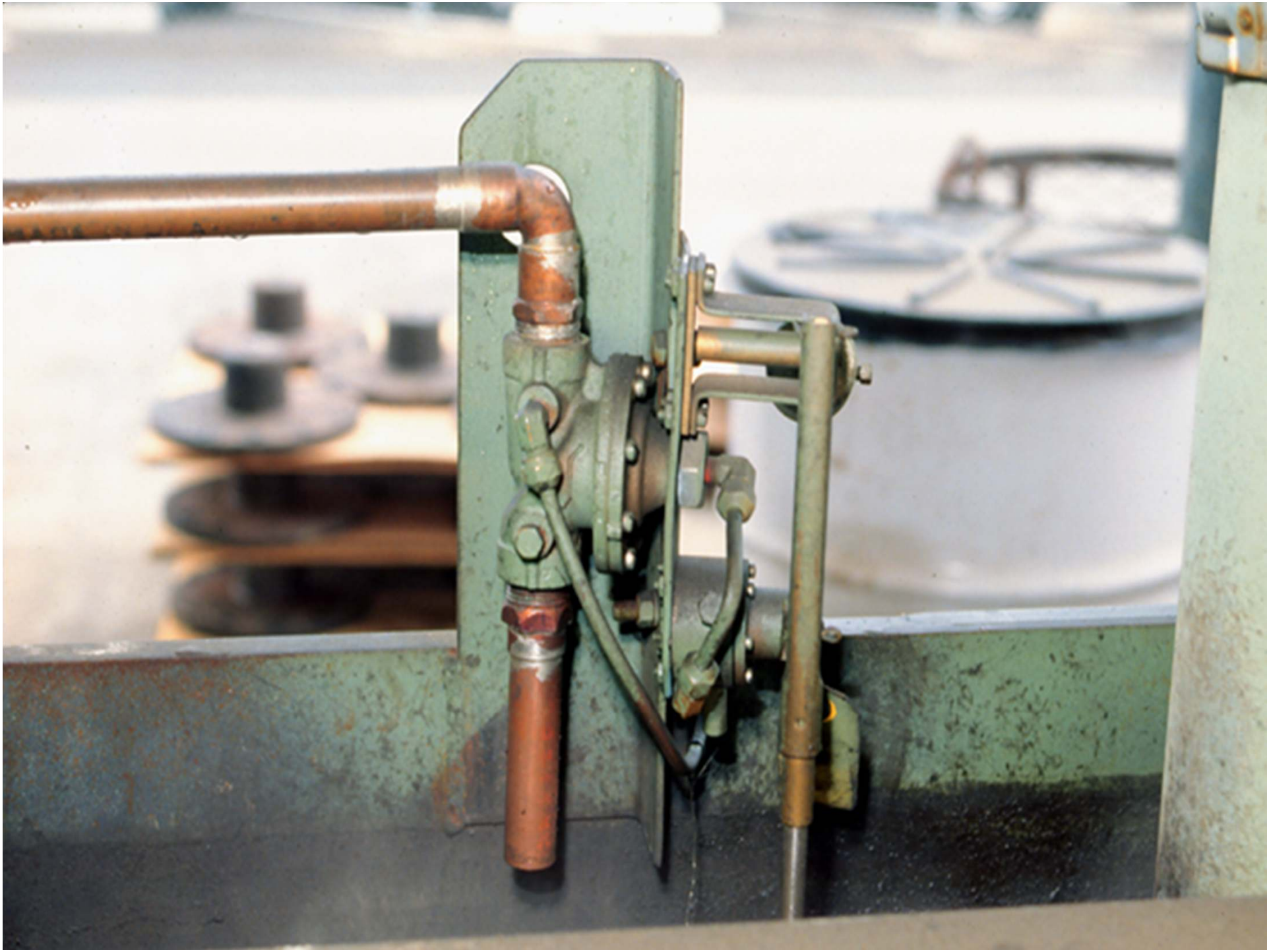
- One-Way Flow
- One-Way Flow with Differential Opening
- Two-Way Flow
- Two-Way Flow with Differential Opening

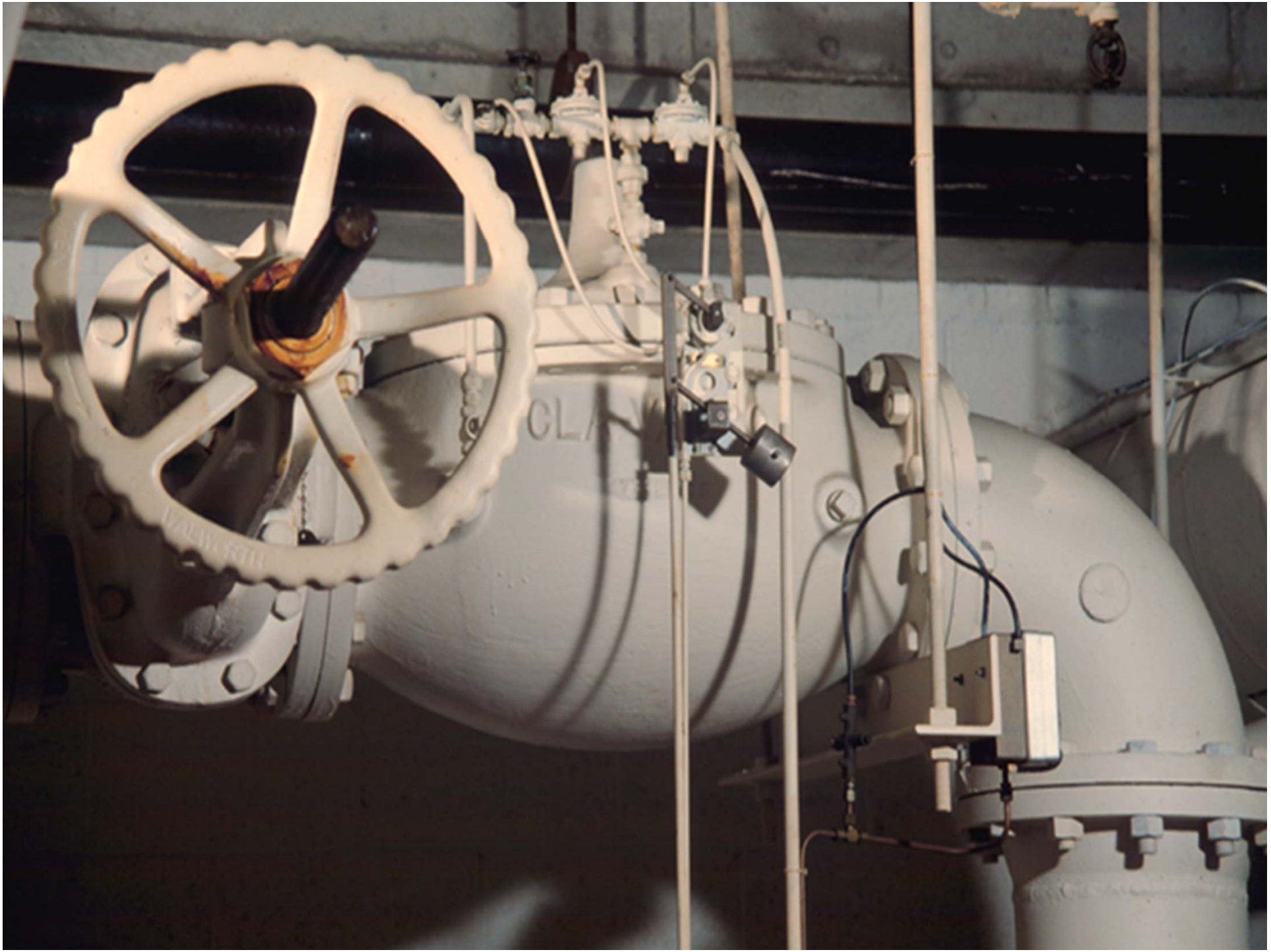


Float Type - 124 Series



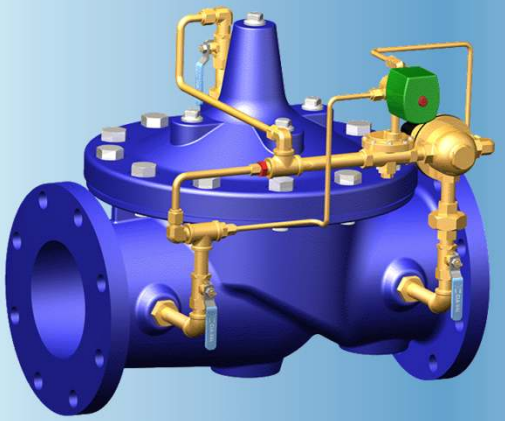

EXIT
Float Valve
PLAY
PAUSE
RESTART





Combination Valves

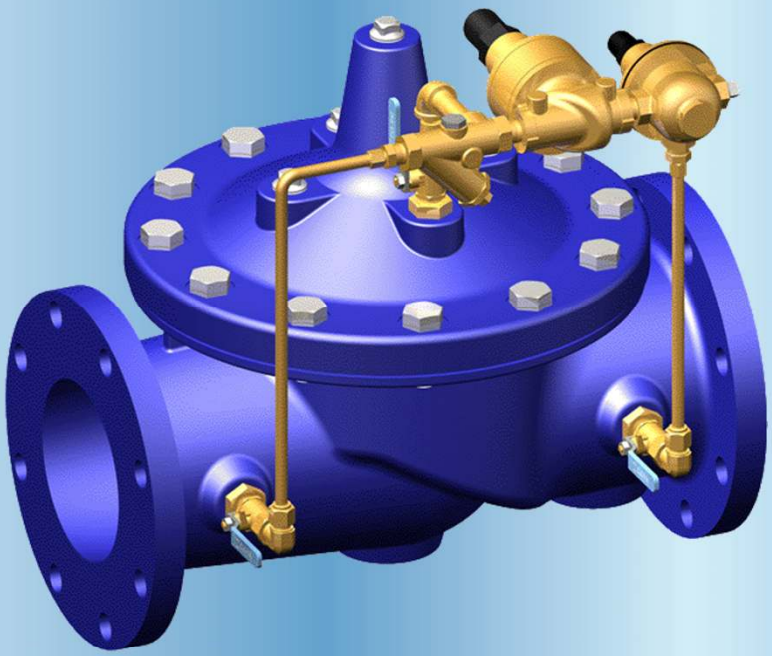
Model 92-01 Pressure
Reducing Pressure
Sustaining Control Valve



Model 93-01 Pressure
Reducing and Solenoid
Shut-Off Valve

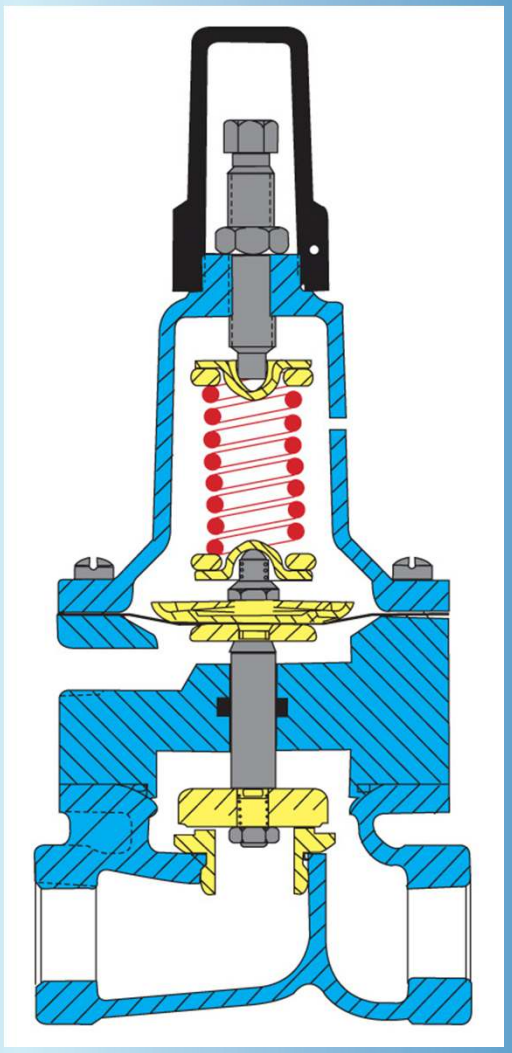
CLA-VAL

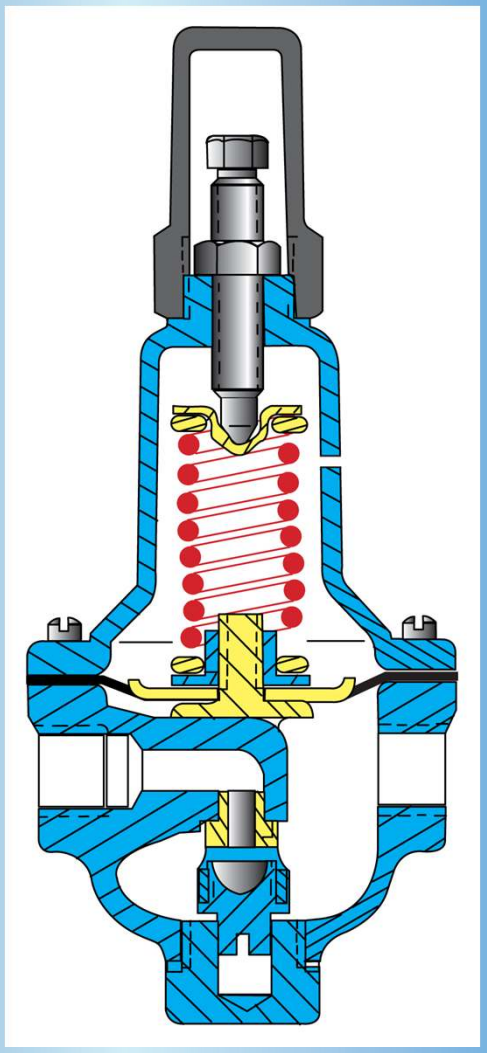
92-01 Pressure Reducing/ Pressure Sustaining Control Valve



