PRESSURE REDUCING VALVE

Purpose: Control outlet pressure Model Number: 40WR

Sizes: 4" - 48"
Type: Throttling
Primarily Controlled By:
Hydraulic pressure
Located: In line
Purpose: To prevent outlet pressure from exceeding a preset maximum level
Inlet Pressure: Maximum: 300 psi
Inlet Pressure: Minimum: 5 psi
Construction: Body: 4" - 36" - Cast iron (semi-steel) with bronze trim
40" - 48" - Ductile iron, with bronze / stainless steel trim
Control Devices:
Strainer: Model 5F-2
Valves:
Needle
Pilot: Pressure Reducing: Model 40WR With internal sensing port or equipped to receive a separate sensing line. (Can also be added to other basic valves as a customized feature.)
See overall parts lists and specific parts information for complete details.

Options

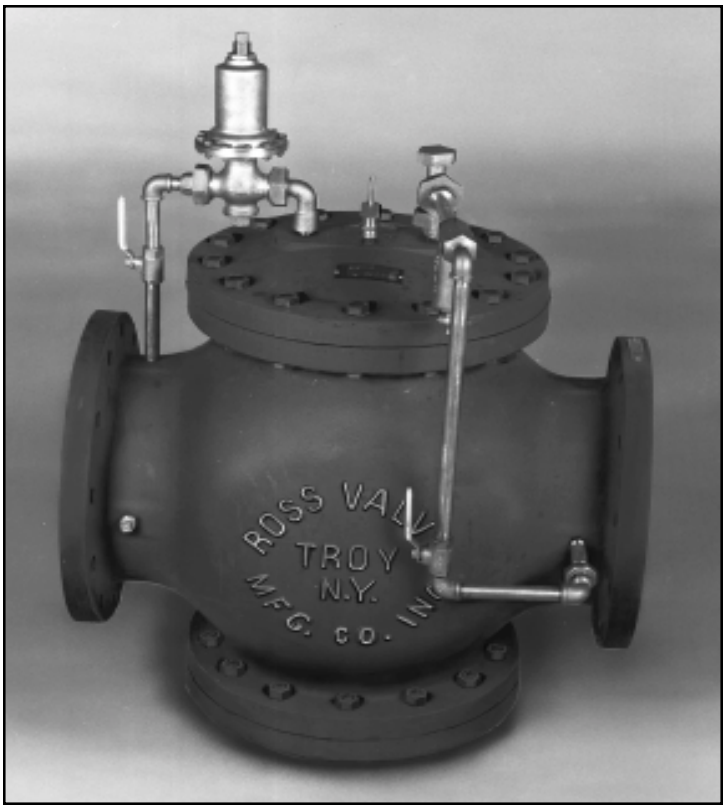
1. Angle body design (90 degree)
2. Cast steel or ductile iron body and stainless steel trim
3. Teflon coated cylinders

Customized Features

Any one or a selection of features can be added to the basic pressure reducing valve.

Code

ACAV - Anti-cavitation Trim
CI - Check Feature (Internal)
CE - Check Feature (Cushioned)
R - Reverse Flow Feature
PR - Dual Pilot: Second Pressure Reducing Pilot Valve
BP - Back Pressure Sustaining Pilot Valve
SC or **SO** - Solenoid Pilot Valve: 2 Way
SG or **SF** - Solenoid Pilot Valve: 3 Way
M - Reversible Electric Motor



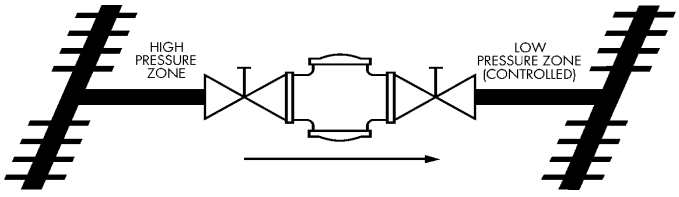
Ross engineers customize the basic **40WR** to accommodate individual needs.