CLA-VAL

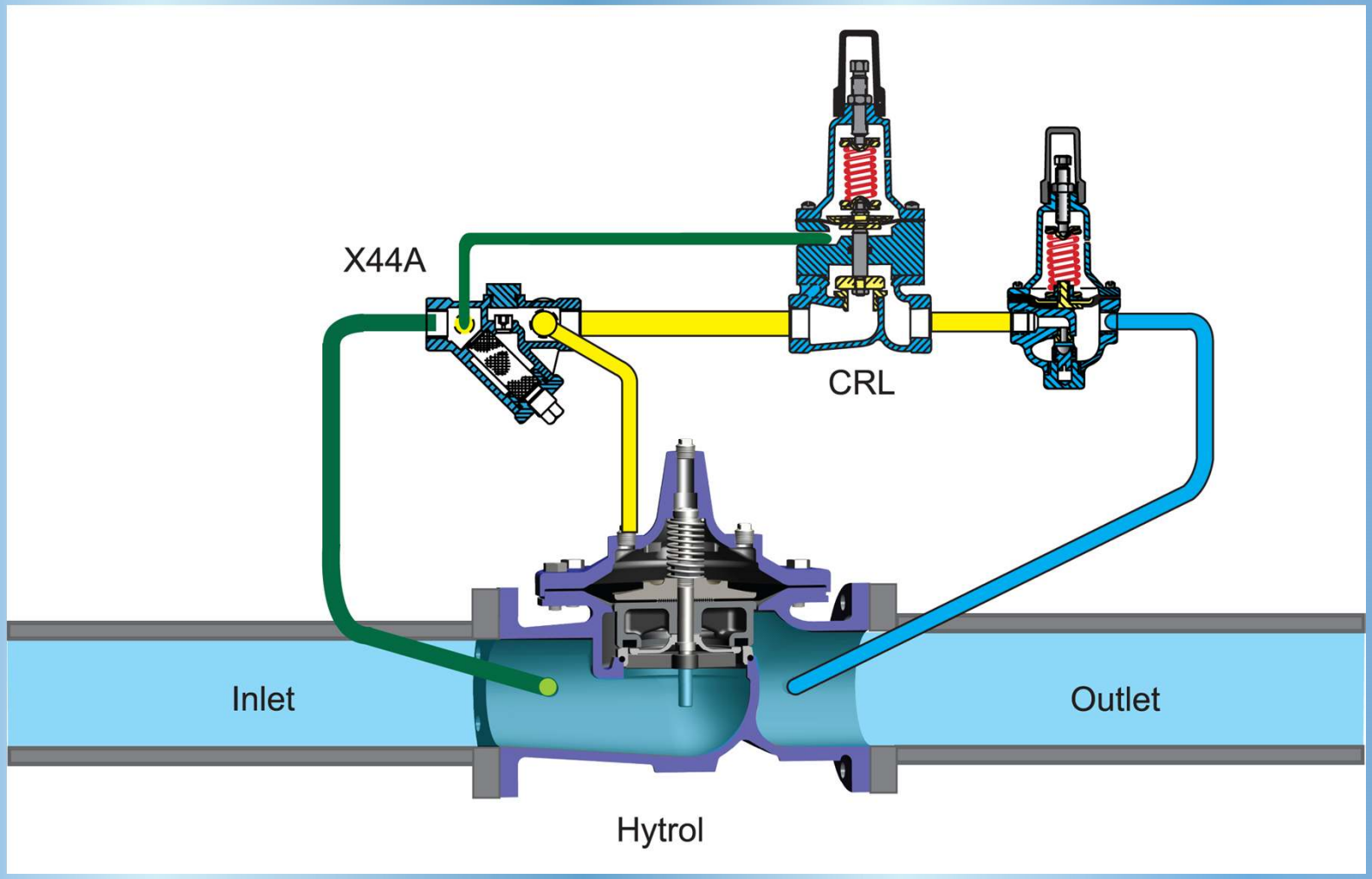
CRL & CRD Comparison



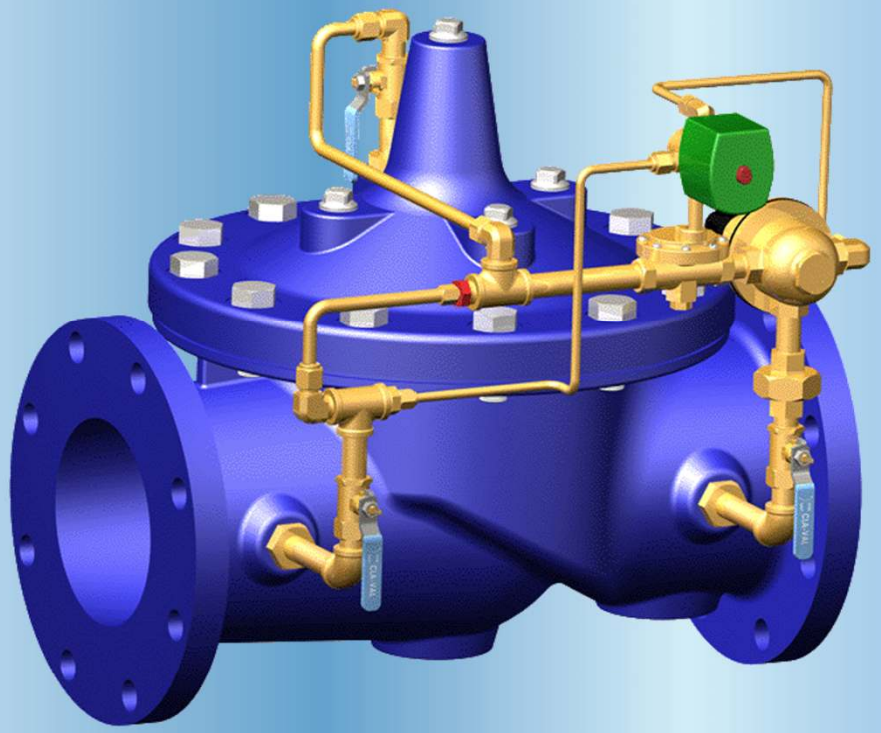


CLA-VAL

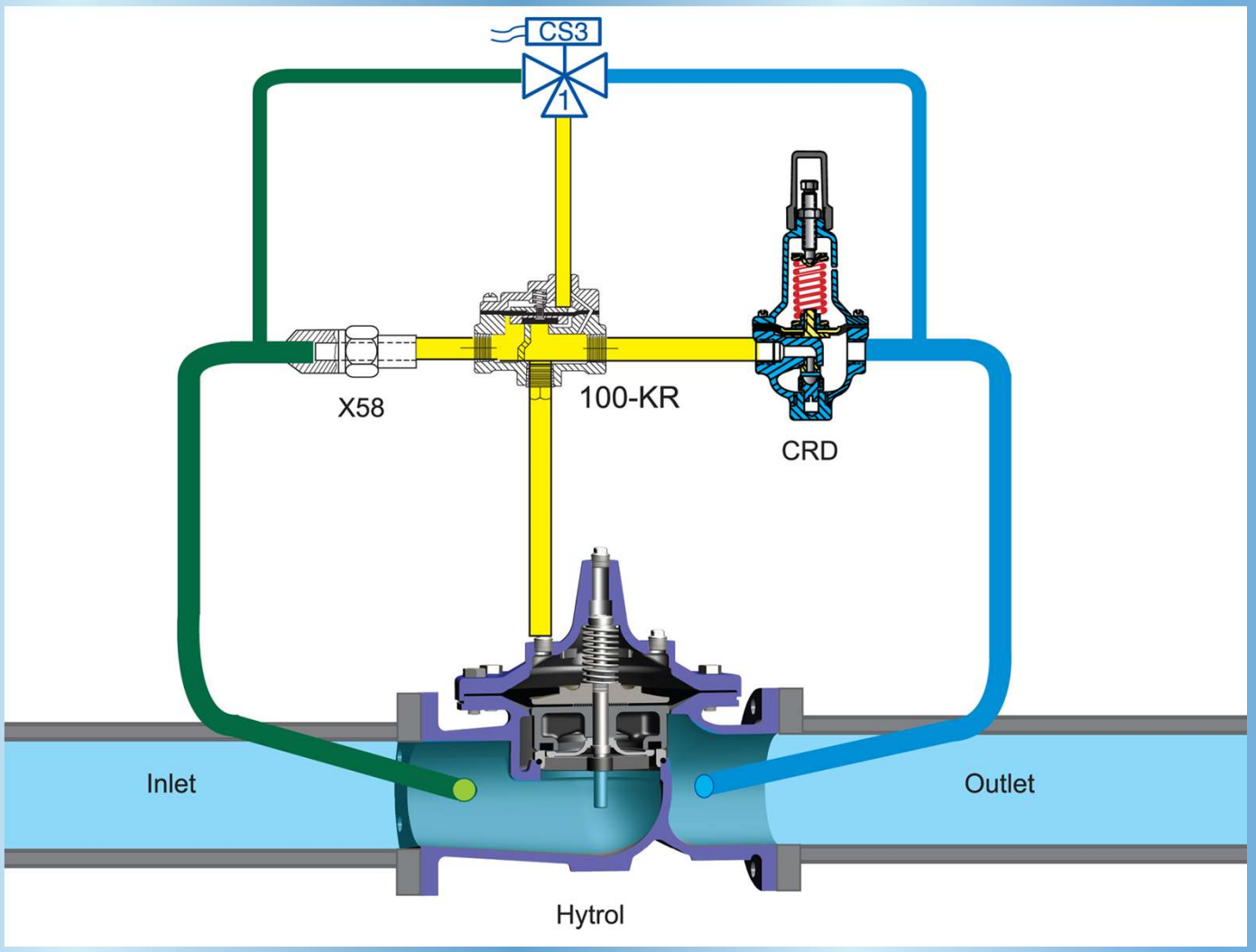
Basic Operation of 92-01 PVS

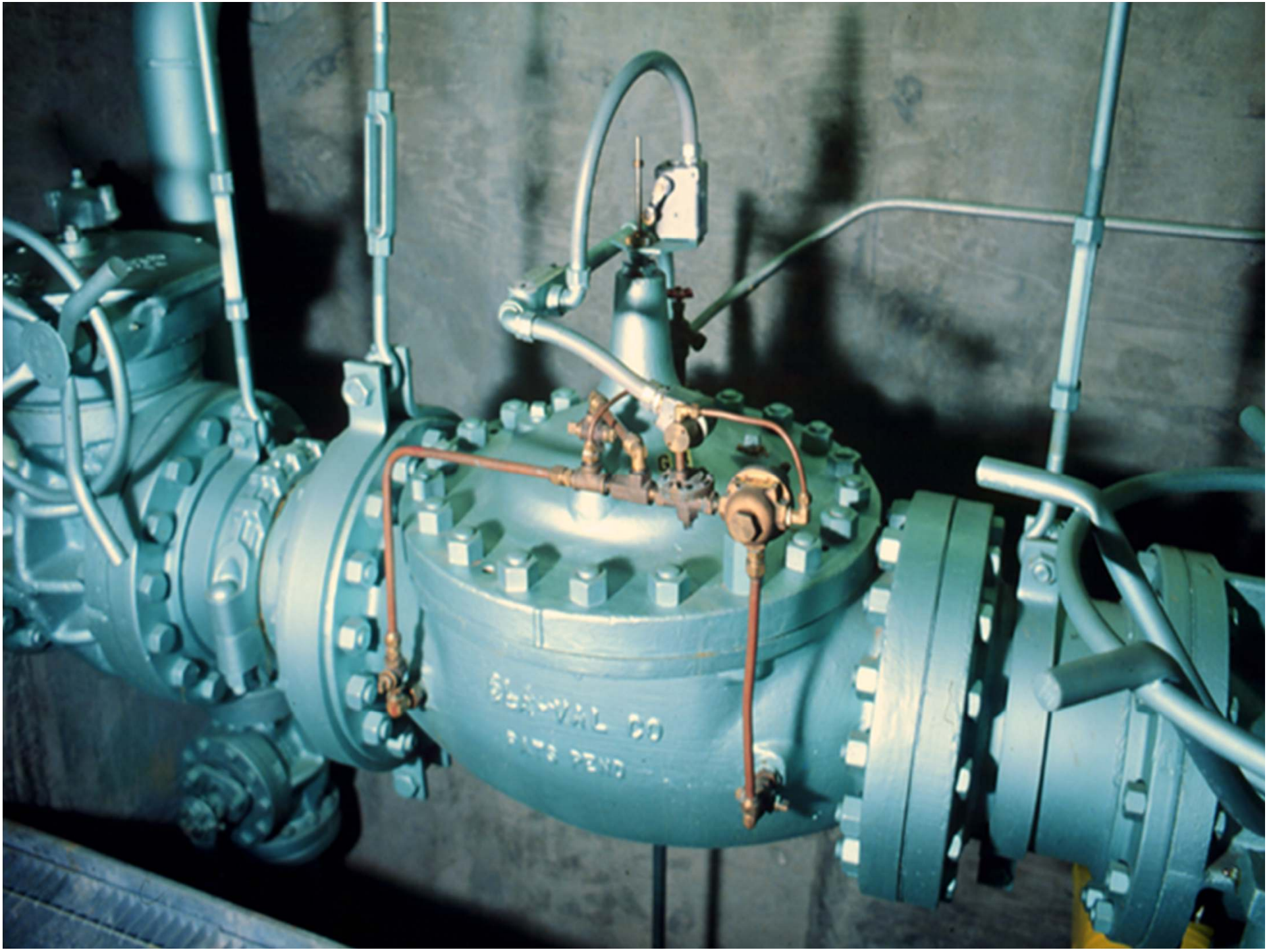


Model 93-01 Pressure Reducing and Solenoid Shut-Off Valve



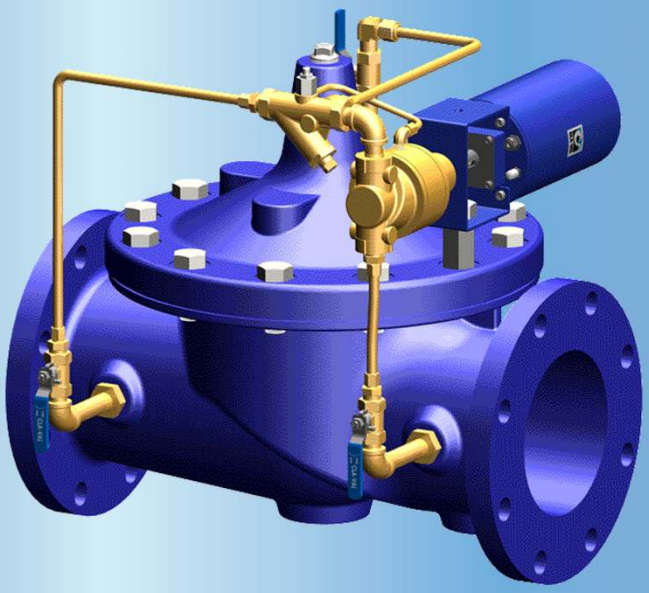
Basic Operation of 93-01 PVS





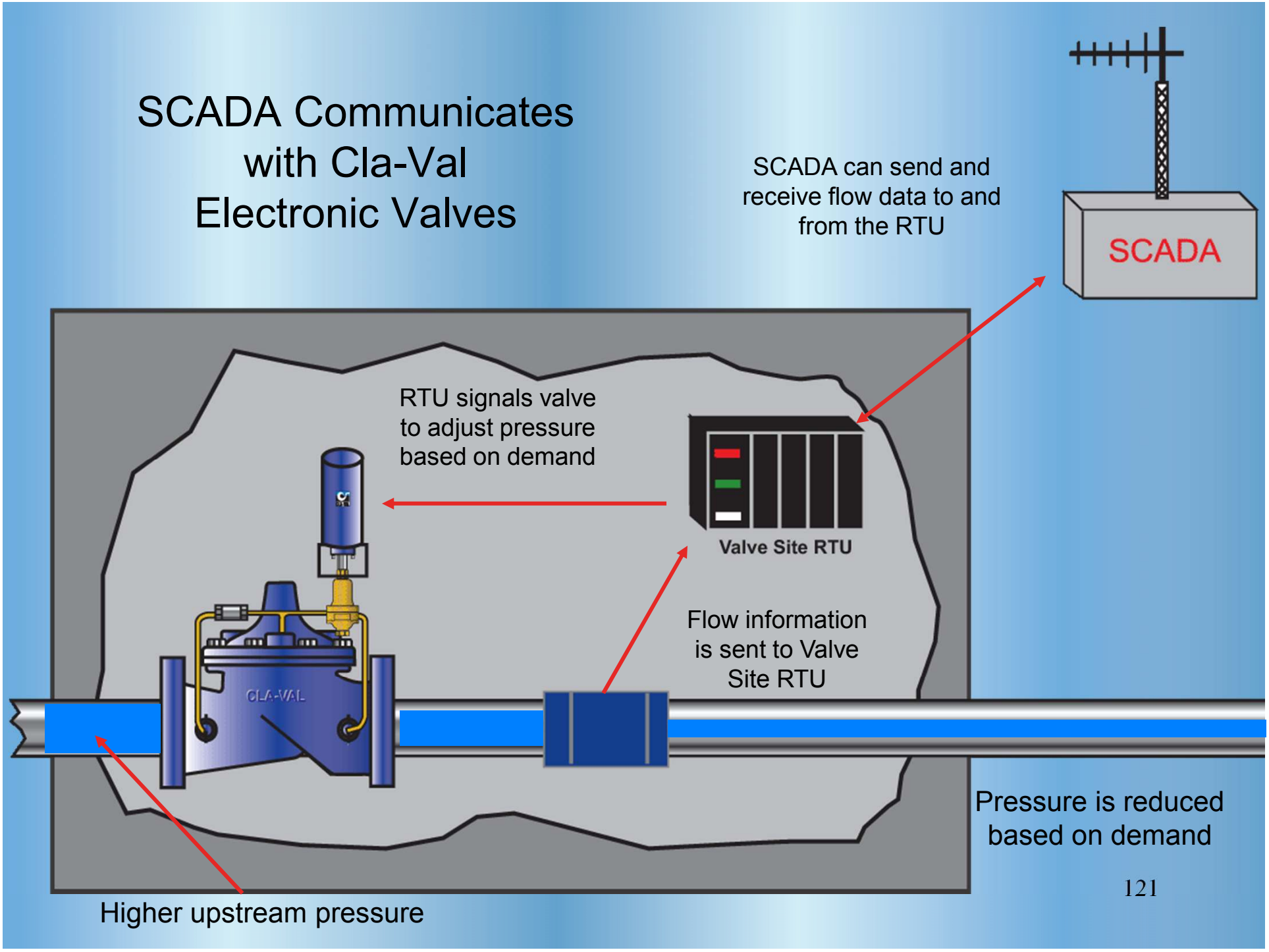
Remote Control Valves

Model 131-01



Model 350-02

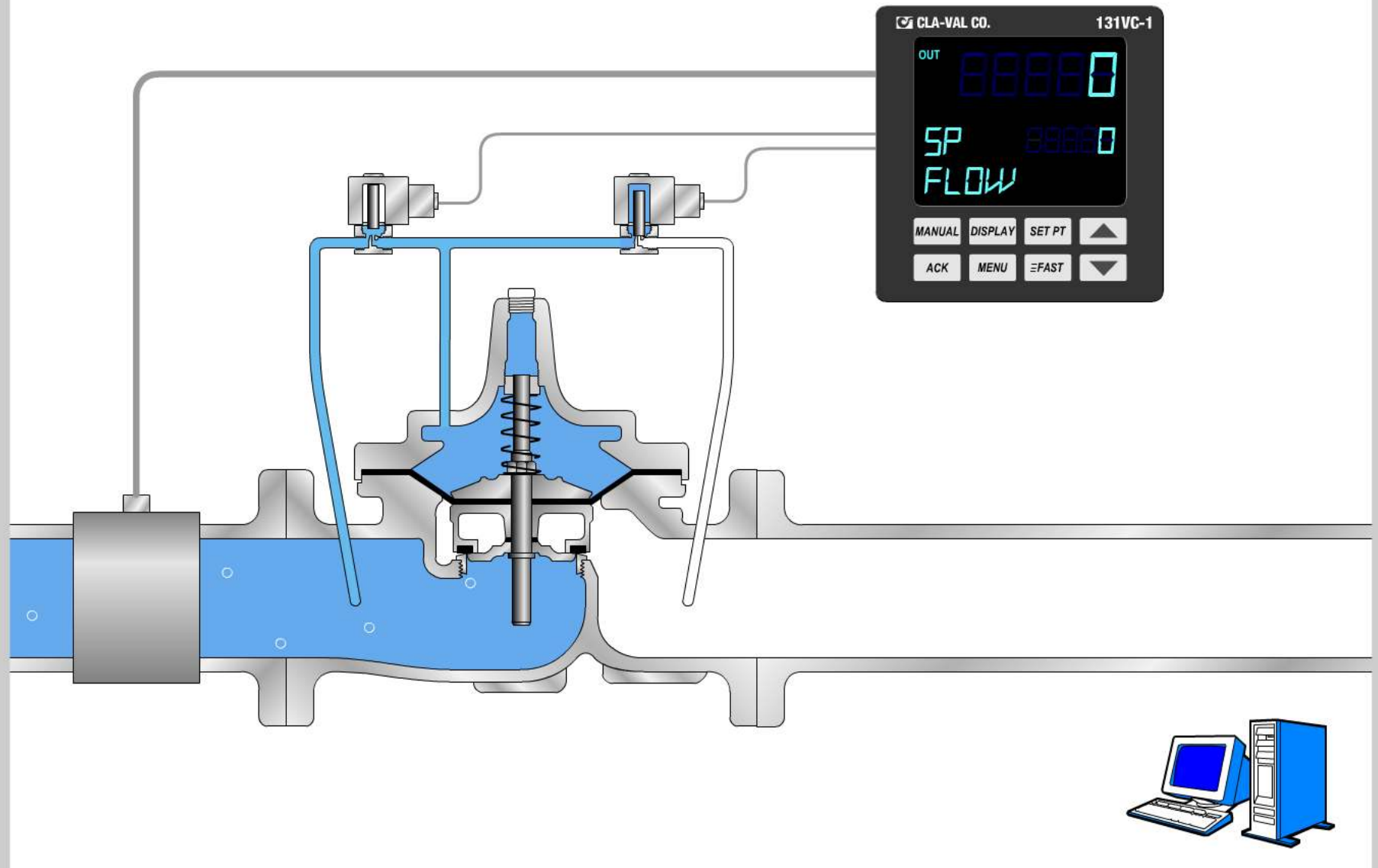
SCADA Communicates with Cla-Val Electronic Valves



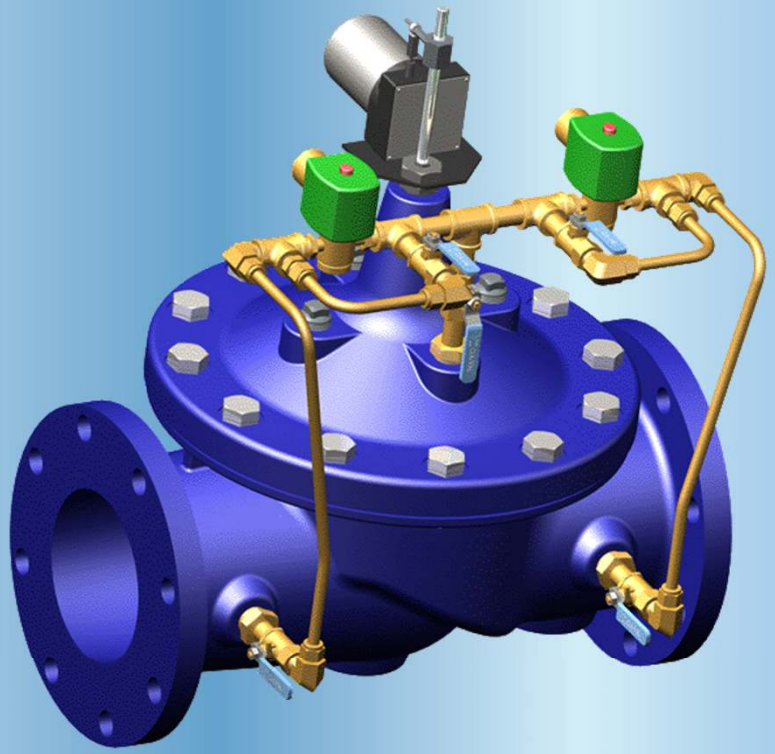
EXIT

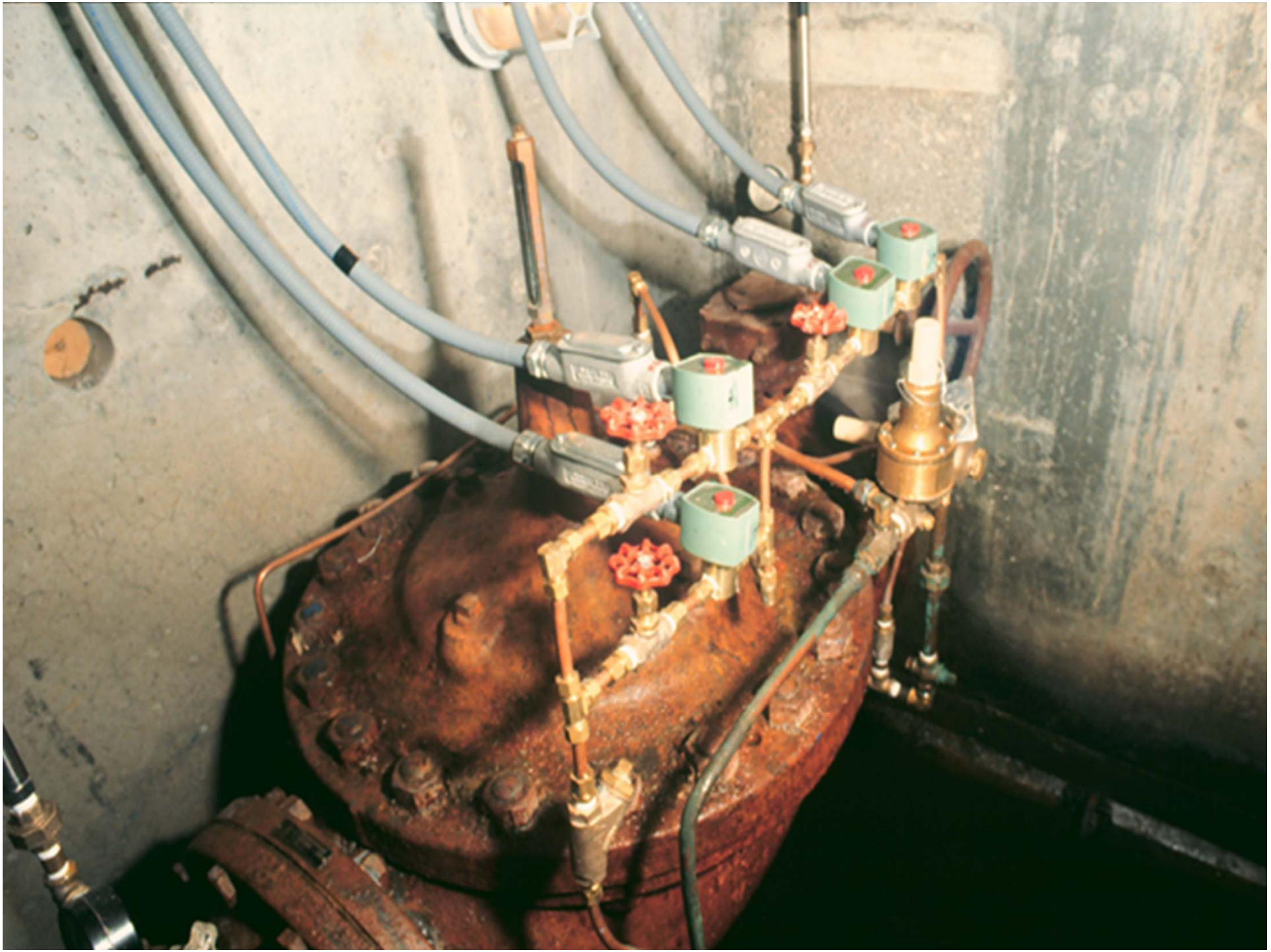
131VC Electronic Control Systems
Flow Control Application

PLAY PAUSE RESTART

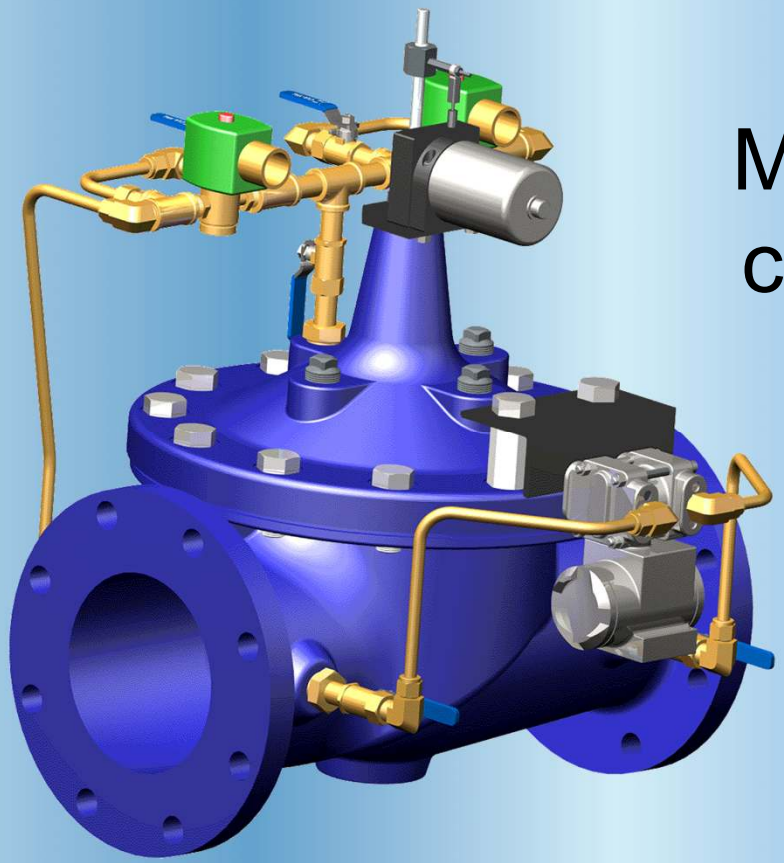


Cla-Val Series 131 Electronic Valve





133-01 Series Metering Valves



Monitors and controls flow

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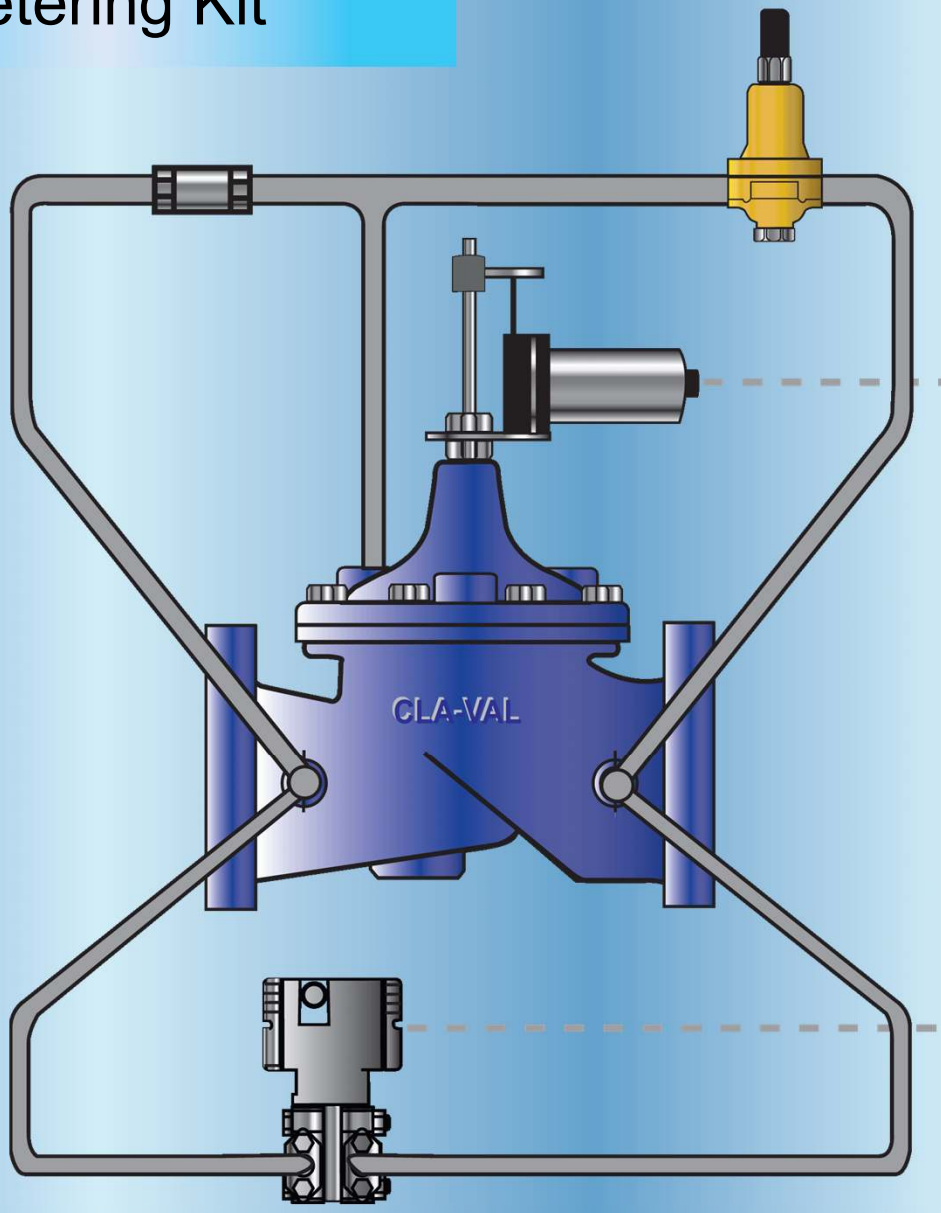
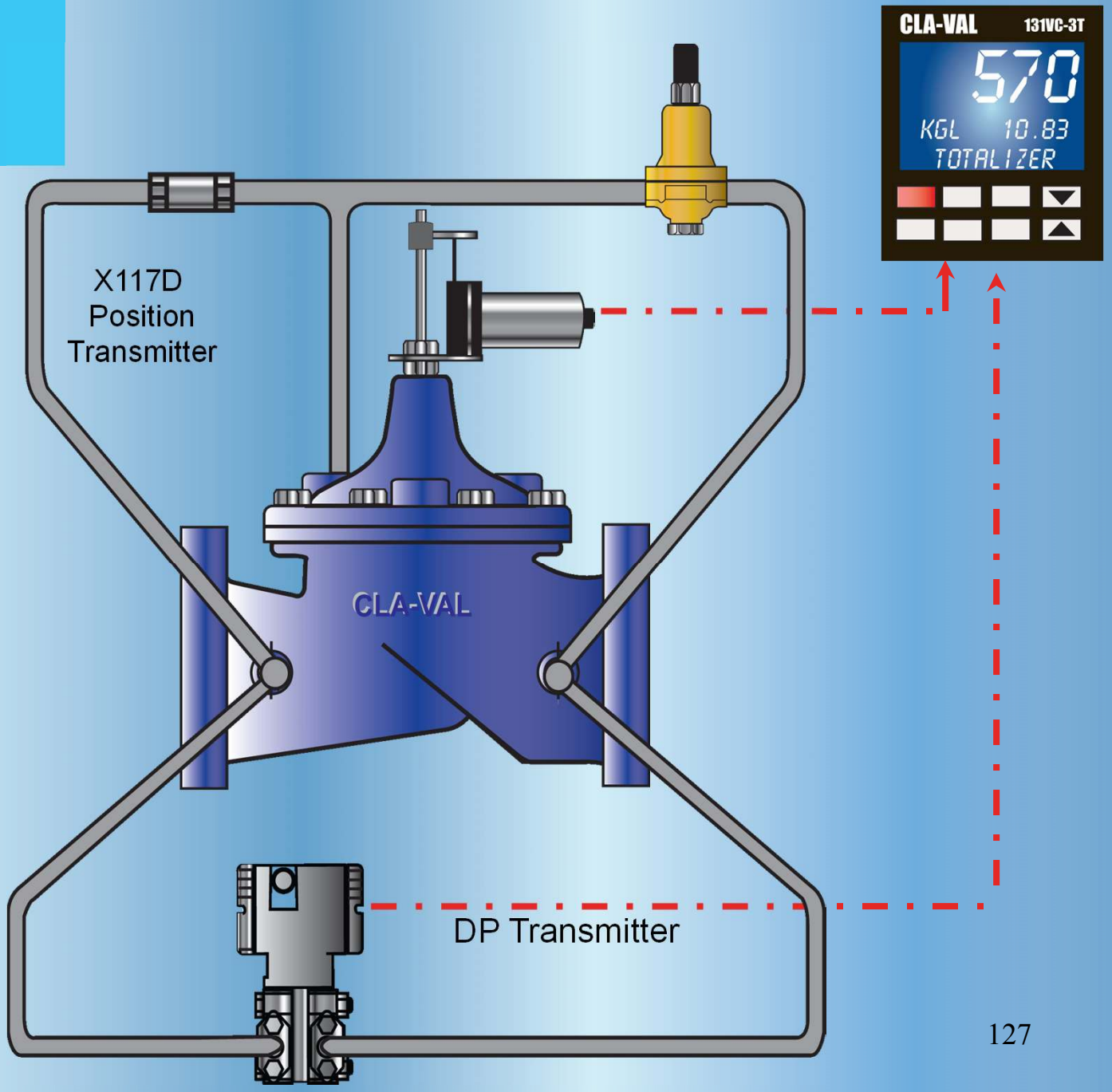
133-01 Flow Metering Kit



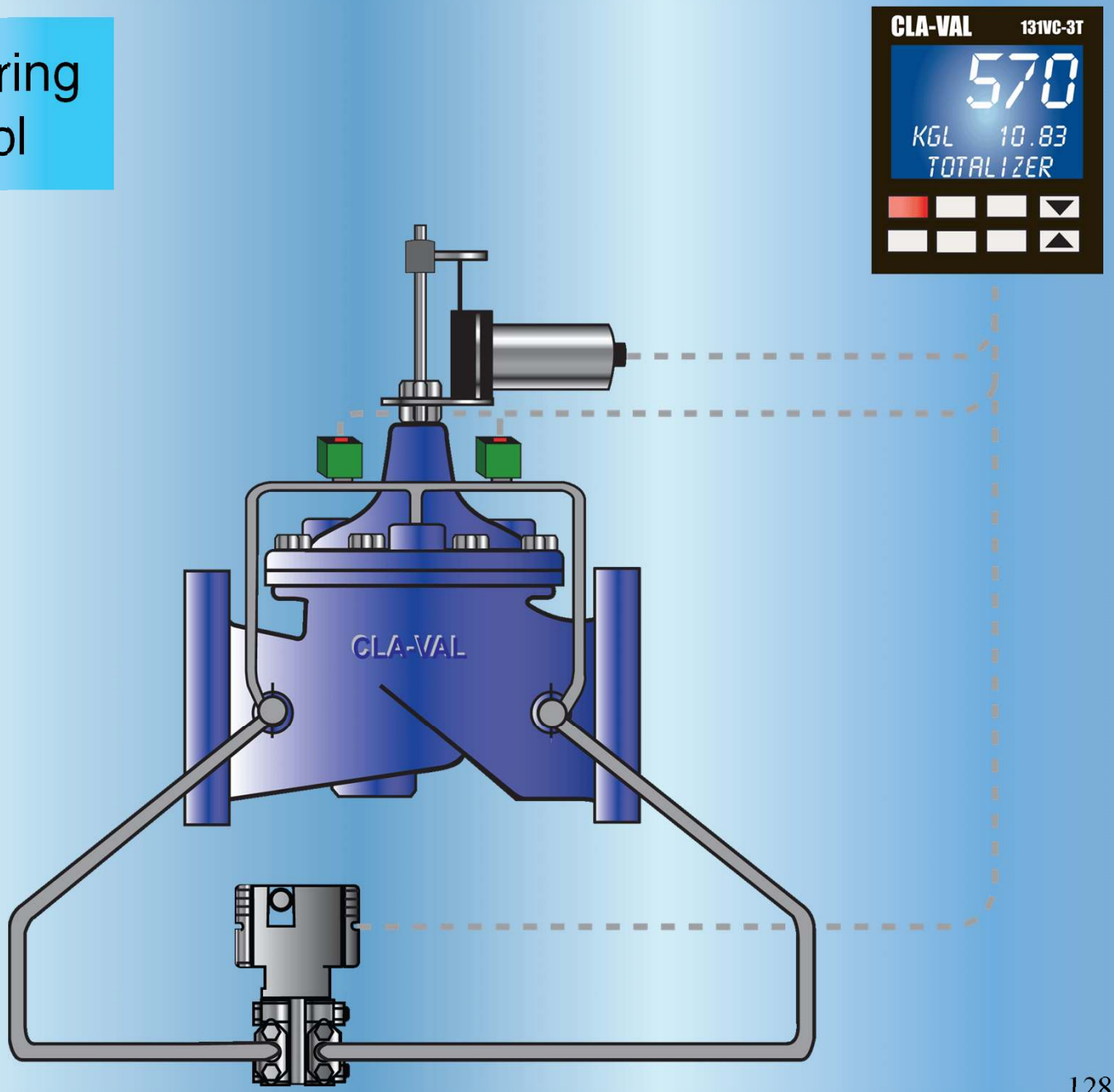
Metering Kit Field Installs on Virtually Any Cla-Val Control Valve