Customized Features - continued

ES - Higher Efficiency Strainer
LS - Limit Switch

Basic Application

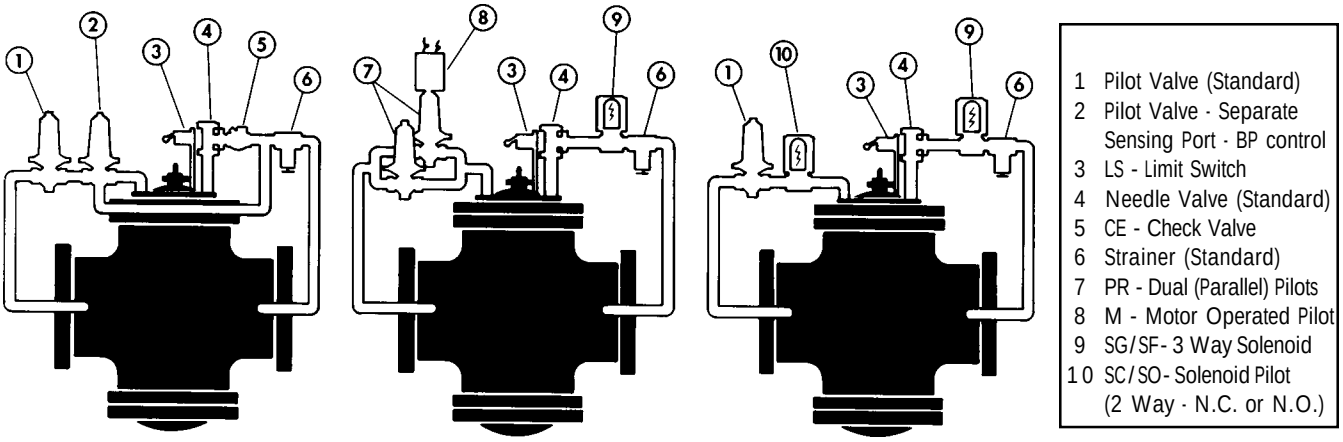
Control systems where the supply (inlet) pressure is higher than the discharge pressure.



If: Supply pressure is higher than user capacity
Ross Main Valve will: Throttle to pass only enough water to the user to maintain a preset lower pressure.

PRESSURE REDUCING VALVE

Customized Features



1 Pilot Valve (Standard)
2 Pilot Valve - Separate Sensing Port - BP control
3 LS - Limit Switch
4 Needle Valve (Standard)
5 CE - Check Valve
6 Strainer (Standard)
7 PR - Dual (Parallel) Pilots
8 M - Motor Operated Pilot
9 SG/SF- 3 Way Solenoid
10 SC/SO- Solenoid Pilot (2 Way - N.C. or N.O.)

ACAV - Anti-Cavitation Seat Trim

Located: Inside the main valve
Purpose: To provide protection against cavitation damage to the internals of the valve
BASIC APPLICATION: To control potential cavitation in a column of water, away from the valve's surfaces.

CI - Check Feature (Internal Modification)

Primarily Controlled By: Hydraulic pressure
Located: Inside the main valve
Purpose: To prevent reverse flow through the main valve
BASIC APPLICATION: Provides extra protection against backflow if there is a sudden drop in inlet pressure (from supply flowing into the valve.), for example, when water is being measured and paid for.
NOTE: The exact modification differs according to need. Some types can only be incorporated in the factory before the valve is shipped and, once done, can't be changed without substantial parts replacement.
CONSULT A ROSS ENGINEER:
1. Whether to use an internal or external check feature. The choice is determined by several factors specific to the valve being customized.
2. To recommend appropriate internal modification, if that is the choice.

CE - Check Feature (Cushioned)

Primarily Controlled By: Hydraulic pressure
Located: On external piping
Purpose: To cause the valve to close on pressure reversal
BASIC APPLICATION:
1. Minimize surge on closure.
2. Provide extra protection against a backflow if there is a sudden drop in inlet pressure (from supply flowing into the valve), for example, when water is being measured and paid for.

CONSULT A ROSS ENGINEER:
Whether to use an internal or external check feature. The choice is determined by several factors specific to the valve being customized.

R - Reverse Flow Feature

Primarily Controlled By: Hydraulic pressure
Located: Inside the main valve
Purpose: To open the main valve on pressure reversal
BASIC APPLICATION: Open the valve to "back feed" water into a normally high pressure zone when the upstream (supply) pressure falls below the downstream (user) pressure. For example, to utilize reserves for adjacent systems under emergency conditions.
NOTE: This modification can only be made in the factory before it is shipped. If a valve is constructed without the reverse flow feature, it can't be changed.