Optional Enclosure

133-01 Flow Metering Kit Components

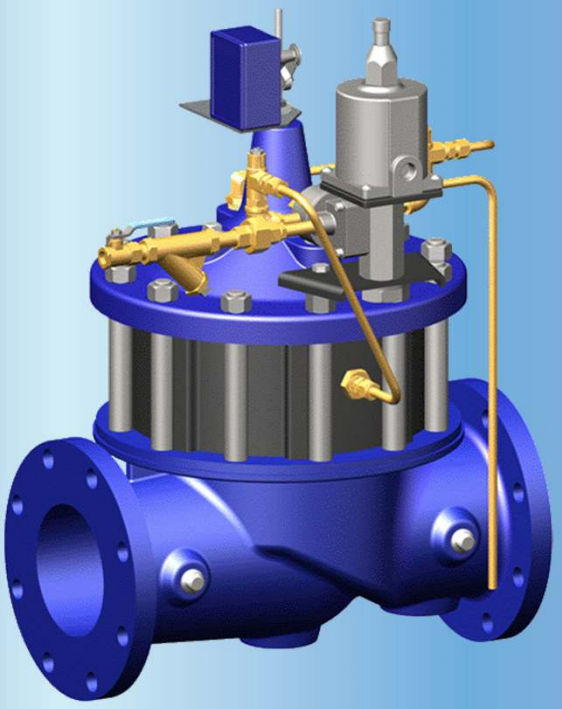


133-01 Metering with Control



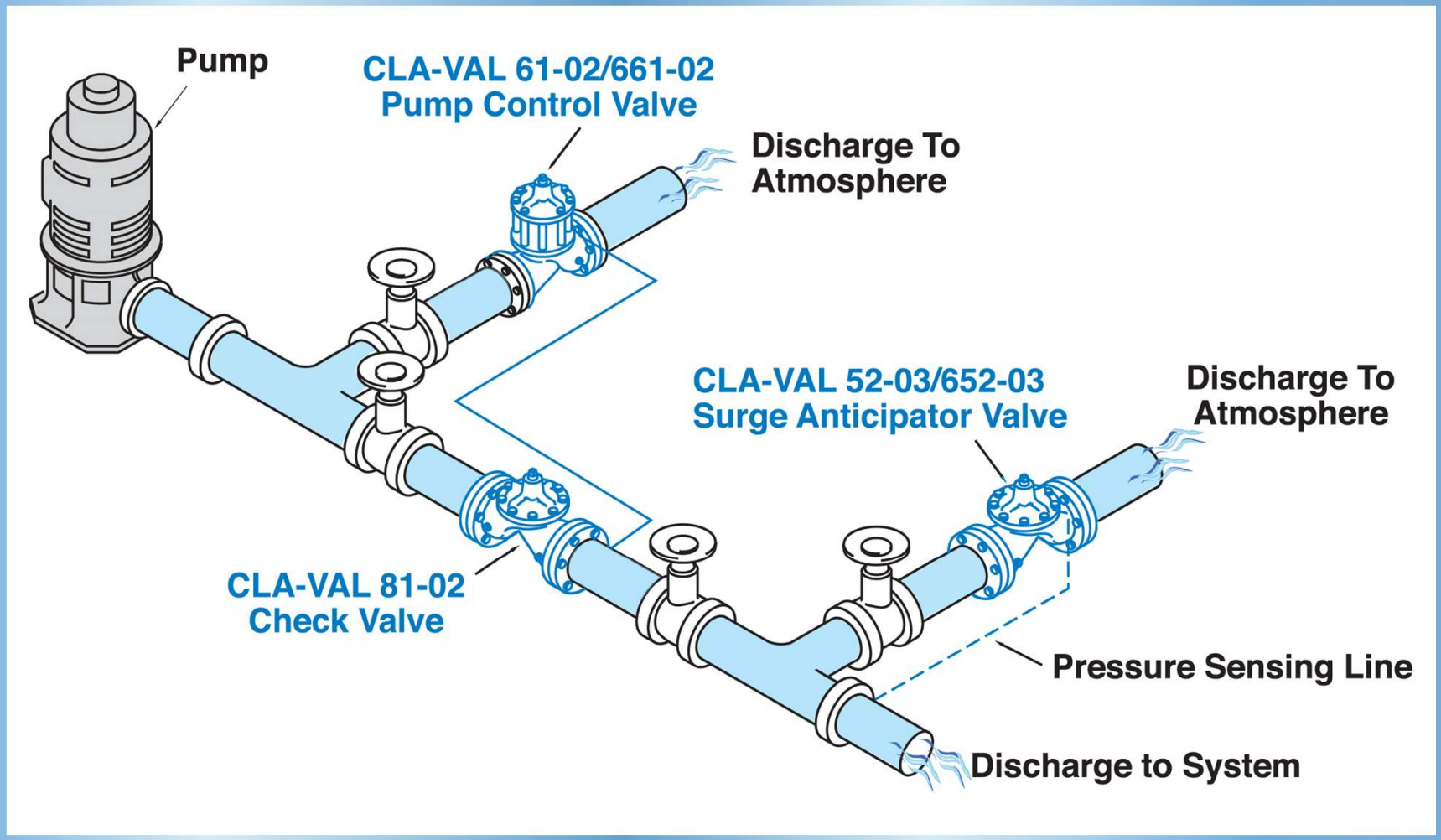
Pump Control Valves

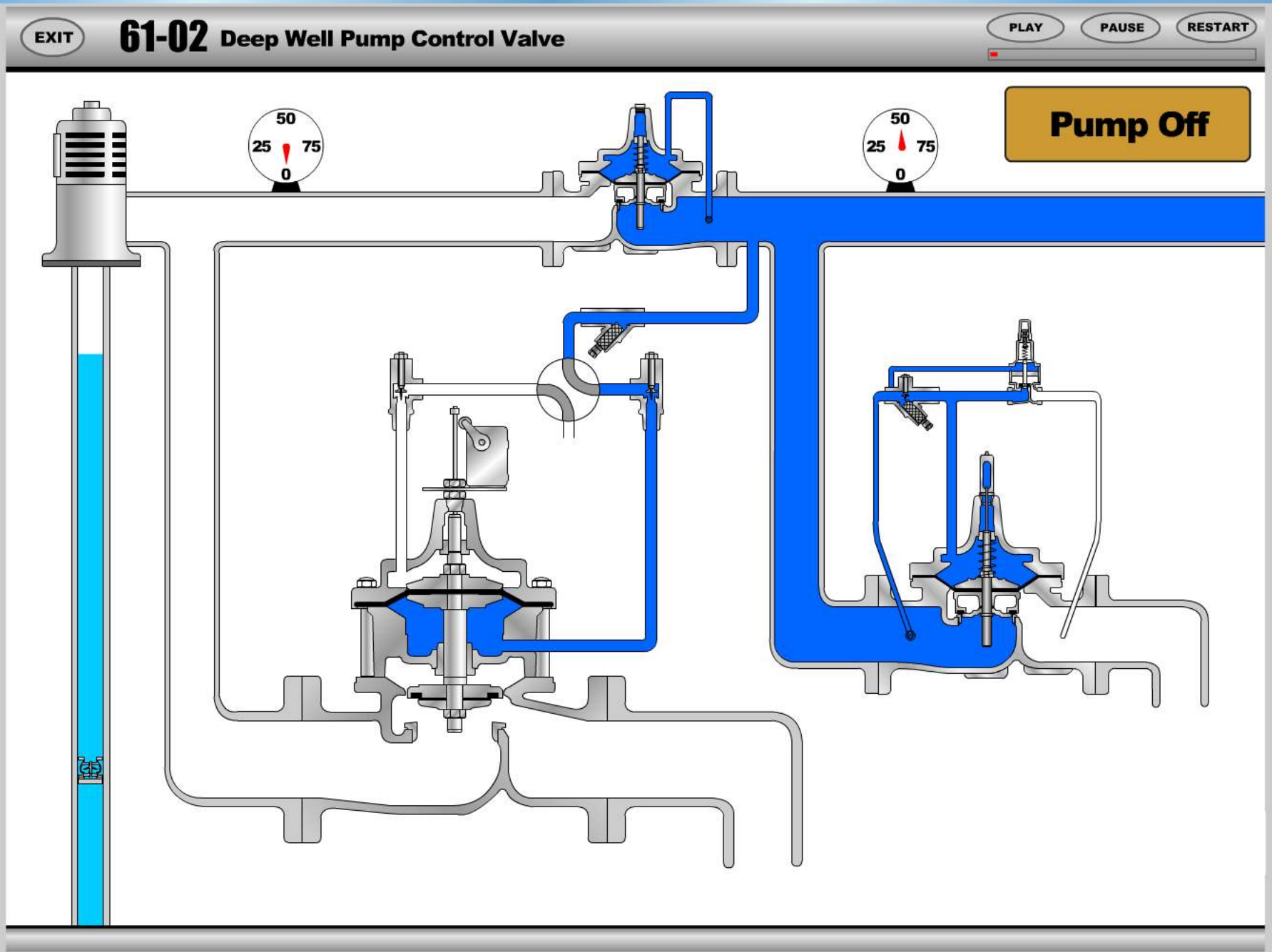
Model 60-11

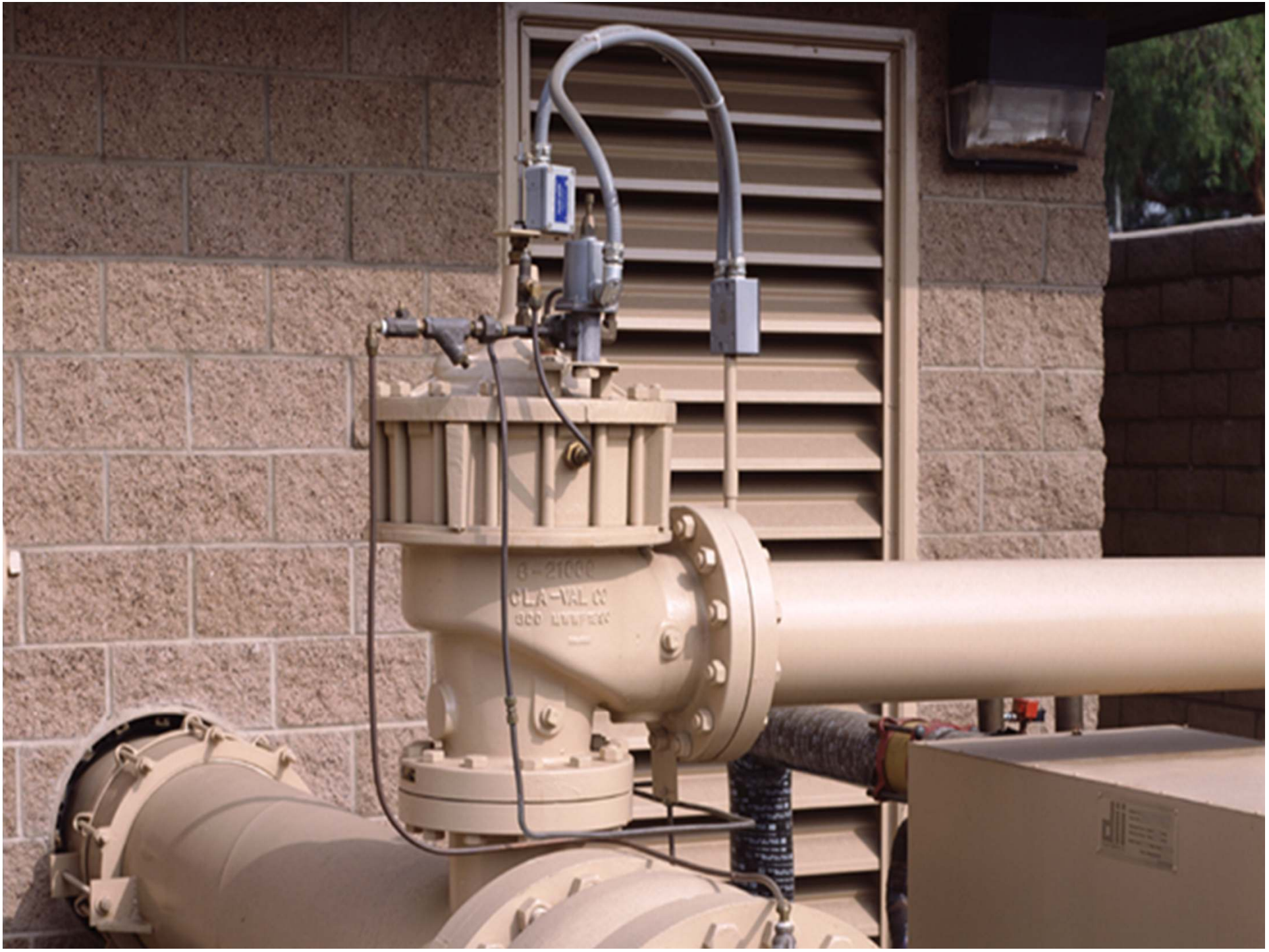


Model 61-02

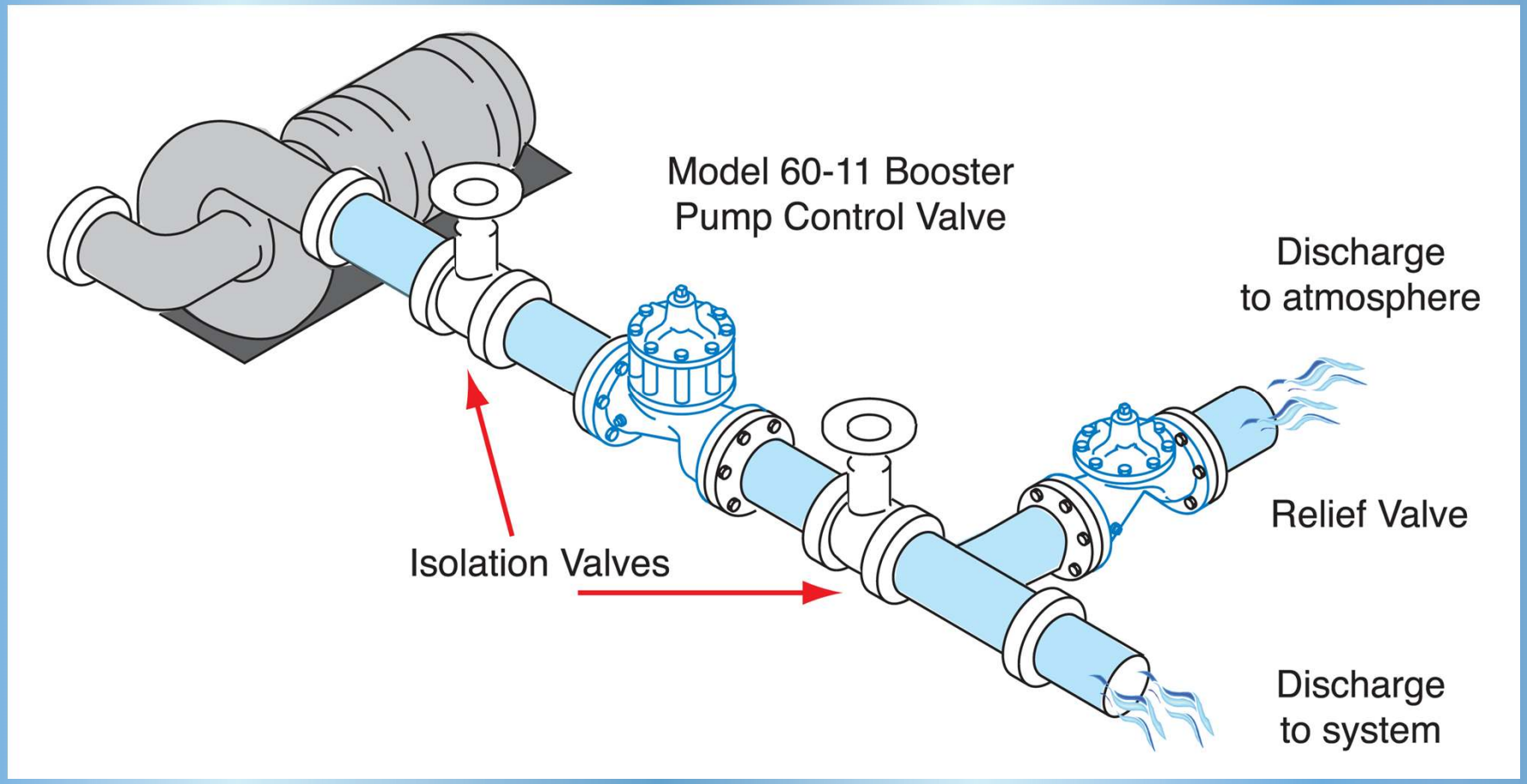
Typical Deep Well Pump Station



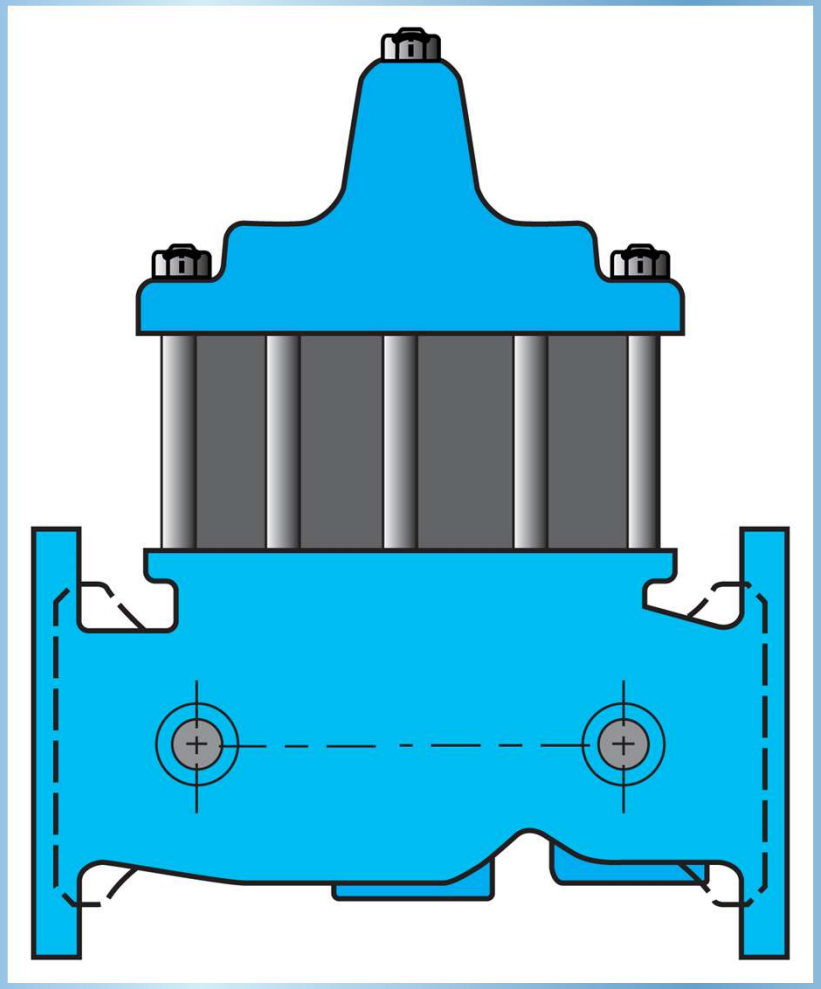

EXIT
61-02 Deep Well Pump Control Valve
PLAY
PAUSE
RESTART
50
25
75
0
50
25
75
0
Pump Off