PR - Dual Pilot: Second Pressure Reducing Pilot Valve

Primarily Controlled By: Hydraulic pressure (downstream)
Located: On external piping in parallel with the first pressure reducing pilot valve
Purpose: To prevent outlet pressure from exceeding a second preset level
BASIC APPLICATION:
1. Service one pilot without shutting down the system.

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2. Allow easier adjustment for two different pressure requirements in the line. For instance, when winter and summer conditions create different levels of demand on the system an operator can simply switch control from one preset pilot to the other.

BP - Back Pressure Sustaining Pilot Valve

Primarily Controlled By: Hydraulic pressure (upstream)
Located: On external control circuit in series with the pressure reducing pilot valve
Purpose: To prevent inlet pressure from falling below a preset minimum level
BASIC APPLICATION: Protect a supply system or transmission line against low pressure caused by excessive flow rates through the pressure reducing valve by causing it to sustain a preset inlet pressure that is acceptable to the supplier.

SC - Normally Closed:

SO - Normally Open:

Solenoid Pilot Valve - 2 Way

Primarily Controlled By: Electricity
Located: On external control circuit in series with the pressure reducing pilot valve
A pilot port controls water flow through external piping out of the operating chamber.
Purpose: To override the hydraulic pilot and fully close the main valve
BASIC APPLICATIONS:
1. Remotely start and stop flow through various lines within a system.
2. Allow main valve to function in a predetermined manner in case of a power outage.

OPERATION: Energizing and de-energizing the solenoid pilot controls the main valve.
OPTION 1 - *Solenoid pilot can be:*
Closed when **de-energized** which locks the main valve closed.
Open when **energized** which allows the main valve to operate as a pressure reducing valve.
OPTION 2 - *Solenoid pilot can be:*
Open when **de-energized** which allows the main valve to operate as a pressure reducing valve.
Closed when **energized** which locks the main valve closed.

SG - Opens Valve When Energized:

SF - Opens Valve When De-energized:

Solenoid Pilot Valve - 3 Way

Primarily Controlled By: Electricity
Located: On external control circuit in series with the pressure reducing pilot valve
Three openings and two ports control pressure in the operating chamber
1 Opening - to the operating chamber
1 Opening - to the line (controlled by 1 port)
1 Opening - to waste (controlled by 1 port)
A 3 way solenoid is always open to the operating chamber.
Purpose: To override the hydraulic pilot and lock the main valve in a WIDE OPEN position
BASIC APPLICATIONS:
1. Remove the valve's control over the line flow/pressure so the system operates as if no valve is involved.
2. Allow the main valve to function in a predetermined manner in case of a power outage.

OPERATION: Energizing and de-energizing the solenoid pilot controls the main valve.
OPTION 1 - *When the pilot is:*
De-energized - Port to the line opens/waste port closes which allows the main valve to operate as a pressure reducing valve.
Energized - Port to the line closes/waste port opens which locks the valve in a WIDE OPEN position
OPTION 2 - *When the pilot is:*
De-energized - Port to the line closes/waste port opens which locks the valve in a WIDE OPEN position.
Energized - Port to the line opens/waste port closes which allows the main valve to operate as a pressure reducing valve.

M - Reversible Electric Motor

Primarily Controlled By: Electricity
Located: Coupled to the adjusting screw on the pressure reducing pilot valve
Purpose: To change the hydraulic pilot setting from a remote point
OPTIONS: Motor limit switches - To prevent an operator from adjusting beyond fixed points (preserve the range).
BASIC APPLICATION: Control a sophisticated system by allowing the pilot setting to be changed through a wide range from a remote point.
NOTE: Valve will continue to regulate the downstream pressure at its last set point if a power failure occurs.

(Customized Features continued on next page)

PRESSURE REDUCING VALVE

ES - Higher Efficiency Strainer

Located: On external piping
Purpose: To provide extra protection against fouling or damaging the control system from foreign particles
BASIC APPLICATION: Protect external piping and controls when extremely fine particles and/or more than usual debris is expected.
NOTE: This strainer offers an increased capacity to hold debris and comes with a finer screen than the standard strainer.

LS - Limit Switch

Primarily Controlled By: Valve position indicator
Located: Attached to the valve position indicator
Purpose:
1. To signal if the valve is open or closed
2. To start or stop allied equipment

COMMON CONFIGURATIONS	
1	40WR-CI or 40WR-CE
2	40WR-R
3	40WR-PR
4	40WR-BP
5	40WR-BP-CI or 40WR-BP-CE
6	40WR-SO or 40WR-SC
7	40WR-BP-SO or 40WR-BP-SC
8	40WR-M

Control Unit

By regulating the flow in and out of the operating chamber, an external piping circuit accurately controls the piston position. It includes:
1. Into the Operating Chamber
   a. External piping - Also attached to the inlet side of the main valve introduces main line inlet water up into the operating chamber.
   b. Needle valve - Limits water flow into the operating chamber. (Can be adjusted to increase or decrease rate at which water flows into the chamber.)
2. Out of the Operating Chamber
   a. External piping - Also attached to the outlet side of the main valve, directs water leaving the operating chamber to the downstream flow.
   b. Hydraulic pilot valve - Controls water flow out of the operating chamber by means of a diaphragm which is held in balance between a spring load on its top side and downstream water pressure underneath. (The spring resistance is preset and can be adjusted when pressure requirements change.)

Operation

Because of the straight forward interaction between the control unit and the throttling piston, the valve automatically delivers a smooth flow while discharging the desired downstream reduced pressure levels.
1. When water flows out of the main valve at a preset pressure level, the
   a. Control unit causes water to flow at an equal rate in and out of the operating chamber.
   b. Piston rests in a mid open/closed position.
2. When downstream (user) pressure increases, the
   a. Downstream pressure backs up through the external pipe, into the pilot valve pushing the pilot diaphragm up.
   b. Pilot valve seat gradually closes.
   c. Water continues to enter the operating chamber through the needle valve and gets trapped.
   d. Water pressure builds up in the operating chamber, pushing the piston down.
   e. Main valve gradually closes.
3. When downstream (user) pressure decreases, the
   a. Downstream pressure on the outlet side of the pilot valve decreases.
   b. Pressure under the pilot diaphragm falls below the preset spring load pressure which pushes it down.
   c. Pilot seat gradually opens.
   d. Pressure in the operating chamber drops as more water flows out than is let in through the needle valve.
   e. Piston gradually rises and the main valve opens accordingly.

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PRESSURE REDUCING VALVE

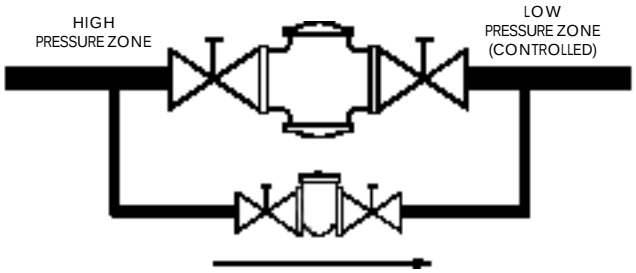
Model Number: 40WR

Recommendation

When a wide range of flows is required, it is recommended that a large reducing valve (40WR series) be installed on a pipe parallel to a smaller reducing valve (23WR or 98EP) as follows:

The small valve - Usually adjusted for a discharge pressure setting of 3 to 5 psi above the large valve setting, will handle the low flow requirements.

The large valve - Opens only when the demands exceed the small valve capacity and pressure drops to the large valve preset pressure.



Benefits include:

1. **Reduces maintenance costs** on the larger, more expensive valve which result when the large valve operates at low flows.
2. Reduces noise which occurs when a large valve operates at low flows.
3. Avoids hunting action of a single large valve operating at low flows and the resulting pressure fluctuations.
4. Provides uninterrupted service while repacking one of the reducing valves.
5. Minimizes the effects of failure of a single large unit.

Cavitation

Cavitation may occur when 2 factors, a high pressure drop combined with a low outlet pressure, are present. Cavitation damage is caused by the collapse of the small cavities formed in the fluid stream during the sudden decrease in pressure. When the valve body or pipe walls confine the fluid stream and raise the pressure above the vapor pressure of the "bubbles", minute implosions occur resulting in extremely high impact forces. Where these implosions contact the valve parts, structural damage will result. If conditions for cavitation are expected, consult a Ross engineer.

Sizing

DO NOT OVERSIZE.