CLA-VAL

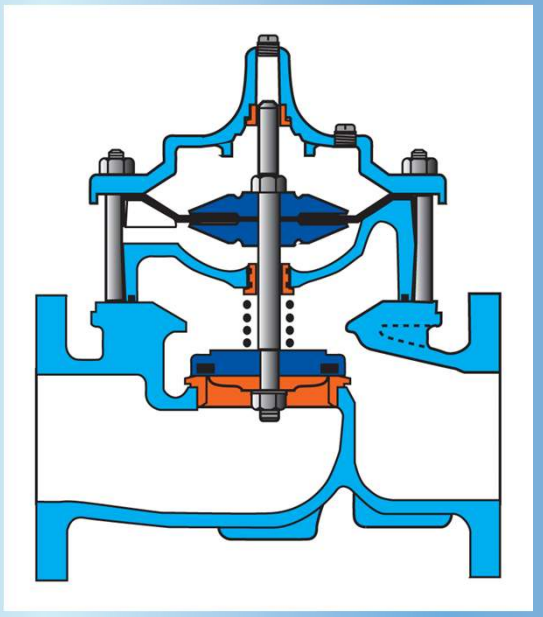
Booster Pump Control Application - Series 60



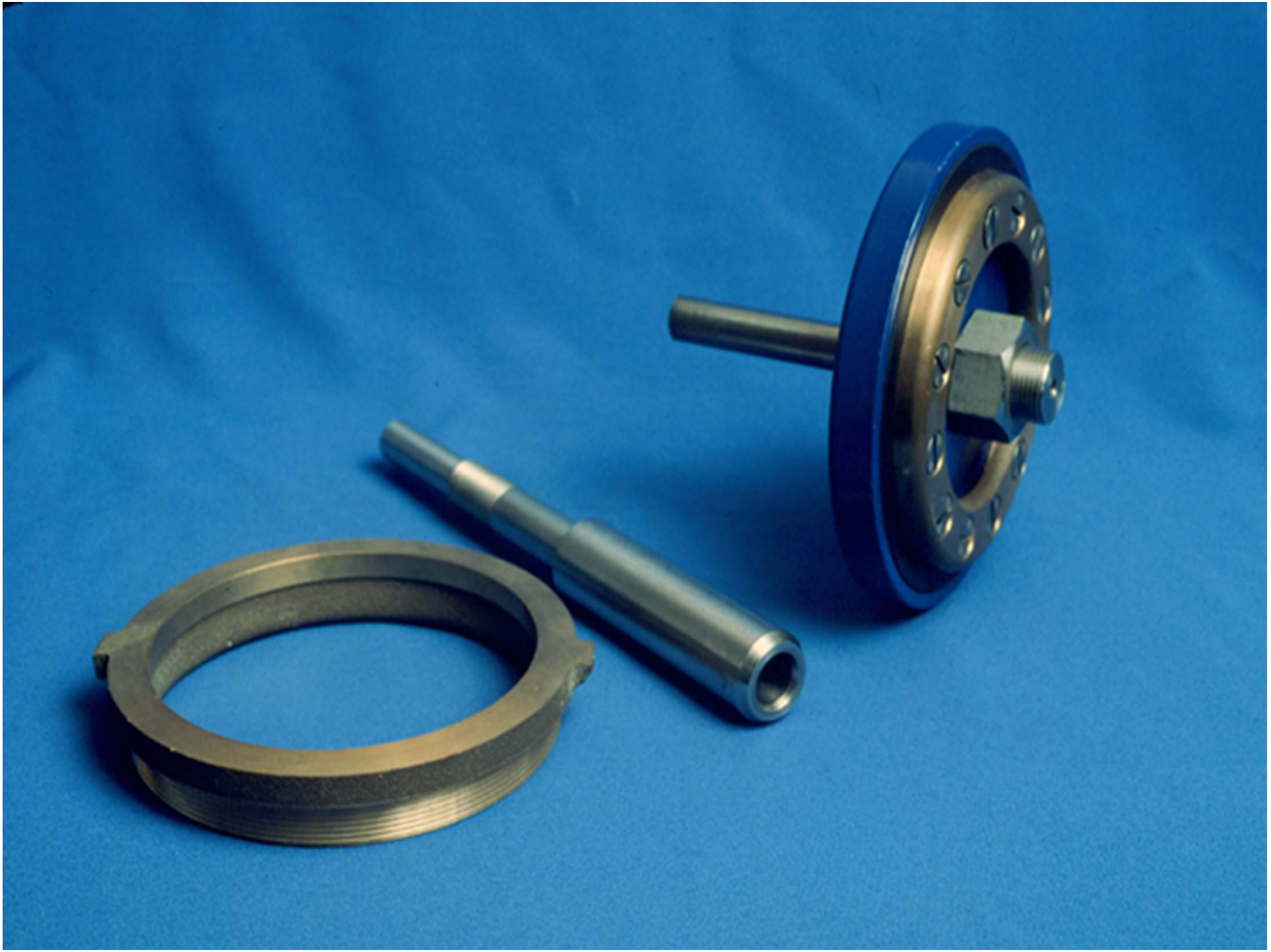
Powercheck Main Valve



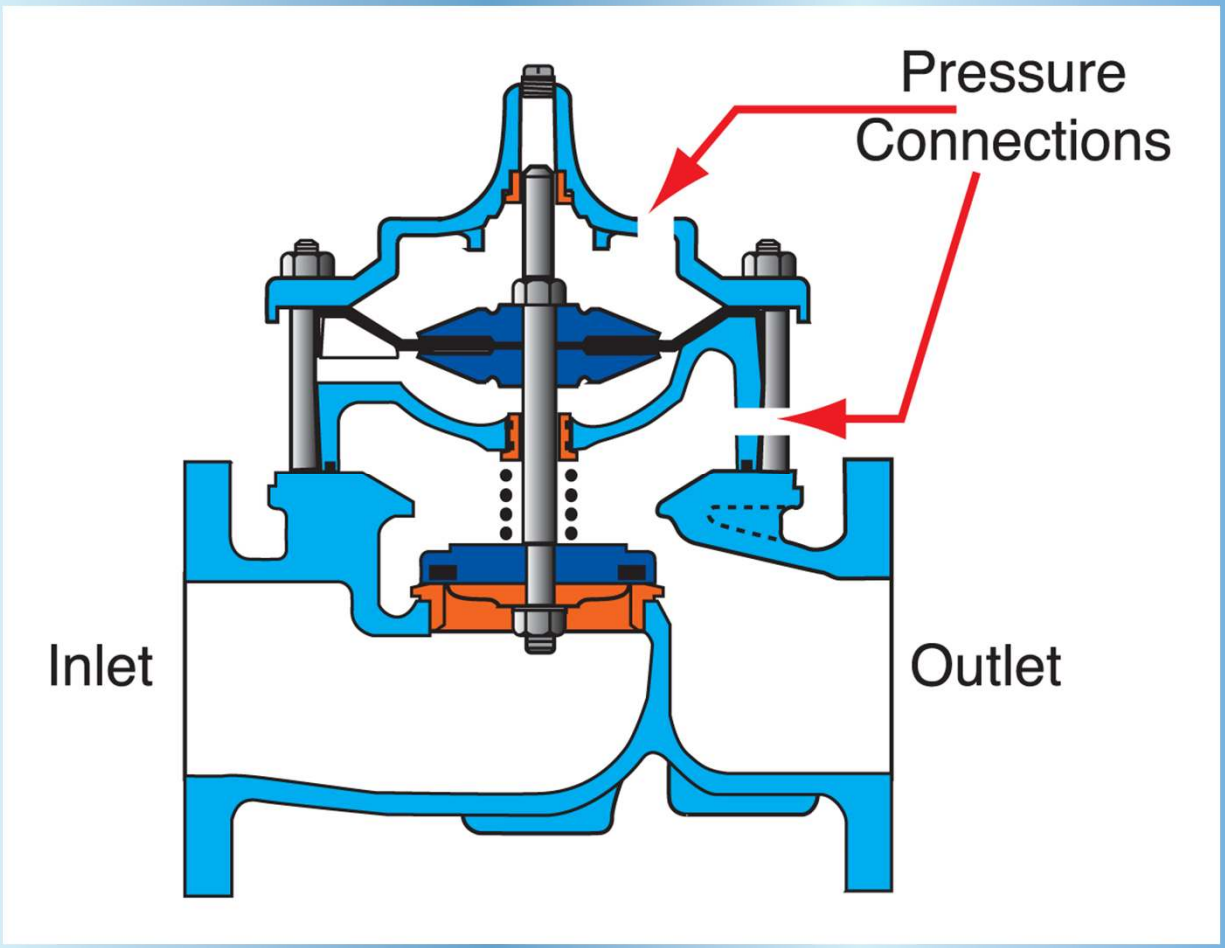
Model 100-03
Built-In lift type
check valve



Spring in cover 10″ and smaller



Powercheck Components - Location and Function



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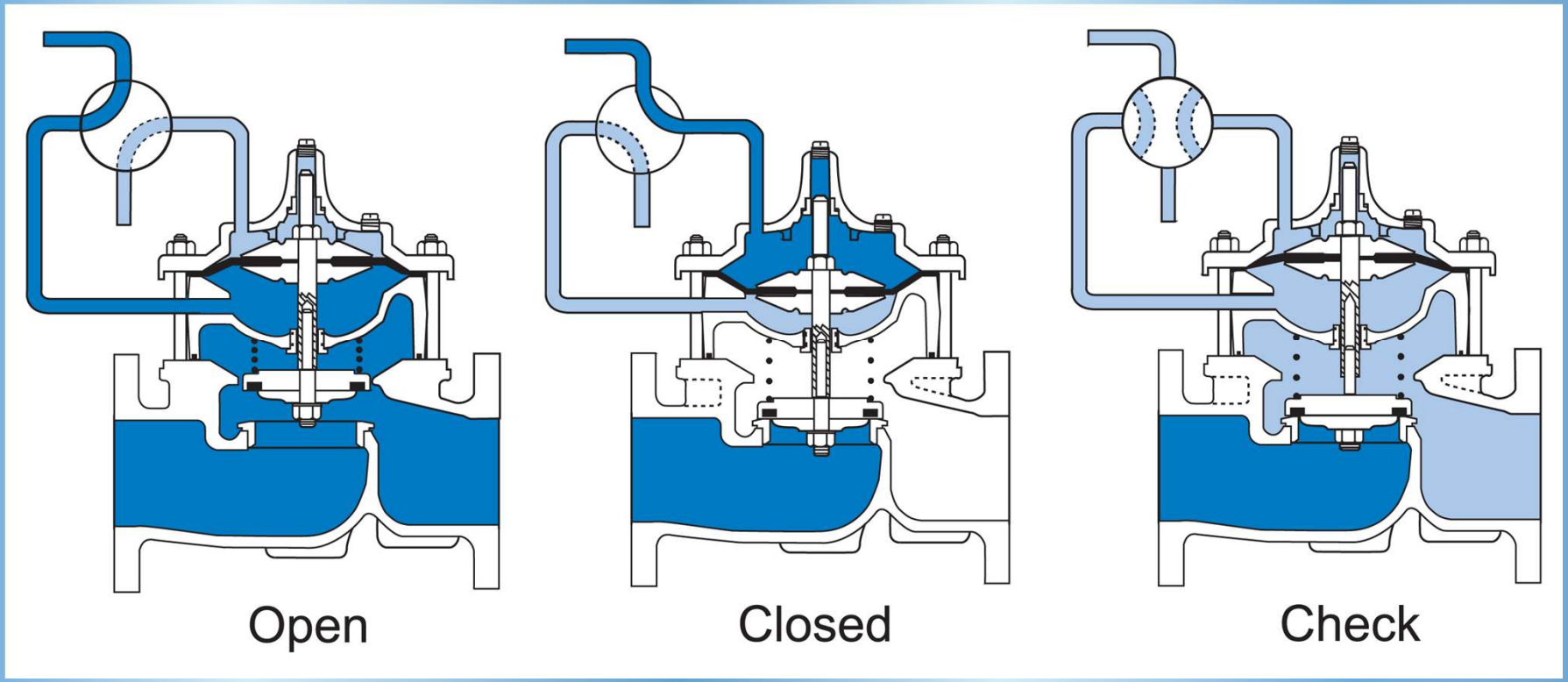
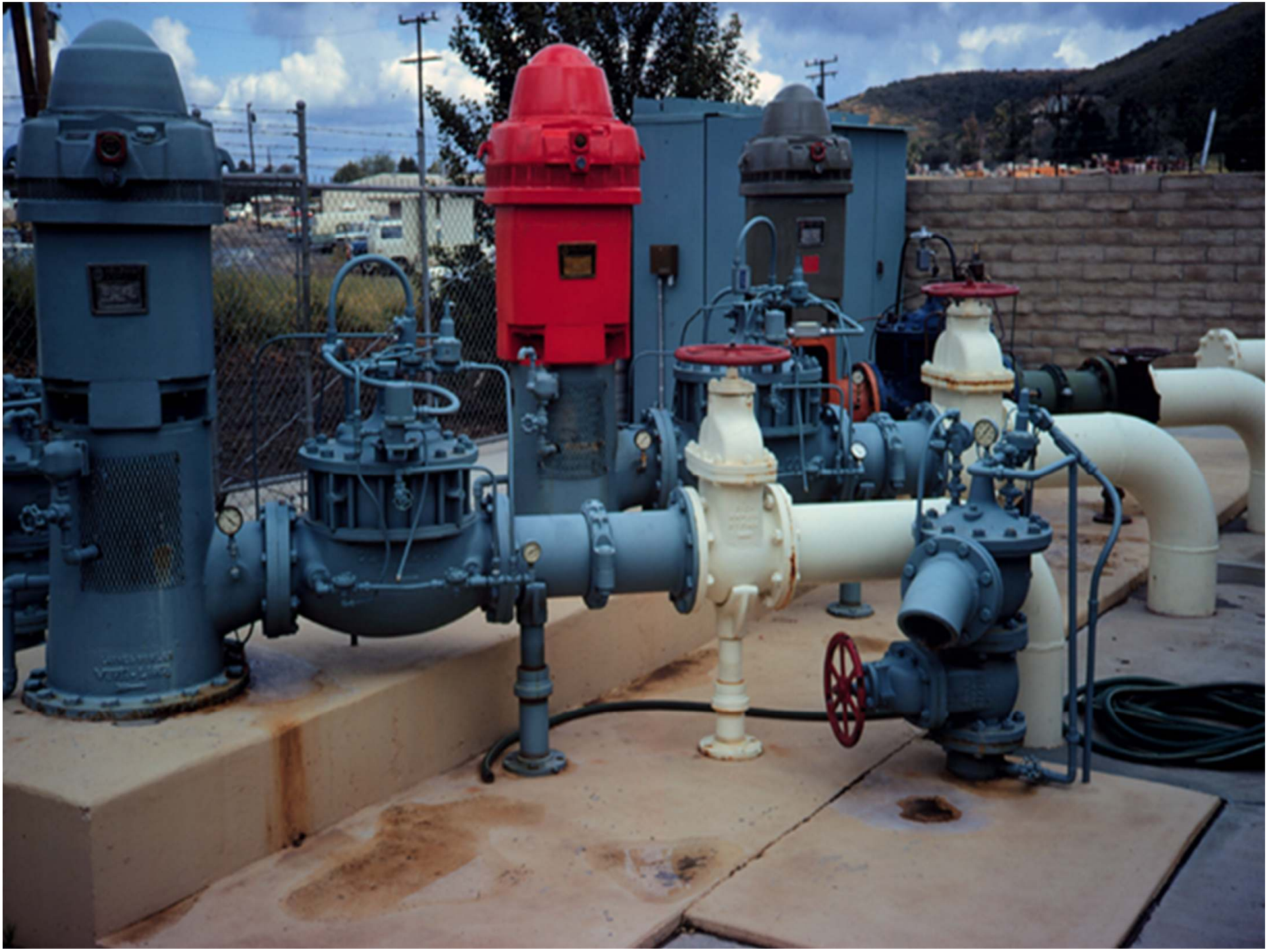
Operation Theory: Open, Closed, Check