Ideal Operating Position: 20% to 100% open - In this position seat erosion is at a minimum and pressure control is stable.

Maximum Flow Rates: Limit line velocity to approximately 15 fps. The valve is capable of passing larger quantities of water for short periods of time. Sustained rates at higher levels may result in high and increased valve maintenance.

Minimum Flow Rates: Intended for sustained flow rates.

Valves (in good operating condition) can shut off drop tight and handle lower flows. Sustained rates at lower levels may result in high maintenance costs.

Note

It is important to service the pilot valve periodically in order to insure dependable service. If a second pilot valve (customized feature) is not added, this will require periodic shutdown of the system.

Consult a Ross Representative

1. For recommendations if conditions for cavitation are encountered.
2. To recommend correct valve sizing.
3. To build a customized valve for any specific requirements.

(Operation continued on next page)

PRESSURE REDUCING VALVE

ROSS ADVANTAGE

1. Ross engineers provide in depth service based on:
   a. state of the art technology and
   b. the company's experience which dates back to 1879.
2. Globe body design provides most desirable characteristics for pressure reduction.
3. Throttling action of piston gives a relatively unobstructed flow at maximum flow rates.
4. Valve operates totally on hydraulic pressure. No external controls are needed.
5. Valve is completely pre-piped, tested and adjusted in the factory.
6. Rugged construction materials provide a longer valve life and insure that the valve WILL NOT experience sudden breakdowns due to component failures.
7. All parts are built and manufactured in the USA.

Additional Information

Approximate Shipping Weights (lbs.)

Valve Size	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"	42"	48"
125 lb. Flanges	235	390	755	965	1530	2120	2750	3300	4050	5200	9800	11800	18300	23000
250 lb. Flanges	275	430	810	1050	1610	2275	2900	3500	4400	5500	10800	12800	19400	24500

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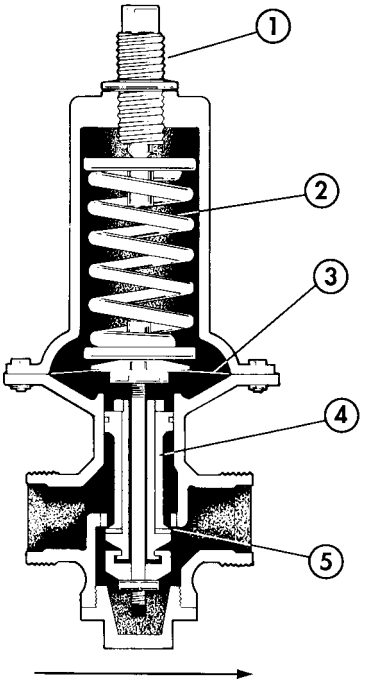
PRESSURE REDUCING VALVE

Pilot Valves — Model Number: 40WR



PARTS	
1	Adjusting Screw
2	Adjusting Spring
3	Diaphragm
4	Pilot Piston
5	Pilot Seat

Pilot: Internal Sensing Port

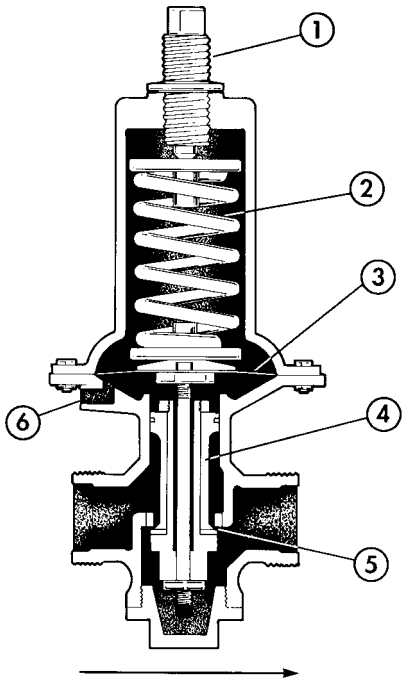
Primarily Controlled By:
Hydraulic pressure (downstream)

Located: On external piping which runs from the operating chamber to the outlet side of the main valve

Purpose: To control flow out of the mainline valve

Operation

1. When downstream (user) pressure increases, the
   a. Pressure backs up into the pilot valve, increasing pressure up through a hollow stem, under the diaphragm, pushing the diaphragm up.
   b. Pilot seat closes, restricting flow out of the operating chamber.
   c. Main valve closes accordingly.
2. When downstream (user) pressure decreases, the
   a. Pressure under the diaphragm decreases.
   b. Pilot seat opens wider, increasing flow out of the operating chamber.
   c. Main valve opens accordingly.



PARTS	
1	Adjusting Screw
2	Adjusting Spring
3	Diaphragm
4	Pilot Piston
5	Pilot Seat
6	Sensing Port

Pilot: External Sensing Port

Primarily Controlled By:
Hydraulic pressure (downstream)

Located: On external piping which runs from the operating chamber to the outlet side of the main valve

Purpose: To control flow out of the mainline valve

NOTE: Utilizes an external pressure sensing connection and requires a separate 1/2 inch line to the point of pressure control. Generally used where an accurate pressure signal can not be obtained at the valve body tap due to turbulence, velocity head, etc.

Operation

1. When downstream (user) pressure increases,
   a. Pressure backs up through top piping under the diaphragm, pushing the diaphragm up.
   b. Pilot seat closes, restricting flow out of the operating chamber, through the lower piping.
   c. Main valve closes accordingly.
2. When downstream (user) pressure decreases,
   a. Pressure under the diaphragm decreases.
   b. Pilot seat opens wider, increasing flow out of the operating chamber through the lower piping.
   c. Main valve opens accordingly.

Standard Pilot Adjustment Ranges

These ranges should be used as a guide only. When specific operating conditions are known, the pilot is constructed to give at least a 30% adjustment above and below the anticipated set point. Standard pilot adjustment ranges: 5 to 25 psi; 15 to 60 psi; 40 to 100 psi; 80 to 180 psi; 150 to 250 psi; over 200 psi.

PRESSURE REDUCING VALVE

Specifications

Basic Valve: Pressure Reducing (40WR)

The pressure reducing valve shall maintain a pre-adjusted downstream pressure regardless of changes in flow rate.

The pressure reducing valve shall reduce a high incoming pressure to a lower, constant discharge pressure regardless of variations in flow rate or changes in upstream pressure.

The valve shall be ruggedly constructed with a size _____inch, 125 lb./250 lb. flanged, full ported globe/angle body design.

The pressure reducing valve shall be fully bronze mounted, external pilot operated, with a rugged internal free floating piston (operated without springs, diaphragm or levers), single seat with seat bore equal to size of valve.

The minimum travel of the piston shall be equal to 25% of the diameter of the seat.

For true alignment (to correct lateral thrust and stem binding) the piston shall be guided above and below the seat a distance no less than 75% of the seat diameter.

The piston shall carry a contoured cushion device that will cause a gradual change in flow area as the valve approaches the seat. The cushion device must move with the piston to minimize head loss when the valve is fully opened and so designed as to insure positive closure.

The main valve shall be packed with leather (or other soft material) to insure tight closure and prevent metal to metal friction and seating.

The main valve shall include a position indicator to show position of opening of the piston.

The main valve will include gauge cocks for testing purposes.

The pilot valve, controlling operation of the main valve, shall have a range for adjustment, be easily accessible and so arranged to allow for its removal from the main valve while the main valve is under pressure.

The pilot valve and all associated piping and fittings necessary for proper operation shall be factory assembled and furnished with the pressure reducing valve.

Ball valves shall be installed in the control piping to completely isolate the pilot valve when conditions may require pilot isolation for maintenance or repair.

An external strainer with blow-off will be provided in the control circuit to protect the pilot and needle valves.

The design shall be such that repairs and dismantling internally of the main valve may be made without its removal from the line.

Operation

ACAV - The valve will include an **anti-cavitation trim feature** to prevent cavitation damage to the valve internals.

CI - The valve will include an **internal check feature** to prevent reverse flow through the valve.

CE - The valve will include an **external check feature** to prevent reverse flow through the valve.

R - The valve will open to r**everse feed** whenever the normal supply pressure drops below the discharge pressure.

PR - The valve will be equipped with **dual pilots**.

BP - The valve will include a **back pressure sustaining pilot** to prevent the incoming pressure from falling below a pre-adjusted minimum.

SC - The valve will include a **normally closed 2 way solenoid** to lock the valve closed when de-energized.