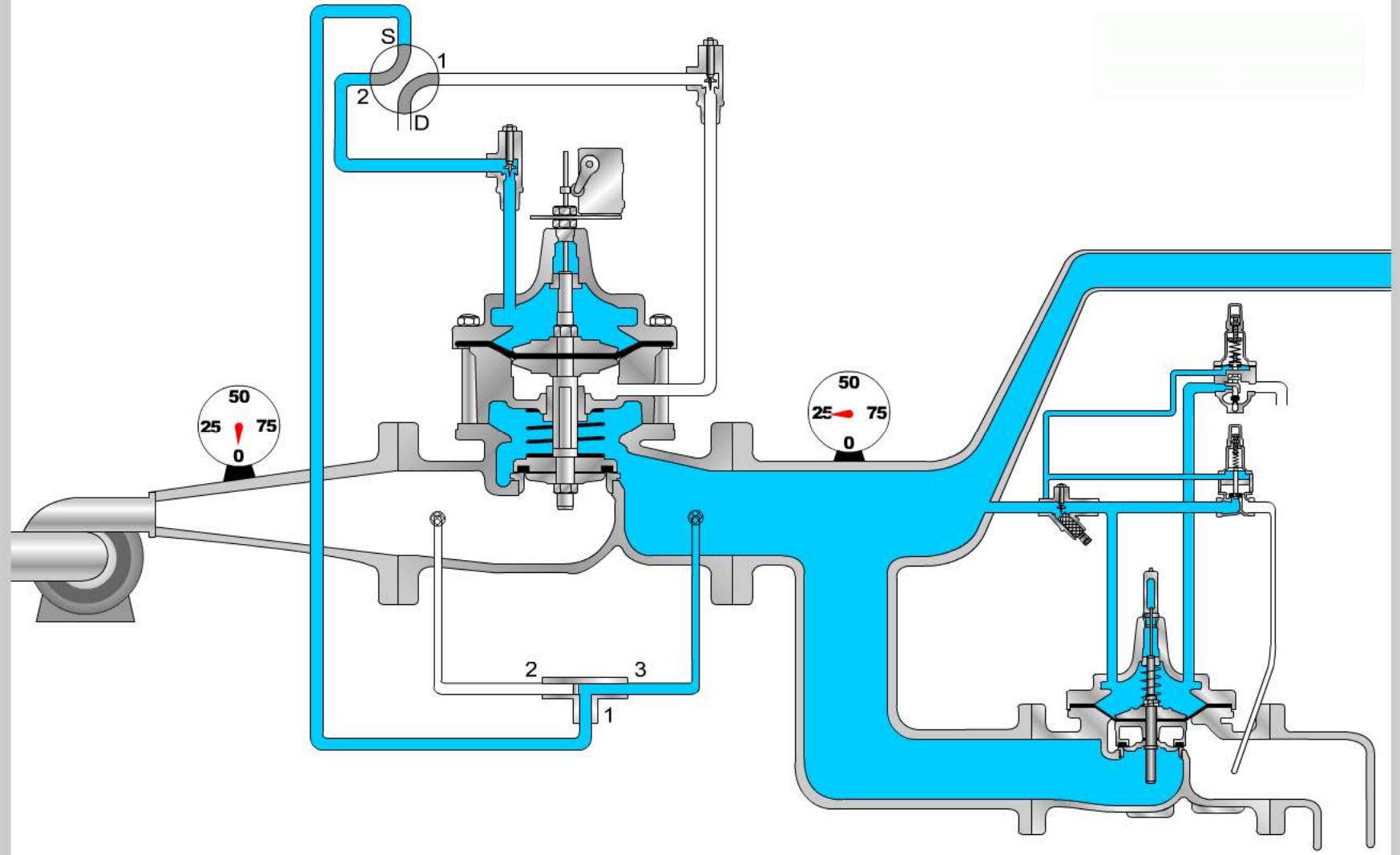




EXIT

60-11 Booster Pump Control Valve

PLAY PAUSE RESTART



What is Surge?

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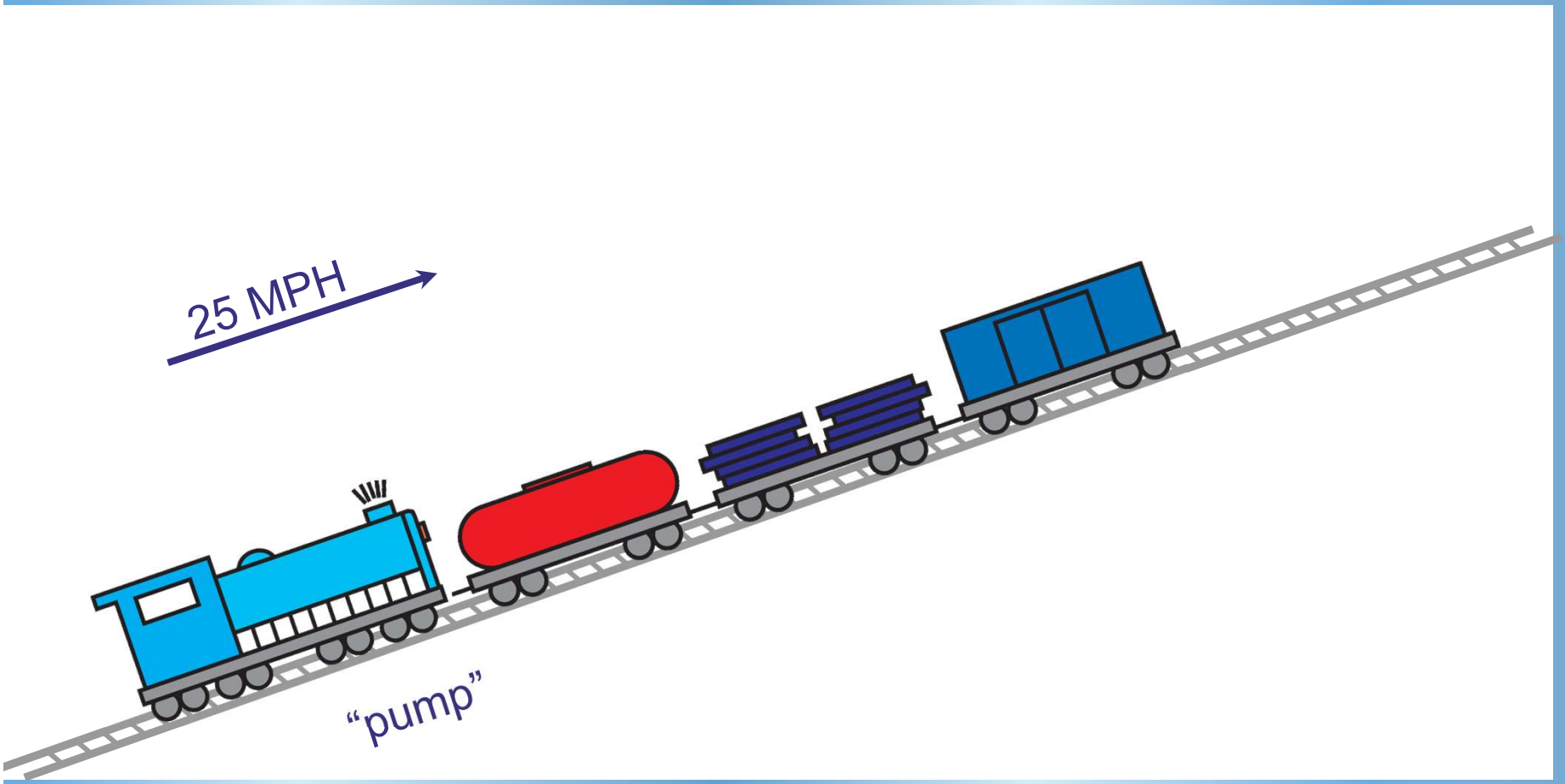
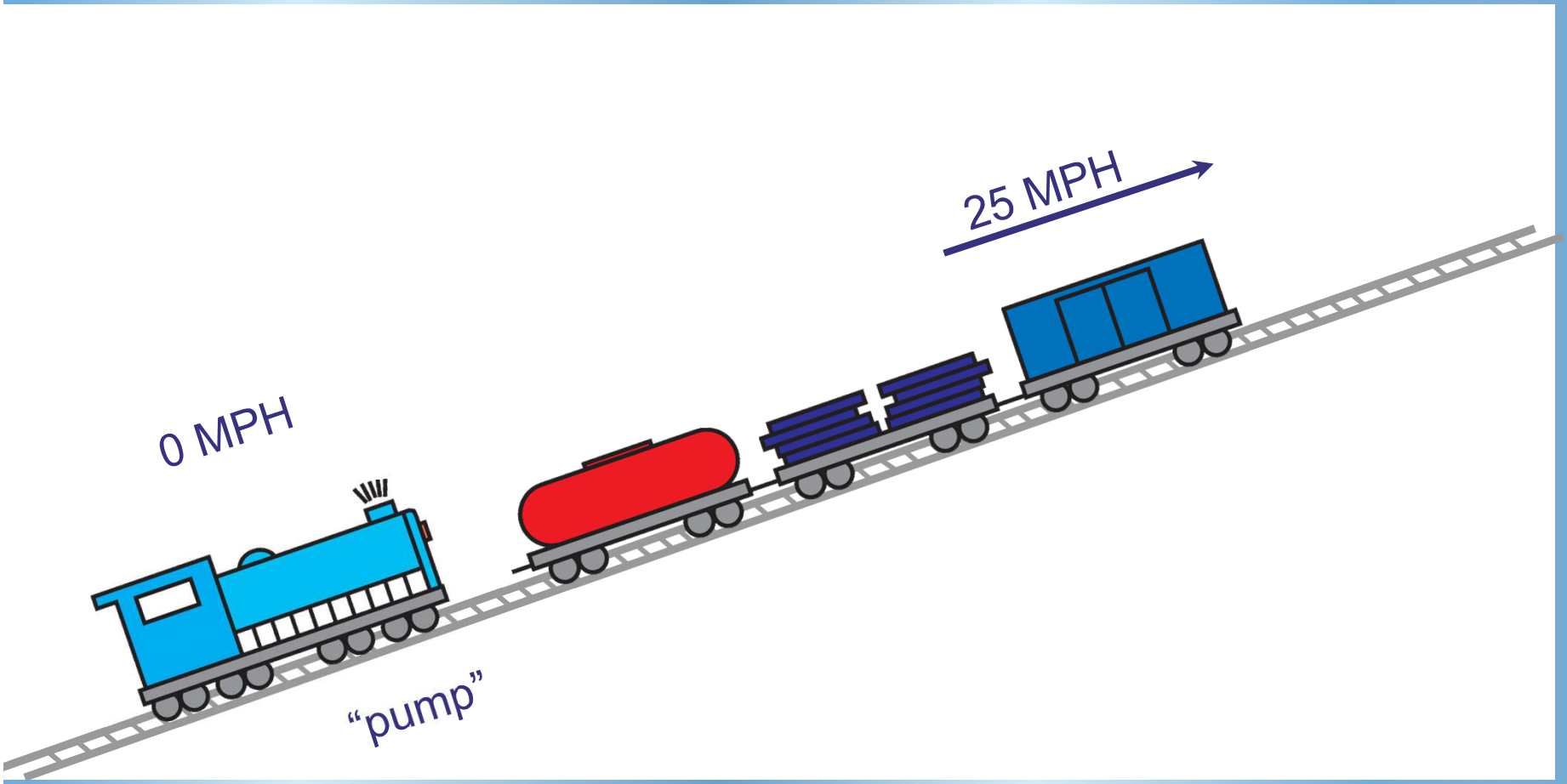
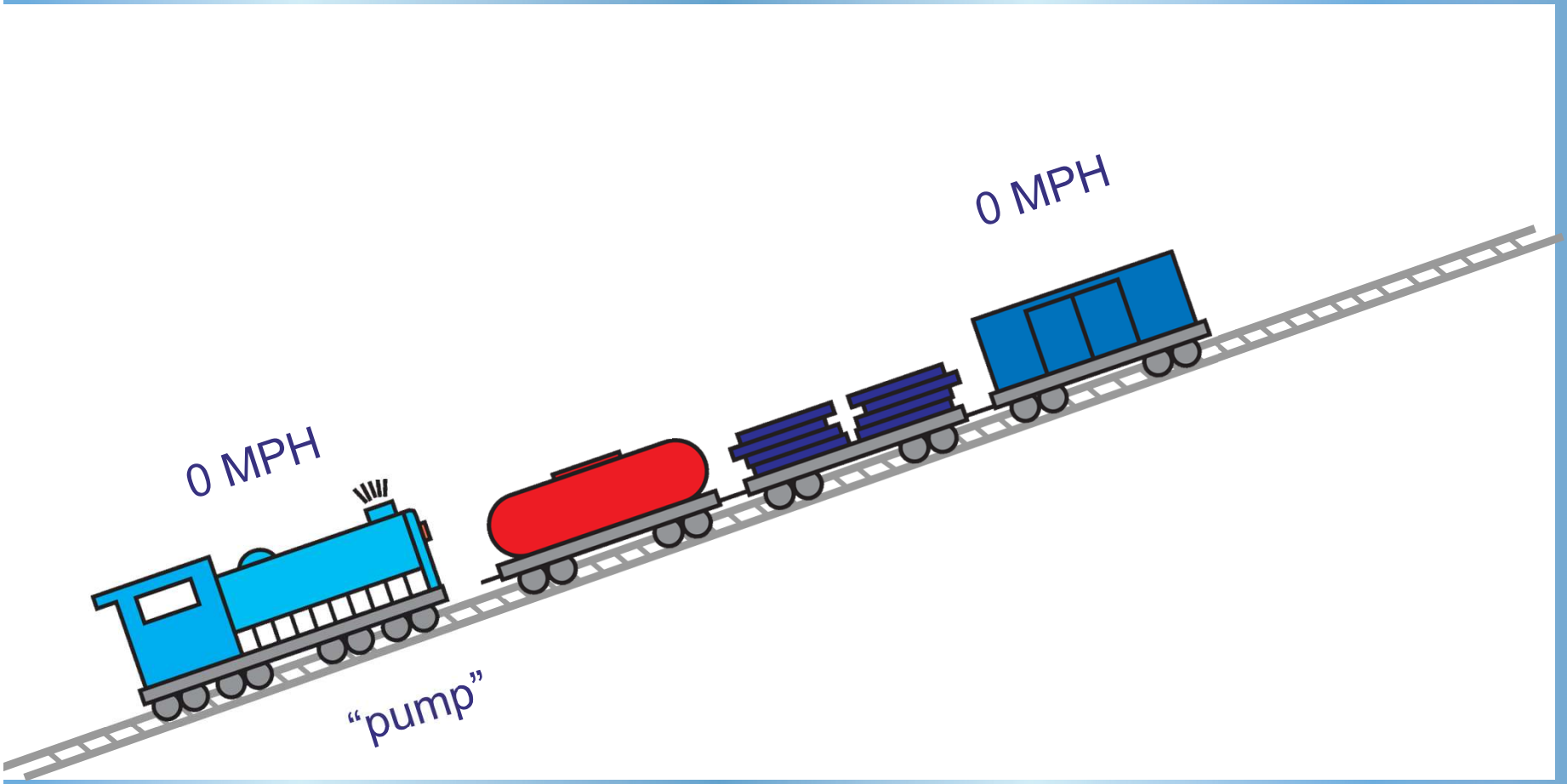
Surge Train #1:
Pumping is Normal



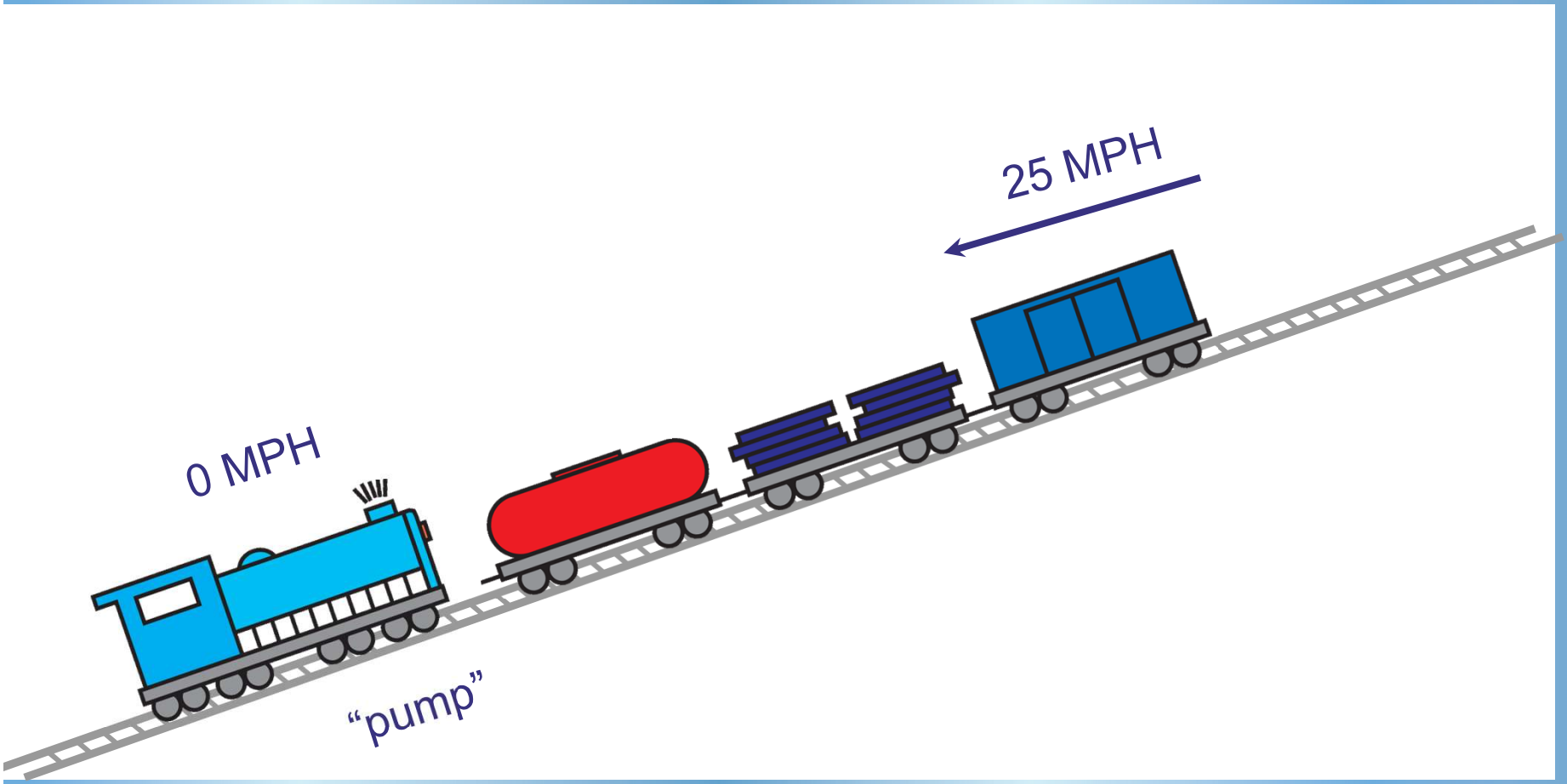
Surge Train # 2:
Power Failure Occurs



Surge Train # 3: Zero Forward Velocity Condition Occurs

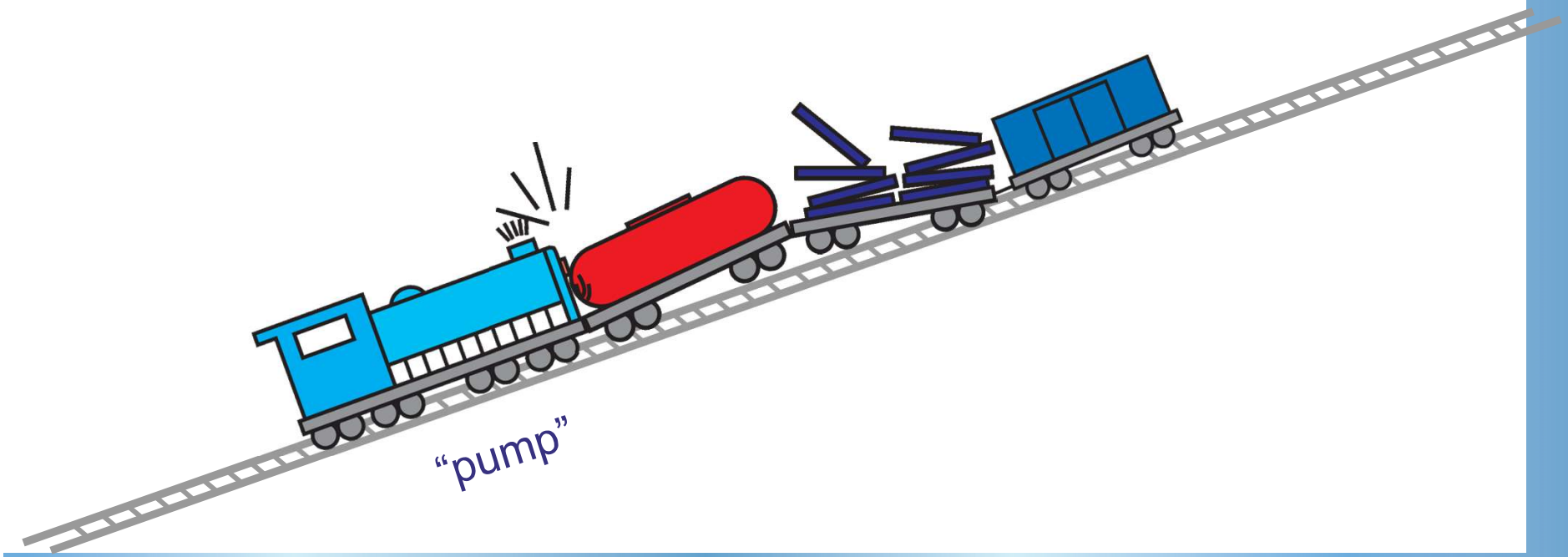


Surge Train # 4:
Return Flow Condition Occurs

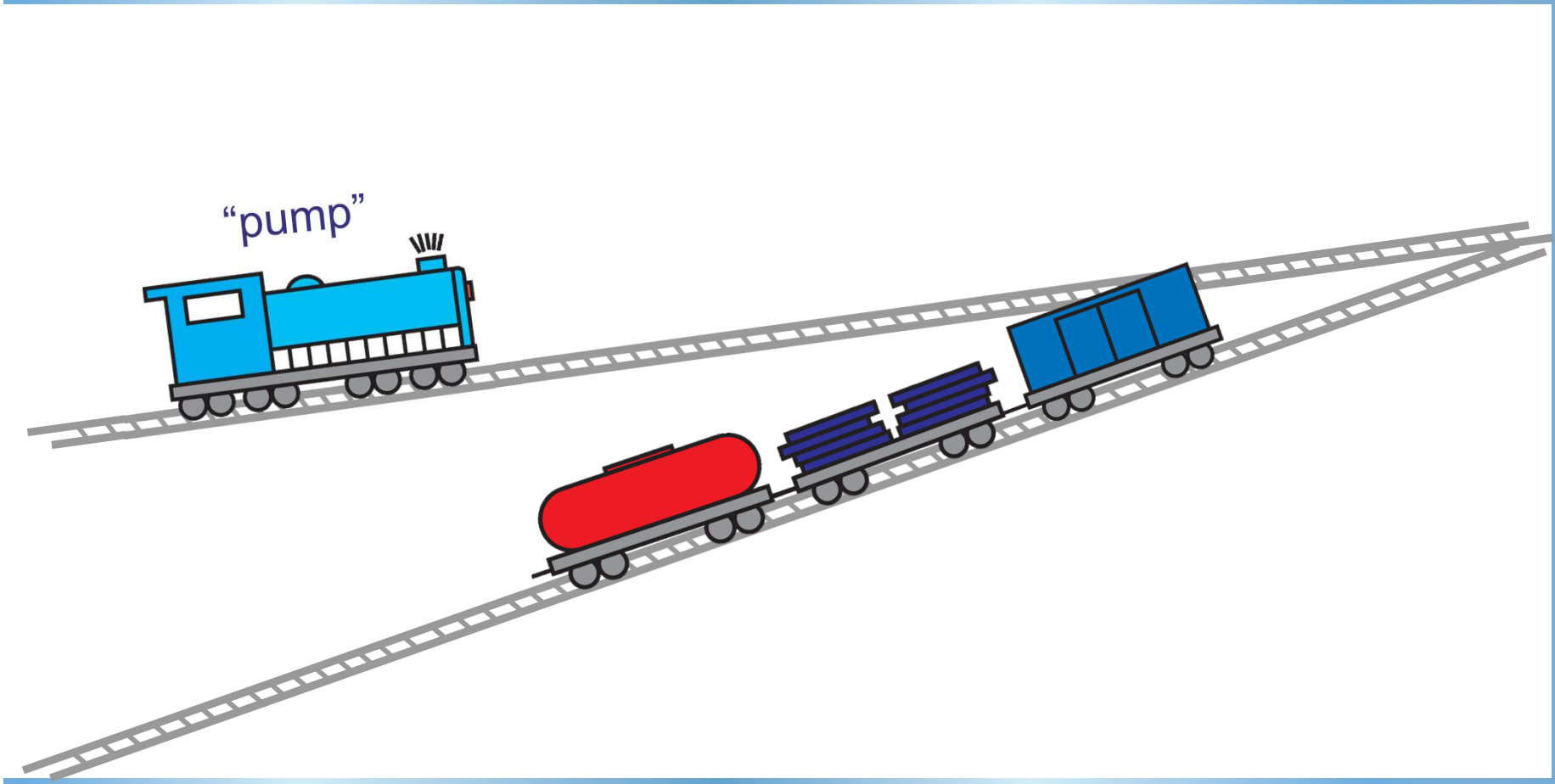


Surge Train # 5:

Surge Condition Occurs,Rapid Change in Velocity, System Energy “Trapped”



Surge Train # 6: Pressure Surge Condition Occurs, System Energy “Released”



Surge Control Valves

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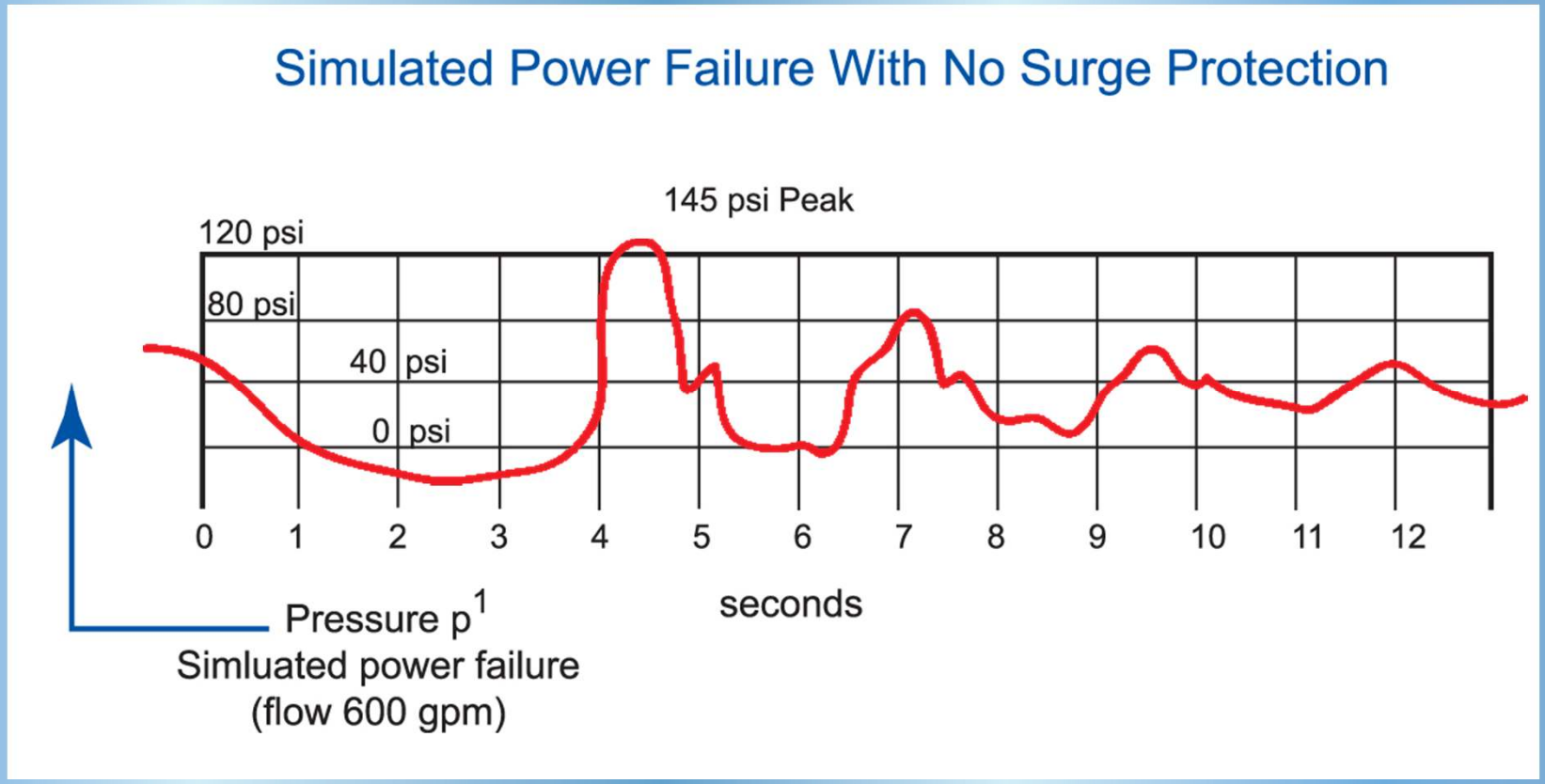
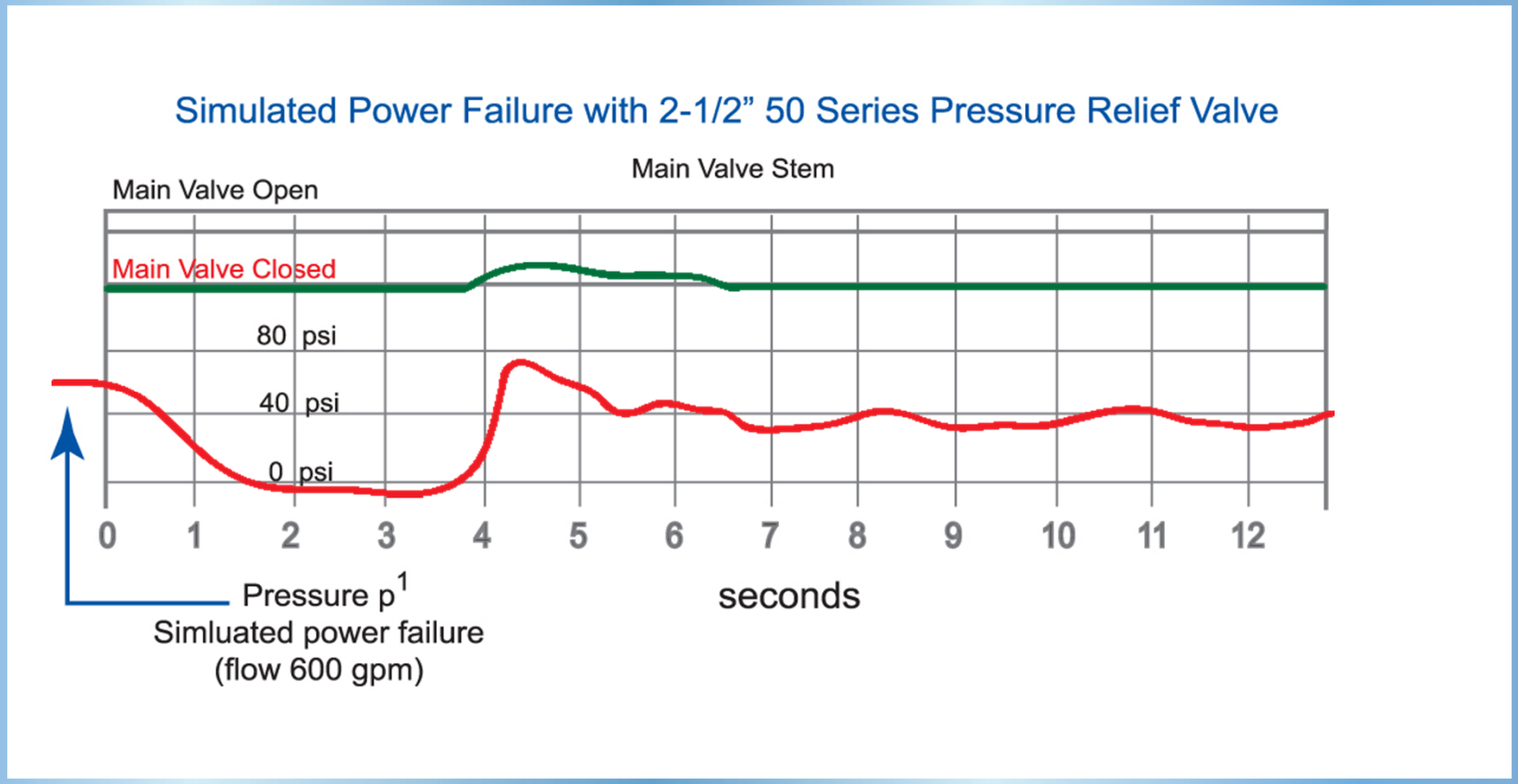
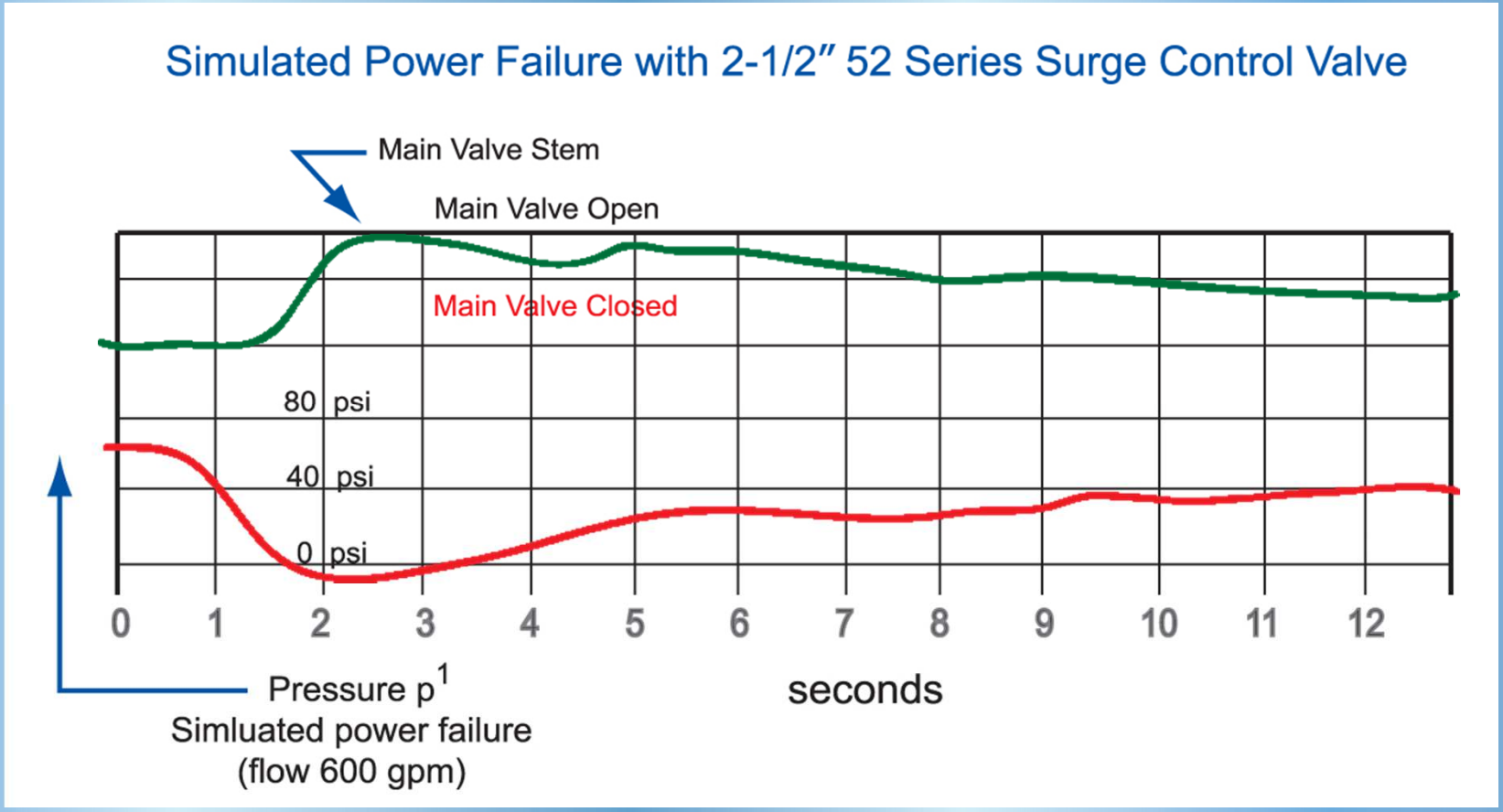
Test Curve with No Relief Valve