SO - The valve will include a **normally open 2 way solenoid** to lock the valve closed when energized.

SG - The valve will include a **3 Way solenoid** to open the valve fully when energized .

SF - The valve will include a **3 way solenoid** to open the valve fully when de-energized.

M - The pilot shall be equipped with a **reversible motor** operator connected to the pilot adjusting screw. The motor shall operate on 120 volt AC 60 Hz supply and shall incorporate built in limit switches to limit the pilot adjustment range.

ES - The valve will include a **higher efficiency strainer** to provide extra protection against fouling or damaging the control system.

LS - The valve will include a **limit switch** to signal if the valve is opened or closed.

Physical and Chemical Properties

The 125 lb. and 250 lb. flanged assemblies shall conform to ANSI standards for flange thickness and drilling and wall thickness of body and caps.

Te valve shall be ruggedly constructed of first class grey iron.

The grey iron shall be free from cold shuts, defective or spongy spots and conforming to ASTM specification A-126 Class B with bronze or stainless steel trim.

The bronze parts shall conform to ASTM specification B-62.

For sizes 4" - 12"

The seat disc shall be bronze.

For sizes 4" - 12"

The seat disc shall be bronze.

The main cup plates shall be bronze.

The main bushing shall be bronze.

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PRESSURE REDUCING VALVE

Model Number: 40WR

For sizes 14" - 36"
The seat disc shall be a cast iron center / bronze outer ring.
The main cup plates shall be bronze.
The main bushing shall be bronze.

For sizes 42" - 48"
The seat disc shall be a cast steel.
The main cup plates shall be cast steel.
The main bushing shall be stainless steel.

For all sizes
The external pilot valve shall be bronze
The rugged internal piston shall be bronze.
The seat ring shall be bronze.
The stem nuts shall be bronze.
The seat packing support shall be bronze.
The position indicator shall be bronze.
The bottom cap cylinder shall be bronze.
Piping shall be rigid brass pipe.
The strainer shall be bronze body with stainless steel screen.
The ball valves shall be full ported with stainless steel shaft, nut and adjusting handle.
Stainless steel shall be Grade 303 / 304 / 316 / CF8M /_____.

(*Option*) The bottom cap cylinder shall be bronze and teflon coated. The Teflon shall be applied in two parts: Part 1 shall be a primer Teflon coating with a minimum thickness of 5 mils. Part 2 shall be a finish coat of Teflon TFE with a minimum thickness of 5 mils. for a final coat minimum thickness of 10 mils.

Test

The test before shipment may be witnessed by a representative of the Engineers for simulated field conditions and a cold hydrostatic test of at least 100% above the maximum pressure for which the valve is to be operated.

Painting

Ferrous surfaces of the valve shall be coated with NSF Certified Epoxy in accordance with ANSI / NSF Std. 61, and conforms to AWWA D102 Inside System No. 1.

Reference

The valve will be equal in all respects to the 40WR _____ model as manufactured by the Ross Valve Mfg. Co., Inc., 6 Oakwood Ave., Troy, NY 12181

NOTE: To indicate the basic valve with the required customized features, simply add the related codes to the basic valve number.

Example: The valve will be equal in all respects to the 40WR-PR-BP-SO model as manufactured by the Ross Valve Mfg. Co., Inc. 6 Oakwood Ave., Troy, NY 12181.
(40WR-PR-BP-SO = 40WR with pressure reducing, back pressure sustaining and open solenoid pilot valves)

Customized Feature Codes

ACAV - Anti-cavitation Trim
CI - Check Feature: Internal
CE - Check Feature: External
R - Reverse Flow
PR - Dual Pilot: Second Pressure Reducing Pilot Valve
BP - Back Pressure Sustaining Pilot Valve
SC - Solenoid Pilot Valve: 2 Way - Normally Closed
SO - Solenoid Pilot Valve: 2 Way - Normally Open
SG - Solenoid Pilot Valve: 3 Way - Opens Valve When Energized
SF - Solenoid Pilot Valve: 3 Way - Opens Valve When De-energized
M - Reversible Electric Motor
ES - Higher Efficiency Strainer
LS - Limit Switch

NOTE: The Ross Valve Mfg. Co., Inc. reserves the right to modify valve construction which will result in equal or superior performance to existing designs. These modifications may be made at any time and at the sole discretion of the manufacturer.