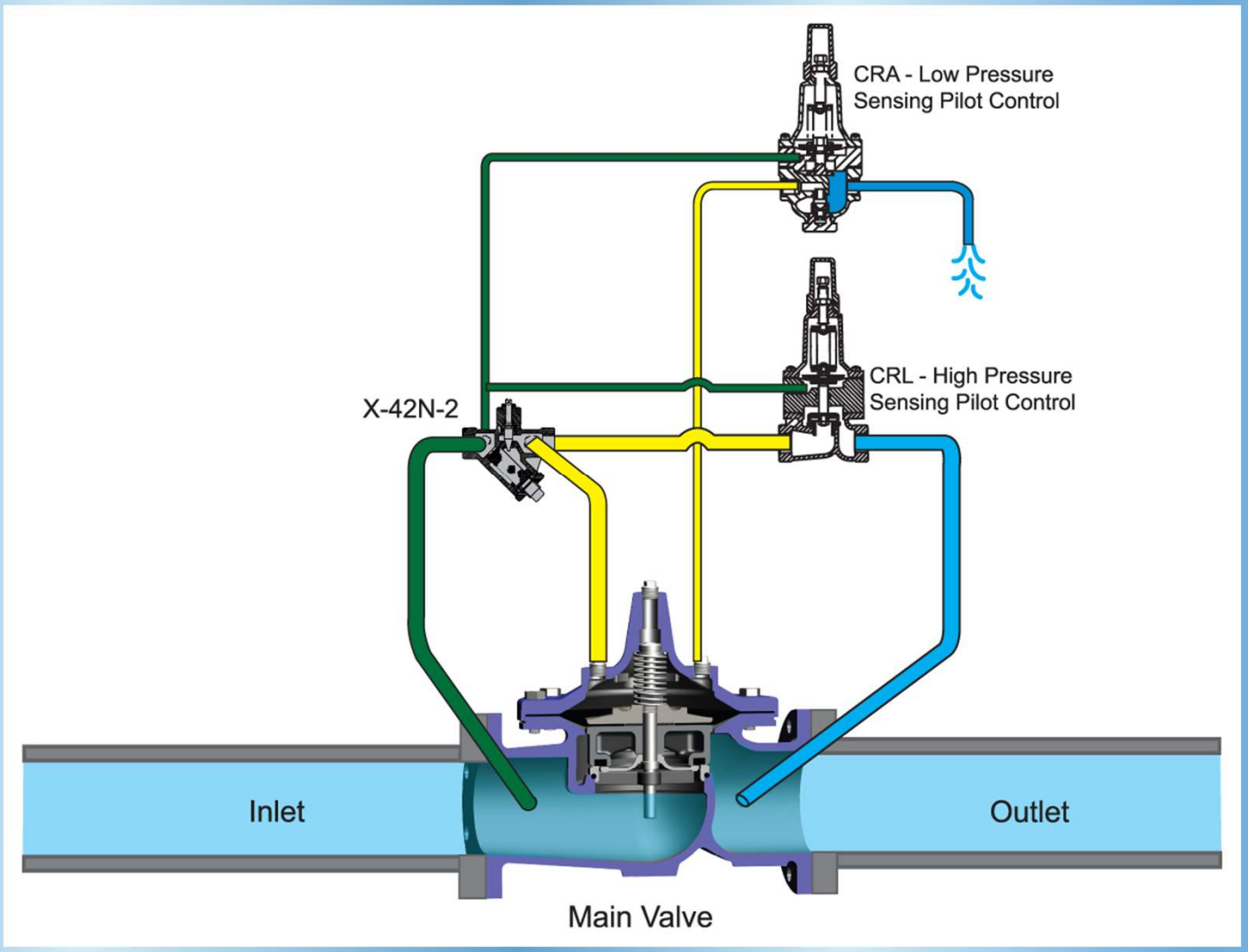
Test Curve With Standard Relief Valve

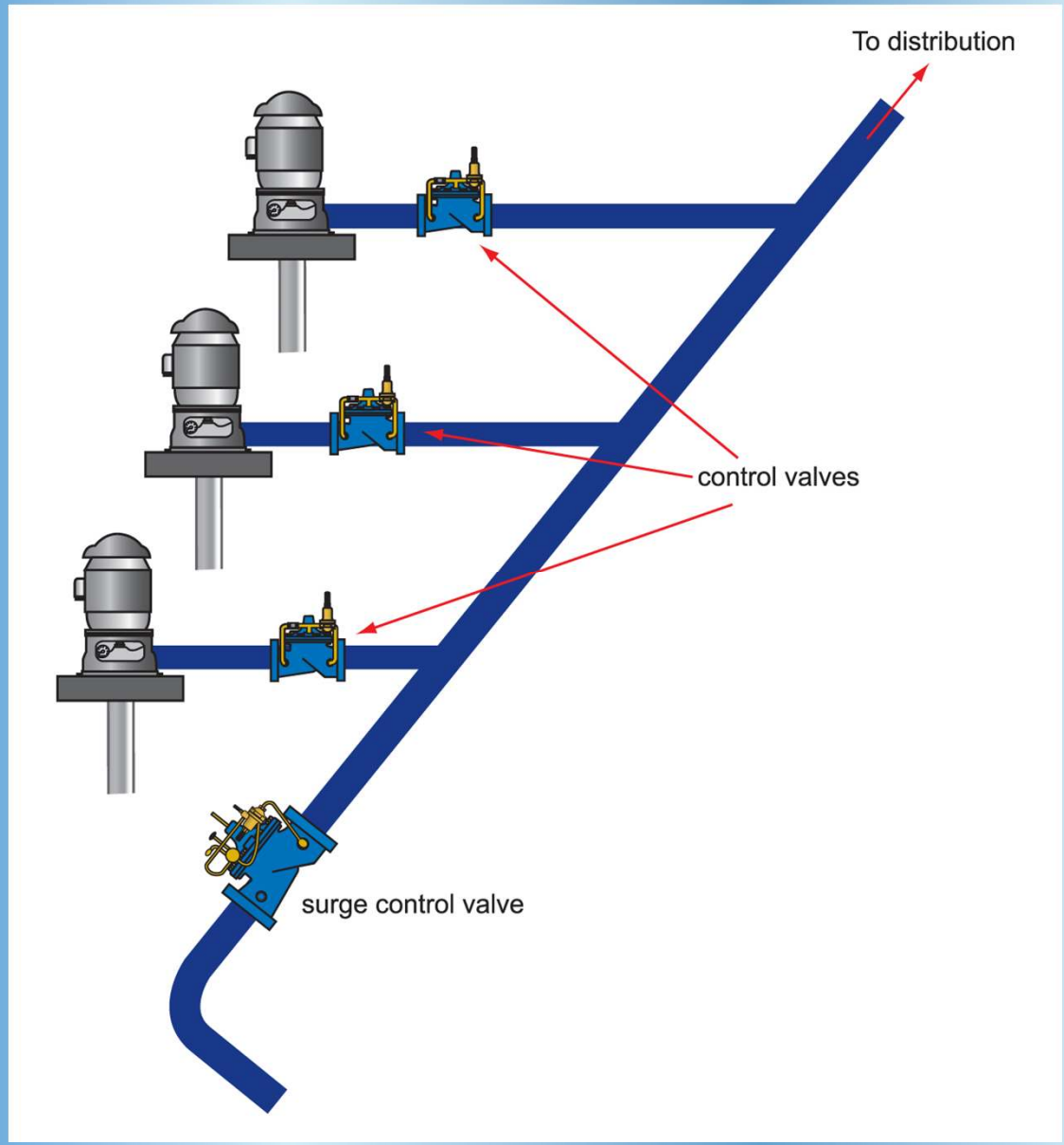


Test Curve With Anticipating Relief Valve



Basic Surge Anticipator Pilot System





Typical Installation at Pump Station

Basic Troubleshooting

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Basic Questions…

- Is the valve installed properly?
- Valves function in the system?
- Have any modifications been made?
- Do you have accurate inlet and outlet pressure gauges?
- Are the isolation valves open?
- If solenoid operated – power to the coil?
- Have you consulted the technical manual? www.cla-val.com

Why control valves don’t work…

- Misapplication?
- Misinstallation – no water or electricity - sense lines connected?
- Inadequate maintenance

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Preventative Maintenance

- Reduces operating cost
- Valve not open fully (reduce flow or pressure)

OR

- Valve will not close (over pressurized system at night)
- Eliminates most emergences and associated damages

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Preventive Maintenance is a Program of :

- Scheduling maintenance – every year/ five year rebuild
- Keeping accurate service records!
- Regular cleaning and inspection – usually once a year.

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Preventative Maintenance Record

Valve No. _____ Installed _____
Location _____
_____
Upstream Pressure Downstream Pressure
Flow Rate _____
Function _____
_____
Size ___ Cat. N o. _____ Code _____
Control Settings _____
_____
Electrical _____
_____
Other _____
_____
Date Service Performed and Parts Used
_____
_____
_____
_____
_____
_____
_____
_____

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Working safely while Troubleshooting and Servicing

- In traffic areas – Keep a defensible traffic space, light boards etc.
- Vaults/confined space – Gas detectors, tripod, harness blowers etc.

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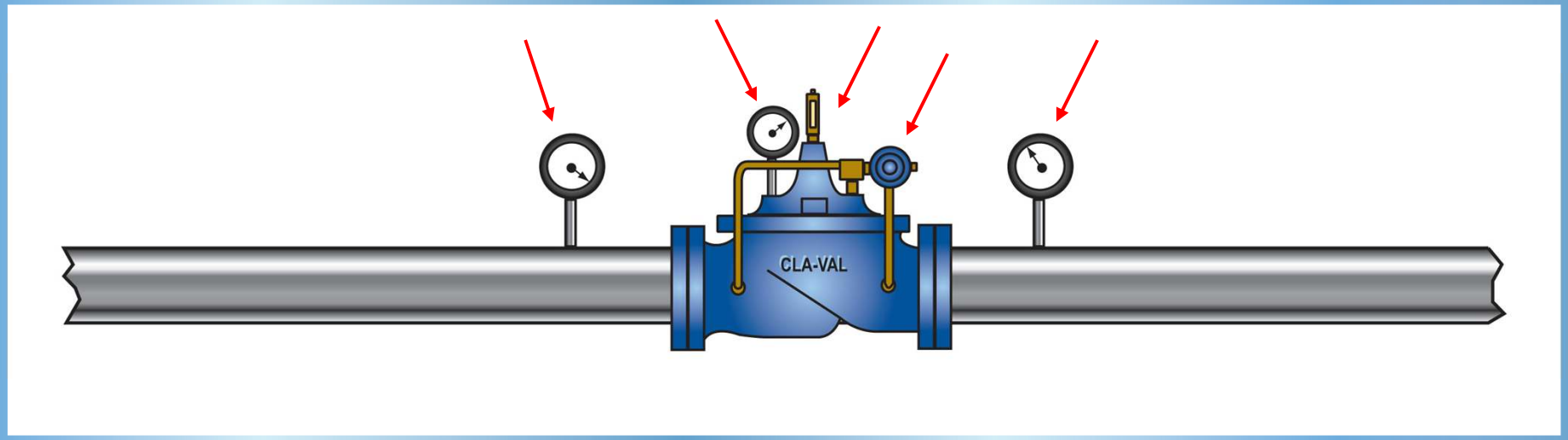
Hytrol Troubleshooting



- Check the effect in the system before testing
- Check pilot system components
- Use three gauges
- Use X101 Valve Position Indicator
- Perform the three Hytrol checks:
  1. Diaphragm test
  2. Stem freedom of movement test
  3. Disc & seat test

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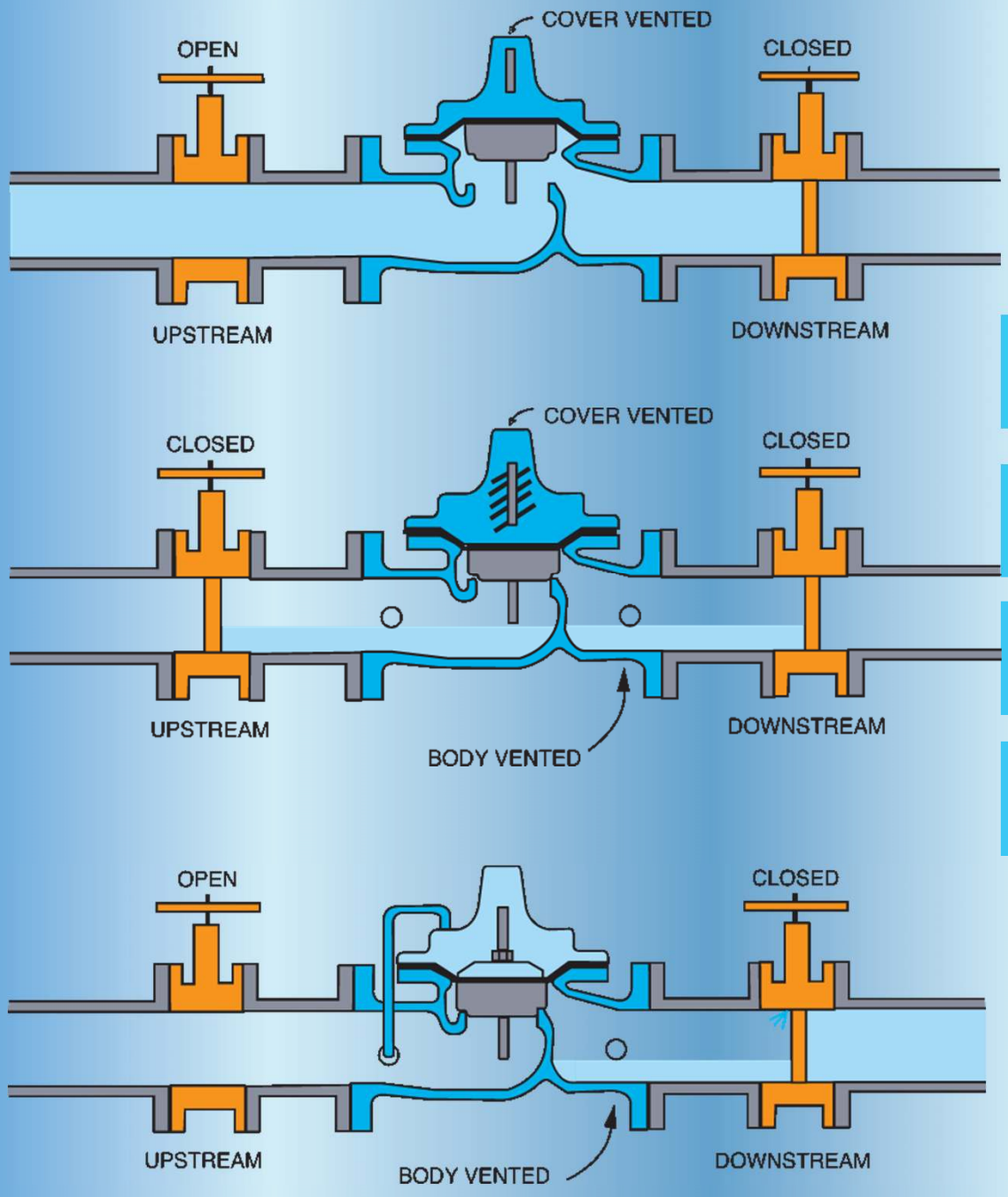


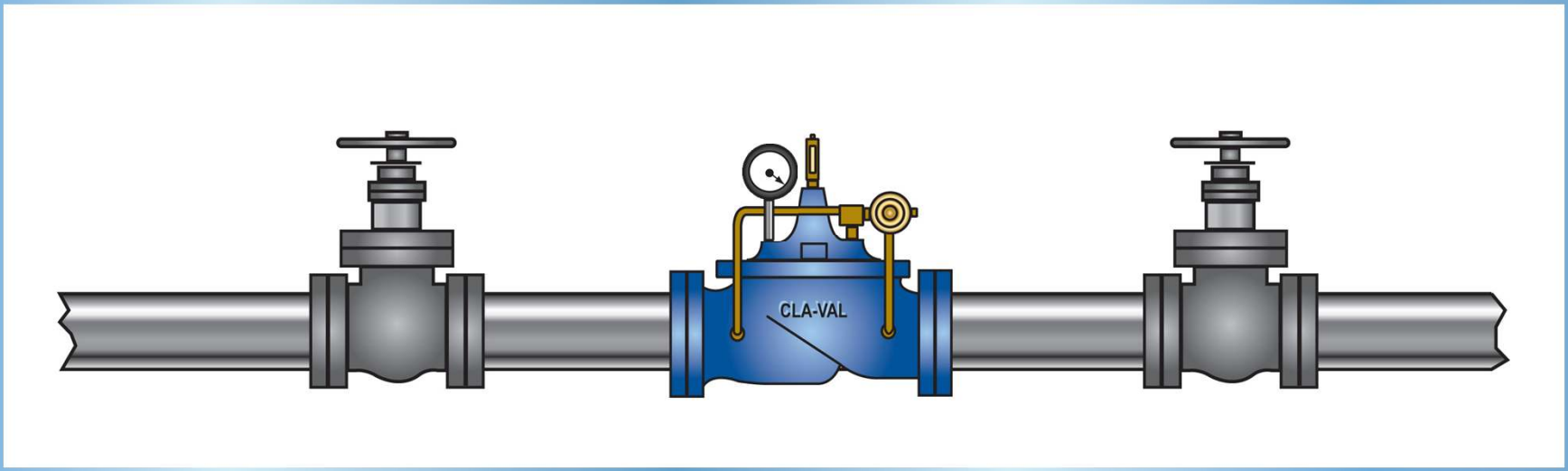
Three Hytrol Checks:

- Diaphragm test
- Stem movement test
- Disc & seat test

Successful Troubleshooting

1. Understanding how the valve works
2. Working safely and efficiently
3. Using test instruments
4. Performing testing in proper sequence

Start-Up Procedures



1. All isolation valves are closed
2. Slightly open inlet isolation valve
3. Install X101 and gauges
4. Bleed air at all high points (pilot control and main valve)
5. Fully open inlet isolation valve
6. Adjust pilot controls to closed position and open all shut-off cocks
7. Slowly open downstream isolation valve
8. Set pilot controls after flow begins

D.M. Valve & Controls Inc.

Innovative Valve Technology